DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 11TH FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8480 • Fax: (808) 768-4567
Web site: www.honolulu.gov

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APR 1 3 2012

PETER B. CARLISLE
MAYOR

LORI M. K. KAHIKINA, P.E.
DIRECTOR

CHRIS TAKASHIGE, P.E.
DEPUTY DIRECTOR

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GROUP 70 INTL

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February 21, 2012

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OFC. OF ENVIRONMENTAL
QUALITY CONTROL

Mr. Gary Hooser, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Mr. Hooser:

Subject: Draft Environmental Assessment (EA) for Kualoa Regional Park Wastewater System Improvements, Ko'olau Poko, O'ahu

The City and County of Honolulu, Department of Design and Construction has reviewed the Draft EA for the subject project, and anticipates a Finding of No Significant Impact. Please publish notice in the next available OEQC Environmental Notice.

We have enclosed a completed OEQC Publication Form and one (1) copy of the document in pdf format on a CD; and one (1) hardcopy of the Draft EA. Please call Jay Hamai at 768-8750, if you have any questions.

Very truly yours,

Chris Takashige

for Lori M. K. Kahikina, P.E.
Director

Enclosure

Project Name: Kualoa Regional Park Wastewater System Improvements

Publication Form
The Environmental Notice
Office of Environmental Quality Control

Instructions: Please submit one hardcopy of the document along with a determination letter from the agency. On a compact disk, put an electronic copy of this publication form in MS Word and a PDF of the EA or EIS. Please make sure that your PDF documents are ADA compliant. Mahalo.

Applicable Law:	Chapter 343, HRS; HAR, Title 11 Chapter 200; Chapter 205A HRS; HAR; Title 11 Chapter 26; and Chapter 25 ROH.
Type of Document:	Environmental Assessment
Island:	O‘ahu
District:	Ko’olau Poko
TMK:	1-4-9-04:01
Permits Required:	Building Permits (Demolition, Buildings, Electrical, Plumbing); Grading, Grubbing, Trenching and Stockpiling Permits; Approval of the wastewater system from the State of Hawaii, Department of Health; Special Management Area Major Use Permit
Proposing Agency:	City and County of Honolulu, Department of Design and Construction
Address	650 S. King Street, 11th Floor, Honolulu, HI 96813
Contact & Phone	Lori M.K. Kahikina, P.E., (808) 768-8480
Accepting Authority:	City and County of Honolulu, Department of Design and Construction
Address	650 S. King Street, 11th Floor, Honolulu, HI 96813
Contact & Phone	Lori M.K. Kahikina, P.E., (808) 768-8480
Consultant:	Group 70 International, Inc.
Address	925 Bethel Street, 5th Floor, Honolulu, HI 96813
Contact & Phone	Jeff Overton, (808) 523-5866

Project Summary: Summary of the direct, indirect, secondary, and cumulative impacts of the proposed action (less than 200 words). Please keep the summary brief and on this one page.

The wastewater systems serving the Kualoa Regional Park comfort stations do not meet current State of Hawaii, Department of Health (DOH) requirements. The wastewater systems for each comfort station have aged and cannot operate as originally designed. Therefore, they require pumping two to three times a week, with greater frequency during peak park usage. In addition, the shoreline has eroded significantly at Comfort Station #3, forcing its closure.

The City is mandated to make improvements under a DOH settlement agreement. The proposed project involves replacing the existing wastewater systems with new collection lines, pump stations, force mains, and a centralized treatment and disposal system. This will directly improve the current ‘septic’ wastewater system to an aerobic system that produces higher-quality effluent.

The project site has been previously disturbed through farming, military uses, sand mining, and park facility construction. Construction for this project will take place in areas previously disturbed, and is not anticipated to generate substantial cumulative impacts. Overall, the project’s secondary impact would be a beneficial effect on the public health and environment, and allow for continued public enjoyment of the park.

Kualoa Regional Park
Wastewater System Improvements

Koʻolau Poko District, Oʻahu, Hawaiʻi

Draft Environmental Assessment

Applicant:
City and County of Honolulu
Department of Design and Construction
650 South King Street, 14th Floor
Honolulu, HI 96813

Prepared By:
Group 70 International, Inc.
Sustainable Development • Architecture • Planning & Environmental Services
Civil Engineering • Interior Design
925 Bethel Street, 5th Floor
Honolulu, HI 96813

March 2012

Kualoa Regional Park
Wastewater System Improvements

Koʻolau Poko District, Oʻahu, Hawaiʻi

TMK (1) 4-9-004: 01

Draft Environmental Assessment

This environmental document is prepared in accordance with the requirements of
Chapter 323, Hawaiʻi Revised Statutes and
Hawaiʻi Administrative Rules, Title 11, Department of Health.

Applicant:
City and County of Honolulu
Department of Design and Construction
650 South King Street, 14th Floor
Honolulu, HI 96813

March 2012

Group 70 International • Sustainable Development • Architecture • Planning & Environmental Services
Civil Engineering • Interior Design
925 Bethel Street, Fifth Floor • Honolulu, Hawaii 96813 • Phone (808) 523-5866 FAX (808) 523-5874

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A Final Submittal Geotechnical Exploration and Foundation Evaluation Report, Reconstruct Park Wastewater Systems at Kualoa Regional Park, Kualoa, Oahu, Hawaii, Yogi Kwong Engineers, LLC, March 2012

B Marine Environmental Assessment in the Vicinity of the Kualoa Regional Park, Oahu, Hawaii, Marine Research Consultants, Inc., December 2011

C DRAFT Archaeological Inventory Survey for Reconstructed Wastewater Systems and Bathhouse Replacement at Kualoa Regional Park, Kualoa Ahupuaʻa, Koʻolaupoko District, Island of Oʻahu, Cultural Surveys Hawaiʻi, Inc., March 2012

D Cultural Impact Assessment for the Proposed Project to Reconstruct Park Wastewater Systems at Kualoa Regional Park, Kualoa Ahupuaʻa, Koʻolaupoko District, Oʻahu Island, Cultural Surveys Hawaiʻi, Inc., January 2012

E Summary of Alternatives Presented to Stakeholder Groups

1.0
Introduction

1.0 INTRODUCTION

This Environmental Assessment (EA) has been prepared in accordance with the requirements of Chapter 343, Hawai'i Revised Statutes (HRS) and Hawai'i Administrative Rules, Title 11, Chapter 200, Department of Health, which set requirements for the preparation of environmental assessments.

1.1 PROJECT INFORMATION SUMMARY

Type of Document:	Environmental Assessment
Project Name:	Kualoa Regional Park Wastewater System Improvements
Ch. 343, HRS Triggers:	Use of County Land and Funds; Use Within National Historic Site
Applicant / Accepting Authority:	City and County of Honolulu, Department of Design and Construction 650 South King Street, 14th Floor, Honolulu, Hawai'i 96813 Contact: Lori M. K. Kahikina, P.E. Tel: (808) 768-8480
Project Sponsor / Recorded Fee Owner:	City and County of Honolulu, Department of Parks and Recreation 1000 Uluohia Street, Suite 309, Kapolei, Hawai'i 96707 Contact: Gary B. Cabato Tel: (808) 768-3001
Planning Consultant:	Group 70 International, Inc. 925 Bethel Street, 5th Floor, Honolulu, Hawai'i 96813 Contact: Jeff Overton Tel: (808) 523-5866
Anticipated Determination:	Finding of No Significant Impact (FONSI)
Project Location:	Kualoa Regional Park, 49-479 Kamehameha Highway Kualoa, Ko'olau Poko District, O'ahu *(Figure 1-1)*
Landowner:	City and County of Honolulu (City)
Tax Map Key:	TMK: (1) 4-9-004: 01 *(Figure 1-2, Figure 1-3)*
Land Area:	Total Park Area: 149 acres; Wastewater Facilities Area: 2 acres
State Land Use District:	Agricultural and Conservation *(Figure 1-4)*
City Zoning:	P-1 Restricted Preservation/P-2 General Preservation *(Figure 1-5)*

City Development Plan:	Koʻolau Poko Sustainable Communities Plan *(Figure 1-6)*
Special Management Area:	Located within Special Management Area (SMA) *(Figure 1-7)*
Historic Designation:	National Register of Historic Places, Kualoa Ahupuaʻa Historical District, Site #74000718
Flood Zone:	Zones VE, AE and X (100 Year Coastal Flood, 100 Year Flood, and Outside 500 Yr. Flood Level) (*Figure 3-5*)

1.2 OVERVIEW OF THE PROPOSED PROJECT

Kualoa Regional Park is located on the windward shore of Oʻahu, approximately 25 miles from downtown Honolulu. The park is bounded to the north by Kamehameha Highway, to the east by the Pacific Ocean, to the south by Kāneʻohe Bay, and to the west by Mōliʻi Pond. The park is generally used by the public for picnics, swimming and camping, with campers representing the highest percentage user group at the park. Kualoa Regional Park is also a favorite wayside scenic stop for visitors traveling along Kamehameha Highway, due to the dramatic views of the ocean, shoreline, Mokoliʻi Islet (Chinaman's Hat), Mokapu peninsula, and Koʻolau Mountains.

Existing facilities include four Comfort Stations, a Food Service Building, a Recreation/Administrative Building, a Caretaker's Cottage, and a Maintenance Facility. Picnic areas are located throughout the park. The park has large lawn areas which are popular for flying kites, group picnics and camping. There is a narrow beach fronting most of the shoreline of the park.

For over a decade, the individual wastewater systems *(Figure 1-8)* serving the park facilities have not functioned properly, due to overall aging. In 2005 the City Department of Parks and Recreation (DPR) disconnected the disposal system (leach fields) from the treatment systems (pre-loader and cavitette tanks). Since then, the preloader unit and cavitette system for each comfort station are currently pumped two to three times a week, and with greater frequency during peak park usage. In addition, the shoreline has eroded significantly in the vicinity of the leach field for Comfort Station #3. These problems forced the closure of this comfort station in 2005. The continued eroding shoreline will eventually affect Comfort Stations #1 and #2.

The holding capacity of existing tanks becomes problematic during summer months when camping usage peaks. To handle the heavy usage of the facility by campers, the City brings in portable toilets to Comfort Station #4. These toilets require frequent pumping to keep them operational.

To address these problems, the proposed project involves replacing the existing individual wastewater systems with new collection lines, force mains, pump stations and a centralized treatment and disposal system. Comfort Station #3 will be removed, and a replacement Bathhouse constructed at a central location in the park *(Figure 2-1).* These wastewater system

improvements are needed to protect the public health and environment and meet State Department of Health (DOH) requirements.

1.3 PURPOSE OF THE ENVIRONMENTAL ASSESSMENT

This EA is being prepared pursuant to Hawai'i State laws. The EA will comply with Hawai'i's Environmental Review Process, HRS Chapter 343, which requires that any program or project that proposes the use of County land or funds, or use within any Historic District, must undergo an environmental review. The EA examines the potential environmental impacts of the project and seeks agency and public comment on subject areas that should be addressed.

The entire project site also lies within the boundary of the City SMA. Proposed improvements are valued over $125,000, subjecting the project to SMA Major Use Permit requirements pursuant to Section 205A HRS, and Chapter 25 Revised Ordinances of Honolulu. This EA is being prepared in support of the upcoming SMA Use Permit application, which will be submitted to the City and County of Honolulu Department of Planning and Permitting (DPP).

1.4 AGENCIES, ORGANIZATIONS AND INDIVIDUALS CONTACTED IN PRE-CONSULTATION

Listed below are the agencies or parties contacted regarding the proposed project prior to publication of this Draft EA. A list of those agencies, organizations and individuals that will be provided an opportunity to review the Draft EA is provided in Section 8.0 of this document. The City Department of Design and Construction (DDC) is the Accepting Authority for this proposed action. The project sponsor is DPR.

<u>Federal Agencies</u>
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service

<u>State Agencies</u>
Department of Agriculture
Department of Business, Economic Development, and Tourism (DBEDT)
DBEDT, Office of Planning
DOH, Wastewater Branch
Department of Land & Natural Resources (DLNR)
DLNR, State Historic Preservation Division (SHPD)
Office of Environmental Quality Control (OEQC)
Office of Hawaiian Affairs (OHA)

<u>City Agencies</u>
Board of Water Supply
DDC
Department of Environmental Services
Department of Facility Maintenance
DPR
DPP, Land Use Approval Branch

Other Organizations and Individuals
Amy Luersen
Betty-Ann Keala
Bob Nakata
Bula Logan
Calvin & Charlene Hoe and ʻOhana
Charles Kapua
City Council Chair Ernest Y. Martin
Creighton & Cathleen Mattoon
Dannette Leota-Pascual
Dawn Wasson
Gladys Pualoa Ahuna
Gloria Fraiola
Hawaiʻi State Library
Herbert Hoe
Historic Hawaiʻi Foundation
Ipolani Tano
Joyce Uyehara
Kualoa Ranch Hawaiʻi, Inc.
Kahaluʻu Neighborhood Board #29
Kāneʻohe Public Library
Kathryn Diamond
Katie Barbieto
Kekela Miller
Keo Coleman
Koʻolauloa Hawaiian Civic Club (Danielle Beirne-Keawe)
Koʻolaupoko Hawaiian Civic Club (Mahealani Cypher)
Moana Lee
Oʻahu Island Burial Council (OIBC) Koʻolauloa Representative (Cy Bridges)
OIBC Koʻolaupoko Representative (Aaron Mahi)
Phillip & Margery Kekauoha
Ralph Makaiau Jr.
Roland "Ahi" Logan
Sam Kekauoha
Sierra Club, Hawaiʻi Chapter
State House Rep. Jessica Wooley
State Senator Clayton Hee
University of Hawaiʻi (UH), Environmental Center
UH Hamilton Library
Winifred Miller

1.5 CONTENTS OF THE DRAFT ENVIRONMENTAL ASSESSMENT

This EA evaluates the potential impacts on the natural and human environment resulting from the proposed Kualoa Regional Park Wastewater Systems Improvement project. This document is presented in six sections. Section 1.0 contains the introduction and project overview. Section 2.0 describes the proposed project and Section 3.0 addresses the environmental, social and economic setting of the proposed project. Alternatives to the proposed project are presented in Section 4.0. A review of the appropriate existing State and City policies and plans is contained in Section 5.0. Section 6.0 contains a statement of anticipated determination, with findings and reasons supporting the anticipated determination. References used in the preparation of this document are in Section 7.0, and Section 8.0 lists agencies, organizations, and individuals that have been contacted in the pre-consultation phase, and those that will receive a copy of this Draft EA.

Figure 1-1 Project Location Map

Figure 1-2 Tax Map Key

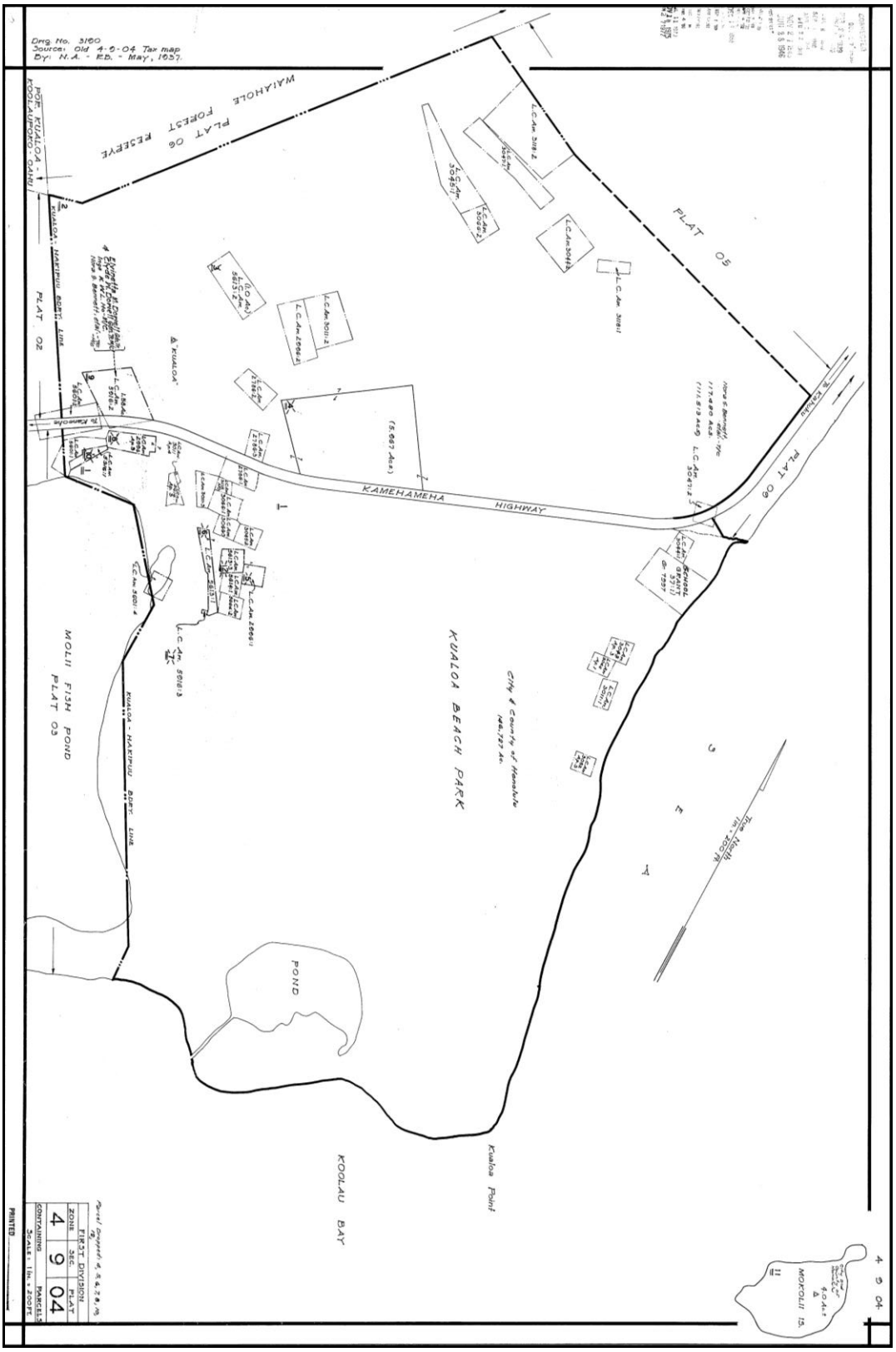

Figure 1-3 City and County of Honolulu Tax Map 4-9-04

Figure 1-4 State Land Use Classification Map

Figure 1-5 City and County of Honolulu Zoning Map

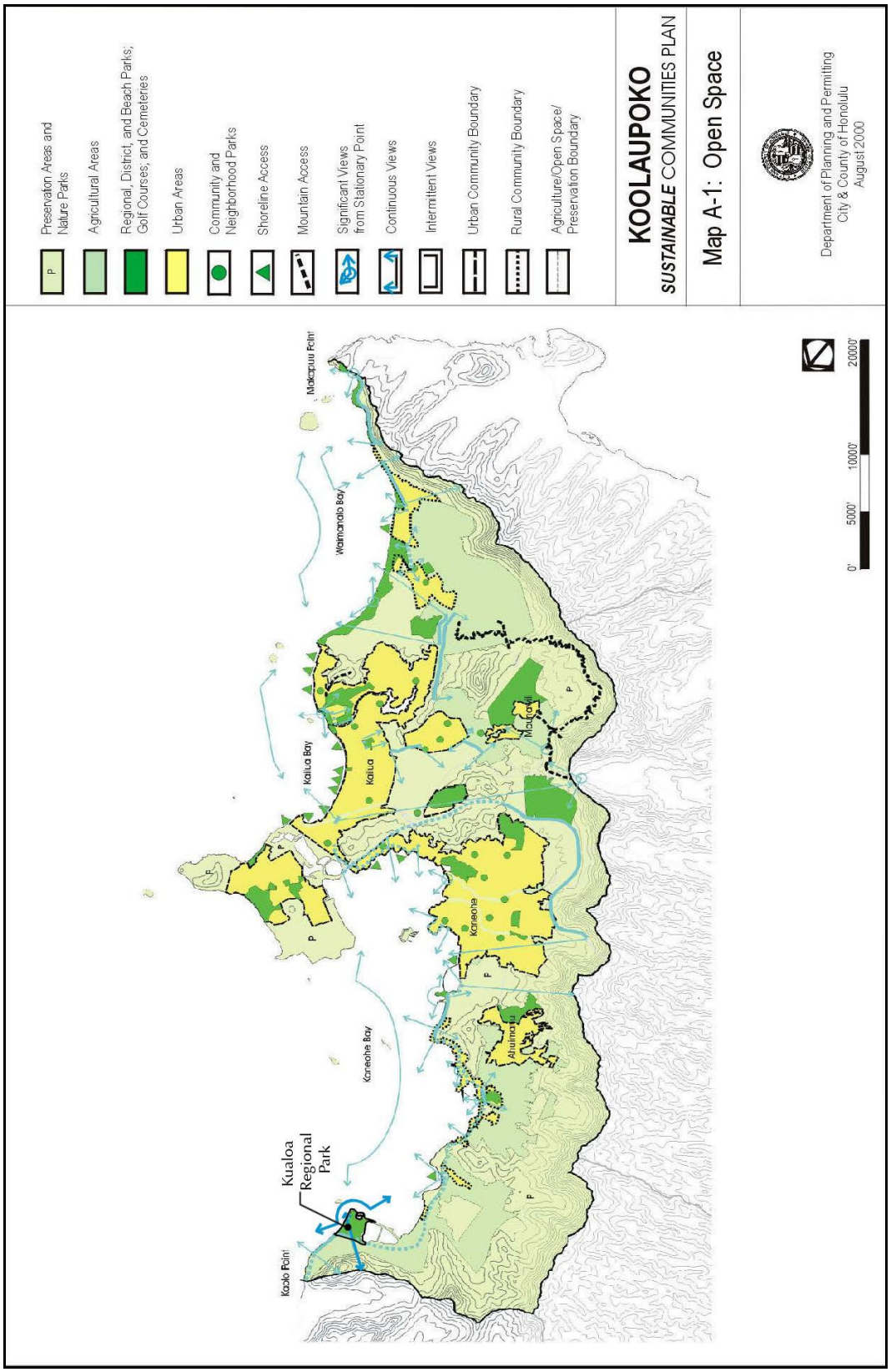

Figure 1-6 City and County of Honolulu Ko'olau Poko Sustainable Communities Plan

Figure 1-7 Special Management Area Map

Figure 1-8 Existing Site Conditions

2.0
Project Description

2.0 PROJECT DESCRIPTION

2.1 PROJECT LOCATION AND SITE CHARACTERISTICS

Kualoa Regional Park is located in the Kualoa agricultural region of Oʻahu's windward coast at the northern end of Kāneʻohe Bay. The Park is bounded by Kamehameha Highway to the north, Mōliʻi Pond to the west, Kāneʻohe Bay to the south, and the Pacific Ocean to the east. Mokoliʻi Islet (Chinaman's Hat) is situated off the eastern coast. Kualoa Regional Park serves the rural, agricultural and residential communities of the Koʻolau Poko District. The community of Waikane is located approximately two miles to the south, and Kaʻaʻawa is approximately three miles to the north.

The area of Kualoa Regional Park has been modified in the past as a result of different land uses. Prior to World War II the lands were part of the sugarcane plantation of Kualoa. The lands were converted to a fighter airfield during the World War II period, and reverted to grazing use after the war. The inland areas were mined for sand in the 1960s and 70s, and the City and County of Honolulu (City) condemned the land in 1971, converting it into a park.

Kualoa Regional Park is a 149-acre beach park administrated by the City Department of Parks and Recreation (DPR). The estimated attendance at Kualoa Regional Park based on permits, user groups and professional estimation of general park usage is approximately 171,000 per year. The park has facilities for daytime picnic use and overnight camping. Other characteristics of the park include programs for student groups, conservation areas and a wildlife refuge. The southern section of the park is reserved for organized camping by children's groups. Coastal facilities consist of restrooms, water and sewer utilities, a road, and parking areas.

The white sandy beach at Kualoa is a particularly valuable resource with good facilities and water conditions in the Kāneʻohe Bay area. Other than Kualoa Regional Park, public shoreline access opportunities in the Kāneʻohe Bay area are limited to two small city parks and one state park.

2.2 EXISTING FACILITIES AND WASTEWATER SYSTEMS

Existing facilities within the park consist of four comfort stations (#1 to #4), a Food Service Building, a Recreation/Administrative Building, a Caretaker's Cottage, and a Maintenance Facility fronting Kamehameha Highway (*Figure 1-8*). Picnic areas are located throughout the park. A brief description of the existing facilities and wastewater systems follows.

<u>Comfort Station #1 to #4</u>
The comfort stations were constructed in 1973 and consist of separate men's and women's restrooms. Stations #1 to #3 include shower areas. Wastewater generated by each comfort station is discharged via a four-inch cast-iron pipe to an individual wastewater system. The treatment system serving each comfort station includes a 1,200-gallon preloader unit and a 1,250-gallon aerated Cavitette system. Most of the aeration equipment has since been removed

or is inactive. With non-working aeration systems, the existing systems essentially operate as a septic system.

Gray water generated by the showers and hose bibbs are collected by trench drains and then dispersed onto the surrounding lawns.

Over the past 40 years, the shoreline has eroded significantly in the vicinity of the leach field for Comfort Station #3, which caused its abandonment since 2005. In addition, aging and overuse has led to clogging of the leach fields for the other Comfort Stations. Surpassing the average 25-year life expectancy of a septic system, these problems are to be expected. In 2005, the City disconnected the disposal systems from the treatment systems. Therefore, maintenance requires frequent pumping of the preloader and the Cavitette tanks for each comfort station. Each system is currently pumped two to three times a week and with greater frequency during peak park usage. Also, during the summer camping season and long weekends, the City brings in portable toilets at Comfort Station #4 to handle the heavy usage of that facility.

Food Service Building

This building is used for food preparation throughout the year, primarily during summer camping. The building was constructed in 1986, and includes one bathroom with a shower. The kitchen sink is connected to a grease trap. Wastewater generated from this building is discharged via a four-inch pipe to a trash and grease tank. The system was designed to transfer wastewater to three vertical aerobic units in parallel via six-inch pipes, then to a disposal pit and leach fields. Aeration equipment has also been removed at this facility; therefore, the system operates essentially as a septic system.

Recreation/Administrative Building

The building is occupied by three full-time employees and one part-time employee, and includes two bathrooms and a kitchen. Wastewater from this building is discharged via four-inch cast-iron pipe to a six-foot diameter cesspool. Overflow from the cesspool is discharged via a four-inch cast-iron pipe to an eight-foot diameter, eight-foot deep cesspool. This wastewater system is not planned for replacement at this time, as it does not meet the definition of "Large Capacity Cesspools" that are mandated for replacement by the Department of Health (DOH).

Caretaker's Cottage

This single-family dwelling home includes a bathroom and kitchen, and is occupied by a family of five. Wastewater from the cottage is discharged via four-inch cast iron pipe to the cesspool system serving the recreation/administration building. This wastewater system is not planned for replacement at this time.

Maintenance Facility

A district-wide DPR Maintenance Facility is located within the park, and is accessed directly from Kamehameha Highway. This facility serves Kualoa and other parks in the windward district. The Maintenance Facility's wastewater is served by a pre-loader, cavitette (aerobic treatment system), and leach field. The wastewater system at this facility is not planned for replacement at this time.

2.3 DESCRIPTION OF THE PROPOSED PROJECT

The existing individual wastewater collection, treatment and disposal systems for the Kualoa Regional Park Comfort Stations and Food Service Building have aged and are inadequate and/or damaged such that the systems no longer operate as intended, and need to be pumped two to three times a week. The City is seeking to improve the existing wastewater systems to meet and comply with current State DOH requirements under Title 11, Chapter 62 of the Hawai'i Administrative Rules (HAR).

The proposed project will demolish and remove Comfort Station #3, build a replacement Bathhouse in an alternate location, and replace the existing individual wastewater systems at Comfort Stations #1, #2, and #4 with a centralized treatment and disposal system *(Figure 2-1).* A centralized wastewater treatment system is a configuration in which the treatment and disposal occur in one central location. Comfort Stations #1, #2 and #4; the Food Service Building; and the new Bathhouse will be connected to the centralized treatment and disposal system.

Pump stations will be installed at Comfort Station #1, Comfort Station #2, Comfort Station #4, and the new Bathhouse. The Food Service Building will share a common pump station with Comfort Station #4. The pump stations are designed to collect wastewater from the plumbing fixtures of each facility and pump it through two-inch polyvinyl chloride (PVC) pipes to a designated central location for treatment and disposal. The proposed treatment system will include one pre-loader tank and three aerobic treatment units. The disposal system will use the elevated mound method. In addition, a "high level" alarm system will be installed to alert City personnel of system failures, and allow for a timely response by maintenance personnel.

A centralized wastewater system will create a common treatment and disposal area farther away from the eroding shoreline. This type of system contains maintenance and operations away from heavily-utilized recreational areas.

Due to the project being located in a Historical District, and in consideration of public safety, the project has been designed to minimize the amount of excavation required. Extension of the collection system piping will occur along previously disturbed routes, and the proposed structures will be located in the least-sensitive archaeological and cultural areas, resulting in the least potential disturbance to subsurface cultural resources. Based on surveys of the project area, the shallow trenching that is proposed for the collection system is not anticipated to encounter significant resources.

<u>Future Park Usage</u>
The City has future development plans within Kualoa Regional Park, as expressed in their draft Master Plan (1995), including a cultural center, administrative offices and information center, as well as various agricultural and cultural theme areas. The proposed construction and upgrade of the existing wastewater systems takes into consideration the location of these future developments *(Figure 2-2),* but is not designed to handle future wastewater flows. The proposed centralized wastewater system will service the existing facilities, and can be expanded in the future to accommodate the potential long-range growth at the park.

Figure 2-1 Wastewater System Plan

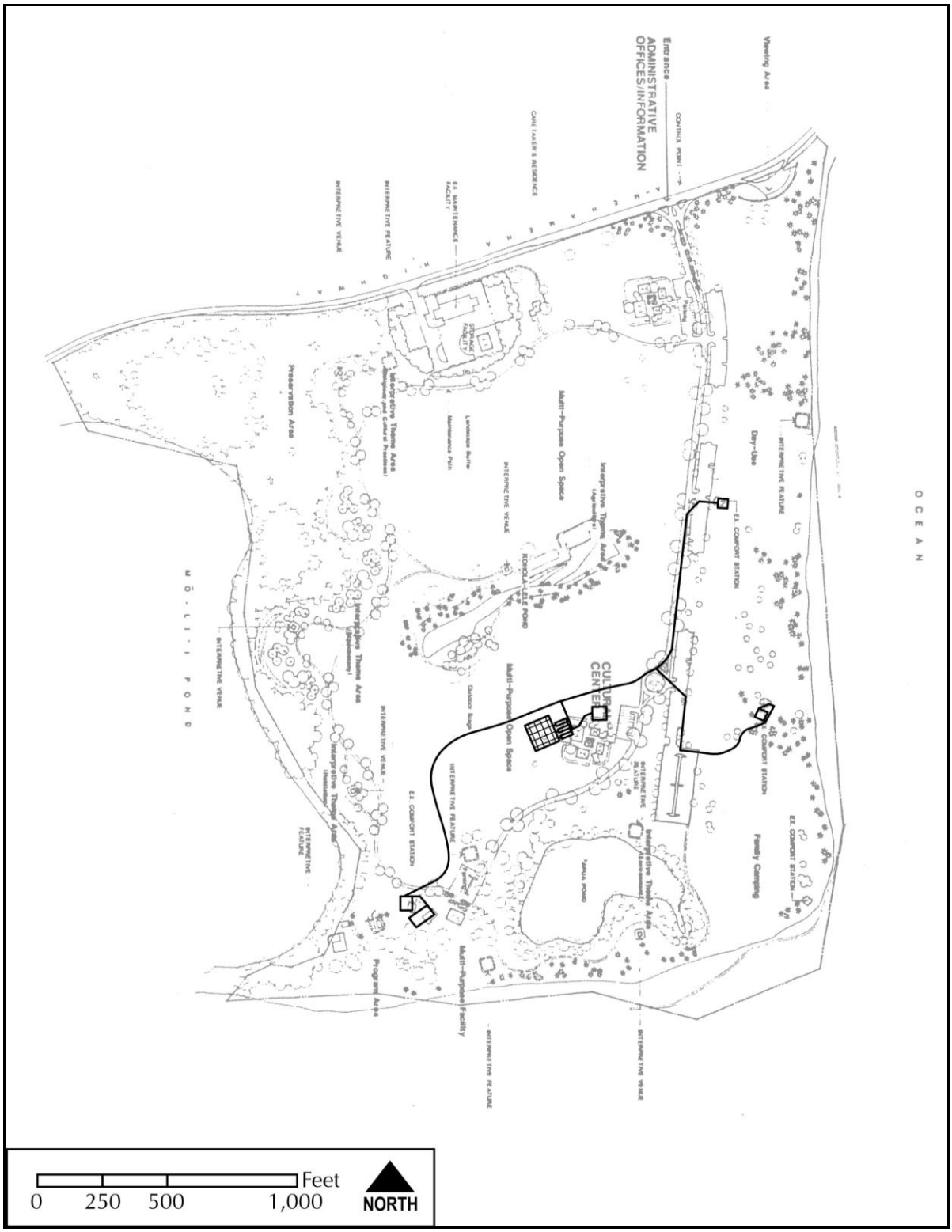

Figure 2-2 Kualoa Regional Park Master Plan Overlay

2.3.1 Wastewater Flows

Design flows from the existing facilities were calculated in accordance with DOH requirements, taking into account the number of people using each facility and an assumed wastewater flow rate generated per person. The following design flows were used for each facility.

Table 2-1. Maximum Wastewater Flows for Facilities at Kualoa Regional Park

Facility	Maximum Wastewater Flow (gpd)
Comfort Station #1	2,520
Comfort Station #2	6,195
Comfort Station #4	6,568
Food Service Building	6,480
Proposed Bathhouse (Replacing Comfort Station #3)	6,999
Total	**28,762**

This will total a maximum flow of 28,762 gallons per day (gpd) from the four Comfort Stations & Food Service Building to the Central Wastewater Treatment and Disposal Facility. The centralized wastewater system will be sized to treat and dispose of approximately 29,000 gpd.

2.3.2 Collection System

Existing wastewater collection lines from the comfort stations and other park facilities will be replaced with new six-inch PVC gravity sewer lines, conveying the facility flow to a pump station. From the pump station, two-inch force main lines will convey wastewater to the centralized treatment facility.

Each pump station (*Figure 2-3*) consists of two grinder pumps. When the wastewater in the tanks reaches a certain level, the pump is automatically activated and pumps the wastewater through the force main to the centralized treatment system. Each pump has provisions to grind up the sewage into small particles, much like a garbage disposal.

The advantage of having two grinder pumps is that if one grinder pump is disabled, the second grinder pump will be available to keep the station operational. Maintenance of the pump stations will be specified in an operation and maintenance manual that will be prepared during construction. A back-up power source is not required and not provided. However, provisions for connections to a portable generator will be provided. The pump stations will be equipped with a "high level" alarm, and if activated, the system is designed to call designated City personnel. Activation of a "high level" alarm is typically an indication of a problem.

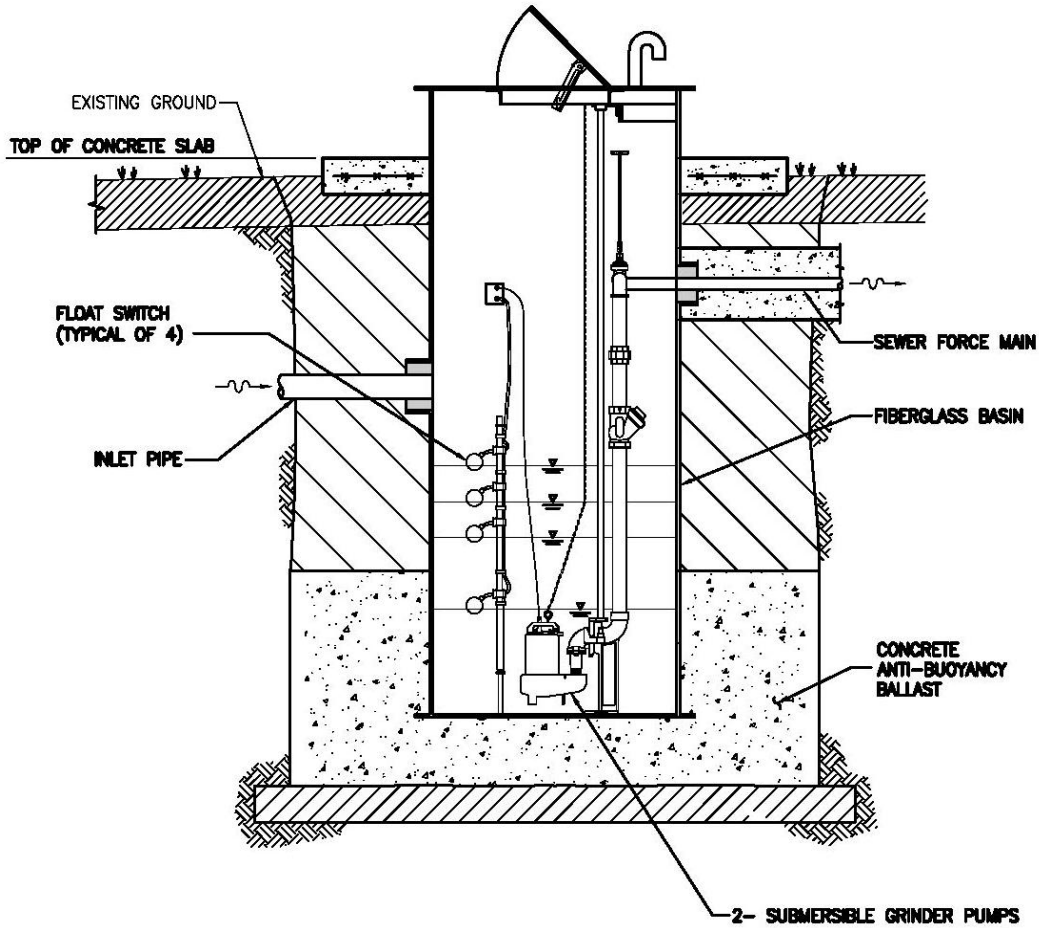

Figure 2-3 Pump Station (Not to Scale)

The force main is proposed to be two inches in diameter, and air relief valves will be installed at high points. The force mains will be concrete-jacketed to avoid potential for accidental pipe breaks, and will be typically buried 24 inches in the ground *(Figure 2-4)*. This depth is shallower than the usual depth of 36 inches. In instances where the new sewer force main crosses an existing utility, the new sewer force main may go deeper. Excavation for the new force main will occur in the least culturally-sensitive areas as possible, in previously disturbed areas, such as areas adjacent to walkways, the access road, and the parking lots.

Proposed areas of excavation were extensively disturbed in the past. Sugarcane was cultivated in the area in the late 1800s. The initial portion of the access road (prior to the roundabout) and the area where the parking lots are currently located were disturbed when the U.S. Army installed a grassed emergency airplane landing strip in the late 1930s, and later a larger more permanent airstrip in 1942. Vast sand mining occurred inland in the 1960s. After the area was condemned by the City 1971, park development activities took place. In the late 1970s, the area east and northeast of ʻĀpua Pond was extensively bulldozed in preparation for sand storage and settling basins associated for the (at that time) proposed Army Corps of Engineers Kualoa Beach Sand Replenishment Project.

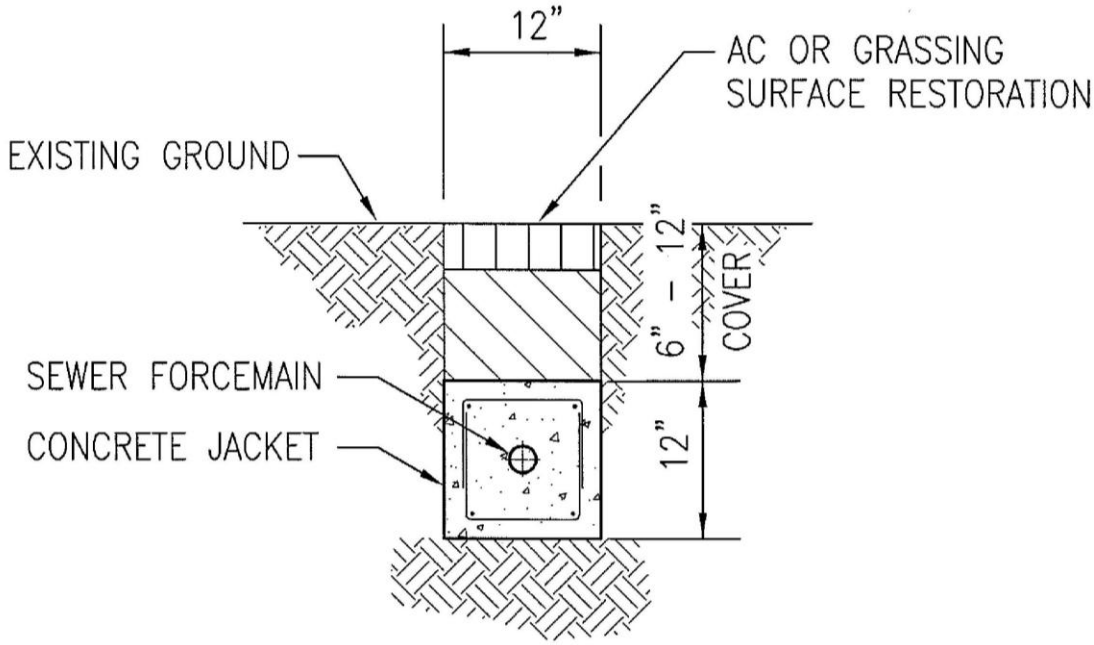

Figure 2-4 Typical Sewer Forcemain Trench (Not to Scale)

In the general area from the roundabout to the proposed central treatment location, three to five feet of the top layer of soil is fill, according to a geotechnical study of the area by Yogi Kwong Engineers, LLC (2012) *(Appendix A).* These conditions reduce the chance of recovering cultural resources during trenching. The total length of the new two-inch force main collection system will be approximately 3,750 feet. The layout for the new distribution system is shown in *Figure 2-1*. The force main should not be difficult to maintain.

2.3.3 Centralized Treatment System

The centralized treatment system will include a pre-loader tank and three aerobic treatment units. The location for the centralized system is shown in *Figure 2-1*, and a site map is shown in *Figure 2-5*. Wastewater will be conveyed to the centralized treatment system by newly installed gravity collection lines, pumps and sewer force main.

After flowing through the pump station, the wastewater will pass through the force main and reach the pre-loader tank where the solids drop out from the liquid stream, and grease and scum are captured via baffle. The addition of a pre-loader tank helps to reduce maintenance of the aerobic treatment unit, particularly the aerators. The proposed pre-loader tank will measure approximately 18 feet long, nine feet wide and eight feet high, and will not be embedded more than three feet deep.

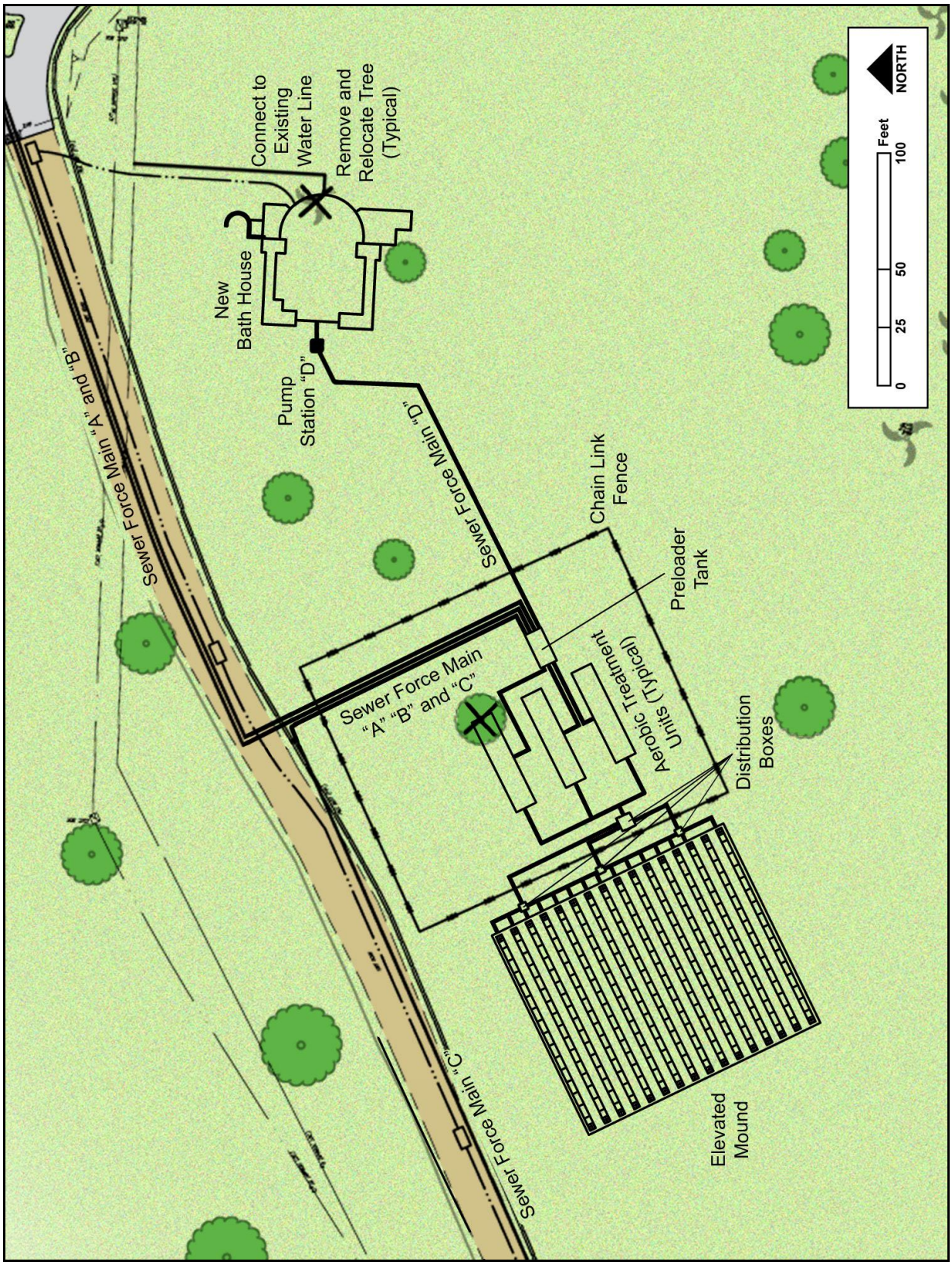

Figure 2-5 Site Plan for New Bathhouse and Central Treatment / Disposal System

From the pre-loader, effluent will flow by gravity into the aerobic treatment tanks, where biological treatment of the wastewater is promoted through bubbling air into the wastewater. The aeration of the wastewater serves two purposes: to keep the materials in the wastewater well mixed and to increase the oxygen in the wastewater. Mixing makes the wastewater in the tank more uniform, evenly distributing the nutrients and microbes. The increased oxygen bubbled into the wastewater creates a hospitable environment for microorganisms to break down organic materials. This results in a higher level of treatment than is typically achieved in a septic tank.

Aerobic treatment units and disinfection is required by the State DOH, Wastewater Branch when discharge occurs directly into ground water. For this project, discharge directly into the ground water will not occur. But, due to the City's understanding of the community's association to the park, along with the attempt to provide a better effluent than minimum, an aerobic treatment unit with disinfection will be used. Although an aerobic system is generally more costly than a septic system, the life of the system when maintained is indefinite, as a "biomat" does not form which causes eventual system failure. Other benefits to the aerobic system include a more efficient, accelerated and thorough treatment process that generally produces a safe and odorless gas.

The proposed fiberglass aerobic treatment tanks will each be approximately 48 feet long and 10 feet in diameter with six 24-inch high risers on top of the tank, each with a treatment capacity of 15,000 gallons. The three cylindrical tanks will be partially embedded (less than seven feet below grade) and protected by backfill and a ground cover flush with the risers *(Figure 2-6).* The tanks will be spaced approximately 26 feet center to center. A chain link fence will be provided around the area of the aerobic treatment units for the purposes of security.

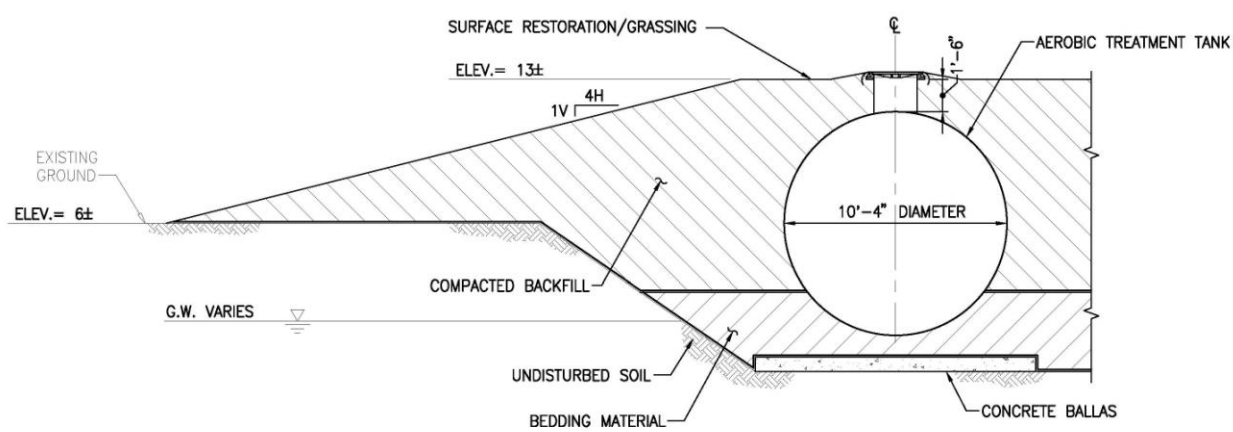

Figure 2-6 Aerobic Treatment Unit Ground Placement (Not to Scale)

After biological treatment and sedimentation within the aerobic treatment tank, the treated effluent is then conveyed through distribution boxes. Here the effluent receives chlorination disinfection before being pumped to the elevated disposal field. The initial distribution box will be a concrete box approximately five feet long, five feet wide and five feet high. The remaining three distribution boxes will be located at the juncture to the elevated mound system.

2.3.4 Disposal System

An elevated mound system located next to the treatment system will dispose of the treated wastewater. Although percolation rates for the soils meet DOH standards for a sub-surface type of system, this type of absorption bed is being used to minimize digging in the area. Elevated mound systems are mounds of engineered materials to create acceptable conditions for effluent disposal and/or to create vertical separation from groundwater.

Percolation tests were performed in June 2010 at the proposed disposal location. Along with the test results and DOH standards, it was determined that a disposal area approximately 12,400 square feet is required. The absorption bed will be constructed of plastic panels or chambers laid over a layer of granular material. This system requires minimum subsurface disruption for installation. The area will be tilled six inches, and then a layer of granular material and distribution system is placed over the tilled surface. The top of the mound will be covered with backfill and landscaped. Inspection ports will be provided allowing opportunity for visual checks of the disposal area.

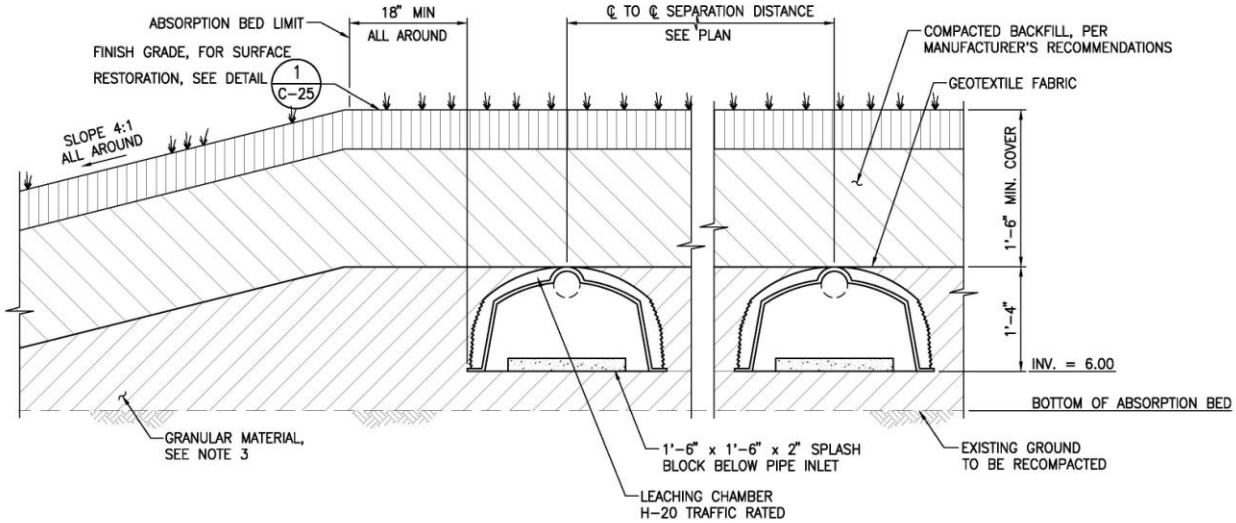

Figure 2-7 Elevated Mound System (Not to Scale)

2.3.5 High Level Alarm

A "high level" alarm system will be installed in each pump station. If the liquid level in the wet well rises above a pre-set high water level, a notification will be sent to operational managers immediately for response to the situation. Because the pump stations are provided with a backup pump, a high level alarm is an indication that the service / duty pump and its backup is not turning "on".

2.3.6 Comfort Station #3 Demolition

Comfort Station #3, at the southeastern most point of the park, has been closed permanently due to beach erosion, and the building is now less than 20 feet from the shoreline. Therefore, Comfort Station #3 will be demolished down to the concrete slab, and its wastewater system will be demolished and removed.

2.3.7 Replacement Comfort Station

The proposed Bathhouse will be located significantly more inland, near the roundabout and just south of the park driveway that runs east-west, situated between the overgrowth to the north and ʻĀpua Pond to the south *(Figure 2-1).* The design is based on a City Medium Bathhouse Prototype C-1. This Bathhouse has both men's and women's bathrooms, each with two sinks and a dressing room with a bench and clothes hooks. The men's bathroom includes two toilets and two urinals, and the women's includes four toilets. There are also maintenance and lifeguard storage rooms located at the rear of the building.

The design of the Bathhouse is the City's prototype with a Hawaiian influence. The roof will reflect a steep-sloped pitch clay tile roof, maintaining the interior open beam vaulted ceilings. A Hawaiian pattern grille design will be incorporated into the walls, gates, and so forth.

The Bathhouse will be a single story on-grade structure approximately 32 feet long by 39 feet wide in plan with a wood-framed roof supported on interior and exterior masonry walls bearing on shallow footings *(Figures 2-8 and 2-9).* In anticipation of generally low roof loading, shallow footings will be used to support the proposed Bathhouse on grade or minimally embedded below the existing grade.

2.3.8 Utilities and Infrastructure

The existing Kualoa Regional Park has water, wastewater, and electric services, and solid waste collection services. The following section describes the physical characteristics of these site utilities with the improvements to the wastewater systems.

<u>Water</u>
Potable water is supplied to the park by the Board of Water Supply. The park is currently serviced by an eight-inch water main connected to an existing water line located along Kamehameha Highway near the existing maintenance facility. This connection is adequate for current and future anticipated demands. Irrigation systems, currently inoperable, throughout the park are connected to the potable supply line. Water meters and its box will be added to the existing service line to Comfort Stations #1, #2, #4, and the Food Service Building. A new water line connection, meter, and backflow preventer will be installed for the new Bathhouse.

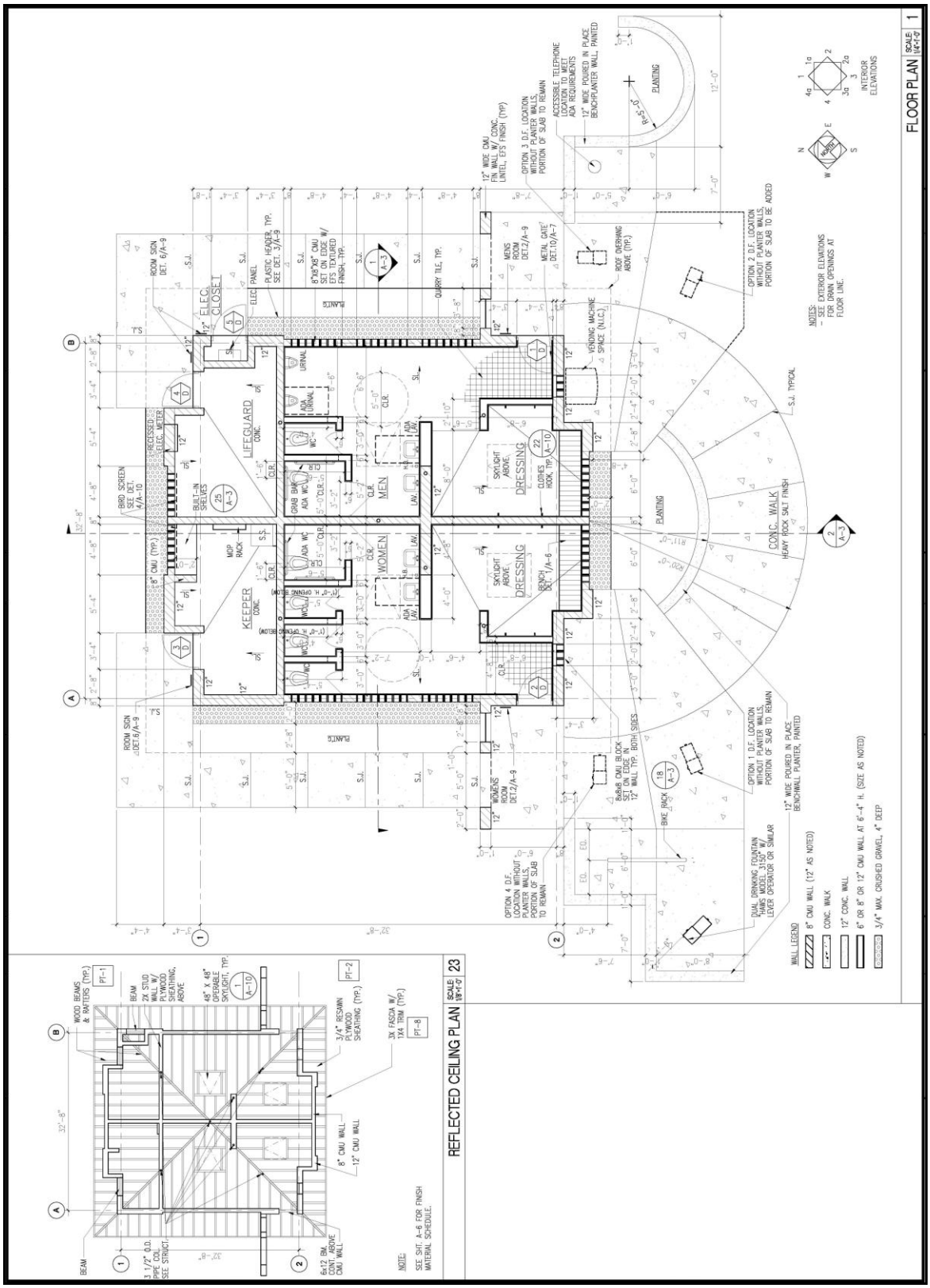

Figure 2-8 Proposed Floor Plan for New Bathhouse

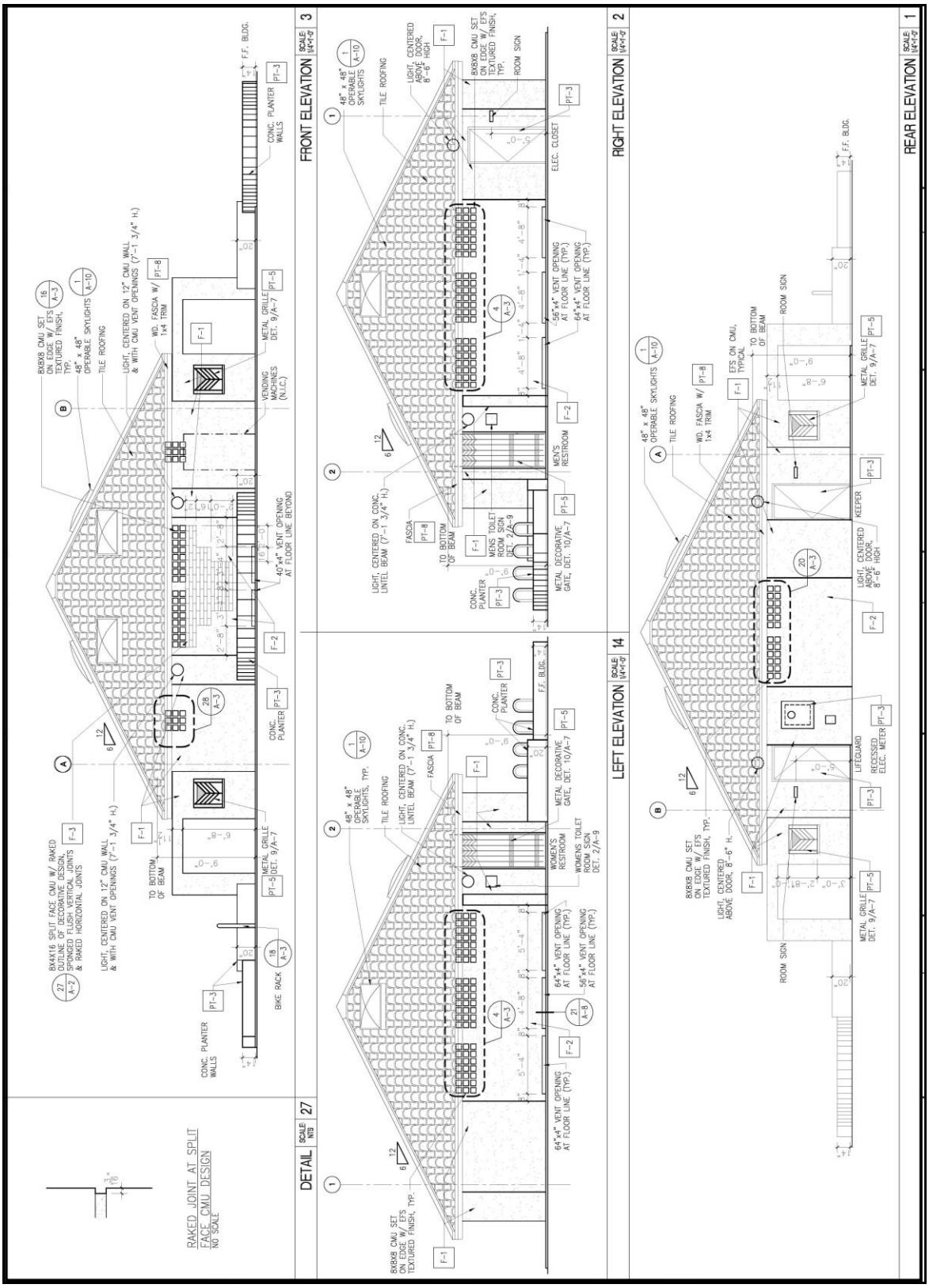

Figure 2-9 New Bathhouse Elevations

Wastewater
There is no City regional wastewater treatment facility or collection system available within the immediate area. The facilities were originally designed as individual wastewater facilities using cavitette aeration tanks and leach fields. However, this system has not been operating properly for years and the aeration units were removed or are inactive, essentially converting the system into holding tanks. Since 2005, the city has used sewage pumper trucks to clean out the systems two to three times a week.

Drainage System
The existing topography at Kualoa is very flat; excess water percolates directly into the ground or make its way to the beach areas or ponds.

Solid Waste Disposal
Solid waste throughout the park is collected and stored at the maintenance facility for pick-up and disposal by a private contractor to H-Power or the Waimanalo Gulch Landfill.

Other Utilities
Electrical, telephone and television cable service is available from existing overhead service lines along Kamehameha Highway. On-site utilities are underground except for approximately 1,900 feet of overhead electrical and telephone service from the park entrance along the makai side of the entry road and parking areas. Propane gas is used at the Food Service Building, and trucked in by a local service.

2.3.9 Construction Characteristics

The proposed project will require the demolition of Comfort Station #3 and removal of the adjacent absorption bed, construction of a replacement Bathhouse at a different location, construction of a centralized treatment system, and trenching for installation of sewer pipes. The project site will require some vegetation clearing, grubbing, minor grading, general construction, planting and grassing.

Vegetation Clearing, Grubbing, Grading and Excavation
The site will be cleared, grubbed and graded to develop the new wastewater system and grassed areas. The project will require a planned relocation and removal of only a few trees and shrubs as practical and as determined by the City Department of Facilities Maintenance.

In general, construction areas which are lightly vegetated will be thoroughly grubbed to a minimum depth of six inches. The grubbed areas will be cleared of vegetation, roots, rubbish, debris, any other organic or deleterious materials, and re-compacted by proof rolling. The excavated on-site materials can be used as a source of fill and backfill materials except elastic silt fill materials. The excavated on-site elastic silt fill materials can be used as a source of landscape fill, provided it is screened of oversized particles and meets the top soil and other landscaping requirements set forth in the project specifications.

The proposed project will not substantially alter the overall existing topography of the project site. Grading will occur to level disturbed ground in excavation areas, and to increase the ground surface elevation over the new aerobic tanks by approximately eight feet and five feet above the absorption bed. Excavation will occur for the following: 1) Installation of gravity sewer piping; 2) Removal of the existing cavitette, distribution box, and leach field at Comfort Stations #1, #2, #3, and #4; 3) Installation of the centralized treatment system; 4) Installation of a grease trap at the Food Service Building; 5) Electrical distribution; 6) New Bathhouse; and 7) Disposal system. The current estimate for excavation is 630 cubic yards, and 10,645 cubic yards of fill.

General Construction

The general construction of the project will include the installation of plumbing, mechanical, and electrical wiring and equipment, general carpentry work, painting and many other trades and work associated with typical construction activities.

Planting and Landscaping

Proposed trees and other plant materials used throughout the park will be native, indigenous, endemic or pre-contact exotic species.

Access, Parking, and Pathways

Kualoa Regional Park is served by Kamehameha Highway, a soft-shouldered two-lane rural highway that directly accesses the park. No other public roadway provides access to the park. The project site is accessed by vehicle through the park's two-lane paved roadway, providing access to the southeastern and southwestern portions of the park. Several parking areas have been developed to serve the park use areas along the shoreline. The shoreline is accessed via pedestrian walkways and lawns.

2.4 PROJECT COST AND SCHEDULE

The total construction cost for the current design project is estimated at $4,879,000. This cost includes removal or abandonment of the various systems components; installation of the new collection, treatment and disposal system; and construction of the new Bathhouse. The anticipated timing for installation of the new system is FY 2012-2013. Construction will require one year.

3.0
Description of the Environmental Setting, Potential Impacts, and Mitigative Measures

3.0 DESCRIPTION OF THE ENVIRONMENTAL SETTING, POTENTIAL IMPACTS, AND MITIGATIVE MEASURES

Addressed below are the environmental setting, potential impacts and mitigative measures for the proposed improvements to the wastewater systems at Kualoa Regional Park.

3.1 CLIMATE

Existing Conditions
The climate of Oʻahu is mild and semitropical with prevailing northeast trade winds. Located along the northeast windward coast, Kualoa Regional Park is subject to unobstructed trade winds. The cooling effect of the breezes creates a comfortable environment with temperatures ranging from lows in the upper 60s (degrees Fahrenheit) to highs in the upper 80s, depending upon the time of day and the season. The abrupt Kualoa Ridge causes a moderate amount of orographic precipitation, approximately 40 to 60 inches annually, with about 75 % of the annual rainfall occurring during winter months (Giambelluca, 1986).

Anticipated Impacts and Mitigative Measures
The proposed project will have no effect on climatic conditions; therefore no mitigative measures are required.

3.2 GEOLOGY AND HYDROLOGY

Existing Conditions
Kualoa Regional Park is located on the northeastern edge of the Koʻolau mountain range on the fringe of the ancient Koʻolau volcano. The original caldera of the volcano extended from near Waimanalo at the southeast to beyond Kāneʻohe at the northwest. The mountain range stretches from near Waimanalo to Kahuku. Major volcanic activity stopped here about three million years ago. A massive earthquake caused the windward side of the Koʻolau volcano to break away and slide down the side of the volcano and into the deep sea (Jokiel, n.d.). The debris from this landslide extends for hundreds of miles north and east of Oʻahu (Garcia, 2009). This landslide, known as the Kāneʻohe Bay slide or the "Nuʻuanu debris avalanche", occurred over one million years ago. Erosion from waves and streams developed the character of the cliff along the Pali, and changes in sea level developed and modified the fringing, patch, and barrier reefs into its present form (Jokiel, n.d.).

Kualoa Regional Park sits atop a sand spit overlying a coralline substrate extending into Kāneʻohe Bay. Evidence indicates that the development of Kualoa Point may be a recent geologic event, induced by the construction of Mōliʻi Fishpond. Unconsolidated sand dunes consisting of skeletal matter from coral organisms originating at and within the barrier reef were deposited by littoral and wind forces along the seaward boundaries of the mountains and the fishpond. The accumulated sand production within the bay, and weathered rock from the Koʻolau mountain cliffs combined to form the plain upon which the park is located today.

The project site is within a coastal plain peninsula surrounded by the Pacific Ocean to the east, Kāneʻohe Bay to the south, and Mōliʻi Fishpond to the west. The park lies within the Kahana aquifer system, which has dike formations (dike complex and marginal dike zones) near the crest and small dike basal aquifers along the coast (Townscape, 2012). The Kāneʻohe area is one in which surface discharge to the sea is high and groundwater underflow discharge low because dikes are parallel to the shore, compartmentalizing the aquifer, and near-shore rocks are poorly permeable (Takasaki & Mink, 1985). This causes high-level water table conditions. Because the entire park area is very near sea level, high tides and heavy rains bring the water table closer to the ground surface. Brackish ground water can be found at relatively shallow depths throughout the site.

Anticipated Impacts and Mitigative Measures

The wastewater improvements project will have no significant adverse effect on the geology and hydrology of the Kualoa peninsula. Treated wastewater will be disposed through an elevated mound system. Due to the makai location and shallow brackish water lens, there is no potential for leached effluent to reach the potable drinking water aquifer. System overflows are highly unlikely due to system monitoring. Pump stations will be continuously monitored with high level alarms and, if activated, will notify appropriate Park and City and County of Honolulu (City) personnel.

3.3 TOPOGRAPHY

Existing Conditions

The surface configuration of Kualoa Regional Park is generally level, with an average elevation of six feet above mean sea level (msl) (*Figure 3-1*). There are mounded areas on the mauka side of the park road, possibly as a result of the construction of a World War II airstrip or imported material. The 3.2 acre ʻĀpua Pond, located in the southern portion of the park, and a fairly large linear depression in the center of the park (original function and antiquity are not certain) called Koholā-lele (leaping or beached whale), are the only areas in the park that are below msl. Earth mounds occur also at the Koholā-lele area, possibly the result of excavated material during the construction of the pond. The highest elevation is approximately fifteen feet above msl in the northwest corner of the Park.

Anticipated Impacts and Mitigative Measures

The proposed project will not substantially alter the overall existing topography of the project site. The basis of design is to disturb as little ground as possible. Grading will be necessary to level disturbed ground in excavation areas, and to increase the ground surface elevation by approximately seven feet over the new aerobic treatment units and three feet above the absorption bed. Excavation areas will be restored to match surrounding existing conditions. Backhoes shall be required to use rubber tracks to minimize disruption to other areas not requiring disturbance. Mitigative measures related to soils and grading are described in the following section.

Figure 3-1 Kualoa Regional Park Elevation Map

3.4 SOILS AND GRADING

Existing Conditions

The southern and eastern portions of the project site are covered with Jaucas Series (*Figure 3-2*), typical beach sand seen on coastal lines throughout the Hawaiian Islands (SCS, 1972). The sand, also called Jaucas loamy fine sand (JaC), is usually single grain, has excellent permeability with low runoff potential, and is capable of supporting some vegetation such as pasture grass and sugarcane. Vegetation with deep root systems is often present with the soil and can provide moderate stability. The soil has high potential for wind and ocean wave erosion when vegetation is not present. The existing ground cover at the project site is lightly vegetated, consisting of large expanses of grass with interspersed bushes, coconut palms and other trees.

The remaining area of the park that will be affected by this project is covered with Mokuleia loam (Ms), a clayey loam alluvium material deposited over coral sand. Permeability is moderate in the surface layer and rapid in the subsoil. Runoff is very slow, and the erosion hazard is no more than slight.

Subsurface conditions were investigated by Yogi Kwong Engineers (YKE), LLC (2012) (*Appendix A*). YKE collected two exploratory boring samples; one at the proposed site of the Bathhouse (B-1), and the other at the proposed site of the aerobic treatment units system (B-2) *(Figure 3-3).*

Interpretation of the subsoil data obtained from drilling was supplemented by available geologic and soil survey maps and YKE's general experience in this area. The exploratory borings and the available testing data show that the subsoils encountered can be generalized into five predominant soil or geologic units as discussed below:

<u>Fill</u> - Variable fill materials were encountered in Borings B-1 and B-2 to approximately three to 4.5 feet below ground surface (bgs) respectively. The fill unit primarily consisted of stiff to very stiff brown silt with sand and gravel in Boring B-1 and stiff reddish brown elastic silt with gravel in Boring B-2. This imported material was deposited within the park area in the past for sand replenishment, disposal and landscape purposes.

<u>Beach Deposits</u> - Beach deposits were encountered in Boring B-1 from approximately three to 11 feet bgs and in Boring B-2 from approximately 4.5 to 10.5 feet bgs. The beach deposits primarily consisted of loose to medium dense, tan to off-white coralline sand and silty coralline sand.

<u>Lagoonal Deposits</u> - Lagoonal deposits were encountered in Boring B-1 from approximately 11 to 20.5 feet bgs and in Boring B-2 from approximately 10.5 to 25.5 feet bgs. The lagoonal deposits primarily consisted of loose to very loose, gray to dark gray silty sand and silty coralline gravel with sand.

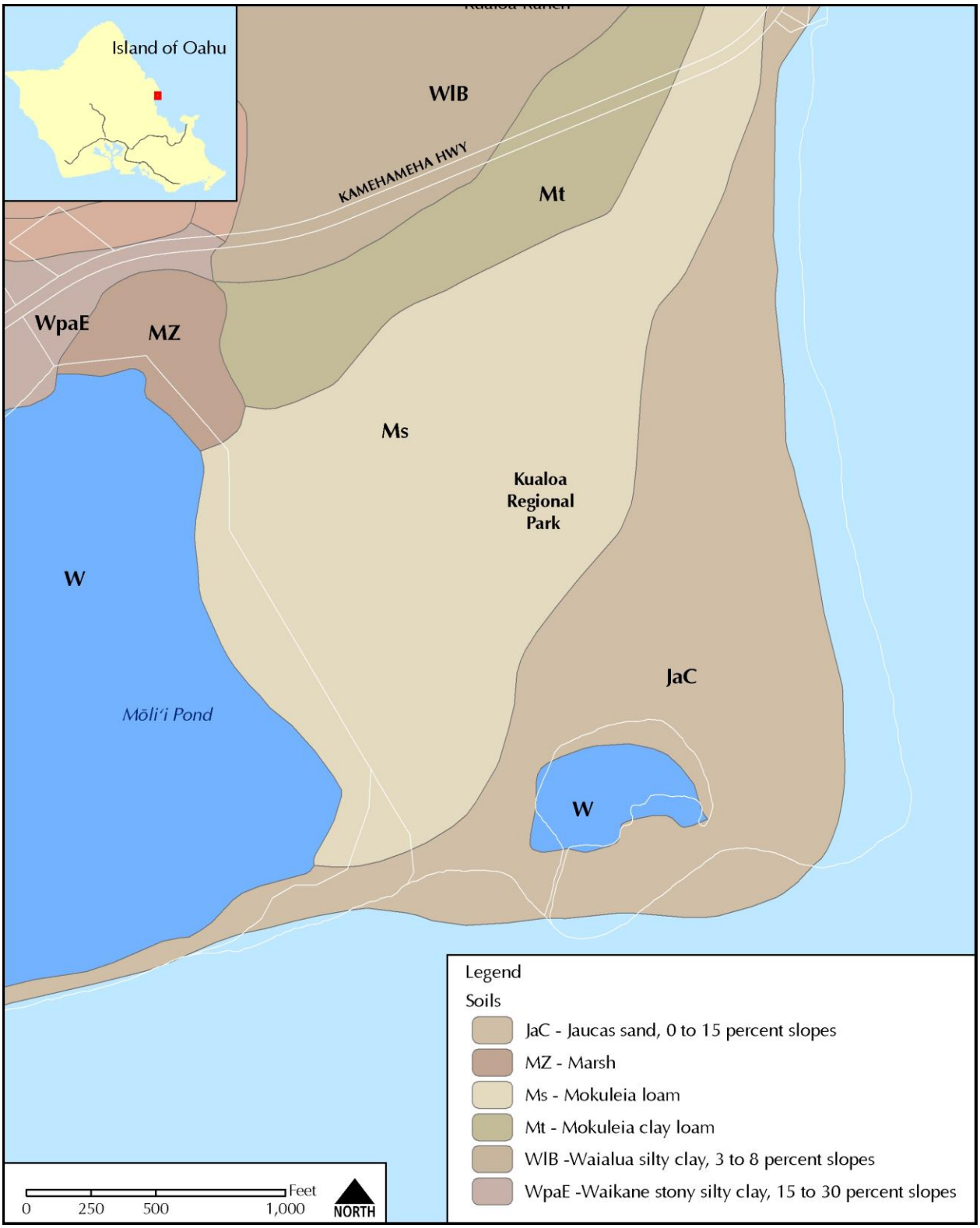

Figure 3-2 Soils Map (U.S.D.A., N.R.C.S., 2007)

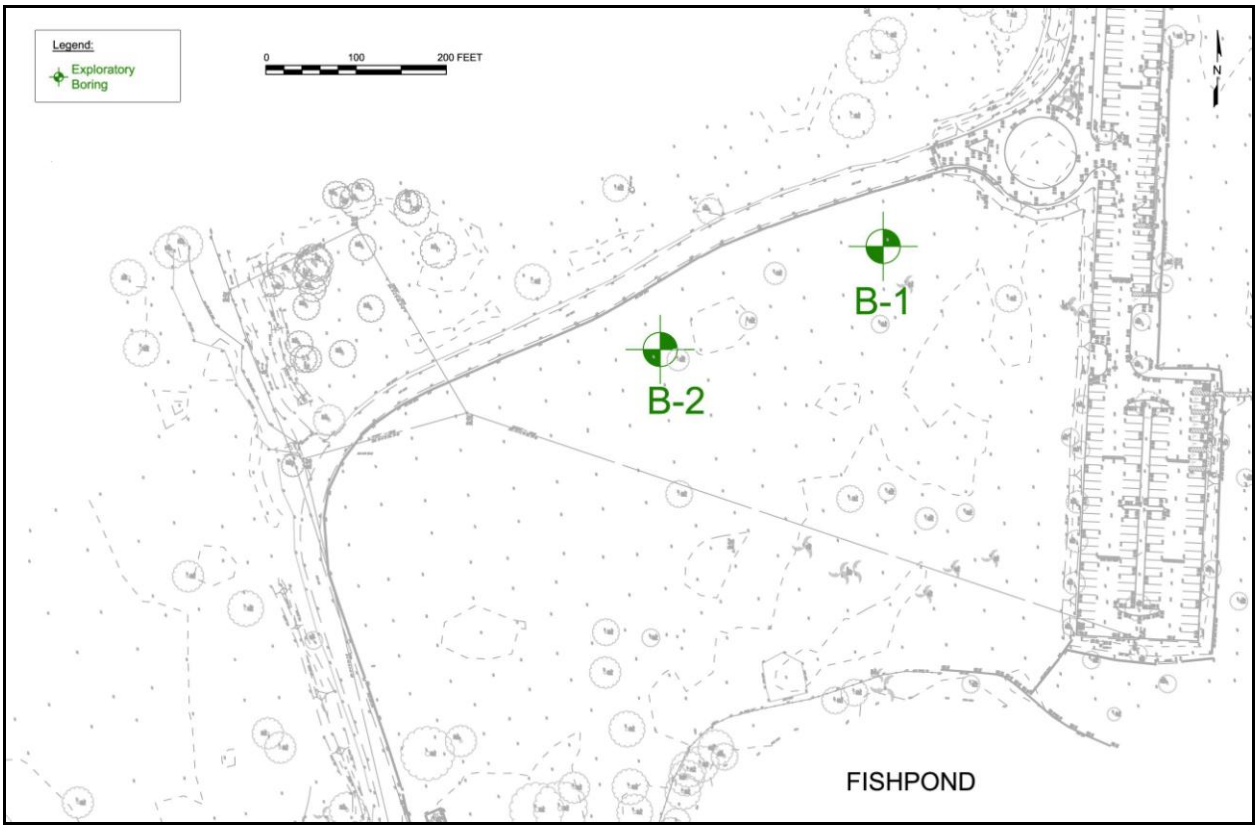

Figure 3-3 Approximate Boring Locations

Coralline Deposits - Coralline deposits were formed primarily as a result of wave actions on coralline reefs during different stands of the sea level. Wave actions caused breakage of reef formation to form rubblestone to coralline detritus. Subsequent re-cementation of coralline debris and beach sand deposits formed cemented calcareous sandstone into "beach rock" limestone ledges. Rises in sea level introduced an influx of fine sediments in a matrix with coarse coralline detritus. Due to the wave actions dominating the depositional environment, coralline deposits and coral reef limestone are often highly variable in all directions.

Coralline deposits were encountered in Boring B-1 from approximately 20.5 to 30 feet bgs and in Boring B-2 from approximately 25.5 to 30.5 feet bgs. The coralline deposits primarily consisted of loose to medium dense, tan poorly graded coralline gravel.

Alluvium - Alluvial deposits were encountered in Boring B-1 from approximately 30 to 37 feet bgs and in Boring B-2 from approximately 30.5 to 32 feet bgs. The alluvial deposit primarily consisted of medium stiff to stiff brown elastic silt locally with sand.

Anticipated Impacts and Mitigation

To minimize the excavation and disturbance of the culturally sensitive area, the Bathhouse foundation will be constructed on or near grade bearing on the thin fill crust. Due to the significant size of the aerobic treatment units (10-foot diameter tanks) however, the foundation of these tanks will require embedment into the underlying beach deposits.

To prevent the aerobic treatment units from floating and comply with the anchoring requirements for the aerobic treatment units, each tank will be bearing on and structurally tied to a minimum eight-inch thick concrete anchor slab at approximately seven feet below the existing ground surface *(Figure 2-6).* The preliminary proposed configuration will require a minimal embedment of slightly over two feet into the underlying culturally sensitive beach deposit layer. Based on the manufacturer's requirements, the concrete anchor slab will be at least 13 feet in width, and extend at least 18 inches beyond both sides of the tank. Due to the anticipated presence of groundwater at the bottom of the excavation, locally available 3B Fine aggregates or ASTM C-33 Size No. 67 aggregates will be used as the bedding material. The self compacting bedding material will be extended to a minimum of three feet above the concrete slab, and wrapped in a suitable geo-textile fabric such as Mirafi 180N or equivalent.

Any water that collects in open excavations will be pumped out immediately to avoid softening of foundations soils. The final ground surface around the proposed structures will be graded to provide positive drainage away from the structures. In cases where this is not feasible, adequate measures will be provided to avoid ponding to quickly drain away storm water that may collect around the proposed structures.

Groundwater was encountered at approximately 4.5 feet below the existing ground surface in the exploratory borings. Dewatering of an excavation will be necessary where the existing groundwater level is above the bottom of the proposed excavation. The Contractor will be required to retain a qualified dewatering consultant / geotechnical engineer to evaluate ground water control measures, and to obtain all necessary permits pertaining to discharge of dewatering effluent.

Grading operations will be conducted in compliance with dust and erosion control requirements of the City Grading Ordinance. A Grading Permit will be obtained from the City in order to begin construction. During Grading Permit review and approval, the grading plans are reviewed by the City and specific conditions may be attached at that time. The contractor will be required to perform proper quality control density testing during fill and sub-grade compaction in accordance with the project specification requirements.

Primary fugitive dust control methods that will be implemented include regular watering of exposed soil areas, good housekeeping on the job site, and prompt landscaping, covering or paving of bare soils in areas where construction is completed. The impact of construction activities on soils will be mitigated by practicing strict erosion control and dust control measures, particularly those specified in the following:

- City Grading Ordinance; Revised Ordinances of Honolulu Chapter 14-13 Provisions for Grading, Soil Erosion & Sediment Control
- State of Hawai'i, DOH, Water Quality Standards, Chapter 11-54 (2009)
- U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), Erosion and Sediment Control Guide for Hawai'i (1981).

3.5 SURFACE WATER AND DRAINAGE

Existing Conditions

'Āpua Pond (also known as Pahalona, Mokoli'i, Kualoa, and Koholā-lele) is the only perennial water body within the park. The large depression located north of 'Āpua Pond in the center of the park, commonly referred to as Koholā-lele Pond, may also retain fluctuating levels of water throughout most of the year. Underground freshwater springs may be located in this area (Clark, 1979). The northwest corner of the site contains a marsh area. Underground freshwater "streams" are also thought to pass beneath parts of Kualoa, however, no sub-surface investigations for fresh water sources have been conducted to date (Miyabara Associates, 1995). No surface streams cross the park. Kualoa Park is adjacent to Mōli'i Pond, a loko i'a or fishpond that has been in operation for approximately 800 years. According to the National Wetlands Inventory (USFWS, 2011), 'Āpua Pond and the lands adjoining Mōli'i Pond are designated as wetlands. Wetland water supply comes mainly from caprock springs derived from basal groundwater.

A Marine Environmental Assessment in the vicinity of Kualoa Regional Park was prepared by Marine Research Consultants, Inc. (MRC) in December 2011 and is included as *Appendix B*. Water samples were collected at two stations along the shoreline of 'Āpua Pond (*Figure 3-4*). Sampling in 'Āpua Pond was conducted on November 16, 2011 at approximately 07:45 to 07:50. Weather conditions consisted of overcast skies and light winds. Pond samples were conducted at a depth of approximately 0.5 feet, and approximately ten feet from the shoreline. Water samples were collected as quickly as possible so that temporal variability between locations was minimized.

Water quality parameters evaluated included all of the specific criteria designated for open coastal waters in Chapter 11-54, Section 06 (a) (Embayments) of the State DOH Water Quality Standards. These criteria include: total nitrogen (TN), nitrate + nitrite nitrogen (NO_{3-} + NO_{2-}), ammonium nitrogen (NH_{4+}), total phosphorus (TP), chlorophyll a (Chl *a*), turbidity, pH, salinity and temperature. In addition, orthophosphate phosphorus (PO_{43-}) and silica (Si) were also reported because these parameters are sensitive indicators of biological activity and the degree of groundwater mixing. In addition, the fecal indicator bacteria enterococcus was also evaluated.

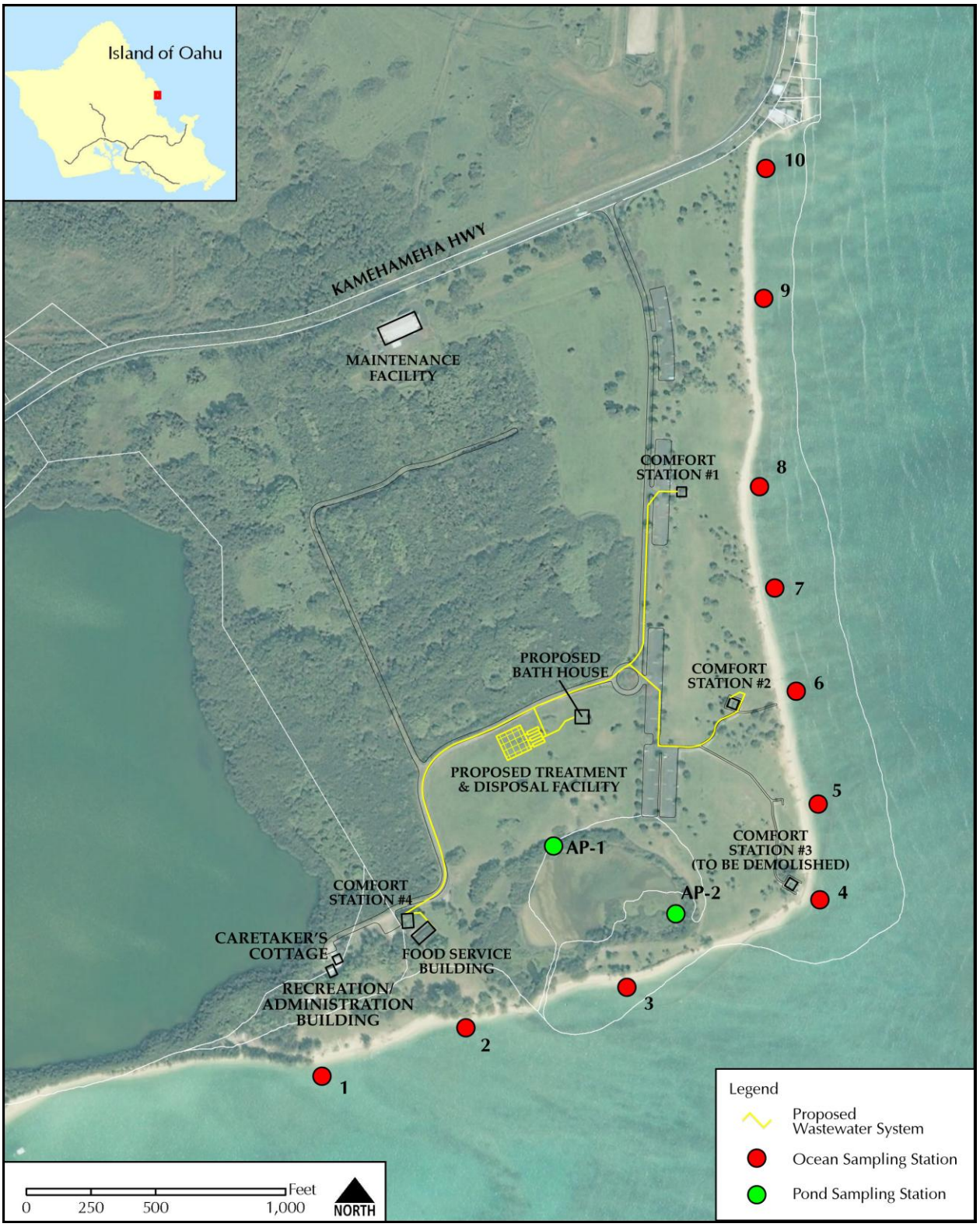

Figure 3-4 Locations of Pond and Ocean Water Sampling Stations (Source: MRC, 2011)

Salinity of the pond samples was low, with values of 21 to 22%. These values indicate that the water in ʻĀpua Pond is about 60 to 62% seawater and 38 to 40% freshwater. The pond shows high nutrient content, which is to be expected due to decomposing organic material at the bottom of the pond. All values of nutrients in ʻĀpua Pond were higher in the mauka sample (AP-1) relative to the makai sample (AP-2). As salinity was lower in sample AP-2, it appears that there is a dynamic mixing process between seaward flowing ground water (high nutrients/low salinity) and landward flowing seawater (low nutrients/high salinity).

ʻĀpua Pond shows high counts of enterococcus (fecal indicator bacteria), with samples in the pond measuring at 160 and 250 µg/100 ml. This is extremely high compared to Hawaiʻi's standard of 7 µg/100 ml, and the Federal standard of 35 µg/100 ml. The cause for this high count is difficult to pinpoint, as enterococci are extremely hardy organisms capable of living in extreme conditions. Enterococci include fecal streptococcus usually found in the bowels of humans, birds (CWRA, 2008), and other animals; are found in soil, vegetation, and surface water (possibly due to contamination by animal excrement); can grow in a range of temperatures from 10 to 45 degrees Celsius; and grow in hypotonic, hypertonic, acidic, alkaline, aerobic and anaerobic conditions (MicrobeWiki, 2010). Some organisms, including birds, cats and dogs, have higher levels of enterococci than humans do (Dwight, 2011 and Mara, 2003). Although not verified, the high values of enterococcus in ʻĀpua Pond could possibly be caused by animal (e.g., aquatic bird, mongoose) excrement which then allows the enterococcus to grow well in the restricted flow of the pond environment (Dwight, 2011).

Ocean sampling revealed a complete lack of enterococci (*see Section 3.6*), in contrast to the results for ʻĀpua Pond, above. The effluent that will seep from the proposed elevated mound will have been highly treated from the aerobic system, meeting Hawaiʻi's standard with a lower enterococcus count than those measured for ʻĀpua Pond.

Kamehameha Highway represents the northern border of the park and any runoff from upper elevations is diverted by a swale that runs parallel to the Highway. Excess surface storm run-off percolates directly into the porous ground material or makes its way to the beach areas or ponds. Standing water occurs during periods of heavy rain due to the flat topographic limitations.

The existing flood zones were reviewed using the National Flood Insurance Program, Flood Insurance Rate Map (FEMA, 2004). The improvements on the park site are located within areas designated as "Other Flood Areas - Zone X: Areas determined to be outside 500-year flood plain" (*Figure 3-5*). The northeastern shore and ʻĀpua Pond are located in the area designated as 100-year flood hazard area Zone AE, where base flood elevation is five feet. Small portions on the western boundary of the park are located in the Zone VE, designated as 100-year coastal flood hazard area. No new building will occur in these areas. For a 100-year tsunami, inundation elevation 200 feet inland of the coastline was calculated to be five feet. Historical data indicates that tsunami run-up at Kualoa point is five feet or less.

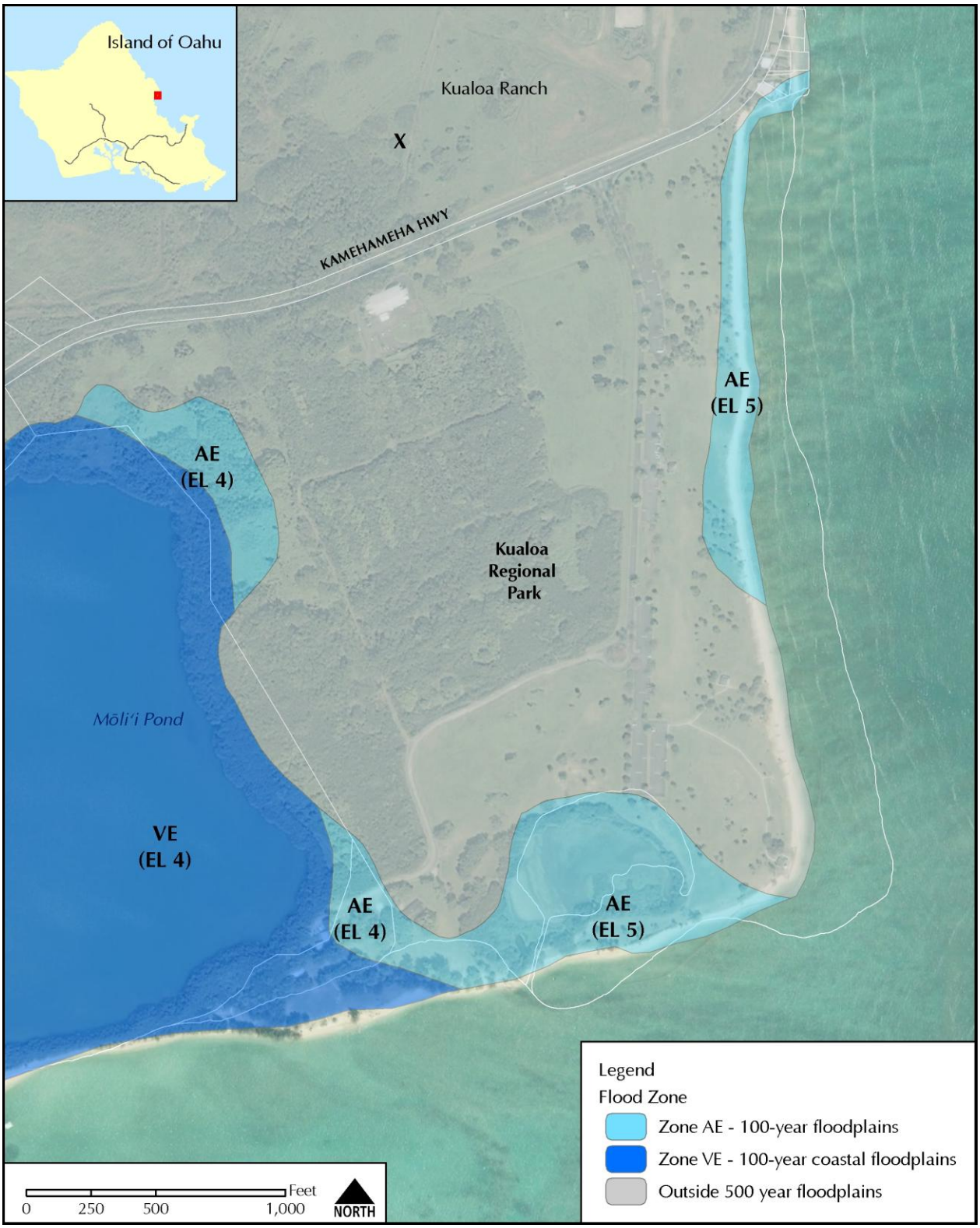

Figure 3-5 Flood Insurance Rate Map

Anticipated Impacts and Mitigative Measures
No significant changes to surface water quality and drainage are anticipated to result from the proposed project. There is the slight potential for short-term impacts due to runoff of suspended soil material to pond waters during construction, therefore, Best Management Practices (BMPs) will be used during the project to prevent/minimize sediment from flowing into the ponds. These BMPs include gravel bag berms and other preventative devices. Construction of the project during the normally drier summer months will help to prevent/minimize runoff from heavy rains normally associated with the winter months. The project does not require construction in flood hazard areas.

The treated wastewater effluent will be disposed of in a disposal system designed in accordance with DOH requirements. Treated effluent will be dispersed in the mound area soils, evapotranspirate, and eventually dissipate in the shallow brackish groundwater. The distance of the proposed elevated mound to ʻĀpua Pond is approximately 400 feet, eight times further than the DOH standard of 50 feet [Hawaiʻi Administrative Rules (HAR) Chapter 11-62, Appendix F, Table 2]. Should any effluent migrate to ʻĀpua Pond, the water quality will be high and should not have any detrimental effects to the water quality of the pond, and may even improve enterococcus bacterial counts.

3.6 SHORELINE AND NEAR SHORE WATERS

Existing Conditions
The shoreline of the Kualoa peninsula is dynamic and ever-changing. Created and influenced by the tides and currents, the beach areas of Kualoa have changed dramatically. For at least 60 documented years, the eastern shore has receded, at places up to 240 feet, while deposited sand along the southern shoreline has increased the land area significantly. A variety of measures have been attempted in the past to deal with the erosion problem with varying degrees of success. Erosion continues today at a rate of up to four feet a year. The erosive effect has not only reduced the land area and caused loss of park improvements (including Comfort Station #3), but has also exposed numerous burial remains and artifacts over the years. A recent shoreline survey conducted in February 2012 (*Figure 3-6*) confirms beach erosion from previous surveys conducted in 1988 and 1970.

An artificial reef, maintained by the Hawaiʻi State Department of Land and Natural Resources (DLNR), is located in the shallow waters off Kualoa. The reef areas provide relatively shallow waters, averaging less than four to six feet below mean low water within 1,000 feet from shore. Park users frequently utilize the off-shore environment. It is possible to wade between Mokoliʻi Islet and the beach at Kualoa during low tide, however wading across these shallow waters can be dangerous due to rip currents.

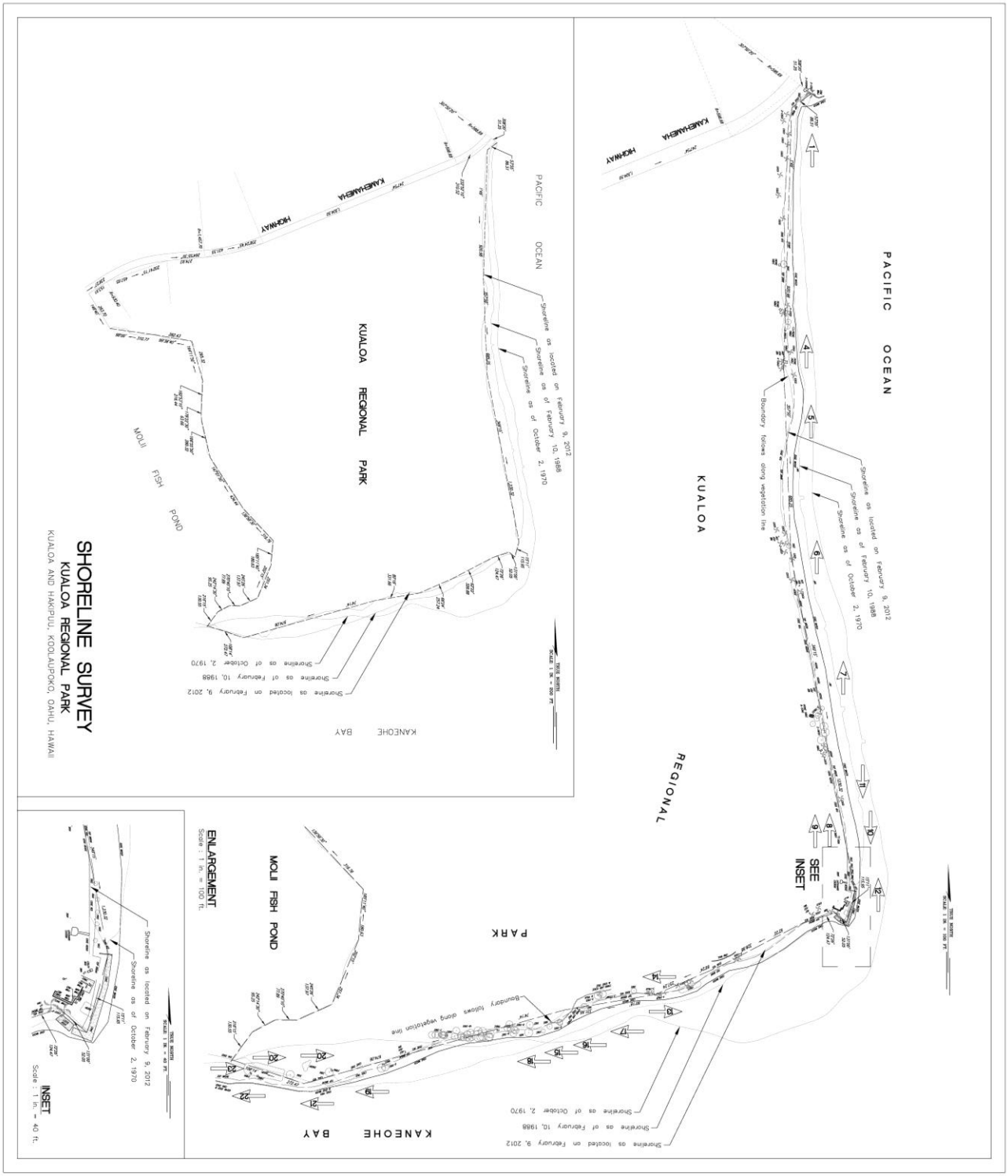

Figure 3-6 Kualoa Regional Park Draft Shoreline Survey

Kāneʻohe Bay, the only true barrier reef and lagoon present in the main Hawaiian Islands, is known for its variety of fish, including papio (trevally), ʻōʻio (bonefish), ʻawaʻawa (mullet), pakiʻi (flounder), weke (goatfish), āholehole (young stage of āhole, Hawaiian flagtail,) awa (milkfish), kala (surgeon fish), akule (big-eyed scad), nehu (smelt, anchovy), uhu (parrotfish), ʻalaʻihi (squirrelfish), hīhimanu (stringray), and ʻōpae (shrimp). The off-shore reef is also home to heʻe (octopus), kāpā (mottled eel), various crabs, clams, mollusks, sea urchins, sea cucumbers and several varieties of seaweed along the beach.

The near shore ocean water of the Pacific Ocean is classified as high quality (Class A) waters by the State DOH, and Kāneʻohe Bay is classified as high quality (Class AA) waters. The objective for Class A waters is that their use for recreational purposes and aesthetic enjoyment be protected. These waters shall not act as receiving waters for any discharge which has not received the best degree of treatment compatible with the National Pollutant Discharge Elimination System (NPDES) criteria. For Class AA, the objective is that these waters remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human-caused source or actions.

The City was issued a citation for a sewage spill by DOH in the year 2000. With the individual wastewater systems of the time, it was thought that subsurface disposal of partially treated effluent was leaching organic nutrients into coastal waters. In 2003, the City proposed a new $1.3 million wastewater system; however, construction stalled over cultural and other concerns.

Kualoa beach was closed by DOH in December 2005 after high bacteria counts were detected in the waters along the shore. The wastewater disposal system for the park was the suspected source, and the City took immediate action by disconnecting the disposal system (leach fields) from the treatment systems (pre-loader and cavitette tanks). However, bacteria counts remained at higher-than-acceptable levels and the beach remained closed until DOH removed the warning signs in May 2006. The City was issued a $300,000 fine for this incident. It is still unclear what exactly caused the bacteria levels to rise and drop.

The beach was closed again from January to March of 2007, also due to a detection of high bacteria levels. This was over a year after Kualoa's wastewater disposal systems were disconnected, causing skepticism as to the source of high bacteria levels in Kualoa's near shore water. The City has demonstrated that the existing system is acting as a holding tank and not leaking (in or out). Historically, bacteria levels are high in the winter and low in the summer – opposite of park usage where park usage is low in the winter and high in the summer; thus, the historically high counts may be due to nonpoint source pollution.

The Marine Environmental Assessment, 2011 (*Appendix B)* took samples along the shore as well as ʻĀpua Pond, as previously discussed. Water samples were collected at 10 locations in Kāneʻohe Bay spanning the oceanfront length of Kualoa Regional Park (*Figure 3-4*). Stations were equally spaced along the shoreline, but care was taken to locate stations directly offshore of existing Comfort Stations. All ocean sampling was conducted from the shoreline on October 26, 2011 during the hours of approximately 08:00 to 09:00. The tide during ocean sampling was rising from a low of +0.5 feet to +0.6 feet. Weather conditions consisted of overcast skies and light winds. Ocean water samples were collected at a depth of one foot approximately ten feet

from the highest wash of waves. The water samples were collected as quickly as possible so that temporal variability between locations was minimized.

The water quality parameters evaluated are the same as those evaluated for ʻĀpua Pond (*see Section 3.5*). In summary, this single sampling assessment of water quality in the ocean offshore of Kualoa Regional Park reveals no areas of anomalous input of materials from land, and generally reflects coastal ocean conditions. While counts of viable enterococcus indicator bacteria in ʻĀpua Pond were substantial, the complete lack of such bacteria in the ocean signifies that during the period of sampling there was limited exchange between the pond and the ocean. The only parameter that showed consistent elevated levels relative to DOH Water Quality Standards was turbidity for dry conditions, a result of re-suspension of fine-grained marine sediments in the near shore zone.

Anticipated Impacts and Mitigative Measures
Proposed work will take place at varying distances to the shoreline. Removal of the individual wastewater system and demolition of Comfort Station #3 will take place less than 20 feet of the most recently surveyed shoreline. Removal of the individual wastewater systems and installation of pumps and pipes at Comfort Stations #1 and #2 will take place at approximately 200 feet and 150 feet of the shoreline, respectively. Construction of the Bathhouse and centralized treatment and disposal system will take place approximately 730 feet from the eastern shoreline, and approximately 860 feet from the southern shoreline. There is the potential for short-term impacts due to runoff of suspended soil material to coastal waters during construction, therefore, BMPs will be used during the project to prevent/minimize sediment from flowing into the ocean. These BMPs include gravel bag berms and other preventative devices. Construction of the project during the normally drier summer months will help to prevent/minimize runoff from heavy rains normally associated with the winter months.

The proposed improvements to Kualoa Regional Park's wastewater system will have a long-term beneficial effect on the park environment, minimizing the potential release of untreated wastewater. In addition, the level of treatment provided by the new treatment/disposal system will be an improvement over treatment and disposal methods of the past.

3.7 FLORA AND FAUNA

Existing Conditions
The park is largely dominated by introduced flora and fauna species. A 1993 survey (Paul Weissich and Associates, 1993) noted four species of native plants, nine species of plants introduced by the Hawaiians, and 34 species of recent introduction. The native plants include ʻae (*Bacopa monnieri*), pohuehue (*Ipomoea pes-caprae)*, naio (*Myoporum sandwicense*), and ʻakiʻaki *(Sporobolus virginicus*). Community members have also identified makaloa (*Cyperus sp.),* kohekohe (*Eleocharis obtusa*), and ʻākulikuli (*Sesuvium portulacastrum*).

The coastal area of the park is dominated by large expanses of grass with interspersed coconut palms and introduced trees. During the 1993 study, there were no native or rare Polynesian introduced species either near the shoreline or in the vicinity of any of the proposed coastal

structures. Several coconut palms near the east beach are threatened if erosion continues along the coastline. Along the south beach, near the property boundary, accreting sand has provided substrate for the growth (primarily) of young Ironwood trees (*Casuarina equisetifolia*). These trees increase in size and age, as a function of distance from the beach. There are many large trees on the property, and two Kamani trees (*Calophyllum inophyllum*) are on the O'ahu "Exceptional Tree List" (Paul Weissich and Associates, Inc., 1993).

Kualoa Regional Park lies in transition between Kāne'ohe Bay and the windward open coast. The site has been extensively altered by human habitation and park development leaving little native flora. Although the park's open space limits the species diversity of terrestrial animals, it has added protection for several rare or endangered waterbirds that frequent this site (Bruner, 1993).

The park supports a typical array of exotic (introduced) birds (Bruner, 1993) including the common waxbill *(Estrilda astrild),* cattle egret *(Bubulcus ibis),* red-vented bulbul *(Pcynonotus cafer),* common myna *(Acridotheres tristis),* house sparrow *(Passer domesticus),* zebra dove *(Geopelia striata),* and house finch *(Carpodacus mexicanus).*

Endangered native waterbird species observed in 'Āpua Pond (Bruner, 1993) include the Ae'o or Hawaiian stilt (*Himantopus mexicanus knudseni*), 'Alae 'ula or Hawaiian (Common) Moorhen (*Gallinula chlorpus*), and 'Alae ke'oke'o or Hawaiian Coot (*Fulica alai*). The non-endangered 'Auku'u or black-crowned night heron *(Nycticorax nycticorax),* a native waterbird, has been seen flying above the park.

Migratory native birds frequent the site depending on the season. Shorebirds seen along the shoreline include Pacific Golden Plover *(Pluvialis fulva),* Ruddy Turnstones *(Arenaria interpres),* Sanderlings *(Calidris alba),* and Wandering Tattlers *(Heteroscelus incanus).* The Plover prefer open areas such as intertidal reefs, rocky shorelines, mud flats, lawns and pastures. The Turnstone, Sanderling, and Tattler often utilize mudflats and shallow ponds.

Sea birds, including the White-tailed Tropicbird (*Phaethon lepturus*), Wedge-tailed Shearwaters *(Puffinus pacificus),* Great Frigate Birds *(Fregata minor),* and others are commonly seen at this coastal site. Sea bird nesting has not been observed in the park proper (probably due to abundant predators), but nesting of several species is common on Mokoli'i Islet. Each fall the fledgling seabirds fly to the ocean, using the moonlight on the sea to navigate their way. Unfortunately, these birds can be attracted to lights on land, causing them to collide with power lines, cars, and other obstacles, or circling the lights until they are exhausted and fall to the ground. Stunned birds land and are then vulnerable to predation.

Mammals which may be encountered in the area include mongoose, mice, rats, domestic and feral dogs and cats, and possibly the endangered Hawaiian Hoary Bat.

Anticipated Impacts and Mitigative Measures
No rare, endangered or threatened plant or mammal species are presently known to exist on the project site, but several species of endangered Hawaiian waterbirds can be found at ʻĀpua Pond. The closest distance from ʻĀpua Pond to the proposed construction area is approximately 400 feet. Disturbance in the area will be short-term. Mitigative measures include controlling dust and using best management practices to protect the water quality of the pond. Re-vegetation of lawn areas disturbed by the wastewater system improvements will occur. Proper lighting will also be used for the Bathhouse and vicinity so as to not attract sea birds to the area.

3.8 ARCHAEOLOGICAL AND CULTURAL RESOURCES

An Archaeological Inventory Survey (AIS) of the proposed wastewater treatment system and new Bathhouse at Kualoa Regional Park was conducted by Cultural Surveys Hawaiʻi, Inc. (CSH) (March 2012). The attached study *(Appendix C)* includes subsurface analysis from 18 trenches of six meters long, one meter wide, and between one to two meters deep.

Existing Conditions
In 1974, the entire ahupuaʻa of Kualoa was placed on the National Register of Historic Places (Site No. 74000718) as a Historic District. The register forms assert that Kualoa was considered one of the two most sacred places on the island of Oʻahu (along with Kūkaniloko). The register forms focus on Kualoa's importance as a symbol of sovereignty and independence for Oʻahu, its role as a place of refuge, its role as a place where sacrificial victims for religious rituals were drowned, and its history as a sacred residence of chiefs. Kualoa is significant in Hawaiian folklore and mythology including traditions of Papa and Wākea, Hāloa, Pele, Hiʻiaka, Kamapuaʻa and moʻo (lizards/dragons). Kualoa is also significant in its association with historic personages in the Judd and Wilder families and for its role in the early history of sugar production on Oʻahu.

Nearly a hundred burials have been reported from Kualoa, thus it must also be considered a significant Hawaiian burial ground. The known locations of these burials are identified in *Figure 21* of *Appendix C*. In 1994 a re-internment facility was constructed for reburying human remains found at Kualoa. This facility has three concrete vaults, surrounded by a Hawaiian built rock wall located in a secluded area in the park.

Previous archaeological research indicates that subsurface cultural deposits associated with pre-contact traditional Hawaiian land use are present throughout the entire Kualoa Regional Park. Documented cultural deposits have been typically associated with a buried silty sand A-horizon (i.e., former land surface) and contain midden, lithic debitage, stone tools, and human burials. Specific to the current project area, it appears that the southwest, east, and north ends of the project area have a high potential to encounter cultural deposits, while the presence of deposits in the central portion of the project area may be less likely. Research indicates that Kualoa Regional Park has been extensively impacted by WWII activities, historic agriculture, and by more recent park development. This has churned-up and/or re-deposited the culturally-enriched buried A-horizon (i.e., subsurface cultural layer) as fill throughout the

immediate area, leaving the potential to encounter cultural resources throughout the entire project area, even within fill layers.

A brief 100 percent pedestrian inspection of the project area's surface confirmed that there were no surface historic properties present. As there were no surface historic properties, the inventory survey's historic property identification efforts focused on the identification of subsurface cultural deposits, which, based on background research, were likely to be preserved beneath layers of historic and modern fill.

Eighteen trenches were placed throughout the project area in areas that are anticipated to be subjected to subsurface disturbance associated with the proposed wastewater improvements (*Figure 3-7*). Observed stratigraphy from open trenching indicated that Kualoa Regional Park has been subjected to at least two episodes of ground disturbance: 1) Grading, compacting, and filling associated with WWII-era military activities; and 2) Grading, filling, and subsurface excavation associated with the development of the existing Kualoa Regional Park. Both of these events has either partially disturbed or has entirely removed the original ground surface, which is the stratigraphic layer that would be associated with traditional Hawaiian activities. However, testing results indicate that in many cases this stratigaphic layer has been reworked and re-deposited within the park grounds. This is evidenced by traditional Hawaiian cultural material (i.e., stone artifacts) being observed within fill layers, as well as in remnants of the original land surface.

A majority of the recovered artifacts were of traditional Hawaiian origin, including: an 'ulu maika (game stone), a micro-adze, an adze pre-form, a basalt file, a basalt chisel, basalt flakes, and volcanic glass flakes. Also recovered were a historic bottle and metal nails of modern origin. A total of 44 grams of midden was collected, consisting of marine shellfish, which included cowry, sea urchin, periwinkle, and bivalves. Plant species identified from the sample collected from a subsurface cultural layer at Trench 17 included: lama (*Diospyros sandwicensis*), hau (*Hibiscus tiliaceus*), 'ōhi'a lehua (cf. *Metrosideros polymorpha*), niu (cf. *Cocos nucifera*), koa (cf. *Acacia koa*), kukui (*Aleurites moluccana*), and hala (cf. *Pandanus tectorius*).

Of note was the presence of an isolated cranial fragment discovered during the excavation of Trench 17 located immediately makai of Comfort Station #2 (*Figure 3-8*). This single isolated cranial fragment, roughly the size of a quarter, was observed within a layer of fill likely deposited during the construction of the Comfort Station. Thus the cranial fragment was discovered in a secondary depositional context and its original primary burial context cannot be confirmed. Following identification, the fragment was wrapped in muslin and placed in a small lauhala basket, as directed by the State Historic Preservation Department (SHPD). The fragment was then reburied in the south end of Trench 17 in the vicinity of where it was originally discovered, at an approximate depth of 50 centimeters below surface. Human remains found during archaeological inventory surveys remain where they were uncovered. Since this was an isolated, previously disturbed fragment, concern for fragment safety (and potentially having to find it again) lead to the determination of protecting it in the lauhala basket.

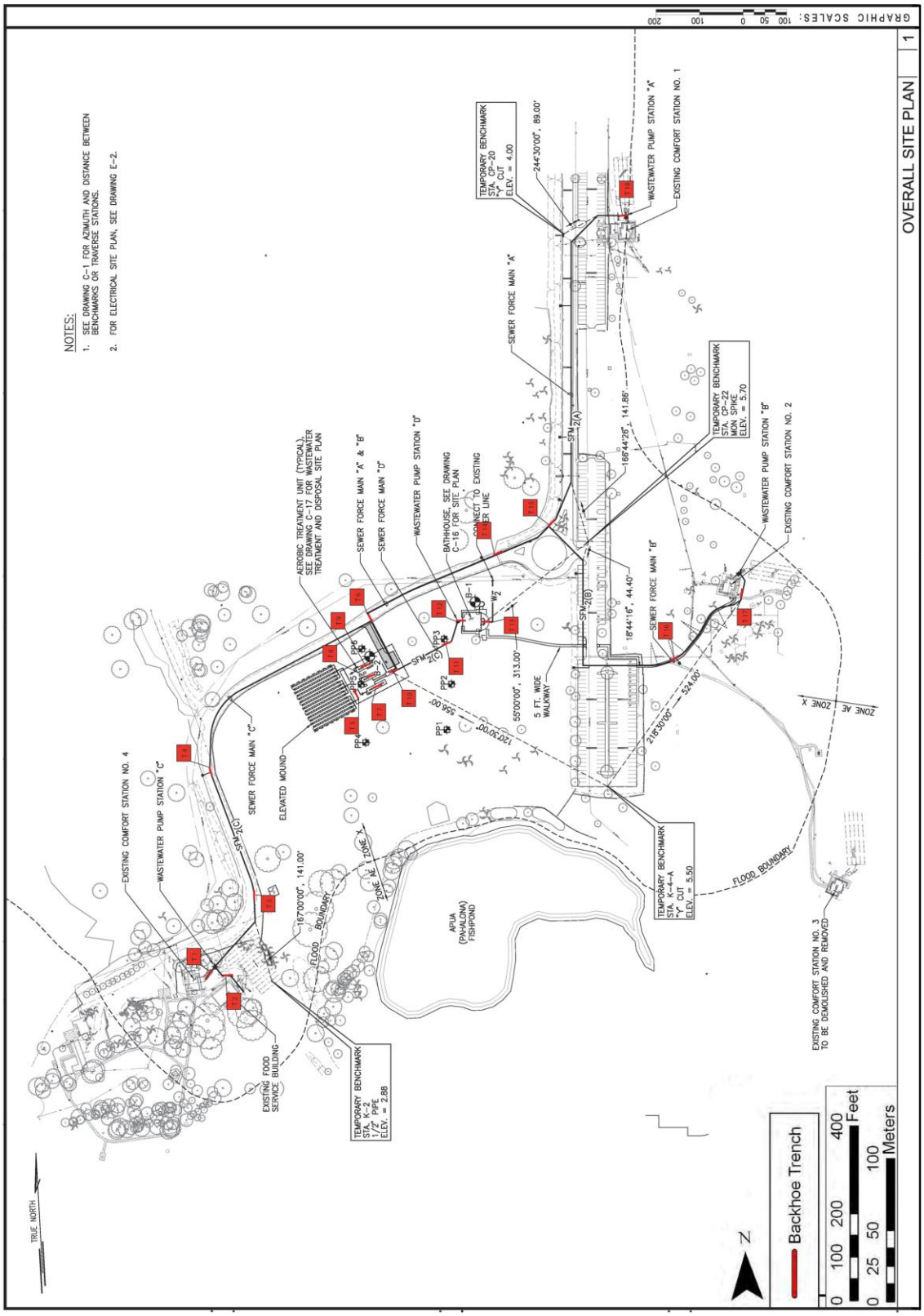

Figure 3-7 Trench Locations for Archaeological Inventory Survey (AIS) (Source: CSH, 2012)

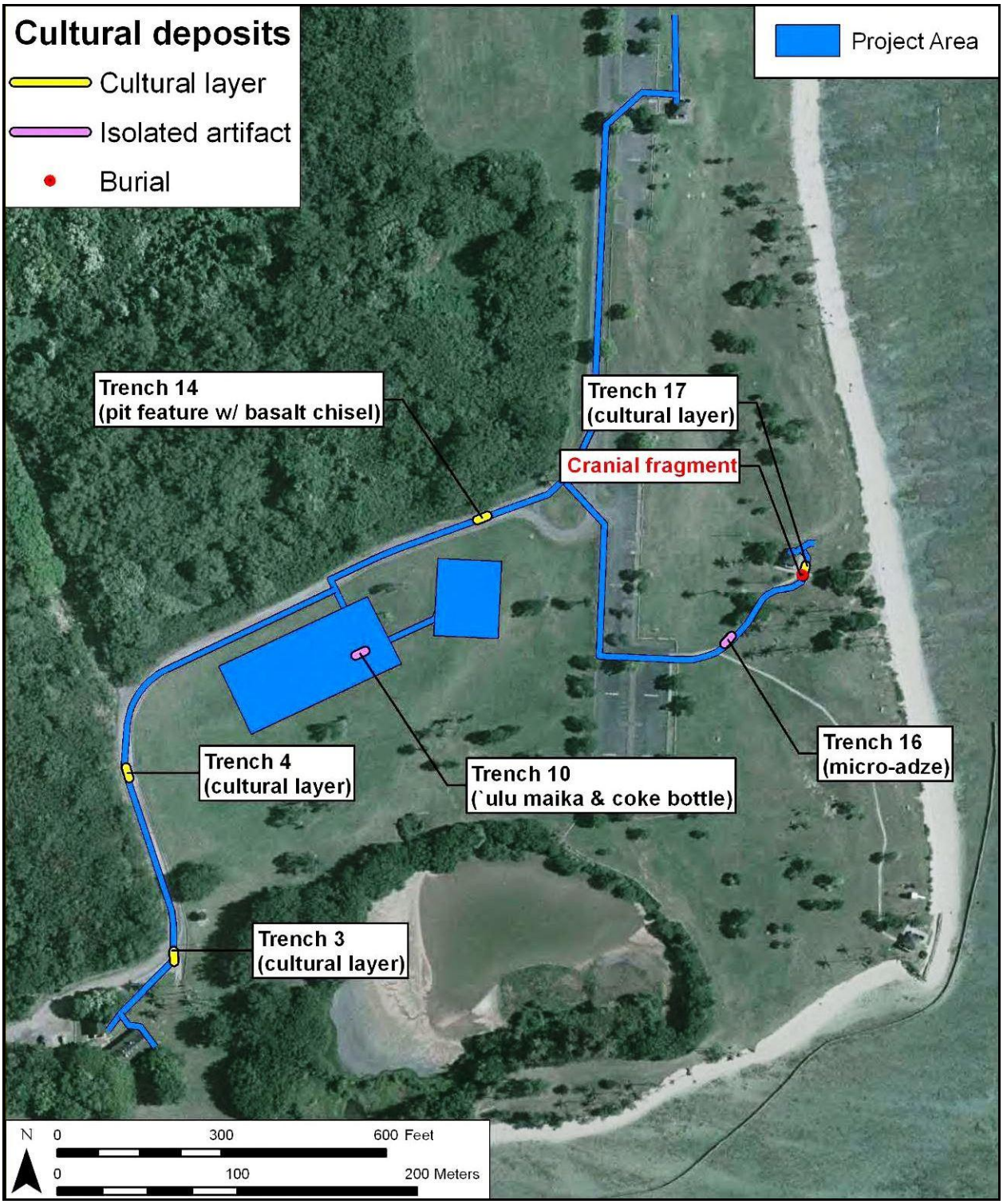

Figure 3-8 Distribution of Cultural Deposits Found During the AIS (Source: CSH, 2012)

Following the procedures of Hawai'i Revised Statutes (HRS) Chapter 6E-43, and Hawai'i Administrative Rules (HAR) Chapter 13-300, the remains were determined by SHPD to be "not a burial nor in a burial site context" [Phyllis Cayan (SHPD History & Culture Branch Chief) via e-mail correspondence 12/19/2011]. As the remains represent a previously identified human skeletal element in a non-burial context, SHPD has assumed jurisdiction on determining appropriate burial treatment. SHPD has indicated that all human fragments, finds, and burials discovered during project construction shall be re-interred at the designated burial mound at Kualoa Regional Park. Additionally, SHPD has requested that the City consult with recognized descendants on when re-interment shall occur, and that the O'ahu Island Burial Council (OIBC) district representatives be notified on the find and also consulted with on how to best care for the discovery.

Anticipated Impacts and Mitigative Measures
The archaeological inventory survey represents a good faith effort to identify and document the cultural resources within the project area. Due to the inherent limitations of any sampling strategy, however, it is likely that additional cultural resources or features associated with the single historic property identified during this inventory survey, potentially including human burials, may be uncovered during the project's construction.

Mitigation measures are twofold: archaeological monitoring and burial treatment. First, project development will proceed under an archaeological monitoring program to facilitate the identification and treatment of any human burials that might be discovered during project construction, and to alleviate the project's effect on non-burial archaeological deposits. An archaeological monitor will be present during all subsurface activities conducted during construction.

Second, in order to alleviate the project's effect on a previously identified human skeletal element in a non-burial context, a project-specific burial treatment plan (a requirement of HAR Chapter 13-300) will be prepared for consideration of the OIBC with review and approval by the SHPD/DLNR. The preparation of this Burial Treatment Plan is currently underway, and will incorporate the appropriate input from SHPD, the recognized lineal/cultural descendants, and the OIBC.

3.9 CULTURAL PRACTICES AND RESOURCES

A Cultural Impact Assessment (CIA) for the reconstruction of wastewater systems at Kualoa Regional Park was prepared by CSH (January 2012) and is included as *Appendix D.* For this study, the Area of Potential Effect (APE) is defined as the approximately two-acre project area. While this investigation focused on the Project APE, the study area included the entire ahupua'a of Kualoa.

Existing Conditions
The project requires compliance with the State of Hawai'i environmental review process under Chapter 343, HRS, which requires consideration of a proposed project's effect on cultural practices and resources. Through document research and ongoing cultural consultation efforts, the CIA provides information pertinent to the assessment of the proposed project's impacts to

cultural practices and resources which may include Traditional Cultural Properties of ongoing cultural significance that may be eligible for inclusion on the State Register of Historic Places. The CIA is intended to support the project's environmental review and may also serve to support the project's historic preservation review under HRS Chapter 6E-42 and HAR Chapter 13-275.

Hawaiian organizations, agencies and community members were contacted in order to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the project area and the vicinity. The organizations consulted included the State Historic Preservation Division, the Office of Hawaiian Affairs, the Oʻahu Island Burial Council, Hui Mālama I Nā Kūpuna O Hawaiʻi Nei, the Koʻolaupoko Hawaiian Civic Club, and community members of Kualoa Ahupuaʻa.

Appendix D contains a chronological listing of the cultural significance of this site. The information gathered details a rich cultural history of the area, beginning about 1100 A.D. Early settlers used the coastline of Kualoa as a temporary campsite for fishing and reef-gathering activities. By A.D. 1400, the southern beach was probably used as a burial ground, and the fishpond wall of Mōliʻi Pond was constructed. By A.D. 1600, the embayment forming ʻĀpua Pond was most likely walled, agricultural use of the lower slopes abutting the southern and eastern beaches was intensified, and the eastern beach was used as a burial ground. After A.D. 1600, virtually the entire project area was occupied, and was also an occasional residence of aliʻi (chiefs), as evidenced in the form of ornaments such as the lei niho palaoa (whale tooth pendant) and leisure activity areas such as an ʻulu maika (bowling) playing field. It was also possibly a residence of kāhuna (priests), as suggested by two heiau (place of worship) and intact pig skeletons that were perhaps offered in the worship of Lono, the god of agriculture.

Moʻolelo are associated with several wahi pana (storied places) in Kualoa and detail several cultural events and traditions, such as Kahaʻi returning from Samoa to plant the first breadfruit tree in Hakipuʻu Ahupuaʻa, the lowering of sails when passing Kualoa to honor its sacred land and high chiefs, the use of Kualoa as a puʻuhonua (place of refuge), and sacrificial drowning of kauwā (a low caste).

Land Commission Award documentation of the Māhele indicates habitation and subsistence practices within and near the project area prior to 1850. The land claims reveal that Hawaiian pā hale (households) were largely located along the coast, including two along the northeast border of the project area, with loʻi kalo (irrigated taro fields) concentrated near Mōliʻi Pond and kula ʻāina (field or pasture land) inland at the base of Kānehoalani Ridge where sweet potato, wauke (paper mulberry), beans, and melons were cultivated.

The cultural landscape at Kualoa has been severely impacted by shifts in the use of the land since the Māhele, including Gerrit P. Judd's ranch (later Kualoa Ranch) and sugar plantation. Significant places of historic interest within the project area include Hale Makani (House of Winds), a stone bathhouse built in 1916 by the Morgan family, and the Morgan family beach house, constructed in 1950, which became the site of the Kualoa Regional Park's office building. During World War II, the military fortified Kualoa, including a grassed emergency airstrip 6,000 feet long and 150 feet wide parallel to the eastern beach that extends into the project area

and across the main road (now Kamehameha Highway). Massive erosion between 1949 and 1979 along the eastern beach of Kualoa Regional Park uncovered coastal cultural resources, including burials. Maps and aerial photographs suggest a long-term pattern of accretion and erosion.

In recent years, Kualoa has been the site of efforts to revitalize cultural practices, including worship with the Temple of Lono, and voyaging traditions with the launching and sailing of Hōkūleʻa. Places associated with these recent practices within the project area include an area occupied by the Temple of Lono between 1981 to 1985, Hōkūleʻa Beach, and an ahu (shrine) constructed after a 16,000 mile voyage by Hōkūle'a between 1985 to 1987.

CSH attempted to contact 33 community members and government agency and community organization representatives. Of the 16 people that responded, nine kūpuna (elders) and/or kamaʻāina (Native-born) participated in formal interviews for more in-depth contributions to the CIA. For the project site, this community consultation indicates:

1. Several cultural sites have been exposed due to beach erosion or inundated with water. Massive erosion along the eastern shore of Kualoa Regional Park has unearthed grave sites. The recovered iwi have been relocated to a tree nursery site just outside of the project area mauka of the entrance road to the park.

2. The area of Kualoa and Hakipuʻu holds special cultural significance for all the community participants: The ridge of Palikū is associated with several moʻolelo of wahi pana (including the goddess Pele); a lunar alignment exists between Kualoa and the sacred birthing site of Kūkaniloko in central Oʻahu; Kaʻōʻio Ridge is the dividing line between the districts of Koʻolaupoko and Koʻolauloa; a portion of Kualoa was used as a puʻuhonua for those who were to be punished or killed; sections were used as a training ground for young aliʻi to learn how to become a chief; Kualoa once contained (and may still continue to contain) various artifacts that symbolized the sovereignty of Oʻahu during the time of Kahekili; Kualoa was the starting point of the Makahiki ritual; and numerous wahi pana can be seen in the Kāneʻohe Bay region from the southern shoreline of Kualoa.

3. Community participants express concerns and recommendations with regard to the project site:

   a. Participants believe there may be other burials throughout the project area, and advise that cultural monitoring would be needed should there be any excavation during the project. The design of the project should also take into full consideration the high potential to encounter burials. Development of a long-term monitoring plan is recommended for the inadvertent uncovering of human remains through continuing beach erosion. It was also recommended to develop a memorial to commemorate those who died at Kualoa.

   b. Three of the participants believe that the proposed location for the wastewater treatment center is probably least likely to cause damage to whatever remains of the intact archaeological stratigraphy in the park. However, one of the participants is concerned of the possibility that trenching for pipelines carrying the sewage to the treatment center may

disturb some previously unidentified intact archaeological stratigraphy. Another participant believes that the current proposed location of the wastewater treatment center is too close to ʻĀpua Pond and Mōliʻi Pond, and could result in inadvertent contamination in the future, which would impact any future attempts to restore the ponds. He recommends that alternative sites for the wastewater treatment center be considered, notably the area close to the entrance to the park by the maintenance building.

c. One of the participants notes that since the entire park area is very near sea level, high tides and heavy rains bring the water table quite near the ground surface. To avoid duplicating problems the project is intended to correct, the system would need to be monitored and maintained properly. Any waste injected, leached, or leaking into the ground has potential to rise to the surface during high tides and heavy rains, and to seep into the nearby fishponds.

Anticipated Impacts and Mitigative Measures
Based on the information gathered for the cultural and historic background and community consultation detailed in the CIA report, the proposed project may potentially impact Native Hawaiian cultural resources and burials. However, the proposed location for the wastewater treatment center is least likely to cause damage to the intact cultural layer in the park.

Land-disturbing activities during construction may uncover burials or other cultural finds. Personnel involved in the construction activities will be informed of the possibility of inadvertent cultural finds, including human remains. Should burials (or other cultural finds) be identified during ground disturbance, the contractor will immediately cease work and the appropriate agencies will be notified pursuant to applicable law. An investigation will then take place to determine the potential for relocating or realigning the wastewater system (or components thereof), and also to determine whether to preserve in place or relocate inadvertent cultural finds.

The City will consult with community members to develop a re-interment plan and cultural preservation plan in the event that any human remains or cultural sites or artifacts are uncovered during construction or long-term maintenance for the project. The City may also consider discussions with the community due to the concerns expressed about the project's possible impact to ʻĀpua Pond.

3.10 LAND USE DESIGNATIONS

Existing Conditions
The project area is bounded by the shoreline on its east and south sides. Directly south of the site is Kāneʻohe Bay, with its coral reefs and Ahu o Laka Sandbar. Directly east is the vast expanse of the Pacific Ocean. Sitting west of the project site adjacent to the park is the 125-acre Mōliʻi Fishpond, which is actively used for aquaculture. Just beyond is Johnson Road which provides access to several single family dwellings. This area is also used for the commercial production of taro, ornamental plants and horse grazing. Across Kamehameha Highway from the park is Kualoa Ranch, which provides visitors with cultural tours and outdoor recreation activities. Further north of the park, single family dwellings occupy the coastline.

Development patterns on O'ahu are set by State land use designations, the City General Plan, regional Development Plans and zoning regulations. The principal function of these regulations are to specify where land uses such as agricultural, commercial, residential, industrial, open and public areas are permitted. A more detailed discussion of existing land use designations and required permits and approvals for the proposed project is provided in Section 5.0.

Kualoa Regional Park is located within the State Land Use Agricultural District *(Figure 1-4)*. The proposed project does not require a change in State Land Use designation and is a permitted use within the Agricultural District.

The site is designated as P-2 Park/Preservation on the City's Zoning Map *(Figure 1-5)*. The proposed project is consistent with the Zoning Map designation. On the City's Ko'olau Poko Sustainable Communities Plan Open Space Map *(Figure 1-6)*, the subject property is designated as Regional Park. The proposed project is also consistent with the Sustainable Community Plan designation.

Anticipated Impacts and Mitigative Measures
The proposed project is consistent with existing land use designations; therefore, there is no need for any change in the existing land use classifications or in the amount of land designated for development. Land use patterns in the area will not change as a result of the proposed action. No mitigative measures are required.

3.11 ROADWAYS AND TRAFFIC

Existing Conditions
Kamehameha Highway serves the park's entrance and exit. Along this section of the windward coast, the highway has two lanes and generally runs parallel to the coastline. The posted speed limit is 45 miles per hour. The project site is accessed by vehicle through the park's two-lane paved road. Several parking areas have been developed to serve the park use areas along the shoreline. The shoreline is accessed via pedestrian walkways and lawns.

Anticipated Impacts and Mitigative Measures

Construction Period
Construction activities will be appropriately scheduled to avoid unnecessary impacts on traffic. Contractors will be responsible for providing necessary vehicle and pedestrian traffic controls and precautions for equipment mobilization, and to maintain traffic safety at the park entrance and along the internal roadway. The construction work and interior roadway improvements will take place within the boundaries of the project site.

Future Traffic Flow
The proposed project involves reconstruction of the existing wastewater collection, treatment and disposal systems, and will not impact the number of visitors or traffic to the park. Proposed improvements are intended to support present attendance levels. Expansion of facilities is not included (Comfort Station #3 will be replaced with the new Bathhouse); therefore, no mitigation measures are required for traffic.

3.12 UTILITIES

Existing Conditions

Water
The Board of Water Supply's system supplies potable water to Kualoa Regional Park through a water meter located at the maintenance facility. From the maintenance facility, the eight-inch water line turns east and runs through the park south along the parking lot.

Wastewater
The proposed project is for the improvements to the wastewater facilities serving Kualoa Regional Park. The project is located in the critical wastewater disposal area as determined by the Oahu Wastewater Advisory Committee. It is also located in the Pass Zone, which allows for individual wastewater systems.

Electrical Power
The electrical needs of the project site are served by the Hawaiian Electric Company system in Kamehameha Highway. The project will require power supplied to new pump stations, the replacement Bathhouse, and the new aerobic treatment unit systems.

Telephone
Telephone service to the project site is provided by Hawaiian Telcom. The project will require telephone service to send alarm signals from the pump stations to City personnel.

Anticipated Impacts and Mitigative Measures
There will be no adverse impact to utilities serving the park. All wastewater plans conform to applicable provisions of the HAR Chapter 11-62, Wastewater Systems. New water, electrical and telephone lines for the new facilities will be connected to existing lines. The proposed project will provide for improving the reliability of the wastewater facilities serving the park.

3.13 SOCIO-ECONOMIC CHARACTERISTICS

Existing Conditions

Recreational Use
O'ahu's park system consists of a hierarchy of four levels: neighborhood, community, district, and regional. The first three levels are intended to serve a population base of less than a three-mile radius. The last level, regional parks (including Kualoa), are larger in area and serve the recreational needs of the entire island.

Kualoa Regional Park is a 149-acre beach park administrated by the City's Department of Parks and Recreation. The estimated attendance at Kualoa Regional Park is 171,000 persons per year. The park has facilities for daytime picnic use and overnight camping. Other characteristics of the park include programs for student groups, conservation areas and a wildlife refuge. The southern section of the park is reserved for organized camping by children's groups.

The white sandy beach at Kualoa is particularly valuable since the beach has good facilities and water conditions in the Kāneʻohe Bay area. Other than Kualoa Regional Park, public shoreline access opportunities in the Kāneʻohe Bay area are limited to two small city parks and one state park.

Area Trends

Windward Oʻahu is economically dependent upon the resources of leeward Oʻahu, which is the financial, industrial, and commercial center of the State. Agriculture production remains an important land use of windward Oʻahu.

Agricultural activities in the area are comprised of small plots of land used for the production of ornamental plants, fruits, vegetables, taro, and cut flowers. Beef, pork, milk, and eggs are also produced, although these activities are generally small-scale operations employing family members or a hired staff of five or less.

Kualoa Ranch, Inc., located across the highway from the park, is the primary employer in the area of the project site. Cattle, taro, papaya, and vegetables are the main commodities produced, but the ranch also receives significant income from on-site tourist-related activities.

Population

The Kualoa area is within the Koʻolau Poko Census County Division (CCD, 91800), block 103.03, tracts 2018 and 2026. Census data for 2010 were used to describe population and housing characteristics for the Koʻolau Poko area (American FactFinder, n.d). Residents of the Koʻolau Poko area are predominantly of Caucasian and Asian descent, making up 32.8 percent and 25.3 percent of the census tract population, respectively. Smaller portions of the area's population are of Japanese (13.8%), Hawaiian or Other Pacific Islander (10%), and Filipino (4.2%) descent.

The population of the Kualoa area is small, representing only about 0.5 percent of Oʻahu's population. The Kualoa region still retains its rural/agricultural character.

Kualoa has been identified as an area of strong cultural continuity. The preservation of Hawaiian communities is important for the regeneration and subsistence of the Island's native culture. These communities are reliant upon natural resources remaining intact to maintain their values and ways of life.

In addition to Kualoa Regional Park's attractiveness as a recreational area, the existence of prehistoric burial sites enhances the cultural importance of the park. The Kualoa community has expressed their desire to preserve the artifacts and archaeological sites of this sacred and historical land. Listing on the National Register indicates a broad interest in these resources.

Housing and Families

The Koʻolau Poko area has slightly larger household sizes than the general Oʻahu population, with 3.13 persons per household size compared to 2.87 persons per household island-wide (American FactFinder, n.d). In 2010, there were 36,894 housing units in Koʻolau Poko, about ten percent of Oʻahu's housing stock of 336,899 units. Over 92% of Koʻolau Poko's units are single-family detached structures, which is indicative of a lower density/agricultural region. More than half of all housing units are owner occupied (68%), with the remainder being renter occupied and a small percentage of units being vacant (4.3%).

Anticipated Impacts and Mitigative Measures

The short-term construction period will generate some temporary disturbance to users of the park near work areas. There will be public notice made of any partial closure of the park required during the construction period. No construction will take place during weekends or holidays.

The project will result in beneficial long-term effects for recreational resources at this park. There will be no adverse effects upon population and housing. The project will create short-term benefits as a result of design and construction employment. Local material suppliers and retail businesses can also be expected to benefit through a multiplier effect from the increased construction activities. State General Excise Tax revenues will be generated by the project's construction and related expenditures.

3.14 AIR QUALITY AND NOISE

Existing Conditions

Air quality on Oʻahu is generally good and relatively low in pollution, except where there are large numbers of vehicles or when weather patterns create stationary air conditions. The project site is adjacent to Kamehameha Highway and vehicles traveling on this road contribute exhaust emission along this route. The area mauka of the development is mountainous and undeveloped, and the predominance of northeast trade winds generally creates relatively clean air conditions in this area.

The existing noise environment at the project site is characteristic of a park setting. Noise sources include traffic from Kamehameha Highway and surf along the shoreline.

Anticipated Impacts and Mitigative Measures

Construction activities are expected to generate short-term impacts to air quality primarily from fugitive dust emissions. The impact of construction activities on air quality will be mitigated through conformance to strict dust control measures, particularly 342B, 1992; and the USDA NRCS Erosion and Sediment Control Guide for Hawaiʻi, 1981. Short term increases in vehicular emissions due to disruption of traffic by construction equipment mobilization may occur. No mitigative measures are required.

Noise impacts will be limited to the construction phase only, where construction work at the project site will involve activities that may generate an increase in noise levels. However, such exposures are only a short-term condition, occurring during normal working hours. Construction-period noise will be mitigated in accordance with Title 11, HAR Chapter 46, Community Noise Control of the State DOH.

3.15 VISUAL RESOURCES

Existing Conditions

The project site is located within a picturesque setting with beautiful ocean, shoreline and mountain vistas. There are unique views of the windward shoreline, Mokoli‘i Islet (Chinaman’s Hat) and mountain to ocean views available from Kualoa Regional Park *(Figures 3-9 to 3-10a through 3-10g).*

The Ko‘olaupoko Sustainable Communities Plan (SCP) (2000) identifies panoramic view areas at Kualoa Regional Park. From Kamehameha Highway, a viewplane sweeps from the Ko‘olau Mountains across the park and out to Mokoli‘i Islet. Views from the Kualoa Park coastline extend north towards Ka‘a‘awa, across the Pacific Ocean and into Kāne‘ohe Bay to Mokapu Peninsula (*Figure 1-6*).

The City’s Coastal View Study (1987) identifies important view sheds around O‘ahu. The project site is included in “Section A of the Kāne‘ohe Bay Viewshed, Kahalu‘u”. Views described in this section are similar to those described in the Ko‘olaupoko SCP.

Anticipated Impacts and Mitigative Measures

The proposed project will have a short-term effect on internal park visual resources during the construction period. Following completion of construction, the new Bathhouse will be visible. The treatment and disposal system will be constructed under a new eight-foot high grassed mound, and surrounded by a chain-link fence for the purpose of its security. These facilities will be designed to complement the park setting, and will not create significant adverse visual effects for park users. The design will be consistent with guidelines set forth in the Ko‘olaupoko SCP. The new Bathhouse will be designed with a Hawaiian theme, with colors and materials that complement and enhance this park setting. The proposed scale and size of the project buildings are appropriate to the vicinity.

The project will not affect the vistas at any of the locations described by the Ko‘olaupoko SCP and Coastal View Study. The view of the new Bathhouse from Kamehameha Highway will be blocked by the grove of trees already established at the park, and will not be present in the viewplane towards Mokoli‘i Islet (*Figure 3-10a*). The new Bathhouse and treatment/disposal location will be visible only from an interior access road, with ‘Āpua Pond in the background.

Figure 3-9 Visual Resources Map Key

3-10a Coastal View from Kamehameha Highway, Mokoli'i Islet on the Left. Proposed Project Location is Behind the Grove of Trees on the Right. (Key 1)

Figure 3-10b Driveway into Kualoa Regional Park with Comfort Station #1 in the Distance (Key 2)

Figure 3-10c Comfort Station #1 (Key 3)

Figure 3-10d Roundabout at the Center of Kualoa Regional Park (Key 4)

Figure 3-10e Comfort Station #4 (center-right distant) and View Across Site for New Bathhouse and Treatment / Disposal Facilities. ʻĀpua Pond to the left. (Key 5)

Figure 3-10f Comfort Station #2 (Key 6)

Figure 3-10g Comfort Station #3 (Key 7)

3.16 POTENTIAL CUMULATIVE AND SECONDARY IMPACTS

Cumulative effects are impacts that result from the incremental effects of an activity when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. The project site has been previously disturbed through farming, military uses, sand mining, and park facility construction. Construction for this project will take place in areas previously disturbed, and is not anticipated to generate significant cumulative impacts.

Secondary effects are impacts that are associated with, but do not result directly from, an activity. Overall, the project's secondary impact would be a beneficial effect on the public health and environment, and allow for continued public enjoyment of the park.

4.0
Alternatives to the Proposed Action

4.0 ALTERNATIVES TO THE PROPOSED ACTION

This Environmental Assessment (EA) provides a summary evaluation of several alternatives to the proposed project described in Section 2.0. The alternatives include:

- No Action
- Upgrade Treatment and Disposal Systems at Individual Comfort Stations
- Connection to Municipal Sewer System
- Park Use Regulation or Closure
- Centralized Comfort Station
- Treatment Facility and Disposal Site
- Minimal Excavation
- Trenchless Technologies
- Wastewater Treatment Systems
- Disposal Systems

This section presents an evaluation of the wide range of alternatives to the proposed action. Several of these options were discussed in stakeholder group meetings held from 2007 to 2011. *Appendix E* includes diagrams and comparison matrices of alternative treatment and disposal options that were presented at these meetings.

4.1 NO ACTION

The No Action alternative would maintain the wastewater systems at Kualoa Regional Park in their present run-down condition and require pumping out the tanks on a regular basis with disposal off-site. Advantages to this current system are that electrical power is not required, and nutrients and pathogens are not discharged into the environment. The No Action alternative would not require new excavations at Kualoa Regional Park, nor would there be other construction-related impacts.

Existing systems, however, are undersized and comfort stations have been closed because the tanks have been filled to capacity. During summer camping season and long weekends, the City and County of Honolulu (City) brings in portable toilets at Comfort Station #4 to handle the heavy usage of that facility. Without improvements, the inadequacy of the park's wastewater management facilities could cause more closures of some of the park facilities, or require a continuation and expanded use of portable toilets during high park occupancy. Park operation becomes inefficient, thus more costly as additional man-hours are required to monitor and routinely check the capacity of existing tanks.

Due to high bacterial counts measured in near shore waters in 2006, the State Department of Health (DOH) issued a Notice of Violation (NOV) to the City with the park's wastewater disposal system as the assumed point source. As a result of the DOH NOV, and described in the Agreement of Resolution, the City is required to replace the current temporary holding tank wastewater system with a more permanent wastewater system by a specific deadline. Currently, no treatment is provided, and the possibility of odors is high when the wastewater

goes septic, or putrefies, since there is no oxygen pumped through the system. The option of doing nothing and continuing the current operation of pumping tanks has the greatest risk of potential for a wastewater spill. The condition of the park's wastewater facilities are in violation of State law, and do not satisfy the resolution of the NOV between the City and DOH.

Pumping of the septic tanks has been undertaken as a temporary interim solution, although DOH prefers a permanent means for managing and operating wastewater systems. In 2011, pumping of the tanks cost approximately $8,722 per month, and costs continue to increase. This cost does not include the hours of manual labor required to continuously monitor levels in the tanks, the effort to shut facilities down when tanks are full, or coordinate pump activities. In 2011, it cost $2,630 per month to rent two American Disability Act (ADA) and ten standard portable toilets, excluding maintenance costs. Even with implementing this temporary mode of operating the wastewater system, approximately 50% of the camp sites are unavailable for public use. This inadequacy of the wastewater treatment and disposal function at the park facilities is considered unacceptable by DOH.

Continuing with the No Action Alternative would result in continued (and rising) pumping and portable toilet costs, public and environmental health risks, and additional fines for the City. This alternative is considered to be impractical.

4.2 UPGRADE TREATMENT AND DISPOSAL SYSTEMS AT INDIVIDUAL COMFORT STATIONS

Treatment of wastewater and disposal would continue to occur at each individual comfort station. This alternative would not require construction of interconnecting utilities throughout the park. The existing treatment and disposal systems at each comfort station would be replaced, as they are old and under capacity based on current DOH regulations. These upgraded systems would be constructed outside the footprint of the existing system, and in previously "undisturbed areas."

It should be noted that the disposal system of the existing Comfort Station #2 is too close to the eroding shoreline, thus it would have to be realigned and constructed in an area not previously disturbed. As noted in the archaeological studies, excavations in these areas also pose a higher probability of finding cultural resources. The facilities would have to be closed for longer periods of time during construction. Using the decentralized systems limits flexibility for the park to expand facilities in the future. For this alternative, the individual systems, specifically Comfort Stations #1 and #2, are close to an eroding shoreline, and considered impractical.

4.3 CONNECTION TO MUNICIPAL SEWER SYSTEM

There is no municipal sewer service in this region of Oʻahu. The closest municipal sewer line is approximately 5.5 miles away near the Hygenic Store in Kāneʻohe. The City has no plans to extend the sewer line along Kamehameha Highway to serve the Kualoa region. If the Park chose this alternative, the costs to create this infrastructure would include piping, pump stations, pumping costs, land acquisition, and sewer connection fees. The capital cost to complete these improvements is estimated at greater than $35 million, making this alternative impractical from a cost perspective. Extension of the City's sewer system along the coastal

highway could also place new community growth pressures on the undeveloped land in this region. This alternative is considered to be impractical.

4.4 PARK USE REGULATION OR CLOSURE

During stakeholder meetings, various ideas for limiting park usage to reduce the generation of wastewater were discussed. The introduction of a public use/entrance fee, similar to the fee assessed for users at Hanauma Bay, could be considered. Reducing the number of campsites would be another option, which is currently happening due to the inadequacy of the current wastewater system. Closure of Kualoa Regional Park to the public, either partial or full closure, was also discussed. The reduction in park use would reduce the total wastewater flows at the park restrooms. Unless the park was completely closed to public use, there would always be the need for wastewater facilities. Because of the City's Agreement of Resolution with DOH, a solution to wastewater management remains a requirement. Closure of the park is not a desired alternative course of action for the City, or the community.

4.5 CENTRALIZED COMFORT STATION

In addition to a new centralized wastewater treatment and disposal system, a new centralized comfort station could be developed to take the place of the four existing comfort stations. The four existing comfort stations would be closed and demolished, and park users would use a new larger, centralized comfort station. There would be no excavation to install a collection system from the existing comfort stations.

Although this new comfort station would be larger and centralized, it does not meet the City's functionality preference as it would not be convenient for park users in remote areas of the park away from the central location. In addition, the anticipated high level of use at a centralized facility would require diligent maintenance to avoid creating unsanitary conditions. This alternative is considered impractical.

4.6 TREATMENT FACILITY AND DISPOSAL SITE

An alternative location for the treatment and disposal system was proposed by kupuna during a lineal descendants meeting. The proposed location was mauka of the park gravel road that leads to the campground area in the back of the park. Although there are obvious benefits about constructing the treatment and disposal system further away from ʻĀpua Pond, in addition to eliminating use of open space of the park, this area was previously deemed infeasible. It was eliminated from consideration because previous archaeological studies suggested that this area is potentially "more sensitive" for the following reasons:

1. It is closer to Mōliʻi fishpond;
2. Nearby is Koholā-lele depression, which some refer to as a "pond";
3. It is along a mauka/makai access route that had Land Commission Awards from the mid-1800s (indicative of where people lived/farmed, suggesting higher potential for encountering significant finds); and
4. It is presumed that this area has fewer disturbances from past and current developments as compared to the park's open space areas.

4.7 MINIMAL EXCAVATION

The basis of this alternative is to minimize excavation of the existing ground. Typically, burying wastewater systems below the surface offers protection of the systems. Constructing the systems above ground increases the potential of damage and risk of the wastewater system, with impacts and threats to the public health and safety.

Due to concerns about the potential damage of the sewer force mains from vehicles, or park users, the sewer force mains would be constructed within a reinforced concrete jacket and protected by concrete piles. This concept would help reduce the potential of damaging the wastewater system leading to wastewater spills and impacting health and safety of the public. Fill can be placed over these to minimize the concrete appearance. The limits of fill would extend outside of the utility alignment to create gradual slopes to match existing ground. Even without fill above the concrete jacket and pile, the concrete jacket and piles create a high point/barrier that disturbs the existing drainage patterns of the site. Thus fill would be needed to create new high points and swales to minimize ponding and drain the site. Raising the topography would change the drainage patterns of the park triggering a No-Rise evaluation approval from the City's Department of Planning and Permitting (DPP). Drainage studies, flood studies, and additional permitting would be required for the import of fill. Excavation would be required at road or parking lot crossings.

The three aerobic treatment tanks (approximately 10 feet in diameter, 50 feet long) and the pre-loader would be constructed on concrete slabs. The top of the tanks would be approximately 13 feet above existing grade. Scaffolding, handrails, and stairs would be needed around the tanks for maintenance access. Handrails would be approximately 17 feet above existing grade. Footings and foundations of the structures and concrete slab would require excavation into the existing ground. To lessen the aesthetic impacts, tall trees and/or vegetation could be planted around the perimeter outside of the chain link fence.

A disposal system is required for this alternative. The disposal option that offers the least disturbance to the existing ground is an elevated mound, as discussed in later sections.

The primary shortfall of this alternative is the significant potential for damage to the system due to vehicles and vandalism. Potential physical damage would result in the real risk of system failure. The issues of drainage ponding and physical damage liability are also substantial shortcomings with this alternative. This alternative is considered to be impractical.

4.8 TRENCHLESS TECHNOLOGIES

Trenchless technologies, such as micro-tunneling or directional drilling, were considered as alternative construction methods. This technology would require excavation of sizable entry and exit jacking pits. Minimum depth of installation is approximately six feet, thus the sewer force main would be installed at soil depths in which iwi are likely to be found. Disturbance of iwi would not be known with this type of construction. These methods are generally more expensive than open trench construction. Further, this option limits opportunity for mitigation should subsurface cultural remains be encountered in construction. This alternative is considered to be impractical.

4.9 WASTEWATER TREATMENT SYSTEMS

There are several options for wastewater treatment systems that could be considered for use at Kualoa Regional Park. Several different systems were considered, including a) composting toilets, b) septic tank treatment system, c) aerobic treatment unit systems, and d) natural treatment systems.

4.9.1 Composting Toilets

The benefit of placing composting toilets at the park is that it would help reduce potable water consumption, as well as creating compost, an end product that can be used as a soil amendment. This makes the use of composting toilets environmentally friendly. However, the use of composting toilets would require extensive replacement of existing plumbing fixtures, as the design of composting toilets includes a waste collection and processing unit. The processing unit, or reactor, may be directly beneath the toilet or in a separate area. Composting toilets reduce the incoming wastes by decomposition and evaporation. Wastes from toilets and urinals drop directly below into a composting unit. Air is drawn through the unit by a fan or passively through vents to allow aerobic breakdown of the wastes and facilitate evaporation of liquid. Without continuous ventilation or proper maintenance, composting toilets have the potential for odors and vector attraction. There is also a purchase cost for specific organic materials to properly maintain the composting system.

The processing unit must be accessed to remove the composted material and excess liquid must be drained from the tank. The composting toilets would need to be raised above the existing floor level (at least six feet) to allow for maintenance access to the lower portion of the composting toilet. To enable this function and make the toilets ADA accessible, it would require significant structural modification of each comfort station.

Composting toilets have limited capacity and are maintenance intensive, which makes this technology unsuitable for an active beach park. For these reasons, composting toilets were not considered as a viable option for Kualoa Regional Park.

4.9.2 Septic Tank Treatment System

The septic tank system is a simple operation, in which solids and grit settle to the bottom of the tank, and oils/grease as well as other floatables rise to the top. A baffle within the tank enhances removal. The tank acts as a settling basin for the incoming waste by reducing the wastewater velocity, creating quiescent conditions for the solids to drop to the bottom and floatables float. Periodic pumping and disposal of solids and floatables is required.

A septic tank system was approved by DOH, but the community expressed a preference for treatment technology that would provide better quality effluent due to the sensitivity and significance to the park. Thus, other options were explored.

4.9.3 Aerobic Treatment Unit System

An aerobic treatment unit is a "mechanical" treatment system in which biological treatment of the wastewater is promoted through bubbling air into the wastewater. The aeration of the wastewater serves two purposes: to keep the materials in the wastewater well mixed and to increase the oxygen in the wastewater. Mixing makes the wastewater in the tank more uniform, evenly distributing the nutrients and microbes. The increased oxygen bubbled into the wastewater creates a hospitable environment for microorganisms to breakdown organic materials. This results in a higher level of treatment than is typically achieved in a septic tank.

Aerobic treatment unit requires electrical power to run the aeration mechanism and a pumping system, depending on the type of unit. It is also desirable to include a pretreatment tank or small septic tank, to separate out floatable, bulky, or stringy materials from the flow stream, prior the wastewater it entering the aerobic treatment tank. The addition of a pretreatment tank helps to reduce maintenance of the aerobic unit, particularly the aerators.

Aerobic treatment units and disinfection is required by the State of Hawaii, Department of Health, Wastewater Branch when discharge occurs directly into ground water. For this project, discharge directly into the ground water will not occur. But, due to the City's understanding of the Community's association to the park, along with the attempt to provide a better effluent than minimum, an aerobic treatment unit with disinfection was developed as an option.

A chain link fence will be provided around the area of the aerobic treatment units for the purposes of security.

4.9.4 Natural Treatment Systems

<u>Constructed Wetland</u>
A natural land treatment system such as constructed wetlands was considered for use in this project. A constructed wetland is essentially a bed of gravel and vegetation in which wastewater receives treatment. The primary mechanism for the consumption of contaminants in the wastewater is the microorganisms which attach themselves to the plant substrate. Typically, natural land systems require larger areas of land compared to conventional mechanical systems. A larger area of land disturbance is against the overall project design goals in trying to minimize the area of disturbance. Preliminary estimates indicated that a constructed wetland would be approximately 200 feet wide by 200 feet long (40,000 square feet), as compared to a conventional mechanical (aeration treatment unit) system that would require approximately 50 feet by 70 feet (3,500 square feet) for the same amount of wastewater. This area is estimated based on the need to have three tanks, approximately 10 feet in diameter, 50 feet long, and 10 feet between each tank.

It should be noted that the similar biological treatment process occurring in natural land systems occurs at a "natural" rate, as opposed to conventional mechanical systems where the treatment process occurs at an accelerated rate due to an input of energy.

A pretreatment tank and disposal system is required for these systems.

Due to the large area required of a constructed wetland system as compared with a conventional mechanical system, the alternative was determined to be not feasible.

Living Machine/Green Machine
A variation of the constructed wetland system was considered and is known as a Living Machine or Green Machine.

The Living Machine's main component is similar to the constructed wetland, except that it uses its own specially designed gravel, and pumps to cycle water levels in cells (either to fill and/or draw down), to assist with oxygen transfer to the wastewater and promote microorganism activity and consumption of the wastewater contaminants. Based on discussions with a manufacturer, the Living Machine will require approximately 4,500 square feet for its treatment component. The overall basin height for the gravel and pumps is approximately 9 feet. Consideration for minimum excavation installation and partially buried installation are similar to the installation of an aerobic treatment unit.

Similar to a constructed wetlands system, it will require a pretreatment tank and a disposal system.

4.10 DISPOSAL SYSTEMS

With a centralized treatment facility, several alternatives for disposal were considered. These alternatives include discharge to surface water, water reuse, and subsurface disposal options.

4.10.1 Discharge to Surface Water

Discharge to nearby surface waters such as ʻĀpua Pond was considered, and conversion to a wetlands treatment system was also evaluated. However, ʻĀpua Pond is an historic fishpond that is listed on the National Register of Historic Places. Because of this, the following permits may be required:

- Department of the Army, Corps of Engineers Nationwide Permit
- State of Hawaiʻi DOH National Pollutant Discharge Elimination System Permit (DOH-NPDES)

This disposal method would not be suitable due to potential water quality degradation and cultural resource issues. Also, acquisition of the above permits would likely be a difficult and lengthy process. Therefore, this option was not further considered.

4.10.2 Water Reuse

Water reuse for irrigation was considered, through either subsurface or surface irrigation. By using the treated effluent for irrigation, potable water use would decrease. The reuse option would require a new irrigation system, which would require excavation and installation of additional piping throughout the park. State DOH restrictions of park use in areas with reuse are also a concern. Depending on the level of treatment, reuse opportunities vary. For a park,

R-2 recycled water can be disposed of via subsurface irrigation. Shallow drip lines, however, may restrict activities over the irrigated area (e.g., no pitching of tents, etc.) that may damage the lines. R-1 recycled water can be sprayed or disposed of subsurface.

Based on a preliminary evaluation of rain data, it was estimated that the reuse irrigation system would only be used during four of the twelve months, since the park is generally wet. During the other eight months that are rainy (i.e., October through May), the available reuse water would be disposed of through a backup disposal system. The backup disposal system would be an elevated mound, similar to what is proposed in the current design.

Water reuse would lead to additional excavation; require a higher level of treatment (i.e. additional disinfection and filtration), additional operations, maintenance, and monitoring requirements; and use of a backup disposal component that is estimated to be used more than the primary means (reuse). Thus, reuse is not considered as a viable method for primary disposal.

4.10.3 Subsurface Disposal

A common method for disposal of treated wastewater is through subsurface soil absorption systems. Typical subsurface soil absorption systems include trenches, beds, and elevated mounds.

Trench or Bed Systems

A trench can vary between one to three feet wide, and its depth will vary depending on system layout. Traditional trench systems have been constructed using perforated pipe and gravel. Recently, however, other materials such as interlocking plastic chambers have been substituted for the perforated pipe and gravel bedding. These alternatives provide additional storage capacity and are less likely to fail as compared to a perforated pipe and gravel system. A bed system is different than a trench in which the bed is typically wider than a trench.

An absorption trench is typically three feet wide, depth as required to meet the system requirements. Each trench will consist of a perforated pipe or plastic chamber which is installed within a bed of gravel. Wastewater is conveyed through the pipe or plastic chamber, and percolates into the gravel over the length of the three-foot wide trench, and ultimately into the soil below. A trench system will require a minimum of two trenches. A trench system has a distinct undisturbed soil area between each trench.

For an absorption bed, the entire disposal area is excavated, and a gravel bed is poured on the bottom of the excavation. Perforated pipe or plastic chambers are laid atop the gravel bed. Wastewater flows conveyed by the perforated pipe or plastic chambers will percolate into the gravel bed and be distributed over the gravel bed and ultimately into the soil below.

Elevated Mound

The structure of an elevated mound is similar to a bed system as described above. The difference between an elevated mound and bed system is that a bed system is usually constructed below the existing ground (requiring excavation), and the elevated mound is typically constructed above existing ground (minimizing excavation of the existing ground).

Elevated mounds may or may not require a pumping system, depending on system configuration. Elevated mounds are generally engineered mounds of sand/soil/gravel used for the purpose of creating a vertical separation between the disposal elevation to the groundwater. Using an elevated mound was primarily selected because of the ability to minimize disturbance of the existing ground.

4.11 COMPARISON OF ALTERNATIVES

The preferred option is to create a centralized aerobic treatment system located makai of the park access road with collection lines located along previously disturbed routes. This would result in the least potential for affecting subsurface cultural resources, construct a system away from the eroding shoreline, and would have the option for expansion in the future.

In conclusion, the available treatment options are dependent on numerous factors that need to be considered. For Kualoa, although it has higher capital and operation and maintenance costs, an aerobic treatment system was selected because of the better quality effluent that could be expected from an aerobic treatment unit as compared to effluent from a septic tank. Installation of individual aerobic systems at each of the existing comfort stations would continue the treatment and disposal of effluent at multiple locations, reducing opportunities for expansion in the future, with some systems close to the shoreline and in areas of higher probability for finding cultural resources. The elevated mound disposal system was selected as it would also minimize disturbance of the existing ground.

5.0
Conformance with Plans, Required Permits and Approvals

5.0 CONFORMANCE WITH PLANS, REQUIRED PERMITS AND APPROVALS

The project's consistency with applicable State of Hawai'i and City and County of Honolulu (City) planning and land use objectives, policies, principles and guidelines are discussed below.

5.1 AMERICANS WITH DISABILITIES ACT OF 1991

In 1991, the Federal government enacted the American with Disabilities Act (ADA) to provide equal accessibility for persons with disabilities. Part of this statue is having building design consider the needs of persons with disabilities. Chapter 103-50 of the Hawai'i Revised Statutes (HRS) states,"….all plans and specifications for the construction of public buildings, facilities, and sites shall be prepared so that the buildings, facilities, and sites are accessible to and usable to persons with disabilities." The disability and communication access board shall adopt rules for the design of buildings, facilities, and site, by or on behalf of the State and Counties.

Discussion: The new Bathhouse of the proposed project will comply with ADA requirements.

5.2 HAWAI'I STATE PLAN

The Hawai'i State Plan establishes a statewide planning system that sets forth goals, objectives, policies, and priority directions to provide for the wise use of Hawai'i's resources and guide the future long-range development of the State. Discussed below is the project's relationship to the goals and applicable objectives, policies and priority directions.

The goal of the State, as stated under the Hawai'i State Planning Act (Chapter 226, HRS), is to achieve the following:

- A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawai'i present and future generations.
- A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people.
- Physical, social, and economic well-being, for individuals and families in Hawai'i, that nourishes a sense of community responsibility, of caring, and of participation in community life.

The objectives and policies of the Hawai'i State Plan that are pertinent to the proposed project are as follows:

§226-6 Objectives and policies for the economy--in general.
(b) To achieve the general economic objectives, it shall be the policy of this State to:
(14) Promote and protect intangible resources in Hawaii, such as scenic beauty and the aloha spirit, which are vital to a healthy economy.

§226-8 Objective and policies for the economy--visitor industry.
(b) To achieve the visitor industry objective, it shall be the policy of this State to:
(1) Support and assist in the promotion of Hawaii's visitor attractions and facilities.
(3) Improve the quality of existing visitor destination areas.

Discussion: Many visitors come to Kualoa Regional Park to take pictures of Mokoli'i Islet and enjoy the dramatic mauka and makai views. Improving the wastewater system at the park will protect the scenic beauty of the ocean and help to provide a quality experience for both visitors and locals alike.

§226-11 Objectives and policies for the physical environment--land-based, shoreline, and marine resources.
(a) Planning for the State's physical environment with regard to land based, shoreline, and marine resources shall be directed towards achievement of the following objectives:
(1) Prudent use of Hawaii's land-based, shoreline, and marine resources.
(2) Effective protection of Hawaii's unique and fragile environmental resources.
(b) To achieve the land-based, shoreline, and marine resources objectives, it shall be the policy of this State to:
(2) Ensure compatibility between land-based and water-based activities and natural resources and ecological systems.
(3) Take into account the physical attributes of areas when planning and designing activities and facilities.
(8) Pursue compatible relationships among activities, facilities, and natural resources.
(9) Promote increased accessibility and prudent use of inland and shoreline areas for public recreational, educational, and scientific purposes.

§226-13 Objectives and policies for the physical environment--land, air, and water quality.
(a) Planning for the State's physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives:
(1) Maintenance and pursuit of improved quality in Hawaii's land, air, and water resources.
(2) Greater public awareness and appreciation of Hawaii's environmental resources.
(b) To achieve the land, air, and water quality objectives, it shall be the policy of this State to:
(2) Promote the proper management of Hawaii's land and water resources.
(3) Promote effective measures to achieve desired quality in Hawaii's surface, ground, and coastal waters.
(4) Encourage actions to maintain or improve aural and air quality levels to enhance the health and well-being of Hawaii's people.

Discussion: The marine and outdoor resources of the project site are the featured assets of Kualoa Regional Park. Planning and design for the project take into consideration the distance to the shoreline for protection of the marine resources. In the short-term, construction activities will be subject to regulatory requirements that will mitigate or minimize potential impacts to natural resources and ecological systems. In the long-term, the proposed project improvements will have beneficial water quality impacts on recreational coastal waters by reducing the probability and frequency of spills of untreated wastewater, providing a "right-sized"

treatment and disposal system to meet today's demands, and a treatment system that provides better quality than the existing system.

§226-14 Objective and policies for facility systems--in general.

(a) Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives.

(b) To achieve the general facility systems objective, it shall be the policy of this State to:

(1) Accommodate the needs of Hawaii's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans.

(2) Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities.

(3) Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user.

(4) Pursue alternative methods of financing programs and projects and cost-saving techniques in the planning, construction, and maintenance of facility systems.

§226-15 Objectives and policies for facility systems--solid and liquid wastes.

(a) Planning for the State's facility systems with regard to solid and liquid wastes shall be directed towards the achievement of the following objectives:

(1) Maintenance of basic public health and sanitation standards relating to treatment and disposal of solid and liquid wastes.

(b) To achieve solid and liquid waste objectives, it shall be the policy of this State to:

(1) Encourage the adequate development of sewerage facilities that complement planned growth.

Discussion: The wastewater improvements at Kualoa Regional Park support statewide social, economic and physical objectives, and will be accommodating the needs of Hawai'i's people as it aligns with state and county plans. The improvements to the wastewater system will accommodate the current users at the park, but is designed with provisions to add additional systems to accommodate future needs, if necessary.

§226-20 Objectives and policies for socio-cultural advancement--health.

(a) Planning for the State's socio-cultural advancement with regard to health shall be directed towards achievement of the following objectives:

(2) Maintenance of sanitary and environmentally healthful conditions in Hawaii's communities.

§226-102 Overall Direction.

The State shall strive to improve the quality of life for Hawai'i's present and future population through the pursuit of desirable courses of action in six major areas of statewide concern which merit priority attention: economic development, population growth and land resource management, affordable housing, crime and criminal justice, quality education, and principles of sustainability.

§226-104 Population growth and land resources priority guidelines.

(a) Priority guidelines to effect desired statewide growth and distribution:

(3) Ensure that adequate support services and facilities are provided to accommodate the desired distribution of future growth throughout the State.

Discussion: The project has a direct correlation with maintaining sanitary and environmentally healthful conditions at the park, and will be able to accommodate increased use at the park in the future.

5.3 HAWAI'I 2050 SUSTAINABILITY PLAN

The Hawai'i 2050 Sustainability Plan as a long-term strategy has as its main goals and objectives respect for culture, character, beauty, and history of the state's island communities; balance among economic, community, and environmental priorities; and an effort to meet the needs of the present without compromising the ability of future generations to meet their own needs.

The 2050 Plan delineates five goals toward a sustainable Hawai'i accompanied by strategic actions for implementation and indicators to measure success or failure. The goals and strategic actions that are pertinent to the reconstruction of wastewater systems at Kualoa Regional Park are as follows:

Goal One: *Living sustainably is part of our daily practice in Hawai'i.* Strategic Actions: *Continually monitor trends and conditions in Hawai'i's economy, society and natural systems.*

Goal Two: *Our diversified and globally competitive economy enables us to meaningfully live, work, and play in Hawai'i.* Strategic Actions: *Identify, prioritize and fund infrastructure "crisis points" that need fixing.*

Goal Three: *Our natural resources are responsibly and respectfully used, replenished, and preserved for future generations.* Strategic Actions: *Provide greater protection for air, and land-, fresh water- and ocean-based habitats.*

Goal Four: *Our community is strong, healthy, vibrant and nurturing, providing safety nets for those in need.* Strategic Actions: *Provide access to diverse recreational facilities and opportunities.*

Goal Five: *Our Kanaka Maoli and island cultures and values are thriving and perpetuated.* Strategic Actions: *Celebrate our cultural diversity and island way of life.*

Discussion: Public infrastructure is key to building a strong economy, protecting the environment and providing for a better quality of life. The wastewater improvements at the park will help to promote health and well-being and enhance the recreational opportunity for the public. These improvements will in turn provide greater protection for the ocean. This project is a priority infrastructure and needs adequate resources for improvements and maintenance. The alarm system that will be installed with the pump stations at the park will be effective in alerting City personnel of system failures, and allow for a timely response by maintenance personnel to protect the park's societal and natural systems. Registered within the Historical District of the Kualoa Ahupua'a, the park has places and features that represent Hawai'i's unique character and cultural significance. These aspects have been identified and will be protected during the project.

5.4 HAWAI'I STATE LAND USE DISTRICT BOUNDARIES

State Land Use Districts are established by the State Land Use Commission in accordance with the State of Hawai'i Land use Law, Chapter 205 HRS. The basic intent of the law is to regulate the classification and uses of lands in the State in order to accommodate growth and development as needed, and to retain and protect important agricultural and natural resources areas. All State lands are classified as Urban, Rural, Agricultural, or Conservation, with consideration given to county general and development plans in determining the classification.

Discussion: The project site is situated within the State Agricultural District (open area recreational facilities) and a small portion of the Conservation District ('Āpua Pond). Construction will not occur in the Conservation District. As will be discussed later, the Agricultural classification for the project site is consistent with City and County of Honolulu General Plan, Ko'olau Poko Sustainable Communities Plan, and current zoning.

5.5 HAWAI'I COASTAL ZONE MANAGEMENT PROGRAM

The Coastal Management Program (CMP) is a comprehensive nationwide program that establishes and enforces standards and policies to guide the development of public and private lands within the coastal areas. In the State of Hawai'i, the CMP is articulated in the State Coastal Zone Management (CZM) Law in Chapter 205A of the HRS. The State CZM objectives and policies address 10 subject areas. Virtually all relate to potential development impacts on the shoreline, near shore, and ocean area environments. The Hawai'i CZM Law charges the counties with designating and administering Special Management Areas (SMA) within the State's coastal areas. Any "development", as defined by the CZM Law, that is located within the SMA requires a SMA Use Permit (SMP).

The project is located within the Special Management Area and subject to the Hawai'i Coastal Zone Management and City and County of Honolulu's SMA policies and controls. The following discusses the project's compatibility with HRS, 205A.

(1) Recreational Resources
Objective: *Provide coastal recreational opportunities accessible to the public.*
Policies:

- *(B) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:*
  - *i. Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;*
  - *iii. Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;*
  - *iv. Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;*
  - *v. Ensuring public recreational use of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;*

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

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

Discussion: The project site is located along the north-eastern shore of O'ahu, bordering Kāne'ohe Bay and the Pacific Ocean. Other than Kualoa Regional Park, public shoreline access opportunities in the Kāne'ohe Bay area are limited with two small city parks and one state park. The project site was acquired by the City from the Morgan family through condemnation proceedings, for the purposes of public access and beach park use. New facilities will not restrict access along the shoreline. The improvements will reflect responsible stewardship of ocean and coastal resources.

(2) Historic Resources

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

Policies:

(A) Identify and analyze significant archaeological resources;

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

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

Discussion: An archaeological inventory survey and a cultural impact assessment have been conducted for the proposed project. Full reports are available in the Appendices.

(3) Scenic and Open Space Resources

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

Policies:

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

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

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

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

Discussion: The proposed project will have a limited impact on the coastal and open space scenic views. The new replacement Bathhouse will be located inland between the park drive and 'Āpua Pond, without alteration of existing public views to and along the shoreline.

(4) Coastal Ecosystems
Objective: *Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.*
Policies:

(A) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;
(B) Improve the technical basis for natural resource management;
(C) Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;
(E) Promote water quantity and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate state water quality standards.

Discussion: The wastewater improvements are being planned with the intent of not having any significant negative, or likely even measurable, effect on water quality or marine biota in the coastal ocean offshore of the property, including reefs.

(5) Economic Uses
Objective: *Provide public or private facilities and improvements important to the State's economy in suitable locations.*
Policies:

(A) Concentrate coastal dependent development in appropriate areas;
(B) Ensure that coastal dependent developments such as harbors and ports, and coastal related development such as visitor facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and
(C) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:
    a. Use of presently designated locations is not feasible;
    b. Adverse environmental effects are minimized; and
    c. The development is important to the State's economy.

Discussion: The proposed action will generate short-term economic benefits from construction activity. Total project construction expenditures are estimated at approximately $4.9 million. The project will be located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area.

(6) Coastal Hazards
Objectives: *Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence and pollution.*
Policies:

(A) Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;
(B) Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint pollution hazards;

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

Discussion: In general, flood and tsunami conditions impose no major constraints on the project. The proposed wastewater improvements are located within Zone X of the Federal Emergency Management Agency, Flood Insurance Rate Map classifications; therefore flood development standards do not apply. The project site is located entirely within the Tsunami Inundation Zone. Development at the site will be required to meet applicable building code standards for non-habitable structures in a tsunami zone.

(7) Managing Development
Objective: *Improve the development review process, communication and public participation in the management of coastal resource and hazards.*
Policies:

(A) Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;
(B) Facilitate timely processing of applications for development permits and resolve overlapping of conflicting permit requirements; and
(C) Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

Discussion: The City Department of Planning and Permitting (DPP) has been consulted in regards to timely processing of applications for development permits such as the SMA Use Permit (Major). The State of Hawai'i Historic Preservation Division has been notified in regards to the proposed project as it relates to the use of the park land and its potential for uncovering buried artifacts.

(8) Public Participation
Objective: *Stimulate public awareness, education, and participation in coastal management.*
Policies:

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

Discussion: The local community was consulted throughout this process as well as in a previous version of wastewater improvements at the park. Various agencies, community groups and lineal descendants have been notified of the project and will have the opportunity to comment during the Environmental Assessment (EA) review period. The Kahalu'u Neighborhood Board No. 29, the community, and lineal descendants of Kualoa are involved in the review of project plans.

(9) Beach Protection
Objective: *Protect beaches for public use and recreation.*
Policies:

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

Discussion: The new replacement Bathhouse will be located inland from the shoreline setback. Comfort Station #3, which is experiencing problems due to erosion, will be removed.

(10) Marine Resources
Objective: *Promote the protection, use, and development of marine and coastal resources to assure their sustainability.*
Policies:
(A) Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;

Discussion: The proposed project was designed and chosen because of its economic feasibility and potential to mitigate water quality problems.

5.6 CITY AND COUNTY OF HONOLULU - GENERAL PLAN

The General Plan for the City was adopted in 1977, and has been subsequently amended (most recently in 2002). The General Plan is a comprehensive statement of the long-range social, economic, environmental and design objectives for the general welfare and prosperity of the people of O'ahu. The objectives and policies are organized into 11 subject areas and are intended to guide and coordinate the formulation and implementation of City land use plans and regulations, and budgeting policies and decisions for public facility capital improvements, operations and maintenance. Kualoa Park is designated as Rural in the General Plan Development Pattern. The proposed project has a relationship to the following objectives and policies of the City and County of Honolulu General Plan:

- PART III: NATURAL ENVIRONMENT. Objective A: To protect and preserve the natural environment. Policy 1: Protect O'ahu's natural environment, especially the shoreline, valleys, and ridges, from incompatible development. Policy 4: Require development projects to give due consideration to natural features such as slope, flood and erosion hazards, water- recharge areas, distinctive land forms, and existing vegetation. Policy 5: Require sufficient setbacks of improvements in unstable shoreline areas to avoid the future need for protective structures. Policy 7: Protect the natural environment from damaging levels of air, water, and noise pollution. Objective B: To preserve and enhance the natural monuments and scenic views of O'ahu for the benefit of both residents and visitors. Policy 1: Protect the Island's well-known resources: its mountains and craters; forests and watershed areas; marshes, rivers, and streams; shoreline, fishponds, and bays; and reefs and offshore islands. Policy 3: Locate roads, highways, and other public facilities and utilities in areas where they will least obstruct important views of the mountains and the sea. Policy 4: Provide opportunities for recreational and educational use and physical contact with O'ahu's natural environment.

- PART V. TRANSPORTATION & UTILITIES. Objective B: To meet the needs of the people of O'ahu for an adequate supply of water and for environmentally sound systems of waste disposal. Policy 5: Provide safe, efficient, and environmentally sensitive waste-collection and waste-disposal services. Objective C: To maintain a high level of service for all utilities. Policy 2: Provide improvements to utilities in existing neighborhoods to reduce substandard conditions. Policy 3: Plan for the timely and orderly expansion of utility systems. Objective D: To maintain transportation and utility systems which will help O'ahu continue to be a desirable place to live and visit. Policy 4: Evaluate the social, economic, and environmental impact of additions to the transportation and utility systems before they are constructed.

- PART VII: PHYSICAL DEVELOPMENT AND URBAN DESIGN. Objective A: To coordinate changes in the physical environment of O'ahu to ensure that all new developments are timely, well-designed, and appropriate for the areas in which they will be located. Policy 8: Locate community facilities on sites that will be convenient to the people they are intended to serve. Objective E: To create and maintain attractive, meaningful, and stimulating environments throughout O'ahu. Policy 9: Design public structures to meet high aesthetic and functional standards and to complement the physical character of the communities they will serve.

- PART X: CULTURE AND RECREATION. Objective A: To foster the multiethnic culture of Hawaii. Policy 1: Encourage the preservation and enhancement of Hawaii's diverse cultures. Policy 3: Encourage opportunities for better interaction among people with different ethnic, social, and cultural backgrounds. Objective B: To protect O'ahu's cultural, historic, architectural, and archaeological resources. Policy 1: Encourage the restoration and preservation of early Hawaiian structures, artifacts, and landmarks. Policy 2: Identify, and to the extent possible, preserve and restore buildings, sites, and areas of social, cultural, historic, architectural, and archaeological significance. Objective D: To provide a wide range of recreational facilities and services that are readily available to all residents of O'ahu. Policy 1: Develop and maintain community-based parks to meet the needs of the different communities on O'ahu. Policy 2: Develop and maintain a system of regional parks and specialized recreation facilities. Policy 5: Encourage the State to develop and maintain a system of natural resource-based parks, such as beach, shoreline, and mountain parks. Policy 12: Provide for safe and secure use of public parks, beaches, and recreation facilities.

Discussion: The proposed wastewater improvements at Kualoa Regional Park promote the objectives of the City and County General Plan. Planning and design of the system gives full consideration to the natural environment in how best to locate this system for functionality and protection of this beautiful shoreline area. The new Bathhouse is being placed in an appropriate area both for convenience of the user and in a location to not disrupt the scenic views. Because of the project site's historic and archaeological importance, care will be taken during both design and construction for minimizing ground-disturbance.

5.7 CITY AND COUNTY OF HONOLULU – KO'OLAU POKO SUSTAINABLE COMMUNITIES PLAN

The 2000 Ko'olau Poko Sustainable Communities Plan (SCP) is currently being updated. The 2010 Ko'olau Poko SCP draft has received public input, but has not been adopted at this time. This EA reflects the plans and policies stated in the 2000 Ko'olau Poko SCP. The project site is designated as Park *(Figure 5-1).*

The Ko'olau Poko SCP describes the role of Ko'olau Poko in O'ahu's development pattern is to experience essentially no growth over the next 20 years. The vision for Ko'olau Poko's future protects the communities' natural, scenic, cultural, historic and agricultural resources while addressing the need to improve and replace, as necessary, the region's aging infrastructure systems. The following describe areas where the proposed project conforms to policies in the Ko'olau Poko SCP:

Open Space Preservation:

- *Protect scenic views, provide recreation and promote access to shoreline and mountain areas.*

Island-Based Parks and Recreation:

- *Ensure environmental compatibility in the design and construction of park facilities.*

Discussion: The wastewater improvements are replacing aging infrastructure within the park while taking into consideration the natural, scenic, cultural, and historic resources of the area.

5.8 CITY AND COUNTY OF HONOLULU – LAND USE ORDINANCE

The purpose of the County Land Use Ordinance (LUO) is to regulate land use in a manner that will encourage orderly development in accordance with adopted land use policies, including the O'ahu General Plan and the Ko'olau Poko Sustainable Communities Plan. The LUO is intended to provide reasonable land use and building development and design standards. These standards are applicable to the location, height, bulk and site of structures, yard areas, off-street parking facilities, and open spaces, and the use of structures and land for agriculture, industry, business, residences or other purposes [Chapter 21, Revised Ordinances of Honolulu (ROH)]. This includes Section 21-9, Special District Regulations, which identifies and describes standards applicable to Flood Hazard Districts.

Discussion: The subject property is designated P-2 General Preservation on the City's Zoning Map *(Figure 1-5).* Most City Parks have this same P-2 zoning designation. 'Āpua Pond is designated P-1 Restricted Preservation, however no construction will occur here. Portions of the park are located in the Federal Management Agency's Flood Zone VE, which is designated as a Coastal High Hazard district in Section 21-9 of the LUO, and Zone AE, designated as Floodway and Flood Fringe Districts. Construction will also not occur in these zones. The remainder of the park is within Flood Zone X, where construction will occur. This zone is not considered a Flood Hazard District, therefore these development standards do not apply. The proposed project is consistent with the Zoning Map designation.

5.9 CITY AND COUNTY OF HONOLULU – SPECIAL MANAGEMENT AREA GUIDELINES

The entire project site lies within the boundary of the City's Special Management Area (SMA). Proposed improvements valued over $125,000 within the SMA are subject to SMA Major permit requirements pursuant to Section 205A, HRS (*see Section 5.5*), and Chapter 25 ROH. An SMA Approval application will be submitted to the City DPP.

The objectives, policies and SMA guidelines, as set forth in Chapter 205A, HRS, are intended to ensure that adequate shoreline access is provided, public recreation and wildlife preserves are reserved, and that minimum adverse effects to water, visual and natural resources are assured.

Special controls on development within this area are necessary to avoid permanent loss of valuable resources and foreclosure of management options. The review guidelines of Section 25-3.2 ROH are used by the DPP and the Honolulu City Council for the review of developments proposed in the SMA. These guidelines are derived from Section 205A-26 HRS. The consistency of the proposed project with the guidelines is discussed below.

a. All development in the special management area shall be subject to reasonable terms and conditions set by the council to ensure that:

1. *Adequate access, by dedication or other means, to publicly owned or used beaches, recreation areas, and natural reserves is provided to the extent consistent with sound conservation principles;*
3. *Provisions are made for solid and liquid waste treatment, disposition and management which will minimize adverse effects upon special management area resources; and*
4. *Alterations to existing land forms and vegetation; except crops, and construction of structures shall cause minimum adverse effect to water resources and scenic and recreational amenities and minimum danger of floods, landslides, erosion, siltation or failure in the event of earthquake.*

Discussion: The proposed project will require an SMA Use Permit (Major). This environmental assessment is being prepared to support the SMA permit application. Public access to the shoreline at Kualoa Regional Park will remain open during construction, and improvements to the system may improve water quality of the near shore waters, preventing beach closures. This project will be designed and constructed for wastewater collection, treatment and disposal, which will have minimum adverse effects upon special management area resources. The project will require removal of weedy vegetation and grading and grubbing for the construction of new facilities.

b. No development shall be approved unless the council has first found that:

1. *The development will not have any substantial, adverse environmental or ecological effect except as such adverse effect is minimized to the extent practicable and clearly outweighed by public health and safety, or compelling public interest. Such adverse effect shall include, but not be limited to, the potential cumulative impact of individual developments, each one of which taken in itself might not have a substantial adverse effect and the elimination of planning options;*
2. *The development is consistent with the objectives and policies set forth in Section 25-3.1 and area guidelines contained in HRS Section 205A-26;*
3. *The development is consistent with the county general plan, development plans and zoning. Such a finding of consistency does not preclude concurrent processing where a development plan amendment or zone change may also be required.*

Discussion: Potential environmental impacts of the proposed project and the mitigation strategies to minimize adverse effects are described in Section 3.0 of this EA. Section 5.0 of this EA describes the extent to which the proposed project is consistent with the county general plan, development plans and zoning.

c. The council shall seek to minimize, where reasonable:

4. *Any development which would substantially interfere with or detract from the line of sight toward the sea from the state highway nearest the coast; and*
5. *Any development which would adversely affect water quality, existing areas of open water free of visible structures, existing and potential fisheries and fishing grounds, wildlife habitats, or potential or existing agricultural uses of land.*

Discussion: The new Bathhouse will be located behind a grove of trees that does not interfere with any line of site towards the sea from Kamehameha Highway. The project is meant to help improve upon the water quality of the near shore waters.

5.10 PERMITS AND APROVALS REQUIRED

In addition to the acceptance of the Final EA/Finding of No Significant Impact by the Department of Design and Construction, other permits may be required. These will include:

- Special Management Area Major Use Permit (DPP)
- Approval of the wastewater system from the State of Hawaii, Department of Health
- Building Permits (Demolition, Buildings, Electrical, Plumbing) (DPP)
- Grading, Grubbing, Trenching and Stockpiling Permits (Department of Land and Natural Resources/DPP)

6.0
Findings and Reasons Supporting Anticipated Determination

6.0 FINDINGS AND REASONS SUPPORTING ANTICIPATED DETERMINATION

6.1 ANTICIPATED DETERMINATION

After reviewing the significance criteria outlined in Chapter 343, Hawai'i Revised Statutes (HRS), and Section 11-200-12, Hawai'i Administrative Rules (HAR), Contents of Environmental Assessment (EA), the proposed action has been determined to not result in significant adverse effects on the natural or human environment. A Finding of No Significant Impact (FONSI) is anticipated.

6.2 REASONS SUPPORTING THE ANTICIPATED DETERMINATION

The potential impacts of the facilities improvements and future operation of the proposed Kualoa Regional Park Wastewater System Improvements have been examined and discussed in this Draft EA. As stated earlier, there are no significant environmental impacts expected to result from the proposed action. This determination is based on the assessments as presented below for criterion (1) to (13).

(1) Involves an irrevocable commitment to loss or destruction of any natural or cultural resources;

The proposed project is for the improved reliability of existing wastewater facilities. There is not expected to be significant destruction of existing natural or cultural resources. As previously noted, there are significant archaeological or historical resources known to exist within the project site; however, these have been avoided in the project design. There will be extensive monitoring of construction as per the archaeological monitoring plan to avoid potential impacts to cultural resources. If during the course of construction any cultural or archaeological resources are unearthed, their treatment will be conducted in strict compliance with the requirements of the Department of Land and Natural Resources and the accepted archaeological monitoring plan.

(2) Curtails the range of beneficial uses of the environment;

The site has been developed as a County regional park since the 1970s. The proposed action will not curtail the range of potential beneficial uses of the environment. The planned improvements are intended to improve the quality of the environment at this park by improving the reliability of the system, quality of treated effluent and manner of disposal.

(3) Conflicts with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders;

The proposed project is consistent with the environmental policies established in Chapter 344, HRS.

(4) Substantially affects the economic welfare, social welfare, and cultural practices of the community or State;

The proposed project is an investment in the improved reliability of an existing County park asset and will improve the economic and social welfare of the community and State. The improvements will not alter the existing area in a negative or significant way, nor will it affect cultural practices in the area. The improvements will provide the park users with properly functioning comfort stations and wastewater systems.

(5) Substantially affects public health;

Insignificant or undetectable impacts to public health may be affected by short-term air and noise impacts during construction, but will be mitigated by appropriate control measures. The long-term benefits to positive social and quality of life implications associated with the project outweigh the temporary negative impacts. Overall, impacts will be significantly positive in terms of public health through the provision of improved wastewater management facilities as compared to the "no action" alternative. The proposed project will reduce the public exposure to sewage spills.

(6) Involves substantial secondary impacts, such as population changes or effects on public facilities;

As this is an existing facility, the proposed improvements will not create significant secondary impacts such as population changes or effects on public facilities. Design and construction work will generate indirect and induced employment opportunities and multiplier effects, but not at a level that would generate any significant expansion. The short-term employment impacts will be beneficial to the local economy.

(7) Involves a substantial degradation of environmental quality;

The proposed project will consist of improved reliability to the wastewater systems on an existing developed park. The wastewater upgrade will improve the overall quality of the park by assuring proper function of the comfort stations and other park facilities.

(8) Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions;

Renovation of and improvement to the park wastewater facilities are consistent with the long term objectives of the City Department of Parks and Recreation, and does not have a cumulative effect.

(9) Substantially affects a rare, threatened or endangered species, or its habitat;

The endangered birds on the property are found mainly within ʻĀpua Pond, which is outside of the project site. Construction will take place in an open area that the birds do not normally congregate.

(10) Detrimentally affects air or water quality or ambient noise levels;

Short-term effects on air, water quality or ambient noise levels during construction will be mitigated by compliance with City and State Department of Health rules which regulate construction-related activities. After development, improvements to the site and related infrastructure should not create detrimental impacts to air, water quality or ambient noise levels. The project will improve water quality in the near shore environment through a reduction in sewer overflows.

(11) Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters;

The existing project site is generally compatible with the criteria stated above. The project is partially located in a Zone AE flood hazard area and tsunami inundation zone, as discussed in Section 3. However, the structure in the Zone AE flood hazard area will be removed due to the erosion-prone area. In general, flood and tsunami conditions impose no major constraints on the project. Any improvements and structures will be designed as required for structures within flood zone X. In addition, development at the site will be required to meet applicable building code standards for non-habitable structures in a tsunami zone.

(12) Substantially affects scenic vistas and view-planes identified in County or State plans or studies; or

The planned improvements will not substantially affect scenic vistas or view-planes.

(13) Require substantial energy consumption.

Construction of the project will not require substantial energy consumption relative to other similar projects.

7.0
List of References

7.0 LIST OF REFERENCES

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8.0
List of Agencies, Organizations, and Individuals Receiving Copies of the Environmental Assessment

8.0 LIST OF AGENCIES, ORGANIZATIONS AND INDIVIDUALS RECEIVING COPIES OF THE EA

A Pre-Consultation Memo and Participant Letter were sent in June 2011 to initiate the environmental review process. The following is a list of agencies and other parties that were presented notice of the proposed project or were contacted during the pre-consultation period of the Draft EA, and those that will be provided an opportunity to review the Draft EA. Comments received during this pre-consultation process are also provided following this list.

Respondents and Distribution	Pre-Consultation Contact	Pre-Consultation Comments Received	Receiving Draft EA	Draft EA Comments Received	Receiving Final EA/ FONSI
Federal Agencies					
U.S. Army Corps of Engineers	x		x		
U.S. Fish and Wildlife Service	x		x		
State of Hawai'i Agencies					
Department of Agriculture	x		x		
Department of Business, Economic Development, and Tourism (DBEDT)	x		x		
DBEDT, Office of Planning	x		x		
Department of Health	x	x	x		
Department of Land and Natural Resources (DLNR)	x	x	x		
DLNR, State Historic Preservation Division (SHPD)	x		x		
Office of Environmental Quality Control (OEQC)	x		x		
Office of Hawaiian Affairs (OHA)	x	x	x		
University of Hawai'i, Environmental Center	x		x		
City and County of Honolulu					
Board of Water Supply	x	x	x		
Dept. of Design and Construction	x	x	x		
Department of Environmental Services	x		x		
Department of Facility Maintenance	x	x			
Department of Parks and Recreation	x	x	x		
Dept. of Planning and Permitting	x	x	x		

Respondents and Distribution	Pre-Consultation Contact	Pre-Consultation Comments Received	Receiving Draft EA	Draft EA Comments Received	Receiving Final EA/ FONSI
Elected Officials					
State Senator Clayton Hee	x		x		
State House Rep. Jessica Wooley	x		x		
Councilmember Ernest Y. Martin	x		x		
Libraries					
Hawai'i State Library			x		
Kaneohe Public Library			x		
UH Hamilton Library			x		
Citizen Groups, Individuals & Consulted Parties					
Historic Hawai'i Foundation	x		x		
Kahalu'u Neighborhood Board #29	x		x		
Ko'olauloa Hawaiian Civic Club (Danielle Beirne-Keawe)	x		x		
Ko'olaupoko Hawaiian Civic Club (Mahealani Cypher)	x		x		
Kualoa Ranch Hawaii, Inc.	x		x		
O'ahu Island Burial Council (OIBC) Ko'olauloa Representative (Cy Bridges)	x		x		
OIBC Ko'olaupoko Representative (Aaron Mahi)	x		x		
Sierra Club, Hawaii Chapter	x		x		
Gladys Pualoa Ahuna	x		x		
Katie Barbieto	x		x		
Jan Becket			x		
Keo Coleman	x		x		
Tai Crouch			x		
Kathryn Diamond	x		x		
Gloria Fraiola	x		x		
Keoki Fukumitsu			x		
Jo Lynn Gunness			x		
Calvin & Charlene Hoe and 'Ohana	x		x		
Herbert Hoe	x		x		
Shad Kāne			x		
Charles Kapua	x		x		

Respondents and Distribution	Pre-Consultation Contact	Pre-Consultation Comments Received	Receiving Draft EA	Draft EA Comments Received	Receiving Final EA/ FONSI
Citizen Groups, Individuals & Consulted Parties (continued)					
Betty-Ann Keala	x		x		
Phillip & Margery Kekauoha	x		x		
Sam Kekauoha	x		x		
Ewa Kia			x		
Elizabeth Lau			x		
Moana Lee	x		x		
Dannette Leota-Pascual	x		x		
Bula Logan	x		x		
Roland "Ahi" Logan	x		x		
Amy Luersen	x		x		
Ralph Makaiau Jr.	x		x		
Creighton & Cathleen Mattoon	x		x		
Kekela Miller	x		x		
Winifred Miller	x		x		
Bob Nakata	x		x		
Richard Paglinawan			x		
Ipolani Tano	x		x		
Joyce Uyehara	x		x		
Dawn Wasson	x		x		

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LORETTA J. FUDDY, A.C.S.W., M.P.H.
INTERIM DIRECTOR OF HEALTH

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

In reply, please refer to:
File:

LUD – 1 4 9 004 001-ID694
Pre Cons DEA Kualoa Reg
Park WWSys

June 15, 2011

JUN 17 2011

Mr. Jeffrey H. Overton, AICP, LEED AP
Group 70 International
925 Bethel Street 5th Floor
Honolulu, Hawaii 96813-4307

Dear Mr. Overton:

Subject: Pre-Consultation for Draft Environmental Assessment Kualoa Regional Park Wastewater System Improvements, Oahu Koolau Poko District, Kualoa Ahupuaa, 49-479 Kamehameha Highway, Kaneohe, Hawaii 96744 TMK (1) 4-9-004: 001

Thank you for allowing us the opportunity to review the above subject project which requests comments on the Pre-Consultation for Draft Environmental Assessment Kualoa Regional Park Wastewater System Improvements. We have the following comments and information on the above subject property:

The subject project is located in the critical wastewater disposal area as determined by the Oahu Wastewater Advisory Committee. It is also located in the Pass Zone.

We have no objections with the proposed project. We are in favor of the proposal that involves replacing the existing wastewater treatment and disposal systems with a new centralized wastewater and disposal system that will be located away from the eroding shoreline.

All wastewater plans must conform to applicable provisions of the Department of Health's Administrative Rules, Chapter 11-62, "Wastewater Systems." Should you have any questions, please contact the Planning & Design Section of the Wastewater Branch at 586-4294 or fax to 586-4300.

Sincerely,

MARSHALL LUM, P.E., ACTING CHIEF
Wastewater Branch

LM/cle

c: DOH's Environmental Planning Office
City & County of Honolulu, Dept. of Planning & Permitting

GROUP 70
INTERNATIONAL

PRINCIPALS

Francis S. Oda, Arch.D., FAIA, AICP, LEED AP
Norman G.Y. Hong AIA
Sheryl B. Seaman AIA, ASID, LEED AP
Hitoshi Hida AIA
Roy H. Nihei AIA, CSI, LEED AP
Ralph E. Portmore AICP
James I. Nishimoto AIA
Stephen Yuen AIA
Linda C. Miki AIA
George I. Atta AICP, LEED AP
Charles Y. Kaneshiro AIA, LEED AP
Jeffrey H. Overton AICP, LEED AP
Christine Mendes Ruotola AICP, LEED AP
James L. Stone, Arch.D., AIA, LEED AP
Katherine M. MacNeil AIA, LEED AP
Tom Young, MBA AIA
Paul T. Matsuda PE, LEED AP

March 23, 2012

Marshall Lum, P.E., Acting Chief
State of Hawaii
Department of Health
PO Box 3378
Honolulu, HI 96801-3378

Subject: Response to Comments for Pre-Consultation for Draft Environmental Assessment (DEA) for the Kualoa Regional Park Wastewater System Improvements (Kāneʻohe, Hawaiʻi)

Dear Mr. Chun:

Thank you for your Pre-Consultation comment letter dated June 15, 2011 concerning the Draft Environmental Assessment for the Kualoa Regional Park Wastewater Systems Improvements, TMK 4-9-004:001.

We acknowledge that the subject project is located in the critical wastewater disposal area as determined by the Oahu Wastewater Advisory Committee, and that it is also located in the Pass Zone. We also acknowledge that Department of Health has no objections with the proposed project, and is in favor of replacing the existing park wastewater treatment and disposal systems. Your office further notes that the new centralized wastewater and disposal system will be located away from the eroding shoreline.

The wastewater plans conform to applicable provisions of the Department of Health's Administrative Rules, Chapter 11-62, "Wastewater Systems."

Upon completion, we will be providing your office with three copies of the Draft EA for your review. We appreciate your input and participation in the environmental review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP, LEED AP
Principal

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

July 5, 2011

JUL - 6 2011

Group 70 International, Inc.
925 Bethel Street 5th Floor
Honolulu, Hawaii 96813

Attention: Mr. Jeffrey H. Overton, AICP, LEED AP

Ladies and Gentlemen:

Subject: Pre-Consultation for Draft Environmental Assessment for Kualoa Regional Park Wastewater System Improvements

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR), Land Division distributed or made available a copy of your report pertaining to the subject matter to DLNR Divisions for their review and comment.

Other than the comments from Division of Aquatic Resources, Engineering Division, Division of State Parks, Land Division-Oahu District, the Department of Land and Natural Resources has no other comments to offer on the subject matter. Should you have any questions, please feel free to call our office at 587-0414. Thank you.

Sincerely,

Charlene E. Unoki

for Russell Y. Tsuji
Administrator

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 9, 2011

MEMORANDUM

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
x Engineering Division
x Div. of Forestry & Wildlife
x Div. of State Parks
x Commission on Water Resource Management
x Office of Conservation & Coastal Lands
x Land Division –Oahu District
x Historic Preservation

FROM: Charlene Unoki, Assistant Administrator Charlene
SUBJECT: Pre-Consultation for Draft Environmental Assessment for Kualoa Regional Park Wastewater System Improvements
LOCATION: Island of Oahu
APPLICANT: Group 70 International on behalf of City & County of Honolulu, Department of Design & Construction

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by July 2, 2011.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

(✓) We have no objections.
(✓) We have no comments.
( ) Comments are attached.

Signed: T. Chee
Date: 6/13/11

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

JUN 09 PM03:48 ENGINEERING

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 9, 2011

RECEIVED
LAND DIVISION
2011 JUN 15 P 2:34
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

MEMORANDUM

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
x Engineering Division
~~x Div. of Forestry & Wildlife~~
x Div. of State Parks
x Commission on Water Resource Management
x Office of Conservation & Coastal Lands
x Land Division –Oahu District
x Historic Preservation

FROM: Charlene Unoki, Assistant Administrator
SUBJECT: Pre-Consultation for Draft Environmental Assessment for Kualoa Regional Park Wastewater System Improvements
LOCATION: Island of Oahu
APPLICANT: Group 70 International on behalf of City & County of Honolulu, Department of Design & Construction

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by July 2, 2011.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(X) Comments are attached.

Signed:
Date: 6/14/11

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/CharleneUnoki
Ref.:PreConEAKualoaRegParkWastewaterImpvts
Oahu:838

COMMENTS

() We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zone ___.

() Please note that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zone____.

(X) Please note that the correct Flood Zone Designations for the project site, according to the Flood Insurance Rate Map Panel Numbers 15003C0165F and 15003C0170F dated September 30, 2004 (Copy attached), are Zones X, AE and VE. The National Flood Insurance Program does not regulate developments within Zone X. However, the National Flood Insurance Program does regulate developments within Zones AE and VE as indicated in bold letters below.

(X) Please note that the project must comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Title 44 of the Code of Federal Regulations (44CFR), whenever development within a Special Flood Hazard Area is undertaken. If there are any questions, please contact the State NFIP Coordinator, Ms. Carol Tyau-Beam, of the Department of Land and Natural Resources, Engineering Division at (808) 587-0267.

Please be advised that 44CFR indicates the minimum standards set forth by the NFIP. Your Community's local flood ordinance may prove to be more restrictive and thus take precedence over the minimum NFIP standards. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

(X) Mr. Robert Sumitomo at (808) 768-8097 or Mr. Mario Siu Li at (808) 768-8098 of the City and County of Honolulu, Department of Planning and Permitting.
() Mr. Carter Romero at (808) 961-8943 of the County of Hawaii, Department of Public Works.
() Mr. Francis Cerizo at (808) 270-7771 of the County of Maui, Department of Planning.
() Ms. Wynne Ushigome at (808) 241-4890 of the County of Kauai, Department of Public Works.

() The applicant should include project water demands and infrastructure required to meet water demands. Please note that the implementation of any State-sponsored projects requiring water service from the Honolulu Board of Water Supply system must first obtain water allocation credits from the Engineering Division before it can receive a building permit and/or water meter.

() The applicant should provide the water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update.

() Additional Comments: _____

() Other: _____

Should you have any questions, please call Ms. Suzie S. Agraan of the Planning Branch at 587-0258.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: 6/14/11

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

LD

RECEIVED
LAND DIVISION
2011 JUN 28 A 10:00

DEPT. OF LAND &
NATURAL RESOURCES
STATE OF HAWAII

DAR 3876
AMX
PMV

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 9, 2011

MEMORANDUM

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
x Engineering Division
x Div. of Forestry & Wildlife
x Div. of State Parks
x Commission on Water Resource Management
x Office of Conservation & Coastal Lands
x Land Division –Oahu District
x Historic Preservation

FROM: Charlene Unoki, Assistant Administrator
SUBJECT: Pre-Consultation for Draft Environmental Assessment for Kualoa Regional Park Wastewater System Improvements
LOCATION: Island of Oahu
APPLICANT: Group 70 International on behalf of City & County of Honolulu, Department of Design & Construction

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by July 2, 2011.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(X) Comments are attached.

Signed:
Date: 23 JUL 2011

RECEIVED
JUN 16 2011
AQUATIC RESOURCES

State of Hawaii
Department of Land and Natural Resources
DIVISION OF AQUATIC RESOURCES

Date: 6/22/2011

MEMORANDUM

TO: Bob Nishimoto, Program Manager
FROM: Paul Murakawa, Aquatic Biologist
THRU: Alton Miyasaka, Aquatic Biologist
SUBJECT: Pre-Consultation for Draft Environmental Assessment for Kualoa Regional Park Wastewater System Improvements, DAR 3876

Comment	Date	Request	Receipt	Referral
		6/9/2011	6/16/2011	6/20/2011

Requested by: Charlene Unoki, Assistant Administrator
Department of Land and Natural Resources, Land Division

Summary of Proposed Project

Title: Kualoa Regional Park Wastewater System Improvements

Project by: City and County of Honolulu, Department of Design & Construction

Location: Kualoa Regional Park 49-479 Kamehameha Hwy, Kaneohe, 96744, Kualoa Ahupua'a, Ko'olau Poko District, Oahu, TMK: 1-4-9-04:01

Brief Description:

The applicant proposes to upgrade the wastewater systems serving the park comfort stations because they do not meet current State of Hawaii, Department of Health requirements. The wastewater systems for each comfort station are old and cannot be operated as originally designed. In addition, the shoreline has eroded significantly at one of the comfort stations (#3) forcing its closure. This comfort station will be demolished and replaced with a new comfort station in a location away from the eroding shoreline. This project involves replacing individual wastewater systems with a new centralized wastewater system consisting of new collection lines, force mains, pump stations and a centralized treatment and disposal system.

Comments:

We have no objection to the project as proposed. We recommend that Best Management Practices (BMPs) be developed and strictly followed during the project. These BMPs will include preventing/minimizing runoff and sediment from flowing into the ocean with the use of silt barriers and other preventative devices. We also recommend that this project occur during the normally drier summer months to prevent/minimize runoff from heavy rains, normally associated with the winter months.

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

54802

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
LAND DIVISION
2011 JUN 29 P 2:58

RECEIVED
STATE PARKS DIV
'11 JUN 13 A9:42

DEPT. OF LAND &
NATURAL RESOURCES
STATE OF HAWAII

DEPT OF LAND &
NATURAL RESOURCES

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 9, 2011

MEMORANDUM

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
__ Div. of Boating & Ocean Recreation
x Engineering Division
x Div. of Forestry & Wildlife
x Div. of State Parks
x Commission on Water Resource Management
x Office of Conservation & Coastal Lands
x Land Division –Oahu District
x Historic Preservation

FROM: Charlene Unoki, Assistant Administrator
SUBJECT: Pre-Consultation for Draft Environmental Assessment for Kualoa Regional Park Wastewater System Improvements
LOCATION: Island of Oahu
APPLICANT: Group 70 International on behalf of City & County of Honolulu, Department of Design & Construction

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by July 2, 2011.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

(✓) We have no objections.
(✓) We have no comments.
( ) Comments are attached.

Signed: _____
Date: 6/27/11

GROUP 70
INTERNATIONAL

March 23, 2012

PRINCIPALS

Francis S. Oda, Arch.D., FAIA, AICP, LEED AP
Norman G.Y. Hong AIA
Sheryl B. Seaman AIA, ASID, LEED AP
Hitoshi Hida AIA
Roy H. Nihei AIA, CSI, LEED AP
Ralph E. Portmore AICP
James I. Nishimoto AIA
Stephen Yuen AIA
Linda C. Miki AIA
George I. Atta AICP, LEED AP
Charles Y. Kaneshiro AIA, LEED AP
Jeffrey H. Overton AICP, LEED AP
Christine Mendes Ruotola AICP, LEED AP
James L. Stone, Arch.D., AIA, LEED AP
Katherine M. MacNeil AIA, LEED AP
Tom Young, MBA AIA
Paul T. Matsuda PE, LEED AP

Russell Y. Tsuji, Administrator
State of Hawaii
Department of Land and Natural Resources
Land Division
P.O. Box 621
Honolulu, Hawaii 96809

Subject: Response to Comments for Pre-Consultation for Draft Environmental Assessment for the Kualoa Regional Park Wastewater System Improvements (Kāneʻohe, Hawaiʻi)

Dear Mr. Tsuji:

Thank you for your Pre-Consultation comment letter dated July 5, 2011 concerning the Draft Environmental Assessment (EA) for the Kualoa Regional Park Wastewater Systems Improvements, TMK 4-9-004:001.

We acknowledge that the Department of Land and Natural Resources, Engineering Division corrects that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Zones X, AE and VE. The improvements on the park site are located within areas designated as Zone X, where development is not regulated by the National Flood Insurance Program.

We also acknowledge that Division of Aquatic Resources recommends the development and strict adherence to Best Management Practices during construction. These recommendations have been included within the Draft EA.

Upon completion, we will be providing your office with five copies of the Draft EA for your review. We appreciate your input and participation in the environmental review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP, LEED AP
Principal

Group 70 International • 925 Bethel Street, 5th Floor • Honolulu, HI 96813-4307 • tel. 808.523.5866 • fax. 808.523.5874 • www.group70int.com

PHONE (808) 594-1888

FAX (808) 594-1865

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

JUL 13 2011

HRD11/5755B

June 30, 2011

Jeffrey H. Overton, Principal Planner
Group 70 International, Inc.
925 Bethel Street, 5th Floor
Honolulu, Hawai'i 96813-4307

Re: Pre-Draft Environmental Assessment Consultation
Kualoa Regional Park Wastewater System Improvement Project
Island of O'ahu

Aloha e Jeffrey Overton,

The Office of Hawaiian Affairs (OHA) is in receipt of your June 6, 2011 letter requesting comments ahead of a draft environmental assessment (DEA) to support a wastewater system improvement project (project) at Kualoa Regional Park proposed by the City and County of Honolulu-Department of Design and Construction (City). The summary of the project included with your letter describes that the wastewater system at Kualoa Regional Park (park) which services four comfort stations, a food service building, a recreation/administrative building and caretaker's cottage does not meet State of Hawai'i-Department of Health standards. Comfort Station #3 at the park has been closed due to shoreline erosion.

Project activities will consist of the demolition of Comfort Station #3 and construction of a new station away from the eroding shoreline and the construction of a new wastewater system consisting of new collection lines, force mains, pump stations and a centralized treatment and disposal system. Overall, OHA recognizes that this project intends to provide necessary infrastructure to support the high volume of visitors who enjoy this popular park and ensure public health and protection of resources.

Your letter correctly recognizes that the project is within the Kualoa Archaeological District, which is listed on the National Register of Historic Places. This should give all involved cause to reflect upon the traditional significance of these sacred lands. OHA is aware that iwi kupuna have been identified within the park and adjacent areas due to shoreline erosion and ground disturbing activities. Additional iwi kupuna are believed to be situated throughout the park. This has been issue of concern for the community for some time now. With this in mind, OHA is alarmed at the potential this project has for encountering iwi kupuna during ground disturbing activities.

While OHA is not opposed to seeing preliminary planning and design for this project move forward, it should be done with full consideration of the potential for encountering iwi kupuna in mind. The City should consider multiple alternative project plans and designs which incorporate the results of community consultation and the findings of an archaeological inventory survey (AIS). OHA advocates that if the City intends to conduct an AIS to support this project, an archaeological inventory survey plan should be prepared.

OHA is also in receipt of a May 12, 2011 letter from Cultural Surveys Hawai'i, Inc. (CSH) seeking comments ahead of a cultural impact assessment to support this project. Once our response to this CSH letter is finalized, you will be provided with a copy.

Thank you for providing the opportunity to comment on this project at this early stage. We look forward to reviewing the DEA and providing additional comments at that time. Please provide one electronic and one hardcopy of the DEA to OHA attn: Compliance Monitoring Program when it becomes available. Should you have any questions or concerns, please contact Keola Lindsey at 594-0244 or keolal@oha.org.

'O wau iho nō me ka 'oia'i'o,

Clyde W. Nāmu'o
Chief Executive Officer

C: Pua Aiu, Administrator- State Historic Preservation Division
Cultural Surveys Hawai'i, Inc.

GROUP 70
INTERNATIONAL

March 23, 2012

Clyde W. Nāmuʻo, Chief Executive Officer
State of Hawaii
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, HI 96813

Subject: Response to Comments for Pre-Consultation for Draft Environmental Assessment for the Kualoa Regional Park Wastewater System Improvements (Kāneʻohe, Hawaiʻi)

Dear Mr. Cabato:

Thank you for your Pre-Consultation comment letter dated June 30, 2011 concerning the Draft Environmental Assessment (EA) for the Kualoa Regional Park Wastewater Systems Improvements, TMK 4-9-004:001.

We would like to also thank you for responding to an additional consultation request from Cultural Surveys Hawaiʻi, Inc. for their preparation of the Cultural Impact Assessment (CIA). The CIA will be included as an appendix in the EA.

The following responses are offered to your comments.

1. We acknowledge that overall, the Office of Hawaiian Affairs (OHA) recognizes that this project intends to provide necessary infrastructure to support the high volume of visitors who enjoy this popular park and ensure public health and protection of resources.
2. We acknowledge that iwi kupuna have been identified within the park and adjacent areas due to shoreline erosion and ground disturbing activities, and that OHA is alarmed at the potential this project has for encountering iwi kupuna during ground disturbing activities.
3. Planning and design for this project are being done with full consideration of the potential for encountering iwi kupuna in mind. The basis of design is to disturb as little ground area as possible while meeting wastewater management objectives for the project. Multiple alternative project plans and designs have been considered incorporating the findings from community consultations and the Archaeological Inventory Survey (AIS).
4. An Archaeological Inventory Survey plan was not prepared prior to conducting the AIS. Consultation efforts included discussions on the AIS scope.

We will provide your Compliance Monitoring Program office with one electronic copy and one hardcopy of the Draft EA for review. We appreciate your input and participation in the environmental review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP, LEED AP
Principal

Group 70 International • 925 Bethel Street, 5th Floor • Honolulu, HI 96813-4307 • tel. 808.523.5866 • fax. 808.523.5874 • www.group70int.com

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

June 24, 2011

JUN 29 2011

Mr. Jeffrey H. Overton, AICP, LEED AP
Group 70 International, Incorporated
925 Bethel Street, 5th Floor
Honolulu, Hawaii 96813-4307

Dear Mr. Overton:

Subject: Your Letter Dated June 6, 2011 Requesting Comments for the Draft Environmental Assessment (DEA) for the Kualoa Regional Park Wastewater System Improvements, TMK 4-9-004:001

Thank you for the opportunity to comment on the proposed Wastewater System Improvements.

For the Draft Environmental Assessment, please determine if the project will be using a private water system and if any Board of Water Supply water services are planned to serve the new comfort station or meet onsite fire protection requirements.

The on-site fire protection requirements should be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.

If you have any questions, please contact Robert Chun at 748-5443.

Very truly yours,

PAUL S. KIKUCHI
Chief Financial Officer
Customer Care Division

Water for Life . . . Ka Wai Ola

GROUP 70 INTERNATIONAL

March 23, 2012

Mr. Paul S. Kikuchi, Chief Financial Officer
Customer Care Division
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, HI 96843

Subject: Response to Comments for Pre-Consultation for Draft Environmental Assessment for the Kualoa Regional Park Wastewater System Improvements (Kāneʻohe, Hawaiʻi)

Dear Mr. Kikuchi:

Thank you for your comment letter dated June 24, 2011 concerning the Draft Environmental Assessment for the Kualoa Regional Park Wastewater Systems Improvements, TMK 4-9-004:001. The following responses are offered to your comments.

The project will be using Board of Water Supply water, which supplies potable water to Kualoa Regional Park at the Corporation Yard. The water supply source is metered at this location, and the water main extends to the east, and extends to the south along the parking lot.

On-site fire protection requirements will be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.

Upon completion, we will be providing your office with a copy of the Draft EA for your review. We appreciate your participation in the environmental review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP, LEED AP
Principal

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 11TH FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8480 • Fax: (808) 768-4567
Web site: www.honolulu.gov

PETER B. CARLISLE
MAYOR

COLLINS D. LAM, P.E.
DIRECTOR

LORI M. K. KAHIKINA, P.E.
DEPUTY DIRECTOR

June 28, 2011

RECEIVED
JUN 29 2011
GROUP 70 INT'L

Jeffrey H. Overton, ACIP, LEED AP
Principal Planner
Group 70 International
925 Bethel Street, 5th Floor
Honolulu, Hawai'i 96813-4307

Dear Mr. Overton:

Pre-Consultation for Draft Environmental Assessment
Kualoa Regional Park Wastewater System Improvements

Thank you for the opportunity to review and comment on this project. The Department of Design and Construction has no comments.

Should there be any questions, please contact me at 768-8480.

Sincerely,

Collins D. Lam, P.E.
Director

CDL:lm (420101)

GROUP 70
INTERNATIONAL

March 23, 2012

Lori M. K. Kahikina, P.E., Acting Director
City and County of Honolulu
Department of Design and Construction
650 South King Street, 11th Floor
Honolulu, HI 96813

Subject: Response to Comments for Pre-Consultation for Draft Environmental Assessment for the Kualoa Regional Park Wastewater System Improvements (Kāneʻohe, Hawaiʻi)

Dear Ms. Kahikina:

Thank you for your Pre-Consultation comment letter dated June 28, 2011 concerning the Draft Environmental Assessment (EA) for the Kualoa Regional Park Wastewater Systems Improvements, TMK 4-9-004:001.

We acknowledge that the Department of Design and Construction has no comments on the subject matter at this time.

Upon completion, we will be providing your office with a copy of the Draft EA for your review. We appreciate your input and participation in the environmental review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP, LEED AP
Principal

DEPARTMENT OF FACILITY MAINTENANCE

CITY AND COUNTY OF HONOLULU

1000 Uluohia Street, Suite 215, Kapolei, Hawaii 96707
Phone: (808) 768-3343 • Fax: (808) 768-3381
Website: www.honolulu.gov

PETER B. CARLISLE
MAYOR

WESTLEY K.C. CHUN, Ph.D., P.E., BCEE
DIRECTOR & CHIEF ENGINEER

GEORGE "KEOKI" MIYAMOTO
DEPUTY DIRECTOR

IN REPLY REFER TO:
DRM 11-466

June 23, 2011

JUN 29 2011

Mr. Jeffrey H. Overton, AICP, LEED AP
Group 70 International, Inc.
925 Bethel Street, 5th Floor
Honolulu, Hawaii 96813-4307

Dear Mr. Overton:

Subject: Pre-Consultation for Draft Environmental Assessment (DEA)
Kualoa Regional Park Wastewater System Improvements
Tax Map Key: 1-4-9-04:01

Thank you for the opportunity to review and comment on the pre-consultation to the DEA for the proposed wastewater system improvements at Kualoa Regional Park.

We have no comments to offer. The proposed improvements will be constructed within park property which is under the jurisdiction of the Department of Parks and Recreation and will have negligible impact on our maintenance operations.

For your information, Kamehameha Highway abutting the park is under the maintenance jurisdiction of the State of Hawaii Department of Transportation.

Since the proposed improvements will not affect our facilities or operations, we request that the Department of Facility Maintenance be removed from the environmental assessment process for this project.

Should you have any questions, please call Charles Pignataro of the Division of Road Maintenance, at 768-3697.

Sincerely,

Westley K.C. Chun, Ph.D., P.E., BCEE
Director & Chief Engineer

GROUP 70
INTERNATIONAL

PRINCIPALS

Francis S. Oda, Arch.D., FAIA, AICP, LEED AP
Norman G.Y. Hong AIA
Sheryl B. Seaman AIA, ASID, LEED AP
Hitoshi Hida AIA
Roy H. Nihei AIA, CSI, LEED AP
Ralph E. Portmore AICP
James I. Nishimoto AIA
Stephen Yuen AIA
Linda C. Miki AIA
George I. Atta AICP, LEED AP
Charles Y. Kaneshiro AIA, LEED AP
Jeffrey H. Overton AICP, LEED AP
Christine Mendes Ruotola AICP, LEED AP
James L. Stone, Arch.D., AIA, LEED AP
Katherine M. MacNeil AIA, LEED AP
Tom Young, MBA AIA
Paul T. Matsuda PE, LEED AP

March 23, 2012

Westley K.C. Chun, Ph.D., P.E., BCEE, Director & Chief Engineer
City and County of Honolulu
Department of Facility Maintenance
1000 Uluohia Street, Suite 215
Kapolei, HI 96707

Subject: Response to Comments for Pre-Consultation for Draft Environmental Assessment (DEA) for the Kualoa Regional Park Wastewater System Improvements (Kāneʻohe, Hawaiʻi)

Dear Dr. Chun:

Thank you for your Pre-Consultation comment letter dated June 23, 2011 concerning the Draft Environmental Assessment (DEA) for the Kualoa Regional Park Wastewater Systems Improvements, TMK 4-9-004:001.

We acknowledge that the proposed improvements will be constructed within City park property which is under the jurisdiction of the Department of Parks and Recreation. The facilities have no impact on Department of Facility Maintenance (DFM) operations. We also acknowledge that Kamehameha Highway abutting the park is under the maintenance jurisdiction of the State of Hawaii Department of Transportation, and that DFM has no further comments.

We appreciate your input and participation in the pre-consultation process. At your request, we will remove DFM from the remainder of the EA process.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP, LEED AP
Principal

DEPARTMENT OF PARKS & RECREATION
CITY AND COUNTY OF HONOLULU
1000 Uluohia Street, Suite 309, Kapolei, Hawaii 96707
Phone: (808) 768-3003 • Fax: (808) 768-3053
Website: www.honolulu.gov

JUL 27 2011
GROUP 70 INT'L

PETER B. CARLISLE
MAYOR

GARY B. CABATO
DIRECTOR

ALBERT TUFONO
DEPUTY DIRECTOR

July 25, 2011

Mr. Jeffrey H. Overton, AICP, LEED AP
Group 70 International, Inc.
925 Bethel Street, 5th Floor
Honolulu, Hawaii 96813-4307

Dear Mr. Overton:

Subject: Pre-Consultation for Draft Environmental Assessment
Kualoa Regional Park Wastewater System Improvements
(Oahu, Koolau Poko District, Kualoa Ahupuaa), TMK 1-4-9-04:01

Thank you for the opportunity to review and comment at the pre-consultation stage of the Environmental Assessment for the Kualoa Regional Park Wastewater System Improvements.

The Department of Parks and Recreation supports the proposed improvements to this park under our jurisdiction.

Should you have any questions, please contact Mr. John Reid, Planner, at 768-3017.

Sincerely,

GARY B. CABATO
Director

GBC:jr
(420119)

GROUP 70
INTERNATIONAL

March 23, 2012

Gary B. Cabato, Director
City and County of Honolulu
Department of Parks & Recreation
1000 Uluohia Street, Suite 309
Kapolei, Hawaii 96707

Subject: Response to Comments for Pre-Consultation for Draft Environmental Assessment for the Kualoa Regional Park Wastewater System Improvements (Kāneʻohe, Hawaiʻi)

Dear Mr. Cabato:

Thank you for your Pre-Consultation comment letter dated July 25, 2011 concerning the Draft Environmental Assessment (EA) for the Kualoa Regional Park Wastewater Systems Improvements, TMK 4-9-004:001.

We acknowledge that the Department of Parks and Recreation supports the proposed improvements to the park, and has no additional comments at this time.

Upon completion, we will be providing your office with a copy of the Draft EA for your review. We appreciate your input and participation in the environmental review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP, LEED AP
Principal

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 768-8000 • FAX: (808) 768-6041
DEPT. WEB SITE: www.honoluludpp.org • CITY WEB SITE: www.honolulu.gov

PETER B. CARLISLE
MAYOR

DAVID K. TANOUE
DIRECTOR

JIRO A. SUMADA
DEPUTY DIRECTOR

2011/ELOG-1268 (RM)

July 5, 2011

JUL - 6 2011

Mr. Jeffery H. Overton, AICP, LEED AP
Group 70 International
925 Bethel Street, 5th Floor
Honolulu, Hawaii 96813

Dear Mr. Overton:

Subject: Pre-Consultation for Draft Environmental Assessment (EA)
Kualoa Regional Park Wastewater System Improvements
49-479 Kamehameha Highway – Kualoa
Tax Map Key 4-9-4: 1

This responds to your request, received June 8, 2011, for comments on your DEA preparation notice for the subject project. We have the following comments:

1. A minor Special Management Area (SMA) permit (File No. 94/SMA-41) was approved on June 23, 1994 to allow six to eight burial vaults for reburying human remains on the subject site. During the EA process the Applicant should identify the location of any known burial sites, including the reburial area mentioned above. The Draft EA should include mitigation measures that will be taken to ensure that identified burial areas are protected during the proposed work.

2. The Project Information Summary indicates that some of the proposed work may be in areas in the State land Use Conservation District. Any work within the Conservation District must be coordinated with the Department of Land and Natural Resources, Office of Conservation and Coastal Lands.

3. The Project Information Summary does not indicate whether or not any of the proposed work will be in the shoreline setback area. The Draft EA should specify the proximity of the proposed work to the certified shoreline. Any work proposed within the shoreline setback area will be subject to the requirements of Chapter 23, Revised Ordinances of Honolulu.

The DPP will provide further comments upon review of the submitted Draft EA.

Please contact Robert Mills of our Land Use Approval Branch at 768-8052, if you have any questions.

Very truly yours,

David K. Tanoue, Director
Department of Planning and Permitting

DKT:nw

GROUP 70 INTERNATIONAL

March 23, 2012

David K. Tanoue, Director
City and County of Honolulu
Department of Planning and Permitting
630 South King Street, 7th Floor
Honolulu, HI 96813

Subject: Response to Comments for Pre-Consultation for Draft Environmental Assessment (DEA) for the Kualoa Regional Park Wastewater System Improvements (Kāneʻohe, Hawaiʻi)

Dear Mr. Tanoue:

Thank you for your comment letter dated July 5, 2011 concerning the Draft Environmental Assessment for the Kualoa Regional Park Wastewater Systems Improvements, TMK 4-9-004:001. The following responses are offered to your comments.

1. The DEA will identify the location of known burial sites, including the reburial area mentioned in minor Special Management Area (SMA) permit (File No. 94/SMA-41). The DEA will also include mitigation measures to ensure that identified burial areas are protected during the proposed work.
2. No work will occur within the State Conservation District.
3. The DEA will specify the proximity of the proposed work to the Certified Shoreline. We acknowledge that any work proposed within the Shoreline Setback Area will be subject to the requirements of Chapter 23, Revised Ordinances of Honolulu.

Upon completion, we will be providing your office with five copies of the Draft EA for your review. We appreciate your participation in the environmental review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC.

Jeffrey H. Overton, AICP, LEED AP
Principal

Appendix A
Final Geotechnical Exploration and
Foundation Evaluation Report

FINAL SUBMITTAL

Geotechnical

Exploration and Foundation Evaluation Report

Reconstruct Park Wastewater Systems at Kualoa Regional Park

Kualoa, Oahu, Hawaii

Prepared for:

Kennedy/Jenks Consultants, Inc.
3375 Koapaka Street Suite F227
Honolulu, HI 96819

March 2012

Prepared by:

Yogi Kwong Engineers, LLC
1357 Kapiolani Blvd., Suite 1450
Honolulu, Hawaii 96814

YKE Project No. 11007

YKE

March 21, 2012

Mr. Kyle Okino, P.E.
Kennedy/Jenks Consultants, Inc.
AIPA Building
3375 Koapaka Street Suite F227
Honolulu, Hawaii 96819

Subject: **Final Submittal**
Geotechnical Exploration and Foundation Evaluation Report
Reconstruct Park Wastewater Systems at Kualoa Regional Park
Kualoa, Oahu, Hawaii

Dear Mr. Okino:

Yogi Kwong Engineers, LLC (YKE) is pleased to submit this Geotechnical Exploration and Foundation Evaluation Report for the proposed Reconstruct Park Wastewater Systems at Kualoa Regional Park on the island of Oahu, Hawaii, for your use. Our geotechnical engineering services were performed in general accordance with our fee proposal dated September 19, 2009.

A Draft Geotechnical Report was submitted to Kennedy/Jenks Consultants, Inc. for review and comments on May 02, 2011, and the review comments are addressed in this report. We appreciate the opportunity to provide these services to Kennedy/Jenks Consultants, Inc. (KJC). If you have any questions regarding this letter and the attached draft Geotechnical Exploration and Foundation Evaluation Report, please do not hesitate to contact us.

Yours truly,
Yogi Kwong Engineers, LLC

Reyn S. Hashiro, P.E.
Project Geotechnical Engineer

Diego Munar Castaneda
Senior Staff Engineer

James Kwong, Ph.D., P.E.
Principal

JAMES K.P. KWONG
LICENSED PROFESSIONAL ENGINEER
No. 6948-C
HAWAII, U.S.A.

Yogi Kwong Engineers, LLC
1357 Kapiolani Blvd., Suite 1450
Honolulu, HI 96814
Tel: (808) 942-0001
Fax: (808) 942-0004

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1.0 INTRODUCTION

This report presents the results of a geotechnical exploration and foundation evaluation performed by Yogi Kwong Engineers, LLC (YKE) for the proposed Reconstruct Park Wastewater Systems at Kualoa Regional Park on the island of Oahu. The approximate project location and its general vicinity are shown on the Project Location Map, Figure 1, and an Aerial Photograph of Project Location, Figure 2, respectively.

1.1 PROJECT DESCRIPTION

We understand that the proposed Reconstruct Park Wastewater Systems at Kualoa Regional Park will consist of a single story Bathhouse, a Treatment System, and a Disposal System. The proposed Treatment System will include three (3) aerobic treatment units, and one (1) concrete pre-loader tank. Since the project site is located in a culturally sensitive area, the proposed structures will be designed to minimize disturbance to the existing grade.

Based on the available preliminary plans, the proposed Bathhouse will be a single story on-grade structure approximately 80 feet long by 65 feet wide in plan with a wood framed roof supported on interior and exterior masonry walls bearing on shallow footings. A preliminary wall loading of 1,400 pounds per linear foot for the dead load and 200 pounds per linear foot for the roof live load was provided in an email dated March 2, 2011 from KJC and MKE Associates LLC based on the city's prototype drawings for the bathhouse.

Based on the manufacturer's product data, the proposed aerobic treatment tanks will each be approximately 48 feet long and 10 feet and 4 inches in diameter with six (6) 24-inch high risers on top of the tank. It is our understanding that the cylindrical tanks will be partially embedded and protected by a ground cover flush with the risers, and the tanks will be spaced approximately 26.5 feet center to center. When fully loaded, we understand that each tank will generate an average loading of approximately 550 pounds per square foot (psf) based on design loads provided by KJC in their email dated March 19, 2012.

The proposed pre-loader tank will measure approximately 18 feet long, 9 feet wide and 8 feet high, and should not be embedded more than 6 feet deep according to the manufacturer's data. The tank will generate an average loading of approximately 660 psf as indicated in the April 8, 2011 email from KJC. The proposed distribution box will be a cast-in-place concrete box approximately 12 feet long, 8.5 feet wide and 5 feet high, and will generate an average loading of approximately 510 psf.

The proposed disposal system will be made up of four (4) concrete distribution boxes and an elevated mound. The approximate dimensions of the distribution boxes will be 5 feet long, 5 feet wide and 5 feet tall. The elevated mound is constructed of plastic panels or chambers laid over a bed of granular material. The approximate extension of the disposal area is 12,400 square feet, while the overall area of the elevated mound is approximately 23,500

square feet. Installation of various new underground utility piping is anticipated for the proposed wastewater system reconstruction.

1.2 PURPOSE AND SCOPE OF WORK

The purpose of this geotechnical exploration and foundation evaluation was to explore and evaluate the subsurface conditions at the locations of the two (2) new major proposed structures, the Bathhouse and the aerobic treatment units, and develop preliminary geotechnical considerations and recommendations pertaining to the design and construction of the subject project.

The following scope of services was performed in general accordance with our fee proposal dated September 19, 2009:

- Reviewed available geotechnical information pertaining to the project site, including as-built drawings, published geologic maps, and soil survey maps.
- Performed a geotechnical site reconnaissance, selected proposed boring locations, contacted Hawaii One Call Center to identify subsurface utilities, and obtained clearance for drilling the borings.
- Verified probable underground utility locations and work areas with utility agency personnel based on available topographic plans prior to drilling.
- Drilled a total of two (2) borings to the approximate depths of 32 and 37 feet below the existing ground surface (bgs).
- Performed soil sampling and classification during the field exploration, and preserved soil samples for subsequent laboratory testing.
- Performed geotechnical laboratory tests on selected soil samples to determine pertinent geotechnical properties.
- Analyzed field exploration and laboratory test data for the development of our geotechnical engineering evaluation findings and recommendations.
- Prepared this Geotechnical Report summarizing our preliminary findings of the geotechnical field exploration, laboratory testing, engineering analyses and evaluations, and presenting our geotechnical recommendations for the foundation support of the proposed facilities and the proposed construction.
- Conducted an in-house quality assurance review of the geotechnical recommendations and evaluation findings by a principal engineer of our firm.

The scope of our services presented herein was limited to a geotechnical exploration and did not include any civil, structural, hydrological, environmental, and hazardous waste assessments or evaluations; detail design; permit applications; and/or a topographic survey of the project site.

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 FIELD EXPLORATION

The field exploration for this project was performed on March 16, 2011 under the supervision of our engineering personnel in general accordance with the scope of work in our fee proposal dated September 19, 2009. Due to the culturally sensitive area, the field exploration activities were performed in the presence of a Cultural Surveys Hawaii archaeologist to verify that no burial sites were encountered. The field exploration included drilling and sampling a total of two (2) borings to the approximate depths of 32 and 37 feet below the ground surface.

The approximate locations of the exploratory borings are shown on the Approximate Boring Location Plan, Figure 4. A detailed description of the procedures used to perform the exploratory borings, along with the logs of these borings, is presented in Appendix A.

2.2 LABORATORY TESTING

Laboratory testing was performed to verify our visual field classifications and to determine pertinent geotechnical engineering properties of selected soil samples retrieved from the exploratory borings. The geotechnical laboratory testing was performed at YKE's laboratory in Honolulu, Hawaii, and by Construction Engineering Labs, Inc. in Pearl City, Hawaii.

A description of the laboratory test procedures is presented in Appendix B. The geotechnical laboratory tests being performed include moisture content and density determination tests, Atterberg limit tests, gradation or sieve analysis tests, California bearing ratio tests, modified proctor tests, and unconfined compression tests.

3.0 SITE CONDITIONS

3.1 SURFACE CONDITIONS

The project site is located to the north of a fishpond and adjacent to the south side of an access road within Kualoa Regional Park on the island of Oahu, as shown in Figure 1. Kaneohe Bay lies to the east and the south of the park. We understand because of its proximity to the shoreline, the project site is considered a culturally sensitive area.

The beach park is sparsely developed with various existing facilities including a cultural center in the vicinity of the proposed reconstruct wastewater systems and existing several bathhouses located across the park. The surface topography of the project area gently slopes up from the shoreline to the boring locations within the beach park. Based on a preliminary topographic survey (provided by Kennedy/Jenks Consultants, Inc. on March 31, 2011), the project site's surface elevation ranges from about 4 to 6.1 feet above Mean Sea Level (MSL).

The existing ground cover at the project areas includes grass and topsoil. Overhead utility poles and lines were observed within the project site with electrical and telephone lines routing along the access road. Water lines traverse underground across Kualoa Regional Park based on the available record drawings. Sewer lines are present adjacent to the existing facilities.

3.2 REGIONAL GEOLOGY

The island of Oahu was built by two shield volcanoes, the Waianae volcano and the Koolau volcano. The younger Koolau volcano is built of the Kailua Volcanic series in the east, and has been truncated by a massive submarine landslide, the Nuuanu Slide to the northeast. The Koolau volcano has age dated from about 2.9 million years (Ma, Mega annum) to as young as 1.78 Ma respectively (Sherrod et al, 2007).

A vast amount of the Koolau volcano was removed by fluvial and marine erosion during the Pleistocene that created deep valleys. After these erosion cycles, the island was submerged more than 1,200 feet, and the valleys were drowned and alluviated. Scattered sporadically above the Koolau basalt are lava flows and vent deposits. During the last several hundred thousand years, regressions and transgressions of sea level occurred, which resulted in renewed erosion of the higher deposits and growth of coral farther offshore.

The regional geology map of the project area and its vicinity is presented in Figure 3. The geology of the project site indicates that beach deposits (Qbd) were formed by the erosion of paleo coral reefs which have been re-worked by waves and deposited as beach deposits. The general surrounding area of the project location is underlain by recent alluvium (Qa) and older alluvium (QTao) to the north and northwest.

3.3 SUBSURFACE CONDITIONS

The subsurface conditions presented in this report are based on our interpretation of the subsoil data obtained from drilling and sampling of the exploratory borings, and the field and laboratory testing performed for this project, which are supplemented by available geologic and soil survey maps and YKE's general experience in this area. More detailed descriptions of the subsurface conditions encountered in the YKE borings are presented on the boring logs in Appendix A. Photographs of the soil samples are shown in Appendix C.

The exploratory borings and the available testing data show that the subsoils encountered can be generalized into five (5) predominant soil or geologic units as discussed below:

FILL – Variable fill materials were encountered in Borings B-1 and B-2 to approximately 3 to 4.5 feet below ground surface (bgs) respectively. The fill unit primarily consisted of stiff to very stiff brown silt with sand and gravel in Boring B-1 and stiff reddish brown elastic silt with gravel in Boring B-2.

BEACH DEPOSITS – Beach deposits were encountered in Boring B-1 approximately from 3 to 11 feet bgs and in Boring B-2 approximately from 4.5 to 10.5 feet bgs. The beach deposits primarily consisted of loose to medium dense, tan to off white coralline sand and silty coralline sand.

LAGOONAL DEPOSITS – Lagoonal deposits were encountered in Boring B-1 approximately from 11 to 20.5 feet bgs and in Boring B-2 approximately from 10.5 to 25.5 feet bgs. The lagoonal deposits primarily consisted of loose to very loose, gray to dark gray silty sand and silty coralline gravel with sand.

CORALLINE DEPOSITS – Coralline deposits were formed primarily as a result of wave actions on coralline reefs during different stands of the sea level. Wave actions caused breakage of reef formation to form rubblestone to coralline detritus. Subsequent re-cementation of coralline debris and beach sand deposits formed cemented calcareous sandstone and "beach rock" limestone ledges. Rises in sea level introduced an influx of fine sediments in a matrix with coarse coralline detritus. Due to the wave actions dominating the depositional environment, coralline deposits and coral reef limestone are often highly variable in all directions.

Coralline deposits were encountered in Boring B-1 approximately from 20.5 to 30 feet bgs and in Boring B-2 approximately from 25.5 to 30.5 feet bgs. The coralline deposits primarily consisted of loose to medium dense, tan poorly graded coralline gravel.

ALLUVIUM – Alluvial deposits were encountered in Boring B-1 from approximately 30 to 37 feet bgs and in Boring B-2 approximately from 30.5 to 32 feet bgs. The alluvial deposit primarily consisted of medium stiff to stiff brown elastic silt locally with sand.

4.0 DISCUSSION AND GEOTECNICAL RECOMMENDATIONS

At the Project team's request, the geotechnical field exploration was limited to two (2) exploratory borings for project economy, with one boring drilled at each of the proposed locations for the bathhouse and the aerobic treatment units. No borings were drilled at the locations of the other proposed structures. The purpose was to evaluate the generalized subsoil conditions at the project site based on the limited boring data, and provide geotechnical recommendations for the site grading and foundation support of these two (2) major components as well as the other proposed structures of the project.

The discussion and recommendations provided in this report are primarily pertaining to the bathhouse and the aerobic treatment units considering the foundation embedment constraints in these culturally sensitive areas and the estimated settlements from structural loads provided by the project team. Additional field exploration and analysis may be required in the event that specific geotechnical recommendations are requested for the site grading and foundation support of the other proposed structures included in the reconstruct wastewater treatment systems project.

Based on the field exploration findings, the laboratory test results, and a review of available records, we believe that the proposed one-story structure may be adequately supported by the fill crust or the underlying beach deposits with minimal embedment into this culturally sensitive subsoil layer. Groundwater was encountered at approximately 4.5 feet below the existing ground surface at the time of drilling. Due to the proximity of the project site to the shoreline, the effect of ocean tides should be taken into account during design and construction of the proposed structures.

To minimize the earthwork required, and therefore disturbance of the culturally sensitive area, we recommend that the bathhouse foundation should be constructed to bear on the thin fill crust. Due to the significant size of the aerobic treatment units (10.3-foot diameter tanks), however, the foundation of these tanks will require embedment into the underlying beach deposits. Similar site grading and foundation support recommendations may be considered for the other proposed structures.

More detailed discussions and our geotechnical recommendations for earthwork, subgrade preparation, and foundations are presented in the following subsections of this report.

4.1 SITE GRADING

Based on our site reconnaissance, the project site was not covered with heavy vegetation at the time of the site visit. In general, construction areas which are lightly vegetated should be thoroughly grubbed by a minimum depth of six (6) inches. The grubbed areas should be cleared of vegetation, roots, rubbish, debris, any other deleterious materials, and if necessary, re-compacted by proof rolling. The grubbed materials should be properly disposed off site prior to fill placement. Any unsuitable materials encountered at or below the cleared

subgrade surface should be removed and if necessary, replaced with a suitable backfill material, such as imported non-expansive (with expansion index less than 20) granular select borrow material, compacted to no less than 95% of its maximum dry density per the latest procedure of ASTM D-1557 Test Method.

If required, imported non-expansive granular select borrow material for use as fills and backfill should consist of well-graded granular materials, free of organic matter, debris, and particles greater than three (3) inches in maximum dimension, and should have less than 15% fines passing the No. 200 sieve, a CBR value of at least 25, a liquid limit of 25% or less, and a plasticity index of 10% or less. All imported soils should be tested, examined and verified for conformance with project requirements by the Geotechnical Engineer-of-Record, prior to transportation to site.

The excavated on site granular soils can be used as a source of fill and backfill materials. Excavated on-site elastic silt should not be used as fills or backfills, however, the elastic silts can be used as a source of landscape fill provided it is screened of oversized particles and meets the top soil and other landscaping requirements set forth in the projects specifications.

Fill and backfill materials should be placed in maximum 8-inch thick loose lifts, and compacted to a minimum of 95% maximum dry density per the latest procedure of ASTM D-1557 Test Method. The contractor should be required to perform proper quality control density testing during fill and subgrade compaction in accordance with the project specification requirements. The testing should be performed in the presence of the Geotechnical Engineer-of-Record. Fill or backfill below water level should consist of free-draining granular materials, such as open-graded gravel (ASTM C 33, No. 67 gradation) or locally available #3B Fine gravel, and should be wrapped in a non-woven filter fabric.

Temporary cut slope in the on-site soils should not exceed to a slope ratio of 1.5H:1V (1.5 Horizontal to 1 Vertical). Both temporary and permanent slope faces should be covered or protected by suitable erosion control matting or methods to minimize erosion damages and reduce the potential of slope unraveling and instability.

Any water that collects in open excavations should be pumped out immediately to avoid softening of foundations soils. It is recommended that the final ground surface around the proposed structures be graded to provide positive drainage away from the structures. In cases where this is not feasible, adequate measures should be provided to avoid ponding and quickly drain away storm water that may collect around the proposed structures.

Groundwater was encountered at approximately 4.5 feet below the existing ground surface in the exploratory borings. Dewatering of an excavation will be necessary where the existing groundwater level is above the bottom of the proposed excavation. The Contractor should be required to retain a qualified dewatering consultant / geotechnical engineer to evaluate ground water control measures, and to obtain all necessary permits pertaining to discharge of dewatering effluents.

4.2 Bathhouse Foundation

Based on the foundation loads provided by the project team, we believe that shallow footings can be used to support the proposed bathhouse on grade or minimally embedded below the existing grade in consideration of the culturally sensitive building site, based on the subsoil conditions encountered in Boring B-1.

It is our opinion that an allowable bearing pressure of 1,500 psf and a minimum footing embedment of eighteen (18) inches may be used for design of the shallow spread and/or continuous wall footing foundations for the bathhouse. The excavated footing foundation subgrade in the on-site fill material should be scarified to a minimum depth of eight (8) inches, moisture conditioned to within 2% wet of optimum moisture content, and re-compacted to at least 95% maximum dry density.

Any unsuitable materials encountered at or below the foundation subgrade surface should be removed and replaced with a suitable backfill material, such as imported non-expansive (with expansion index less than 20) granular select borrow material, compacted to no less than 95% of its maximum dry density per the latest procedure of ASTM D-1557 Test Method.

Should the bathhouse footings be required to bear directly on the existing grade, we recommend that a minimum of eighteen (18) inches of fill will be installed surrounding the footings in order to provide proper confinement and passive resistance. The on-site fill materials, and/or imported non-expansive granular select borrow material described in Section 4.1, can be used as fill or backfill for the footing excavations. Fill or backfill materials should be placed in maximum 8-inch thick loose lifts, and compacted to a minimum of 95% maximum dry density per the latest procedure of ASTM D-1557 Test Method.

A one third (1/3) increase in the allowable bearing capacity may be used for design when transient loads such as wind and/or seismic forces are considered. A base friction factor of 0.40 and a passive lateral earth resistance of 300 psf per foot of depth (psf/ft) can also be used for the footing design. We estimate that the settlements of the footing foundations should be less than one (1) inch total and one half (1/2) of an inch differential based on the recommended allowable bearing pressure.

4.3 Aerobic Treatment Units

It is our understanding that the proposed wastewater treatment system will include three (3) aerobic treatment units, and that each unit will consist of an approximately ten (10) foot and four (4) inches in diameter and 48-foot long fiberglass tank with a treatment capacity of 15,000 gallons to be constructed underground. The required wastewater tank excavation is anticipated to encounter primarily fills, flowing sand and groundwater based on the subsoil conditions encountered in Boring B-2.

According to the available product specifications, we understand that each tank is required to be anchored with either prefabricated deadman or an anchor slab using at least eight (8) hold-down straps. Failure to anchor the tank may cause tank failure due to buoyancy forces from the underlying groundwater table that may fluctuate with the ocean tides in Kaneohe Bay. The tank will also need to be installed on a minimum 12-inch thick bedding layer above the concrete anchor slab per the manufacturer's recommendation.

We also understand that, due to the significant size of the tanks, it will be desired to place the tanks with only half height or about five (5) feet in height of the tanks to be exposed, and that the exposed tank sections will be covered in order to protect and reduce the visual impact of the wastewater treatment units.

To achieve and comply with the anchoring requirements of the tank manufacturer, we believe that at a minimum each tank should be bearing on and structurally tied to a minimum eight (8) inch thick concrete anchor slab at approximately seven (7) feet below the existing ground surface as shown in the Wastewater Tank Foundation and Cover Geotechnical Recommendations, Figure 6. The preliminary proposed excavation and tank placement concept will require a minimal embedment of slightly over two (2) feet into the underlying culturally sensitive beach deposit layer.

Based on the manufacturer's requirements, the concrete anchor slab should be at least 13 feet in width, and extend at least 18 inches beyond both sides of the tank. Due to the anticipated presence of groundwater in the excavation, from a geotechnical standpoint locally available 3B Fine aggregates or ASTM C-33 Size No. 67 aggregates can be used as the bedding material. The self compacting bedding material should be extended to a minimum of three (3) feet above the concrete slab, and wrapped in a suitable geo-textile fabric such as Mirafi 180N or equivalent. The Contractor should verify with the tank manufacturer on bedding material requirements, the more stringent will apply.

The on-site silt with sand and gravel, and/or imported non-expansive granular select borrow material can be used as cover or landscaping fill for the tank ground cover. According to the tank manufacturer, minimum 2 feet of fill should cover the wastewater tanks. We recommend using the minimum required cover in order to reduce the total loading on the tank foundations.

It is our opinion that an allowable bearing pressure of up to 1,500 psf may be used for design of the concrete anchor slabs. A one third (1/3) increase in the allowable bearing capacity may be used for design when transient loads such as seismic forces are considered. The concrete anchor slab subgrade should be properly proof rolled a minimum of not less than three (3) passes by a heavy compaction roller.

Due to the granular nature of the underlying subsoils, it is believe that a significant portion of the ground settlements under the loading of the tank excavation backfill and cover will occur during construction. We estimate that the remaining total and differential settlements of the

aerobic treatment tanks bearing on the bedding material and the anchor slabs should be less than one (1) inch total and one half (1/2) of an inch differential during operations based on the recommended moderate allowable bearing pressures.

From a geotechnical standpoint the tank ground cover fill materials should be placed in loose lifts not exceeding eight (8) inches in thickness, and re-compacted or compacted to at least 90% of maximum dry density per ASTM D-1557. The concrete anchor slab subgrade should be properly proof rolled a minimum of not less than three (3) passes by a heavy compaction roller. The Contractor should also verify with the tank manufacturer on the type of cover fill and compaction methods should be used within one-foot of the tank. Cover fill compaction should not adversely impact the tank.

Fill slopes on the ground cover around the tanks should be constructed with a maximum slope ratio of 3H:1V as shown in Figure 6. The cover fill slope should be over-filled and trim to the final finish grade. The temporary cut slopes on all sides of the tank excavation is the Contractor's responsibility and should conform with OSHA requirements and recommendations by the Contractor retained Engineers.

4.4 Elevated Mound (Disposal System)

Based on an email provided by KJC, dated March 12, 2012, we understand that the proposed disposal system will include an elevated mound constructed of plastic panels or leaching chambers laid over and surrounded by a granular material, and bearing on the existing ground surface. A detail of the elevated mound YKE reviewed is presented in Figure 7. Due to the presence of elastic silts on the existing ground surface as encountered in boring B-2, we believe it is prudent that an infiltration rate of the existing ground surface be determined in order to assure that the system subgrade can provide the required long term absorption.

From a geotechnical standpoint, locally available 3B Fine aggregates or ASTM C-33 Size No. 67 aggregates can be used as the bedding material. Bedding materials and cover fill should conform to the manufacturer's recommendation. The self compacting granular material should be wrapped in a suitable geo-textile fabric such as Mirafi 180N or equivalent. The leaching chambers and granular material will be covered by a minimum cover of three (3) feet of compacted fill in compliance of manufacturer's recommendations. Fill slopes on the ground cover around the elevated mound should be constructed with a maximum slope ratio of 4H:1V as shown in Figure 7. We recommend using the minimum required cover and a light weight imported non-expansive material in order to reduce loading on the elevated mound subgrade. Top soil over the cover fill should be in conformance with the plans and specifications.

Based on the granular nature of the underlying subsoils, we believe that a significant portion of the ground settlements under the loading of the elevated mound disposal system will occur

during construction. We estimate that post construction total and differential settlements should be less than one (1) inch total and one half (1/2) of an inch differential.

4.5 Building Slabs-On-Grade

Based on the near surface subsoil conditions in Boring B-1, we believe that concrete slabs bearing on the surface fill material at grade may be used at the proposed bathhouse.

If a capillary water break layer and a basaltic termite barrier are required, it is our opinion that four (4) inches of basaltic termite barrier and six (6) inches of #3B Fine gravel or ASTM C 33 No. 67 aggregates should be provided below the proposed slabs on grade.

After scarification, the slab subgrade should be re-compacted to at least 95% maximum dry density per ASTM D-1557 Test Method. Any unsuitable materials encountered at or below the slab subgrade should be removed and replaced with a suitable backfill material, such as the imported non-expansive granular select borrow material, compacted to no less than 95% of its maximum dry density per the latest procedure of ASTM D-1557 Test Method.

4.6 Lateral Earth Pressures

Based on the generally granular subsoil conditions encountered in the two (2) exploratory borings, we believe that an at rest earth pressure of 60 pounds per square foot (per foot length of wall) may be used to verify the design of below grade structures to be embedded below ground. Full hydrostatic pressure should be considered to +3 feet MSL.

4.7 Liquefaction Potential And Seismic Design Considerations

Liquefaction is a phenomenon in which a soil loses a substantial amount of shear strength due to the build-up of excess pore-water pressure, which is most commonly generated by strong earthquake ground shaking. Liquefaction can also occur as a result of cyclic loading conditions generated by vibratory construction equipment. In general, soils most susceptible to liquefaction are saturated, loose, uniformly graded, fine-grained sands containing little or no fines.

Because the project site at Kualoa Regional Park is underlain by very loose to loose silty sands and gravels (mainly beach and lagoonal deposits) under a high groundwater table, we believe that the onsite deposits may have a high liquefaction potential under ground shaking conditions during a major earthquake or induced by construction equipment such as vibratory hammers and vibratory compaction rollers.

A detailed analysis of the liquefaction potential of the project site would have required a more elaborate field exploration program including the drilling and sampling of deep borings to about 100 feet below the existing grade. Such an analysis is beyond the scope of work for this geotechnical exploration and foundation evaluation.

4.8 Utility Trench Pavement Restoration

It is our understanding that this Reconstruct Park Wastewater Systems project at Kualoa Regional Park will include the installation of new underground utilities within the project site. Where the new utility trenches will be located below paved areas, we recommend that the pavement restoration section be constructed to match the existing adjacent pavement section, or the following minimum pavement section should be used, provided the trench backfill is compacted in conformance with the project plans and specifications.

2.5-inch Asphalt Concrete	
6-inch Base Course	(95% Compaction per ASTM D-1557)
8.5-inch Minimum Total Thickness	(Over compacted trench backfill)

The minimum pavement thickness recommendation provided for utility trench restoration is not developed for support of frequent heavy construction traffic or heavy construction equipment. It is our understanding that the utility trenches will be excavated on access roads and parking areas within the Kualoa Regional Park, and that these pavement areas will be primarily used by privately owned vehicles, city maintenance trucks, occasional trash vehicles (one a week), and on rare occasions by large emergency vehicles.

5.0 LIMITATIONS

The geotechnical recommendations and conclusions presented in this report are based on the assumption that the scope of the designed and constructed project, as described, does not change appreciably and that significant variations in soil properties from those encountered by our field exploration do not occur. The borings are widely spaced; therefore, some variation in soil properties between the borings is likely. If any conditions notably different from those described herein are encountered during construction, we should be immediately notified in writing. The geotechnical recommendations presented in this report were developed assuming the Geotechnical Engineer-of-Record will be retained to observe actual field conditions encountered during construction to verify the applicability of the recommendation presented in this report, and to recommend appropriate changes in design or construction procedures, if conditions differ from those described herein.

This report was prepared for use by Kennedy/Jenks Consultants, Inc. in accordance with generally accepted geotechnical engineering principles and practices. The geotechnical opinions and recommendations given in this report are based on our analysis of the data collected for this project. Additional conclusions and/or recommendations made from the data by others are solely their own responsibility.

Our analysis is based on the data obtained from the borings at the locations indicated on the Boring Location Map. If project plans or requirements change, the conclusions and recommendations provided herein by YKE may need to be revised. The nature and extent of variations between the borings may become evident during construction and will likely differ from those discussed in this report. No warranty is included, either expressed or implied, that the actual conditions encountered will conform exactly to the conditions described herein.

Our services were provided in a manner consistent with the level of care and skill ordinarily exercised by other professional consultants under similar circumstances. No other representation is intended or implied.

6.0 REFERENCES

MacDonald, G.A., Abbott, A.T., and Peterson. F.L., 1983. *Volcanoes in the Sea: The Geology of Hawaii*, 2nd Edition, University of Hawaii Press, Honolulu, Hawaii.

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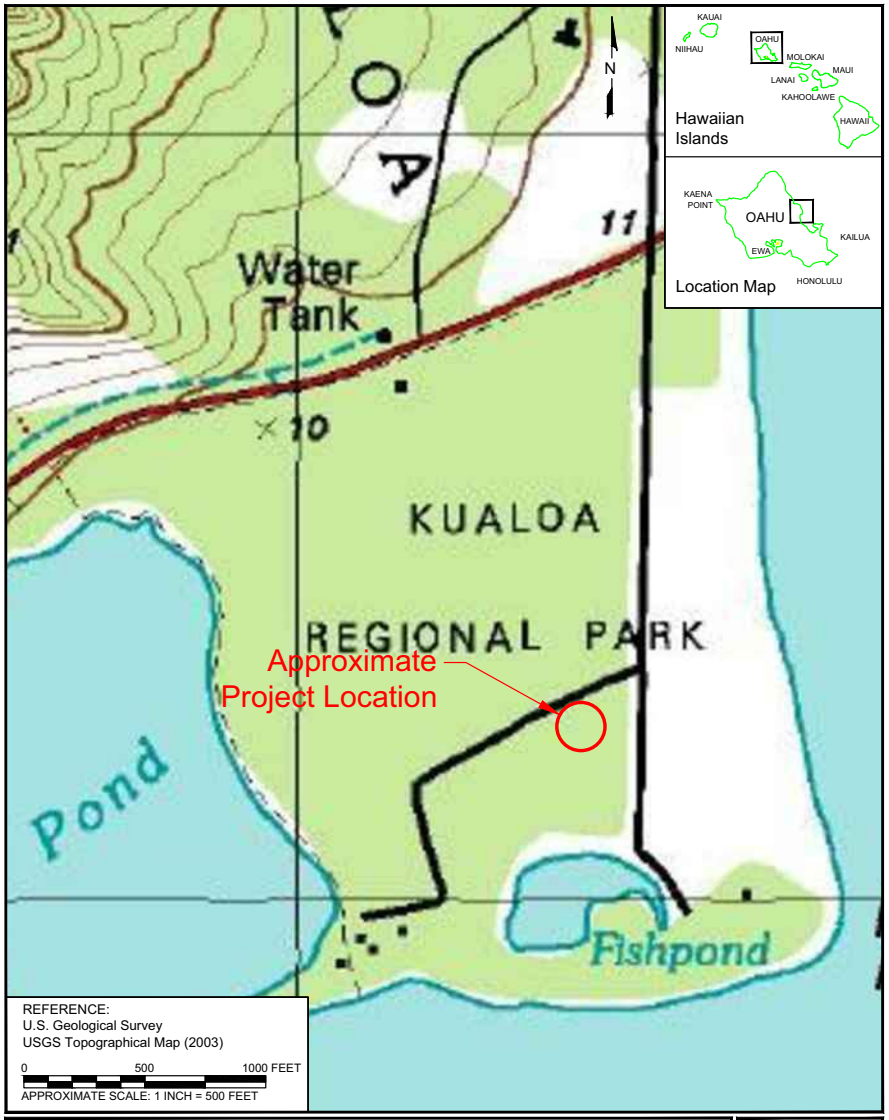
U.S. Geologic Survey Topographic Map, *Kaneohe Quadrangle*, 1998. U.S. Department of Defense.

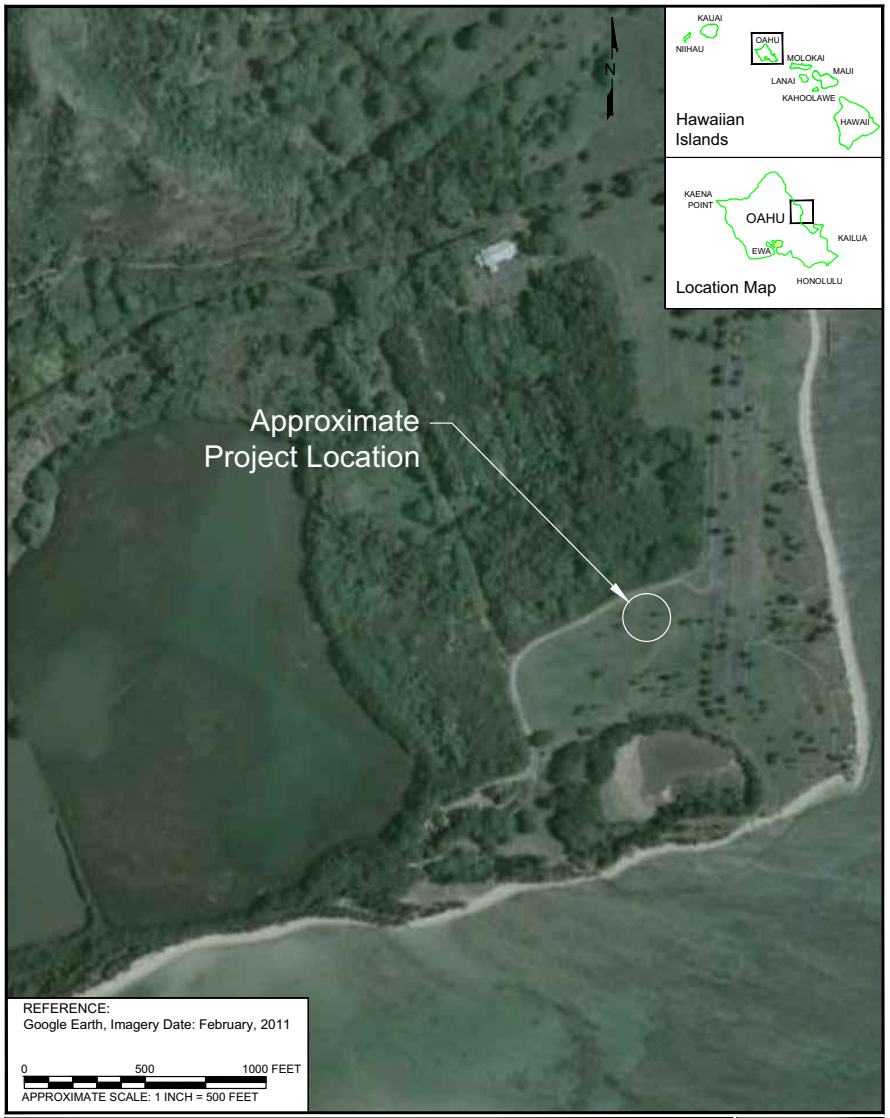


REFERENCE:
U.S. Geological Survey
USGS Topographical Map (2003)

0 500 1000 FEET
APPROXIMATE SCALE: 1 INCH = 500 FEET

PROJECT LOCATION MAP
Reconstruct Park Wastewater Systems at Kualoa Regional Park
Kualoa, Oahu, Hawaii
Project No. 11007

YOGI KWONG ENGINEERS, LLC
FIGURE 1

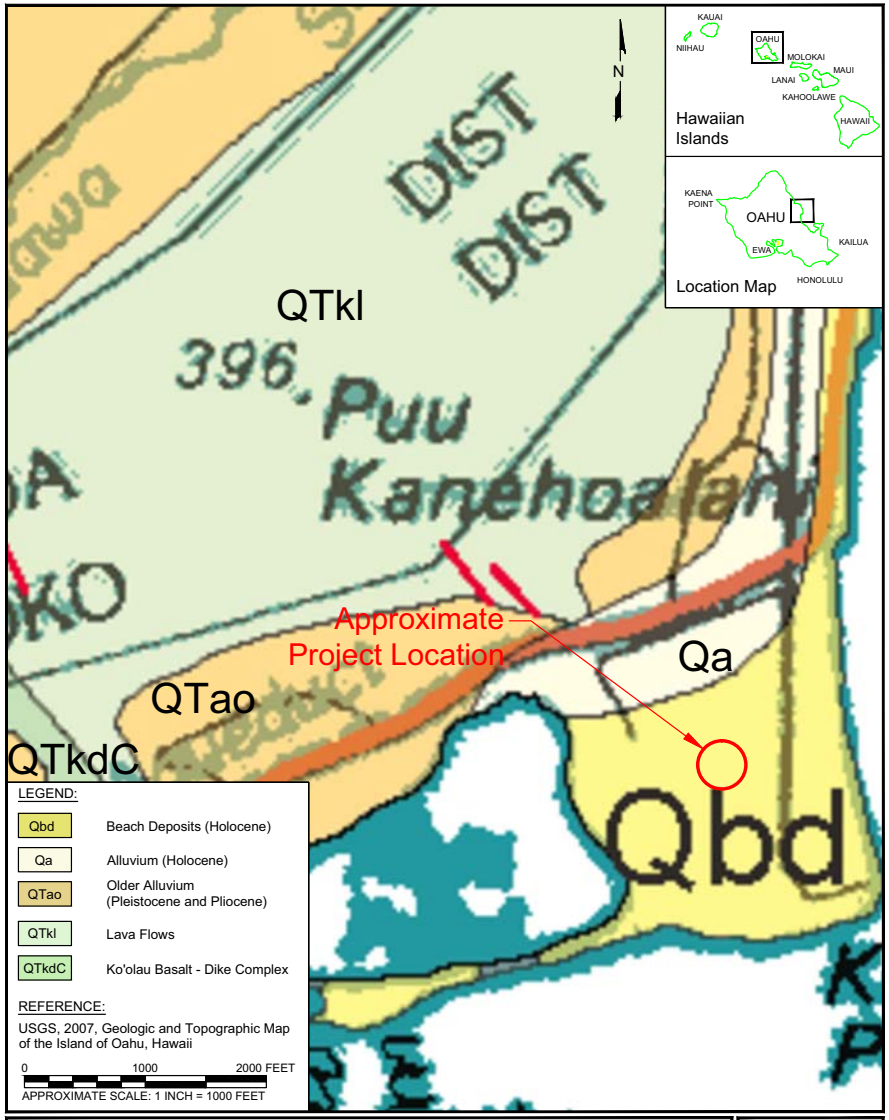


REFERENCE:
Google Earth, Imagery Date: February, 2011

0 500 1000 FEET
APPROXIMATE SCALE: 1 INCH = 500 FEET

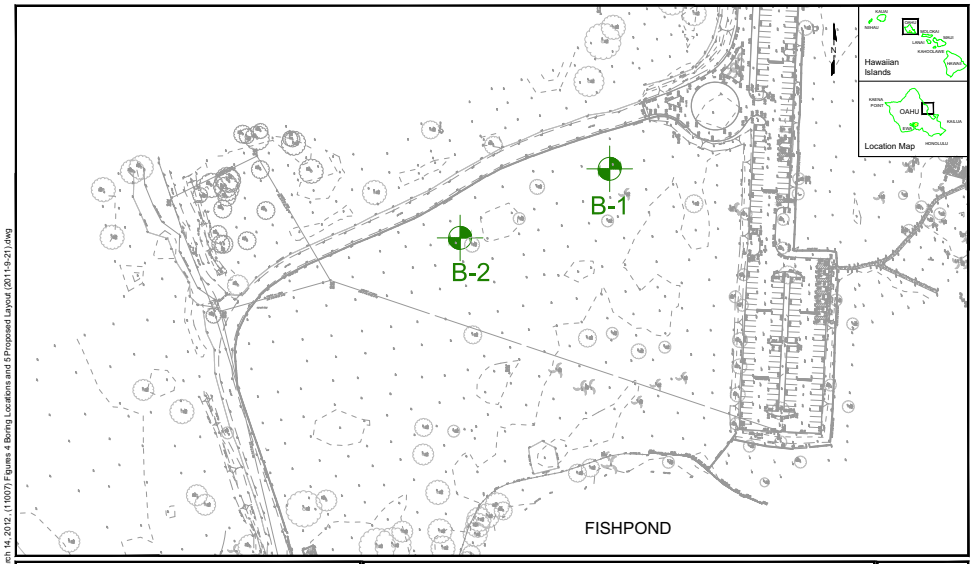
AERIAL PHOTOGRAPH OF PROJECT LOCATION
Reconstruct Park Wastewater Systems at Kualoa Regional Park
Kualoa, Oahu, Hawaii
Project No. 11007

YOGI KWONG ENGINEERS, LLC
FIGURE 2



REGIONAL GEOLOGY MAP
Reconstruct Park Wastewater Systems at Kualoa Regional Park
Kualoa, Oahu, Hawaii
Project No. 11007

YOGI KWONG ENGINEERS, LLC
FIGURE 3



Plotted: March 14, 2012 - (11007) Figures 4 Boring Locations and 5 Proposed Layout (2011-9-21).dwg

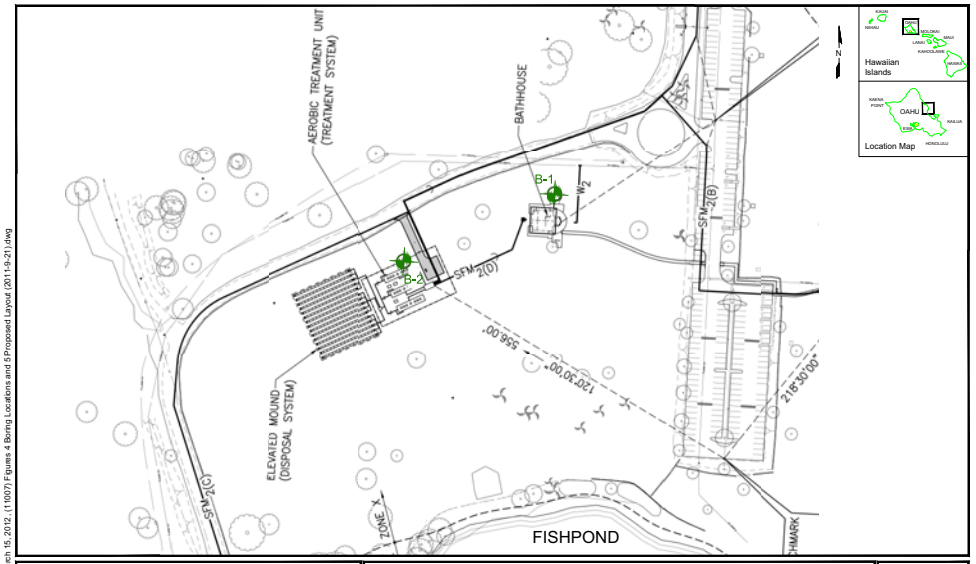
APPROXIMATE BORING LOCATION PLAN
Reconstruct Park Wastewater Systems at Kualoa Regional Park
Kualoa, Oahu, Hawaii
Project No. 11007

REFERENCE:
Preliminary Topographic Survey provided by Kennedy/Jenks Consultants, Inc. (03-03-11)

Legend:
Exploratory Boring

0 100 200 FEET
APPROXIMATE SCALE: 1 INCH = 100 FEET

FIGURE 4



PROPOSED BUILDING LAYOUT (DATED 03-12-12)
Reconstruct Park Wastewater Systems at Kualoa Regional Park
Kualoa, Oahu, Hawaii
Project No. 11007

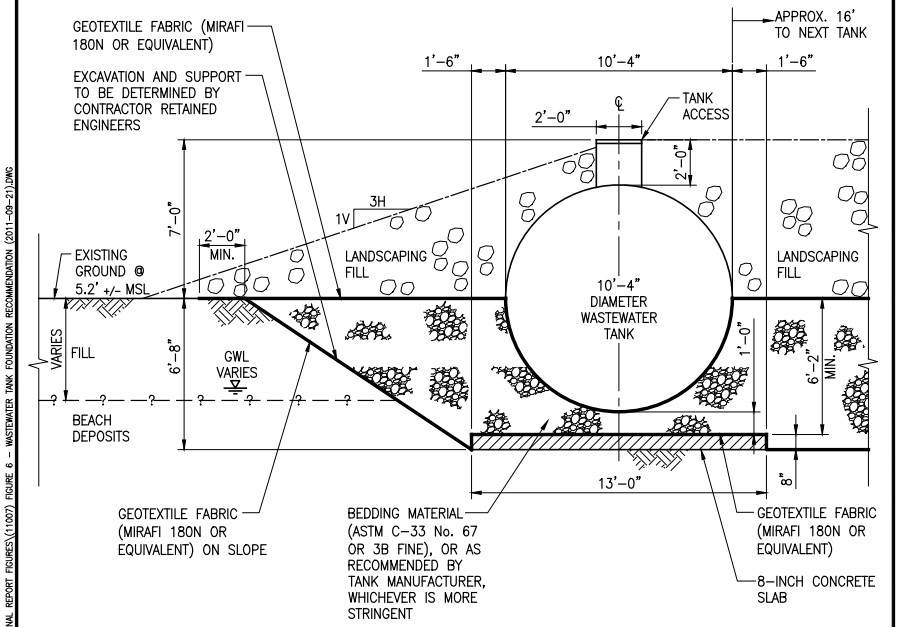
REFERENCE:
Overall Site Plan Provided by
Kennedy/Jenks Consultants, Inc.
(03-12-12)

Legend:
Exploratory Boring

0 100 200 FEET
APPROXIMATE SCALE: 1 INCH = 100 FEET

FIGURE 5

Plotted: March 15, 2012, (11007 Figures 4 Boring Locations and 5 Proposed Layout (2011-9-21).dwg



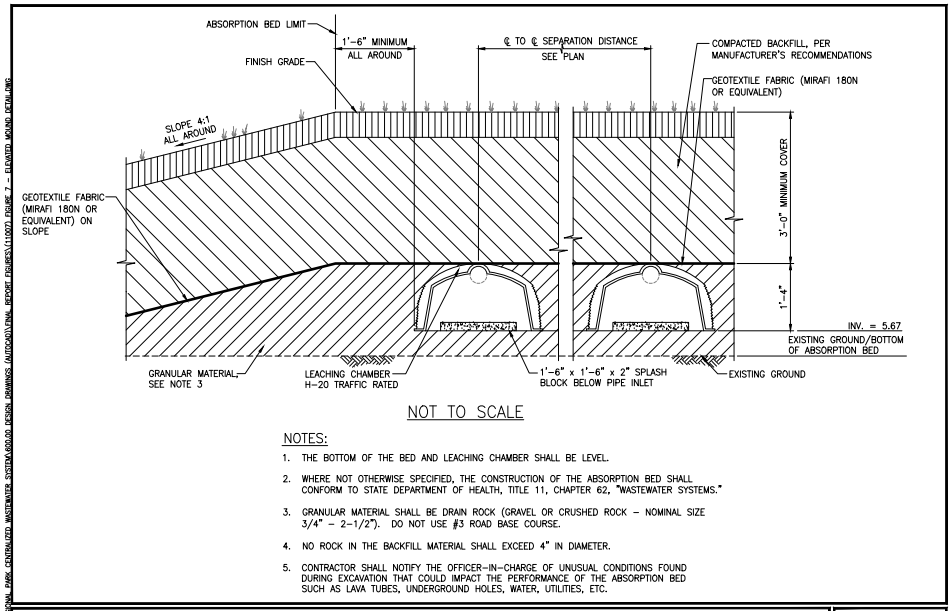
NOT TO SCALE

NOTE:
CONTRACTOR'S AND MANUFACTURER'S RETAINED ENGINEERS SHOULD VERIFY ALL ANCHOR AND BEDDING REQUIREMENTS.

P:\11007 KUALOA REGIONAL PARK CENTRALIZED WASTEWATER SYSTEM\600.00 DESIGN DRAWINGS (AUTOCAD)\FINAL REPORT FIGURES\(11007) FIGURE 6 - WASTEWATER TANK FOUNDATION RECOMMENDATION (2011-09-21).DWG

WASTEWATER TANK FOUNDATION AND COVER GEOTECHNICAL RECOMMENDATIONS
Reconstruct Park Wastewater Systems at Kualoa Regional Park
Kualoa, Oahu, Hawaii
Project No. 11007

Yogi Kwong Engineers, LLC
FIGURE 6



NOT TO SCALE

NOTES:

1. THE BOTTOM OF THE BED AND LEACHING CHAMBER SHALL BE LEVEL.
2. WHERE NOT OTHERWISE SPECIFIED, THE CONSTRUCTION OF THE ABSORPTION BED SHALL CONFORM TO STATE DEPARTMENT OF HEALTH, TITLE 11, CHAPTER 62, "WASTEWATER SYSTEMS."
3. GRANULAR MATERIAL SHALL BE DRAIN ROCK (GRAVEL OR CRUSHED ROCK – NOMINAL SIZE 3/4" – 2-1/2"). DO NOT USE #3 ROAD BASE COURSE.
4. NO ROCK IN THE BACKFILL MATERIAL SHALL EXCEED 4" IN DIAMETER.
5. CONTRACTOR SHALL NOTIFY THE OFFICER-IN-CHARGE OF UNUSUAL CONDITIONS FOUND DURING EXCAVATION THAT COULD IMPACT THE PERFORMANCE OF THE ABSORPTION BED SUCH AS LAVA TUBES, UNDERGROUND HOLES, WATER, UTILITIES, ETC.

ELEVATED MOUND DETAIL (Provided by Kennedy/Jenks Consultants, Inc. dated March 12, 2012)
Reconstruct Park Wastewater Systems at Kualoa Regional Park
Kualoa, Oahu, Hawaii
Project No. 11007

YOGI KWONG ENGINEERS, LLC
FIGURE 7

D:\11007 KUALOA REGIONAL PARK CENTRALIZED WASTEWATER SYSTEM\600.00 DESIGN DRAWINGS (AUTOCAD)\FINAL REPORT FIGURES\11007 FIGURE 7 - ELEVATED MOUND DETAIL.DWG

APPENDIX A FIELD EXPLORATION

A.1 Exploratory Borings
A.2 Soil Sampling

APPENDIX B LABORATORY TESTING

B.1 Moisture Content and Dry Density
B.2 Atterberg Limits (Plasticity Index)
B.3 One-Dimensional Consolidation Test
B.4 Unconfined Compression Test
B.5 California Bearing Ratio (CBR)
B.6 Modified Proctor Compaction Test
B.7 Gradation Analysis

APPENDIX C PHOTOGRAPHS OF SOIL SAMPLES

APPENDIX D SELECTED SITE CONDITION PHOTOGRAPHS

LIST OF APPENDIX FIGURES

Figure A-1 Unified Soil Classification
Figure A-2 Log of Boring Key
Figures A-3 and A-4 Logs of Borings
Figure B-1 Plasticity Chart
Figure B-2 and B-3 Consolidation Test
Figure B-4 Unconfined Compression Test
Figure B-5 Laboratory CBR Test
Figure B-6 Modified Proctor Compaction Test
Figure B-7 Grain Size Distribution Curves
Figures C-1 and C-10 Photographs of Soil Samples
Figures D-1 and D-2 Selected Site Condition Photographs

APPENDIX A FIELD EXPLORATION

This appendix summarizes the results of our field exploration and soil sampling performed in support of the Reconstruct Park Wastewater Systems Project at Kualoa Regional Park. Refer to Section 3.3 of report for anticipated subsurface conditions for this project. The location of the study corridor is presented in Figure 1 and the approximate boring locations are presented in Figure 4.

A.1 EXPLORATORY BORINGS

The borings were drilled by YK Drilling LLC (YKD) using a Mobile Drill B-54 drill rig with 4-inch solid-stem, continuous flight augers, and PQ-size steel casing with wireline coring using recirculated water. Drilling methods used are noted on the Logs of Borings, which are presented on Figures A-3 and A-4.

After drilling, the borings were backfilled with drill cuttings and imported gravel as necessary, and then sealed with bentonite and cement grout in the top 5 feet.

A.2 SOIL SAMPLING

Soil sampling was conducted under the observation of YKE personnel, who logged the materials encountered in the boring and obtained samples for further examination and laboratory tests.

Both relatively undisturbed and disturbed soil samples were obtained using a Standard Penetration Test (SPT) sampler or a Dames & Moore type "U" sampler. The SPT or Dames & Moore samplers were driven into the ground by successive blows of a 140-pound hammer falling 30 inches. The sampler was driven for a total distance of 18 inches, and blow counts for each 6 inches of penetration were recorded. Where the SPT sampler was used, this procedure followed the American Society of Testing and Materials (ASTM) D1586 standard for determining the standard penetration resistance of soil. Blow counts for the last 12 inches of penetration are noted on the Logs of Borings.

Soil samples were initially classified in the field according to ASTM D2488 and the Unified Soil Classification System shown on Figure A-1. The field classifications were later refined according to ASTM D2487 based on the results of laboratory tests performed on selected samples. Samples recovered during the field exploration program were transported to our office in Honolulu for further examination and laboratory testing.

Samples recovered during the field exploration program were transported to our office in Honolulu for further examination and laboratory testing.

SOIL CLASSIFICATION CHART

	Major Divisions		Symbol	Typical Names	Other Criteria
COARSE GRAINED SOILS More than 50% of material larger than No. 200 sieve size	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravel Little or no fines (<5%)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Cu>4 and 1<Cc<3
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	Not meeting Cu and Cc criteria for GW
		Gravels with Fines Appreciable amount of fines (>12%)	GM	Silty gravels, gravel-sand-silt mixtures	Atterberg limit below A-line or PI<4
			GC	Clayey gravels, gravel-sand-silt mixtures	Atterberg limit above A-line with PI>7
	Sands More than 50% of coarse fraction passing No. 4 sieve	Clean Sands Little or no fines (<5%)	SW	Well-graded sands, gravelly sands, little or no fines	Cu>6 and 1<Cc<3
			SP	Poorly graded sands, gravelly sands, little or no fines	Not meeting Cu and Cc criteria for SW
		Sands with Fines Appreciable amount of fines (>12%)	SM	Silty sands, sand-silt mixture	Atterberg limit below A-line or PI<4
			SC	Clayey sands, sand-clay mixture	Atterberg limit above A-line with PI>7
FINE GRAINED SOILS More than 50% of material smaller than No. 200 sieve size	Silts and Clays Liquid limit less than 50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	Atterberg limit below A-line
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clay	Atterberg limit above A-line
			OL	Organic silts and organic silty clays flow plasticity	Atterberg limit below A-line
	Silts and Clays Liquid limit larger than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	Atterberg limit below A-line
			CH	Inorganic clays of high plasticity, fat clays	Atterberg limit above A-line
			OH	Organic clays of high plasticity, organic silts	Atterberg limit below A-line
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils	

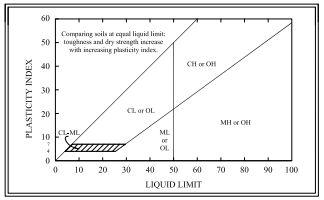
Notes: 1. $Cu = D60/D10$, $Cc = (D30)^2/(D60 \times D10)$ where D60, D30 and D10 are diameters associated with 60%, 30% and 10% smaller in gradation curves.
2. Dual symbols are used to indicate borderline classifications such as GP/SP.

GRADATION CHART

Soil Fraction		Size Range			
		Lower Limit		Upper Limit	
		Millimeters	Sieve	Millimeters	Sieve
Boulders		304.8	12*	914.4	36*
Cobbles		76.2	3*	304.8	12*
Gravel		4.76	4**	76.2	3*
Sand	Coarse	2	10**	4.76	4**
	Medium	0.42	40**	2	10**
	Fine	0.074	200**	0.42	40**
Fines				0.074	200**

* U.S. standard sieve opening in inches
** U.S. standard sieve number

PLASTICITY CHART



UNIFIED SOIL CLASSIFICATION
Reconstruct Park Wastewater Systems at Kualoa Regional Park
Kualoa, Oahu, Hawaii
YOGI KWONG ENGINEERS, LLC
PROJECT NO. 11007
FIGURE A-1

RECONSTRUCT PARK WASTEWATER SYSTEMS AT KUALOA REGIONAL PARK

LOG OF BORING KEY

Sheet 1 of 1

LOCATION: KUALOA REGIONAL PARK, KUALOA, OAHU, HAWAII
DATE(S) DRILLED:
GROUND SURFACE ELEVATION:
LOGGED BY:
CHECKED BY:
GROUNDWATER LEVEL / DATE:
HAMMER TYPE:
HAMMER WEIGHT/DROP:
CONTRACTOR:
DRILLING METHOD:
DRILL EQUIP:
BOREHOLE BACKFILL:

ELE. (FT, MSL)	DEPTH (FT)	SAMPLE TYPE	SAMPLE NO.	SAMPLING RESISTENCE	RECOVERY, %	RQD, %	GRAPHIC LOG	DESCRIPTION	WATER CONTENT, %	DRY UNIT WEIGHT, pcf	UCS, psf	LIQUID LIMIT	PLASTICITY INDEX	OTHER TESTS AND REMARKS
0	0							STRATA SYMBOLS						
								Silt (ML)						
								Elastic silt (MH)						
								Silty sand (SM)						
								Poorly graded sand with gravel (SP)						
-5	5							Silty sand (SM)						
								Well-graded sand with silt and gravel (SW-SM)						
								Silty gravel (GM)						
								Poorly graded gravel (GP)						
								SAMPLER SYMBOLS						
-10	10							Standard Penetration Test (SPT) sampler						
								Dames and Moore (D&M) sampler						
								Core sample						
-15	15			10				Number of blows to advance sampler 12 inches, or distance indicated						
						40		Rock Quality Designation, % of sample that is >/= 4 inches						
								ABBREVIATIONS FOR TESTS						
-20	20							Gravel = % of sampler passing through 76.2 mm sieve and retained on #4 sieve						
								Sand = % of sample passing through #4 sieve and retained on #200 sieve						
								Fines = % of sample passing through #200 sieve						
								PP = Pocket Penetrometer Test, tsf						
-25	25							TV = Torvane Test, tsf						
								CBR = California Bearing Ratio Test						
								Consol = Consolidation Test						
-30	30													

v3

YOGI KWONG ENGINEERS, LLC

Date Printed: 3/21/2012

FIGURE A-2

RECONSTRUCT PARK WASTEWATER SYSTEMS AT KUALOA REGIONAL PARK

LOG OF BORING B-1

Sheet 1 of 2

LOCATION: KUALOA REGIONAL PARK, KUALOA, OAHU, HAWAII
DATE(S) DRILLED: 3-16-11
GROUND SURFACE ELEVATION: 4.9 FT MSL
LOGGED BY: P. SELVARAJAH
CHECKED BY: R. HASHIRO
GROUNDWATER LEVEL / DATE: SEE END OF LOG
HAMMER TYPE: SAFETY
HAMMER WEIGHT/DROP: 140 LB / 30 IN
CONTRACTOR: YK DRILLING, LLC
DRILLING METHOD: 4-INCH SSA, WASH BORE, PQ WIRELINE
DRILL EQUIP: MOBILE DRILL B-54
BOREHOLE BACKFILL: CUTTINGS, BENTONITE, GRAVEL, CEMENT GROUT

ELE. (FT, MSL)	DEPTH (FT)	SAMPLE TYPE	SAMPLE NO.	SAMPLING RESISTENCE	RECOVERY, %	RQD, %	GRAPHIC LOG	DESCRIPTION	WATER CONTENT, %	DRY UNIT WEIGHT, pcf	UCS, psf	LIQUID LIMIT	PLASTICITY INDEX	OTHER TESTS AND REMARKS
	0		1	30	67			FILL Brown silt with sand, gravel and roots (ML), very stiff, moist	10.9 14.8	88.2 84.6				Consol.
			2	25	0									No recovery (Cobble wedged in the SPT sampler tip)
			3	38	67			BEACH DEPOSITS Tan to off white coarse well graded coralline sand with trace silt and coralline gravel (SW-SM), medium dense, moist	26.5	82.7				
0	5		4	15	61			grades with trace silt and more gravel, wet	35.0					Gravel = 26% Sand = 67% Fines = 7%
			5	15	56			Tan silty sand (SM), loose, wet						Begin casing @ 7.5' bgs Partial off white water return
-5	10							Tan coralline sand with coralline gravel (SP), loose, wet						
			6	8	56			LAGOONAL DEPOSITS Gray silty sand (SM), loose, wet						
			7	2	67			becomes gray to tan with coralline gravel, very loose, wet	52.3					Gravel = 28% Sand = 51% Fines = 21%
-10	15													
			8	5	67			Yellowish gray silty coralline gravel with sand (GM), very loose, wet						Partial off white water return
-15	20													
			9	33	67			CORALLINE DEPOSITS Tan poorly graded coralline gravel (GP), medium dense, wet						
														No water return
			PQ-1		0									No recovery
-20	25													
			10	34	67			grades with silt						No water return
			PQ-2		28			contains trace off white coralline cobbles						
-25	30													Hard drilling

v3

YOGI KWONG ENGINEERS, LLC

Date Printed: 3/21/2012

FIGURE A-3

RECONSTRUCT PARK WASTEWATER SYSTEMS AT KUALOA REGIONAL PARK

LOG OF BORING B-1

Sheet 2 of 2

LOCATION: KUALOA REGIONAL PARK, KUALOA, OAHU, HAWAII
DATE(S) DRILLED: 3-16-11
GROUND SURFACE ELEVATION: 4.9 FT MSL
LOGGED BY: P. SELVARAJAH
CHECKED BY: R. HASHIRO
GROUNDWATER LEVEL / DATE: SEE END OF LOG
HAMMER TYPE: SAFETY
HAMMER WEIGHT/DROP: 140 LB / 30 IN
CONTRACTOR: YK DRILLING, LLC
DRILLING METHOD: 4-INCH SSA, WASH BORE, PQ WIRELINE
DRILL EQUIP: MOBILE DRILL B-54
BOREHOLE BACKFILL: CUTTINGS, BENTONITE, GRAVEL, CEMENT GROUT

ELE. (FT, MSL)	DEPTH (FT)	SAMPLE TYPE	SAMPLE NO.	SAMPLING RESISTENCE	RECOVERY, %	RQD, %	GRAPHIC LOG	DESCRIPTION	WATER CONTENT, %	DRY UNIT WEIGHT, pcf	UCS, psf	LIQUID LIMIT	PLASTICITY INDEX	OTHER TESTS AND REMARKS
-25	30		11	8	100			ALLUVIUM Brown elastic silt (MH), medium stiff to stiff, moist						PP = 1.25 tsf TV = 0.75 tsf PP = 1.2 tsf PP = 1.25 tsf
			PQ-3		100			becomes reddish brown						
-30	35		12	10	100			becomes medium stiff	67.5	62.4	1379			PP = 1.2 tsf
								Boring completed at 37.0 feet below exisiting ground surface on 3/16/2011 Summary of Groundwater Levels Date / Time Depth Below Ground Surface 3-16-11 / 0840 4.5' 3-16-11 / 1040 4.5'						
-35	40													
-40	45													
-45	50													
-50	55													
-55	60													

v3 YKE YOGI KWONG ENGINEERS, LLC **Date Printed:** 3/21/2012 **FIGURE A-3**

RECONSTRUCT PARK WASTEWATER SYSTEMS AT KUALOA REGIONAL PARK

LOG OF BORING B-2

Sheet 1 of 2

LOCATION: KUALOA REGIONAL PARK, KUALOA, OAHU, HAWAII
DATE(S) DRILLED: 3-16-11
GROUND SURFACE ELEVATION: 5.2 FT MSL
LOGGED BY: P. SELVARAJAH
CHECKED BY: R. HASHIRO
GROUNDWATER LEVEL / DATE: SEE END OF LOG
HAMMER TYPE: SAFETY
HAMMER WEIGHT/DROP: 140 LB / 30 IN
CONTRACTOR: YK DRILLING, LLC
DRILLING METHOD: 4-INCH SSA, WASH BORE, PQ WIRELINE
DRILL EQUIP: MOBILE DRILL B-54
BOREHOLE BACKFILL: CUTTINGS, BENTONITE, GRAVEL, CEMENT GROUT

ELE. (FT, MSL)	DEPTH (FT)	SAMPLE TYPE	SAMPLE NO.	SAMPLING RESISTENCE	RECOVERY, %	RQD, %	GRAPHIC LOG	DESCRIPTION	WATER CONTENT, %	DRY UNIT WEIGHT, pcf	UCS, psf	LIQUID LIMIT	PLASTICITY INDEX	OTHER TESTS AND REMARKS
5	0		1	24	67			FILL Reddish brown with brown and dark brown elastic silt with gravel and roots (MH), stiff, moist	25.2 39.5	83.8 71.4		64.6	31.3	
			2	8	56			grades with a lens of brown and tan silty sand, and less gravel, medium stiff to stiff	45.9					Mod. Proctor, CBR
			3	12	67			becomes reddish brown to gray with more gravel ▽	50.7 47.5	71.8 73.7				Consol.
0	-5		4	17	67			BEACH DEPOSITS Tan to off white well graded coralline sand with silt and coralline gravel (SW-SM), medium dense, wet	27.4					Gravel = 41% Sand = 50% Fines = 9%
			5	18	56			becomes off white to light gray, loose	28.3					Gravel = 40% Sand = 51% Fines = 9% Begin casing @ 7.5' bgs. Partial brown water return
-5	10		6	6	33			LAGOONAL DEPOSITS Gray silty coralline gravel with sand (GM), very loose, wet						
			7	5	44			becomes loose						Partial gray water return
-10	15		8	9	44			becomes grayish brown with finger coral, very loose						Partial gray water return
-15	20		9	5	44			becomes dark gray with shell fragments						No water return
-20	25		10	18	67			CORALLINE DEPOSITS Tan poorly graded coralline gravel (GP), loose, wet						No water return
-25	30													

v3 YKE YOGI KWONG ENGINEERS, LLC **Date Printed:** 3/15/2012 **FIGURE A-4**

RECONSTRUCT PARK WASTEWATER SYSTEMS AT KUALOA REGIONAL PARK

LOG OF BORING B-2

Sheet 2 of 2

LOCATION: KUALOA REGIONAL PARK, KUALOA, OAHU, HAWAII
DATE(S) DRILLED: 3-16-11
GROUND SURFACE ELEVATION: 5.2 FT MSL
LOGGED BY: P. SELVARAJAH
CHECKED BY: R. HASHIRO
GROUNDWATER LEVEL / DATE: SEE END OF LOG
HAMMER TYPE: SAFETY
HAMMER WEIGHT/DROP: 140 LB / 30 IN
CONTRACTOR: YK DRILLING, LLC
DRILLING METHOD: 4-INCH SSA, WASH BORE, PQ WIRELINE
DRILL EQUIP: MOBILE DRILL B-54
BOREHOLE BACKFILL: CUTTINGS, BENTONITE, GRAVEL, CEMENT GROUT

ELE. (FT, MSL)	DEPTH (FT)	SAMPLE TYPE	SAMPLE NO.	SAMPLING RESISTENCE	RECOVERY, %	RQD, %	GRAPHIC LOG	DESCRIPTION	WATER CONTENT, %	DRY UNIT WEIGHT, pcf	UCS, psf	LIQUID LIMIT	PLASTICITY INDEX	OTHER TESTS AND REMARKS
-25	30													
			11	12	67			ALLUVIUM Brown elastic silt with sand (MH), stiff, moist						
								Boring completed at 32.0 feet below existing ground surface on 3/16/2011 Summary of Groundwater Levels Date / Time Depth Below Ground Surface 3-16-11 / 1150 4.4' 3-16-11 / 1400 4.4'						
-30	35													
-35	40													
-40	45													
-45	50													
-50	55													
	60													

v3

YOGI KWONG ENGINEERS, LLC

Date Printed: 3/15/2012

FIGURE A-4

APPENDIX B LABORATORY TESTING

To verify field classifications, selected soil samples obtained during the field exploration were laboratory tested for moisture contents, dry densities, Atterberg limits (plasticity index), swell potential, expansion potential, direct shear, unconfined compressive strength, modified proctor compaction, California Bearing Ratio, and one-dimensional consolidation test tests. The tests and results are described in the following paragraphs.

B.1 MOISTURE CONTENT AND DRY DENSITY

Selected soil samples were tested to measure their moisture contents and dry densities. The tests were performed in accordance with American Society for Testing and Materials (ASTM) Test Method D2216 and D2937. When measuring the moisture content, each sample had a minimum mass of 20 grams and was dried in a draft oven at 110°C for at least 12 hours. The densities were found by testing relatively undisturbed ring samples from a Dames and Moore sampler. The moisture contents and dry densities are presented on the Log of Borings at the appropriate sample depths.

B.2 ATTERBERG LIMITS (PLASTICITY INDEX)

To assist in soil classification, the liquid limit and plastic limit tests were performed on select samples. The tests were performed in accordance with ASTM D4318. This test is useful for determining the plasticity of a soil and whether the fines behave more like a clay or silt. After passing the sample through a No. 40 sieve and mixing it thoroughly with water, the soil was put into a liquid limit device where blows were counted to close a 2 mm groove. The procedure was repeated with varying moisture contents. After plotting the data, the liquid limit was taken as the moisture content needed to close the 2 mm groove at 25 blows. The plastic limit was the moisture content of the soil when it was able to be rolled into 3.2 mm diameter threads. The plasticity index is the difference between the liquid limit and plastic limit. The results are presented in Figure B-1 and also in the Logs of Borings at the appropriate sample depths.

B.3 ONE-DIMENSIONAL CONSOLIDATION TEST

The compressibility of a relatively undisturbed soil samples were determined by the performance of one-dimensional consolidation test in accordance with ASTM D2435. The consolidation test is used to estimate the magnitude and rate of differential and total settlement. This method restrained the sample laterally and drained it axially. Typically, the ring samples, approximately 2.4-inches in diameter, were cut to 0.75-inches in height, maintaining a minimum 2.5 diameter-to-height ratio. The samples were placed into a consolidometer and loaded incrementally every 24 hours. Once the sample reached the end of the consolidation, it was then unloaded incrementally every 24 hours until all the loads were removed. The results are presented in Figure B-2 and B-3.

B.4 Unconfined Compressive Strength Test

Relatively undisturbed soil samples were tested for its unconfined compressive strength in accordance with ASTM D2166. The cohesive soil samples were axially loaded in an unconfined state. The unconfined compressive strength is the maximum load per unit area or the load per unit area at 15% axial strain, whichever occurs first. The samples had a minimum diameter of 1.3 inches and had a height to diameter ratio between 2 and 2.5. The unconfined compressive strengths of the selected soil samples are shown on Figure B-4, and also in the Logs of Borings at the appropriate sample depths.

B.5 California Bearing Ratio (CBR)

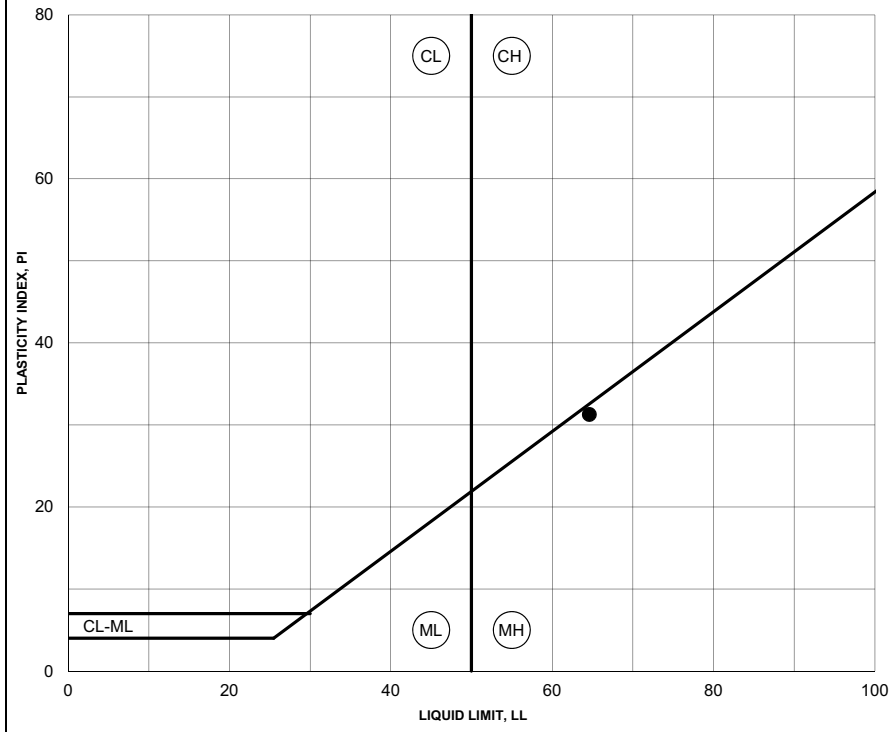
Laboratory CBR tests were performed on near surface bulk samples obtained at select boring locations in accordance with ASTM D1883-05 test procedures. The CBR tests were performed at the optimum moisture contents of the bulk samples as determined by the Modified Proctor Compaction test performed in accordance with ASTM D1557. After compaction, the samples were soaked in water for four (4) days and then penetrated by a cylindrical rod. The penetration resistance, in load per unit area, was taken at specific penetration values and the results were plotted to find the CBR values in accordance with the prescribed methods in ASTM D1883-05. The test results are presented in Figure B-5.

B.6 Modified Proctor Compaction Test

Modified Proctor Compaction Tests were performed on near surface bulk samples obtained within the project site. The tests were performed in accordance with ASTM D1557-07 test procedures. The soil is first passed through a No. 4 sieve (4.75 mm) and is separated into five pound specimens. The soil is then placed into a 4 inch diameter mold and compacted in 5 layers with 25 blows of a 10 pound hammer applied to each layer. The moisture content and the density were taken at the end of the test. The test is repeated with varying moisture contents. A minimum of four sets of moisture contents and densities were plotted on a graph to find the optimum moisture content and density. The test results are presented in Figure B-6.

B.7 Gradation Analysis

Gradation analyses (ASTM D422) were performed on selected samples using the wash sieve method to evaluate grain size distribution. The soil was passed through various sieves with decreasing opening sizes. The dry weights retained on each sieve were used to calculate the percent passing for each grain size. Results of gradation analyses are presented on Figure B-7 and included on the Log of Borings at the appropriate sample depths.



Boring		Depth (ft)	LL %	PL %	PI %	Classification
●	B-2	0.0	64.6	33.3	31.3	Elastic silt (MH)

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Kualoa, Oahu, Hawaii

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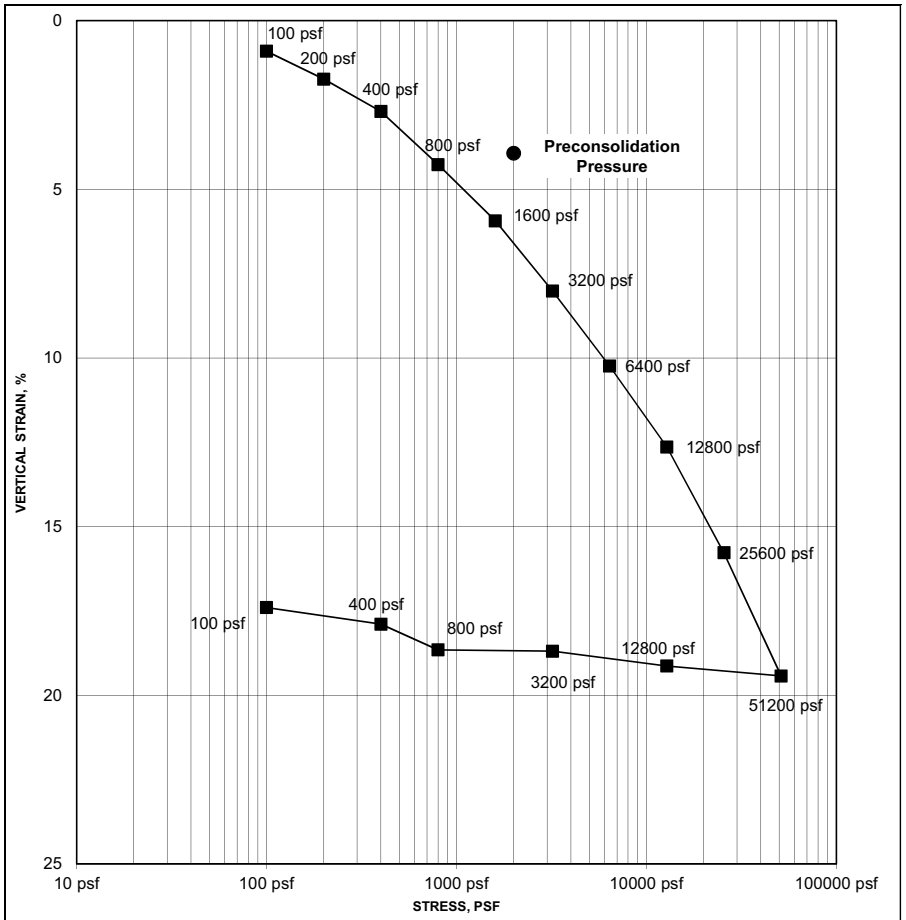
PLASTICITY CHART

FIGURE B-1

3/14/2012 Atterbergs PI



Boring	Depth (ft)	Description	LL	PI	Initial		Final		p_o (psf)	C_c (*)	C_r (*)
					w_o (%)	γ_d (pcf)	w_o (%)	γ_d (pcf)			
B-1	1.0	Brown silt with sand, gravel and roots	-	-	14.8	84.6	24.3	102.4	2000	11.3	0.69

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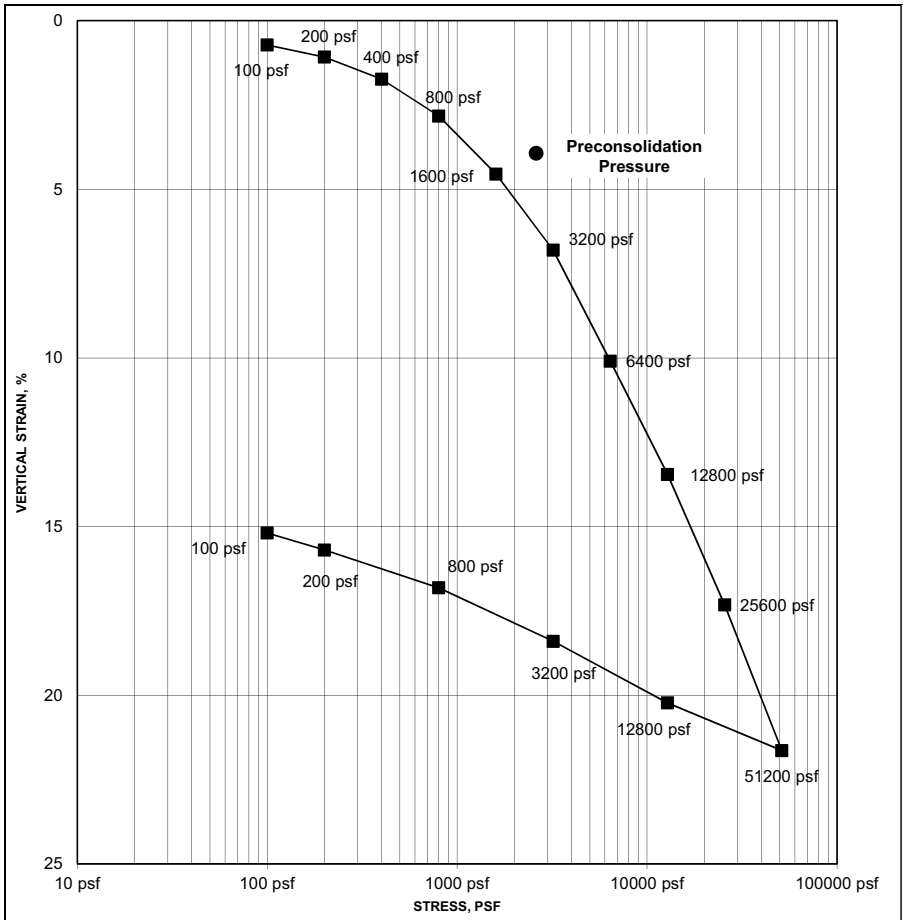
Kualoa, Oahu, Hawaii

CONSOLIDATION TEST

Project Number: 11007

FIGURE B-2

3/14/2012 Consolidation B-1 Sample 1



Boring	Depth (ft)	Description	LL	PI	Initial		Final		p_o (psf)	C_c (*)	C_r (*)
					w_o (%)	γ_d (pcf)	w_o (%)	γ_d (pcf)			
B-2	3.0	Reddish brown to gray elastic silt with gravel	-	-	50.7	71.8	42.3	84.7	2600	13.6	2.52

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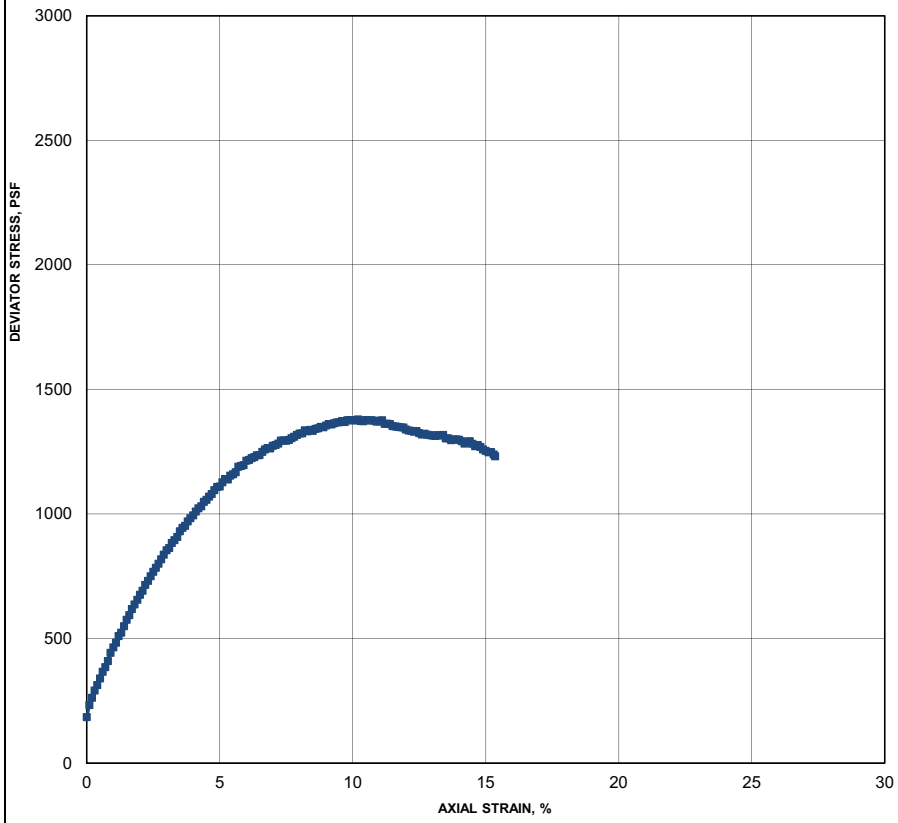
CONSOLIDATION TEST

Project Number: 11007

FIGURE B-3

3/14/2012 Consolidation B-2 Sample 3



Boring	Depth (ft)	Description	w_o (%)	γ_d (pcf)	ε_f (%)	c_u (psf)	UCS (psf)
B-1	35.5	Reddish brown elastic silt	67.5	62.4	10.20	690	1379

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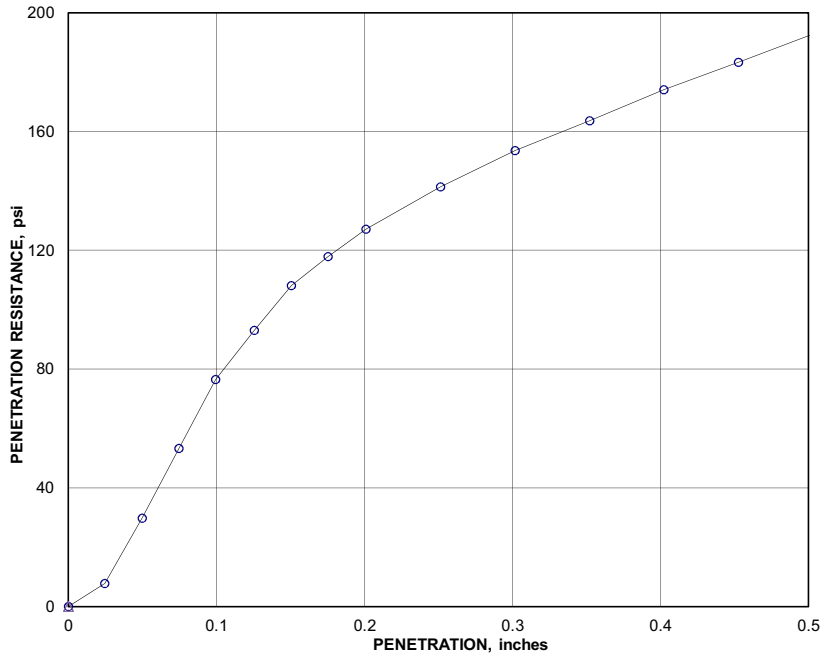
Project Number: 11007

UNCONFINED COMPRESSION STRENGTH

FIGURE B-4

3/14/2012 UCS (2012-03-14) UCS



ASTM TEST SPECIFICATION: D 1883-05 Standard Test Method for CBR of Laboratory-Compacted Soil

Boring	B-2	Depth	1' - 3'
Description	Brown elastic silt		

Modified Proctor Maximum Dry Density (γ_{dmax}, pcf)	Optimum Moisture Content (w_{opt}, %)
90.2	33.5

Test No.		1	2	3
Initial	Moisture Content, %	33.6		
	Dry Density, pcf	87.1		
Final	Moisture Content, %	37.1		
	Dry Density, pcf	86.8		
Linearity Correction (in.)		0.017		
Surcharge Weight, lbs		10		
Total Swell, %		0.4		
CBR Value @ 0.1"		8.6		
CBR Value @ 0.2"		8.6		

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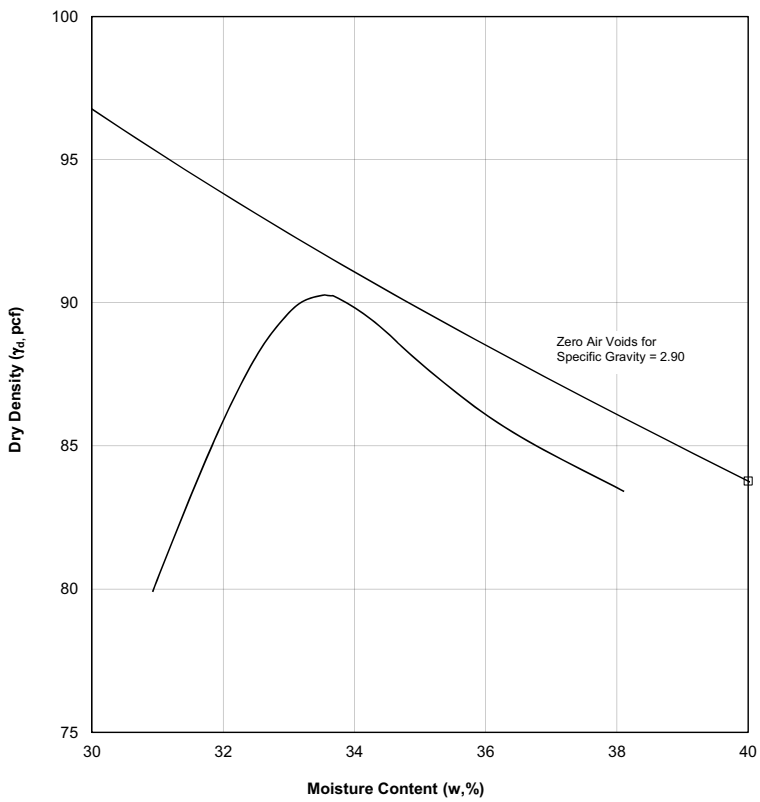
LABORATORY CBR TEST

FIGURE B-5

3/20/2012 11007 Draft Report - Mod Proctor and CBR CBR B-2



ASTM TEST SPECIFICATION: D 1557-00 Method C MODIFIED

	CLASSIFICATION		PLASTICITY		Specific Gravity	TEST RESULTS	
Boring Location / Depth	USCS	AASHTO	LL (%)	PI (%)		Maximum Dry Density (γ_{dmax}, pcf)	Optimum Moisture Content (w_{opt}, %)
B-2 / 1' - 3'	MH	-	-	-	2.90	90.2	33.5

Project: Reconstruct Park Wastewater Systems at Kualoa Regional Park

Kualoa, Oahu, Hawaii

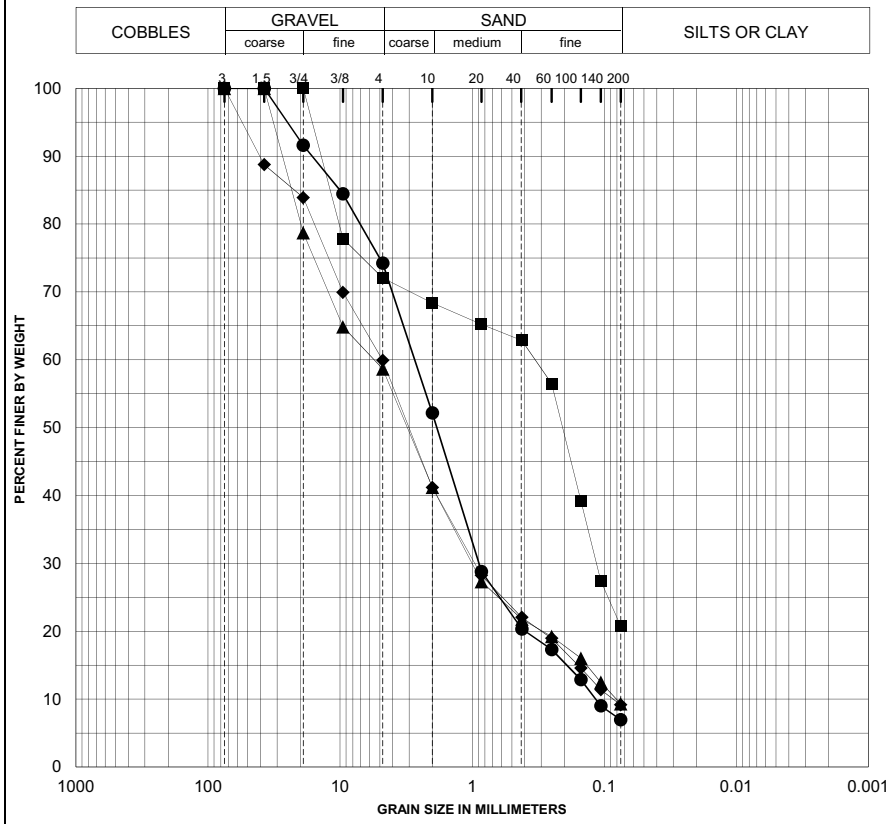
MODIFIED PROCTOR COMPACTION TEST

Project Number: 11007

FIGURE B-6

Yogi Kwong Engineers, LLC

3/14/2012 11007 Draft Report - Mod Proctor and CBR Mod. Proctor B-2



Boring		Depth (ft)	Description	Gravel %	Sand %	Fines %
●	B-1	4.5	Tan to off white coarse well graded coralline sand with trace silt and gravel (SW-SM)	26	67	7
■	B-1	12.0	Gray to tan silty sand with coralline gravel (SM)	28	51	21
▲	B-2	4.5	Tan to off white well graded coralline sand with silt and coralline gravel (SW-SM)	41	50	9
◆	B-2	6.0	Off white to light gray well graded coralline sand with silt and coralline gravel (SW-SM)	40	51	9

Project: Reconstruct Park Wastewater Systems at Kualoa Regional Park

Kualoa, Oahu, Hawaii

GRAIN SIZE DISTRIBUTION CURVES

Project Number: 11007

Figure B-7

3/15/2012 Gradation (2012-03-14) Gradation

APPENDIX C

Photographs of Soil Samples

Boring B-1, Sample 1, Depth 0' to 1.5'

Boring B-1, Sample 1, Depth 0' to 1.5'

Boring B-1, Sample 2, Depth 1.5' to 3'

Boring B-1, Sample 2, Depth 1.5' to 3'

Boring B-1, Sample 3, Depth 3' to 4.5'

Boring B-1, Sample 3, Depth 3' to 4.5'

PHOTOGRAPHS OF SOIL SAMPLES

Reconstruct Park Wastewater Systems at Kualoa Regional Park

Kualoa, Oahu, Hawaii

Project No. 11007

YOGI KWONG ENGINEERS, LLC.

FIGURE C-1

Boring B-1, Sample 4, Depth 4.5' to 6'

Boring B-1, Sample 4, Depth 4.5' to 6'

Boring B-1, Sample 5, Depth 6' to 7.5'

Boring B-1, Sample 5, Depth 6' to 7.5'

Boring B-1, Sample 6, Depth 10.5' to 12'

Boring B-1, Sample 6, Depth 10.5' to 12'

PHOTOGRAPHS OF SOIL SAMPLES
Reconstruct Park Wastewater Systems at Kualoa Regional Park
Kualoa, Oahu, Hawaii Project No. 11007

YOGI KWONG ENGINEERS, LLC.
FIGURE C-2

Boring B-1, Sample 7, Depth 12' to 13.5'

Boring B-1, Sample 7, Depth 12' to 13.5'

Boring B-1, Sample 7, Depth 12' to 13.5'

Boring B-1, Sample 8, Depth 15.5' to 17'


Boring B-1, Sample 8, Depth 15.5' to 17'

Boring B-1, Sample 9, Depth 20.5' to 22'

PHOTOGRAPHS OF SOIL SAMPLES
Reconstruct Park Wastewater Systems at Kualoa Regional Park
Kualoa, Oahu, Hawaii Project No. 11007

YOGI KWONG ENGINEERS, LLC.
FIGURE C-3

Boring B-1, Sample 9, Depth 20.5' to 22'

Boring B-1, Sample 10, Depth 25.5' to 27'

Boring B-1, Sample 10, Depth 25.5' to 27'

Boring B-1, Sample 11, Depth 30.5' to 32'

Boring B-1, Sample 11, Depth 30.5' to 32'

Boring B-1, Sample 11, Depth 30.5' to 32'

PHOTOGRAPHS OF SOIL SAMPLES
Reconstruct Park Wastewater Systems at Kualoa Regional Park
Kualoa, Oahu, Hawaii
Project No. 11007

YOGI KWONG ENGINEERS, LLC.
FIGURE C-4

Boring B-1, Sample 11, Depth 30.5' to 32'

Boring B-1, Sample 12, Depth 35.5' to 37'

Boring B-1, Sample 12, Depth 35.5' to 37'

Boring B-1, Sample PQ-2 and PQ-3, Depth 27' to 30.5' and 32' to 35.5'

Boring B-1, Sample PQ-2 and PQ-3, Depth 27' to 30.5' and 32' to 35.5'

Boring B-1, Sample PQ-2 and PQ-3, Depth 27' to 30.5' and 32' to 35.5'

PHOTOGRAPHS OF SOIL SAMPLES
Reconstruct Park Wastewater Systems at Kualoa Regional Park
Kualoa, Oahu, Hawaii
Project No. 11007

YOGI KWONG ENGINEERS, LLC.
FIGURE C-5

Boring B-1, Sample PQ-2 and PQ-3, Depth 27' to 30.5' and 32' to 35.5'

Boring B-1, Sample PQ-2 and PQ-3, Depth 27' to 30.5' and 32' to 35.5'

PHOTOGRAPHS OF SOIL SAMPLES

Reconstruct Park Wastewater Systems at Kualoa Regional Park

Kualoa, Oahu, Hawaii Project No. 11007

YOGI KWONG ENGINEERS, LLC.

FIGURE C-6

Boring B-2, Sample 1, Depth 0' to 1.5'

Boring B-2, Sample 1, Depth 0' to 1.5'

Boring B-2, Sample 2, Depth 1.5' to 3'

Boring B-2, Sample 2, Depth 1.5' to 3'

Boring B-2, Sample 3, Depth 3' to 4.5'

Boring B-2, Sample 3, Depth 3' to 4.5'

PHOTOGRAPHS OF SOIL SAMPLES

Reconstruct Park Wastewater Systems at Kualoa Regional Park

Kualoa, Oahu, Hawaii Project No. 11007

YOGI KWONG ENGINEERS, LLC.

FIGURE C-7

Boring B-2, Sample 4, Depth 4.5' to 6'

Boring B-2, Sample 4, Depth 4.5' to 6'

Boring B-2, Sample 5, Depth 6' to 7.5'

Boring B-2, Sample 5, Depth 6' to 7.5'

Boring B-2, Sample 6, Depth 10.5' to 12'

Boring B-2, Sample 6, Depth 10.5' to 12'

PHOTOGRAPHS OF SOIL SAMPLES

Reconstruct Park Wastewater Systems at Kualoa Regional Park

Kualoa, Oahu, Hawaii Project No. 11007

YOGI KWONG ENGINEERS, LLC.

FIGURE C-8

Boring B-2, Sample 7, Depth 12' to 13.5'

Boring B-2, Sample 7, Depth 12' to 13.5'

Boring B-2, Sample 8, Depth 15.5' to 17'

Boring B-2, Sample 8, Depth 15.5' to 17'

Boring B-2, Sample 9, Depth 20.5' to 22'

Boring B-2, Sample 9, Depth 20.5' to 22'

PHOTOGRAPHS OF SOIL SAMPLES

Reconstruct Park Wastewater Systems at Kualoa Regional Park

Kualoa, Oahu, Hawaii Project No. 11007

YOGI KWONG ENGINEERS, LLC.

FIGURE C-9

Boring B-2, Sample 10, Depth 25.5' to 27'


Boring B-2, Sample 10, Depth 25.5' to 27'

Boring B-2, Sample 11, Depth 30.5' to 32'


Boring B-2, Sample 11, Depth 30.5' to 32'

Boring B-2, Sample 11, Depth 30.5' to 32'

PHOTOGRAPHS OF SOIL SAMPLES
Reconstruct Park Wastewater Systems at Kualoa Regional Park
Kualoa, Oahu, Hawaii Project No. 11007

YOGI KWONG ENGINEERS, LLC.
FIGURE C-10

APPENDIX D
Selected Site Condition Photographs

View of site around Boring B-1

View of site around Boring B-1

View of site around Boring B-2

View of site around Boring B-2

View of site around Boring B-2

View of site around Boring B-2

SELECTED SITE CONDITION PHOTOGRAPHS

Reconstruct Park Wastewater Systems at Kualoa Regional Park

Kualoa, Oahu, Hawaii Project No. 11007

YOGI KWONG ENGINEERS, LLC.

FIGURE D-1

View of Bath house

General view of site

General view of site

General view of site

General view of site

General view of site

SELECTED SITE CONDITION PHOTOGRAPHS

Reconstruct Park Wastewater Systems at Kualoa Regional Park

Kualoa, Oahu, Hawaii Project No. 11007

YOGI KWONG ENGINEERS, LLC.

FIGURE D-2

Appendix B
Marine Environmental Assessment

MARINE ENVIRONMENTAL ASSESSMENT IN THE VICINITY OF THE KUALOA REGIONAL PARK OAHU, HAWAII

Prepared for:

Group 70 International, Inc.
925 Bethel St.
Honolulu, HI 96813

By:

Marine Research Consultants, Inc.
1039 Waakaua Pl.
Honolulu, HI 96822

Submitted:

December 5, 2011

INTRODUCTION

Planning is underway for improvements of the wastewater system at Kualoa Regional Park on the northern shoreline of Kaneohe Bay in Oahu, Hawaii. As a component of the planning process, it has been deemed valuable to develop a baseline of water in the nearshore marine environment. The baseline will serve to provide an indication of the existing conditions of water chemistry in the area that will be evaluated during the preparation of planning documents (e.g., Environmental Assessment, SMA) for the Reconstruction of Wastewater Facilities at Kualoa Regional Park. Presented below are the methods and results of the initial phase of the water quality assessment conducted on October 26 and November 16, 2011.

METHODS

Water samples were collected at 10 locations in Kaneohe Bay spanning the oceanfront length of Kualoa Regional Park, as well as two stations collected along the shoreline of Apua Pond (Figure 1). Stations were equally spaced along the shoreline, but care was taken to locate stations directly offshore of existing comfort stations. All ocean sampling was conducted from the shoreline on October 26, 2011 during the hours of approximately 0800-0900, while sampling in Apua Pond was conducted on November 16 at approximately 0745-07:50. The tide during ocean sampling was rising from a low of +0.5

feet to +0.6 feet. Weather conditions during both sampling events consisted of overcast skies and light winds. Ocean water samples were collected at a depth of 1 foot approximately 10 feet from the highest wash of waves. Pond samples were conducted at a depth of approximately 0.5 feet approximately 10 feet from the shoreline. Each set of water samples (ocean and pond) were collected as close together as possible so that temporal variability between locations was minimized.

Water quality parameters evaluated included all of the specific criteria designated for open coastal waters in Chapter 11-54, Section 06 (a) (Embayments) of the State of Hawaii Department of Health (DOH) Water Quality Standards. These criteria include: total nitrogen (TN), nitrate + nitrite nitrogen (NO_3^- + NO_2-, hereafter referred to as NO_3^-), ammonium nitrogen (NH_4^+), total phosphorus (TP), chlorophyll a (Chl *a*), turbidity, pH, salinity and temperature. In addition, orthophosphate phosphorus (PO_4^{3-}) and silica (Si) were also reported because these parameters are sensitive indicators of biological activity and the degree of groundwater mixing. In addition, the indicator bacteria enterococcus was also evaluated at each site.

Samples for water chemistry were collected in triple rinsed one-liter polyethylene bottles. Following collection, subsamples for nutrient analyses (NH_4^+, PO_4^{3-} , and NO_3^-) were filtered through GF/C filters into 125-milliliter (ml) acid washed, triple rinsed, polyethylene bottles and stored on ice. Water for enterococcus analyses was collected in autoclaved 100 ml plastic bottles.

All samples were stored on ice following collection, and delivered to the analytical laboratory within hours of collection, where they were processed within 24 hrs of collection. All laboratory chemistry analyses were performed by Marine Analytical Services in Honolulu, HI (EPA Lab. No. HI00009). Marine Analytical Services possess "acceptable" ratings from EPA-compliant proficiency and quality control testing. Enterococcus was analyzed by Hawaii Food and Water Testing, located in Honolulu, HI.

Analysis for inorganic nutrients (NH_4^+, PO_4^{-3}, NO_3^- and Si) were performed using a continuous flow Technicon Autoanalyzer according to published methods of seawater and wastewater analysis (Strickland and Parsons 1968, Technicon 1973, Clesceri et al. 1989). TN and TP were analyzed in a similar fashion following oxidative digestion. Total organic nitrogen (TON) and Total organic phosphorus (TOP) were derived as the differences between TN and inorganic nitrogen (NH_4^+, NO_3^-), and TP and PO_4^{-3}, respectively. The EPA methods that were employed for chemical analyses, as well as detection limits, are listed in the Code of Federal Regulations (CRF) Title 40, Chapter 1, Part 136, are as follows:

NH_4^+ - EPA 350.1, detection limit 0.14 μg/L,
NO_3^- - EPA 353.2, detection limit 0.14 μg/L,
PO_4^{-3} - EPA 365.2, detection limit 0.31 μg/L,
TP - EPA 365.4, detection limit 3.1 μg/L,
TN - EPA 351.2, detection limit 1.4 μg/L. and
Si - EPA 370.1, detection limit 2.8 μg/L.

Turbidity was determined on subsamples analyzed with a Hach 2100P Turbidity meter, with results reported in nephelometric turbidity units (ntu) (EPA Method 180.1, limit of detection 0.01 ntu). Chl *a* was measured by filtering enough water through glass fiber filters for color to be visible; pigments on filters were extracted in 90% acetone in the dark at 20° C for 12-24 hours. Fluorescence before and after acidification of the extract was measured with a Turner Designs fluorometer. Salinity was determined using an AGE Model 2100 laboratory salinometer with a readability of 0.0001‰ (ppt). Enterococcus was evaluated using EPA Method 1600, with minimum detection limit of 1 colony/100 ml.

In situ field measurements of water temperature, pH, dissolved oxygen and salinity were acquired using an RBR Model XR-620 CTD calibrated to factory specifications. The CTD has a readability of 0.001°C, 0.001pH units, 0.001% saturation, and 0.001 parts per thousand (salinity).

RESULTS

Table 1 shows results of water chemistry analyses collected at the ten locations along the shoreline of Kualoa Regional Park and two locations in Apua Pond shown in Figure 1. Salinity at all ocean stations was similar, ranging in value from 33.22‰ at Station 8 to 34.42‰ at Stations 3 and 4. As open ocean salinity is generally 34.5-35‰, the somewhat lower values suggest a small input of freshwater at the shoreline along the length of the Park. However, owing to the relatively consistent values, there is not an area of concentrated groundwater or surface water input, at least during the period of sampling. Salinity of the pond samples was substantially lower, with values of 21-22‰. These values indicate that the water in Apua Pond is about 60-62% seawater and 38-40% freshwater.

Values of inorganic nutrients (NH_4^+, PO_4^{-3}, NO_3^- and Si) in ocean samples all varied by an order of magnitude across the sampling regime. However, there was little consistency in the variation. For instance, the highest concentration of NO_3^- occurred at Station 5 (53.5 μg/L), while PO_4^{-3} at this Station was the lowest of any measured (0.93 μg/L) . Concentrations of dissolved Si generally mirror values of salinity, as silica typically occurs in high concentrations in groundwater relative to ocean water. Such was not the case with the data set from Kualoa where there was no apparent pattern between silica and salinity (Table 1). While the range in concentrations of inorganic nutrients in ocean samples varied by an order of magnitude, the ranges of Total N and Total P were more consistent.

Concentrations of inorganic nutrients in Apua Pond differed considerable from the ocean samples. Values of NO_3^- in the pond were similar or lower to ocean values; however the concentrations of all other nutrients were one to two orders of magnitude higher than ocean samples. The elevated values in the Pond of TN and TP relative to the ocean samples are reflected in substantially higher concentrations of organic constituents TON and TOP. Such results are not surprising owing to the thick layer of decomposing organic material that comprised the floor of the pond. All values of nutrients in Apua Pond were higher in the mauka sample (AP-1) relative to the makai sample (AP-2). As salinity was lower in the makai

sample, it appears that there is a dynamic mixing process between seaward flowing ground water (high nutrients/low salinity) and landward flowing seawater (low nutrients/high salinity).

Chlorophyll *a*, pH, temperature, dissolved oxygen in ocean samples all displayed similar values with no conspicuous outliers (Table 1). Turbidity ranged from 0.93 ntu to 3.03 ntu with no apparent pattern. Owing to the shallow depth of the sampling sites, it is likely that measured values of turbidity are largely a result of resuspension fine-grained marine sediment. Turbidity in pond samples was only slightly elevated relative to ocean samples, while chlorophyll a was an order of magnitude higher in the pond (Table 1). pH varied substantially, with a lower value at the mauka side, and high value at the makai side than in the ocean. Temperature in the pond was higher and dissolved oxygen lower in the pond relative to the ocean (Table 1).

Also shown in Table 1 are Department of Health Water Quality Standards for embayments under "wet" and "dry" conditions. The distinguishing condition between wet and dry criteria is the average fresh water inflow from land either exceeding (wet) or not exceeding (dry) one percent of embayment volume per day. As such a calculation is not readily available, both sets of criteria will be compared to sample results. Three sets of standards are also stated; "not to exceed the given value more than 10% of the time; not to exceed the given value more than 2% of the time, and geometric means not to exceed the given value." As such, there is no statistical ability to compare a single set of samples to these standards. However, for the interest of determining a comparative level of water quality to State standards, comparisons are made to the "not to exceed more than 10% or 2%" criteria.

It can be seen in Table 1 that the only measurements to exceed either of the "wet" criteria are $NO_3^-+NO_2^-$ and turbidity, at one station each. When considering "dry" criteria, two samples of $NO_3^-+NO_2^-$ and all but one sample of turbidity exceed criteria. No values of NH_4^+, TP, TN, or Chl a exceeded either wet or dry criteria. In order to accurately evaluate compliance of water quality to DoH standards, a repetitive time-course program would be required.

Results of evaluation of indicator bacteria showed no colonies of enterococcus at any of the ocean sampling stations (Table 2). However, both pond samples exhibited high counts (250/100 ml at station AP-1, 160/100 ml at station AP-2) (Table 3).

In summary, this single sampling baseline assessment of water quality in the ocean offshore of Kualoa Regional Park reveals no areas of anomalous input of materials from land, and generally reflects coastal ocean conditions. The salinity of Apua Pond reveals a mix of about 60% ocean water and 40% freshwater, likely from makai flowing groundwater). Nutrient composition of pond water was about an order of magnitude higher than ocean water (with the exception of NO_3^-. These elevated nutrient concentrations likely reflect the decomposition of the thick layer of decomposing organic material in the pond.

While counts of viable enterococcus indicator bacteria the Apua Pond were substantial, the complete lack of such bacteria in the ocean signifies that during the period of sampling there

was limited exchange between the pond and the ocean, an essentially no leakage to the ocean from the comfort stations in the Park. The only parameter that showed consistent elevated levels relative to State Water Quality Standards was turbidity for dry conditions. As all values of Chl *a* were exceptionally low compared to DoH standards, the relative elevation of turbidity is a result of resuspension of fine-grained marine sediments in the nearshore zone.

Principal Investigator

December 5, 2011
Date

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FIGURE 1. Aerial photograph of Kualoa Regional Park showing locations of ten ocean water sampling stations, and two stations in Apua Pond (AP-1, AP-2).

TABLE 1. Results of water chemistry analyses from sampling stations along the shoreline of Kaneohe Bay off of Kualoa Regional Park collected on October 26, 2011. Two samples within Apua Pond were sampled on November 16, 2011. See Figure 1 for locations of sampling stations. Also shown are DOH WQS for "embayments" under "dry" and "wet" conditions, "not to exceed more than 10% and 2% of the time" criteria. The only constituents to exceed DOH 10% or 2% criteria in Kaneaohe Bay for wet conditions was nitrate + nitrite (NO_3^- $+NO_2^-$) and turbidity at stations shown in blue. Measurements exceeding dry criteria are shown in yellow.

SAMPLE	PO_4^{3-}	$NO_3^-+NO_2^-$	NH_4^+	Si	TP	TOP	TN	TON	TURB	SALT	pH	Chl-a	TEMP	Diss. O_2
STATION	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)		(µg/L)		(ntu)	(o/oo)	(std. units)	(µg/L)	deg. C	% sat.
1	0.93	18.90	1.26	120.12	6.51	5.58	112.98	92.82	1.43	33.65	8.05	0.16	25.65	99.1
2	2.17	10.08	3.22	108.64	8.06	5.89	167.58	154.28	1.29	33.91	8.03	0.14	25.63	99.1
3	1.24	13.30	0.98	70.84	6.51	5.27	150.22	135.94	0.93	34.42	8.05	0.21	25.78	98.6
4	0.93	5.74	0.56	44.24	6.51	5.58	105.14	98.84	1.43	34.42	8.06	0.13	25.76	99.1
5	0.93	53.48	1.68	43.96	6.20	5.27	148.68	93.52	2.58	33.72	8.06	0.07	25.79	99.4
6	0.93	19.46	0.98	47.60	6.82	5.89	115.22	94.78	2.17	33.45	8.05	0.12	25.35	99.6
7	0.93	12.18	0.28	51.52	6.51	5.58	126.70	114.24	3.03	33.39	8.06	0.07	25.60	93.2
8	0.93	6.72	0.42	59.64	6.51	5.58	121.80	114.66	1.95	33.22	8.08	0.10	25.63	92.7
9	0.93	4.48	0.70	55.72	8.06	7.13	127.12	121.94	2.89	33.33	8.09	0.10	25.76	95.2
10	2.79	14.70	0.14	111.72	9.61	6.82	155.82	140.98	1.20	33.65	8.06	0.15	25.54	97.2
AP-1	17.36	6.72	325.92	4523	116.56	99.20	3472	3139	3.90	21.68	7.41	2.61	28.40	65.4
AP-2	7.44	1.12	137.76	3687	84.32	76.88	2887	2748	2.16	22.08	8.33	1.06	28.30	60.6
DOH WQS														
DRY	10%	14.00	8.50		40.00		250.00		1.00	*	***	1.50	**	****
	2%	25.00	15.00		60.00		350.00		1.50	*	***	3.00	**	****
WET	10%	20.00	13.00		50.00		350.00		3.00	*	***	4.50	**	****
	2%	35.00	20.00		75.00		500.00		5.00	*	***	8.50	**	****

* Salinity shall not vary more than ten percent form natural or seasonal changes considering hydrologic input and oceanographic conditions.
** Temperature shall not vary by more than one degree C. from ambient conditions.
***pH shall not deviate more than 0.5 units from a value of 8.1.
****Dissolved Oxygen not to be below 75% saturation.

TABLE 1A. Latitude and Longitude (WGS84) of water sampling stations off Kualoa Regional Park, Oahu, Hawaii shown in Figure 1.

STATION	LATITUDE (N)	LONGITUDE (W)
1	21˚30.467'	157° 50.467'
2	21˚30.499'	157° 50.362'
3	21˚30.523'	157° 50.252'
4	21˚30.574'	157° 50.122'
5	21˚30.647'	157° 50.122'
6	21˚30.704'	157° 50.134'
7	21˚30.783'	157° 50.155'
8	21˚30.835'	157° 50.163'
9	21˚30.940'	157° 50.160'
10	21˚31.028'	157° 50.159'
AP-1	21˚30.610'	157° 50.279'
AP-2	21˚30.565'	157° 50.216'

HAWAII FOOD & WATER TESTING
2688 B Kilihau Street
Honolulu, HI 96819
Phone: 808/836-5558
Fax: 808/826-5509

Marine Research
1039 Waakaua Place
Honolulu, HI 96822

Case No. 275
Received: 10-26-11
Analyzed: 10-26-11
Compl'd: 10-27-11

Water Samples

Job: Kualoa Park

Sampled 10-26-11

Lab #	Sample ID		Enterococcus MF/100 ml
2080	Kualoa Park 1	08:05	< 1
2081	Kualoa Park 2	08:11	< 1
2082	Kualoa Park 3	08:16	< 1
2083	Kualoa Park 4	08:23	< 1
2084	Kualoa Park 5	08:29	< 1
2085	Kualoa Park 6	08:34	< 1
2086	Kualoa Park 7	08:39	< 1
2087	Kualoa Park 8	08:43	< 1
2088	Kualoa Park 9	08:50	< 1
2089	Kualoa Park 10	08:56	< 1

Methods, Minimum Detection Levels:
Enterococcus - EPA 1600, MDL 1/100 ml

Approved By:

Amy Hobui
10/31/11

TABLE 2. Results of enterococcus testing for samples collected off of Kualoa Regional Park. See Figure 1 for locations of sampling stations.

HAWAII FOOD & WATER TESTING
2688 B Kilihau Street
Honolulu, HI 96819
Phone: 808/836-5558
Fax: 808/826-5509

Marine Research
1039 Waakaua Place
Honolulu, HI 96822

Case No. 277
Received: 11-16-11
Analyzed: 11-16-11
Compl'd: 11-17-11

Water Samples

Job: Kualoa Park

Sampled 11-16-11

Lab #	Sample ID		Enterococcus MF/100 ml
2098	KRP Pond 1	07:45	250
2099	KRP Pond 2	07:50	160

Methods, Minimum Detection Levels:
Enterococcus - EPA 1600, MDL 1/100 ml

Approved By:

Amy Nobui
11/17/11

TABLE 3. Results of enterococcus sampling in Apua Pond, Kualoa Regional Park conducted on November 16, 2011. See Figure 1 for locations of sampling stations.

MARINE RESEARCH CONSULTANTS, INC.
1039 WAAKAUA PL., HONOLULU, HI 96822

CHAIN OF CUSTODY

SUBMITTED TO:
MARINE ANALYTICAL SPECIALISTS
1738 LAUKAHI ST., HON, HI 96821

PROJECT: KUALOA REGIONAL PARK (KRP)

SAMPLE NO.	SAMPLE ID	DATE	TIME	SAMPLE TYPE	# OF CONTAINERS	REQUESTED ANALYSES	PRESERVE
08-2010	1-10	10/26/11	0800	grab	10	NH4, NO3+NO2, TN, TP, TURB, SAL,CHL a,pH	ice

SAMPLED BY:			RELINQUISHED BY:			RECEIVED BY:		
S. Dollar	10/26/11		S. Dollar	10/26/11		D. Walsh	10/26/11	
PRINT	DATE		PRINT	DATE		PRINT	DATE	
	0800			12:35		Daniel Walsh	12:35	
SIGNATURE	TIME		SIGNATURE	TIME		SIGNATURE	TIME	

COMMENTS:

CHAIN OF CUSTODY

HAWAII FOOD & WATER TESTING
2688 B Kilihau Street
Honolulu, HI 96819
Phone: 836-5558
Fax: 836-5509 Email: lab@hfwt.com

Name & Address:	
Steve Dollar	
Contact: MRCI	
Phone: 779-4007	
Fax:	email:

Temp Control:
Job:
P.O. #:
Sampled By:

Lab #	Sample Description	Date	Time	Type of Sample	On-Site pH	On-Site Chlorine	On-Site Temp	Analysis Requested
2080/2081	KUALOA PARK 1/2	10/26/11	0805/0811					ENTEROCOCCUS
2082/2083	3/4	↓	08/16/0823					↓
2084/2085	5/6		0829/0834					
2086/2087	7/8		0839/0843					
2088/2089	9/10		0850/0856					

RELINQUISHED BY:		RECEIVED BY:	
Sign: [signature]	Date: 10/26/11 Time: 1000	Sign: Ami Mulligan	Date: 10/26/11 Time: 1000
Print: Steve Dollar		Print: Ami Mulligan	

SPECIAL INSTRUCTIONS

CHAIN OF CUSTODY

HAWAII FOOD & WATER TESTING
2688 B Kilihau Street
Honolulu, HI 96819
Phone: 836-5558
Fax: 836-5509

Name & Address:	
Steve Dollar	
MRCI	
Contact:	
Phone:	
Fax:	email:

Temp Control:
Job:
P.O. #:
Sampled By:

Lab #	Sample Description	Date	Time	Type of Sample	On-Site pH	On-Site Chlorine	On-Site Temp	Analysis Requested
2098	KRP POND 1	11/16/11	7:45					ENTEROCOCCUS
2099	KRP POND 2	"	7:50					"
								"

RELINQUISHED BY:		RECEIVED BY:	
Sign: [signature]	Date: 11/16/11 Time: 0845	Sign: Ami Mulligan	Date: 11-16-11 Time: 08:45
Print: Steve Dollar		Print: Ami Mulligan	

SPECIAL INSTRUCTIONS

Appendix C
Draft Archaeological Inventory Survey

DRAFT
Archaeological Inventory Survey for Reconstructed Wastewater Systems and Bathhouse Replacement at Kualoa Regional Park, Kualoa Ahupuaʻa, Koʻolaupoko District, Island of Oʻahu TMK: [1] 4-9-004: 001 por.

Prepared for

Kennedy/Jenks Consultants, Inc.

Prepared by

Jon Tulchin, B.A.

and

Hallett H. Hammatt, Ph.D.

Cultural Surveys Hawaiʻi, Inc.

Kailua, Hawaiʻi

(Job Code: KUALOA 2)

March 2012

Oʻahu Office
P.O. Box 1114
Kailua, Hawaiʻi 96734
Ph.: (808) 262-9972
Fax: (808) 262-4950

www.culturalsurveys.com

Maui Office
1860 Main St.
Wailuku, Hawaiʻi 96793
Ph: (808) 242-9882
Fax: (808) 244-1994

Management Summary

Reference	Archaeological Inventory Survey for Reconstructed Wastewater Systems and Bathhouse Replacement at Kualoa Regional Park, Kualoa Ahupuaʻa, Koʻolaupoko District, Island of Oʻahu, TMK: [1] 4-9-004: 001 por. (Tulchin & Hammatt 2012)
Date	March 2012
Project Number (s)	Cultural Surveys Hawaiʻi Inc. (CSH) Job Code: KUALOA 2
Investigation Permit Number	CSH completed the fieldwork component of the archaeological inventory survey (AIS) under Hawaiʻi State Historic Preservation Division/Department of Land and Natural Resources (SHPD/DLNR) permit No. 11-17, issued per Hawaiʻi Administrative Rules (HAR) Chapter 13-13-282.
Project Location	The project area is located within Kualoa Regional Park and is situated within existing park infrastructure (i.e., asphalt roads and parking lots, concrete walkways, and comfort stations) as well as within open grassy fields. The project area is depicted on the 1998 USGS 7.5-Minute Series Topographic Map, Kahana (1983) and Kāneʻohe (1998) quadrangles (Figure 1).
Land Jurisdiction	City and County of Honolulu
Project Proponent	Kennedy/Jenks Consultants, Inc.
Agencies	State Historic Preservation Division/Department of Land and Natural Resources (SHPD/DLNR)
Project Description	Kualoa Regional Park currently has four comfort stations that were constructed in 1973. Each comfort station was built with its own independent wastewater treatment system. All four comfort stations have wastewater treatment systems that have reached their use-life and need to be replaced. Additionally, Comfort Station #3 has been abandoned due to coastal erosion. Thus the proposed project involves construction of a replacement structure for Comfort Station #3, and the construction of a centralized wastewater system to service all four of the park's comfort stations. Four pump stations will be installed to transport the wastewater flows from each comfort station and the existing food service building to the centralized wastewater system. The centralized wastewater system will be designed to utilize an elevated leach field with subsurface pumping systems to minimize the area of excavation during construction. Anticipated ground disturbance will involve open trenching for the installation of approximately 3,750 linear feet of force mains, a 5,000 gallon pre-loader tank, and three 15,000 gallon aerobic treatment units. The proposed project will also involve the demolition and removal of the existing Comfort Station #3 facility.

Project Acreage	Approximately 2 acres
Area of Potential Effect (APE) and Survey Acreage	Based on available information, the proposed Kualoa Regional Park Wastewater Treatment Project will not impose adverse visual, auditory or other environmental impact to any known historic properties, including standing architecture, located outside the project area. Accordingly, the proposed development, based on available information lacks potential to affect historic properties outside the archaeological inventory survey area. As a result the proposed development's APE is the same as the archaeological inventory survey area, which totals approximately 2-acres.
Historic Preservation Regulatory Context	At the request of the Kennedy/Jenks Consultants, Inc., CSH completed this archaeological inventory survey investigation. It fulfills the requirements of the Hawai‘i Administrative Rules (HAR) Chapter 13-13-276 and was conducted to identify, document, and make Hawaii Register of Historic Places (Hawaii Register) eligibility recommendations for the subject parcel's historic properties. The investigation includes a project-specific effect recommendation and treatment/mitigation recommendations for the parcel's historic properties that are recommended Hawai‘i Register eligible. This document is intended to support the proposed project's historic preservation review under Hawai‘i Revised Statutes (HRS) Chapter 6E-8 and HAR Chapter 13-13-275, as well as the project's environmental review under HRS Chapter 343. It is also intended to support any project-related historic preservation consultation with stake-holding state, and county agencies and interested Native Hawaiian and community groups.
Fieldwork Effort	Nifae Hunkin, B.A., Frederick LaChance, B.A., Kulani Jones, B.S., Leandra Medina, B.A., and Andrea Kay, M.S. assisted project director Jon Tulchin, B.A., with the field effort, which required 24 person-days to complete. Fieldwork took place between October 11 and October 17, 2011 under the general supervision of Hallett H. Hammatt, Ph.D. (principal investigator). Fieldwork consisted of a 100% pedestrian inspection of the areas proposed for development. Following the pedestrian inspection, the historic property identification effort focused on a subsurface testing program within the areas proposed for wastewater improvements within the project area. 18 test trenches were excavated, documented, and sampled.
Number of Historic Properties Identified	One: SIHP No. 50-80-06-528, the *ahupua‘a* of Kualoa. During the current investigation culturally enriched buried A-horizons (i.e., cultural layers) were identified. These cultural layers are consisted to be contributing components to SIHP -528.

Historic Properties Recommended Eligible to the Hawai‘i Register of Historic Places (Hawai‘i Register)	SIHP No. 50-80-06-528, the *ahupua‘a* of Kualoa.
Historic Properties Recommended Ineligible to the Hawai‘i Register	None
Effect Recommendation	The proposed project will affect historic properties recommended eligible to the Hawai‘i Register. CSH's project specific effect recommendation is "effect, with agreed upon mitigation measures."
Mitigation Recommendation	The inventory survey's recommended mitigation measures are twofold. First, project development should proceed under an archaeological monitoring program to facilitate the identification and treatment of any human burials that might be discovered during project construction, and to alleviate the project's effect on non-burial archaeological deposits. Second, in order to alleviate the project's effect on a previously identified human skeletal element in a non burial context, a project specific burial treatment plan (a requirement of HAR Chapter 13-300) should be prepared for consideration of the OIBC and review and approval by the SHPD/DLNR.

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Section 1 Introduction

1.1 Project Background

At the request of Kennedy/Jenks Consultants, Inc., Cultural Surveys Hawai‘i, Inc. (CSH) conducted an archaeological inventory survey for reconstructed wastewater systems and bathhouse replacement at Kualoa Regional Park, Kualoa Ahupua‘a, Ko‘olaupoko District, Island of O‘ahu, TMK: [1] 4-9-004: 001 por. The project area is located within Kualoa Regional Park and is situated within existing park infrastructure (i.e., asphalt roads and parking lots, concrete walkways, and comfort stations) as well as within open grassy fields. The project area is depicted on the 1998 USGS 7.5-Minute Series Topographic Map, Kahana (1983) and Kāne‘ohe (1998) quadrangles (Figure 1), a Tax Map Key [1] 4-9-004 (Figure 2), and on an aerial photograph (Figure 3).

Kualoa Regional Park currently has four comfort stations that were constructed in 1973. Each comfort station was built with its own independent wastewater system. All four comfort stations have wastewater systems that have reached their use-life and need to be replaced. Additionally, Comfort Station #3 has been abandoned due to coastal erosion. Thus the proposed project involves construction of a replacement structure for Comfort Station #3, and the construction of a centralized wastewater system to treat and dispose of wastewater flows from all four of the park’s comfort stations and food service building (Figure 4). Four pump stations will be installed to transport the wastewater flows from each comfort station and the existing food service building to the centralized wastewater system. The centralized wastewater system disposal component will be an elevated leach field with pumping systems to minimize the excavation of existing ground for construction. Open trenching excavation methods are anticipated to be used for construction including the installation of approximately 3,750 linear feet of force mains, a 5,000 gallon pre-loader tank, and three 15,000 gallon aerobic treatment units. The proposed project will also involve the demolition and removal of the existing Comfort Station #3 facility.

Based on available information, the proposed Project will not impose adverse visual, auditory or other environmental impact to any known historic properties, including standing architecture, located outside the project area. Accordingly, the proposed development, based on available information lacks potential to affect historic properties outside the archaeological inventory survey area. As a result the proposed development’s Area of Potential Effect (APE) is the same as the archaeological inventory survey area, which totals approximately 2-acres.

1.2 Historic Preservation Regulatory Context and Document Purpose

This document is intended to support the proposed project’s historic preservation review under Hawai‘i Revised Statutes (HRS) Chapter 6E-8 and HAR Chapter 13-13-275, as well as the project’s environmental review under HRS Chapter 343. It is also intended to support any project-related historic preservation consultation with stake-holding state, and county agencies and interested Native Hawaiian and community groups.

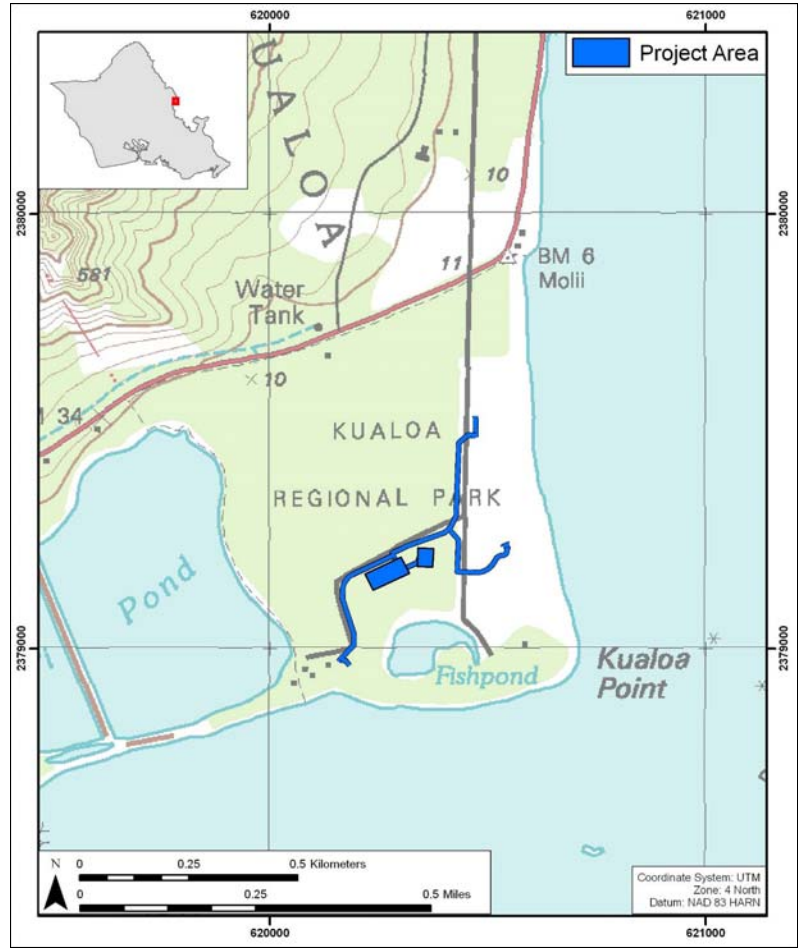


Figure 1. U.S. Geological Survey 7.5-Minute Series Topographic Map, Kahana (1983) and Kāne‘ohe (1998) quadrangles, showing the location of the project area

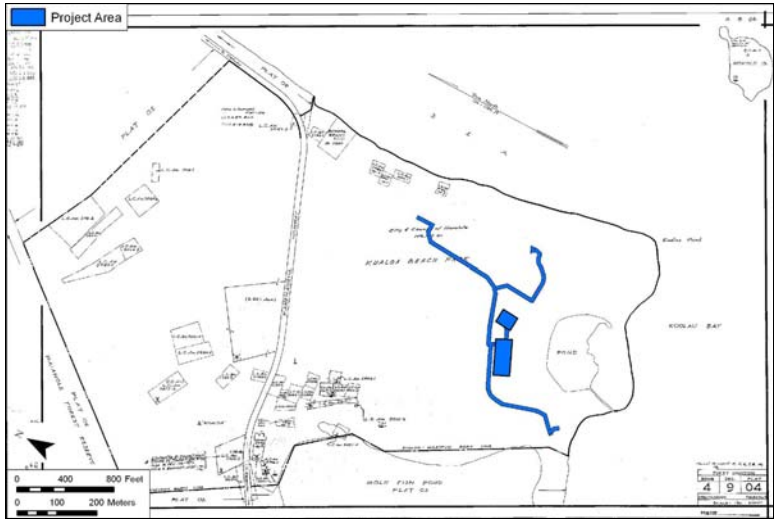


Figure 2. Tax Map Key [1] 4-9-004, showing location of the project area

Figure 3. Aerial photograph showing the location of the project area (source: Google Earth 2011)

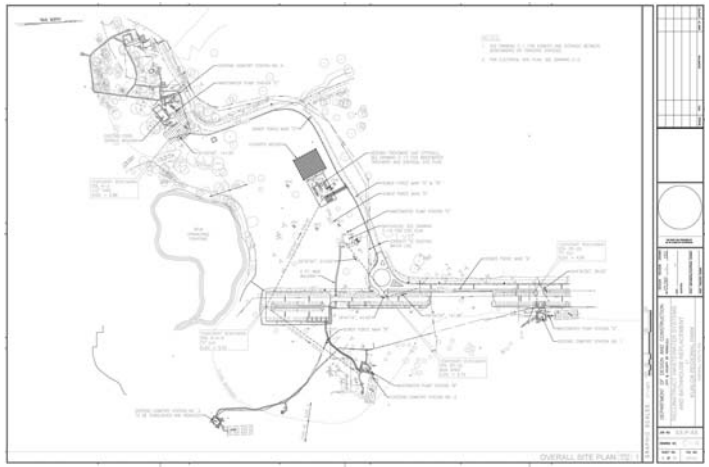


Figure 4. Kualoa Regional Park Wastewater Treatmernt Project Overall Site Plan (source: City and County of Honolulu Department of Design and Construction)

At the request of the Kennedy/Jenks Consultants, Inc., CSH completed this archaeological inventory survey investigation. It fulfills the requirements of the Hawai‘i Administrative Rules (HAR) Chapter 13-13-276 and was conducted to identify, document, and make Hawaii Register of Historic Places (Hawaii Register) eligibility recommendations for the subject parcel’s historic properties. The investigation includes a project-specific effect recommendation and treatment/mitigation recommendations for the parcel’s historic properties that are recommended Hawai‘i Register eligible.

Under Hawai‘i state historic preservation legislation, archaeological inventory surveys are designed to identify, document, and provide significance and mitigation recommendations for historic properties. Under this legislation, historic properties are defined as any “building, structure, object, district, area, or site, including heiau and underwater site, which is over fifty years old.” A project’s effect and potential mitigation measures are evaluated based on the project’s potential impact to “significant” historic properties (those historic properties determined eligible, based on established significance criteria, for inclusion in the Hawai‘i Register of Historic Places [Hawai‘i Register]). Determinations of eligibility to the Hawai‘i Register result when a state agency official’s historic property “significance assessment” is approved by the State Historic Preservation Division (SHPD), or when SHPD itself makes an eligibility determination for an historic property (HAR Chapter 13-284).

1.3 Scope of Work

The following archaeological inventory survey scope of work is designed to satisfy the Hawai‘i state requirements for archaeological inventory surveys (HAR Chapter 13-276):

1. Historic and archaeological background research, including a search of historic maps, written records, Land Commission Award documents, and the reports from prior archaeological investigations. This research will focus on the specific project area’s past land use, with general background on the pre-contact and historic settlement patterns of the *ahupua‘a* and district. This background information will be used to compile a predictive model for the types and locations of historic properties that could be expected within the project area.
2. A 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 and located with a Trimble GPS. This GPS data will be in the report in ArcGIS format and be sufficient for planning purposes.
3. Based on the project area’s environment and the results of the background research, subsurface testing with a combination of hand and backhoe excavation was conducted. Subsurface testing focused on locating and evaluating subsurface deposits, such as buried cultural layers and/or deposits with significant paleoenvironmental data, which could not be located by the ground survey. Testing in sensitive areas was conducted by hand after the initial backhoe work. If appropriate samples from these excavations are found, they will be analyzed for chronological and paleoenvironmental information.

All subsurface historic properties identified will be documented to the extent possible, including geographic extent, content, function/derivation, age, interrelationships, and significance.

4. 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’s past land use and historic properties.
   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 SHPD and the City and County of Honolulu relating to archaeological matters. This coordination takes place after consent of the owner or representatives.

1.4 Environmental Setting

1.4.1 Natural Setting, Geology, and Topography

Kualoa Regional Park is located on a coastal plain at the base of Ko‘olau mountain range within the ahupua‘a (land division generally running from the mountains to the sea) of Kualoa. Elevation within the park ranges from sea level to slightly above 8 feet above mean sea level (2.44 meters). The area is generally level with the exception of the sloping beaches along the south and eastern sides.

1.4.2 Rainfall, Soils, and Vegetation

Since the alignment of the Ko‘olau mountain range lies perpendicular to the northeast trade winds, orographic rains are a common occurrence and account for the high amount of moisture and rainfall along the mountains and cliffs on the windward side of O‘ahu (Sanderson 1993:33). The average rainfall for the ahupua‘a of Kualoa is about 40 to 60 inches annually (Juvik and Juvik 1998:56).

According to U.S. Department of Agriculture (USDA) soil survey data (Foote et al. 1972), sediments in the project area consist of Mokuleia loam (Ms) and Jaucas sand (JaC) (Figure 5).

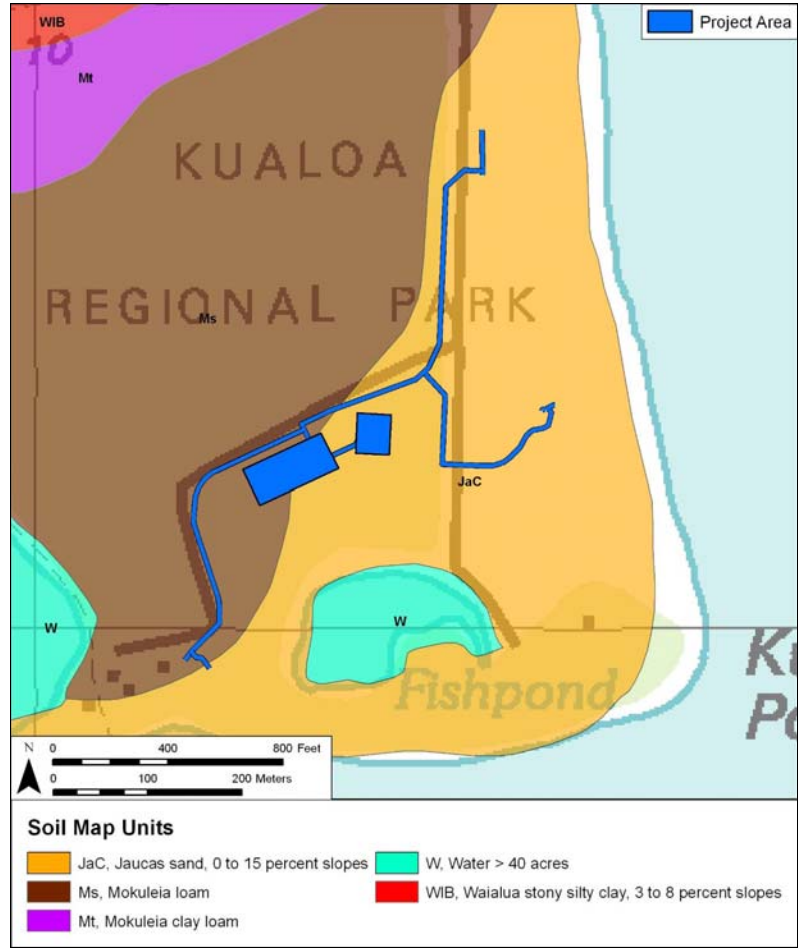


Figure 5. Portion of the USGS 7.5-minute series topographic map, Kahana (1983) and Kāne‘ohe (1998) quadrangles, showing the Project area with soil overlay (Foote el al. 1972)

The Mokuleia series are well-drained soils along the coastal plain derived from alluvium deposited over coral sand (Foote et al. 1972:95). Jaucas sand develops from wind- and water-deposited sand from coral and seashells (Foote et al. 1972:48).

Typical vegetation in the area primarily consists of introduced varieties for landscaping purposes, including *koa haole*, coconut trees, Christmas berry, *hau*, lantana, *milo* trees, and a variety of landscaped grasses covering the grounds (Foote et al. 1972).

1.4.3 Built Environment

Kualoa Regional Park has several asphalt covered access roads and parking areas, as well as public facilities, such as restrooms and picnic areas, and a fishpond. The park also has a maintenance facility, which is located at the northern end of the park, near the entrance off of Kamehameha Highway, and administrative offices and a caretaker's home located at the eastern end of the park. A fishpond wall once existed along the reef offshore of Kualoa Point until its destruction during a storm in 1933; underwater remnants are located off the south-facing beach (Gunness 1987a).

The coastline around Kualoa Regional Park has been in a state of flux due to a combination of cultural and natural occurrences. The destruction of the fishpond wall destabilized the natural erosion and replenishment of the sand along the east beach. In an effort to stabilize the erosion, the City and County of Honolulu constructed a "surgebreaker" concrete structure in 1984.

Section 2 Methods

2.1 Field Methods

Nifae Hunkin, B.A., Frederick LaChance, B.A., Kulani Jones, B.S., Leandra Medina, B.A., and Andrea Kay, M.S. assisted project director Jon Tulchin, B.A., with the field effort, which required 24 person-days to complete. Fieldwork took place between October 11 and October 17, 2011 under the general supervision of Hallett H. Hammatt, Ph.D. (principal investigator). Fieldwork consisted of a 100% pedestrian inspection of the areas proposed for development. Following the pedestrian inspection, the historic property identification effort focused on a subsurface testing program within the areas proposed for wastewater improvements within the project area. 18 test trenches were excavated, documented, and sampled.

2.1.1 Pedestrian Inspection

A complete ground survey of the project area was undertaken for the purpose of historic property identification and documentation. The ground survey of the project area was accomplished through systematic sweeps. The interval between the archaeologists was generally between 5-10 m. All historic properties if historic properties were observed the would be documented through detailed written description, with evaluation of function, interrelationships, and significance; photographs; scale drawings using standard tape-and-compass mapping procedures; and located with Trimble ProXH GPS survey equipment (sub-foot accuracy).

2.1.2 Subsurface Testing

The sub-surface testing program consisted of the excavation of 18 trenches. Trenches were placed in areas anticipated to be impacted by project construction, and excavated to assess the stratigraphy and potential for subsurface cultural deposits within the archaeological inventory survey area.

A standard backhoe with a two-foot wide bucket was used to excavate at least portions of each test trench. Generally, trenches excavated to assess subsurface stratigraphy and prospect for subsurface cultural deposits were approximately 6 m long, 1 m wide, and between 1 to 2 m deep. All trenches were excavated below the water table.

The assisting backhoe was initially used to remove overlying alluvial sediment or fill deposits within each test trench. The backhoe bucket was only used to remove Jaucas sand from trenches once at least one hand-excavated shovel trench was first dug down the center of the trench, parallel to the trench's long axis (Figure 6). This hand excavation in sand deposits was specifically undertaken to identify potential burial deposits prior to sand excavation with the backhoe. These shovel trenches were one shovel width wide (approximately 25 cm) and dug from the upper Jaucas sand surface. Sand was carefully scraped off in thin layers in order to minimize any possible burial disturbance. Smaller shovel test probes, approximately 25 by 25 cm, were excavated down from the base of the shovel trench as an extra precaution to identify any particularly deep burial deposits.

Figure 6. Example of hand-excavated shovel trench dug down the center of test trench prior to machine excavation

CSH personnel closely monitored all backhoe excavation activity. In sand deposits, at least two archaeologists monitored the backhoe excavation, one positioned at either end of the trench to monitor both the removal of sediment from the trench and the emptying of the backhoe bucket on the adjacent back-dirt pile.

The stratigraphy in each trench was drawn and photographed. The sediments were described for each of the trenches using standard USDA soil description observations/ terminology. Sediment descriptions include Munsell color, texture, consistency, structure, plasticity, cementation, origin of sediments, descriptions of any inclusions such as cultural material and/or roots and rootlets, lower boundary distinctiveness and topography, and other general observations.

2.1.2.1 Sampling

The sampling of subsurface cultural layers and/or A horizons was carried out to characterize the cultural content of these layers. Sampling also helped establish geographic boundaries to these layers and the general time frame of their deposition (pre-contact/traditional Hawaiian, and/or post-contact, and/or modern). The samples were excavated out of the sidewall or from the base of the excavation, into five gallon (c. 20 liter) buckets. The sediment was then screened through 1/8-inch (3.2 mm) mesh and all cultural materials were collected, bagged by provenience, and returned to the laboratory.

2.1.2.2 Identification of Cultural Layers

Cultural layers were assigned to stratigraphic layers containing evidence of cultural activity. Typically the presence of charcoal flecking, artifacts, midden, burials (human and faunal), and pit features located within a stratigraphic layer facilitate its designation as a cultural layer.

The boundaries of the subsurface deposits that make up the single historic property located within the project area was established through interpolation. Trench stratigraphic documentation and the results of cultural content sampling of specific layers established where culturally enriched layers were present. Boundaries were drawn around trenches that had these layers.

2.1.2.3 Pit Features

Pit features were identified and labeled as distinct protuberances from modern or buried A horizons down into underlying culturally sterile layers. These pit features could reflect natural depressions of the land surface and/or could be associated with shallow man-made excavations. Roman number designations (ex. Pit Feature 1) were assigned to the most clearly defined and distinct pit features in order to keep information obtained from these pit features organized. Sediment from recorded pit features was sampled and screened through 1/8-inch (3.2 mm) mesh. Pit features were also depicted in trench profiles and information was collected regarding their shape, content, distinctness and degree of protrusion into underlying culturally sterile layers.

2.1.2.4 GPS

The location of each of the trenches and identified historic properties were recorded using a Trimble Pro GPS unit. GPS location information was converted into GIS shape files ESRI’s ArcGIS 9.1. UTM coordinates for the historic property boundaries are included in Appendix D.

2.1.2.5 Backfilling of Trenches

Following all documentation and sampling each trench was backfilled

2.2 Laboratory Methods

2.2.1 Wood Taxa Identification

Two charcoal samples were submitted to the International Archaeological Research Institute, Inc. (IARII) for wood taxa identification. The freshly fractured transverse and tangential facets of each charcoal piece were viewed under magnification of a dissecting microscope. Taxa identifications were made by comparing the anatomical characteristics seen during examination against those of known woods in the Pacific Islands Wood Collection at the Department of Botany, University of Hawai‘i, and published descriptions (Murakami 2011).

2.2.2 Radiocarbon Dating

Two samples of charcoal were sent to Beta Analytic, Inc. of Miami, Florida for radiocarbon dating analysis. Both samples used the Accelerator Mass Spectrometer method of analysis. Appendix C shows the Beta Analytic results. The resulting conventional radiocarbon ages were calibrated into calendar ages AD/BC using the OxCal Calibration Program, version 3.9, developed by the Oxford Radiocarbon Accelerator Unit (ORAU) and available as share-ware over the Internet.

2.2.3 Midden and Artifact Analysis

Invertebrate remains collected from specific subsurface features or cultural layers were identified to genus and species, weighed, and analyzed. Data was tabulated by depth and stratigraphic unit. Common marine shells were identified and analyzed at the Cultural Surveys Hawai‘i laboratory in Waimanalo, O‘ahu using an in-house comparative collection and reference texts (i.e. Abbott and Dance 1990; Eisenberg 1981; Kay 1979; Titcomb 1972, Titcomb 1979).

Traditional Hawaiian materials collected were sorted, identified, measured, quantified, and photographed to scale. In general, artifact analysis focused on establishing, to the greatest extent possible, material type, formal/function type, cultural affiliation and/or age of manufacture. The forms and functions were determined using reference material (i.e. Barrera and Kirch 1973; Brigham 1974; Buck 2003; Emory et al. 1968).A catalogue of all collected artifacts was prepared and is presented in Section 5 Results of Laboratory Analysis below.

2.3 Document Review

Background research included: a review of previous archaeological studies on file at SHPD; review of documents at Hamilton Library of the University of Hawai‘i, the Hawai‘i State Archives, the Mission Houses Museum Library, the Hawai‘i Public Library, and the Archives of the Bishop Museum; study of historic photographs at the Hawai‘i State Archives and the Archives of the Bishop Museum; and study of historic maps at the Survey Office of the Department of Land and Natural Resources. Historic maps and photographs from the CSH

library were also consulted. In addition, Māhele records were examined from the Waihona ‘Aina database (<www.waihona.com>).

This research provided the environmental, cultural, historic, and archaeological background for the project area. The sources studied were used to formulate a predictive model regarding the expected types and locations of historic properties in the project area.

2.4 Historic Property Evaluation for Hawai‘i Register Eligibility

Under state of Hawai‘i historic preservation legislation, historic property significance is evaluated and expressed as eligibility for listing on the Hawai‘i Register of Historic Places (Hawai‘i Register). To be considered eligible for listing on the Hawai‘i Register, a historic property must possess integrity of location, design, setting, materials, workmanship, feeling, and association, and meet one or more of the following broad cultural/historic significance criteria: “A” reflects major trends or events in the history of the state or nation; “B” is associated with the lives of persons significant in our past; “C” is an excellent example of a site type/work of a master; “D” has yielded or may be likely to yield information important in prehistory or history; and, “E” has traditional cultural significance to an ethnic group, includes religious structures and/or burials. For this report, historic property integrity and significance were assessed based on the guidance provided in National Register Bulletin # 15, “How to Apply the National Register Criteria for Evaluation.”

Section 3 Cultural Consultation

Active consultation for this project has been ongoing for over two years now as the project proponents (Kennedy/Jenks Consultants, Inc. and the City & County of Honolulu) are very cognizant of the cultural significance of Kualoa Ahupua'a and are committed to working closely with the lineal descendants of Kualoa, the SHPD/DLNR, the OIBC and other appropriate cultural stakeholders. A series of correspondence and working meetings have been held with these entities to gather input (*mana'o*) regarding respectful approaches towards conducting the AIS as well as for the careful treatment of any *iwi kūpuna* (human skeletal remains) found during the course of this project (Table 1).

Additional community consultation for the project was undertaken by CSH as part of a cultural impact assessment (refer to Genz and Hammatt 2011) and as part of an ethnographic study of Kualoa Ahupua‘a (refer to Shideler and Hammatt 2007).

3.1 Consultation Prior to AIS Fieldwork

Consultations prior to actual AIS fieldwork were conducted to inform concerned parties on the waste water system improvements alternatives and the proposed archaeological inventory survey methodology and sampling strategies. Consultation with groups and individuals, included previously identified lineal descendants specific to Kualoa, OIBC, and SHPD/DLNR. Consultation meetings took place at Kualoa Beach Park and at OIBC meetings in Honolulu. Table 1 includes columns for, date and purpose, attendees, and comments. Transcribed meeting summaries are included as appendices.

3.2 Post AIS Fieldwork Consultation

These consultation efforts focused on the mitigation issues related to the single historic property of SIHP #50-80-06-528 (Kualoa Ahupua‘a). This was done following the cultural consultation guidelines of HAR Chapter 13-284-6(c), regarding historic property significance, and HAR Chapter 13-284-8(a) (2), regarding potential historic property mitigation. This effort focused on the treatment of an isolated cranial fragment that was discovered during subsurface testing, and was determined to be "not a burial nor in a burial site context" by SHPD [Phyllis Cayan (SHPD History & Culture Branch Chief) via e-mail correspondence 12/19/2011].

During the subsurface testing within the project area an isolated cranial fragment was discovered during the excavation of Trench 17, located immediately *makai* of Comfort Station #2. The fragment was wrapped in muslin and placed in a small *lauhala* basket. The fragment was then reburied in the south end of Trench 17 in the vicinity of where it was originally discovered. The discovery of this human skeletal fragment prompted a November 14, 2011 on-site meeting with the City and County of Honolulu (Department of Design and Construction and the Division of Parks and Recreation), CSH, Aukahi, Kennedy/Jenks Consultants (project proponent) and concerned community members (Ms. Gladys Pualoa-Ahuna, Mr. Ahi Logan, and Mr. Calvin Hoe) to discuss preferences for burial treatment of the discovered cranial fragment (see Appendix D). Ms. Gladys Pualoa-Ahuna stated her preference would be to move the *iwi kūpuna* to a temporary City facility, and then reinter the *iwi kūpuna* at an onsite re-internment facility on

a later date. Mr. Ahi Logan stated his preference would also be to move the *iwi kūpuna* to a temporary City facility, and then reinter the *iwi kūpuna* at an onsite re-internment facility on a later date. Mr. Calvin Hoe needed more time to discuss the matter with his family before he could state any preference. However, in a follow up conversation with Mr. Hoe, he indicated that he also preferred moving the *iwi kūpuna* to the on-site re-interment facility.

Table 1. Project Related Cultural Consultation

Date and Purpose	Attendees	Comments
July 5, 2011, the project team met with the Kualoa lineal descendants to review and discuss the AIS field work plan.	City representatives	Detailed that this project is needed as the current wastewater system which has effectively been turned into "holding tanks" is no longer acceptable according to Department of Health (DOH) standards and needs to be replaced with a wastewater system that will eliminate and prevent wastewater discharges into the ground or state waters at Kualoa Regional Park. This need was prompted when it was found that elevated bacteria levels in the ocean exceeded DOH acceptable bacteria standards and when a waste water spill occurred in December 2006 at Comfort Station #2, causing a DOH violation against the City and County of Honolulu.
	Kennedy & Jenks	Provided an overview of the current wastewater system improvement design and its alignment, which was determined in part by previous archaeological studies, to areas of least sensitivity and an attempt was made to place sewer force mains in areas that have been previously disturbed.
	CSH	Provided a brief history of past archaeological investigations in the Kualoa area. Based on previous work in the project area, CSH suggests there is a lower potential for significant finds at the location of the proposed bathhouse, treatment system, and disposal system. However, CSH indicated a higher probability of significant finds in areas known as 2A and 2B based on previous research (i.e. near existing bathhouse and kitchen facility).
	Group 70	Indicated they would be conducting the environmental assessment (EA) for the project and provided the regulatory context for the EA.
	Aukahi	Lani Lapilio facilitated the consultation meeting.
	Kualoa lineal descendants	Mr. Ahi Logan and Ms. Gladys Pualoa would both like to move forward with the project. Mr. Calvin Hoe expressed that he is not in favor of the expanded park development and had concerns as to the need for and how the waste water system improvements would be accomplished, but will continue to work with the City in making responsible decisions for the future.

Date and Purpose	Attendees	Comments
*See full meeting minutes in Appendix D		
July 13, 2011, the project team met with OIBC to describe plans for the project and preliminary plans for archaeological testing.	City representatives	Reiterated the situation requiring the wastewater replacement at Kualoa Regional Park as the current system of “holding tanks” that will continually need to be pumped on a weekly basis until it is replaced with a wastewater system that will eliminate and prevent wastewater discharges into the ground or state waters at Kualoa Regional Park.
	Kennedy & Jenks	Discussed preferred alternative of an aerobic waste water treatment system and how the City and County of Honolulu came to this preferred alternative over other alternative waste water treatment systems.
	CSH	Explained the AIS sampling strategy based on preferred alternative proposed by the City and County of Honolulu.
	Group 70	Reiterated the EA process and how AIS is a component of the EA, and a CIA will be included.
	Aukahi	Facilitated the consultation meeting.
	OIBC	Recommends that consultation with the community should continue, and agrees that AIS should move forward.
*No meeting minutes generated for this meeting		
August 4, 2011, the project team met with the Kualoa lineal descendants to review and discuss the AIS field work plan.	City representatives	Reiterated the situation requiring the wastewater replacement at Kualoa Regional Park as the current system of “holding tanks” is not in compliance with DOH standards and will need to be replaced with a wastewater system that will eliminate and prevent wastewater discharges into the ground or state waters at Kualoa Regional Park.
	Kennedy & Jenks	Discussed with the Kualoa lineal descendants why alternatives such as a “living machine” treatment system would not work in this situation, as it would require 4 to 5 times more area than compared to the proposed centralized wastewater and disposal system.
	CSH	Presented their proposed AIS testing locations for the current wastewater treatment design and it was noted that the trenches are subject to change per CSH discretion.

Date and Purpose	Attendees	Comments
	Group 70	Reiterated the EA process and provided a regulatory DOH framework of systems 50 feet from a body of water (i.e. ‘Apua pond) and the system would be located 200 + feet away from the ‘Apua pond, even further away than DOH standards of 50 feet from any body of water
	Aukahi	Facilitated the consultation meeting and reviewed 7/13/2011 OIBC meeting comments for continued consultations
	Kualoa lineal descendants	• Mr. Calvin Hoe expressed that he is not in favor of the expanded park development and had concerns as to the need for and how the proposed waste water system improvements would be carried out, and would like to continue further discussions on possible alternatives to the proposed current treatment system. Also stated that the proposed location of the new comfort station was not good because no one goes there. Additionally, he expressed concern over the proximity of the new facility to ‘Apua pond. • Ms. Charlene Hoe expressed that she is not convinced that the proposed wastewater treatment system is the best option in this situation and expressed the desire for a more self – sustaining wastewater treatment alternative such as the “living machine”. She also expressed concern over the proximity of the new facility to ‘Apua pond. • Ms. Gladys Pualoa-Ahuna expressed that she would like this project to move forward. • Mr. Ahi Logan expressed that he would like this project to move forward.
*See full meeting minutes in Appendix E		
September 14, 2011, the project team made a follow up presentation to OIBC to update the Council on the results of the descendant discussions	City representatives	Reiterated the situation requiring the wastewater replacement at Kualoa Regional Park as the current system of “holding tanks” is not in compliance with DOH standards and will need to be replaced with a wastewater system that will eliminate and prevent wastewater discharges into the ground or state waters at Kualoa Regional Park.

Date and Purpose	Attendees	Comments
	Kennedy & Jenks	Discussed with the Kualoa lineal descendants why alternatives such as a “living machine” treatment system would not work in this situation, as it would require 4 to 5 times more area than compared to the proposed aerobic treatment system.
	CSH	CSH presented their proposed AIS testing locations for the current wastewater treatment design and why these locations were chosen, and it was noted that the trenches are subject to change per CSH discretion.
	Group 70	Reiterated the EA process
	Aukahi	Facilitated the consultation meeting
	OIBC	Council recommended that the AIS move forward in close coordination with the descendants. Before the AIS work started, the team sent out letters to the descendant and followed up with phone calls to notify the lineal descendants that work was beginning and subsequent notifications were made to the descendants on the results of the excavation work.
*See full meeting minutes in Appendix F		
November 14, 2011, another meeting was held with the lineal descendants to present the archeological findings of the AIS, and discuss the lineal descendants’ preference of how they would like the discovered cranial fragment to be treated.	City representatives	Provided information on the existing temporary curation facility and re-interment facility.
	Kennedy & Jenks	Provided details that a 2 – inch sewer force main is planned to be located where the *iwi kūpuna* cranial fragment was found.

Date and Purpose	Attendees	Comments
	CSH	Presented their findings of the AIS, showing locations of trenches and the human cranial fragment find. CSH detailed that the cranial fragment was found within “disturbed sandy sediments above the intact cultural layer” and this particular burial could have been disturbed during previous construction – either the construction for Comfort Station #2 or the utility work for Comfort Station #2.
	Group 70	Indicated that info would be provided in DEA and FEA.
	Aukahi	Provided a summary of events to complete the Historic Preservation Review Process. • Preferred treatment will be included in a form of a burial treatment plan, but since the *iwi kūpuna* was found during the inventory survey, the final decision will rest with SHPD, although the OIBC would also be consulted with on the burial treatment plan. • The cranial fragment find might need to be advertised for three days in December, with a waiting period of 30 days for the public to make a claim of relationship or knowledge of the *iwi kūpuna*. • The OIBC may hear and review claims of genealogy in February 2012.
	Kualoa lineal descendants	Ms. Gladys Pualoa-Ahuna and Mr. Ahi Logan expressed that their preferences for burial treatments of the discovered cranial fragment would be to move the *iwi kūpuna* to the temporary City facility and then to re-inter the *iwi kūpuna* at the on-site re-interment facility at a later date. Mr. Calvin Hoe initially stated that he would need more time to discuss this matter with his family before he could state any preference, however, Mr. Hoe later agreed that removal and re-internment of the *iwi kūpuna* in the on-site facility would be appropriate.
*See full meeting minutes in Appendix G		

Section 4 Background Research

4.1 Overview

The Kualoa Regional Park is located in the *ahupua‘a* of Kualoa at the northeastern-most portion of the *moku* (district) of Ko‘olau Poko (short Ko‘olau), on the island of O‘ahu. Ko‘olau, which means “windward,” is indicative of its location on the windward side of the island. The *ahupua‘a* of Kualoa marks the division between the larger *moku* of Ko‘olau Loa (Long Ko‘olau) and the smaller district of Ko‘olau Poko and is situated between Ka‘a‘awa on the northeastern end and Hakipu‘u on the southeastern end. The eastern portion of the *ahupua‘a* is bounded by ocean, and the Ko‘olau Range marks the western boundary.

Pukui et al. (1976:84) describe Kualoa as a: “Land division, point and beach park, an area anciently considered one of the most sacred places on the island. When a chief was here, all passing canoes lowered their masts in recognition of his sacredness. A place of refuge was here. ‘Lit. Long back.’”

In 1974, the entire *ahupua‘a* of Kualoa was placed on the State and National Registers of Historic Places (State Site No. 50-80-06-528). The register forms assert that Kualoa was considered one of the two most sacred places on the island of O‘ahu (along with Kūkaniloko). The register forms focus on Kualoa’s import as a symbol of sovereignty and independence for O‘ahu, its role as a place of refuge, its role as a place where sacrificial victims for religious rituals were drowned, and its history as a sacred residence of chiefs. Kualoa is significant in Hawaiian folklore and mythology including traditions of Papa and Wākea, Hāloa, Pele, Hi‘iaka, Kamapua‘a and *mo‘o* (lizards/dragons). Kualoa is also significant in its association with historic personages in the Judd and Wilder families and for its role in the early history of sugar production on O‘ahu. Nearly a hundred burials have been reported from Kualoa and, thus it must also be considered to be a significant Hawaiian burial ground.

4.2 Traditional and Historical Background

4.2.1 Mythological and Traditional Accounts

Traditional accounts and Hawaiian language newspapers detail several cultural traditions at Kualoa, including the use of the land as a *pu‘uhonua* (place of refuge), the lowering of sails, and sacrificial drowning.

4.2.1.1 Pu‘uhonua

Pu‘uhonua are places of refuge where *kapu*-breakers or non-combatants during times of war could find culturally sanctioned asylum and safety from which they might be allowed to leave at a later time and reintegrate within society. According to Kamakau, ruling chiefs were regarded as *pu‘uhonua* incarnate. Their lands (*‘āina pu‘uhonua*), as well as their consorts and deities, were also regarded as sacrosanct. Ten places on O‘ahu were regarded as *pu‘uhonua*, six of which were in the Ko‘olau districts. One of several such sanctuaries was the ahupua‘a of Kualoa (Kamakau 1992:17–18). As Shideler and Hammatt (2007:62) detail, however, there is a notable lack of reference asserting that Kualoa was a *pu‘uhonua* other than Kamakau, especially among

Hawaiian language newspaper accounts.

4.2.1.2 Lowering Sails

In ancient times and today, voyagers and sailors passing by Kualoa honored its sacred land of high chiefs by lowering their canoes’ sails (Fornander 1919, Vol. IV:370). This is tradition is associated with the ruling chief Kūali‘i:

> During his youth Kūali‘i was brought up sometimes at Kailua, at other times at Kualoa. One of the special tabus attached to Kualoa, whenever the chief resided there, was that all canoes, when passing by the land of Kualoa, on arriving at Makawai, should lower their masts and keep them down until they had passed the sea off Kualoa and got into that of Ka‘a‘awa. I note the tabu and the custom, but I am not certain of the underlying motive. It may have been a religious observance on account of the sacred character of the “Pali o Kualoa,” or a conventional mode of deference to the high chief residing there. It was strictly observed however, and woe to the infractor of the tabu (Fornander 1969:278).

4.2.1.3 Sacrificial Drowning

Ritualized drowning is commonly associated with Kualoa through *mo‘olelo* of Hi‘iaka’s transit of Kualoa and ruling chiefs (*Ka Loea Kalaiaina* 1899; *Ka Loea Kalaiaina* 1900; *Ka Na‘i Aupuni* 1906; Fornander 1917, Vol. IV:549; *Hōkū o Hawai‘i* 1926), as well as the following ‘ōlelo no‘eau: “Ka limu lana o Kawahine,” which Pukui (1983:156) translates as “The floating seaweed of Kawahine,” and glosses as “A term applied to the *kauwā* who were drowned at Kualoa, O‘ahu, before serving as sacrifices.” The practice of *kauwā* sacrificial drownings at Kualoa may have resembled those of Kewalo, in which priests performed the drowning and designated the *kauwā* for a *heiau* associated with a form of the deity Kāne (Shideler and Hammatt 2007:73).

4.2.2 Mid- to late-1800s

4.2.2.1 Māhele Awards

The process of the *Māhele* (division of lands) in 1848 introduced private property to the Hawaiian people and reformed the ancient land tenure system in Hawai‘i. All lands were identified and classified as Crown Lands, Government Lands, or Konohiki Lands and all lands were subject to the right of native tenants. Prior to 1848, native tenants were unable to hold title to lands in fee simple. In 1850, the Kuleana Act was passed to further define and protect native tenant rights because of questions that arose as the chiefs and *konohiki* began selling off portions of their lands awarded to them. All land claims were heard before the Land Commission (a committee of five), the land surveyed and expert testimony given regarding the claim. The burden of proof was on the native tenant to prove the land he/she was claiming was actually cultivated for a living. Approximately 1,500,000 acres were allotted to the “government and people,” however, the sum of the native tenant awards (*kuleana*) were less than 30,000 acres (Chinen 1958:31).

At the *Māhele*, Kamehameha III (Kauikeaouli) claimed the entire Kualoa Ahupua‘a (Kualoa 1

and Kualoa 2) to be part of his private lands. On November 20, 1850, Gerrit P. Judd bought Kualoa 1 and Kualoa 2, a total of 622 acres, from Kamehameha III. The deed also included Mokoli‘i Island and the adjoining fishing grounds.

The *maka‘āinana* received their *kuleana* awards (individual land parcels) in 1850 and thereafter. There were 37 LCA *kuleana* claims filed within Kualoa Ahupua‘a, of which 35 were awarded (Figure 7 and Table 2). Some of these claims also had multiple ‘*āpana* (lots) in nearby Hakipu‘u, Waikāne, Ka‘a‘awa Ahupua‘a, and even as far as Waipi‘o. Claims consisted of a pā hale (house lot), *lo‘i kalo*, and *kula ‘āina* (field or pasture land). Records show that the most commonly grown crops in the Kualoa region were sweet potato, *wauke* (paper mulberry), beans, and melons. The majority of *pā hale* (25 homes) were located near the coastline. Of these homes near the shoreline, five were located within the boundaries of Kualoa Regional Park and two bordered the project area: LCA 3011 (Mahiole) and LCA 3052 (Kaneakalau). The remainder (ten homes) were located further inland near their *lo‘i kalo* or *kula ‘āina*. Of the homes located further inland, eight were located within the boundaries of Kualoa Regional Park, as well as 11 *lo‘i kalo* and two *kula‘āina* within the park. The remaining 26 *kula ‘āina* parcels were located outside of Kualoa Regional Park, closer to the Ko‘olau Mountain Range, spanning from the Hakipu‘u Ahupua‘a boundary to Kānehoalani Ridge (Waihona ‘Aina 2000).

In 1855, the first tax records for Kualoa lists 59 names (45 males and 11 females). The elderly and young children were not assessed taxes, and it should be noted that there were probably more than 59 people living at Kualoa in 1855. However, the numbers do help to show trends and give a frame of reference to the increase or decrease in population. The 1863 records show a slight increase (69) in population, with the numbers steadily rising and peaking in 1866 (the height of the sugar industry at Kualoa), with 143 people listed. From 1866 onward, the numbers show a diminution in population. By 1871, the numbers drop to 70, or less than half of what it was in 1866. This pattern could be related to the start of the O‘ahu Plantation at Kualoa in 1863 and to its demise in 1871. By 1880, there were only 15 people listed on the tax records for Kualoa. There could be several explanations for this. After the close of the sugar operations at Kualoa, people migrated closer to areas of activity, such as Honolulu, in search of jobs and better economic opportunities. Another explanation for this could be that, for whatever reason, the *kuleana* at Kualoa became absorbed by the Judd family and Kualoa Ranch. Bureau of Conveyance records seem to indicate that the majority of the *kuleana* were sold to the Judd family.

4.2.2.2 O‘ahu Plantation (Kualoa Sugar Plantation, Wilder’s Plantation)

In 1863, the partnership of Charles H. Judd, Samuel G. Wilder, and Gerrit P. Judd had enough capital and lands in Kualoa, Hakipu‘u and Ka‘a‘awa to launch the Kualoa Sugar Plantation, which began with 627 acres under cultivation (*Star-Bulletin* December, 1925). The Civil War in the United States had created quite a demand for sugar with attendant rise in price. Unfortunately for the plantation, its period of sugar production was during a depression in sugar prices that occurred between the end of the Civil War and the great boom following the Reciprocity Treaty of 1876.

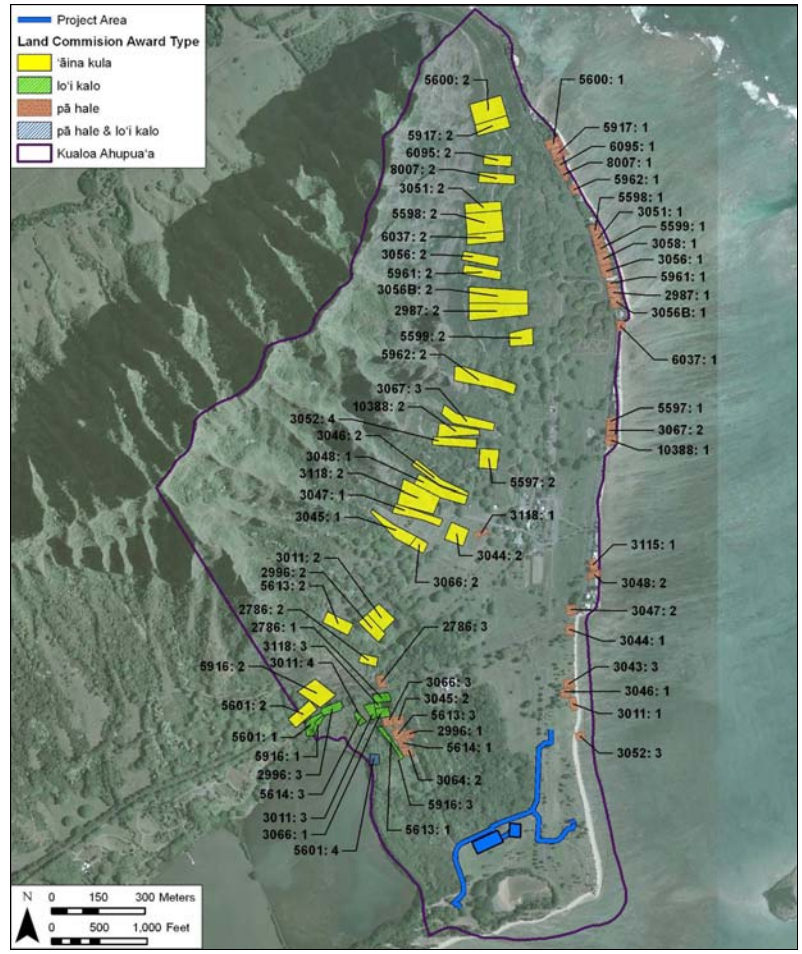


Figure 7. LCAs in Kualoa (base image, 2007 Google aerial)

Table 2. LCAs in Kualoa

LCA	RP	Claimant	Ahupua‘a	Land Use	Notes
2786	617	Ma‘alea	Kualoa	House lot, *lo‘i*, sweet potatoes, *wauke*	
2987	1431	Laumania (Laumanea)	Kualoa Hakipu‘u	House lot, *‘āina kula* (two *‘ili* in one piece), *lo‘i*	
2996	492	Nawahinekaunu	Kualoa	House lot, sweet potatoes, melons, *wauke*, *lo‘i*	
3011	620	Mahiole	Kualoa	House lot, sweet potatoes, *lo‘i*	Unclear reference to a pond; located in the Project area
3043	499	Kapi‘ioho (Kapi‘ipo)	Haikupu‘u	House lot	
3044	6952	Kamakai	Kualoa	House lot, sweet potatoes, *wauke*	
3045	6950	Keli‘iokahonua	Kualoa	House lot, sweet potatoes, *wauke*	
3046	1126	Kamanu	Kualoa	House lot, 2 *‘ili kula*, partially cultivated	
3047	624	Kauaiwahine	Kualoa	House lot, sweet potatoes	
3048	616	Kekihe	Kualoa	House lot, sweet potatoes	Claimant died in 1848, leaving his land to his child Analuhi
3051	621	Keli‘ikuhiau (Keli‘ikuiau)	Kualoa Hakipu‘u	House lot, *‘āina kula*, *lo‘i*	
3052	292	Kaneakalau	Kualoa	House lot, *lo‘i*, sweet potatoes, *wauke*	Located in the Project area
3056	481	Kailihewa	Kualoa	House lot, sweet potatoes, *wauke*	
3056B	482	Kona‘aihele	Kualoa Haikpu‘u	House lot, sweet potatoes, *lo‘i*	
3057	N/A	Kaiwinui			Not awarded
3058	487	Kuewa	Kualoa Hakipu‘u	House lot, *lo‘i*	

LCA	RP	Claimant	Ahupua‘a	Land Use	Notes
3064	1134	Kaulahea	Hakipu‘u	House lot, *lo‘i*	
3066	618	Kae	Kualoa	House lot, *lo‘i*, *wauke*	Claimant died in 1849, leaving his land to his sister Wahinenui
3067	485	Kukolo (Kukola)	Kualoa	House lot, sweet potatoes, *lo‘i*	Pā hale distinct and enclosed with an adobe fence
3115	615	Kamaohao (Namakaohao)	Kualoa Hakipu‘u	House lot	
3118	65	Haole		House lot, sweet potatoes, *lo‘i*	Pā hale included in the *‘āina kula*, not enclosed
5597	627	Keanu	Kualoa	House lot, sweet potatoes, *wauke*, *lo‘i*	
5598	488	Kanakanui	Kualoa Hakipu‘u	House lot, *‘aina kula*, *lo‘i*	Died, date unknown. Left his land to his son, Newa.
5599	489	Kua	Kualoa Hakipu‘u	House lot, sweet potatoes, *lo‘i*	Inherited land from his brother
5600	491	Konohili	Kualoa	House lot, sweet potatoes, *wauke*, *lo‘i*	Pā hale, *makai* of the road, enclosed with a mud wall
5601	484	Kau	Kualoa	House lot, sweet potatoes, melons, *lo‘i*	
5613	290	Kamali‘i	Kualoa	House lot, sweet potatoes, *wauke*, *lo‘i*	Claimant died in 1848, leaving his land to his wife Po‘opu‘u
5614	291	Kepa‘a	Kualoa	House lot, sweet potatoes, *lo‘i*	Lo‘i includes a fish pond in Hakipu‘u. Kepa‘a is the caretaker; however, the King’s land agent claims the fish pond
5916	483	Pupuka	Kualoa	House lot, sweet potatoes, *lo‘i*	Inherited land from Kamakahonu, a former

LCA	RP	Claimant	Ahupua‘a	Land Use	Notes
					Konohiki
5917	486	Po‘ohiwi	Kualoa Hakipu‘u	House lot, sweet potatoes, *wauke*, *lo‘i*	Claimant died in 1848; his brother Kakiana was the heir; Kakiana became the caretaker of claimant's land, wife, and child
5953	none	Mahina	Kualoa		Claimant died in 1848; Hulue took the children to Ka‘a‘awa to live; the land was returned to the konohiki of Kualoa as the claimant did not have any relatives to go to the *po‘alima* or to work the land.
5961	622	Mahoe	Kualoa	House lot, sweet potatoes,	
5962	626	Maliu	Kualoa	House lot, sweet potatoes, *lo‘i*	
6037	623	Aweau	Kualoa	House lot, sweet potatoes	Claimant received land from Kamakahonu, a former Konohiki; claimant died in 1848, widow abandoned the land; a relative named Newa has reclaimed the property.
6095	490	Ululani	Kualoa	House lot, previously planted in sweet potatoes	Due to the claimant being ill, the witness stated the two ‘ili were not planted at the time the statement was given
6949	none	Kona‘aihele	Kualoa	House lot, sweet potatoes, *lo‘i*	
8007	619	Aihulu	Kualoa Ka‘a‘awa Hakipu‘u	House lot, sweet potatoes, *wauke*, *lo‘i*	
10388	493	Nalino	Kualoa Hakipu‘u	House lot, sweet potatoes, *lo‘i*	

Elizabeth Kina‘u Wilder (daughter of Gerrit P. and Laura F. Judd), relates that she and her husband (S. G. Wilder) and their three first-born children, Willie, Laura and *Kauka* (Gerrit P. Wilder), her brother Charley Judd, S. G. Wilder's sister Emilita Wilder and brother John Wilder moved to Kualoa in 1864 (Wight 1909:132-133). It seems the eight of them had a great affection for Kualoa, with Elizabeth recording: "A more beautiful or peaceful scene it has never been my lot to gaze upon" (Wight 1909:132). There were drawbacks, however, as "the flies [could be] intolerable" by day, and the family slept under mosquito nets at night (Wight 1909:104, 136). She recorded that in 1864

> My husband [Samuel G. Wilder] and father [Gerrit P. Judd] had become partners in a new plantation they intended starting. A mill was built on the extreme point, [Samuel G.] Wilder and John [Wilder] with their own hands, after three unsuccessful attempts, erecting the stone chimney. Fields were fenced and plowed for the cane, small flumes were put up, Chinese coolies imported as laborers, and it rapidly assumed a very plantation like aspect [Wight 1909:133].

An account published in the *Pacific Commercial Advertiser* (2/18/1865) provides our best description of the plantation at its peak:

> . . . we come to the Kualoa estate of Messrs. Judd & Wilder, now called the Oahu Plantation." Including Ka‘a‘awa, it consists of about four thousand acres . . . [we now see] a beautiful field of cane growing, about two hundred acres in extent, with extensive mill buildings erected and powerful machinery driven by steam. This change has all been made within the last fifteen months, and shows what industry and determination can accomplish, like much of the land on this side of Oahu, the cane fields here consist of rich bottom-land, lying just above the level of high tide. So near the surface is the water, that the roots of the cane find moisture all the year around, reducing the risk of drought very much. The soil like that of Lahaina, Waikapū and Wailuku receives its deposits of rich alluvium from the mountains in the rear.
>
> Two spacious stone buildings, each 80 x 124 feet, located near the point and beyond the dwelling about one mile, have been erected for the manufacture of sugar. The stone was brought from the foot of the mountain, only a few hundred yards inland, while the lime was burned from coral stone procured in the sea. The cost of this large and permanent building thus scarcely exceeds that of a wooden one. The machinery consists of that which was used on the Union Plantation at Makawao, with such improvements and additions as experience has shown to be necessary. We found the mill in operation; though all the works are not yet complete. Mr. Wilder hopes to get off three tons per day, after the first of March, by running night and day. The entire crop this season will be between two hundred and fifty and three hundred tons and during the present year the extent of land put into cane will be increased to about four hundred acres.
>
> About eighty laborers are employed on the estate, and we learned from the proprietors that they find no difficulty obtaining all that are required. Mr. Cording also assured us that he had refused over one hundred applications for labor. This certainly indicates anything but a scarcity of labor. So far as we could learn, there

> is an abundance of field hands everywhere and when overseers treat their men as they should be treated, no cause of complaint is found. Near the Oahu Plantation mill, we found rows of neat little houses erected for the native workmen, many of whom are permanent residents on the estate, who find it for their interest to engage as laborers on it.

4.2.3 Twentieth Century

Historic maps from the period from 1913 to 1967 depict the rise and decline of habitation, land use and infrastructure in what is now Kualoa Park today (Figure 8 to Figure 12).

4.2.3.1 Kualoa during World War II

Immediately after December 7, 1941, the army viewed Kualoa as a strategic position for protecting Kāne‘ohe Bay and the Navy airbase on Mōkapu peninsula (Dorrance 1993:6). “Kualoa Ranch offered the lands free-of-charge to the Army providing they were returned in their original condition at the end of hostilities” (Dorrance 1993:6). There were at least four major military uses of Kualoa during World War II: as an air strip for fighters and bombers; as a place for coastal fortifications including bunkers, a control center and strung barbed wire; as a center for motor vehicle maintenance; and, as a barracks and recreation center.

A grassed emergency airstrip was built parallel to the East Beach of Kualoa in the late 1930s (Gunness 1987a:30). At the beginning of World War II, the United States army took over Kualoa Ranch and bulldozed a strip 6,000 ft (feet) long and 150 ft wide by April, 1942. About 1800 ft of the air strip was south of the present Kamehameha Highway, with the majority of the airstrip extending to the northeast, running about 2200 ft northeast (behind or west) of the sugar mill ruin (Figure 14 and Figure 15). Gunness (1986:9) relates that “local residents have reported that in bulldozing for the airstrip, a number of human burials were disturbed; but unfortunately, no records were kept concerning their discovery and disposal.” The grass and dirt were covered with perforated metal plates (“Irving Steel Grid Mat”; Figure 16) to form a steel landing-pad, and grass was planted in the mesh. The airstrip extended across the main road (present Kamehameha Highway) “and whenever the planes took off they’d have to block traffic (Francis Morgan, pers. communication). From May to October 1942 the 19th Fighter Squadron operated from the airfield and was followed in September to November of 1942 by the 31st Bombardment squadron (Dorrance 1993:6). Aircraft used included B-18 bombers, P-40 fighters and later P-38s (Dorrance 1993:6 (Figure 17).

A US Army Museum of Hawaii photograph (#2611b) dated May 10, 1942 appears to show both P-38s and B-18 bombers, indicating that bombers were operating out of Kualoa before the 31st Bombardment squadron was stationed there (Figure 18). A US Army Museum of Hawai‘i photograph circa 1945 (#2757, Figure 19) shows a P-38 in camouflage revetment at Kualoa.

It is said that bombers from the Kualoa airfield actively participated in the Battle of Midway (Dorrance 1993:6). Midway lies however some 1,309 miles from Honolulu Airport and would have been too far for the standard B-18 to have made it back (range 2225 miles ferry - Wagner 1968:111) without refueling. The Kualoa airstrip was continued in use until 1951 to train pilots (Gunness 1987a:30).

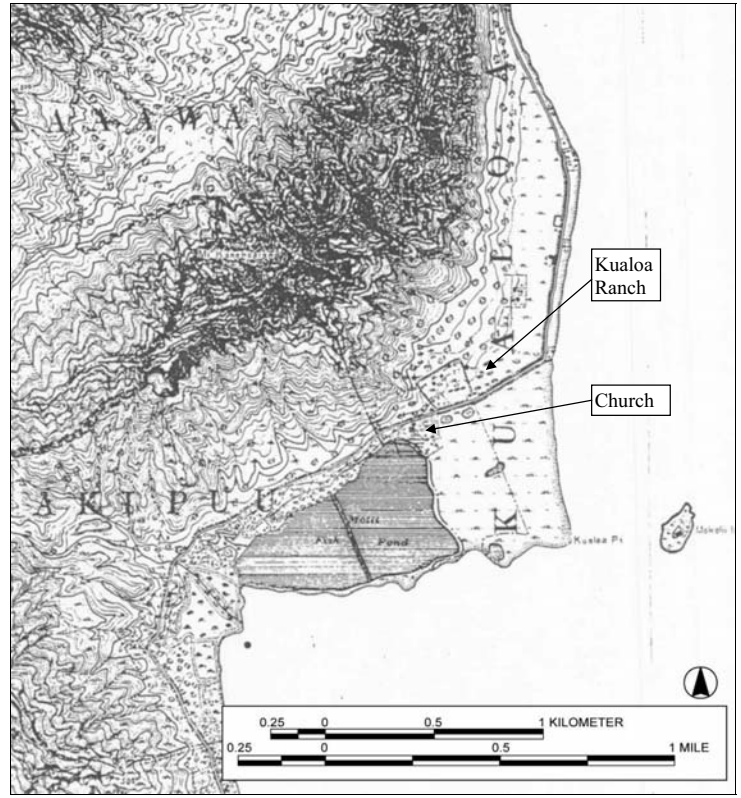
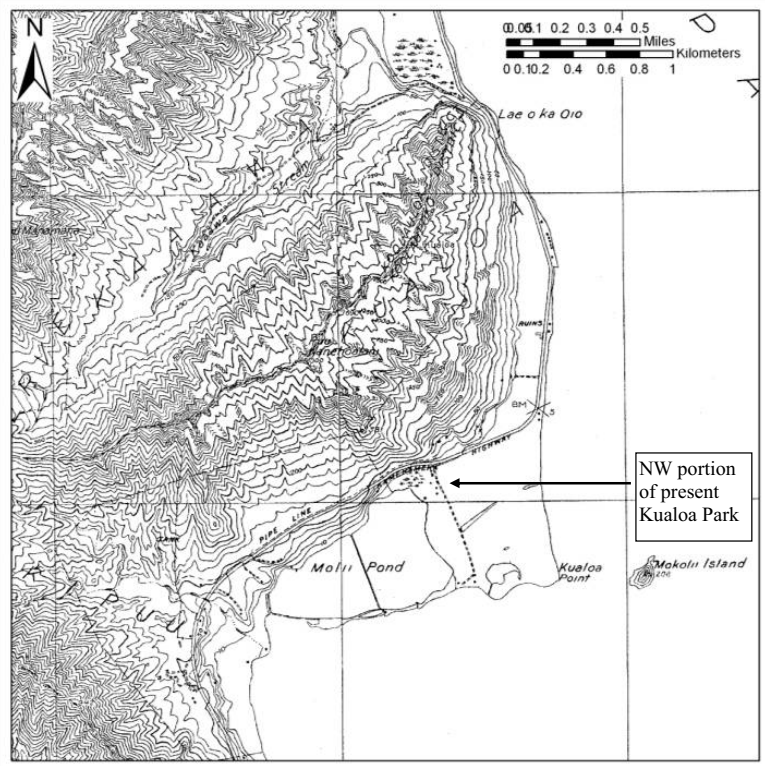


Figure 8. 1913 U.S. Geological Survey map, showing wide-open area with little habitation or trees in what is now Kualoa Regional Park

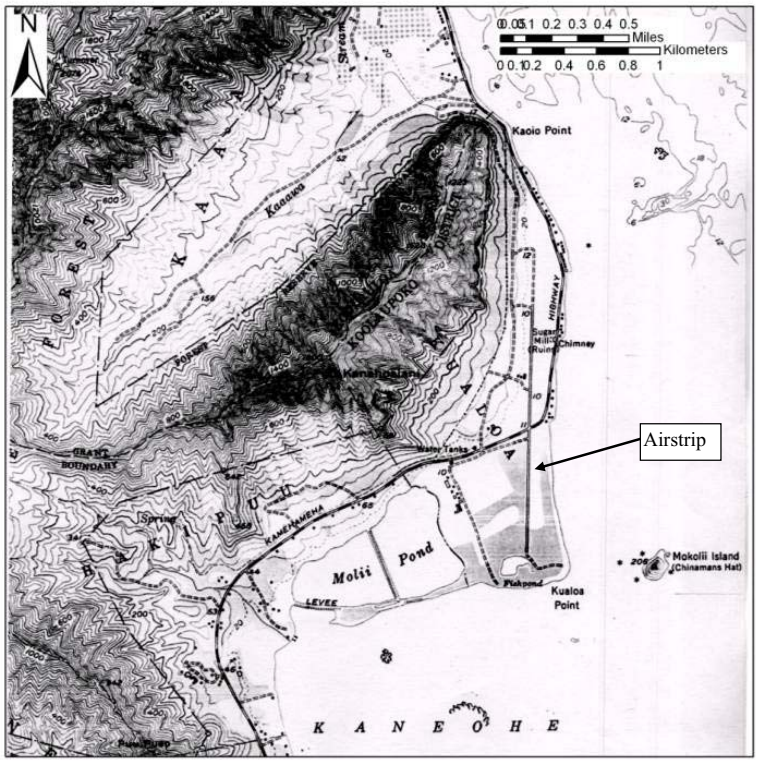
Map Georeferenced to the 1993 Kahana USGS 7.5 ' minute quadrangle UTM NAD 83 Zone 4N

Figure 9. 1922 U.S. Geological Survey Kāne‘ohe quad map, showing more houses, especially in the northwest corner of the present park near the church and increasing ranch infrastructure *mauka* of Kamehameha Highway



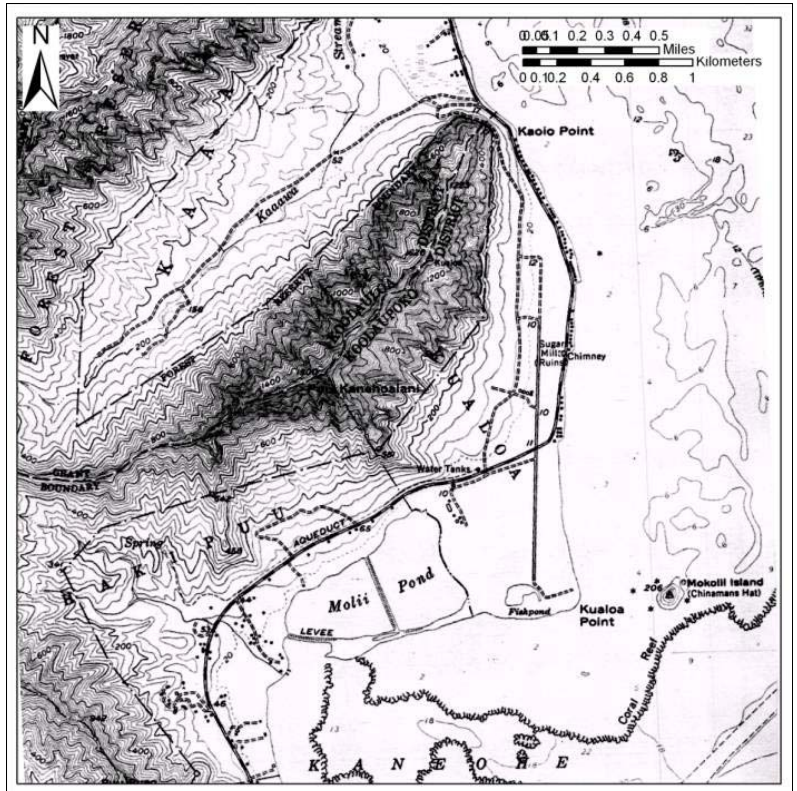
Map Georeferenced to the 1993 Kahana USGS 7.5 ' minute quadrangle UTM NAD 83 Zone 4N

Figure 10. 1928/1930 U.S. Geological Survey Waikāne quad map, which shows fewer houses in the northwest portion of the existing park



Map Georeferenced to the 1993 Kahana USGS 7.5 ' minute quadrangle UTM NAD 83 Zone 4N

Figure 11. 1954 U.S. Geological Survey Kahana Quad map, showing the former airstrip and extensive infrastructure in the northwest portion of the park and extensive development along the coast to the north



Map Georeferenced to the 1993 Kahana USGS 7.5 ' minute quadrangle UTM NAD 83 Zone 4N

Figure 12. 1967 U.S. Geological Survey Kahana Quad map, showing less infrastructure in the present Kualoa Regional Park

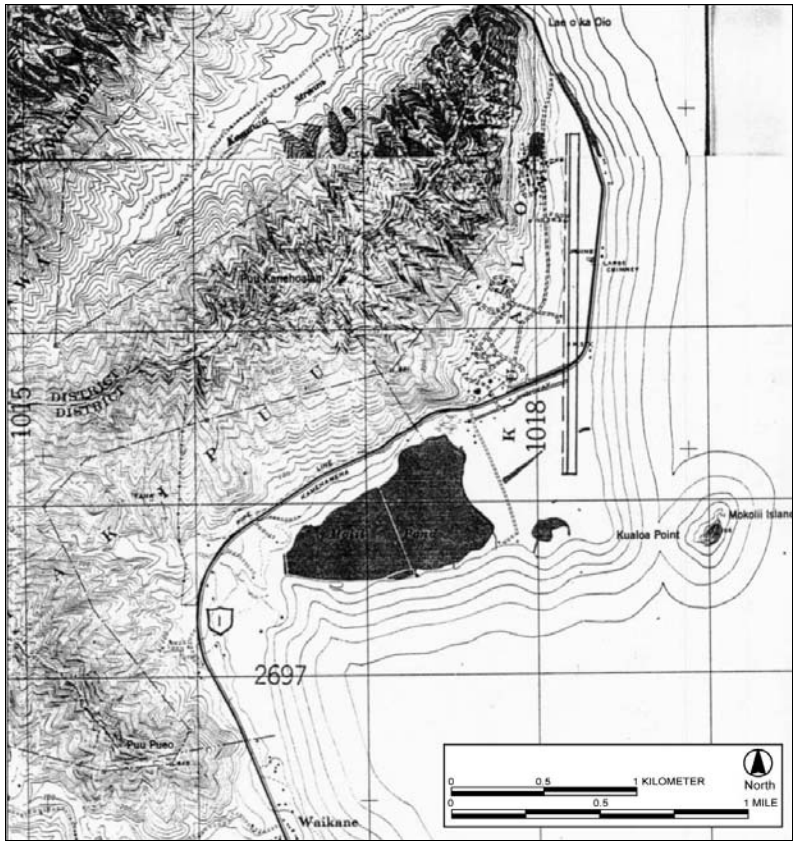


Figure 13. 1943 U. S. Army Corps of Engineers Kahana and Kāne‘ohe quad maps, showing the airstrip and extensive army infrastructure

Figure 14. Aerial view of Kualoa, circa 1943, showing the airstrip and extensive infrastructure (Courtesy of U.S. Army Museum of Hawai‘i)

Figure 15. 1945 aerial view of Kualoa Point showing a portion of the airstrip and military infrastructure (photo from U.S. Army Engineer District Honolulu 1977:C-4)

Figure 16. A 1944 photo showing Lockheed P-38 fighter (top left) and “Irving Steel Gridmat” (Courtesy of U.S. Army Museum of Hawai‘i)

Curtiss P-40 “Hawk Fighter (from Wagner, 1968:208)

Douglas B-18 Bomber (from Taylor, 1969:485)

Lockheed P-38 “Lightning” Fighter (from Taylor, 1969:511)

Figure 17. Types of aircraft based at Kualoa Air Base during World War II (photo from Dorrance 1993:6)

Figure 18. Aerial view of north portion of Kualoa airstrip during World War II showing extensive camouflaged bays for aircraft (Courtesy of U.S. Army Museum of Hawai‘i)

Figure 19. Photo showing a P-38 fighter at Kualoa, bottom right (Courtesy of U.S. Army Museum of Hawai‘i)

A series of ten aircraft “bays” were excavated perpendicular to the runway, back into the hill side north of the old mill ruin, to shelter bomber-sized aircraft. Five smaller bays were excavated into the hillside in back of the old mill for other storage purposes. These aircraft bays were covered with camouflage netting. The Army also parked two rows of aircraft near the southern end of the runway, towards Kāne‘ohe for maintenance (Dorrance 1996:18). Photos suggest that barbed wire was strung off shore parallel to the coastline along the airstrip.

A coast artillery battery consisting of two six-inch guns was established above Laeoka‘ō‘io Point. These guns could pitch a 105-pound armor piercing shell sixteen miles (Dorrance 1993:4). These guns were said to have been “turret guns from the aircraft carrier U.S.S. Lexington (Fullard-Leo 1997:21). “Over 20,000 square feet of tunnels behind the guns contained electrical power generators, a galley, latrine, first aid and radio rooms, sleeping quarters, radio and radar apparatus and ammunition magazines, all protected from poison gas attack by air locks” (Dorrance 1996:18). In 1946, after the guns had been removed, the battery was named Battery Cooper. Concrete bunkers were constructed in the uplands of Kualoa to protect parked airplanes. Numerous small fortifications were established from the edge of the shore to the base of the steep *pali*. A series of small cement pillboxes were constructed on the edge of Mōli‘i Pond.

4.2.3.2 Kualoa Erosion Control

Beach erosion at Kualoa has a direct impact on the archaeological and historical features of the area. Recent erosion has resulted in considerable loss of land and associated subsurface remains. A determination of patterns of beach erosion in the past would aid in determining the configuration of the land in traditional times and would also aid in the interpretation of coastal archaeological features. Thus it seemed appropriate to present a brief overview of the known history of erosion at Kualoa.

During the winter of 1973 - 1974, Kualoa Regional Park suffered from extreme erosion with the beachfront at the Point being reduced fifty feet (*Star-Bulletin*, 12/31/1977:E1). On February12, 1974, the Water Transportation Facilities Division, Department of Transportation, State of Hawai‘i, made a request on behalf of the City and County of Honolulu, Department of Parks and Recreation to the US Army Corps of Engineers, Honolulu Engineer District for conducting and coordinating a beach erosion control study. This resulted in the production of the first major erosion study: *Detailed Project Report, Beach Erosion Control and Final Environmental Statement, Kualoa Regional Park, Oahu, Hawaii* (Connolly 1977). This study notes that most of Kualoa peninsula consists of “unconsolidated marine calcareous sediments, chiefly cream-colored and light tan, very permeable beach sand consisting of grains of worn coral, coralline algae, and shells with appreciable amount of foraminifera and other calcareous marine organisms.” The primary natural forces acting on these unconsolidated deposits are northeast trade waves and North Pacific swells which “cause littoral material to move in a southerly direction” (Connolly 1977:B-3).

Wind and wave-induced currents move sand in a clockwise direction, southerly along the east shore and westerly on the southern shore. A sand tracing study using fluorescent dye indicated migration velocities of 10-30 feet per day (Connolly 1977:B-3). It is estimated that between 1949 and 1975, the Kualoa Regional Park lands lost approximately 6 acres or 80,000 cubic yards of sand. In this documented period, erosion was relatively uniform and substantial

along the expanse of East Beach, and was most severe at Kualoa Point. The average loss of beach width in this area has been over 120 feet, representing a loss of approximately 124,000 cubic yards of sand. There has been some net accretion of sand along South Beach (estimated at 44,000 cubic yards), but the pattern along South Beach appears more variable and fluctuating. The net pattern has been substantial loss for the Park (there has been substantial sand accretion on Mōli‘i Fishpond Wall just west of the park). On average, between 1949 and 1975, the eastern shoreline of the Park receded at a rate of about four feet per year, and in the vicinity of the point the shoreline has receded at a rate of about seven ft per year.

Because of the important and unique cultural and recreation resource represented by Kualoa Regional Park, and because of the high rate of loss due to erosion, the Army Engineer District concluded that a “no action” or “do nothing” approach was unacceptable (Erosion Study 1977:D-4). A short-term plan and a long-term plan were suggested. As an interim measure, the City and County was to construct a line of concrete blocks parallel to shore in an attempt to entrap sand and build back sections of the east beach (Erosion Study 1977:D- 8). The Army Engineers’ long-term “Protective Beach Plan” (“the Selected Plan”; Sections E, F & G of the 1977 Erosion Study) suggested constructing a 3,500-foot long protective beach utilizing 45,000 cubic yards of sand which would then require sand replenishment estimated at 18,000 cubic yards every four years. This would involve the massive hydraulic suction dredge or hydraulic pumping of a sand slurry from an off-shore sand deposit, 1,000 ft south of Mōli‘i Pond to a 300 ft by 1100 ft work and storage area in the center of the Park, where the sand would dewater in an initial basin and the effluent settle in a second basin. The sand would then be trucked to the East Beach, dumped, and spread.

In the winter of 1977 the erosion was again particularly bad. During the month of December, eleven feet of beach width was lost in some areas, with five feet lost in just one weekend. City parks employee, Don Griffin asserted that: “the December losses at the beach park were the worst in recorded history” (*Star-Bulletin*, 12/31/1977:E:1).

In June of 1977 the Kualoa archaeologists met with Dr. Rob Hommon, State Historic Preservation Office archaeologist to discuss the effect of erosion on the archaeology of Kualoa. A subsequent (KARP 1977a:9) report articulated support for the Army Corps plan being proposed, but also called for the construction of a discontinuous breakwater (ten 200-ft sections each separated from the next by 200-ft) at the Point. An interesting aspect of this study was the articulation of the view that the offshore structure/fishpond near the Point “was functioning as a breakwater (or groin) preventing or reducing erosion along the east beach and the point” until such time (circa 1850) as it was destroyed by a combination of daily wave action and tsunami wave action (KARP 1977a:5, 8). Rather notably, this ancient Hawaiian construction bears striking similarity in shape, design, and location to the offshore breakwater design considered by the Army Corps (Erosion Study 1977: Figure D-1) (Figure 20).

In late November or December of 1977, the City and County interim measure discussed in the Federal Erosion Study was installed. This consisted of an approximately 150 ft-long “Sandgrabber system” constructed of hand-placed 3-ft high by 4-ft wide, concrete hollow blocks, tied together with steel bars that acted like a permeable sea wall, positioned in a gentle arc roughly parallel to the East Beach shore.

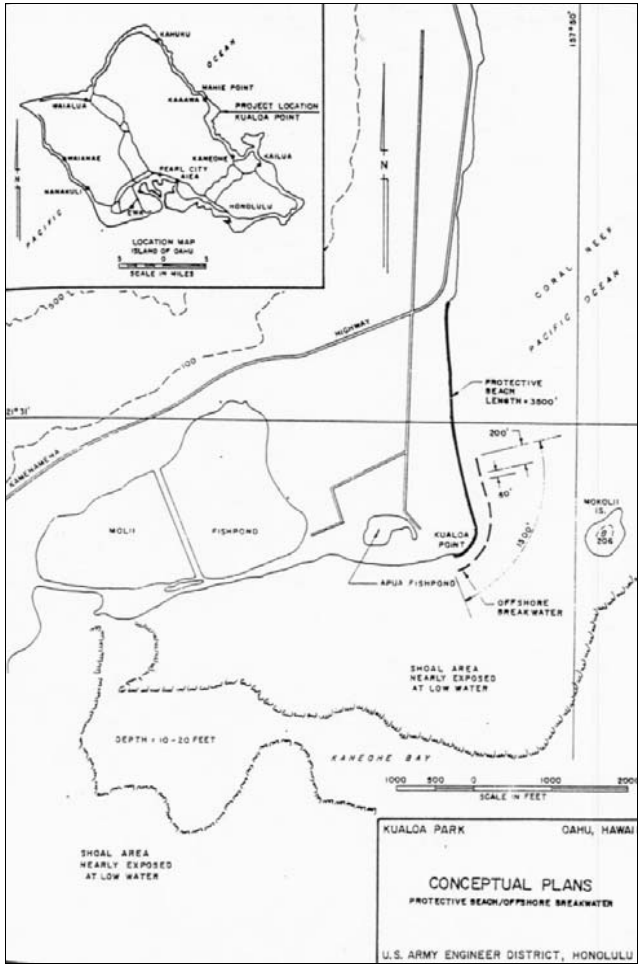


Figure 20. Map showing the offshore breakwater design by the Army Corps of Engineers to control erosion (photo from U.S. Army Engineer District Honolulu 1977:D-1)

Robert Connolly III, writing on behalf of the Kualoa archaeological research staff, documented the failure of this system. While the Sandgrabber did have notable positive effects in stopping erosion and accumulating sand in some areas, Connolly III maintained that it actually increased erosion over a distance of at least 150 meters Connolly maintained that after “a definite error in the original construction of the Sandgrabber” that “the problem was compounded when an additional section was added on the south end” (Connolly 1978:5-7). Connolly made several specific recommendations based on the seemingly reasonable conclusion that erosion is caused primarily by a south-flowing longshore current and not by the easterly current. During the winter of 1977, the city began research into a “Surgebreaker” system, which would function primarily by dissipating wave energy.

In December of 1984 the 381 Surgebreaker modules were installed by Highway Construction Company using a hydraulic backhoe. “The surgebreaker also [like the “sandgrabber”] was partially effective but down drift erosion continued” (*Star-Bulletin*, 11/24/1994:C:1).

While the Federal Erosion Study recommendations were not implemented *per se*, large volumes of sand were trucked in from Kahuku in two phases in July/August of 1990 and December 1990/January 1991 (Meeker 1991:2-3). By the time of the second phase of sand replenishment (five months after the first) the failure of the sand barrier effort was already evident (Meeker 1991:3, 10). The protective sand quickly had been swept away.

4.3 Previous Archaeological Research

The entire *ahupua‘a* of Kualoa was placed on the National Register of Historic Places in October, 1974. Kualoa Ahupua‘a was assigned State Inventory of Historic Places (SIHP) #50-380-06-528. The National Register form for Kualoa justifies the significance of the *ahupua‘a* on the basis that “the lands of Kualoa were considered to be a symbol of sovereignty (based on the Ka‘ōpulupulu tradition) and “the feeling of sacredness for Kualoa” expressed in traditions of Kualoa as a place for the training of chiefs, as a *pu‘uhonua*, where people fled to for protection, as a place for the drowning of sacrificial victims, and as a place in numerous legends (Hāloa, Pele, Kamapua‘a, Hi‘iaka, etc) (State Parks Division 1973). The sugar mill is cited as a remnant of the early sugar industry of O‘ahu. In sum, “Kualoa remains significant, even without physical remains of ancient sites, because of its central place in O‘ahu traditions and the feeling of the sacredness of the land, even by present day Hawaiians” State Parks Division 1973).

4.3.1 Summary of Archaeological Work within Kualoa Regional Park

In the following section archaeological work conducted within Kualoa Regional Park is summarized. Figure 21 provides the locations of archaeological finds within Kualoa Regional Park.

4.3.1.1 McAllister 1933

McAllister (1933:167-168) briefly describes five sites at Kualoa including: site 308, a faced terrace; site 309, Three rock forms; site 310, Niuola‘a Heiau; site 311, Mokoli‘i Island and site 312, Koholālele Pond.

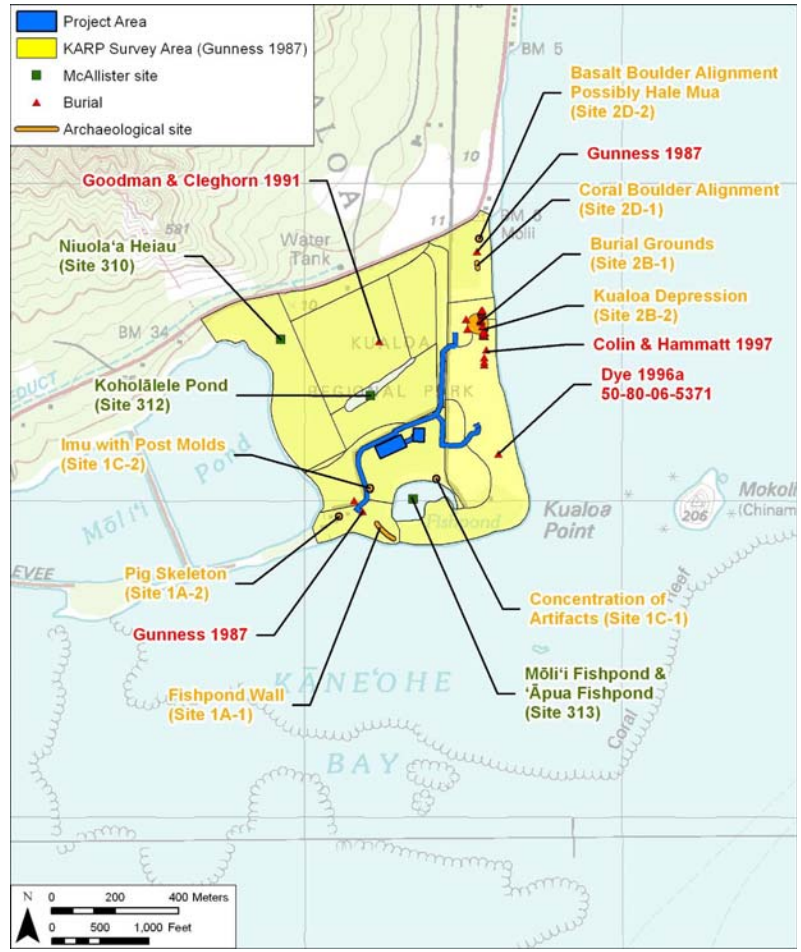


Figure 21. U.S. Geological Survey 7.5-Minute Series Topographic Map, Kahana (1983) and Kāne‘ohe (1998) quadrangles, showing the location of archaeological sites identified within Kualoa Regional Park

4.3.1.2 Ahlo 1980

The Corps of Engineers commissioned this study to evaluate the potential effects of earth moving equipment (associated with an erosion control project) on archaeological resources. “The intent of the study was solely to determine the depth of the cultural deposit in a very specific area.” About 43 small shallow holes were dug with a shovel at ten meter intervals along the beach edge and about 44 holes were excavated at ten meter intervals along a line parallel to and just back 7-8 m. from East Beach and about ten holes were dug perpendicular to the coast along proposed north and south access routes. This study documented two areas in which prehistoric cultural deposits appeared to be intact, one located from 35 m north to 35 m south of the fenced enclosure (the 1977 Dr. Hallett Hammatt U. H. field school site 2B-1, see Figure 21) and a narrow strip of a cultural layer 3 m wide and 350 m long along the northern-most portion of East Beach (these two cultural deposits were separated by a gap of about 70 m).

4.3.1.3 Gunness 1987

This M.A. thesis presents an overview of the setting and history of Kualoa and focuses on recounting the archaeological studies and findings at Kualoa by the Kualoa Archaeological Research Project (KARP) in the decade following its inception in December, 1974. Findings are typically presented by “Survey Area” using a number and letter designation for portions of Kualoa Regional Park (see Figure 22). Detailed discussions of human burials and material culture are presented. It should be noted that Gunness’ tentative conclusions regarding the gender ratio of Kualoa burials was subsequently refuted (Pietrusewsky and Douglas 1989). Noting the large number of artifacts recovered, Gunness postulates that Kualoa was an area particularly utilized for stone working and wood working - “a prehistoric industrial park” with “a second specialized use as a games field” or “chiefly playground.” Gunness delineates a chronological sequence for Kualoa, but the volcanic glass dates she based conclusions on are presently regarded as highly suspect. Gunness relates the archaeological findings at Kualoa to the oral tradition and concludes that “archaeological findings within Kualoa Regional Park do tend to support, and at least partially explicate, significant aspects of the oral traditions concerning Kualoa.”

4.3.1.4 Pietrusewsky and Douglas 1989

Describes the skeletal and dental remains of 41 prehistoric and 1 historic Hawaiian burials recovered from Kualoa Regional Park between 1975 and 1985. Only one of the burials (KUA-17) was believed to be historic based on the presence of buttons. One burial yielded a calibrated carbon date of 1400 - 1525 A. D. Many of these burials were recovered under salvage conditions as a result of sand erosion. Despite the small sample size, this report provides ther best picture of the paleodemography of the prehistoric Hawaiian community of Kualoa based on burials recovered and analyzed prior to 1889.

4.3.1.5 Kawachi and Johnson 1990

SHPD archaeologists responded to an inadvertent find of burials at East Beach eroding out of the sand bank south of the 1977 field-school site. The burials were reported by “Sy Lono” also referred to as “Sy Harris of the Temple of Lono” and were from the vicinity of the former

“Temple of Rono” occupation site along East Beach (1980s). Some bones were removed but others were seen and left *in situ*. All information suggests traditional Hawaiian interment.

4.3.1.6 Douglas 1990

The remains recovered were identified as belonging to seemingly seven individuals (two of the burials were represented by a single bone fragment). These were thought to represent two females of unknown age, a female age 25-30, a male age 35-40, a male age 45-50, and a child age 2-4. All information suggests traditional Hawaiian interment. When compared with the data developed by Pietrusewsky and Douglas (1989), certain traits again suggested familial affinity.

4.3.1.7 Goodman and Cleghorn 1991

In 1991, the Bishop Museum carried out archaeological monitoring of tree removal. Twenty-one palm trees, eroding from the East and South beaches, were removed and replanted in the Kualoa Beach Park tree nursery. During this process, two human burials were encountered: one at East Beach and one in the tree nursery. Replanting activities in the tree nursery also revealed the remnants of a historic stone wall and an adjacent row of postholes, believed to be a historic fence line.

The following indigenous and historic artifacts were also observed and recovered during archaeological monitoring: basalt flakes, a ground stone fragment, a fishook tab, a coral abrader, a worked bone fragment, glass bottle fragments, and metal, terra cotta and ceramic fragments.

4.3.1.8 Meeker 1991

This report summarizes archaeological monitoring accomplished in association with sand replenishment and tree transplanting projects. During phase I in July, 1990, large semi-trailer trucks brought sand from Kahuku and stock piled it in the central portion of the park near the tree nursery. Smaller dump trucks hauled the stored sand to the beach and there was no significant ground disturbance. Meeker reports however that photographs taken five months later “demonstrate that as a protective measure, the sand barrier was unsuccessful.

During phase II in January 1991 heavy rains and soft ground resulted in a shift of the stock pile area to just northwest of ‘Āpua Pond. Bulldozing associated with improving access to the new stockpile area was not monitored and subsequently a sparse scattering of shell midden, charcoal flecks, stone working debris and a few fragments of fire-cracked rock were observed in the disturbed area. In coordination with the State Historic Preservation Division, four shovel test units were excavated in the disturbed area to investigate the subsurface deposits in the strip. It was concluded that there had been an extensive midden and lithic scatter in the area but that it had been much disturbed over decades and that there was no evidence of intact cultural deposits. In phase III of the project, monitoring of the removal of twenty-two trees from the tree nursery documented four minor features. The report notes: “it can be demonstrated that the concrete surge breaker off shore and the replenishment of beach sand are inadequate solutions” for preserving archaeological deposits along east beach.

4.3.1.9 Somer 1991

Between August 7 - 9, 1991, Pat Wrath of Kualoa Park, and Paul Cleghorn and Lonnie Somer of the Bishop Museum recovered one eroding burial believed to be a traditional Hawaiian interment. Located just east of the northernmost comfort station (just south of the 1977 field school site), this interment was designated burial 68 as the 68th burial to be recovered from Kualoa Regional Park. In this same period of high surf and tides a variety of common artifacts, midden including pig bone and teeth, and three firepit features were also observed.

4.3.1.10 Cleghorn 1994

Relates the recovery of one eroding burial (burial # 76) of an adult directly west of the swale near the 1977 UH field school site.

4.3.1.11 Lee 1994

The discovery of an adze and firepit eroding out of the East Beach cultural layer were reported on in 1994. The exact location was not specified but photographs were included. A high rate of beach erosion was noted and documented in photographs.

4.3.1.12 Colin, Borthwick, and Hammatt 1995

CSH reported on the disinterment of a burial inadvertently discovered in the tree nursery area (Area 4B, see Figure 22). The flexed burial in a pit feature appears to have been complete and undisturbed prior to discovery. No age, gender or osteological data is presented.

4.3.1.13 Colin, Heidel, Borthwick, and Hammatt 1995

Cultural Surveys Hawai‘i was contracted to perform data recovery on an organic layer (thought to be a probable *imu*) feature exposed in road widening work on the spur road to the Kualoa Park Offices. The excavation of eleven trenches revealed seven postholes and five other features none of which were interpreted as an *imu*. The stratigraphy encountered was related to the construction of an airplane parking area, which had massively impacted the subsurface archaeology in the area. Basalt flakes were the only artifacts encountered. Two radiocarbon dates were recovered but both had wide ranges extending into the twentieth century. It was concluded however that the postholes and larger features related to traditional Hawaiian habitations.

4.3.1.14 Cleghorn 1996

In September and October of 1995, archaeological monitoring was conducted adjacent to three parking lots on east beach and at the Administration Building on the South Beach in association with the construction of new handicap access ramp ways. Shallow (30 cm) hand and mechanical test excavations were conducted but no significant or potentially significant cultural materials were found. Excavations typically were too shallow to penetrate overlying fill strata.

4.3.1.15 Dye 1996

This report details the response to an inadvertent burial find on July 22, 1995. The individual was in a burial pit but no particulars are related. GPS coordinates are given for this site at the south central portion of east beach designated as site 50-80-06-5371.

4.3.1.16 Colin and Hammatt 1997

CSH undertook fieldwork in July of 1997 in association with proposed erosional groin anchor facilities consisted of the excavation of 2 one-meter square units in the area east of the northernmost comfort station. Both units encountered human bone fragments and prehistoric artifacts and midden in a disturbed context. Archaeological monitoring for all excavations in the area was recommended.

4.3.2 Kualoa Archaeological Research Project (KARP)

After placement of Kualoa Ahupua‘a on the National Register of Historic Places in 1974 the City and County of Honolulu was required to carry out an archaeological survey of areas proposed for development within Kualoa Regional Park (Barrera 1974). Based on the survey’s findings the Kualoa Archaeological Research Project (KARP) was created in order “to determine the nature and extent of archaeological remains within the park area, in conjunction with priority park area development plans; and to support and enhance the park’s cultural and environmental programs through archaeological research and interpretive inputs” (Gunness 1987a:36).

With the establishment of KARP (1975-1985), the lands of Kualoa Regional Park were arbitrarily given number and letter designations to facilitate research and analysis, particularly of subsurface findings (Figure 22). The following is a synopsis of findings situated within KARP survey areas that are located within the current project area (survey areas1A-1C, 2A-2C, and 2E).

4.3.2.1 Survey Area 1

Survey Area 1 (see Figure 22) includes most of South Beach and adjacent areas inland lying between Mōli‘i Pond on the west, the main park access road on the east side of ‘Āpua Pond to the east and south of the roughly east-west trending spur access road to the park offices (and south of an imaginary line extending this alignment west to Mōli‘i Pond). This archaeological survey area has been broken down into three major subareas including 1A - in the southwest portion of the park, 1B - immediately *mauka* of 1A, and 1C in the area *mauka* of ‘Āpua Pond.

Survey Area 1A

Survey Area 1A lies east of Mōli‘i Fishpond and west of ‘Āpua Fishpond and *makai* (south) of the roughly east-west trending end-portion of the access road to the present Kualoa Park offices (see Figure 22). Survey Area 1A includes the present wood frame park offices (built by the Morgan family as a beach house in the 1950s), a care taker residence, quonset hut, the stone bath house (built circa 1916), a comfort station (built circa 1970) and a kitchen facility (built circa 1984).

Archaeological research in this area began with the research on the ‘Āpua Pond wall (sometimes designated “1A-1”) involving the excavation of thirty-six one-meter-square test pits.

Figure 22. Aerial photograph (source: Google Earth 2011) showing KARP survey areas in relation to the current project area

The next major finding (sometimes designated “1A-2") is popularly referred to as the “Pig Burial.”

In 1916, the Morgan family built a stone bathhouse on the beach (Gunness 1987a:57), which they knew as “*Hale Makani*” or “House of Winds”. The beach has accreted substantially in the area and by 1987 was some 122 m (400 ft) to the south of the bathhouse (Gunness 1987a:57). Before the clearing of *koa haole* from the inland side of the bathhouse could take place in late 1976, the KARP staff was asked to conduct archaeological testing of the area at which time “17 square meters were excavated in four closely adjacent areas in the ‘back yard’ of the bathhouse” (Gunness 1987a:587). Beginning 5 to 10 cm (centimeters) beneath a mixed historic and prehistoric layer, the excavations uncovered a prehistoric cultural layer that went to depths of 40 to 50 cm in some places. Gunness reports that:

> The soil contained charcoal; fish, bird and mammal bones; sea urchin remains; and quantities of shell representing numerous species of edible mollusks and bivalves. In addition, a number of prehistoric types of artifacts were uncovered. These included sling-stones, a hammer-stone, polished adze flakes, whetstone fragments, numerous coral abraders, bone fishhook manufacturing debris, a pearl shell fishhook blank, a double *leho* sinker (for octopus fishing), and a dogtooth pendant. Additionally, eleven volcanic glass flakes were recovered . . . [Gunness 1987a:57-9].

In addition to the above artifacts, numerous features were also uncovered including an *imu* or earth oven, which measured approximately 90 cm across (Gunness 1987a:59).

Interestingly, an intact pig skeleton (Figure 23 and Figure 24) was uncovered just 45 cms to the west of the *imu*, in a narrow pit:

> The skeleton is that of a boar with limbs tightly flexed (suggesting that they may have been bound), lying on its right side, with its head pointed in the *mauka* direction. A dog femur was found just above the forelimbs. A pattern of post molds appear to be associated with the pig burial feature (and possibly the *imu* feature) suggesting that some kind of structure marked the location [Gunness 1987a:57-59].

The relationship of these features has remained speculative as Gunness concludes that: “it is unclear if the *imu* and pig burial are associated; or what their relationship may be to other post molds in the test pits just to the north — which indicate additional structural features” (Gunness 1987a:59-62).

Due to the orientation and location of the pig burial along a direct line running down from the mountain ridge to the eastern side of Mōli‘i Fishpond, the burial might have acted as an *ahupua‘a* (literally referring to a “heap of stones associated with a pig”) boundary offering separating the *ahupua‘a* of Kualoa from that of neighboring Hakipu‘u Ahupua‘a (Gunness 1987a:62).

Connolly (1978:3) associated the pig burial with the date 1422 A.D. presumably on the basis of a date derived from rind hydration analysis of volcanic glass. This dating system is highly suspect at this time, and would be regarded as questionable.

Figure 23. Photo of probable *ahupua‘a* boundary marker (pig skeleton) and archaeological feature (from Gunness 1987a:61)

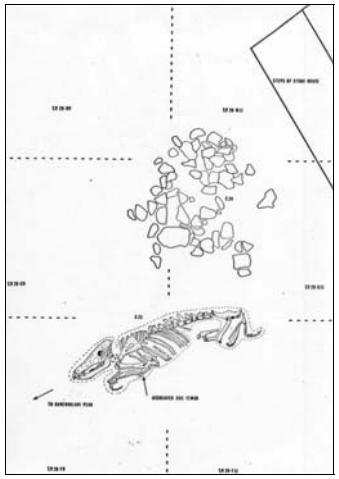


Figure 24. Illustration of pig skeleton and probable *ahupua‘a* boundary marker at Kualoa (drawing from files of Kualoa Archaeological Research Project)

In 1983, plans were made to construct a new park kitchen facility in the South Beach area directly adjacent to the pig burial (Survey Area 1A). However, due to the archaeological significance of this area, coupled with the fact that there was mounting evidence of a larger prehistoric cultural layer(s), made it essential that the kitchen facility be relocated (Connolly (1978:3). Furthermore, prior to the genesis of the Kualoa Archaeological Research Project (KARP 1975), a comfort station was constructed in the south beach area. Construction of the comfort station and its leaching field was believed to have disturbed the archaeological deposits in the surrounding area. Therefore, archaeological investigations were conducted to determine just how much of the cultural layer had been disturbed, and how far the cultural deposits extended (Connolly 1978:65).

Gunness (1984:16-18) conducted augering tests digging seven holes (numbered 1-7) just south west of the present park offices (sometimes known as “auger site”). No cultural deposits were observed. An eighth auger hole (number 8) located 5 m south of the stone bath house similarly yielded no notable cultural deposits while a ninth auger hole (number 9) located west of the pig burial site indicated a 40 cm thick cultural deposit. Based on these archaeological investigations, it was possible to define the seaward extent of prehistoric cultural deposits in the 1A survey area as:

> The mauka side of a curving line drawn from the eastern end of the Mōli‘i Fishpond wall through the makai portion of the park offices, past the front of the historic stone bathhouse and comfort station, and ending approximately 40 meters north of the presently mapped north end of the ‘Āpua Pond wall [Gunness 1984:19].

Three additional shovel pits (consecutively numbered with the nine auger holes as excavations numbered 10, 11, and 12) were excavated by Gunness (extending into January of 1984) in the immediate vicinity of the present kitchen facility (Gunness 1987a:66). It had been believed that construction of the South Beach Comfort Station and grubbing of the general area had heavily disturbed or destroyed archaeological deposits in the vicinity (Gunness 1987a:65). As a result of these excavations, Gunness concluded that the archaeological resources in an area extending from 8 m west of the comfort station to 65 m east of the comfort station were heavily damaged but were present. These shovel pits also allowed Gunness to fine tune her earlier delineation of the *makai* edge of the prehistoric cultural deposit, drawing the seaward edge “ending approximately 5 to 10 meters north of the presently mapped northern end of the ‘Āpua Pond wall” (Gunness 1987a:67). Gunness comments:

> Over the years following the excavations in the stone bathhouse area, evidence had accumulated suggesting that the prehistoric cultural materials found behind the stone bathhouse did not represent a small, isolated site. Artifacts were occasionally surface collected in the parking areas on either side of the bathhouse and quonset hut . . . others were found in the parking area behind the park offices. The soil in these areas is dark gray in color and contains the same kind of midden remains that were found during the bathhouse test excavations [Gunness 1987a:64].

It is unclear whether there was any archaeological monitoring for the kitchen facility construction. Gunness (1987a:67-68) relates that there was no archaeological monitoring of an

associated leaching field but mentions her observation of basalt flakes and scattered small pit features in the excavations. In 1985, Gunness (1987a:68) monitored the excavations for two of three septic tanks associated with the kitchen facility, noting the presence of several large pit features, a number of artifacts, and human remains (designated burial # 37) near the east corner of the Kitchen facility (tank # 2).

Additional archaeological monitoring was conducted in association with separate trenches for water and electric line hook-ups to the kitchen facility extending from the north west corner of that facility to connect with the main water and electric lines (in Survey Area 1B — a distance of approximately 40 m). Midden, artifacts and numerous pit and post mold features are reported but little characterization of these deposits was possible (Gunness 1987a:68-70).

From May to September of 1990, Goodman (1991) monitored tree removal along East Beach and South Beach. She describes stratigraphy and four mundane artifacts recovered from the southeastern portion of survey area 1A. Her reporting of “a thin, discontinuous, unconsolidated . . . [layer that] contains indigenous artifact forms” (Goodman 1991:16) somewhat calls into question Gunness’ belief that the area Goodman was working in was seaward of any significant archaeological deposits. Possibly the two basalt flakes Goodman recovered were only secondarily deposited. Goodman (1991:30) considers this question of whether the artifacts are redeposited or are from a thin *in situ* cultural deposit, but she offers no conclusion.

In general terms, it may be said that significant archaeological deposits are generally thought to be absent within 80 m of the sea between Mōli‘i Pond and ‘Āpua Pond and highly important archaeological resources are extant in the *mauka* portion of survey area 1A.

Survey Area 1B

Survey Area 1B is, in actuality, a *mauka* continuation of the archaeological deposits found in survey area 1A. Area 1B is bounded on the south and east by the South Beach access road, on the west by Mōli‘i Pond, and on the north by an imaginary east-west line extending from the corner where the South Beach access road to the park offices turns south, to Mōli‘i Pond (see Figure 22). Only the southernmost portion of survey area 1B has received any archaeological study.

In late 1977, an area of approximately 45 m x 65 m in the south portion of area 1B was bulldozed to remove *koa haole* for parking. The KARP staff surface-collected some 267 artifacts. Included in the finds were “basalt flakes, polished adze fragments, scrapers, abraders, and a basalt awl and other woodworking tools” (Gunness 1985a:15).

In the Spring of 1983, additional artifacts were surface-collected in the area when it was again bulldozed in association with the construction of new water and electrical lines. Surface collections included “basalt flakes, hammer stones, and adze fragments, coral abraders, basalt awls, quantities of volcanic glass and a *niho palaoa”* (Gunness 1985a:16). The *niho palaoa* or “whale tooth” ornament is made of *Chama* sp. (rock oyster) shell, which is commonly believed to be an early material of manufacture for these ornaments (Gunness 1984:12). Seven test pits (numbered 1 through 7) were excavated along the purposed alignment of the waterline (Gunness 1984:13).

> The test pits showed a surface cultural layer of dark gray loamy sand, which was heavily disturbed (probably plowed) to a maximum depth of approximately 20

> cm. Below this plowed zone, with the exception of Test Pits 2 and 7, the layer was intact for varying depths and contained numerous features and indigenous artifacts (plow scars were recorded in the top of the underlying layer II in Test Pits 2 and 7). Layer II consisted of culturally sterile coral sand to the water table [Gunness 1987a:73].

Archaeological monitoring during the actual digging of the water and electrical lines revealed numerous post molds and pits, firepits/fireplaces, and several *imu* which contained a quantity of artifacts, as well as a human (burial # 14) and a dog burial (feature 81) (Gunness 1984). Archaeological monitoring of backhoe excavation at the southwestern-most end of the waterline trench encountered “an unidentified structure with a basalt stone face and coral fill” (Gunness 1984:13). This nature of this site (designated feature 29) is unresolved but the trench was realigned to avoid further damage. Two test pits were opened in an attempt to further document the feature:

> Testing indicates a structure at least 75 cm. in height with a basalt boulder facing on the east, and coral fill with loamy sand matrix behind. The foundation of the features sits below the present water table. Quantities of volcanic glass and a few basalt flakes were recovered in screening the loamy sand matrix. Pig bones were discovered in the coral fill of the trench approximately 1 meter behind the basalt facing [Gunness 1987a:82, 86-87].

Gunness (1987:87) notes a feature density of roughly two features per every square meter along the trenches of survey area 1B and concluded from the assemblage of 2,639 artifacts recovered that this was a “workshop” area (Gunness 1987a:88). Based on the high number of prehistoric artifacts and some 98 features located in area 1B, preservation and additional archaeological investigations were recommended (Gunness 1987a:90). “The entire area is an important archaeological site” (Gunness 1987b:4, map).

Survey Area 1C

Area 1C is bounded on the south by ‘Āpua Pond, on the east by the main park road, and on the north and west by the south beach access road (see Figure 22).

As a result of observations made during the monitoring of grubbing along the northern edge of ‘Āpua Pond, Area 1C was further broken down into two sub-areas, 1C-1 and 1C-2. In 1985, “Test pits were excavated in Site Areas 1C-1 (north east of ‘Āpua Pond) and 1C-2 (WNW of ‘Āpua Pond); and an additional 22 backhoe trenches, varying in length from 6 to 20 meters, were excavated and recorded around the eastern, northern, and northwestern perimeters of Survey Area 1C” (Gunness 1987b:4, map).

Area 1C-1

Area 1C-1 is an 80 meter x 80 meter area in a corner created by the northern edge of ‘Āpua Pond and the southern end of the main park road which was observed during grubbing as an area of black loamy sand with a dense concentration of indigenous artifacts. A total of 350 prehistoric artifacts were collected and “noticeable amounts of shell midden” were recorded (Gunness 1987a:91, 93). Two shovel test pits (TP1 and TP2) were excavated, revealing “substantially intact archaeological deposits with numerous features” Gunness also noted that the area was very damp and “that waterlogged organic remains may exist here” (Gunness 1986:11).

Area 1C-2

Area 1 C-2 “is an irregularly-shaped area of roughly 4,900 square meters between the southern half of the north-south portion of the access road, and the northwestern edge of ‘Āpua Pond” and “is directly across the access road from the densest concentration of features and artifacts in Survey Area 1B, and is almost certainly an extension of that site” (Gunness 1987a:94). A total of five test pits were excavated in this area (numbered TP1 - TP5; TP3 was eventually expanded to 24 square meters), producing shell midden, and a high concentration of prehistoric artifacts (3,920 artifacts in all). In four of the five test pits (all but TP 3) the entire cultural deposit was “completely churned” (Gunness 1986:42).

Test Pit 3 uncovered “a large *imu* surrounded by at least 13 post molds. The overlying loamy sand, and the fill in the *imu* contained literally thousands of basalt flakes” (Gunness 1986:45). In all, 3,530 artifacts were recovered from test pit 3 (Gunness 1987a:99). A sample of charcoal taken from the bottom of the *imu* was radiocarbon tested and calibrated to a date between A.D. 1670 and 1730. The area is presently demarcated by concrete barriers as a buffer zone for this archaeologically sensitive area.

Of the 22 backhoe trenches excavated (numbered TT 1 - TT 22) around much of the northern perimeter of survey area 1C, most revealed highly disturbed cultural layers (that are no longer intact) containing little to no prehistoric artifacts (Gunness 1987a:100-12). Test Trench 6, however, uncovered a “concentration of large basalt rocks near the north end of the trench” (Gunness 1986:34). After opening an additional 15 sq m (square meters) at the north end of the trench, 214 prehistoric artifacts were recovered; no historic-era artifacts were found. It was concluded however that even though no historic materials were recovered during the expanded excavations around the north end of Test Trench 6, that “this is an historically excavated and filled ditch or trench” (Gunness 1986:37). Gunness suggests it may have served as a livestock barrier (Gunness 1986:39).

Gunness (1987b:4) recommended that “except for site areas 1C-1 and 1C-2 . . . no further archaeological work is necessary here.”

4.3.2.2 Survey Area 2 (East Coast of Kualoa Regional Park)

Survey Area 2 is a long narrow strip bounded on the north by Kamehameha Highway, on the east by the Pacific Ocean, on the south by Kāne‘ohe bay, and on the west by a line running 20 to 30 m west of and parallel to the main park road (Gunness 1987a:113). This area was then broken down into five sub-areas (2A to 2E) for easier recording and describing of artifacts and features.

It is a well-recorded fact that the eastern coastline of Kualoa Park is eroding away at a high rate. This erosion has exposed a cultural layer between 15 and 50 cm thick. Due to the wave action on the shoreline, the erosion has exposed midden materials, firepits, stone artifacts. As of 1984, approximately 2,000 stone artifacts had been surface collected from the beach and adjacent reef, and human burials have been found in otherwise sterile deposits. The artifacts “represent a range of activities including adze and other stone tool manufacture, wood working, fishing, food preparation, and game playing” (Gunness 1987a:114; see also Clark and Connolly 1978b:3-4).

Survey Area 2A (Southeast Coast of Kualoa Regional Park)

Archaeological Survey Area 2A conforms to an area lying within a loop of road (formed by

the southern end of the main access road and a dirt maintenance road) previously extant at the southern end of the main Kualoa Access Road. In general terms, this survey area lies east of the main access road and is roughly bounded by the three East Beach comfort stations.

This area was the focus of archaeological studies in 1977 and 1978 (Gunness 1978) associated with a proposed location for storage and settling basins as part of a proposed U.S. Army Corps of Engineers (1977) Kualoa Beach Sand Replenishment Project (see discussion of the history of erosion). In September of 1977, the area was extensively bulldozed by a volunteer group from the National Guard and “it was discovered at that time that much of the surface had been scraped to sterile sand, and that the entire surface layer had been extensively disturbed” Gunness 1978:6). Only ten mundane artifacts were recovered at that time.

A total of 11 test trenches were excavated in the summer of 1978, scattered over the southern portion of the survey area, including one 1-m square unit (called test trench 1 or test pit 1) and ten 2.5 m x 70 cm shovel test trenches (test trenches 2 - 11). After excavations were complete, it was determined that: “If, at one time, there were any archaeological remains in this area, they have been eliminated by historic modification of the landscape” (Gunness 1978:11).

Gunness (1987a:119) would later write that:

> It was determined that no intact prehistoric cultural deposits remained in Survey Area 2A; and following the above described testing, this area was completely altered during the construction of the settling basins for the later-abandoned erosion control project. In 1985, it was again bulldozed flat and the southern portion was developed as a camping ground.

She concluded (1987b:5) that “no further archaeological work is necessary here.”

Survey Area 2B

Survey Area 2B, encompasses the south and central portions of the eastern beach, extending from the southeast portion of ‘Āpua Pond on the South to include the field school site (1977, 1983 and 1984 field schools) on the north. This has been the most studied portion of the park. Two sub-areas have been designated, including the field school site which has been called 2B-1 and the “waterlogged site” or “Kualoa Depression” site known as 2B-2. Survey area 2B has been heavily tested by archaeologists since Barrera’s work in the summer of 1974.

All of Barrera’s 51 one-meter square excavations are understood as lying within what would become known as archaeological survey area 2B. Barrera discovered an extensive cultural layer complete with post molds, pits, fire pits, what he believed was an oval or round house site (in test pits 26-33; Barrera 1974:19-20) and an assortment of stone tools, fishing equipment and a human burial (test pits 11, 37-38; Barrera 1974:20-21). From his research in what became survey area 2B, Barrera (1974:39, 41) noted that “Kualoa Regional Park has considerable potential for significantly contributing to our understanding of the prehistoric Hawaiian way of life” and that “the importance of Kualoa’s scientific potential should not be underestimated.”

In August 1975, Clark and Connolly (1975) excavated seven one-meter-square test pits approximately 150 meters north of Barrera’s house site (Barrera’s test pits 26-33) and encountered an abundance of artifacts, midden and features (KARP 1976:1). The three northernmost test pits would eventually be the locus of a series of University of Hawai‘i Field

Schools, while the southern four were just to the south in the immediate vicinity of what Clark would call “the Kualoa Depression” (Clark 1979). At the same time, large numbers of artifacts started to be recovered from just off shore of the same general area (KARP 1976:1).

In 1980, Hamilton M. Ahlo, Jr. tested the north portion of survey area 2B (as well as much of the length of 2C and 2D) to evaluate the effects of erosion control projects on the archaeological deposit. Excavation units were small (25 cm), shallow (60 cm) holes dug at 10 m intervals along the beach edge. He (1980:4) documents that from 35 m north of the field school site to 35 m south “still retains a physically intact cultural deposit.”

The Field School Site (2B-1)

In the summers of 1977, 1983 and 1984, the University of Hawai‘i conducted field schools at Kualoa Park, in the 2B-1 area. The results of the research of these three field schools are summarized in *The Kualoa Archaeological Research Project: 1974-1984 A Brief Overview* (Gunness 1985a:19-25; the text is largely repeated in Gunness’ masters thesis, 1987a:123-142 and in an article published in *Hawaiian Archaeology*, 1993: 59-63).

In the 1977 summer session Dr. Hallett H. Hammatt, visiting professor at the University of Hawai‘i and Stephan D. Clark and Robert D. Connolly III of the Kualoa Archaeological Research Project led fifteen undergraduate and graduate students in work at this Kualoa site over a period of ten weeks (two summer sessions, Anthropology 380 and Anthropology 381). Representing approximately 950 man-days of archaeological endeavor, this first field school was probably the largest single archaeological study of a specific area at Kualoa.

The goal of the 1977 field school was to excavate a 10m^2 grid in the area around the northernmost test pits excavated in 1975, where an intact cultural layer had been noted. However a great deal of energy was expended removing overlying layers I (a plow zone) and II (a sterile sand layer) and only 4 1m^2 pits were completely excavated. A shovel excavation of a 10 m by 1 m trench into the adjacent depression (2B-2) was undertaken and on a day of exceptionally low tide, the beach side of the channel was cleaned and recorded (Gunness 1985a:20-21).

In the second summer session of 1983, Dr. P. Bion Griffin supervised Anthropology 380 fieldwork at Kahana Valley and at the 2B-1 Kualoa site. Sixteen students and 2 teaching assistants spent 20 days at Kualoa excavating ten 1m^2 test pits and testing an apparent wall feature (known as 2D-1) eroding out to the north of the field school site (Gunness 1985a:21-23).

In the second summer session of 1984, Dr. Matthew Spriggs directed and Jo Lynn Gunness supervised ten Anthropology 380 students and a teaching assistant at the 2B-1 Kualoa field school site (Spriggs 1993). A total of 37 m^2 were excavated at the [then] fenced field school site, and 7 m^2 of the adjacent depression (2B-2) were also excavated. Gunness (1985a:23-25) reports the recovery of 17 human burials on 9/22/1984, which were exposed by high tides in a relatively short 13 m-long stretch of the beach just north of the 2B-1 field school site. Student volunteers from the University of Hawai‘i continued work on weekends until Thanksgiving, 1984 (Gunness 1987a:128).

The Kualoa Depression (2B-2)

Referred to variously as an ‘*auwai* for Koholālele Pond, a water channel, a swale, “the water logged site” or site 2B-2, this interesting site located just south of the field school site was tested.

in 1975, revealing waterlogged and preserved organic materials. Further organic artifacts were revealed by erosion in the area in December of 1977 (Gunness 1987a:123). This site was the focus of a 1979 paper by Stephan D. Clark entitled “*The Kualoa Depression: A Cause for Optimism*.” Clark noted the unusually good preservation of organic materials in this swale or depression and attributed the preservation at least in part to the presence of underground freshwater springs in the immediate area. Clark (1979:3) notes “this is the only known Hawaiian site with a waterlogged component” and relates the recovery of carved wood including a *kapa* or bark-cloth beater, pandanus, and what appeared under a microscope to be strands of human hair. Clark notes the potential of such sites to inform us about the past. Gunness (1987a:123) reports additional finds from the depression including *kukui*, gourd, a net gauge, pieces of canoe plank - some of which still retain their sennet lashings, and a 5 ft-long wooden pole with adze markings.

At Clark’s request, an analysis of land snail samples was undertaken by Patrick V. Kirch and Carl C. Christensen (1979). While the authors emphasized the tentative nature of their findings, they appear to document (1979:9, 10) a significant pattern of change in the vicinity of the Kualoa Depression with a gradual shift from a lowland strand/dry forest dominated by endemic flora (Faunal Association 1) to a modified artificial landscape, dominated in part by Polynesian introduced economic plants (Faunal Association 2) to fresh water (Faunal Association 3) to an assemblage of recently introduced genera (Faunal Association 4). This appears to reinforce the idea that the Kualoa depression was made by Polynesians relatively late in pre-European times.

Gunness (1987a:141-42) summarizes the results of excavations in archaeological survey area 2B as follows:

> Based on preliminary analysis of information from Site 2B-1, the first archaeologically documented use of the area was as a burial ground in the period around A.D. 1400-1600. Concurrent, temporary use of the area for fishing and reef gathering activities during this time is also likely, eventually producing the light gray cultural layer, the remnants of which are recorded as Layer IIIb.
>
> This was followed around A.D. 1600 by apparently sudden, intensive use of the area for fairly specialized activities including stone tool manufacture, woodworking, and cooking activities; all contributing to the development of layer IIIa. Interestingly, no human burials are associated with this layer.
>
> Separated from the prehistoric deposits in Layer IIIa in the eastern half of the site by what is believed to be a single-event storm deposit, the top of Layer IIIa contains the kinds of early historic artifacts that could be expected to be found in a house site. . . . However, in comparing archaeological findings with surveyor James Dillon’s 1850 *‘āpana* descriptions it is possible that the historic remains within the northern half of the field school site are associated with the house site belonging to Kamanu. . . .

Survey Area 2C

Survey Area 2C, is located on East Beach just north of the field school site, and runs north for approximately 150 meters. Clark and Connolly (1975) conducted a surface survey of the entire area and reported no surface structural remains, but reported burials and prehistoric remains along the coast of the entire area. This area was bulldozed and planted in grass in the winter of

1977-1978 (Gunness 1987a:143). Monitoring by the KARP staff (particularly Stephan D. Clark) during bulldozing and trenching for grass planting and the instillation of a sprinkler system, resulted in the recording of a number of feature concentrations. Gunness (1987a:144, 146) relates that monitoring of construction activity in survey area 2C recovered or recorded:

> Six hundred and six indigenous artifacts (primarily lithic materials). . . . Twenty-seven features including three human burials, several *imu*, other fire features, two stone alignments, a water channel, and several areas defined simply as activity areas on the basis of artifact concentrations.

Survey Area 2E

Survey Area 2E is a 30 to 60 m wide strip extending along the western side of the main park road, from Kamehameha Highway, south, to the park secondary road. Gunness (1987a:166) has chosen to include it within Survey Area 2 (rather than survey area 4) as it has a direct bearing on the archaeological findings in that area.

Gunness (1987a:166) excavated 28 backhoe test trenches (Test trenches TT 1 -TT 28) in this area prior to the commencement of road construction in 1986. This testing showed that as much as a meter of soil was graded away during construction of the airstrip, removing virtually all archaeological material that may have been present in the area under the airstrip. “this left a 50 to 100 cm-high embankment along the airstrip’s western side” (Gunness 1987a:166). Gunness’ (1987a:166-167) 1986 research served to delimit the western edge of the airstrip as 8 test trenches were opened below the embankment and 16 above the embankment, with 10 of the trenches cutting across the embankment. The western margin of the airstrip grading runs parallel to the present main access road (which was built over the graded airstrip) and lies approximately 15 m west of the west side of the road.

East of (below) the embankment under the former airstrip, typically the trenches showed culturally sterile sand immediately overlain by coral fill. Any cultural deposits that may have been extant were scraped away during airstrip construction in 1942. In three of these more eastern trenches excavation below the embankment revealed “the very base of truncated features were recorded underlying the coral fill,” but the features were thought to be historic (Gunness 1987a:167). The remainder of the “below” (eastern) test trenches were culturally sterile.

Gunness (1987a:167) writes that 34 features were recorded in the trenches above the embankment or to the west of the airstrip grading. The features included a dog burial, probable post molds; an *imu*, numerous pits (most appear to be historic), and an historically filled trench in which thin copper wires had been laid along its length. The last-mentioned feature is probably related to the airfield installation. While extant prehistoric deposits were observed in this area, the prehistoric deposits were typically “completely churned.” Some 124 indigenous artifacts were recovered after bulldozing. The artifacts are similar to those found in other areas of the park (Gunness 1987a:171). Gunness (1987) concluded that “no further archaeological work is necessary here.”

4.4 Background Summary and Predictive Model

Kualoa Ahupua‘a was considered one of the two most sacred places on the island of O‘ahu. Traditional accounts indicate its importance as a symbol of sovereignty and independence for O‘ahu, its role as a place of refuge, its role as a place where sacrificial victims for religious rituals were drowned, and its history as a sacred residence of chiefs.

LCA *kuleana* claims filed within Kualoa Ahupua‘a indicated a pattern of multiple ‘*āpana* consisting of coastal and inland house lots and more *mauka* agricultural lots. While no *kuleana* claims are present within current project area, LCA documentation does indicates that traditional Hawaiian habitation was occurring immediately north of the project area, within the grounds of Kualoa Regional Park.

Immediately after December 7, 1941, the army viewed Kualoa as a strategic position for protecting Kāne‘ohe Bay and the Navy airbase on Mōkapu peninsula (Dorrance 1993:6). There were at least four major military uses of Kualoa during World War II: as an air strip for fighters and bombers; as a place for coastal fortifications including bunkers, a control center and strung barbed wire; as a center for motor vehicle maintenance; and, as a barracks and recreation center. A grassed emergency airstrip was built parallel to the East Beach of Kualoa in the late 1930s (Gunness 1987a:30). At the beginning of World War II, the United States army took over Kualoa Ranch and bulldozed a 6,000 ft (feet) long and 150 ft wide airstrip that extended approximately 1800 ft into Kualoa Regional Park. WWII-era photographs of Kualoa Regional Park indicate extensive military development, including: an airstrip, hangars, storage bays, and miscellaneous structures.

Previous archaeological research indicates subsurface cultural deposits associated with pre-Contact traditional Hawaiian land use present throughout the entire Kualoa Regional Park. Documented cultural deposits have been typically associated with a buried silty sand A-horizon (i.e., former land surface) and contain midden, lithic debitage, stone tools, and human burials. Specific to the current project area, it appears that the southwest, east, and north ends of the project area have a high potential to encounter cultural deposits, while the presence of deposits in the central portion of the project area may be less likely. However, research indicates that Kualoa Regional Park has been extensively impacted by WWII activities, historic agriculture, and by more recent park development. This has churned-up and/or re-deposited the culturally enriched buried A-horizon (i.e., subsurface cultural layer) as fill throughout the immediate area, leaving the potential to encounter archaeological remains throughout the entire the entire project area, even within fill layers.

Section 5 Results of Fieldwork

5.1 Pedestrian Inspection

As discussed in the Methods Section, above, a brief 100 percent pedestrian inspection of the project area's surface confirmed that there were no surface historic properties present. As there were no surface historic properties, the inventory survey's historic property identification efforts focused on the identification of subsurface cultural deposits, which, based on background research, were likely to be preserved beneath layers of historic and modern fill.

5.2 Subsurface Testing

5.2.1 Summary

Eighteen (18) trenches were placed throughout the project area in areas that are anticipated to be subjected to subsurface disturbance associated with the proposed wastewater improvements (Figure 25 and Figure 26). Based on subsurface testing results, the stratigraphy within the project area is largely as expected. The following paragraphs provide an overview and summary of the backhoe testing results. For detailed information regarding each of the excavated trenches, please refer to the trench profiles, sediment descriptions, and photographs, which follow this more general summary discussion.

A stratigraphic profile was taken at each trench. In general the observed and documented stratigraphy consisted of both imported and locally procured fill sediments overlying naturally deposited marine sand. These observations agree with the USDA soil data for the project area and its vicinity (Foote *et al*. 1972). All excavations were backfilled after completion of stratigraphic documentation.

Observed stratigraphy from open trenching indicated that Kualoa Regional Park has been subjected to at least two episodes of ground disturbance: 1. Grading, compacting, and filling associated with WWII-era military activities; and 2. Grading, filling, and subsurface excavation associated with the development of the existing Kualoa Regional Park. Both of these events has either partially disturbed or has entirely removed the original ground surface, which is the stratigaphic layer that would be associated with traditional Hawaiian activities. However, testing results indicate that in many cases this stratigaphic layer has been reworked and re-deposited within the park grounds. This is evidenced by traditional Hawaiian cultural material (i.e., stone artifacts) being observed within fill layers, as well as in remnants of the original land surface.

Cultural material was observed within Trenches 3, 4, 10, 14, 16 and 17 (Figure 27). Observed cultural material was primarily associated with traditional Hawaiian material culture and included: stone tools (i.e., an *‘ulu maika* and a micro-adze), lithic debitage, volcanic glass, and marine shell midden. Cultural material within Trenches 3, 4, 14, and 17 was present within buried former land surfaces (or associated pit features) that had been disturbed by grading and filled over. In these cases the upper boundary of the former land surface (i.e., buried A-horizon) had been removed, and the remaining sediment layer showed evidence of being oiled and compacted probably associated with road and airstrip construction. Cultural material within

Figure 25. Aerial photograph showing the distribution of test trenches within the project area (source: Google Earth 2011)

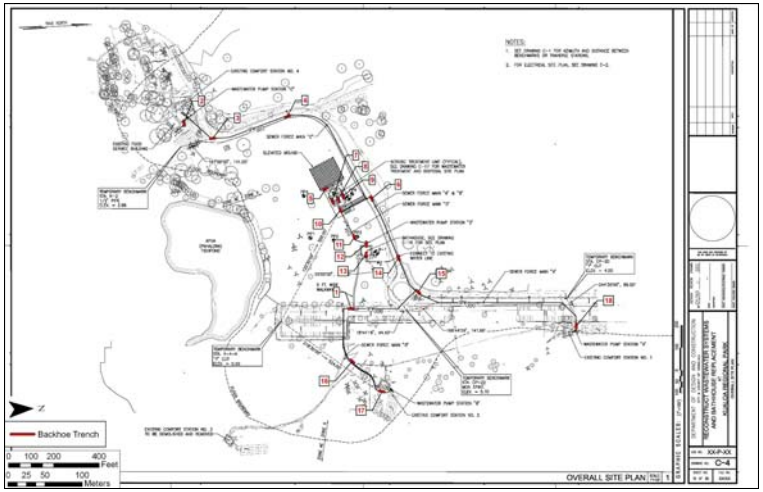


Figure 26. Kualoa Regional Park Reconstruct Wastewater Systems and Bathhouse Replacement Overall Site Plan (source: City and County of Honolulu Department of Design and Construction) showing the locations of test trenches in relation to areas anticipated to be impacted by subsurface disturbance

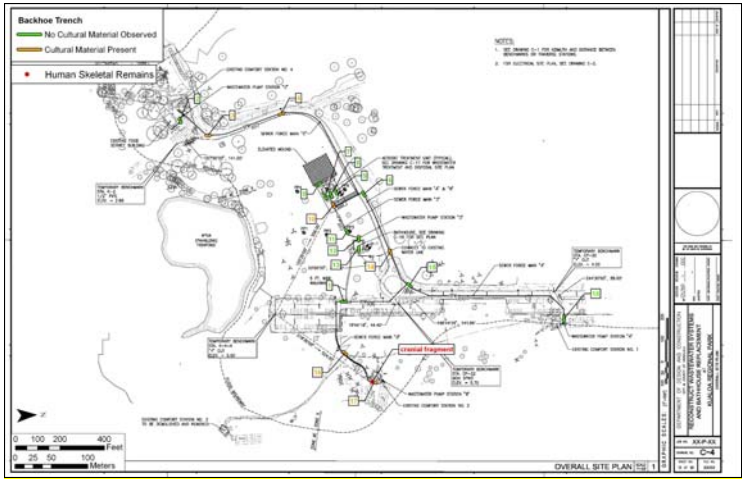


Figure 27. Kualoa Regional Park Reconstruct Wastewater Systems and Bathhouse Replacement Overall Site Plan (source: City and County of Honolulu Department of Design and Construction) showing the presence or absence of cultural material within test trenches

Trenches 10 and 16 was present within fill layers consisting of alluvial sediment and marine sand both procured from the general area and re-deposited.

Of note was the presence of an isolated cranial fragment discovered during the excavation of Trench 17, located immediately *makai* of Comfort Station #2. This fragment was stratigraphically associated with a re-deposited sand layer, a fill layer most likely procured from the park grounds during episodes of grading. Thus the cranial fragment was discovered in a secondary depositional context and its original primary burial context cannot be confirmed. The single isolated cranial fragment was approximately the size of a quarter. The fragment was wrapped in muslin and placed in a small *lauhala* basket. The fragment was then reburied in the south end of Trench 17 in the vicinity of where it was originally discovered, at an approximate depth of 50 cmbs.

5.2.2 Trench Documentation

5.2.2.1 Trench 1

Length:	6 m
Width:	0.85 m
Maximum Depth:	1.7 m
Orientation:	N/S

The stratigraphy of Trench 1 (Table 3, Figure 28 and Figure 29) consisted of multiple fill layers (Stratum I) overlying naturally deposited jaucas sand (Stratum II). Stratum I appears to be a mixture of alluvial sediment and marine sand that has been locally procured and re-deposited. This layer is likely associated with WWII-era military activities and the development of the existing Kualoa Regional Park. These two periods of disturbance have completely removed the original land surface and can attribute to the absence of cultural deposits at this location.

Table 3. Strata Observed at Trench 1

Stratum	Depth (cmbs)	Description
Ia	0-80	10 YR 5/2, grayish brown; loamy sand; weak, medium, granular structure; dry weakly coherent consistency; non-plastic; mixed origin; abrupt boundary; smooth topography.30% coral cobbles. Fill layer possibly associated with WWII airstrip.
Ib	80-90	10 YR 8/3, very pale brown; coarse sand; structureless; dry loose consistency; non plastic; marine origin; very abrupt boundary; smooth topography. Backfilled sand.
Ic	90-130	10 YR 3/1, very dark grey; sandy loam; structureless; moist firm consistency; non plastic; mixed origin; very abrupt boundary; smooth topography. Backfilled sand that has been oiled and compacted.
II	130-170*	10 YR 8/3, very pale brown; sand; structureless; moist loose consistency; non plastic; marine origin. Naturally deposited sand.

* Base of Excavation

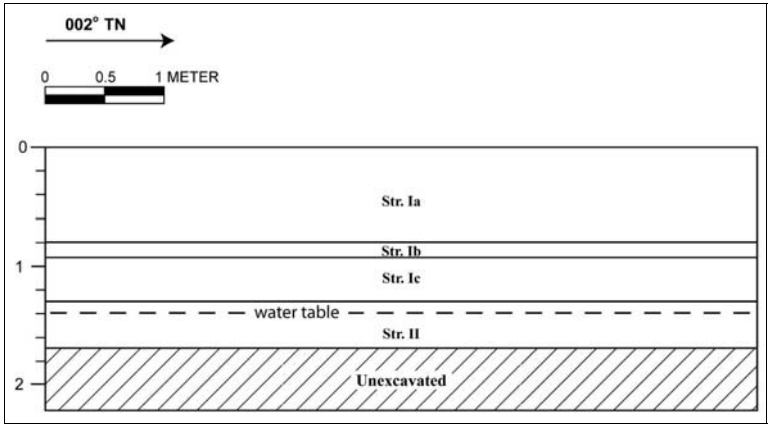


Figure 28. Profile of Trench 1, west sidewall

Figure 29. Photograph of Trench 1, west sidewall

5.2.2.2 Trench 2

Length:	6 m
Width:	0.85 m
Maximum Depth:	1.3 m
Orientation:	E/W

The stratigraphy of Trench 2 (Table 4, Figure 30, and Figure 31) consisted of multiple fill layers (Stratum I) overlying naturally deposited jaucas sand (Stratum II). Stratum I appears to be a mixture of imported material and locally procured sand that has been re-deposited. This layer is likely associated with the development of the existing Kualoa Regional Park infrastructure (i.e., kitchen and comfort station). Observed subsurface disturbance (i.e., grading and filling) at this location has completely removed the original land surface and can attribute to the absence of cultural deposits at this location.

Table 4. Strata Observed at Trench 2

Stratum	Depth (cmbs)	Description
Ia	0-10	5 YR 4/3, reddish brown; clay loam; strong, medium, blocky structure; dry very hard consistency; slightly plastic; terrigenous origin; very abrupt boundary; smooth topography. Imported fill associated with park landscaping.
Ib	10-40	Crushed coral fill.
Ic	40-80	10 YR 4/2, dark grayish brown; silty sand; structureless; moist loose consistency; non plastic; mixed origin; very abrupt boundary; irregular topography. Backfilled and graded sand that shows evidence of prior machine disturbance.
II	80-130*	10 YR 8/3, very pale brown; sand; structureless; moist loose consistency; non plastic; marine origin. Naturally deposited sand.

* Base of Excavation

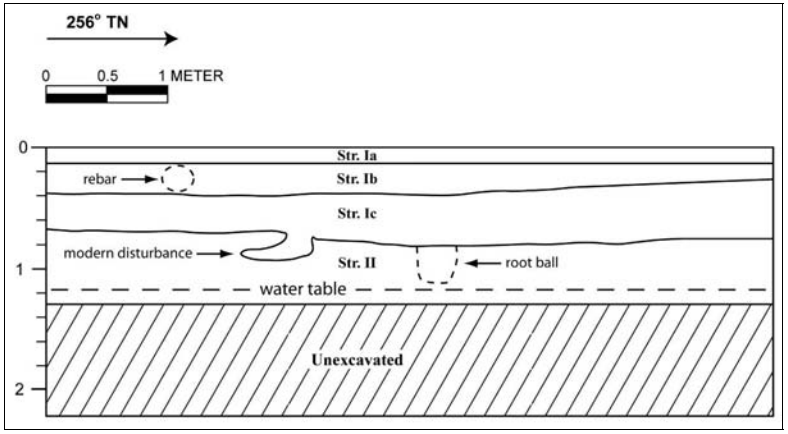


Figure 30. Profile of Trench 2, south sidewall

Figure 31. Photograph of Trench 2, south sidewall

5.2.2.3 Trench 3

Length:	6 m
Width:	0.85 m
Maximum Depth:	1.5 m
Orientation:	N/S

The stratigraphy of Trench 3 (Table 5, Figure 32, and Figure 33) consisted of a modern road surface (Stratum I) overlying a culturally enriched buried A-horizon (i.e., former land surface) (Stratum II), deposited atop culturally sterile naturally deposited jaucas sand (Stratum III). Stratum II consists of a buried former land surface (A-horizon) containing lithic debitage (i.e., basalt flakes) and fire-cracked rock. The cultural material observed in Stratum II indicates pre- to early post-Contact tradition Hawaiian land use. The upper boundary of this stratum has been impacted by road construction (i.e., graded, compacted, and oiled), with the lower boundary being intact. Of note is the presence of filled pit feature (Pit Feature 1) originating from Stratum II and extending into Stratum III (see Figure 32 and Figure 33). The pit measures approximately 3 m wide and 0.4 m deep. The pit feature was situated within the middle of the trench and extended across the short axis of the trench, extending beyond both of the trench’s east and west sidewalls. The pit feature was filled with approximately 90% coral cobbles and 10% water-rounded basalt cobbles and pebbles (Figure 34). Basalt flakes were also observed within this feature. The function of this feature is unknown, but its association with a cultural layer and the presence of basalt flakes within it suggest it is of pre- to early post-Contact traditional Hawaiian origin.

Table 5. Strata Observed at Trench 3

Stratum	Depth (cmbs)	Description
Ia	0-15	Basalt gravel.
Ib	15-35	Crushed coral fill.
II	35-60	10 YR 3/2, very dark grayish brown; silty sand; structureless; dry loose consistency; non plastic; mixed origin; very abrupt boundary; wavy topography. Buried former land surface (A-horizon) containing evidence of pre- to early post-Contact land use. Basalt flakes and fire-cracked rock observed. Upper boundary of layer has been graded, compacted, and oiled as a result of road construction.
III	60-150*	10 YR 8/3, very pale brown; sand; structureless; moist loose consistency; non plastic; marine origin. Naturally deposited sand.

* Base of Excavation

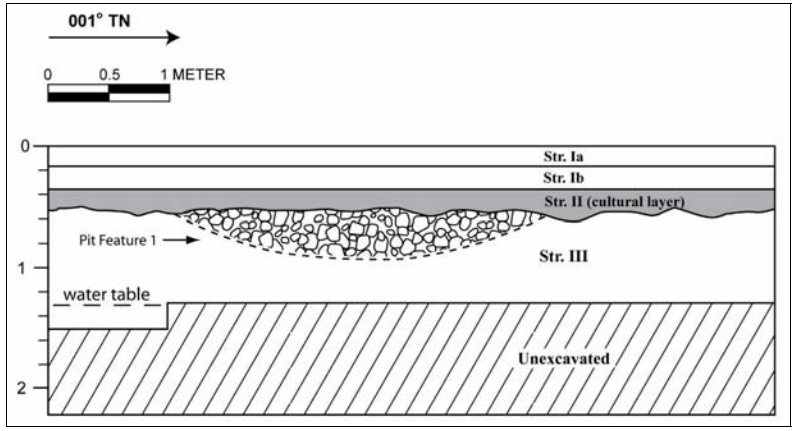


Figure 32. Profile of Trench 3, west sidewall

Figure 33. Photograph of Trench 3, west sidewall

Figure 34. Pit Feature 1 filled with coral cobbles and water-rounded basalt

5.2.2.4 Trench 4

Length:	6 m
Width:	0.85 m
Maximum Depth:	1.8 m
Orientation:	N/S

The stratigraphy of Trench 4 (Table 6, Figure 35, and Figure 36) consisted of a modern road surface (Stratum I) overlying a culturally enriched buried A-horizon (i.e., former land surface) (Stratum II), deposited atop culturally sterile naturally deposited jaucas sand (Stratum III). Stratum II consists of a buried former land surface (A-horizon) containing lithic debitage (i.e., basalt flakes) and fire-cracked rock. The cultural material observed in Stratum II indicates pre- to early post-Contact tradition Hawaiian land use. The upper boundary of this stratum has been impacted by road construction (i.e., graded, compacted, and oiled), with the lower boundary being intact. Of note is the presence of a post-hole feature (Pit Feature 2) originating from Stratum II and extending into Stratum III (see Figure 35 and Figure 36). The post-hole measures approximately 0.2 m wide and 0.5 m deep.

Table 6. Strata Observed at Trench 4

Stratum	Depth (cmbs)	Description
Ia	0-15	Basalt gravel.
Ib	15-35	Crushed coral fill.
II	35-65	10 YR 3/2, very dark grayish brown; silty sand; structureless; dry loose consistency; non plastic; mixed origin; very abrupt boundary; wavy topography. Buried former land surface (A-horizon) containing evidence of pre- to early post-Contact land use. Basalt flakes and fire-cracked rock observed. Upper boundary of layer has been graded, compacted, and oiled as a result of road construction.
III	65-180*	10 YR 8/3, very pale brown; sand; structureless; moist loose consistency; non plastic; marine origin. Naturally deposited sand.

* Base of Excavation

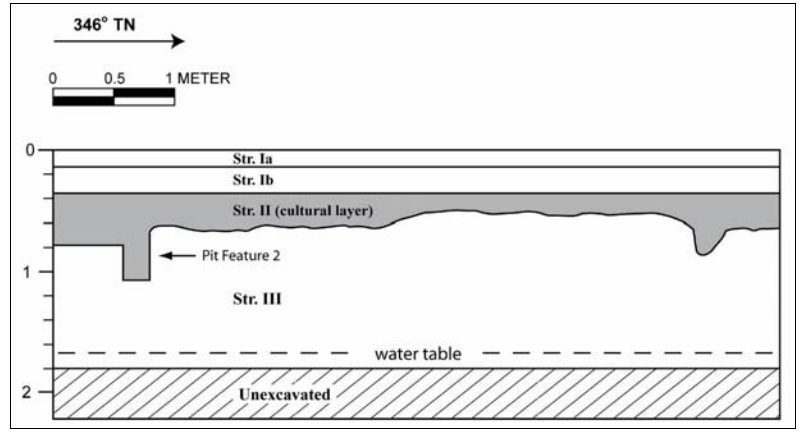


Figure 35. Profile of Trench 4, west sidewall

Figure 36. Photograph of Trench 4, west sidewall

5.2.2.5 Trench 5

Length:	6 m
Width:	0.85 m
Maximum Depth:	1.6 m
Orientation:	N/S

The stratigraphy of Trench 5 (Table 7, Figure 37, and Figure 38) consisted of multiple fill layers (Stratum I) overlying a naturally deposited marsh sediment (Stratum II). Stratum I appears to be a mixture of alluvial sediment and marine sand that has been locally procured and re-deposited. This layer is likely associated with the development of the existing Kualoa Regional Park. Observed stratigraphy indicates that marsh lands were present at this location, which were filled-in either during WWII activities or subsequent park development.

Table 7. Strata Observed at Trench 5

Stratum	Depth (cmbs)	Description
Ia	0-90	7.5 YR 3/3, dark brown; silt loam; moderate medium crumb structure; dry weakly coherent consistency; non plastic; terrigenous origin; abrupt boundary; wavy topography. Locally procured alluvial fill associated with land reclamation for park development.
Ib	40-140	7.5 YR 3/3, dark brown; clay loam; moderate medium crumb structure; dry weakly coherent consistency; slightly plastic; terrigenous origin; abrupt boundary; irregular topography. Locally procured alluvial fill associated with land reclamation for park development.
Ic	40-110	10 YR 4/2, dark grayish brown; silty sand; structureless; dry loose consistency; non plastic; mixed origin; very abrupt boundary; irregular topography. Contains glass fragments. Backfilled sand.
Id	110-130	10 YR 6/4, light yellowish brown; sand; structureless; dry loose consistency; non plastic; mixed origin; very abrupt boundary; irregular topography. Backfilled sand.
II	65-180*	10 YR 8/1, very dark gray; sand; structureless; moist loose consistency; non plastic; mixed origin. Naturally deposited sand layer at water table with lots of decomposing matter. Likely a marsh deposit.

* Base of Excavation

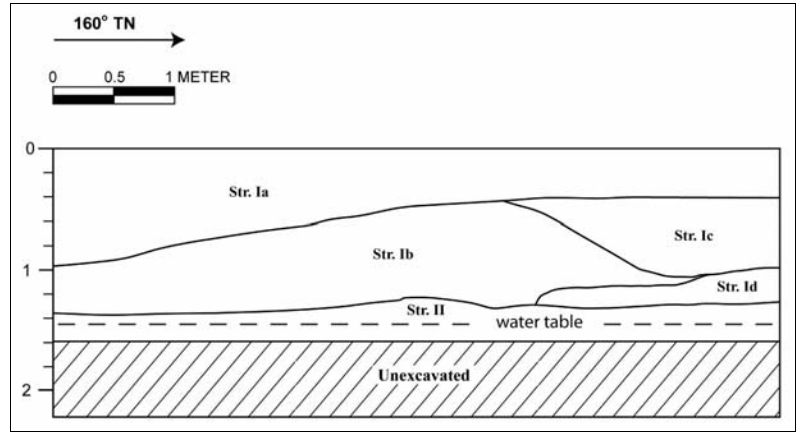


Figure 37. Profile of Trench 5, east sidewall

Figure 38. Photograph of Trench 5, east sidewall

5.2.2.6 Trench 6

Length:	6 m
Width:	0.85 m
Maximum Depth:	1.7 m
Orientation:	E/W

The stratigraphy of Trench 6 (Table 8, Figure 39, and Figure 40) consisted of a modern road surface (Stratum I) overlying naturally deposited jaucas sand (Stratum II). Road construction at this location (i.e., grading and filling) has completely removed the original land surface and can attribute to the absence of cultural deposits at this location.

Table 8. Strata Observed at Trench 6

Stratum	Depth (cmbs)	Description
Ia	0-10	Basalt gravel
Ib	10-40	Crushed coral fill
II	40-170*	10 YR 8/3, very pale brown; sand; structureless; dry loose consistency; non plastic; marine origin. Naturally deposited sand.

* Base of Excavation

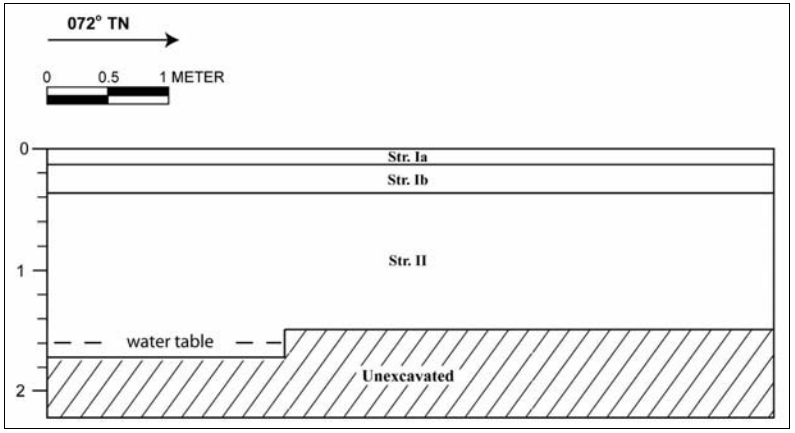


Figure 39. Profile of Trench 6, north sidewall

Figure 40. Photograph of Trench 6, north sidewall

5.2.2.7 Trench 7

Length:	6 m
Width:	0.85 m
Maximum Depth:	1.4 m
Orientation:	E/W

The stratigraphy of Trench 7 (Table 9, Figure 41, and Figure 42) consisted of locally procured fill material (Stratum I) overlying a naturally deposited marine sand (Stratum II). Observed stratigraphy indicates that this location has been graded and filled-in due to park development. This disturbance has completely removed the original land surface and can attribute to the absence of cultural deposits at this location.

Table 9. Strata Observed at Trench 7

Stratum	Depth (cmbs)	Description
I	0-100	5 YR 4/4, reddish brown; clay loam; weak fine crumb structure; moist friable consistency; slightly plastic; terrigenous origin; abrupt boundary; smooth topography. Alluvial sediment that has been locally procured and re-deposited.
II	100-140*	10 YR 8/3, very pale brown; sand; structureless; dry loose consistency; non plastic; marine origin. Naturally deposited sand.

* Base of Excavation

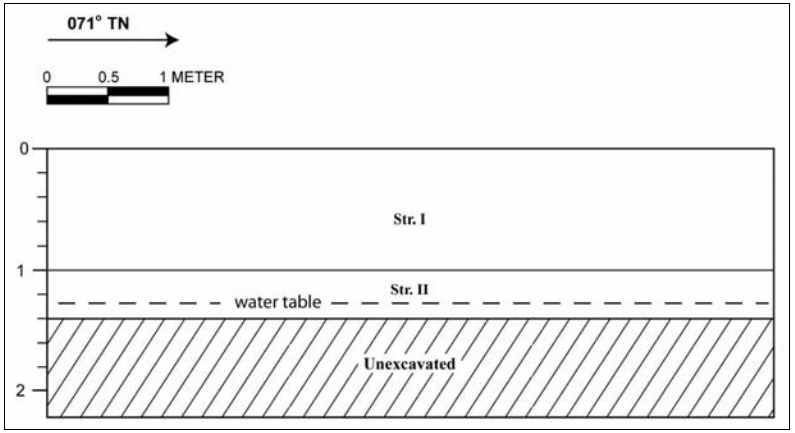


Figure 41. Profile of Trench 7, north sidewall

Figure 42. Photograph of Trench 7, north sidewall

5.2.2.8 Trench 8

Length:	6 m
Width:	0.85 m
Maximum Depth:	1.4 m
Orientation:	E/W

The stratigraphy of Trench 8 (Table 10, Figure 43, and Figure 44) consisted of locally procured fill material (Stratum I) overlying naturally deposited marine sand (Stratum II). Observed stratigraphy indicates that this location has been graded and filled-in due to park development. This disturbance has completely removed the original land surface and can attribute to the absence of cultural deposits at this location.

Table 10. Strata Observed at Trench 8

Stratum	Depth (cmbs)	Description
I	0-100	5 YR 4/4, reddish brown; clay loam; weak fine crumb structure; moist friable consistency; slightly plastic; terrigenous origin; abrupt boundary; smooth topography. Alluvial sediment that has been locally procured and re-deposited.
II	100-140*	10 YR 8/3, very pale brown; sand; structureless; dry loose consistency; non plastic; marine origin. Naturally deposited sand.

* Base of Excavation

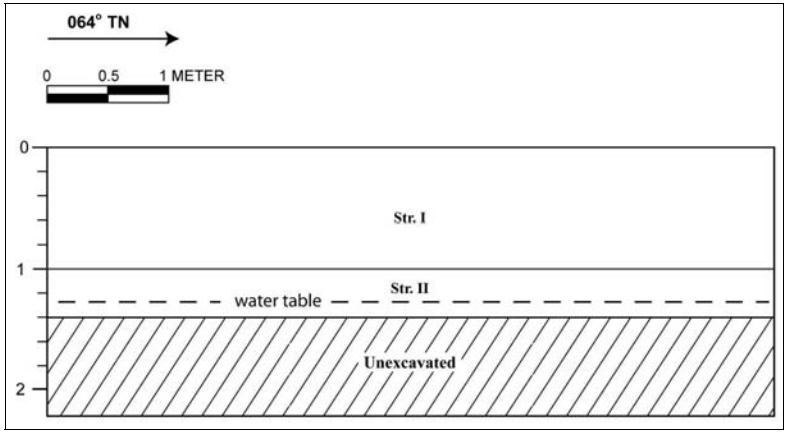


Figure 43. Profile of Trench 8, north sidewall

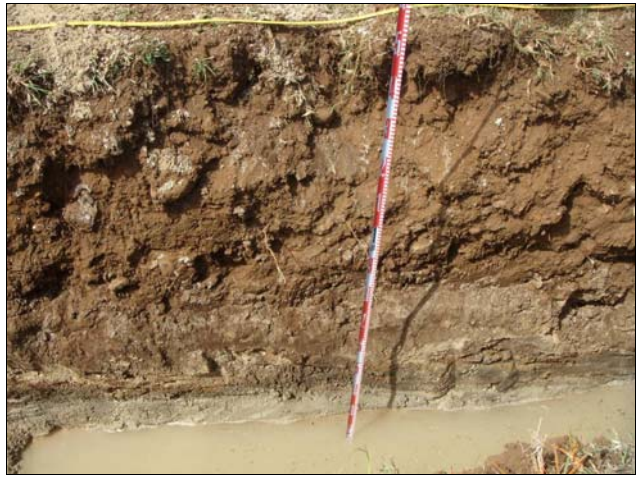


Figure 44. Photograph of Trench 8, north sidewall

5.2.2.9 Trench 9

Length:	6 m
Width:	0.85 m
Maximum Depth:	1.5 m
Orientation:	E/W

The stratigraphy of Trench 9 (Table 10, Figure 43, and Figure 44) consisted of multiple fill layers (Stratum I) overlying naturally deposited jaucas sand (Stratum III). Of note is the presence of a buried A-horizon (former land surface) remnant (Stratum II), which has been almost completely removed by the grading and filling associated with Stratum I. Buried A-horizons are important as they are the most likely stratigraphic layer to contain intact cultural deposits. Stratum II was sampled, but no cultural material was observed.

Table 11. Strata Observed at Trench 9

Stratum	Depth (cmbs)	Description
Ia	0-100	5 YR 4/4, reddish brown; clay loam; weak fine crumb structure; moist friable consistency; slightly plastic; terrigenous origin; abrupt boundary; smooth topography. Alluvial sediment that has been locally procured and re-deposited.
Ib	20-60	10 YR 4/2, dark grayish brown; silty sand; structureless; dry loose consistency; non plastic; mixed origin; very abrupt boundary; irregular topography. Contains glass fragments. Backfilled sand.
II	75-115	10 YR 3/2, very dark grayish brown; silty sand; structureless; dry loose consistency; non plastic; mixed origin; very abrupt boundary; irregular topography. Buried A-horizon remnant.
III	75-150*	10 YR 8/3, very pale brown; sand; structureless; dry loose consistency; non plastic; marine origin. Naturally deposited sand.

* Base of Excavation

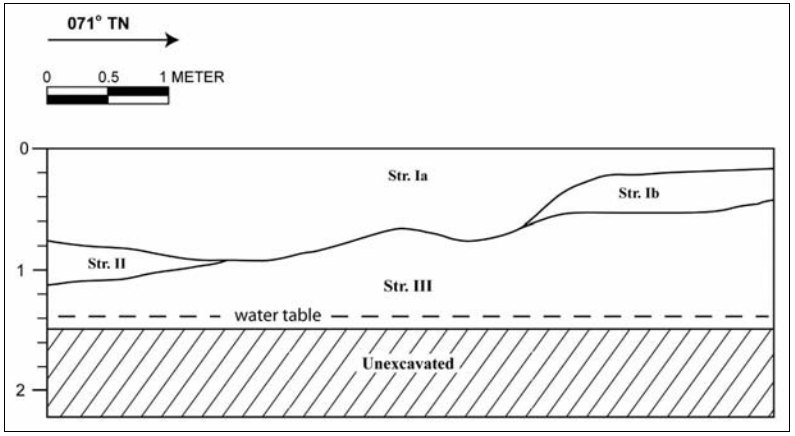


Figure 45. Profile of Trench 9, north sidewall

Figure 46. Photograph of Trench 9, north sidewall

5.2.2.10 Trench 10

Length:	6 m
Width:	0.85 m
Maximum Depth:	1.5 m
Orientation:	E/W

The stratigraphy of Trench 10 (Table 12, Figure 47, and Figure 48) consisted of locally procured fill (Stratum I) overlying a naturally deposited marine sand (Stratum II). Observed stratigraphy indicates that this location has been graded and filled-in due to park development. Of note was the presence of an *‘ulu maika* (traditional Hawaiian game stone) and a historic coka-cola bottle (1938-1951) within Stratum I, an layer of re-deposited alluvial sediment likely of local origin. The presence of both a pre- to early post-contact traditional Hawaiian artifact and a historic bottle emphasize that cultural material can be located virtually anywhere during subsurface excavation within the project area, even within areas that have been previously disturbed and contain fill deposits.

Table 12. Strata Observed at Trench 10

Stratum	Depth (cmbs)	Description
I	0-70	5 YR 4/4, reddish brown; clay loam; weak fine crumb structure; moist friable consistency; slightly plastic; terrigenous origin; abrupt boundary; smooth topography. Alluvial sediment that has been locally procured and re-deposited.
II	50-150*	10 YR 8/3, very pale brown; sand; structureless; dry loose consistency; non plastic; marine origin. Naturally deposited sand.

* Base of Excavation

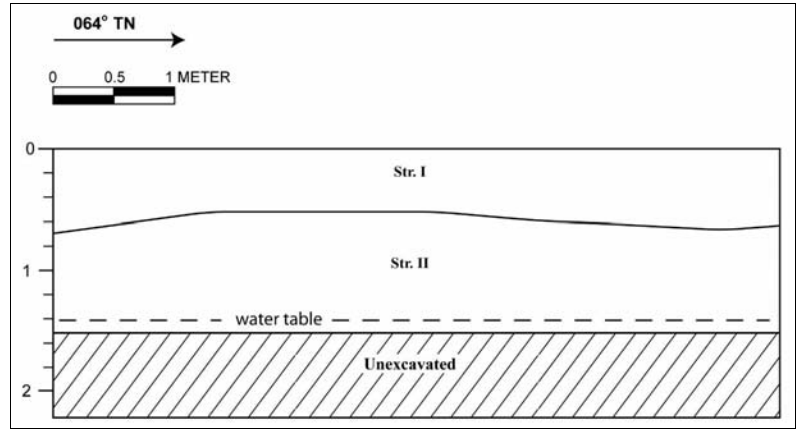


Figure 47. Profile of Trench 10, north sidewall

Figure 48. Photograph of Trench 10, north sidewall

5.2.2.11 Trench 11

Length:	6 m
Width:	0.85 m
Maximum Depth:	1.5 m
Orientation:	E/W

The stratigraphy of Trench 11 (Table 13, Figure 49, and Figure 50) consisted of locally procured fill material (Stratum I) overlying naturally deposited marine sand (Stratum II). Observed stratigraphy indicates that this location has been graded and filled-in due to park development. This disturbance has completely removed the original land surface and can attribute to the absence of cultural deposits at this location.

Table 13. Strata Observed at Trench 11

Stratum	Depth (cmbs)	Description
I	0-50	7.5 YR 4/2, brown; sandy silt loam; weak fine crumb structure; dry weakly coherent consistency; non-plastic; mixed origin; abrupt boundary; smooth topography. Locally procured sediments utilized as fill associated with park development.
II	50-150*	10 YR 8/3, very pale brown; sand; structureless; dry loose consistency; non plastic; marine origin. Naturally deposited sand.

* Base of Excavation

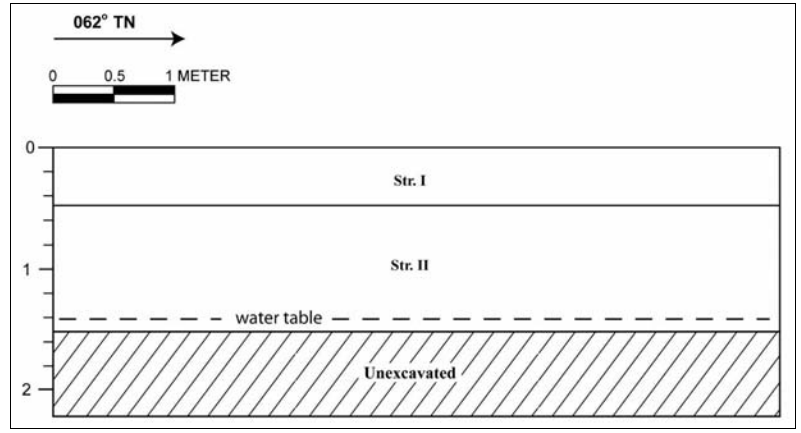


Figure 49. Profile of Trench 11, north sidewall

Figure 50. Photograph of Trench 11, north sidewall

5.2.2.12 Trench 12

Length:	6 m
Width:	0.85 m
Maximum Depth:	1.5 m
Orientation:	E/W

The stratigraphy of Trench 12 (Table 14, Figure 51, and Figure 52) consisted of locally procured fill material (Stratum I) overlying naturally deposited marine sand (Stratum II). Observed stratigraphy indicates that this location has been graded and filled-in due to park development. This disturbance has completely removed the original land surface and can attribute to the absence of cultural deposits at this location.

Table 14. Strata Observed at Trench 12

Stratum	Depth (cmbs)	Description
I	0-60	10 YR 4/2, dark grayish brown; sandy loam; structureless; dry slightly hard consistency; non-plastic; mixed origin; abrupt boundary; wavy topography. Locally procured sediments utilized as fill associated with park development.
II	60-150*	10 YR 8/3, very pale brown; sand; structureless; dry loose consistency; non plastic; marine origin. Naturally deposited sand.

* Base of Excavation

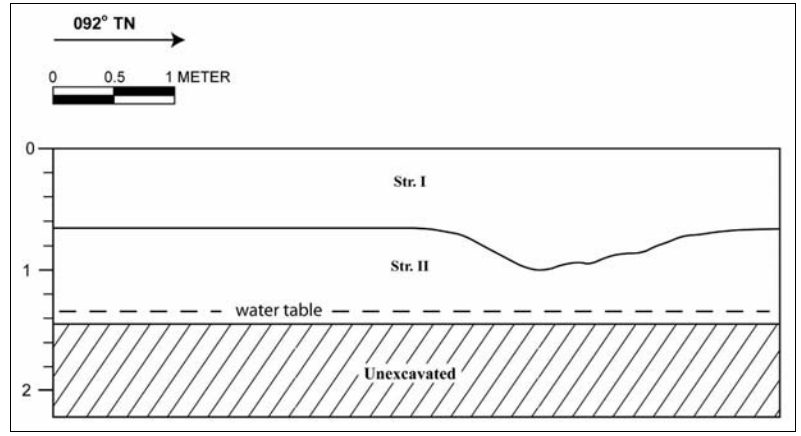


Figure 51. Profile of Trench 12, north sidewall

Figure 52. Photograph of Trench 12, north sidewall

5.2.2.13 Trench 13

Length:	6 m
Width:	0.85 m
Maximum Depth:	1.4 m
Orientation:	E/W

The stratigraphy of Trench 13 (Table 15, Figure 53, and Figure 54) consisted of locally procured fill material (Stratum I) overlying naturally deposited marine sand (Stratum II). Observed stratigraphy indicates that this location has been graded and filled-in due to park development. This disturbance has completely removed the original land surface and can attribute to the absence of cultural deposits at this location.

Table 15. Strata Observed at Trench 13

Stratum	Depth (cmbs)	Description
I	0-60	10 YR 4/2, dark grayish brown; sandy silt loam; weak fine crumb structure; dry slightly hard consistency; non-plastic; mixed origin; abrupt boundary; wavy topography. Locally procured sediments utilized as fill associated with park development.
II	60-140*	10 YR 8/3, very pale brown; sand; structureless; dry loose consistency; non plastic; marine origin. Naturally deposited sand.

* Base of Excavation

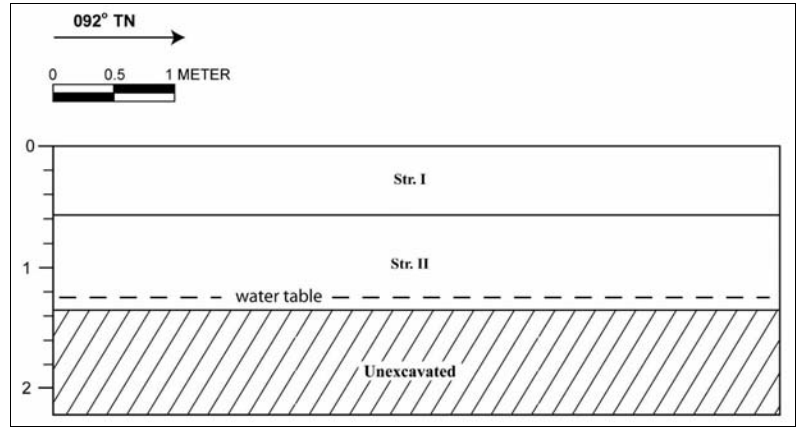


Figure 53. Profile of Trench 13, north sidewall

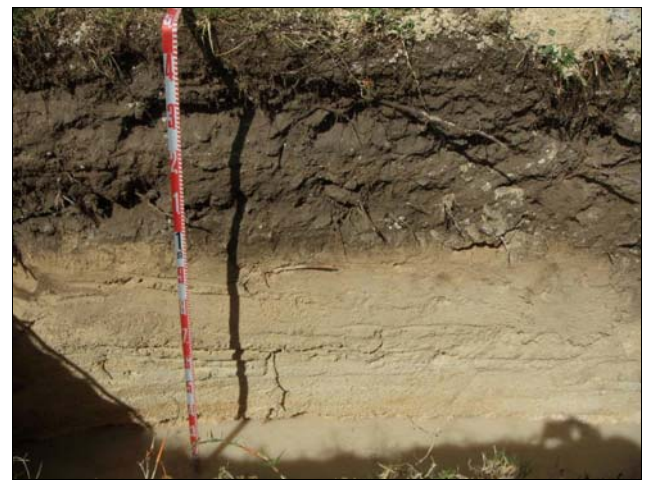


Figure 54. Photograph of Trench 13, north sidewall

5.2.2.14 Trench 14

Length:	6 m
Width:	0.85 m
Maximum Depth:	1.5 m
Orientation:	E/W

The stratigraphy of Trench 14 (Table 16, Figure 55, and Figure 56) consisted of a modern road surface (Stratum I) overlying naturally deposited marine sand (Stratum II). Observed stratigraphy indicates that this location has been graded and filled-in due to road construction. This disturbance has completely removed the original land surface; however, a pit feature (Pit Feature 3), which was likely excavated from the now removed original land surface, was observed excavated into Stratum II (naturally deposited sterile marine sand). The pit feature was excavated out of the trench’s sidewall and screened. A basalt chisel and a basalt flake were observed and collected.

Table 16. Strata Observed at Trench 14

Stratum	Depth (cmbs)	Description
Ia	0-20	Basalt gravel
Ib	20-55	Crushed coral fill
Ic	55-70	10 YR 3/1, very dark grey; sandy loam; structureless; moist firm consistency; non plastic; mixed origin; very abrupt boundary; smooth topography. Backfilled sand that has been oiled, graded, and compacted.
II	70-150*	10 YR 8/3, very pale brown; sand; structureless; dry loose consistency; non plastic; marine origin. Naturally deposited sand.

* Base of Excavation

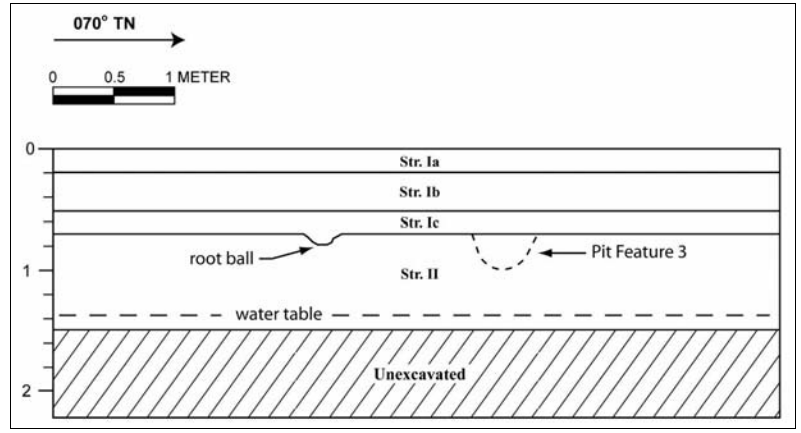


Figure 55. Profile of Trench 14, north sidewall

Figure 56. Photograph of Trench 14, north sidewall

5.2.2.15 Trench 15

Length:	6 m
Width:	0.85 m
Maximum Depth:	1.5 m
Orientation:	N/S

The stratigraphy of Trench 15 (Table 17, Figure 57, and Figure 58) consisted of imported and locally procured fill (Stratum I) overlying naturally deposited marine sand (Stratum II). Observed stratigraphy indicates that this location has been graded and filled-in due to road construction. This disturbance has completely removed the original land surface and can attribute to the absence of cultural deposits at this location.

Table 17. Strata Observed at Trench 15

Stratum	Depth (cmbs)	Description
Ia	0-15	10 YR 4/2, dark grayish brown; silty sand; structureless; dry loose consistency; non plastic; mixed origin; very abrupt boundary; smooth topography.
Ib	15-30	10 YR 8/1, white; sand; structureless; dry loose consistency; non plastic; marine origin. Backfilled sand.
Ic	30-60	Basalt gravel
Id	60-75	10 YR 3/1, very dark grey; silty sand; structureless; dry slightly hard consistency; non plastic; mixed origin; very abrupt boundary; smooth topography. Backfilled sand that has been oiled, graded, and compacted.
II	75-150*	10 YR 8/3, very pale brown; sand; structureless; dry loose consistency; non plastic; marine origin. Naturally deposited sand.

* Base of Excavation

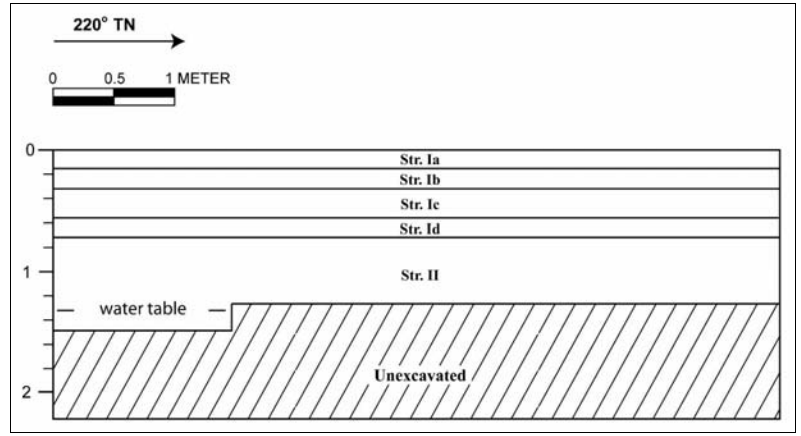


Figure 57. Profile of Trench 15, east sidewall

Figure 58. Photograph of Trench 15, east sidewall

5.2.2.16 Trench 16

Length:	6 m
Width:	0.85 m
Maximum Depth:	1.35 m
Orientation:	N/S

The stratigraphy of Trench 16 (Table 18, Figure 59, and Figure 60) consisted of locally procured fill (Stratum I) overlying naturally deposited marine sand (Stratum II). Observed stratigraphy indicates that this location has been graded and filled-in due to park development. This disturbance has completely removed the original land surface; however a micro-adze was collected from Stratum Ib, a layer of re-deposited sand likely of local origin. The presence of a traditional Hawaiian artifact within previously disturbed fill layers emphasizes the potential of encountering cultural material throughout the entire project area, even in areas that have been heavily impacted by either WWII airstrip construction or the more recent Kualoa Regional Park development. While the original (pre development) land surface has been completely removed in this location the presence of the micro-adze suggests that at least portions of the fill material used at this location originally consisted of intact culturally enriched A-horizons that have be removed and re-deposited, now displaced from their primary depositional context.

Table 18. Strata Observed at Trench 16

Stratum	Depth (cmbs)	Description
Ia	0-15	10 YR 5/3, brown; sandy silt; structureless; dry loose consistency; non plastic; mixed origin; abrupt boundary; smooth topography. Modern A-horizon.
Ib	15-50	10 YR 7/2, light gray; silty sand; structureless; dry loose consistency; non plastic; mixed origin, abrupt boundary; smooth topography. Backfilled sand. Micro-adze observed and collected.
Ic	50-75	10 YR 3/1, very dark grey; silty sand; structureless; dry slightly hard consistency; non plastic; mixed origin; very abrupt boundary; smooth topography. Backfilled sand that has been oiled, graded, and compacted.
II	75-135*	10 YR 8/3, very pale brown; sand; structureless; dry loose consistency; non plastic; marine origin. Naturally deposited sand.

* Base of Excavation

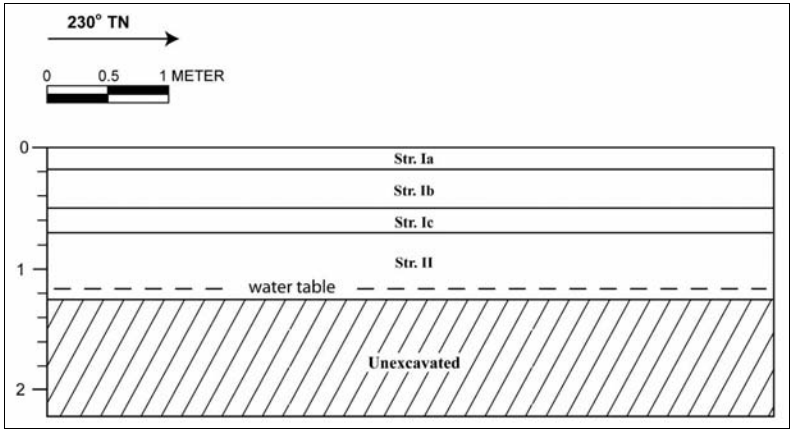


Figure 59. Profile of Trench 16, east sidewall

Figure 60. Photograph of Trench 16, east sidewall

5.2.2.17 Trench 17

Length:	6 m
Width:	0.85 m
Maximum Depth:	1.7 m
Orientation:	N/S

The stratigraphy of Trench 17 (Table 19, Figure 61, and Figure 62) consisted of locally procured fill (Stratum I) overlying a culturally enriched buried A-horizon (i.e., former land surface) (Stratum II), developed atop culturally sterile naturally deposited jaucas sand (Stratum III). Stratum II consists of a buried former land surface (A-horizon) containing lithic debitage (i.e., basalt flakes), fire-cracked rock, marine shell midden, and metal nails. The cultural material observed in Stratum II indicates both pre- and post-Contact land use.

Of note was the presence of an isolated cranial fragment discovered during the excavation of Trench 17. This fragment was stratigraphically associated with a re-deposited sand layer (Stratum Ib), a fill layer most likely created during bathhouse construction and from the park grounds during episodes of grading and filling. Thus the cranial fragment was discovered in a secondary depositional context and its original primary burial context cannot be confirmed. The single isolated cranial fragment was approximately the size of a quarter. The fragment was wrapped in muslin and placed in a small *lauhala* basket. The fragment was then reburied in the south end of Trench 17 in the vicinity of where it was originally discovered, at an approximate depth of 50 cmbs.

Table 19. Strata Observed at Trench 17

Stratum	Depth (cmbs)	Description
Ia	0-15	10 YR 5/4, yellowish brown; sandy silt; structureless; dry loose consistency; non plastic; mixed origin; abrupt boundary; smooth topography. Modern A-horizon.
Ib	15-90	10 YR 7/2, light gray; silty sand; structureless; dry loose consistency; non plastic; mixed origin, abrupt boundary; smooth topography. Contains bands/lenses of very pale brown (10 YR 8/3) sand indicating prior machine disturbance. Isolated human cranial fragment observed in this layer.
Ic	60-115	10 YR 7/3, very pale brown; silty sand; structureless; dry slightly hard consistency; non plastic; mixed origin; very abrupt boundary; smooth topography. Contains bands/lenses of very dark grey (10 YR 3/1) silty sand indicating prior machine disturbance.
II	100-170*	10 YR 2/2, very dark brown; silty sand; structureless; moist loose consistency; non plastic; mixed origin; very abrupt boundary; wavy topography. Buried A horizon (former land surface) containing basalt flakes, fire-cracked rock, marine shell midden, and metal nails.
III	150-170*	10 YR 8/3, very pale brown; sand; structureless; dry loose consistency; non plastic; marine origin. Naturally deposited sand.

* Base of Excavation

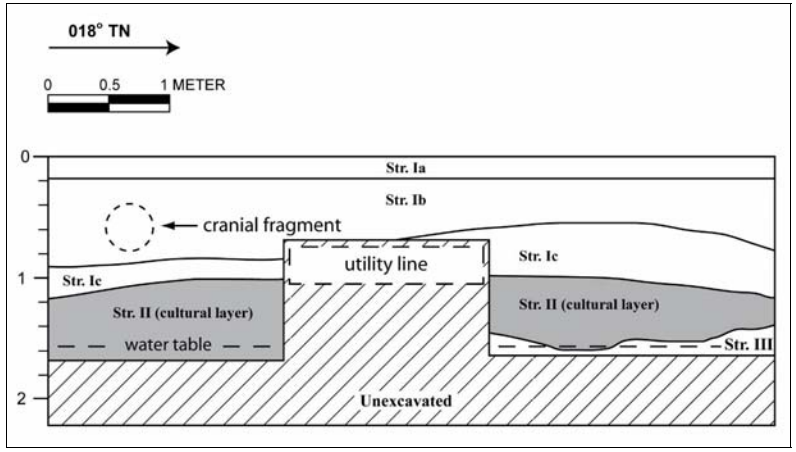


Figure 61. Profile of Trench 17, west sidewall

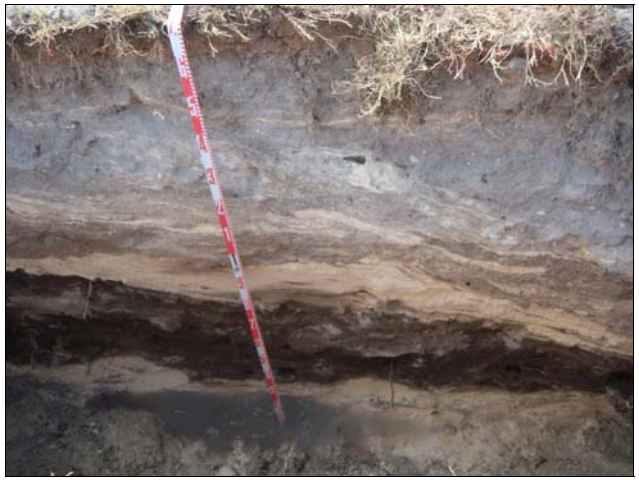


Figure 62. Photograph of Trench 17, west sidewall

5.2.2.18 Trench 18

Length:	6 m
Width:	0.85 m
Maximum Depth:	1.7 m
Orientation:	N/S

The stratigraphy of Trench 18 (Table 20, Figure 63, and Figure 64) consisted of multiple fill layers (Stratum I) overlying naturally deposited jaucas sand (Stratum II). Stratum I appears to be a mixture of alluvial sediment and marine sand that has been locally procured and re-deposited. This layer is likely associated with WWII-era military activities and the development of the existing Kualoa Regional Park. These two periods of disturbance have completely removed the original land surface and can attribute to the absence of cultural deposits at this location.

Table 20. Strata Observed at Trench 18

Stratum	Depth (cmbs)	Description
Ia	0-30	10 YR 5/2, grayish brown; silt loam; weak, fine, granular structure; dry weakly coherent consistency; non-plastic; mixed origin; abrupt boundary; smooth topography. Backfilled sand.
Ib	30-50	10 YR 3/1, very dark grey; silty sand; structureless; dry slightly hard consistency; non plastic; mixed origin; very abrupt boundary; smooth topography. Backfilled sand that has been oiled and compacted.
II	50-170*	10 YR 8/3, very pale brown; sand; structureless; moist loose consistency; non plastic; marine origin. Naturally deposited sand.

* Base of Excavation

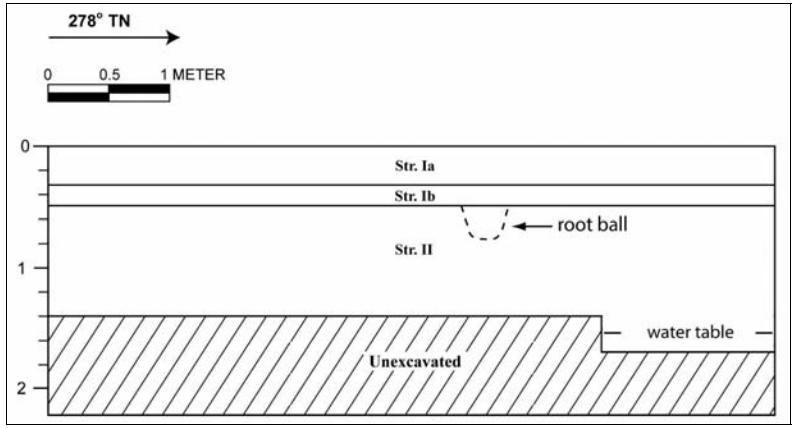


Figure 63. Profile of Trench 18, south sidewall

Figure 64. Photograph of Trench 18, south sidewall

5.3 Historic Property Descriptions

5.3.1 SIHP No. 50-80-06-528

The entire *ahupua‘a* of Kualoa was placed on the National Register of Historic Places in October, 1974. Kualoa Ahupua‘a was assigned State Inventory of Historic Properties (SIHP) #50-80-06-528. The National Register form for Kualoa justifies the significance of the *ahupua‘a* on the basis that “the lands of Kualoa were considered to be a symbol of sovereignty (based on the Ka‘ōpulupulu tradition) and “the feeling of sacredness for Kualoa” expressed in traditions of Kualoa as a place for the training of chiefs, as a *pu‘uhonua*, where people fled to for protection, as a place for the drowning of sacrificial victims, and as a place in numerous legends (Hāloa, Pele, Kamapua‘a, Hi‘iaka, etc) (State Parks Division 1973). The sugar mill is cited as a remnant of the early sugar industry of O‘ahu. In sum, “Kualoa remains significant, even without physical remains of ancient sites, because of its central place in O‘ahu traditions and the feeling of the sacredness of the land, even by present day Hawaiians” (State Parks Division 1973). Also of note is the assignment of a separate SIHP number (SIHP # 50-80-06-5371) to a single inadvertent burial located at the south central portion of East Beach (Dye 1996).

During the course of the current investigation a subsurface cultural layer was observed to be present discontinuously throughout the project area. This cultural layer is considered to be a contributing component of SIHP #50-80-06-528 (Kualoa Ahupua‘a). Below is a description of the subsurface cultural layer document within the project area during subsurface test excavations.

5.3.1.1 Subsurface cultural layer

FORMAL TYPE:	Subsurface cultural layer
FUNCTION:	Activity area
AGE:	Pre- to post-Contact
DIMENSIONS:	Indeterminate
LOCATION:	Distributed throughout Kualoa Regional Park
TAX MAP KEY:	[1] 4-9-004: 001 por.
LAND JURISDICTION:	Public; City and County of Honolulu

A subsurface cultural layer was observed to be present discontinuously throughout the project area (Figure 65). It is defined as an area that shows subsurface remnants of pre- and post-Contact activity. Generally, this is evidenced by an A horizon developed on the natural jaucas beach sand that pervades the area and is primarily enriched with traditional Hawaiian cultural material. This A horizon was subsequently buried by historic fill events that brought the surface to its current elevation. During these fill events, the A horizon was both disturbed and cut away to varying degrees.

Many elements observed during subsurface testing show evidence of pre-Contact traditional Hawaiian activity in the area such as the presence of midden (marine shell and mammal bone), fire cracked rock, charcoal deposits, lithic debitage (basalt flakes), and stone tools (i.e., ‘*ulu*

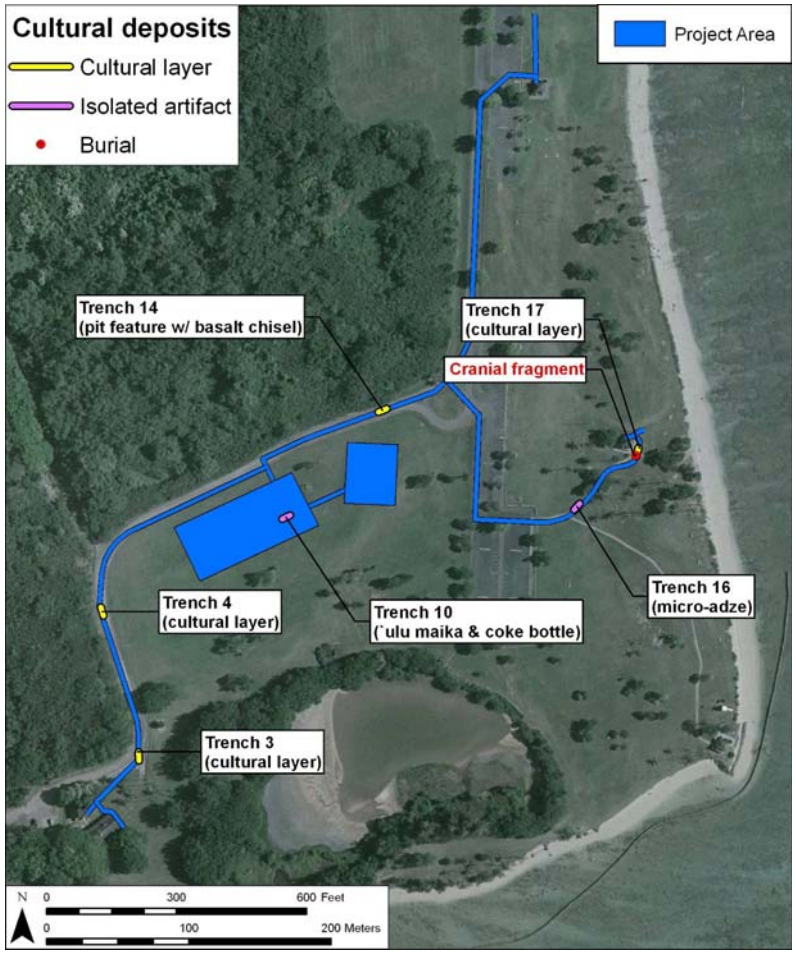


Figure 65. Aerial photograph (source: Google Earth 2011) showing the distribution of cultural deposits within the project area

maika, micro-adze, and basalt chisel). These cultural materials were observed within cultural layers but also were observed within fill layers consisting of locally procured sediments, which based on the presence of cultural material within them, may have originally consisted of culturally enriched A-horizons that have be removed and re-deposited.

While observed and collected cultural material was predominantly of pre- to early post-Contact traditional Hawaiian origin, a historic bottle and modern metal nails were also recovered, suggesting that the cultural layer spans from the pre- to post-Contact era, and that historic and modern development of Kualoa Regional Park has impacted SIHP -528.

Also documented were three pit features (Pit Features 1-3) located within different areas of the discontinuous cultural layer (see section 4.2.2 Trench Documentation above). The size, shape, and contents of the pits vary considerably (Table 21). Pit Feature 1 measured approximately 3 m wide and 0.4 m deep. The pit feature was situated within the middle of Trench 3 and extended across the short axis of the trench, extending beyond both of the trench's east and west sidewalls (see Figure 32). The pit feature was filled with approximately 90% coral cobbles and 10% water-rounded basalt cobbles and pebbles (see Figure 34). Basalt flakes were also observed within this feature. The function of this feature is unknown, but its association with a cultural layer and the presence of basalt flakes within it suggest it is of pre- to early post-Contact traditional Hawaiian origin.

Pit Feature 2 was observed within the west side wall of Trench 4 (see Figure 35 and Figure 36). The pit feature measured approximately 0.2 m wide and 0.5 m deep. It originated from a culturally enriched buried A-horizon and extends into the underlying culturally sterile Jaucas sand. This feature has been interpreted as a post-hole based on its size and shape.

Pit Feature 3 was observed within the north sidewall of Trench 14 (see Figure 53 and Figure 54). The feature measured approximately 0.4 m wide by 0.3 m deep. The pit feature was excavated out of the trench's sidewall and screened. A basalt chisel and a basalt flake were observed and collected.

Of note was the presence of an isolated cranial fragment discovered during the excavation of Trench 17 (see Figure 61). This fragment was stratigraphically associated with a re-deposited sand layer (Stratum Ib), a fill layer most likely procured from the park grounds during episodes of grading and filling associated with the construction of the adjacent Bath House #2. Thus the cranial fragment was discovered in a secondary depositional context and its original primary burial context cannot be confirmed. The single isolated cranial fragment was approximately the size of a quarter. The fragment was wrapped in muslin and placed in a small *lauhala* basket. The fragment was then reburied in the south end of Trench 17 in the vicinity of where it was originally discovered, at an approximate depth of 50 cmbs.

Following the procedures of Hawai‘i Revised Statutes (HRS) Chapter 6E-43, and Hawai‘i Administrative Rules (HAR) Chapter 13-300, the remains were determined by SHPD to be "not a burial nor in a burial site context" [Phyllis Cayan (SHPD History & Culture Branch Chief) via e-mail correspondence 12/19/2011]. As the remains represent a previously identified human skeletal element in a non burial context SHPD/DLNR has assumed jurisdiction on determining appropriate burial treatment.

Table 21. Documented Pit Features Associated with Cultural Layer

	Trench #	Dimensions (width x depth)	Pit fill	Post-screening Contents	Function
Pit Feature 1	3	300 cm x 40 cm	90% coral cobbles, 10% water-rounded basalt cobbles and pebbles	Contents to large and bulky to screen; however, numerous basalt flakes were observed and collected when the feature was partially excavated.	Indeterminate
Pit Feature 2	4	20 cm x 50 cm	Dark stained buried A-horizon	Charcoal	Post hole
Pit Feature 3	14	40 cm x 30 cm	Slightly stained Jaucas sand	Basalt flake and chisel	Indeterminate

Section 6 Results of Laboratory Analysis

6.1 Artifacts

Numerous artifacts (Accession #’s 1-13) were recovered during subsurface investigations conducted within the project area, most were associated with a subsurface cultural layer interpreted to be a contributing component of SIHP #50-80-06-528, Kualoa Ahupua‘a (Table 22). A majority of the recovered artifacts were of traditional Hawaiian origin, including: an *‘ulu maika* (a stone shaped like a short, wide cylinder used in the *maika* game, which is similar to bowling) (Figure 66), a micro-adze (Figure 67), an adze pre-form, a basalt file (Figure 68), a basalt chisel (Figure 69), basalt flakes (Figure 70), and volcanic glass flakes (Figure 71). Also recovered was a historic coca-cola bottle (dated between 1938 and 1951, http://www.antiquebottles.com/coke/) and metal nails, likely of modern origin.

In summary, the artifact assemblage observed at SIHP #50-80-06-528 indicates that the site is primarily associated with pre-contact indigenous Hawaiian land use, with an emphasis on lithic reduction work related to the manufacture of stone tools. The historic bottle and modern nail were likely introduced to the area during either WWII-era airstrip construction or the more recent Kualoa Regional Park development.

6.2 Midden

Midden associated with pre- to early post-Contact traditional Hawaiian land use was only encountered during the excavation of Trench 17. A total of 44 g of midden was collected (Table 23). The majority of the observed and collected midden consisted of marine shellfish, which included: Cowry, sea urchin, periwinkle, and bi-valves.

6.3 Wood Taxa Identification

Wood taxa identification of charcoal samples collected from SIHP #50-80-06-528 were analyzed in an attempt to determine the forms of vegetation that may have been present at coastal Kualoa prior to historic and modern development and/or give insight into the type of plant material that was being transported to and utilized at the site. The ability to confirm the presence plant species commonly associated with traditional Hawaiian use would provide insight into specific activities that may have been associated with the subsurface cultural layer identified during this investigation.

Two charcoal samples collected from a subsurface cultural layer associated with SIHP #50-80-06-528 (Kualoa Ahupua‘a) were submitted to IARII for wood taxa identification (Murakami 2011; see Appendix B). The first sample was taken from a pit feature documented in Trench 4 (Pit Feature 2) and the second sample was collected from a screened bulk sample of the cultural layer documented at Trench 17.

Plant species identified from the sample collected from Pit Feature 2 at Trench 4 included: *lama* (*Diospyros sandwicensis*), *kī* (*Cordyline fruticosa*), *hau* (*Hibiscus tiliaceus*), *‘ōhi‘a lehua* (cf. *Metrosideros polymorpha*), *‘ilima* (cf. *Sida fallax*), *‘ahakea* (cf. *Bobea* sp.), *hao*

Table 22.Artifacts observed at SIHP #50-80-06-528, subsurface cultural layer

Accession Number	Trench Number	Stratum	Depth (cmbs)	# of Pieces	Length (cm)*	Width (cm)*	Thickness (cm)*	Weight (g)*	Material Type	Comments
1	4	II (Cultural layer)	25 - 50	5	2.4 - 6.6	2.3 - 4	0.4 - 1	49.5	Basalt	Lithic debitage (i.e., flakes)
2	4	II (Cultural layer)	25 - 50	3	1 - 1.3	0.9 - 1	0.2 – 0.3	0.9	Volcanic glass	Flakes
3	4	II (Cultural layer)	25 - 50	1	5.5	3	2	44.8	Dense basalt	Micro adze core
4	14	Pit Feature 3	90	1	4	3.2	0.5	5.2	Basalt	Basalt flake
5	14	Pit Feature 3	90	1	6.1	1.6	1.35	20.2	Basalt	Basalt core chisel
6	16	II (Cultural layer)	20	1	4	1.6	0.85	10.1	Dense basalt	Micro adze
7	17	II (Cultural layer)	100 – 175	2	8	6	1.5	8.2 – 63	Basalt	Lithic debitage (i.e., flakes)
8	17	II (Cultural layer)	100 – 175	3	5.6	0.6	0.6	3.6	Metal	Nails
9	10	Ia (Fill layer)	0 – 13	1	6.4 diam.	N/A	3.7	250.2	Basalt	*'Ulu maika*
10	10	Ia (Fill layer)	0 – 13	1	4	1.5	1	6	Basalt	Basalt file
11	10	Ia (Fill layer)	0 – 43	1	19.5	6 diam.	N/A	452.5	Glass	Coke bottle

Accession Number	Trench Number	Stratum	Depth (cmbs)	# of Pieces	Length (cm)*	Width (cm)*	Thickness (cm)*	Weight (g)*	Material Type	Comments
12	3	II (Cultural layer)	40 – 60	11	2.1 – 5.5	1.8 – 4.8	0.5 – 1.6	161.0	Basalt	Lithic debitage (i.e., flakes)
13	3	Pit Feature 1	60 – 80	8	3.1 – 11	2.7 – 6	0.4 – 2.1	424	Basalt	Lithic debitage (i.e., flakes)

*For basalt and volcanic glass flakes a range is provided for all dimension measurements based on the trench and stratum that each set of flakes was collected.

Figure 66. ‘*Ulu maika* (traditional Hawaiian game stone) (Accession #9)

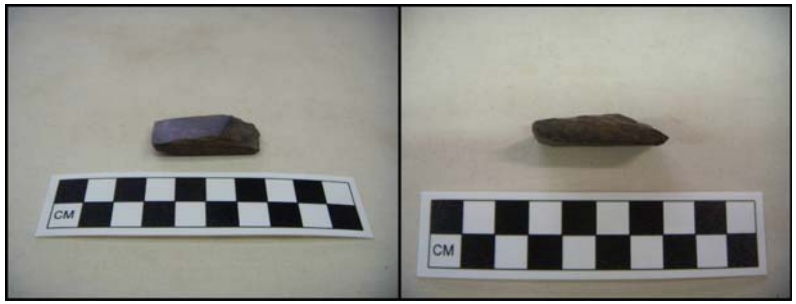


Figure 67. Micro-adze (Accession #6)

Figure 68. Basalt file (Accession #10)

Figure 69. Basalt chisel (Accession #5)

Figure 70. Basalt flakes (Accession #13)

Figure 71. Volcanic glass flakes (Accession #2)

Figure 72. Historic Coca-cola bottle (Accession #11)

Table 23. Midden observed at SIHP #50-80-06-528, subsurface cultural layer

Trench #	Stratum / Feature	Depth (cmbd)	# of Pieces	Weight (g)	Material Type	Comments
17	II	100 – 175	39	Total 41.9	Shell	Cowry, urchin, periwinkle, bi-valves, etc.
17	II	100 – 175	3	Total 2.4	Faunal	Indeterminate fragments

Table 24. Charcoal Taxa Identification in Charcoal Samples from SIHP-528, subsurface cultural layer (adapted from Murakami 2011: 5)

Provenience	Taxa	Common/ Hawaiian Name	Origin/Habit	Part	Weight (g)
Trench 17, Stratum II, 140 cmbs	cf. *Hibiscus tiliaceus*	*Hau*	Native/Shrub-Tree	Wood	0.13
	cf. *Cocos nucifera*	*Niu,* coconut	Polynesian Introduction/Tree	Wood	0.07
	Diospyros sandwicensis	*Lama*	Native/Tree	Wood	0.05
	cf. *Acacia koa*	*Koa*	Native/Tree	Wood	0.01
	Aleurites moluccana	*Kukui*	Polynesian Introduction/Tree	Nutshell	0.05
	cf. *Metrosideros polymorpha*	*‘Ōhi‘a lehua*	Native/Shrub	Wood	0.03
	cf. *Pandanus tectorius*	*Hala*	Native (?)/Tree	Wood	0.02
	Unknown 1	-	-	Wood	0.03
Trench 4, Pit Feature 2, 60 cmbs	*Diospyros sandwicensis*	*Lama*	Native/Tree	Wood	2.99
	Not identified	-	-	cf. Bark	1.03
	Unknown 2	-	-	Wood	2.14
	Cordyline fruticosa	*Kī, ti*	Polynesian Introduction/Shrub	Wood	0.19
	Hibiscus tiliaceus	*Hau*	Native/Shrub-Tree	Wood	0.41
	cf. *Metrosideros polymorpha*	*‘Ōhi‘a lehua*	Native/Shrub	Wood	0.93
	cf. *Sida fallax*	*‘Ilima*	Native/Shrub	Wood	0.19
	cf. *Bobea sp.*	*‘Ahakea*	Native/Tree	Wood	0.17
	cf. *Syzygium sp.*	*‘Ohi‘a ai* (mountain apple), roseapple, or Java plum	Native + Historic Introductions/Tree	Wood	0.30
	cf. *Rauvolfia sandwicensis*	*Hao*	Native/Tree	Wood	0.73
	cf. *Coprosma sp.*	*Pilo*	Native/Shrub	Wood	0.06
	cf. *Pteridophyta*	Fern		Stem	0.09

(cf. *Rauvolfia sandwicensis*), *pilo* (cf. *Coprosma* sp.), ferns (cf. *Pteridophyta*), and a tree from the *Syzygium* genus which could not be identified down to the species (Table 24). Of note is that a majority of the charcoal present in Pit Feature 2 consisted of *lama*, an endemic tree utilized by traditional Hawaiians for houses, enclosures for certain idols (Malo 1951:21 in Murakami 2011), and chisel handles (Buck 1957:38 in Murakami 2011). This provides additional data that Pit Feature 2 likely functioned as a post hole, possibly associated with a habitation or for the delineation of a sacred area.

Plant species identified from the sample collected from a subsurface cultural layer at Trench 17 included: *lama* (*Diospyros sandwicensis*), *hau* (*Hibiscus tiliaceus*), *‘ōhi‘a lehua* (cf. *Metrosideros polymorpha*), *niu* (cf. *Cocos nucifera*), *koa* (cf. *Acacia koa*), *kukui* (*Aleurites moluccana*), and *hala* (cf. *Pandanus tectorius*) (Table 24).

In summary, wood taxa identification of charcoal samples collected from SIHP #50-80-06-528 documented the presence of numerous native and Polynesian introduced species. Ethnobotanical research indicates that all of the identified plant species present within the cultural layer had the potential to have been utilized by traditional Hawaiians. Based on wood taxa identification possible activities conducted at the cultural layer include: fishing, food preparation, tool and clothing manufacture, and house and canoe construction (Murakami 2011: 1-4). Thus the results of wood taxa identification provide additional data indicating that the subsurface cultural layer identified during this current investigation is associated with pre- to early post-Contact traditional Hawaiian occupation with a focus on habitation.

6.4 Radiocarbon Analysis

Charcoal samples collected from SIHP #50-80-06-528 (Kualoa Ahupua‘a subsurface cultural layer) were sent to Beta Analytic, Inc. for radiocarbon dating, utilizing the accelerator mass spectrometry (AMS) method, in order to better establish the age range of occupation at the subsurface cultural layer. Dating results are shown in Table 25 below (also refer to Appendix C).

Two samples from SIHP #50-80-06-528 were submitted for radiocarbon dating analysis (Figure 73 and Figure 74). The first sample (Beta-310828) yielded three possible date ranges, with a calibrated 2-sigma date of 1669 AD-1781 AD (43.0 %) being the most probable. This date range is within the late pre-Contact to early post-Contract period. The second sample (Beta-310829) yielded three possible date ranges, with a calibrated 2-sigma date range of 1729 AD-1810 AD (51.6 %) being the most probable. This date range is also within the late pre-Contact to early post-Contract period.

Table 25. Results of Radiocarbon Analysis of Charcoal Collected at SIHP #50-80-06-528, Kualoa Ahupua‘a subsurface cultural layer

CSH ID#	Beta Analytic ID #	Sample Material / Analytic Technique	Provenience	Conventional Radiocarbon Age	C13/C12 Ratio	Oxcal Calibrated Calendar Age (2 sigma)
KUALOA2-TR4	Beta-310828	Charcoal / AMS	Pit feature 2 (cultural layer) 60 cmbs, Trench 4	140 +/- 40 BP	-25.9 o/oo	1669 AD-1781 AD (43.0 %) 1798 AD-1891 AD (36.8 %) 1908 AD-1945 AD (15.6 %)
KUALOA2-TR17	Beta-310829	Charcoal / AMS	Stratum II (cultural layer) 140 cmbs, Trench 17	200 +/- 30 BP	-23.6 o/oo	1646 AD-1690 AD (25.5%) 1729 AD-1810 AD (51.6 %) 1925 AD-1955 AD (18.2 %)

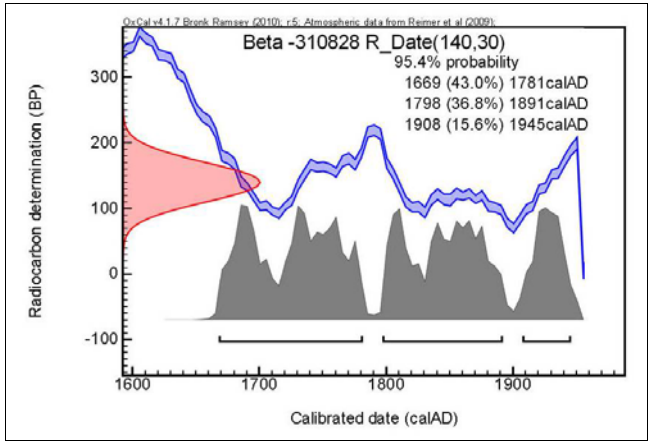


Figure 73. Graph showing results of radiocarbon analysis of charcoal collected from subsurface cultural layer observed at Trench 2

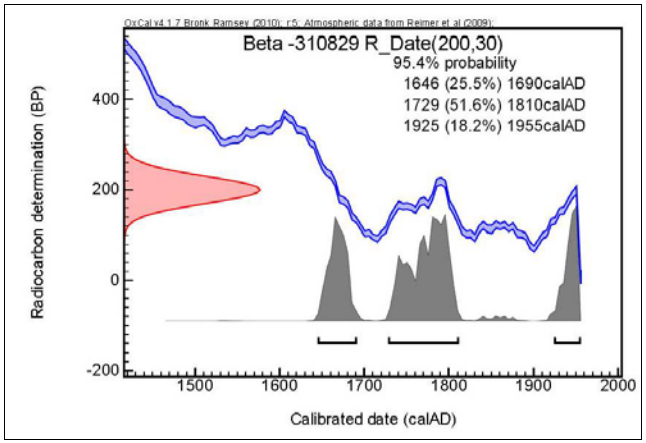


Figure 74. Graph showing results of radiocarbon analysis of charcoal collected from subsurface cultural layer observed at Trench 17

Section 7 Summary and Interpretation

Fieldwork for the current investigation was initiated on October 11th, 2011 and completed on October 17th, 2011. Archaeological investigations involved the excavation of 18 test trenches that included both hand and machine excavation. Observed stratigraphy from open trenching indicated that Kualoa Regional Park has been subjected to at least two episodes of ground disturbance: 1. Grading, compacting, and filling associated with WWII-era military activities; and 2. Grading, filling, and subsurface excavation associated with the development of the existing Kualoa Regional Park. Both of these events has either partially disturbed or has entirely removed the original ground surface, which is the stratigaphic layer that would be associated with traditional Hawaiian activities. However, testing results indicate that in many cases this stratigaphic layer has been reworked and re-deposited within the park grounds. This is evidenced by traditional Hawaiian cultural material (i.e., stone artifacts) being observed within fill layers, as well as in remnants of the original land surface. While intact cultural deposits were rarely encountered during the current investigation, the probability of encountering cultural deposits, including human burials, during proposed project construction is high.

During the course of the current investigation one historic property was documented: a subsurface cultural layer present discontinuously throughout the project area and considered to be a contributing component of SIHP #50-80-06-528 (Kualoa Ahupua‘a). This cultural layer consists of a dark silty sand A horizon that has been buried and cut away by historic fill events associated with WWII-era military activities and the development of the existing Kualoa Regional Park. The cultural layer is primarily enriched with traditional Hawaiian cultural material including: midden (marine shell and mammal bone), fire cracked rock, charcoal deposits, volcanic glass flakes, and lithic debitage associated with stone tool manufacture (i.e., basalt flakes).

Wood taxa identification of charcoal samples collected from the cultural layer (SIHP #50-80-06-528) documented the presence of numerous native and Polynesian introduced species. Ethnobotanical research indicates that all of the identified plant species present within the cultural layer had the potential to have been utilized by traditional Hawaiians. Based on wood taxa identification possible activities conducted at the cultural layer include: fishing, food preparation, tool and clothing manufacture, and house and canoe construction (Murakami 2011: 1-4). Thus the results of wood taxa identification provide additional data indicating that the subsurface cultural layer identified during this current investigation is associated with pre- to early post-Contact traditional Hawaiian occupation with a focus on habitation.

Radiocarbon dating of charcoal samples collected from the cultural layer (SIHP #50-80-06-528) indicated that occupation at the observed and documented cultural layer ranged from the late pre-Contact to early post Contact periods. Charcoal samples collected from a cultural layer at Trench 4 yielded three possible date ranges, with a calibrated 2-sigma date of 1669 AD to 1781 AD (43.0 %) being the most probable. Charcoal samples collected from a cultural layer at Trench 17 yielded three possible date ranges, with a calibrated 2-sigma date range of 1729 AD to 1810 AD (51.6 %) being the most probable.

Of note is the discovery of an isolated cranial fragment discovered during the excavation of Trench 17, located immediately *makai* of Comfort Station #2. The cranial fragment was

observed within a layer of fill likely deposited during the construction of the comfort station. The fill material appears to have been procured from the immediate area, and the cranial fragment probably represents a burial that had been impacted by the previous construction. Following the procedures of Hawai‘i Revised Statutes (HRS) Chapter 6E-43, and Hawai‘i Administrative Rules (HAR) Chapter 13-300, the remains were determined by SHPD to be “not a burial nor in a burial site context” [Phyllis Cayan (SHPD History & Culture Branch Chief) via e-mail correspondence 12/19/2011]. As the remains represent a previously identified human skeletal element in a non burial context SHPD/DLNR has assumed jurisdiction on determining appropriate burial treatment. SHPD/DLNR has indicated that all human fragments, finds, and burials discovered during project construction shall be reinterred at the designated burial mound at Kualoa Regional Park. Additionally, SHPD/DLNR has requested that the City and County consult with recognized descendants on when reinterment shall occur, and that the O‘ahu Island Burial Council (OIBC) district representatives be notified on the find and also consulted with on how to best care for the discovery.

Section 8 Significance Assessments

8.1 Significance Assessments

The inventory survey investigation and documentation of the project area’s single historic property has provided sufficient information for significance evaluations. Significance is determined after evaluation of the historic property in light of the five broad criteria used by the Hawai‘i State Register of Historic Places (HAR 13-284-6). The criteria are the following:

A Historic property reflects major trends or events in the history of the state or nation.

B Historic property is associated with the lives of persons significant in our past.

C Historic property is an excellent example of a site type.

D Historic property has yielded or may be likely to yield information important in prehistory or history.

E Historic property has cultural significance to an ethnic group, including, but not limited to, religious structures, burials, and traditional cultural properties.

The subsurface cultural layer present discontinuously throughout the project area is considered to be a contributing component of SIHP #50-80-06-528, the entire *ahupua‘a* of Kualoa. SIHP #50-80-06-528 was placed on the National Register of Historic Places in October, 1974. The Hawai‘i and National Register of Historic Places forms for Kualoa Ahupua‘a indicate that this historic property was eligible to the Hawai‘i and National registers under significance criteria D and E (see Appendix A).

Section 9 Project Effect and Mitigation Recommendations

9.1 Project Effect

The proposed project will affect historic properties recommended eligible to the Hawai‘i Register. CSH’s project specific effect recommendation is “effect, with agreed upon mitigation measures.” The mitigation measures described below will help alleviate the project’s impact on significant historic properties.

9.2 Mitigation Recommendations

The inventory survey’s recommended mitigation measures for SIHP #50-80-06-528 are twofold: burial treatment, and archaeological monitoring.

9.2.1 Burial Treatment

It is a requirement of Hawai‘i state burial law that the treatment of the previously identified human skeletal element in a non burial context within the project area be addressed in a project specific burial treatment plan prepared for the consideration of the O‘ahu Island Burial Council (OIBC) (HAR Chapter 13-300-33). The preparation of this burial treatment plan is currently underway and will incorporate the appropriate input from SHPD, the recognized lineal/cultural descendents, and the OIBC.

9.2.2 Archaeological Monitoring

This archaeological inventory survey represents a good faith effort to identify and document the historic properties within the project area. Due to the inherent limitations of any sampling strategy, however, it is likely that additional historic properties or features associated with the single historic property identified during this inventory survey, potentially including human burials, will be uncovered during the project’s construction.

In order to mitigate the potential damage to these as yet unidentified archeological features within the project area, it is recommended that project construction proceed under an archaeological monitoring program. This monitoring program will facilitate the identification and proper treatment of any burials that might be discovered during project construction, and will gather additional information regarding the project’s non-burial archaeological deposits. Thus given the sensitivity of the project area’s location it is recommended that an archaeological monitor be present during all subsurface activities conducted during the construction of the proposed Project.

9.3 Disposition of Materials

The complete collection of artifacts associated with this archaeological inventory survey was collected from public lands; accordingly, this material belongs to the landowner, the City and County of Honolulu. This collection is small, comprised of the materials collected from the single historic property documented within the project area (refer to Section 5 above). The artifacts associated with this archaeological inventory survey will be temporarily housed at the

CSH storage facility. CSH will make arrangements with the landowner regarding the disposition of the project’s collection. Should the landowner request archiving of material, then the archive location will be determined in consultation with SHPD.

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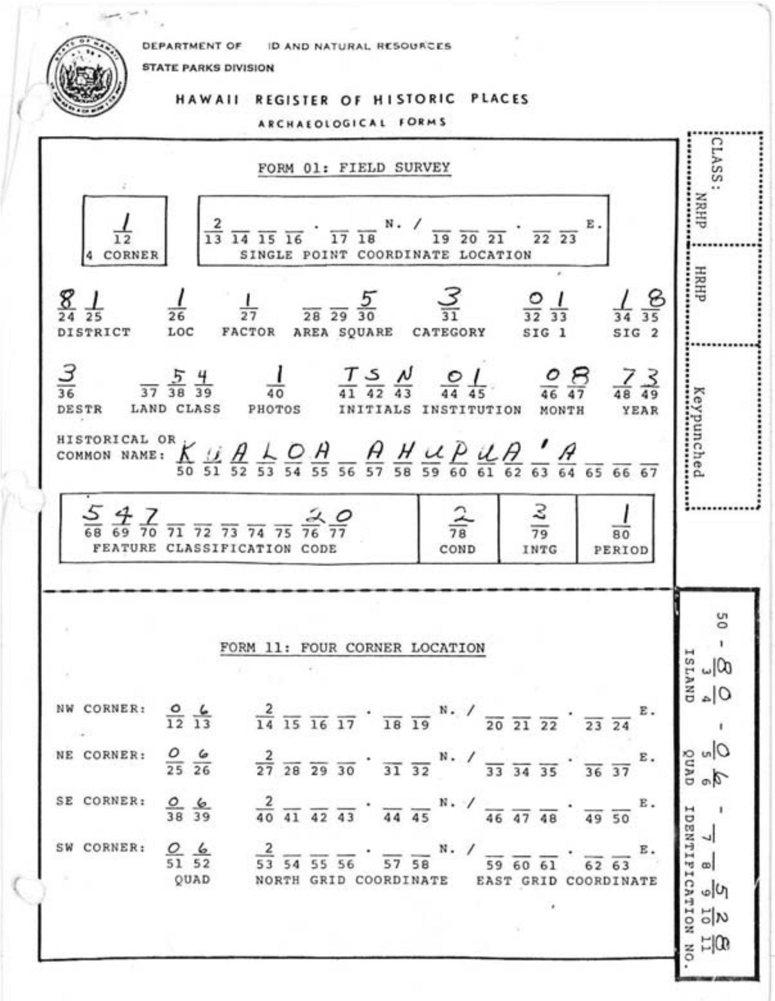
Appendix A Hawai‘i and National Register Forms for Kualoa Ahupua‘a



DEPARTMENT OF ID AND NATURAL RESOURCES
STATE PARKS DIVISION

HAWAII REGISTER OF HISTORIC PLACES
ARCHAEOLOGICAL FORMS

CLASS: NRHP | HRHP | Keypunched

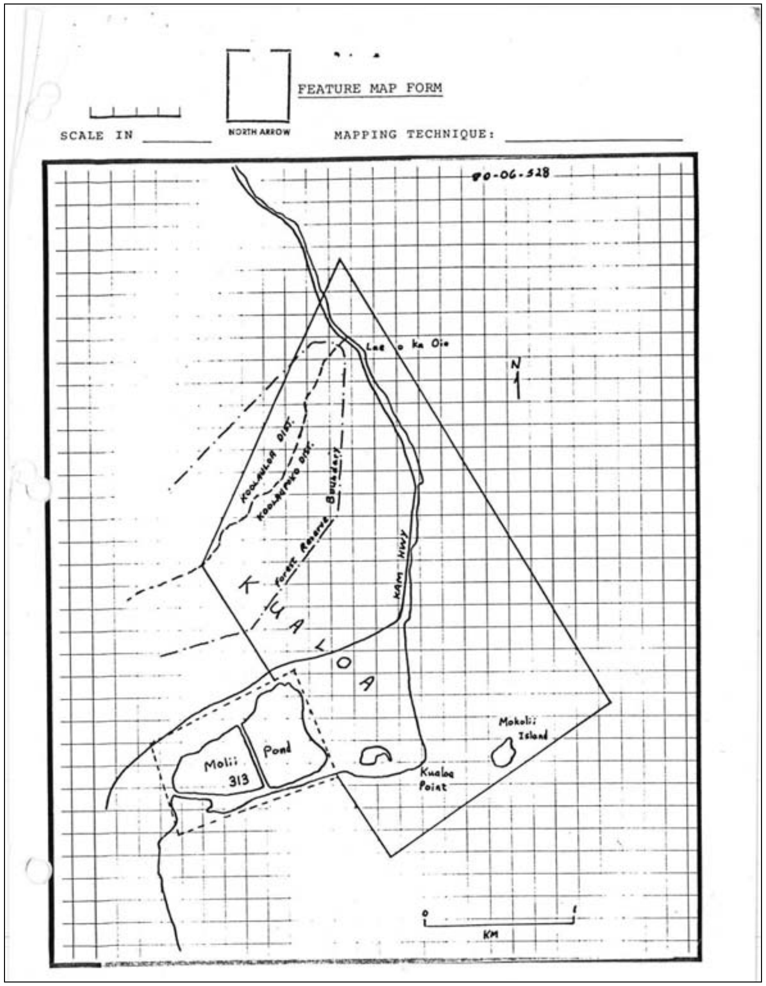
FORM 01: FIELD SURVEY

4 CORNER	12	1
SINGLE POINT COORDINATE LOCATION	13 14 15 16 . 17 18 N. / 19 20 21 . 22 23 E.	2 ___ . __ N. / ___ . __ E.
DISTRICT	24 25	8 1
LOC	26	1
FACTOR	27	1
AREA SQUARE	28 29 30	5
CATEGORY	31	3
SIG 1	32 33	0 1
SIG 2	34 35	1 8
DESTR	36	3
LAND CLASS	37 38 39	5 4
PHOTOS	40	1
INITIALS	41 42 43	T S N
INSTITUTION	44 45	0 1
MONTH	46 47	0 8
YEAR	48 49	7 3
HISTORICAL OR COMMON NAME	50–67	KUALOA AHUPUA'A
FEATURE CLASSIFICATION CODE	68 69 70 71 72 73 74 75 76 77	5 4 7 _ _ _ _ _ 2 0
COND	78	2
INTG	79	3
PERIOD	80	1

FORM 11: FOUR CORNER LOCATION

	QUAD	NORTH GRID COORDINATE	EAST GRID COORDINATE
NW CORNER:	0 6 (12 13)	2 _ _ _ . _ _ N. / (14 15 16 17 . 18 19)	_ _ _ . _ _ E. (20 21 22 . 23 24)
NE CORNER:	0 6 (25 26)	2 _ _ _ . _ _ N. / (27 28 29 30 . 31 32)	_ _ _ . _ _ E. (33 34 35 . 36 37)
SE CORNER:	0 6 (38 39)	2 _ _ _ . _ _ N. / (40 41 42 43 . 44 45)	_ _ _ . _ _ E. (46 47 48 . 49 50)
SW CORNER:	0 6 (51 52)	2 _ _ _ . _ _ N. / (53 54 55 56 . 57 58)	_ _ _ . _ _ E. (59 60 61 . 62 63)

50 - 8 0 - 0 6 - _ _ 5 2 8
ISLAND (3 4) QUAD (5 6) IDENTIFICATION NO. (7 8 9 10 11)



FEATURE MAP FORM

SCALE IN ________

NORTH ARROW

MAPPING TECHNIQUE: ________

Lat.		Long.	
SW	21° 30' 24" NW 21° 31' 38"	SW	7° 50' 22"/NW 157° 51' 06"
SE	21° 30' 55" NE 21° 32' 36"	SE	7° 49' 30"/NE 157° 50' 31"

FEATURE DESCRIPTION FORM

DESCRIPTION OF ANY PERTINENT DATA NOT ELSEWHERE RECORDED: 1-bearings and sources used to locate feature; 2-size; 3-shape; 4-construction technique; 5-materials used; 6-terrain features; 7-condition; 8-surface artifacts; 9-midden; 10-unusual or important characteristics; 11-evaluation of its importance as a representative of its particular class; 12-probable function and 13-how certain this function is for the feature

Description:

Kualoa is an ancient Hawaiian land division (ahupua'a) at the north end of Kaneohe Bay, windward Oahu. The ahupua'a extends from the coast to the top of the nearly vertical, fluted mountain behind. The coast is almost all sandy beach, with portions being steadily eroded by the sea, and other portions being built up through accretion. Behind the beach area is flat land, covered with low scrub at the south end, and with majestic monkey pod trees at the north end. Most of this flat land, however, was used for a World War II airdrome, although virtually all traces of it have been removed. The vegetation, therefore, is generally that which was generated after the 1940's when the area was returned for use as pastureland. Offshore is a tiny and beautiful island, Mokoli'i.

The interior of Kualoa ahupua'a is spectacularly beautiful, for it rises swiftly above the flat through a narrow alluvial deposit to the bases of nearly vertical cliffs, covered with the verdure of the wet climate and crenalated from eons of erosion. Native vegetation is found in narrow gullies and ravines, especially groves of kukui, the state tree of Hawaii. The top of the mountain ridge has low, windswept bushes growing along it and the many layers of the lava flows which built the ridge are clearly visible.

The Kamehameha Highway, the only highway link around this side of the island, comes through the area, as shown on the attached map and airphoto, and some residential housing has been built along the coast at the north end of Kualoa. Kualoa Ranch still raises cattle and horses in the flat areas, while the seaward portion of Kualoa south of Kamehameha Highway has recently been condemned by the City and County of Honolulu as a new county park. Immediately to the west, in the next land area (Hakipu'u), is Moli'i Fishpond, a National Register property.

Significance:

Two of the most sacred areas on the island of Oahu have traditionally been considered to be the Kukaniloko Birthstones (a National Register property) and the Kualoa ahupua'a.

In Hawaiian tradition, the lands of Kualoa were considered to be the symbol of sovereignty and independence for Oahu, and were closely protected by the Oahu chiefs and priests. This is most clearly seen in the oral history tradition about the succession of Kahahana to the Oahu throne, and the attempt by King Kahekili of Maui to con him out of Kualoa and the "palaoa-pae" (washed up whalebone and ivory along the Oahu coastline):

> *"Shortly after his installation, Kahahana called a great council of the Oahu chiefs and the high-priest Kaopulupulu, and laid before them the demands of Kahekili regarding the land of Kualoa and the 'Palaoa-pae.' At first the council was divided, and some thought it was but a fair return for the kindness and protection shown Kahahana from his youth by Kahekili; but the high-priest was strongly opposed to such a measure, and argued that it was a virtual surrender of the sovereignty and independence of Oahu. Kualoa being one of the most sacred places on the island, where stood the sacred drums of Kapahuula and Kaahu-ulapunawai, and also the sacred hill of Kauakahi-a-Kahoowaha; and the*

8. SIGNIFICANCE

PERIOD (Check One or More as Appropriate)

- ☐ Pre-Columbian
- ☐ 15th Century
- ☐ 16th Century
- ☐ 17th Century
- ☐ 18th Century
- ☐ 19th Century
- ☐ 20th Century
- x Precontact

SPECIFIC DATE(S) (If Applicable and Known)

AREAS OF SIGNIFICANCE (Check One or More as Appropriate)

Aboriginal	Education	Political	Urban Planning
☒ Prehistoric	Engineering	☒ Religion/Philosophy	Other (Specify)
☐ Historic	Industry	Science	
Agriculture	Invention	Sculpture	
Architecture	Landscape Architecture	Social/Humanitarian	
Art	Literature	Theater	
Commerce	Military	Transportation	
Communications	Music		
Conservation			

SEE INSTRUCTIONS

STATEMENT OF SIGNIFICANCE

Repeat

Two of the most sacred areas on the island of Oahu have traditionally been considered to be the Kukaniloko Birthstones (a National Register property) and the Kualoa ahupua'a.

In Hawaiian tradition, the lands of Kualoa were considered to be the symbol of sovereignty and independence for Oahu, and were closely protected by the Oahu chiefs and priests. This is most clearly seen in the oral history tradition about the succession of Kahahana to the Oahu throne, and the attempt by King Kahekili of Maui to con him out of Kualoa and the "palaoa-pae" (washed up whalebone and ivory along the Oahu coastline):

> *"Shortly after his installation, Kahahana called a great council of the Oahu chiefs and the high-priest Kaopulupulu, and laid before them the demands of Kahekili regarding the land of Kualoa and the 'Palaoa-pae.' At first the council was divided, and some thought it was but a fair return for the kindness and protection shown Kahahana from his youth by Kahekili; but the high-priest was strongly opposed to such a measure, and argued that it was a virtual surrender of the sovereignty and independence of Oahu. Kualoa being one of the most sacred places on the island, where stood the sacred drums of Kapahuula and Kaahu-ulapunawai, and also the sacred hill of Kauakahi-a-Kahoowaha; and the surrender of the 'Palaoa-pae' would be a disrespect to the gods; in fact, if Kahekili's demands were complied with, the power of war and of sacrifice would rest with the Maui king and not with Kahahana. He represented strongly, moreover, that if Kahahana had obtained the kingdom by conquest, he might do as he liked, but having been chosen by the Oahu chiefs, it would be wrong in him to cede to another the national emblems of sovereignty and independence. Kahahana and all the chiefs admitted the force of Kaopulupulu's arguments, and submitted to this advice not to comply with the demands of Kahekili."*
>
> *(Fornander, 1969, Volume II: Page 218)*

FEATURE DESCRIPTION FORM

DESCRIPTION OF ANY PERTINENT DATA NOT ELSEWHERE RECORDED: 1-bearings and sources used to locate feature; 2-size; 3-shape; 4-construction technique 5-materials used; 6-terrain features; 7-condition; 8-surface artifacts; 9-midden; 10-unusual or important characteristics; 11-evaluation of its importance as a representative of its particular class; 12-probable function and 13-how certain this function is for the feature

Significance (continued)
Page 2

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(Fornander, 1888, Volume II: Page 218)

Numerous other writers have also reflected the feeling of sacredness for Kualoa. Raphaelson says that Kualoa has always been sacred soil, to which the newborn children of the chiefs were brought to live and be trained in warfare and the ancient traditions of the Hawaiian chiefs. Kamakau referred to Kualoa as being a very sacred place of refuge (puuhonua) in ancient times where people fled for protection if they had broken a tabu. Kualoa was also the place where sacrificial victims for religious rituals were drowned. Many authors say that all canoes passing seaward of Kualoa lowered their sails in acknowledgement of the nature of Kualoa as a sacred residence of chiefs.

Kualoa is also significant in Hawaiian folklore and mythology. Apparently it was considered to be the sacred land of Haloa, the son of Wakea and Papa, the progenitors of the Hawaiian people. One of the most important chiefly genealogies links to Hawaiian cosmogony through Haloa and shows the importance of Haloa, and therefore, of Kualoa.

Kualoa figures in the famous legends of Pele, the Volcano Goddess and her sister, Hiiaka, as well as in the legends of Kamapua'a, the half-man, half-pig of Oahu. Here Pele's sister, ~~Hiiaka, killed a huge mo'o~~, or dragon, and the small island, Mokoli'i, lying offshore but part of Kualoa is his tail. His body became the foothills below the steep Kualoa cliffs. ~~Kamapua'a hid from Pele~~ in a hollow at Kualoa, and later made the holes in the Kualoa mountains.

A shark god story exists about the area at Kualoa Point where the son of the shark god ~~whose son was fed by the people~~ of Kualoa until a stingy chief stopped the feeding and claimed the fish that were usually fed him. The shark god father of the starving son was enraged and created a tidal wave that killed the chief, but the people of Kualoa were saved.

In the 19th century, an early Western family owned Kualoa and built a major sugar mill there. A few remains of this sugar mill still exist next to the Kamehameha Highway, remnants of this early industry of Oahu which attained so much importance in later times.

DATE:

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Significance (continued)
Page 3

~~Few physical remains still exist at Kualoa, for most were destroyed by the sugar cane or the Army Air Force.~~ There probably still exist remains in the foothills, but no thorough survey has been made to date. In the past, however, there would have been village areas, tapa manufacturing areas, religious structures, and ceremonial centers for hula.

Kualoa remains significant, even without physical remains of ancient sites, because of its central place in Oahu traditions and the feeling of the sacredness of the land, even by present day Hawaiians. Therefore, on the basis of its place in Hawaiian legend and tradition, we recommend the sacred lands of Kualoa be placed on the Hawaii Register as a valuable district, and nominated to the National Register as a district of state significance.

SIGNED: DATE:

Form 10-300a (July 1969)

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES
INVENTORY - NOMINATION FORM

(Continuation Sheet)

STATE	Hawaii
COUNTY	Honolulu
FOR NPS USE ONLY	
ENTRY NUMBER	DATE

(Number all entries)

8. SIGNIFICANCE (Page two)

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GPO 921-724

Form 10-301 (July 1969)

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES
PROPERTY MAP FORM

(Type all entries - attach to or enclose with map)

STATE	Hawaii
COUNTY	Honolulu
FOR NPS USE ONLY	
ENTRY NUMBER	DATE

SEE INSTRUCTIONS

1. NAME
COMMON: Kualoa Ahupua'a
AND/OR HISTORIC:

2. LOCATION
STREET AND NUMBER: at the northern end of Kaneohe Bay
CITY OR TOWN: Kaneohe vicinity
STATE: Hawaii CODE 15 COUNTY: Honolulu CODE 003

3. MAP REFERENCE
SOURCE: USGS 7.5 minute series (topographic) Kahana Quad
SCALE: 1:24,000
DATE: 1954

4. REQUIREMENTS
TO BE INCLUDED ON ALL MAPS
1. Property boundaries where required.
2. North arrow.
3. Latitude and longitude reference.

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES
PROPERTY PHOTOGRAPH FORM

(Type all entries - attach to or enclose with photograph)

STATE	Hawaii
COUNTY	Honolulu
FOR NPS USE ONLY	
ENTRY NUMBER	DATE

SEE INSTRUCTIONS

1. NAME
COMMON: Kualoa Ahupua'a
AND/OR HISTORIC:

2. LOCATION
STREET AND NUMBER: at the northern end of Kaneohe Bay
CITY OR TOWN: Kaneohe vicinity
STATE: Hawaii CODE 15 COUNTY: Honolulu CODE 003

3. PHOTO REFERENCE
PHOTO CREDIT: Tryck, Nyman and Hayes, Inc.
DATE OF PHOTO: May 26, 1972
NEGATIVE FILED AT: Tryck, Nyman and Hayes, Inc., 765 Amana Street Honolulu, Hawaii

4. IDENTIFICATION
DESCRIBE VIEW, DIRECTION, ETC.
Vertical air photo from altitude of 880 meters (2,887 feet)

GPO 921-737

Appendix B Wood Taxa Identification

RADIOCARBON SAMPLE SCREENING FOR KUALOA 2 PROJECT, KUALOA, O'AHU ISLAND

Gail M. Murakami
November 15, 2011

INTRODUCTION

This report presents the results of taxa identification in two charcoal samples from the Cultural Surveys Hawaii Kualoa 2 Project in Kualoa, Island of O'ahu. Identification of charcoal found in archaeological context can give insight into the vegetation of the surrounding area at the time that the woods were burned. This information can be used to interpret the environment as well as possible cultural use of specific plants.

METHODS

Two charcoal samples were examined for taxa identification. The freshly fractured transverse and tangential facets of each charcoal piece were viewed under magnification of a dissecting microscope. Taxa identifications were made by comparing the anatomical characteristics seen during examination against those of known woods in the Pacific Islands Wood Collection at the Department of Botany, University of Hawai'i, and published descriptions.

RESULTS

Thirteen woody taxa were identified in the two samples, collected during the Kualoa 2 Project. A review of the identified taxa is presented below. The summary of results is presented in Table 1. In Table 1 "cf." indicates that the charcoal resembles the taxon specified but its exact identity is uncertain at this time.

REVIEW OF TAXA

AGAVACEAE

Cordyline fruticosa (L.) A. Chev. (*Kī*, ti)

This Polynesian introduction is a shrub cultivated in mesic valleys and forests of all the main Hawaiian Islands except Kaho'olawe. The leaves, arranged in a close spiral at the tips of the stems, were used for house thatch, food wrappers, raincoats, and sandals (Wagner et al. 1990:1348-1349). The swollen fleshy roots were baked for food or used to produce an alcoholic beverage (Neal 1965:203).

APOCYNACEAE

Rauvolfia sandwicensis A. DC (*Hao*)

This endemic species is a tree or shrub, 3 to 10 m tall, found primarily in mesic forests but also in dry forest or dry shrubland and on lava flows, on all the main Hawaiian islands except Kaho'olawe at 100 to 800 m elevations (Wagner et al.:1990: 220).

ARECACEAE

Cocos nucifera L. (*Niu*, coconut)

This Polynesian introduction is a palm which grows up to 30 m tall and is widely cultivated today. Coconut appears to be sparingly naturalized in coastal areas where it is thought to have been originally cultivated. All parts of the plant were used by the Hawaiians. Among the many uses were: house posts, drums, and food containers from the trunk; baskets, thatching, brooms, *kukui* nut lamp supports from parts of the leaves; rope from the husk; utensils for eating or drinking from the shell; and the flesh and water of the fruit were eaten (Wagner et al. 1990:1362-1363).

EBENACEAE

Diospyros sandwicensis (A. DC) Fosb. (*Lama*)

This small endemic tree, 2 to 10 m tall, is found in wet or dry regions of all the main Hawaiian Islands (Rock 1913:395; Wagner et al. 1990:587). Its hard wood was once used by Hawaiians for houses, enclosures for certain idols (Malo 1951:21), and chisel handles (Buck 1957:38). Hillebrand (1888:275) reported that the small fruits were eaten by the natives.

EUPHORBIACEAE

Aleurites moluccana (L.) Willd. (*Kukui*)

Once cultivated, this Polynesian introduction has escaped into the native forest, where the pale foliage of the 10 to 20 m trees (Wagner et al. 1990:598) can be seen in abundance in moist gulches and valleys. Dyes were once extracted from the bark and roots (Buck 1957:187), the oily kernel was burned for light (Buck 1957:107) or eaten as a relish after baking (Buck 1957:48), and net floats and dugout canoes were made from the soft wood (Buck 1957:297).

FABACEAE

Acacia koa A. Gray (*Koa*)

One of the largest endemic trees in Hawai'i, *koa* may attain 35 m in height at higher elevations (Wagner et al. 1990:641-642) and not branch until 12 m or more above the ground (Rock 1913:175). This straight trunk was especially useful for canoes as well as paddles, and surfboards (Malo 1951:126, 223). *Koa* trees which are also found at lower elevations in the dry regions, have a distribution range of 60 to 2,060 m on all of the main Hawaiian Islands except Ni'ihau and Kaho'olawe (Wagner et al. 1990:641).

MALVACEAE

Hibiscus tiliaceus L. (*Hau*)

This indigenous plant is described by Handy and Handy (1972:232-233) as a "large-leaved shrublike tree" which was planted near houses and gardens. The straight-stemmed variety was once planted for bast fibers from which cords, ropes, and coarse *tapa* cloth were made. Its soft wood was used to make canoe outriggers, fishnet floats, and fire by rubbing a harder wood against it. The creeping variety was used for windbreaks. This species occurs primarily along coasts, streams, and other wet areas up to 1,220 m in elevation on all main islands although not documented from Ni'ihau and Kaho'olawe (Wagner et al. 1990:888).

Sida fallax Walp. (*'Ilima*)

This indigenous shrub was planted in the past, as it is today, near houses to provide flowers for *lei* making (Neal 1965:553). It has been found growing naturally along coasts, on open lava fields, in dry to mesic forests on all of the main Hawaiian Islands (Wagner et al. 1990:898). The entire plant had many uses for native Hawaiians. Erect stems were tied to the frame of the sleeping house upon which *pili* grass (*Heteropogon contortus*) was lashed. Whole *'ilima* bushes tied together were also used to secure mounds of taro plantings in swampy areas. The prostrate coastal *'ilima* was used as floor coverings under mats (Handy and Handy 1972:228). The roots and flowers were used medicinally (Neal 1965:553).

MYRTACEAE

Metrosideros polymorpha Gaud. (*'Ōhi'a lehua*)

This endemic species ranges in habit from prostrate shrubs to tall trees and in distribution from sea level to 2200 m elevation in many ecological situations on all of the main Hawaiian Islands (Wagner et al. 1990:967). The hard wood was once used for making spears and mallets, idols, posts and rafters for houses, and enclosures around temples (Buck 1957:87; Malo 1951:20; Neal 1965:638).

Syzygium sp.

Four species of these trees are found on O'ahu. *Syzygium cumini* (Java plum) and *S. jambos* (rose apple) have naturalized in the mesic forests after their introduction prior to 1871 and in 1825, respectively. The Polynesian introduction *S. malaccense* (mountain apple, *'ōhi'a 'ai*) may be found in low mesic to wet forests while the native *S. sandwicensis* (*'ōhi'a hā*) seems to be restricted to ridges and slopes on Kaua'i, O'ahu, Moloka'i, Lāna'i and Maui (Wagner et al. 1990:975-976). The trunks from *'ōhi'a 'ai* were formerly used for posts, house rafters and temple enclosures; idols were also carved from the wood. The fruit was eaten and the bark, flowers and leaves were used medicinally (Rock 1974:323). A dye for clothing was extracted from the bark (Buck 1957:187).

PANDANACEAE

Pandanus tectorius S. Parkinson ex Z (*Hala, pu hala*)

This indigenous species is a tree up to about 10 m tall which occurs in mesic coastal sites and low elevation slopes of mesic valleys at 0 to 610 m elevations on all of the main islands except Kaho'olawe (Wagner et al. 1990:1479-1481). The leaves were used for house thatching, mats, baskets, and fans (Buck 1957:103-105; Handy and Handy 1972:201; Neal 1965:52). The wood was used to make calabashes, troughs and boards to mash sweet potatoes (Handy and Handy 1972:202). *Lei* are made today

from the colorful fruit segments or keys but in the past were not favored for important occasions as another meaning for *hala* was failure (Pukui and Elbert 1986:51).

RUBIACEAE

Bobea sp. (*'Ahakea*)

This genus consists of four species endemic to the Hawaiian Islands. Three of these trees occur on O'ahu. *Bobea brevipes* and *B. elatior* are found in mesic to wet forest but *B. sandwicensis* is known from dry to mesic forests (Wagner et al. 1990:1115-1117). *'Ahakea* wood was formerly used for canoe rims (Pukui and Elbert 1986:6) and *poi* boards (Malo 1951:20).

Coprosma spp. (*Pilo*)

The three endemic species found on O'ahu, *C. foliosa*, *C. longifolia*, and *C. ochracea*, range in habit from scandant shrubs to trees 15 m tall and occur in mesic and wet forests, bogs and subalpine shrubland on all the main Hawaiian Islands except Kaho'olawe and Ni'ihau (Wagner et al. 1990:1125-1129).

Table 1. Charcoal Taxa Identification in Samples from the Kualoa 2 Project.

Unit	Layer	WIDL No.	Taxa	Common/ Hawaiian Name	Origin/Habit	Part	Count	Weight, g
17	II	1132-1	cf. *Hibiscus tiliaceus*	*Hau*	Native/Shrub-Tree	Wood	6	0.13
		1132-2	cf. *Cocos nucifera*	*Niu*, coconut	Polynesian Introduction/Tree	Wood	3	0.07
		1132-3	*Diospyros sandwicensis*	*Lama*	Native/Tree	Wood	2	0.05
		1132-4	cf. *Acacia koa*	*Koa*	Native/Tree	Wood	1	0.01
		1132-5	*Aleurites moluccana*	*Kukui*	Polynesian Introduction/Tree	Nutshell	3	0.05
		1132-6	cf. *Metrosideros polymorpha*	*'Ōhi'a lehua*	Native/Shrub	Wood	3	0.03
		1132-7	cf. *Pandanus tectorius*	*Hala*	Native (?)/Tree	Wood	1	0.02
		1132-8	Unknown 1			Wood	1	0.03
4	II	1132-9	*Diospyros sandwicensis*	*Lama*	Native/Tree	Wood	19	2.99
		1132-10	Not identified			cf. Bark	5	1.03
		1132-11	Unknown 2			Wood	12	2.14
		1132-12	*Cordyline fruticosa*	*Kī*, ti	Polynesian Introduction/Shrub	Wood	1	0.19
		1132-13	*Hibiscus tiliaceus*	*Hau*	Native/Shrub-Tree	Wood	2	0.41
		1132-14	cf. *Metrosideros polymorpha*	*'Ōhi'a lehua*	Native/Shrub	Wood	14	0.93
		1132-15	cf. *Sida fallax*	*'Ilima*	Native/Shrub	Wood	2	0.19
		1132-16	cf. *Bobea* sp.	*'Ahakea*	Native/Tree	Wood	3	0.17
		1132-17	cf. *Syzygium* sp.	Mountain apple, roseapple, Java plum, *'ōhi'a ai*	Native + Historic Introductions/Tree	Wood	3	0.30
		1132-18	cf. *Rauvolfia sandwicensis*	*Hao*	Native/Tree	Wood	8	0.73
		1132-19	cf. *Coprosma* sp.	*Pilo*	Native/Shrub	Wood	1	0.06
		1132-20	cf. Pteridophyta	Fern		Stem	1	0.09

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Appendix C Radiocarbon Analysis

BETA

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Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

December 9, 2011

Dr. Hallett H. Hammatt/Jon Tulchin
Cultural Surveys Hawaii
P.O. Box 1114
Kailua, HI 96734
USA

RE: Radiocarbon Dating Results For Samples KUALOA2-T4, KUALOA2-T17

Dear Hallett and Tulchin:

Enclosed are the radiocarbon dating results for two samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

The cost of the analysis was charged to the MASTERCARD card provided. A receipt is enclosed with the mailed report copy. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood

Digital signature on file

Page 1 of 4

BETA

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Hallett H. Hammatt/Jon Tulchin — Report Date: 12/9/2011

Cultural Surveys Hawaii — Material Received: 11/28/2011

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 310828	150 +/- 30 BP	-25.9 o/oo	140 +/- 30 BP
SAMPLE : KUALOA2-T4			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid			
2 SIGMA CALIBRATION :	Cal AD 1670 to 1780 (Cal BP 280 to 170) AND Cal AD 1800 to 1890 (Cal BP 150 to 60) Cal AD 1900 to 1950 (Cal BP 50 to 0) AND Cal AD 1950 to post 1950 (Cal BP 0 to post 1950)		
Beta - 310829	180 +/- 30 BP	-23.6 o/oo	200 +/- 30 BP
SAMPLE : KUALOA2-T17			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid			
2 SIGMA CALIBRATION :	Cal AD 1650 to 1680 (Cal BP 300 to 260) AND Cal AD 1730 to 1810 (Cal BP 220 to 140) Cal AD 1930 to post 1950 (Cal BP 20 to post 1950)		

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

Page 2 of 4

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.9:lab. mult=1)

Laboratory number: **Beta-310828**

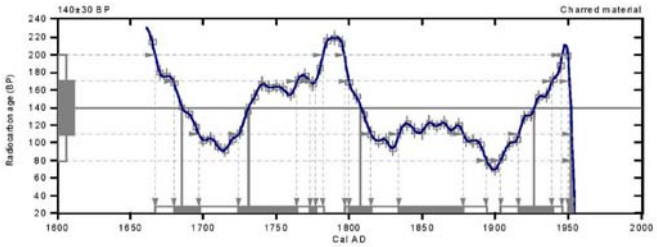
Conventional radiocarbon age: **140±30 BP**

2 Sigma calibrated results: (95% probability)
Cal AD 1670 to 1780 (Cal BP 280 to 170) and
Cal AD 1800 to 1890 (Cal BP 150 to 60) and
Cal AD 1900 to 1950 (Cal BP 50 to 0) and
Cal AD 1950 to post 1950 (Cal BP 0 to post 1950)

Intercept data

Intercepts of radiocarbon age with calibration curve:
Cal AD 1680 (Cal BP 260) and
Cal AD 1730 (Cal BP 220) and
Cal AD 1810 (Cal BP 140) and
Cal AD 1930 (Cal BP 20) and
Cal AD Post 1950

1 Sigma calibrated results: (68% probability)
Cal AD 1680 to 1700 (Cal BP 270 to 250) and
Cal AD 1720 to 1760 (Cal BP 230 to 190) and
Cal AD 1770 to 1780 (Cal BP 180 to 170) and
Cal AD 1800 to 1820 (Cal BP 150 to 140) and
Cal AD 1830 to 1880 (Cal BP 120 to 70) and
Cal AD 1920 to 1940 (Cal BP 30 to 10) and
Cal AD Post 1950



References:

Database used
INTCAL09
References to INTCAL09 database
Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192
Mathematics used for calibration scenario
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.6:lab. mult=1)

Laboratory number: **Beta-310829**

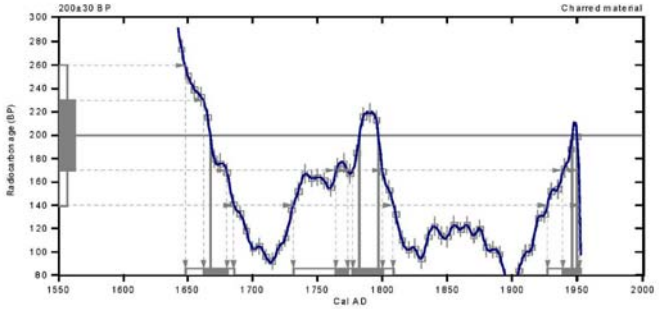
Conventional radiocarbon age: **200±30 BP**

2 Sigma calibrated results: (95% probability)
Cal AD 1650 to 1680 (Cal BP 300 to 260) and
Cal AD 1730 to 1810 (Cal BP 220 to 140) and
Cal AD 1930 to post 1950 (Cal BP 20 to post 1950)

Intercept data

Intercepts of radiocarbon age with calibration curve:
Cal AD 1670 (Cal BP 280) and
Cal AD 1780 (Cal BP 170) and
Cal AD 1800 (Cal BP 150) and
Cal AD 1950 (Cal BP 0) and
Cal AD 1950 (Cal BP 0)

1 Sigma calibrated results: (68% probability)
Cal AD 1660 to 1680 (Cal BP 290 to 270) and
Cal AD 1760 to 1770 (Cal BP 190 to 180) and
Cal AD 1780 to 1800 (Cal BP 170 to 150) and
Cal AD 1940 to post 1950 (Cal BP 10 to post 1950)



References:

Database used
INTCAL09
References to INTCAL09 database
Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192
Mathematics used for calibration scenario
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Appendix D Community Consultation Meeting Minutes for July 5, 2011

Meeting Memorandum **Kennedy/Jenks Consultants**

Meeting Time: 2:00pm to 5:00pm **Page:** 1 of 3
Meeting Location: Kennedy/Jenks Conference Room **Date:** July 5, 2011
Meeting Date: July 5, 2011 **K/J Job No.:** 10000623*00
Project: Centralized Wastewater System at Kualoa Regional Park (DRAFT)

Persons Attending:
(*See Attached: Pg. 3 – July 5, 2011 Meeting Agenda Outline / Pg. 4 & 5 – Meeting Sign-In Sheet)

PURPOSE: Present the field work plan of the Archeological Inventory Survey (AIS) to the Lineal Descendants of Kualoa based on the proposed locations of the centralized wastewater system and replacement bathhouse at Kualoa Regional Park.

1) Opening pule by Mr. Ahi Logan.
2) The City presented a history and reasons why this project is needed:
   a. In 2005, the City (Department of Environmental Services – Water Quality Branch) found that bacteria levels in the ocean exceeded the State of Hawaii, Department of Health (DOH) acceptable bacteria standards. The City disconnected the disposal system from the treatment systems at Comfort Station #1, Comfort Station #2, Comfort Station #4, and the Food Service Building, effectively changing the existing treatment tanks into "holding tanks."
   b. In December 2006, there was a wastewater spill at Comfort Station #2.
   c. In January of 2007, DOH cited the City with a Notice of Violation (NOV).
   d. A condition of DOH's resolution with the City is such that the "holding tanks" are replaced with a wastewater system that "eliminates and prevents wastewater discharges onto the ground or into state waters" at Kualoa Regional Park.
   e. Mr. Calvin Hoe commented that he believes the previous water pollutant testing done in the waters around Kualoa Regional Park did not seem conclusive that the comfort stations from Kualoa Regional Park were causing the pollution.
3) Kennedy/Jenks Consultants (K/J) provided an overview of the current wastewater system improvement design. K/J noted that the current wastewater improvement design is based on previous discussions and presentations with the Lineal Descendants and is generally not different than what has been designed in the past. The alignment was designed based on previous archaeological studies to areas of least sensitivity. Also we are trying to install the sewer force mains in areas that have been previously disturbed.
   a. Mr. Ahi Logan asked if what is shown was the final decision.
      i. K/J responded that it was moving toward its 60% design but would welcome and listen to any comments or suggestions.
   b. Mr. Calvin Hoe shared his thoughts as one member of a larger 'ohana. He was asked to come and get more information:
      i. A "big concern of his family" is the concept of putting sewage on the burials.
      ii. His personal preference is that the "Living Machine" wastewater treatment system be explored, and that he would like to look at other alternatives.
      iii. Was reuse, similar to Laie, considered?

Meeting Memorandum
Centralized Wastewater System at Kualoa Regional Park
July 5, 2011
Page 2 of 3

iv. Would the water quality of the fish pond be affected by the wastewater treatment and disposal system? Was its possible effects considered? Mr. Calvin Hoe commented that the fish pond has not been the same for a long time and he would like to see the fish pond restored.

v. If the team is looking for previously disturbed areas, a larger trench was dug for a sand mining pipeline near Comfort Station #3 because the City was looking at using Kualoa Regional Park as a sand mine.

c. Mr. Calvin Hoe was asked if he was okay with the field work plan for the AIS. Mr. Calvin Hoe did not object.

d. Mr. Ahi Logan asked how much more wastewater treatment capacity is to be gained from this wastewater treatment system improvement? How much more population can the park accommodate with this improvement?

i. K/J responded that the currently proposed wastewater treatment system is designed to handle the existing wastewater flows of Kualoa Regional Park's visitors. K/J added that the system has provisions for adding treatment and disposal capacity if necessary in the future.

4) CSH provided a summary of their AIS testing methods and locations.

a. CSH shared some history about the archeological work that was done at the site in the past. CSH explained how the park was "broken" down into "survey areas."

b. Mr. Ahi Logan asked CSH about their general feel about the possibility of discovering archaeological finds.

i. CSH responded that based on work done by previous archaeologist at the park, along with other available documentation/reports, CSH is generally and cautiously comfortable with the location of the proposed bathhouse, treatment system, and disposal system.

ii. CSH is not as comfortable with work within survey areas known as 2A & 2B, but any type of work within these areas are a concern.

5) The meeting was opened up for additional comments and questions.

a. Mr. Ahi Logan asked for meeting minutes for the day's meeting to share with his family.

i. Aukahi responded that she would distribute the meeting minutes to him once they were completed.

b. Ms. Gladys Pualoa-Ahuna requested a wastewater treatment facility with additional wastewater treatment capacity for future use.

c. Mr. Ahi Logan said he would like this project to move forward.

d. Ms. Gladys Pualoa-Ahuna said she would like this project to move forward.

e. Mr. Calvin Hoe commented that he does not share the view on future park development however he will continue to work with the City in making responsible decisions for the future.

6) Informal Discussion

a. K/J noted to Mr. Calvin Hoe that natural land systems such as the "living machine" was considered, but was deemed unfavorable because it required much larger land disturbance as compared to the proposed aerobic treatment units.

Meeting Memorandum
Centralized Wastewater System at Kualoa Regional Park
July 5, 2011
Page 3 of 3

b. K/J noted to Mr. Calvin Hoe that reuse was also evaluated but our initial findings showed that reuse could only be applied in 3 of the 12 months. During the other 9 months of the year the effluent would be disposed of with a system similar to what is currently proposed (an elevated mound).

7) Closing pule by Ms. Gladys Pualoa-Ahuna.

By: _____
Cale Yamada

Descendant 'Ohana Meeting
Tuesday, July 5, 2011
2:00 p.m., Kualoa Regional Park

Kualoa Regional Park – Wastewater System Improvements Project

Agenda

I. Welcome/Self-Introductions (Lani)

- City - Jay Hamai, Asst. Chief WW Division, DD&C
- Kennedy & Jenks – June Nakamura, Project Manager, Kyle Okino, Senior Associate Engineer & Cale Yamada , Staff Engineer
- Group 70 - Barbara Natale, Planner
- Cultural Surveys Hawai'i - Doug Borthwick, Project Archaeologist & Joe
- Aukahi - Lani Ma'a Lapilio, Facilitator

II. Purpose of Meeting (Lani)

III. City (Jay) – Project Status

IV. Project Description (Kyle)

V. Archeological Review Process (Doug)
   A. Archaeological Inventory Survey Proposal
   B. CIA

VI. Discussion/Q & A/Closing Pule

VII. Mahalo/ Pau

Meeting Sign-In Sheet

Project: Kualoa Regional Park Wastewater System Improvements
Meeting Date/Time: July 5, 2011 / 2:00 p.m.
Location: Kualoa Regional Park

Page 1 of

Name	Affiliation	Contact Information (Phone & E-Mail)
June Nakamura, Kyle Okino, & Cale Yamada	Kennedy/Jenks Consultants	(808) 483-0477 eleyanna@kennedyjenks.com
Alfi Logan A	Descendants of Kualoa	722 4048
Gladys Pua Lapilio	Oversight Monitor for Bishop Museum Kualoa	(808) 232-5788 email: gpualapilio@gmail.com
Jay Hamai	DDC-WW	768-8750 jhamai@honolulu.gov
Doug Borthwick	CSH	—
Barbara Natale	Group 70	441-2117 bnatale@group70int.com
Jeff Overton	" "	523-5846 joverton@group70int.com (?)
Lani Ma'a Lapilio	Aukahi	540-5741 lani@aukahi.com

Meeting Sign-In Sheet

Page 2 of

Name	Affiliation	Contact Information (Phone & E-Mail)
Iris Fukunaga	C & C of Honolulu Kualoa Regional Park	ifukunaga@honolulu.gov 237-8525
Joe Genz	Cultural Survey	262-9972 jgenz@culturalsurveys.com
Nicole Ichihara	Cultural Surveys Hawai'i	262-9972 nishihara@culturalsurveys.com
Calvin Hee	Hakipuu Ohana	3938762 yahoo.com calvinhoc@hc

Appendix E Community Consultation Meeting Minutes for August 4, 2011

Meeting Memorandum **Kennedy/Jenks Consultants**

Meeting Time:	3:30pm to 5:30pm	**Page:**	1 of 3
Meeting Location:	Kualoa Regional Park	**Date:**	August 8, 2011
Meeting Date:	August 4, 2011	**K/J Job No.:**	10000623*00
Project:	Centralized Wastewater System at Kualoa Regional Park (DRAFT)		

Persons Attending:

(*See Attached: Pg. 4 – August 4, 2011 Meeting Agenda Outline / Pg. 5 & 6 – Meeting Sign-In Sheet)

PURPOSE: Revisit the alternative wastewater treatment system options and the corresponding Archeological Inventory Survey's (AIS) field work plan with the lineal descendants of Kualoa Regional Park.

1) Opening pule by Ms. Gladys Pualoa-Ahuna.
2) Aukahi distributed meeting minute handouts of the last lineal descendant meeting on July 5, 2011.
   a. Aukahi asked the lineal descendants if they had any comments on the July 5, 2011 meeting minutes:
      i. Mr. Calvin Hoe noted that the meeting location was wrong.
         1. Kennedy/Jenks Consultants (K/J) said they made a mistake, and that the location should have read "Kualoa Regional Park."
      ii. Mr. Calvin Hoe questioned the findings of the Department of Health's (DOH) testing protocol that concluded that there was a "wastewater spill." Mr. Calvin Hoe asked what was the "wastewater spill?"
         1. The Design Team responded that the City made an agreement to upgrade Kualoa Regional Park's wastewater system after the DOH gave them a Notice of Violation (NOV) for a wastewater spill at the park.
      iii. Ms. Gladys Pualoa-Ahuna asked Mr. Calvin Hoe to share the questions that his family had about the project.
         1. Mr. Calvin Hoe responded that his family had similar questions as he had expressed.
            a. How was the testing done that determined there was a wastewater spill at the park?
            b. What are the wastewater treatment alternatives?
         2. Mr. Calvin Hoe added that he and his family would like to see more alternatives explored and would like to be more actively involved in finding a solution.
      iv. Mr. Herbert Hoe commented that he would like to make sure the lineal descendants participate in deciding which wastewater system is the best for the park.
      v. Mr. Calvin Hoe said that the proposed location of the new comfort station is not good because no one goes there.
   b. Aukahi thanked all for providing comments and questions, and that is what these meetings are for. This meeting is what will help us take the next steps.
3) Oahu Island Burial Council (OIBC) meeting update.

Meeting Memorandum
Centralized Wastewater System at Kualoa Regional Park
August 4, 2011
Page 2 of 3

   a. Aukahi summarized the most recent presentation to the OIBC on July 13, 2011.
      i. The design team presented the project AIS work plan.
      ii. Main instruction given by the OIBC was to consult more with the lineal descendants about the Kualoa Regional Park's wastewater system improvements.
      iii. The next scheduled OIBC meeting is August 10, 2011.
   b. Aukahi asked Mr. Calvin Hoe if he had additional comments because he was one of the lineal descendants that attended. Mr. Calvin Hoe responded that he had nothing to add.
4) The City discussed the current project status:
   a. In 2005, the State (Department of Health – Clean Water Branch) found that bacteria levels in the ocean exceeded the State of Hawaii, Department of Health (DOH) acceptable bacteria standards. The City disconnected the disposal system from the treatment systems at Comfort Station #1, Comfort Station #2, Comfort Station #4, and the Food Service Building, effectively changing the existing treatment tanks into "holding tanks."
   b. In November 2006, DOH claimed there was a wastewater spill at Comfort Station #2.
   c. In January of 2007, DOH cited the City with a Notice of Violation (NOV) for the December 2006 wastewater spill.
   d. A condition of DOH's resolution with the City is such that the "holding tanks" are replaced with a wastewater system that "eliminates and prevents wastewater discharges onto the ground or into state waters" at Kualoa Regional Park.
5) K/J presented the current project which involves a centralized wastewater treatment and disposal system, along with a replacement bathhouse.
6) K/J asked if there were any comments or questions about the current wastewater treatment design.
7) K/J noted that they previously conducted working sessions with the lineal descendants in the past, in which they discussed the pros and cons of each different treatment and disposal alternative. K/J prepared a matrix to help summarize alternatives and criteria considered in developing the current design.
   a. K/J responded to the lineal descendants' comments and questions:
      i. The location of the treatment and disposal system was selected because it is thought to have the lowest probability of finding 'iwi.
      ii. Mr. Calvin Hoe asked what the cost would be to continue pumping and maintaining the existing holding tank system?
         1. Department of Parks & Recreation (DPR) responded that pumping is required five (5) times a week, and currently costs $100 per load. The City added that this cost is only the pumping cost and it does not include the City's efforts to monitor the wastewater level in the holding tank every day, carryout shutdown procedures (if necessary), and coordinate pumping events.
         2. K/J added that this project is driven by the City's resolution with the DOH to install a wastewater treatment system.
      iii. Ms. Charlene Hoe requested a wastewater system design that is more self-sustaining. Why is the "living machine" not considered an alternative treatment option?

Meeting Memorandum
Centralized Wastewater System at Kualoa Regional Park
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1. K/J did not look at the design of the "living machine" specifically because the "living machine" option falls under similar design requirements as passive natural land treatment systems. These types of systems would require four-to-five times more area than compared to an aerobic treatment system. K/J will research the "living machine" alternative.
2. The operation and maintenance of a constructed wetland would be intensive because the plants within the pond would need to be inspected and maintained daily.

iv. Mr. Calvin Hoe asked if the current design's disposal system would affect Apua Pond.
1. K/J responded that the minimum distance between a disposal system and a body of water is 50-feet in accordance with the DOH standards. The location of the current disposal system is approximately 200-feet away from Apua Pond. The potential impacts on Apua Pond as a result of the proposed disposal system will require a separate study.

v. Ms. Charlene Hoe asked if the wastewater treatment system could be constructed within the adjacent tree farm near the asphalt pile location or near the park's main entrance to maintain Kualoa Regional Park's existing usable recreational area?
1. K/J responded that the location of the proposed improvements is based on results/findings of previous archaeological studies. Based on those results/findings, the locations have been identified which have the lowest probability of uncovering iwi during construction. Iwi has been found in the tree farm area.
2. Ms. Charlene Hoe expressed that she was not convinced that the aerobic treatment system is the best treatment alternative.

8) Cultural Surveys Hawaii (CSH) presented their proposed AIS testing locations for the current wastewater treatment design, and it was noted that the trenches are subject to change per CSH's discretion.
a. Mr. Calvin Hoe asked if his students could observe the AIS field work.
i. CSH responded to Mr. Calvin Hoe to contact CSH to organize and schedule the possible event.
b. The lineal descendants were asked if they objected to CSH starting their AIS field work in the second week of August.
i. None of the lineal descendants objected.
ii. Mr. Ahi Logan and Ms. Gladys Pualoa-Ahuna both requested that the project move forward to construction.

9) Closing pule by Mr. Ahi Logan.

By: _____
Cale Yamada

Cultural Surveys Hawai'i Job Code: KUALOA 2 Appendix E

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Centralized Wastewater System at Kualoa Regional Park
August 4, 2011
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9) Closing pule by Mr. Ahi Logan.

By: _____
Cale Yamada

DRAFT

Archaeological Inventory Survey for Kualoa Regional Park E-5
TMK: [1] 4-9-004: 001 por.

Descendant 'Ohana Meeting
Thursday, August 4, 2011
Kualoa Regional Park
3:00 p.m. – 4:30 p.m.

Kualoa Regional Park – Wastewater System Improvements Project

Agenda

I. Welcome/Opening Pule/Self-Introductions (Lani)

- City - Jay Hamai, Asst. Chief WW Division, DD&C
- City – Miles Hazama, Supervisor, Dept. of Parks & Rec.
- Kennedy & Jenks – June Nakamura, Project Manager, Kyle Okino, Senior Associate Engineer & Cale Yamada , Staff Engineer
- Group 70 - Barbara Natale, Planner
- Cultural Surveys Hawai'i - Doug Borthwick, Project Archaeologist
- Aukahi - Lani Ma'a Lapilio, Facilitator

II. Purpose of Meeting (Lani)

- Review the AIS work plan and discuss alternatives matrix

III. Approval of Notes/Update on OIBC meeting

IV. City (Jay)

- Need for Project/ Status

V. Project Description (Kyle)

- Present matrix of alternatives and exhibits

VI. Archaeological Review Process (Doug)

- Archaeological Inventory Survey Proposal
- CIA

VII. Discussion/Q & A/Closing Pule

VIII. Mahalo/ Pau

Meeting Sign-In Sheet

Project: Kualoa Regional Park Wastewater System Improvements
Meeting Date/Time: August 4, 2011 / 3:30 p.m.
Location: Kualoa Regional Park

Page 1 of

Name	Affiliation	Contact Information (Phone & E-Mail)
Doug Borthwick	CSH	–
Jay Hamai	C&C of Honolulu DDC-WD	jhamai@honolulu.gov
Herbert Hoe	Hakipuu Resident	808 533 8390
Kuna Hoe	" Hakipuu Resident	
Marvin Engoring	Hakipuu Resident	
Kaneala Smith	Hakipuu Resident	(808) 498-8740
Richard Galeng	Hakipuu Resident	RickG9074@GMAIL.COM (808) 692-2535
Calvin Hoe	Hakipuu	3938762

Meeting Sign-In Sheet

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Name	Affiliation	Contact Information (Phone & E-Mail)
Iris Fukunaga	City & Cty Hon Kualoa Reg Park	2378525 ifukunaga@honolulu.gov.
Lani Maí Lapilio	Aukahi	
Jeff Overton	Group 70	351 4200 jho@group70int.com
Miles Hazama	DPR	233-7300 mhazuma@honolulu.gov.
Roland Atti Logan	Lineal Descendant	
[illegible]	" "	232-5188
Charlene Hoe	Hekipuu	284-8558

Appendix F Community Consultation Meeting Minutes for September 14, 2011

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

GUY H. KAULUKUKUI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BLVD., RM. 555
KAPOLEI, HI 96707

DRAFT MINUTES

OAHU ISLAND BURIAL COUNCIL MEETING

DATE: **Wednesday, September 14, 2011**
TIME: **10:00 A.M. to 2:00 P.M.**
PLACE: **DLNR Conference Room 322B (Third Floor)**
Kalanimoku Bldg.
1151 Punchbowl Street
Honolulu, HI 96813

I. Call to Order/Roll Call/Opening Pule.

Chairman Kawika McKeague called the meeting to order at 10:42 a.m. Quorum was established with six council members (McKeague, Ehrhorn, Scheuer, Kane, Hoag, Bridges). Councilmember Cy Bridges offered an opening pule.

II. Introduction of OIBC commissioners and SHPD staff

OIBC members present: Kawika McKeague, Chuck Ehrhorn, Jonathan Scheuer, Shad Kane, Steve Hoag, Cy Bridges

OIBC members excused: Hinaleimoana Wong, Kehau Abad, Leimaile Quiteves, Aaron Mahi

SHPD Staff: Cicely Lorenzo-Ganir, Clerk; Pua Aiu, Administrator

There was no staff from the Office of the Attorney General present.

Guests:

Mike Lee	Kyle Okino	Jay Hamai
Warren Soh	Pua Colburn	Nova-Jean McKenzie
Ralph K. Makaian, Jr.		Richard K. Paglinawan
Alan E. Haun	Drew Stotesbury	Dawn Chang
Doug Borthwick	Kahu Manu Mook	Kim Evans
David Shideler	Matt McDermott	Barbara Natale

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III. Opening Remarks by OIBC Chairman

Chairman McKeague welcomed all to the meeting. McKeague informed all that we would be losing quorum in about an hour, due to the late start because of parking issues, and time limitations on some council members. He also noted that people interested in serving on the burial council submit their applications, as the council is running low on representation for certain seats. McKeague asked that folks testifying treat each other with dignity and respect. There is a four minute limit on public testimony.

IV. Approval of OIBC meeting minutes
A. OIBC Draft Minutes of November 10, 2010
B. OIBC Draft Minutes of December 8, 2010
C. OIBC Draft Minutes of March 9, 2011
D. OIBC Draft Minutes of May 11, 2011
E. OIBC Draft Minutes of June 8, 2011

Chairman McKeague, with a consensus from the OIBC, asked that the approval of OIBC meeting minutes be pushed to the latter part of the meeting, due to time constraints.

V. New and/or Current Business
NOTE: Two agenda items for new and/or current business were discussed in an order different from the agenda posted at the Lt. Governor's office.

A. Informational Presentation of the Draft Plan for the Supplemental Archaeological Inventory Survey (SAIS) for Turtle Bay Resort

*Originally Item D. on agenda

Commissioner Scheuer recused himself from this agenda item as he previously did community relations work for Turtle Bay, and sat in the audience, as this item was for informational purposes only.

Presentation by Dawn Chang (Kuiwalu), Richard Paglinawan (Kahuku Burial Committee), Drew Stotesbury (Turtle Bay Resort), and Alan Haun (Haun & Associates).

Paglinawan satted that the revised master plan has reduced the number of units from 3500 units, to 1375 units for the two hotel sites. Also, the Supplemental Environmental Assessment Inventory was ordered over a year ago.

Stotesbury stated that the project will have160 affordable units, above the required 59 affordable units due to zoning. They are preparing the SEIS notice, and working on the Supplemental AIS. Less than 1/3 of the shoreline will be

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developed. The remaining 2/3 will be open. There will be about 60-65 acres of waterfront.

Chang stated that the project is proactive in terms of cultural consultation, and sensitive to cultural resources. The setbacks at 300 feet and 150 feet avoid the most sensitive areas (sand dunes). The Cultural Impact Assessment (CIA) is being worked on. Ethnographic interviews are being done that will be incorporated into the revised SEIS. Tomorrow, 15 Sept. 2011, there will be an Open House at Turtle Bay Resort to inform the public before the comment deadline.

Paglinawan introduced the following kupuna from the area (seated in the audience): Nova-Jean McKenzie (participated in Kahuku Burial Committee), Pua Colburn, Warren Soh, Carol Anamizu-Farm (did not sign guest sheet), Ralph Makaiau, and Buddy Ako (did not sign guest sheet). The purpose of the committee is to address any inadvertent discovery of iwi. Purchases of basket and tapa were approved in the event iwi are found. Also mentioned that those submitting cultural descendancy applications for approval to the area can also provide assistance to the committee.

Haun prepared the Supplemental AIS for the project; it is currently under review by SHPD. Previously worked for PHRI in the early 1980s. Is familiar with the property. The property was occupied for over 1400 years. In the 1800s the Land Commission awarded the property for occupation and settlement. In the 1850s it was Kahuku Ranch. In 1890 it became Kahuku Plantation (sugarcane). Then from 1935 to 1942 it was Kahuku Army Airfield. A tsunami in 1946 wiped out the area. The supplemental AIS will build on early work on the property from 1970s and 1980s that did subsurface testing. The current work is to protect what may remain there now. Referring to Figure 25, Haun pointed out the location of burials previously identified (25). Twenty-two have been reinterred, three remain preserved in place in the southwest corner by the highway. Areas will be targeted in supplemental AIS with additional subsurface testing, as well as areas with dense forest. Test excavations will be both manual and mechanical. There will be 320 systematically placed excavations, which are about 150 feet in every direction, will attempt to uniformally sample the area. In total, there will be approximately 350 excavations. Any iwi found in the inventory survey will be treated as previously identified, that will be preserved in place until proper procedures are in place. The Supplemental AIS is in draft form, and modifications are certainly possible.

Commissioner Kane wanted a sense of proximity of the project to the iwi.

Stotesbury stated that the project is ¾ mile away (not contiguous) from where iwi are to where the planned expansion is. Mitigation efforts are still to be determined for the 100 acres.

Haun pointed out that the marsh area will be preserved.

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Chairman McKeague informed the rest of the council that he met with Keola, Keala, Jerry Myers, and Peter Apo's staff.

Commissioner Ehrhorn wanted clarification on the reinterment area and remains recovered during the initial data recovery. Wanted to make sure it was in accordance with the 1992 burial treatment plan.

Chang stated that the reinterment area is next to the existing kuleana parcel, with a burial there. Three ahupuaas are involved. They are already considering a potential reinterment site to be proactively thinking ahead of time to enable immediate curation versus being put in a trailer.

Commissioner Ehrhorn stated that some members of the burial council not present at the meeting were concerned about the iwi being brought to a distant site. They want to reinter as close as possible to where the iwi were found.

Chairman McKeague pointed out that previously identified iwi have already been reinterred. Chang confirmed that none are unresolved.

Chairman McKeague asked about test areas. Mentioned that Test Area A has jaucus sands.

Haun stated that areas outside the test area have already been heavily tested, and analyzed for structural flow. These areas have been scraped and filled already. The extent of the data recovery cleared the way for the hotel site. However, there is still potential along the shore line.

Commissioner Ehrhorn asked about the fill area being the residential site.

Stotesbury stated that 75 units will be in the fill area. Then 150 units will be on the next parcel moving east.

There was no PUBLIC TESTIMONY on this issue.

B. Update Regarding the Kualoa Regional Park Wastewater Treatment Project.
Information/Discussion/Recommendation

Commissioner Scheuer recused himself from this agenda item as a familial relationship worked for Group 70 as a planner, and sat in the audience, as this item was for informational purposes only.

Update by Jay Hamai (The City and County of Honolulu) and Kyle Okino (Kennedy Jenks Consultants).

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As of August 2011, 50% design was submitted to the C&C, as well as the AIS. They are awaiting final comments on the AIS from SHPD. The AIS states that any iwi found will be treated as previously identified. The aerobic units by the bath houses are where most of the work is concentrated. A test sample was done along the transmission lines. This is where there was least likely hood of finding iwi. It was stated that John Morgan (Kualoa Family Ranch) sand mined a portion of this land at one time. Proposed two to three weeks of field work, and reporting of any finds. Upon completion, the figures and discussions will be provided to SHPD.

In July 2011, the panel met with lineal descendants of the area: Cal Ho & Ohana, Helbert Ho and Ohana, Ahi, and Aunty Gladys. The descendants did not object to moving forward of the project to AIS. There was a request by the desendants to have students observe field work.

Past history on this project: In January 2007, the City needed to take action because of a Department of Health Notice of Violation. In January 2010, the city ewas ordered to replace wastewater system with one that will prevent the violation.

Commissioner Hoag asked about what is causing the violation.

Hamai stated that there is a leak at Station #2. All the waste is in the holding tank. Looking for a long-term solution.

Chairman McKeague is pleased with what he hears regarding this project. He values the effort being demonstrated. Asked that the council and regional representatives on the burial council continue to be informed. Also asked about a contingency fund for this project area, since there is a high probability that more iwi will be found. Inquired about the costs that could be generated from more potential finds.

PUBLIC TESTIMONY:

Calvin Ho (Cy Bridge's cousin) thanked the OIBC and the City. Encouraged the City to talk with family from the area. Hopes meetings will continue. Is not entirely comfortable with placement of the remains, and has requested other sites. The City has put asphalt piles 100 yards away from the proposed reinterment site. There are also concerns about the proximity of the leech field to the fishpond. Stated that the sewage is not spilling, but being taken away by pump truck on a regular basis. Concerned about funds for this project. Reinforced that that the park is a special place, and is sacred. Supports more discussions, possibly an alternative way to deal with wastewater, such as a green machine.

Chairman McKeague agreed with the consistent meetings with families. Also likes project implementation and design alternatives.

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Commissioner Ehrhorn seconded the level of treatment.

End of public testimony on this agenda item.

C. Update from the City & County of Honolulu's Rail Transit Team Regarding the Honolulu Rail Transit Project for Areas of Honouliuli, Hoaeae, Waikele, Waipio, Waiawa, Manana, Waimano, Waiau, Waimalu, Kalauao, Aiea, Halawa, Moanalua, Kahuiki, Kapalama, Nuuanu, Pauoa, Makiki, Manoa, and Waikiki Ahupuaa, Ewa and Kona Districts. TMK: Various
Information/Discussion/Recommendation

Update by Matt McDermott (Cultural Surveys Hawaii).

The process describes the treatment of iwi. Was completed in July, within six months of the AIS. An OIBC task force was formed once comments were received back. The draft is finalized before the start of the next phase (Phase IV).

Referring to CSH handout (Job Code: KALIHI 19: Identification and Inclusion of Appropriate Parties) Section 4 and Section 5. *

*In the beginning, there was broad communication to interested parties, who chose to opt in or opt out of the process. A database was created indicating areas of interest, how they were contacted, etc. Cultural protocol and ceremony are also of concern.

*Big changes were made in the schedule. (1) "Within two days after initial consultations with SHPD", added more time. (2) A password protected system for broad email notification would limit the information being sent out initially. It keeps it very general, asking those that want more information to contact CSH.

*Changes are highlighted in yellow.

Chairman McKeague was on the OIBC task force that met a couple times. Asked that another meeting of the OIBC task force be scheduled.

*CSH will solidify changes and provide a working document that can be changed. Is projecting completion of a final version in October.

CSH is getting input on burial protocol from the Society for Hawaiian Archaeology and Robin Danner.

CSH has contacted the Council for Native Hawaiian Events to disseminate information. It is also looking at civic clubs to help do the same.

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CSH has also requested that unions (carpenters, operators, laborers) become involved in the process. Pre-1980s burial finds could still be in the institutional memory versus being forgotten.

PUBLIC TESTIMONY:

Mike Lee (Lineal Claimant for Ewa iwi kupuna) mentioned an underground car system, earthquake soundings, Article 12 Section 7.

Unidentified lady inquired about burial relocation sites being as close as possible to where they were found. Wanted to see the City curation process in the AIS. Also wanted to the City to have cultural monitoring especially during Phase IV, in the Kalihi area from the mountain to the sea between Puuhale and Mokauea. Stated descendants of iwi kupuna have a close tie and more say than civic clubs.

CSH is still reviewing the cultural monitors. McDermott will provide a response to the unidentified lady.

Lee stated that the Chinatown section is recognized by SHPD.

End of public testimony on this agenda item.

D. Hilton Hawaiian Village, Hilton Hawaiian Village Master Plan Improvements Project, Waikiki Ahupuaa, Kona District, Oahu Island. TMK: (1) 2-6-008:001, 003, 005, 007, 012, 019, 020, 021, 023, 024, 027, 031, 034, 037, 038; (1) 2-6-009: 001, 002, 003, 007, 009, 010-013; (1) 2-6-005:001(portion)
Information/Discussion/Recommendation
*Originally Item A. on agenda

Commissioner Scheuer recused himself from this agenda item as a familial relationship worked for Group 70 as a planner, and sat in the audience, as this item was for informational purposes only.

Presentation by Barbara Natale (Group 70), Geri Gibson (Hilton Hawaiian Village), and David Shideler (Cultural Surveys Hawaii).

February 2011 the Council was briefed on this project. Report was sent to SHPD. May 2011 letter from SHPD accepting the report.

Shideler explained that nineteen backhoe test trenches were done on the eastern corner of the 224 acre parcel where tower development (timeshare tower 1) is proposed. This is the central portion of the Hilton Hawaiian Village (HHV) campus. The AIS reported minimal finds, water-table high, and layer deposits, prompting an Archaeological Monitoring Plan. In the area by the Central Rainbow Bizarre, eight trenches were done. The sand matrix did not have pre-

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contact (<1890) features or artifacts. There were early 20th century finds, prompting a Data Recovery Plan. Site 2870 is a cultural layer (Earl Buddy Nehler, 1980) that had 2 burials and another bone, is north of the timeshare tower 1, and was reinterred on-site. The EIS was accepted by the Department of Planning and Permitting in July 2011. The Director's report is going to the City Council in October, hopefully with approval by the end of 2011.

Gibson proposes that the first timeshare tower will be occupied by early 2016. With construction to commence in late 2012 or early 2013.

Chairman McKeague provided lots of constructive criticism and liked the good faith efforts extended by HHV.

There was no PUBLIC TESTIMONY on this issue.

The discussion went off the agenda item above. Chairman McKeague noted that Mike Lee will forward to him the verbatim Dec. 8, 2010, OIBC meeting minutes from Kai Markell. Chairman McKeague also noted from the unidentified lady that Kawaiahao church is not sure who is doing genealogy/lineal descendants, and he will recommend two Kona representatives and himself to facilitate dialog and a meeting with the church and their person doing lineal connection regarding this.

NOTE: Chairman McKeague placed the rest of the agenda on hold at 11:58 a.m., informing all that were present that some members of the council needed to leave. **The OIBC lost quorum and the meeting ended at 12:02 p.m. without further discussion on the deferred item to approve the draft minutes and the rest of the agenda (Item V.(E.), V. (F.), VI., VII., VIII.)**

E. Updates and Letter Response from OIBC Regarding the Kawaiahao Church Multi-Purpose Building Renovation Project, Honolulu Ahupuaa, Kona District, Island of Oahu. TMK: (1) 2-1-032:017
Information/Discussion/Decision

F. Reformation of the OIBC subcommittee on Federal Section 106 Committee.
Information/Discussion/Decision

VI. OIBC COMMITTEE REPORTS
A. OIBC Legislative Committee. Discussion/Recommendation/Decision
B. OIBC Section 106 Committee. Discussion/Recommendation/Decision
C. OIBC Task Force on Environment Reviews
Discussion/Recommendation/Decision

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VII. ANNOUNCEMENTS

VIII. ADJOURNMENT

Motion by Chairman McKeague, seconded by Chuck Ehrhorn, to adjourn the meeting. The vote was unanimous. The motion passed unanimously.

The meeting ended at 12:02 p.m.

Respectfully Submitted:

CICELY LORENZO-GANIR

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Appendix G Community Consultation Meeting Minutes for November 14, 2011

Meeting Memorandum **Kennedy/Jenks Consultants**

Meeting Time: 2:00pm to 3:30pm **Page:** 1 of 3
Meeting Location: Kualoa Regional Park **Date:** November 15, 2011
Meeting Date: November 14, 2011 **K/J Job No.:** 10000623*00
Project: Centralized Wastewater System at Kualoa Regional Park – AIS Findings (DRAFT)

Persons Attending:
(*See Attached: Pg. 3 – November 14, 2011 Meeting Agenda, Pg. 4 & 5 – Meeting Sign-In Sheet)

PURPOSE: Present the archeological findings of the Archeological Inventory Survey (AIS), and discuss the lineal descendants' preference of how they would like the discovered cranial fragment to be treated.

1) Opening pule by Ms. Gladys Pualoa-Ahuna.
2) Aukahi provided a brief overview of the meeting's agenda, and everyone in attendance introduced themselves.
3) CSH presented their findings of the AIS.
   a. The AIS took 3-4 days and consisted of 18 trenches.
   b. The AIS report is being completed and will include lab results.
   c. CSH provided exhibits depicting the trench locations and the artifacts discovered within the trenches. AIS trenches were generally within the location of the current wastewater treatment system design. CSH indicated that the current design is such that the sewer force main is to be constructed within the existing road and sidewalk.
      i. CSH indicated that AIS trenches # 15 & 16 were excavated adjacent to the sidewalk or road.
      ii. Based on CSH's observations of the soil layers delineated within the trenches, it is their feeling that the soil layers beneath the sidewalk or road are similar to what they observed, and would not expect to find anything different if the trench were within the road or sidewalk.
         1. Mr. Woody Vaspra asked, "How deep were the testing trenches?"
            - CSH replied, "From the ground surface to approximately the top of the water table."
   d. CSH distinguished the locations where cultural artifacts were found and where the cranial fragment was found in their testing pits.
   e. CSH stated that the general central area has been heavily disturbed and the soil layers at Kualoa Regional Park were "intact cultural layers" and others "disturbed/imported sediment layers."
      i. Ms. Catie Johnson asked, "What is the difference between an "intact cultural layer" and a "disturbed/imported sediment layer."
         1. CSH replied that a "disturbed/imported sediment" layer would consist of backfilling soil for things like construction and/or grading, while an "intact cultural layer" is the accumulation or build-up of soil, naturally, over time.
      ii. Ms. Catie Johnson asked, "Which layer was the cranial fragment found?"
         1. CSH replied that the cranial fragment was found in Trench 17, makai of Comfort Station #2, within the disturbed sandy sediments above the "intact cultural layer."

Meeting Memorandum
Centralized Wastewater System at Kualoa Regional Park
November 14, 2011
Page 2 of 3

   iii. Ms. Catie Johnson asked, "How deep is the 'intact cultural layer?'"
      1. CSH replied, "Approximately three (3) to four (4) feet deep."
   iv. Mr. Woody Vaspra asked, "What has happened to the uncovered cranial fragment?"
      1. CSH replied, "The cranial fragment was placed in a lauhala box, wrapped in muslin cloth and put back where it was found. GPS was used to mark its location, and wooden boards were placed around it, to protect it, in the uncovering process if the OIBC dictates that it is to be relocated."
   v. Mr. Calvin Hoe asked, "What is going to be constructed in the location where the cranial fragment was found?"
      1. K/J replied, "A sewer force main."
   vi. Mr. Woody Vaspra asked, "What size is the sewer force main?"
      1. K/J replied, "A 2-inch sewer force main."
   vii. Mr. Calvin Hoe asked, "Where could the fragment have come from?"
      1. CSH replied, "Many burials have currently been uncovered by shoreline erosion, but it is CSH's best guess that this particular burial was disturbed during previous construction—either the construction of Comfort Station #2 or the utility work for Comfort Station #2.
      2. Mr. Calvin Hoe expressed his concern with past decisions made by the City regarding Kualoa Regional Park, and remains cautious about decisions regarding the park's future.
4) Aukahi asked the lineal descendants their preference for burial treatment of the discovered cranial fragment.
   a. Ms. Gladys Pualoa-Ahuna asked if the City still has a temporary holding facility for the remains.
      i. DPR replied, "Yes, we do."
   b. Ms. Gladys Pualoa-Ahuna stated her preference would be to move the iwi kupuna to a temporary City facility, and then reinter the iwi kupuna at an onsite re-internment facility on a later date.
   c. Mr. Ahi Logan state his preference would also be to move the iwi kupuna to a temporary City facility, and then reinter the iwi kupuna at an onsite re-internment facility on a later date.
   d. Mr. Calvin Hoe needed more time to discuss this with his family before he can state any preference.
5) Aukahi provided a summary of events to come to complete the Historic Preservation Review Process.
   a. The lineal descendants' statements of preferred treatment will be included in the burial treatment plan, but it was noted that since the iwi kupuna was found during the inventory survey the final decision will rest with the OIBC.
   b. The cranial fragment iwi kupuna "find" must be advertised for three (3) days in December.
   c. Following the advertisement, there will be a waiting period of 30 days for the public to possibly make a claim of relationship or knowledge about the uncovered iwi kupuna.
   d. In February 2012, the OIBC may hear and review claims of genealogy.

Meeting Memorandum
Centralized Wastewater System at Kualoa Regional Park
November 14, 2011
Page 3 of 3

e. March 2012 will be the earliest that the design team can present a burial treatment plan to the OIBC for a ruling on preservation in place or relocation of the iwi kupuna fragment.

6) Closing pule by Mr. Ahi Logan.

By: _____
Cale Yamada

DRAFT

m:\ttly\k projects\documents\0623 kualoa regional park\meeting minutes\2011\nov14 meeting minutes\draft\2011nov14 revised meetingmemo (lineal descendants burial findings meeting).doc © 2005 Kennedy/Jenks Consultants(F-9)

Descendant ‘Ohana Meeting
Monday, November 14, 2011
2:00 p.m. – 3:30 p.m. Kualoa Regional Park

Wastewater System Improvements Project

Agenda

2:00 p.m. Welcome/Opening Pule/Self-Introductions (Lani)

- City - Jay Hamai, Asst. Chief WW Division, DD&C
- City - Miles Hazama, DPR and Iris Fukunaga, Park Manager
- Kennedy & Jenks – Kyle Okino, Senior Associate Engineer; Cale Yamada , Staff Engineer
- Cultural Surveys Hawai'i - Doug Borthwick, Project Archaeologist and John Tulchin – Fieldwork/Report Supervisor
- Aukahi - Lani Ma'a Lapilio, Facilitator

2:15 p.m. Purpose of Meeting (Lani)

- Archaeological Inventory Survey Report
- Next Steps in the Historic Preservation Review Process

2:30 p.m. Archaeological Inventory Survey Findings (Doug)

- Next Steps in the Historic Preservation Review Process

3:00 p.m. Discussion/Q & A (Kākou)

3:30 p.m. Mahalo/ Pule/ Pau (Lani)

Meeting Sign-In Sheet

Page 2 of 2

Name	Affiliation	Contact Information (Phone & E-Mail)
Woody Vaspra	came with Calvin Hoe	303 570 5813 wvaspra@gmail.com
Caltie Johnson	came with Calvin Hoe	303-506-4253 caltie.wcoe@gmail.com
Calvin Hoe	Hakipuu ohana	393 8762 calvinhoe_hlc@yahoo.com
Lani Mae Lagilio	AUKAHI	
Cale Yamada	KENNEDY/JENKS CONSULTANTS	caleyamada@kennedyjenks.com (808)488-0477

Meeting Sign-In Sheet

Page 1 of 2

Project: Kualoa Regional Park Wastewater System Improvements
Meeting Date/Time: November 14, 2011 @ 2:00 p.m.
Location: Kualoa Regional Park

Name	Affiliation	Contact Information (Phone & E-Mail)
Atti Logan Apuakehau	Hawaii Civic Club	722 4045
Gladys Pualani Ahuna	Kualoa Ohana	232 5188 gpahuna@gmail.com
Jon Tulchin	CSH	jtulchin@culturalsurveys.com 262-9972
Doug Borthwick	CSH	✓
Iris Fukunaga	DPR	ifukunaga@honolulu.gov
JAY HAMAI	ODC	jhamai@honolulu.gov
Miles Hazama	DPR	mhazama@honolulu.gov
KYLE OKINO	K/J CONSULTANTS	kyleokino@kennedyjenks.com 488-0477

Appendix D
Cultural Impact Assessment

Cultural Impact Assessment for the Proposed Project to Reconstruct Park Wastewater Systems at Kualoa Regional Park, Kualoa Ahupuaʻa, Koʻolaupoko District, Oʻahu Island

TMK: [1] 4-9-004:001

Prepared for

Kennedy/Jenks Consultants, Inc.

Prepared by

Joseph H. Genz, Ph.D.

Nicole Ishihara, B.A.

and

Hallett H. Hammatt, Ph.D.

Cultural Surveys Hawaiʻi, Inc.

Kailua, Hawaiʻi

(Job Code: KUALOA 4)

January 2012

Oʻahu Office
P.O. Box 1114
Kailua, Hawaiʻi 96734
Ph.: (808) 262-9972
Fax: (808) 262-4950

www.culturalsurveys.com

Maui Office
1860 Main St.
Wailuku, Hawaiʻi 96793
Ph: (808) 242-9882
Fax: (808) 244-1994

Prefatory Remarks on Language and Style

A Note about Hawaiian and other non-English Words:

Cultural Surveys Hawaiʻi (CSH) recognizes that the Hawaiian language is an official language of the State of Hawaiʻi, it is important to daily life, and using it is essential to conveying a sense of place and identity. In this report, CSH uses italics to identify and highlight all foreign (i.e., non-English and non-Hawaiian) words. Italics are only used for Hawaiian words when citing from a previous document that italicized them. CSH parenthetically translates or defines in the text the non-English words at first mention, and the commonly-used non-English words and their translations are also listed in the *Glossary* (Appendix A) for reference.

A Note about Plant and Animal Names:

When community participants mention specific plants and animals by Hawaiian, other non-English or common names, CSH provides their possible scientific names (Genus and species) in the *Common and Scientific Names of Plants and Animals Mentioned by Community Participants* (Appendix B). CSH derives these possible names from authoritative sources, but since the community participants only name the organisms and do not taxonomically identify them, CSH cannot positively ascertain their scientific identifications. CSH does not attempt in this report to verify the possible scientific names of plants and animals in previously published documents; however, citations of previously published works that include both common and scientific names of plants and animals appear as in the original texts.

Abbreviations

AIS	Archaeological Inventory Survey
AMS	Army Mapping Service
APE	Area of Potential Effect
Land Commission	Board of Commissioners to Quiet Land Titles
CIA	Cultural Impact Assessment
CSH	Cultural Surveys Hawai‘i
DNLR	Department of Land and Natural Resources
EIS	Environmental Impact Statement
GPS	Global Positioning System
HAR	Hawai‘i Administrative Rules
HECO	Hawaiian Electric Company
HRS	Hawai‘i Revised Statutes
LCA	Land Commission Award
OEQC	Office of Environmental Quality Control
OHA	Office of Hawaiian Affairs
OIBC	O‘ahu Island Burial Council
SHPD	State Historic Preservation Division
SIHP	State Inventory of Historic Properties
TCP	Traditional Cultural Property
TMK	Tax Map Key
TS	Transit Station
USDA	United States Department of Agriculture
USGS	United States Geological Survey

Management Summary

Reference	Cultural Impact Assessment for the Proposed Project to Reconstruct Park Wastewater Systems at Kualoa Regional Park, Kualoa Ahupua‘a, Ko‘olaupoko District, O‘ahu Island (TMK: [1] 4-9-004:001 (Genz et al. 2012)
Date	January 2012
Project Number	Cultural Surveys Hawai‘i (CSH) Job Code: KUALOA 4
Agencies	State of Hawai‘i Department of Health/Office of Environmental Quality Control (DOH/OEQC)
Project Location	The Project area is Kualoa Regional Park, which is located on the northeastern coast of O‘ahu in Kualoa Ahupua‘a between Hakipu‘u and Ka‘a‘awa Ahupua‘a
Land Jurisdiction	The Department of Parks and Recreation, City and County of Honolulu
Project Description	Kualoa Regional Park has four comfort stations that were constructed in 1973. Each comfort station was built with its own wastewater system including a treatment and disposal component. All four of the wastewater systems have reached their useful life and need to be replaced. Comfort Station #3 was closed due to the eroding shoreline. This Project involves constructing a replacement bath house for Comfort Station #3, and a centralized wastewater system away from the eroding shoreline. Four pump stations will be installed to convey the wastewater flows from each comfort station (including the replacement bath house) and the food service building to the centralized wastewater system. The centralized wastewater system will be sized to treat and dispose of approximately 29,000 gallons per day. The system will be designed to use pumping systems and partially mound system components to minimize excavation during construction. It is estimated that the system will consist of 3,750 linear feet of force main, a 5,000 gallon pre-loader tank, three 15,000 gallon aerobic treatment units, and an elevated mound for disposal. The Project will involve abandoning the existing wastewater treatment systems in place except for the system serving Comfort Station #3 which will be demolished and removed. Comfort Station #3 will be demolished.

Project Acreage	Approximately two acres
Area of Potential Effect (APE) and Survey Acreage	For the purposes of this Cultural Impact Assessment (CIA), the APE is defined as the approximately 2-acre Project area. While this investigation focused on the Project APE, the study area included the entire ahupua‘a (land division usually extending from the uplands to the sea) of Kualoa.
Document Purpose	The Project requires compliance with the State of Hawai‘i environmental review process (Hawai‘i Revised Statutes [HRS] Chapter 343), which requires consideration of a proposed project's effect on cultural practices and resources. Kennedy/Jenks Consultants, Inc. requested CSH conduct this CIA. Through document research and ongoing cultural consultation efforts, this report provides information pertinent to the assessment of the proposed Project's impacts to cultural practices and resources (per the *Office of Environmental Quality Control's Guidelines for Assessing Cultural Impacts*) which may include Traditional Cultural Properties of ongoing cultural significance that may be eligible for inclusion on the State Register of Historic Places, in accordance with Hawai‘i State Historic Preservation Statute (Chapter 6E) guidelines for significance criteria according to Hawai‘i Administrative Rules (HAR) §13-275 under Criterion E. The document is intended to support the Project's environmental review and may also serve to support the Project's historic preservation review under HRS Chapter 6E-42 and HAR Chapter 13-275.
Consultation Effort	Hawaiian organizations, agencies and community members were contacted in order to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the Project area and the vicinity. The organizations consulted included the State Historic Preservation Division, the Office of Hawaiian Affairs, the O‘ahu Island Burial Council, Hui Mālama I Nā Kūpuna O Hawai‘i Nei, the Ko‘olaupoko Hawaiian Civic Club, and community members of Kualoa Ahupua‘a.
Results of Background Research	Background research for this Project yielded the following results (presented in approximate chronological order): 1. Archaeological excavation and survey data indicate a sequence of settlement patterns and cultural use of Kualoa and the Project area. Between A.D. 1100 and 1400, the early settlers used the coastline of Kualoa as a temporary campsite for fishing and reef-gathering activities. By A.D. 1400, the southern beach was probably used as a burial ground, and the fishpond wall of Mō‘ili Pond was constructed. By A.D. 1600,

	the embayment forming ‘Āpua Pond was most likely walled, agricultural use of the lower slopes abutting the southern and eastern beaches was intensified, and the eastern beach was used as a burial ground with evidence of grave disturbance. After A.D. 1600, virtually the entire Project area was occupied, as evidenced by a nearly intact cultural layer containing numerous features and a remarkable amount of artifacts that indicate a community of resident stone working artisans and other craft specialists. This was also an occasional residence of ali‘i (chiefs), as evidenced in the form of ornaments such as the lei niho palaoa (whale tooth pendant) and leisure activity areas such as an ‘ulu maika (bowling) playing field. It was also possibly a residence of kāhuna (priests), as suggested by two heiau (place of worship) and intact pig skeletons that were perhaps offered in the worship of Lono, the god of agriculture (Gunness 1987:237–246). 2. Several archaeological sites are located in the Project area. ‘Āpua Pond, with walls of sand embankment and stone, is located in the southern portion of the Project area (Site 313, McAllister 1933:168). Excavations uncovered a basalt stone alignment, which contains a mākāhā (sluice gate) (Site 1A-1, Clark and Connolly 1978:5). Excavation immediately north of ‘Āpua Pond locations uncovered dense concentrations of 7,800 artifacts (Survey Area 1C, Gunness 1987:91–99), and an imu (earth oven) filled with thousands of basalt flakes surrounded by at least 13 post molds that radiocarbon date to between A.D. 1670–1730 (Site 1C-2). Near Mōli‘i Pond on the border of Kualoa and Hakipu‘u Ahupua‘a, an intact pig skeleton in a flexed position was uncovered in association with an imu and numerous artifacts (Site 1A-2, Gunness 1987:57–59), which may have acted as an ahupua‘a (literally referring to a "heap of stones associated with a pig") boundary offering (Gunness 1987:62). The Kualoa Depression, variously referred to as an ‘auwai (ditch) for Koholālele Pond, a water channel or a swale, contained preserved organic materials (Site 2B-2, Gunness 1987:123). 3. Numerous human remains have been documented within and near the Project area, which were scattered along the beach and recovered or uncovered through excavation. These remains represent 85 individuals (Shideler and Hammatt 2007, Vol. I:219), with a discrete burial area along the eroding shoreline of the eastern beach (2B-1, Gunness 1987:120, 141; SIHP 50-80-06-5371, Dye 1996a; Colin and Hammatt 1997). Other burials have been found inland near the depression of Koholālele

	(Goodman and Cleghorn 1991:21–28; Putzi 1994:1) and inland of ‘Āpua Pond (Gunness 1987). 4. Mo‘olelo are associated with several wahi pana (storied places) in Kualoa and detail several cultural events and traditions, such as Kaha‘i returning from Samoa to plant the first breadfruit tree in Hakipu‘u Ahupua‘a (Beckwith 1970:238), the lowering of sails when passing Kualoa to honor its sacred land and high chiefs (Fornander 1919, Vol. IV:370), the use of Kualoa as a pu‘uhonua (place of refuge) (Kamakau 1992:17–18), and sacrificial drowning of kauwā (a low caste) (Fornander 1917, Vol. IV:549; *Hōkū o Hawai‘i* 1926; *Ka Loea Kalaiaina* 1899; *Ka Loea Kalaiaina* 1900; *Ka Na‘i Aupuni* 1906; Pukui 1983:156). 5. Land Commission Award (LCA) documentation of the Māhele indicates habitation and subsistence practices within and near the Project area prior to 1850. The land claims reveal that Hawaiian pā hale (households) were largely located along the coast, including two along the northeast border of the Project area (LCA 3011 to Mahiole and LCA 3052 to Kaneakalau), with lo‘i kalo (irrigated taro fields) concentrated near Mōli‘i Pond and kula ‘āina (field or pasture land) inland at the base of Kānehoalani Ridge where sweet potato, wauke (paper mulberry), beans, and melons were cultivated (Waihona ‘Aina 2000). 6. The cultural landscape at Kualoa has been severely impacted by shifts in the use of the land since the Māhele, including Gerrit P. Judd’s ranch (later Kualoa Ranch) and sugar plantation. Significant places of historic interest within the Project area include Hale Makani (House of Winds), a stone bathhouse built in 1916 by the Morgan family, and the Morgan family beach house, constructed in 1950, which became the site of the Kualoa Regional Park’s office building (Francis Morgan interview, Shideler and Hammatt 2007, Vol. II:101). During World War II, the military fortified Kualoa, including a grassed emergency airstrip 6,000 feet long and 150 feet wide parallel to the eastern beach that extends into the Project area and across the main road (now Kamehameha Highway) (Dorrance 1993:6). Massive erosion between 1949 and 1979 along the eastern beach of Kualoa Regional Park uncovered coastal archaeological features, including burials (Gunness 1987). Maps and aerial photographs suggest a long-term pattern of accretion and erosion. 7. In recent years, Kualoa has been the site of efforts to revitalize

	cultural practices, including worship with the Temple of Lono (Palani Nobriga interview, Shideler and Hammatt 2007, Vol. II:129–135), and voyaging traditions with the launching and sailing of *Hōkūle‘a* (Gordon Pi‘ianaia interview, Shideler and Hammatt 2007, Vol. II:162–182; Herbert Hoe interview, Shideler and Hammatt 2007, Vol. II:55). Places associated with these recent practices within the Project area include an area occupied by the Temple of Lono between 1981–1985, Hōkūle‘a Beach, and an ahu (shrine) constructed after a 16,000 mile voyage by *Hōkūle‘a* between 1985–1987.
Results of Community Consultation	CSH attempted to contact 33 community members and government agency and community organization representatives. Of the 16 people that responded, nine kūpuna (elders) and/or kama‘āina (Native-born) participated in formal interviews for more in-depth contributions to the CIA. This community consultation indicates: 1. The flow of water through the ahupua‘a of Hakipu‘u creates a mauka-makai (mountain-sea) relationship, according to Mr. Fukumitsu, from the mountain waterfalls and streams with ‘ōpae (freshwater shrimp) to the brackish waters of Mōli‘i Pond, in which grow pua (young baby moi [threadfish]), ‘anae (mullet), awa (milkfish), pāpio (juvenile stage of ulua [crevalle, jack, or pompano]), and ‘ō‘io (ladyfish, bonefish). Diverted ‘auwai (ditches) from Hakipu‘u Stream and springs irrigate 30 lo‘i on the Fukumitsu property west of Mōli‘i Pond, and the wetlands of Hakipu‘u also serve as haven for the ‘alae ‘ula (Hawaiian moorhen) and ae‘o (Hawaiian stilt bird), according to Mr. Fukumitsu. In Kualoa, Mr. Paglinawan indicates several plants that grow in the marshy areas of ‘Āpua and Koholālele: ‘ae (sap wrung from leaves), a type of plant with succulent leaves used in food prepration; makaloa (a sedge), which is used to make fine mats; and kohekohe, which is used in food prepration. 2. Kāne‘ohe Bay provides many resources to community participants. Mr. Fukumitsu catches saltwater ‘ōpae, flounder, weke (goatfish) ‘oama (young of the weke), and mullet in the ocean, hunts Samoan and white crabs, and gathers clams and several varieties of seaweed along the beach, including limu ‘ele‘ele, manuweu, limu kohu, waiwaiole. Mr. Crouch remembers fishing for āholehole (young stage of āhole, Hawaiian flagtail,) awa, and kala (surgeon fish), and seeing schools of mullet, akule (big-eyed scad), and nehu (smelt, anchovy), as well as kāpā (mottled eel) and he‘e (octopus). Mr.

Paglinawan remembers fishing for kala, weke, uhu (parrotfish), ‘ala‘ihi (squirrelfish), and hīhimanu (stringray), and hunting kūhonu (a crab), ‘ala‘eke (a crab), and he‘e. In addition, Ms. Kia hunted crabs and gathered ogo (seaweed).

3. Forest resources gathered by Ms. Kia in Waikāne Valley include Pele’s tears, bananas, ti leaves, and ‘awapuhi (ginger). Coastal resources indicated by Mr. Fukumitsu and Mr. Paglinawan include medicinal plants called haue (purple vervain) and ‘ākulikuli (a coastal herb). On the island of Mokoli‘i, Mr. Paglinawan describes how fishermen once hunted fledgling ‘ua‘u (shearwater), koa‘e kea (white-tailed tropic bird), and koa‘e ula (red-tailed tropic bird).
4. Several cultural sites in Kualoa retain significance for community participants, who have also found several artifacts on land and at sea. Mr. Crouch identified the outline of Niuola‘a Heiau during archaeological excavations at the park between 1974 to 1981, and notes a heiau called ‘Āpua located in the northeast corner of the Project area that was once connected to the eastern beach burial grounds, but has since been destroyed. Mr. Becket notes that two other heiau may be located at the base of Kānehoalani Ridge—an agricultural heiau of Lono and a “joy” heiau once associated with sexual activities. In addition to the partially submerged heiau of Pahulu north of the Project area, Mr. Becket describes two platforms, possibly agricultural heiau, in the mountains of Ka‘a‘awa and the heiau of Puakea in Hakipu‘u.

   In addition to heiau, Mr. Fukumitsu observes a kū‘ula (fishing shrine) and the site of a former dwelling of the previous fishpond caretaker, George Uyemura, on the western wall of Mōli‘i Pond. Mr. Fukumitsu has recovered ‘ulu maika stones near his home in Hakipu‘u, sling stones on the sandbars, and an ancient poi pounding board, and Ms. Kia has recovered poi pounders, ‘ulu maika stones, and a small collection of glass floats on the shores and waters of Kualoa Beach Park and Mokoli‘i Island.
5. The cultural layer resulting from human occupation in the inland area of Kualoa Regional Park has been severely disturbed by farming activities, construction and use of the military airfield during WWII, sand mining and filling in the late 1960s, and by extensive park development activities since 1974, according to Ms. Gunness.

   Several cultural sites have been exposed due to beach erosion

or inundated with water. Mr. Fukumitsu describes how the construction of facilities of Kualoa Regional Park initiated massive erosion along the eastern shore of Kualoa Regional Park that has unearthed grave sites. The recovered iwi have been relocated to a tree nursery site just outside of the Project area mauka of the entrance road to the park. In contrast, a submerged structure, most likely a fishpond wall, extends offshore from the southeastern point of Kualoa Regional Park. According to Mr. Crouch, this pond, called Pilihe‘e, was an ‘umeiki, a type of fish trap for ‘ō‘io and ‘anae. According to Mr. Crouch, extensive loss of sand along the eastern beach has eroded the foundation of this Pahulu Heiau (still visible at low tide), but the rocks have settled down in the remaining sand.

6. The area of Kualoa and Hakipu‘u holds special cultural significance for all the community participants: The ridge of Palikū is associated with several mo‘olelo of wahi pana (including the goddess Pele); the area is associated with the voyaging of La‘amaikahiki, which resulted in the tradition of lowering sails when canoes passed by; Kaha‘i is credited with bringing the first breadfruit to the Hawaiian Islands with the first planting in Kualoa; the god Maui is supposedly buried in the mountains of Hakipu‘u; a lunar alignment exists between Kualoa and the sacred birthing site of Kūkaniloko in central O‘ahu; over 400 ancient royal burials are located in the cave of Pohukaina; the coastal area was a burial ground; Ka‘ō‘io Ridge is the dividing line between the districts of Ko‘olaupoko and Ko‘olauloa; a portion of Kualoa was used as a pu‘uhonua for those who were to be punished or killed; sections were used as a training ground for young ali‘i to learn how to become a chief; Kualoa once contained (and may still continue to contain) various artifacts that symbolized the sovereignty of O‘ahu during the time of Kahekili; former mounded taro cultivation in Hakipu‘u resembled that of Tahiti, suggesting an ancestral connection; Kualoa was the starting point of the Makahiki ritual; and numerous wahi pana can be seen in the Kāne‘ohe Bay region from the southern shoreline of Kualoa. More recently, Kualoa was the site of the launching of *Hōkūle‘a* in 1975 at Mr. Crouch’s suggestion.
7. Community participants express five concerns and recommendations:

   a. Mr. Fukumitsu observes that the wetlands connecting Hakipu‘u Stream and Mōli‘i Fishpond, including his family’s lo‘i, constitute the last intact sustainable cultural

	and natural resource system in Ko‘olaupoko Moku, and recommends preserving this system through education (museum exhibits and a cultural center), monitoring of archaeological sites, and zoning as a cultural and natural resource sanctuary. b. Ms. Cypher, Mr. Nāmu‘o, and Ms. Cayan are concerned that there may be other burials throughout the Project area—Ms. Cypher advises that cultural monitoring would be needed should there be any excavation during the Project, and Mr. Nāmu‘o advises that the design of the Project should take into full consideration the high potential to encounter burials. Mr. Crouch and Ms. Cypher recommend developing a long-term monitoring plan for the inadvertent uncovering of human remains through continuing beach erosion, which for Ms. Cypher includes building an on-site mausoleum for any ‘iwi found in the Project area. Ms. Lau similarly recommends developing a memorial to commemorate those who died at Kualoa. c. Ms. Gunness, Mr. Kāne, and Mr. Morgan believe that the proposed location for the wastewater treatment center is probably least likely to cause damage to whatever remains of the intact archaeological stratigraphy in the park. On the other hand, Mr. Paglinawan believes that the current proposed location of the wastewater treatment center is too close to ‘Āpua Pond and Mōli‘i Pond, and could result in inadvertent contamination in the future, which would impact any future attempts to restore the ponds; he recommends that alternative sites for the wastewater treatment center be considered, notably the area close to the entrance to the park by the maintenance building. In addition, Ms. Gunness is concerned of the possibility that trenching for pipelines carrying the sewage to the treatment center may disturb some previously unidentified intact archaeological stratigraphy. d. Mr. Crouch would also like protective measures for submerged cultural resources, such as Pahulu Heiau. He also recommends restoring cultural sites, such as Niuola‘a Heiau, and developing interpretive areas. e. Ms. Gunness notes that since the entire park area is very near sea level, high tides and heavy rains bring the water table quite near the ground surface. To avoid duplicating problems the Project is intended to correct, the system would need to be monitored and maintained properly. Any

	waste injected, leeched, or leaking into the ground has potential to rise to the surface during high tides and heavy rains, and to seep into the nearby fishponds.
Impacts and Recommendations	Based on the information gathered for the cultural and historic background and community consultation detailed in this CIA report, the proposed Project may potentially impact Native Hawaiian cultural resources and burials. CSH identifies these potential impacts and makes the following recommendations: 1. Numerous human remains, cultural and historic sites, cultural layers, and artifacts have been documented within the Project area. These include discrete burial grounds (Site 2B-1, Gunness 1987:120, 141; SIHP 50-80-06-5371, Dye 1996a; Colin and Hammatt 1997) and individual burials (Gunness 1987), ‘Āpua Pond (Site 313, McAllister 1933:168) and its former wall (Site 1A-1, Clark and Connolly 1978:5), a depression (Site 2B-2, Gunness 1987:123), an imu with post molds (Site 1C-2), a pig skeleton (Site 1A-2, Gunness 1987:57–59), cultural layers indicative of habitation and stone tool production (Survey Areas 1A, 1B, 1C, 2A, 2B, and 2C, Gunness 1987), the former site of ‘Āpua Heiau (Mr. Crouch interview), sites of two former pā hale (LCA 3011 and 3052, Waihona ‘Aina 2000), a historic bathhouse (Francis Morgan interview, Shideler and Hammatt 2007, Vol. II:101), an ahu for Hōkūle‘a (Herbert Hoe interview, Shideler and Hammatt 2007, Vol. II:55), and an area occupied by the Temple of Lono (Palani Nobriga interview, Shideler and Hammatt 2007, Vol. II:129–135). While the proposed location for the wastewater treatment center is probably least likely to cause damage to the intact cultural layer in the park, land-disturbing activities during construction may uncover presently undetected burials or other cultural finds. Personnel involved in the construction activities of the Project should be informed of the possibility of inadvertent cultural finds, including human remains. Should burials (or other cultural finds) be identified during ground disturbance, the construction contractor should immediately cease all work and the appropriate agencies notified pursuant to applicable law. The Department of Parks and Recreation, City and County of Honolulu, should consult with community members to develop a reinterment plan and cultural preservation plan in the event that any human remains or cultural sites or artifacts be uncovered during construction or long-term maintenance for

	the Project. 2. The community has expressed concerns about the Project's impact to ‘Āpua Pond. CSH recommends that the City and County of Honolulu and community have discussions specific to this concern and work towards a compromised resolution.

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Section 1 Introduction

1.1 Project Background

At the request of Kennedy/Jenks Consultants, Inc., Cultural Surveys Hawai‘i, Inc. (CSH) conducted a Cultural Impact Assessment (CIA) for the proposed Project to Reconstruct Park Wastewater Systems at Kualoa Regional Park, Kualoa Ahupua‘a, Ko‘olaupoko District, O‘ahu Island, TMK: [1] 4-9-004:001 The Project area is depicted on an aerial image (Figure 1), a U.S. Geological Survey (USGS) quadrangle (Figure 2), and a Tax Map Key (TMK) map (Figure 3).

Kualoa Regional Park has four comfort stations that were constructed in 1973. Each comfort station was built with its own wastewater system including a treatment and disposal component. All four of the wastewater systems have reached their useful life and need to be replaced. Comfort Station #3 was closed due to the eroding shoreline.

This Project involves constructing a replacement bath house for Comfort Station #3, and a centralized wastewater system away from the eroding shoreline (Figure 4). Four pump stations will be installed to convey the wastewater flows from each comfort station (including the replacement bath house) and the food service building to the centralized wastewater system. The centralized wastewater system will be sized to treat and dispose of approximately 29,000 gallons per day. The system will be designed to use pumping systems and partially mound system components to minimize excavation during construction. It is estimated that the system will consist of 3,750 linear feet of force main, a 5,000 gallon pre-loader tank, three 15,000 gallon aerobic treatment units, and an elevated mound for disposal. The Project will involve abandoning the existing wastewater treatment systems in place except for the system serving Comfort Station #3 which will be demolished and removed. Comfort Station #3 will be demolished.

Figure 1. Aerial photograph showing Project area (2005 USGS orthoimagery)

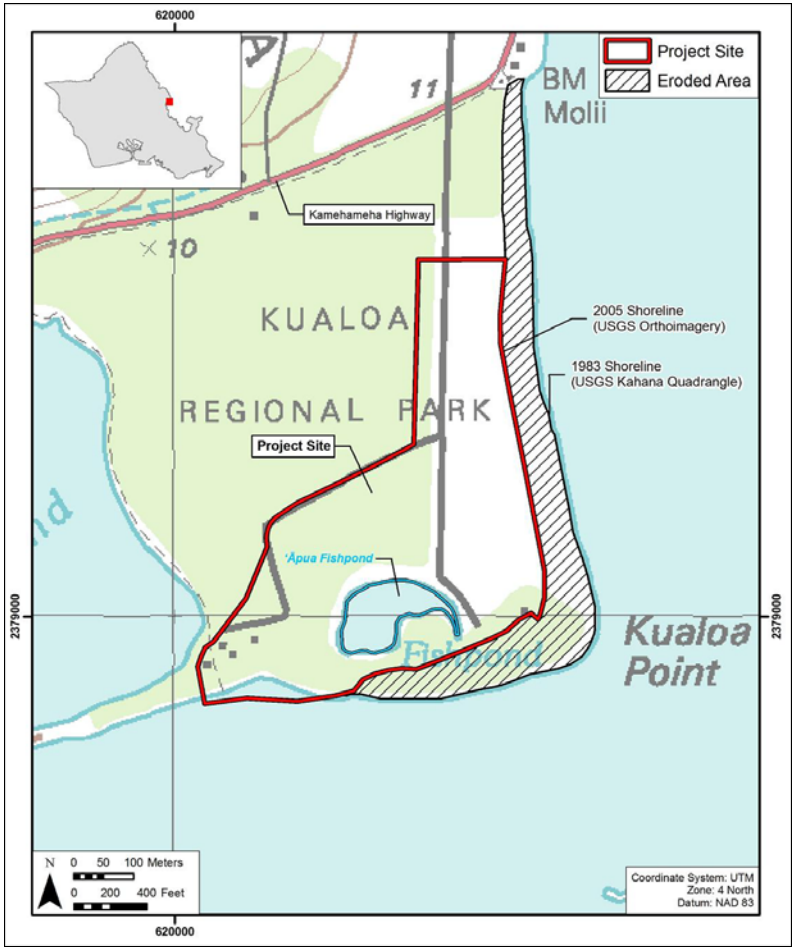


Figure 2. Portion of the USGS 7.5-minute series topographic map, Kahana (1983) and Kāne‘ohe (1998) quadrangles, showing the Project area

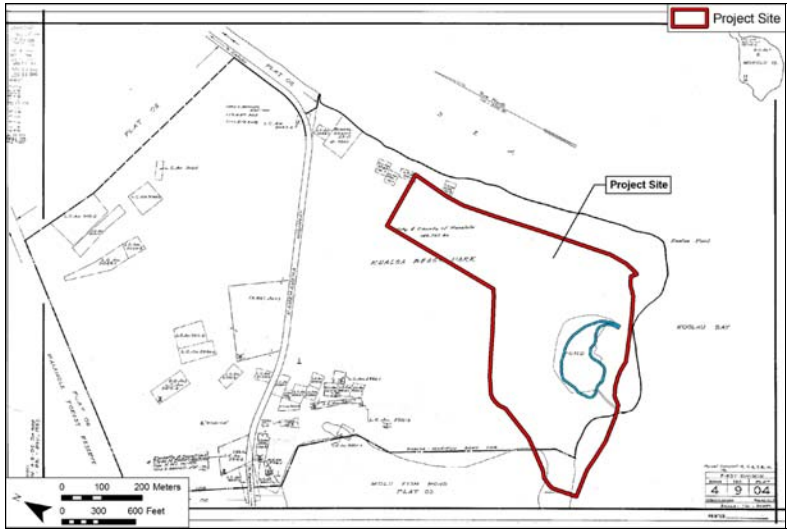


Figure 3. Tax Map Key (TMK): [1] 4-9 showing the Project area in Kualoa (Hawai‘i TMK Service 2011)

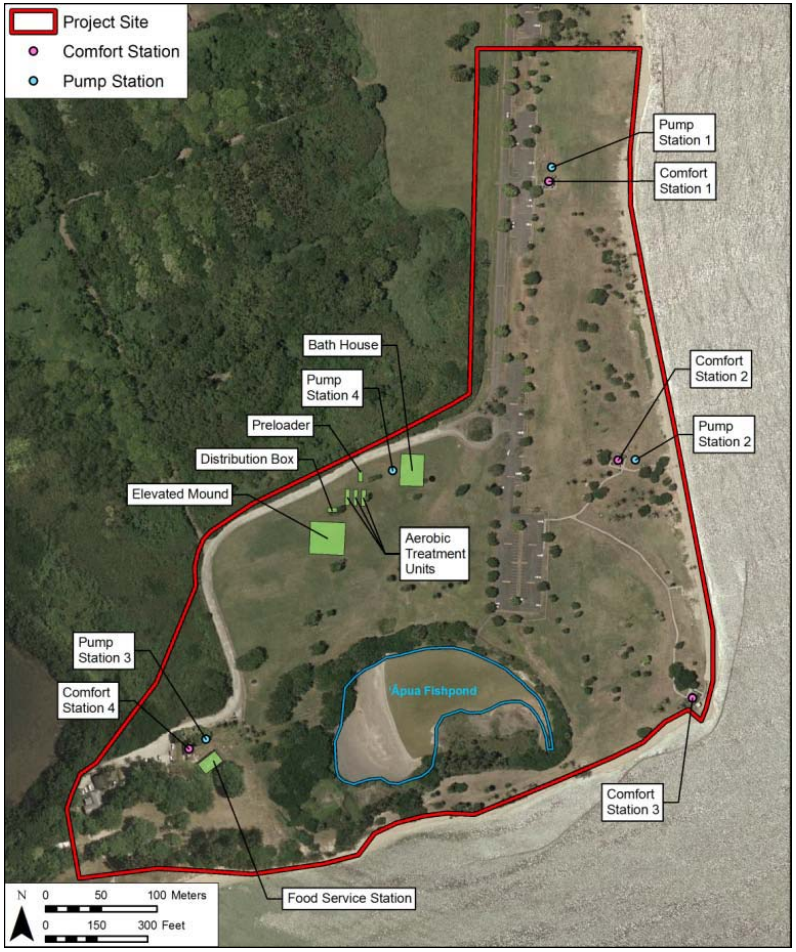


Figure 4. Aerial photograph, showing the Project site plan (2005 USGS orthoimagery)

1.2 Document Purpose

The Project requires compliance with the State of Hawai‘i environmental review process (Hawai‘i Revised Statutes [HRS] Chapter 343), which requires consideration of a proposed project's effect on cultural practices. CSH conducted this CIA at the request of Kennedy/Jenks Consultants, Inc. Through document research and ongoing cultural consultation efforts, this report provides information pertinent to the assessment of the proposed Project's impacts to cultural practices and resources (per the *Office of Environmental Quality Control's Guidelines for Assessing Cultural Impacts*), which may include Traditional Cultural Properties (TCPs) of ongoing cultural significance that may be eligible for inclusion on the State Register of Historic Places, in accordance with Hawai‘i State Historic Preservation Statute (Chapter 6E-42) guidelines for significance criteria in Hawai‘i Administrative Rules (HAR) §13-275 under Criterion E, which states that to be significant an historic property shall:

> 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 accounts—these associations being important to the group's history and cultural identity.

The document is intended to support the Project's environmental review and may also serve to support the Project's historic preservation review under HRS Chapter 6E and HAR Chapter 13-275.

CSH conducted an Archaeological Inventory Survey (AIS) for the Project area. The results of this archaeological study are presented in a companion report (Bourke and Hammatt 2011).

1.3 Scope of Work

The scope of work for this CIA includes:

1. Examination of cultural and historical resources, including Land Commission documents, historic maps, and previous research reports, with the specific purpose of identifying traditional Hawaiian activities including gathering of plant, animal, and other resources or agricultural pursuits as may be indicated in the historic record.
2. Review of previous archaeological work at and near the subject parcel that may be relevant to reconstructions of traditional land use activities; and to the identification and description of cultural resources, practices, and beliefs associated with the parcel.
3. Consultation and interviews with knowledgeable parties regarding cultural and natural resources and practices at or near the parcel; present and past uses of the parcel; and/or other practices, uses, or traditions associated with the parcel and environs.
4. Preparation of a report that summarizes the results of these research activities and provides recommendations based on findings.

1.4 Environmental Setting

1.4.1 Natural Setting, Geology, and Topography

Kualoa Regional Park is located on a coastal plain at the base of Ko‘olau mountain range within the ahupua‘a (land division generally running from the mountains to the sea) of Kualoa. Elevation within the park ranges from sea level to slightly above 8 feet above mean sea level (2.44 meters). The area is generally level with the exception of the sloping beaches along the south and eastern sides.

1.4.2 Rainfall, Soils, and Vegetation

Since the alignment of the Ko‘olau mountain range lies perpendicular to the northeast trade winds, orographic rains are a common occurrence and account for the high amount of moisture and rainfall along the mountains and cliffs on the windward side of O‘ahu (Sanderson 1993:33). The average rainfall for the ahupua‘a of Kualoa is about 40 to 60 inches annually (Juvik and Juvik 1998:56).

According to U.S. Department of Agriculture (USDA) soil survey data (Foote et al. 1972), sediments in the Project area consist of Mokuleia loam (Ms) and Mokuleia clay loam (Mt) around the inland area, with Jaucas sand (JaC) comprising the beachfronts (Figure 5). The Mokuleia series are well-drained soils along the coastal plain derived from alluvium deposited over coral sand (Foote et al. 1972:95). Jaucas sand develops from wind- and water-deposited sand from coral and seashells (Foote et al. 1972:48).

Typical vegetation in the area primarily consists of introduced varieties for landscaping purposes, including koa haole, coconut trees, Christmas berry, hau, lantana, milo trees, and a variety of landscaped grasses covering the grounds (Foote et al. 1972).

1.4.3 Built Environment

Kualoa Regional Park has several asphalt covered access roads and parking areas, as well as public facilities, such as restrooms and picnic areas, and a fishpond. The park also has a maintenance facility and a caretaker's home, which are located at the northern end of the park, near the entrance off of Kamehameha Highway. A fishpond wall once existed along the reef offshore of Kualoa Point until its destruction during a storm in 1933; underwater remnants are located off the south-facing beach (Gunness 1987).

The coastline around Kualoa Regional Park has been in a state of flux due to a combination of cultural and natural occurrences. The destruction of the fishpond wall destabilized the natural erosion and replenishment of the sand along the east beach. In an effort to stabilize the erosion, the City and County of Honolulu constructed a "surgebreaker" concrete structure in 1984. This seems to have accelerated the rate of sand loss along the eastern beach, which, in turn, has exposed cultural artifacts and human burials.

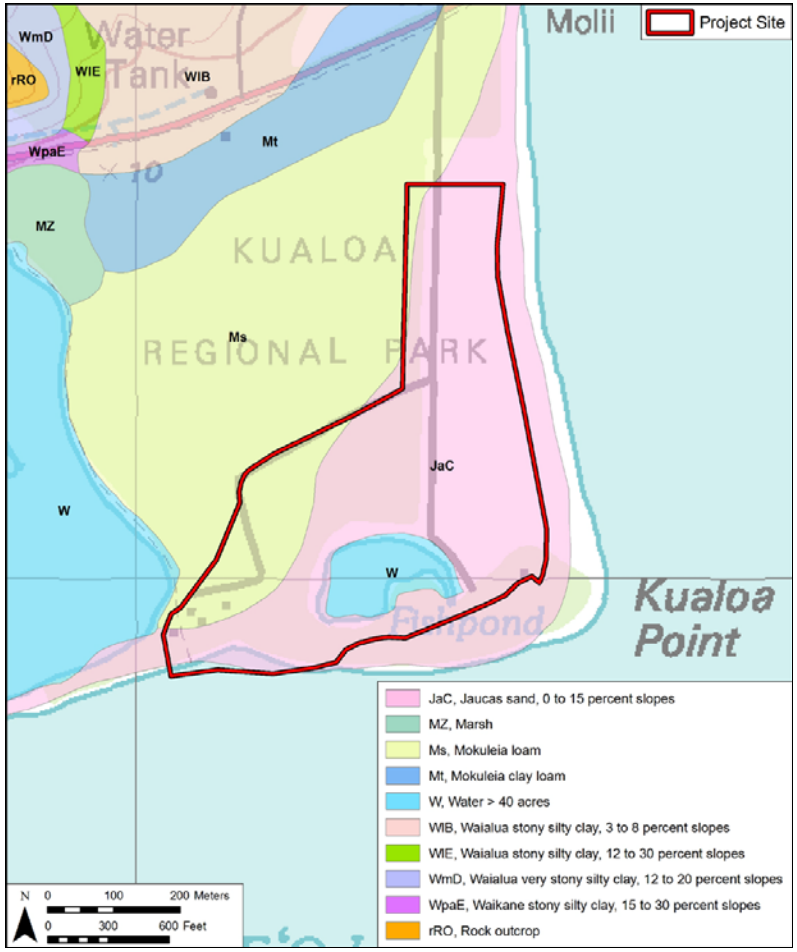


Figure 5. Portion of the USGS 7.5-minute series topographic map, Kahana (1983) and Kāne‘ohe (1998) quadrangles, showing the Project area with soil overlay (Foote el al. 1972)

Section 2 Methods

2.1 Archival Research

Historical documents, maps and existing archaeological information pertaining to Kualoa Ahupua‘a were researched at the CSH library and other archives including the University of Hawai‘i at Mānoa’s Hamilton Library, the State Historic Preservation Division (SHPD) library, the Hawai‘i State Archives, the State Land Survey Division, and the archives of the Bishop Museum. Previous archaeological reports for the area were reviewed, as were historic maps and photographs and primary and secondary historical sources. Information on Land Commission Awards (LCAs) was accessed through Waihona ‘Aina Corporation’s Māhele data base as well as a selection of CSH library references. Research for the Cultural and Historical Background section centered on the following cultural and historic resources, practices, and beliefs: religious and ceremonial knowledge and practices; traditional subsistence land use and settlement patterns; gathering practices and agricultural pursuits; wahi pana (storied places) and associated mo‘olelo (stories, oral traditions), mele (songs), oli (chants), and ‘ōlelo no‘eau (proverbs); and historic land transformation, development, and population changes (see Scope of Work above).

2.2 Community Consultation

2.2.1 Sampling and Recruitment

A combination of qualitative methods, including purposive, snowball, and expert (or judgment) sampling, were used to identify and invite potential participants to the study. These methods are used for intensive case studies, such as CIAs, to recruit people that are hard to identify, or are members of elite groups (Bernard 2006:190). Our purpose is not to establish a representative or random sample. It is to “identify specific groups of people who either possess characteristics or live in circumstances relevant to the social phenomenon being studied….This approach to sampling allows the researcher deliberately to include a wide range of types of informants and also to select key informants with access to important sources of knowledge” (Mays and Pope 1995:110).

We began with purposive sampling informed by referrals from known specialists and relevant agencies. For example, we contacted the SHPD, Office of Hawaiian Affairs (OHA), O‘ahu Island Burial Council (OIBC), and community and cultural organizations in Kualoa Ahupua‘a for their brief response/review of the Project and to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the Project area and vicinity, cultural and lineal descendants, and other appropriate community representatives and members. Based on their in-depth knowledge and experiences, these key respondents then referred CSH to additional potential participants who were added to the pool of invited participants. This is snowball sampling, a chain referral method that entails asking a few key individuals (including agency and organization representatives) to provide their comments and referrals to other locally recognized experts or stakeholders who would be likely candidates for the study (Bernard 2006:192). CSH also employs expert or judgment sampling which involves assembling a group of people with recognized experience and expertise in a specific area (Bernard 2006:189–191). CSH maintains a database that draws on over two decades of established relationships with community

consultants: cultural practitioners and specialists, community representatives and cultural and lineal descendants. The names of new potential contacts were also provided by colleagues at CSH and from the researchers' familiarity with people who live in or around the study area. Researchers often attend public forums (e.g., Neighborhood Board, Burial Council and Civic Club meetings) in (or near) the study area to scope for participants. Please refer to Table 6, Section 4, for a complete list of individuals and organizations contacted for this CIA.

CSH focuses on obtaining in-depth information with a high level of validity from a targeted group of relevant stakeholders and local experts. Our qualitative methods do not aim to survey an entire population or subgroup. A depth of understanding about complex issues cannot be gained through comprehensive surveying. Our qualitative methodologies do not include quantitative (statistical) analyses, yet they are recognized as rigorous and thorough. Bernard (2006:25) describes the qualitative methods as "a kind of measurement, an integral part of the complex whole that comprises scientific research." Depending on the size and complexity of the project, CSH reports include in-depth contributions from about one-third of all participating respondents. Typically this means three to twelve interviews.

2.2.2 Informed Consent Protocol

An informed consent process was conducted as follows: (1) before beginning the interview the CSH researcher explained to the participant how the consent process works, the Project purpose, the intent of the study and how his/her information will be used; (2) the researcher gave him/her a copy of the Authorization and Release Form to read and sign (Appendix C); (3) if the person agreed to participate by way of signing the consent form or providing oral consent, the researcher started the interview; (4) the interviewee received a copy of the Authorization and Release Form for his/her records, while the original is stored at CSH; (5) after the interview was summarized at CSH (and possibly transcribed in full), the study participant was afforded an opportunity to review the interview notes (or transcription) and summary and to make any corrections, deletions or additions to the substance of their testimony/oral history interview; this was accomplished either via phone, post or email or through a follow-up visit with the participant; (6) the participant received the final approved interview and any photographs taken for the study for record. If the participant was interested in receiving a copy of the full transcript of the interview (if there is one as not all interviews are audio-recorded and transcribed), a copy was provided. Participants were also given information on how to view the report on the OEQC website and offered a hardcopy of the report once the report is a public document.

2.2.3 Interview Techniques

To assist in discussion of natural and cultural resources and cultural practices specific to the study area, CSH initiated semi-structured interviews (as described by Bernard 2006) asking questions from the following broad categories: cultivation, gathering practices and mauka (toward the ocean) and makai (seaward) resources, burials, trails, historic properties, and wahi pana. The interview protocol is tailored to the specific natural and cultural features of the landscape in the study area identified through archival research and community consultation. For example, for this study, burial practices and subsistence were emphasized over other categories less salient to Project participants. These interviews and oral histories supplement and provide depth to consultations from government agencies and community organizations that may provide

brief responses, reviews and/or referrals gathered via phone, email and occasionally face-to-face commentary.

2.2.3.1 In-depth Interviews and Oral Histories

Interviews are conducted with individuals or in focus groups comprised of kūpuna (elder) and kama‘āina (Native-born) who have a similar experience or background (e.g., the members of an area club, elders, fishermen, hula dancers). Interviews are conducted initially at a place of the study participant's choosing (usually at the participant's home or at a public meeting place) and/or—whenever feasible—during site visits to the Project area. Generally, CSH's preference is to interview a participant individually or in small groups (two–four); occasionally participants are interviewed in focus groups (six–eight). Following the consent protocol outlined above, interviews may be recorded on tape and in handwritten notes, and the participant photographed. The interview typically lasts one to four hours, and records the—who, what, when and where of the interview. In addition to questions outlined above, the interviewee is asked to provide biographical information (e.g., connection to the study area, genealogy, professional and volunteer affiliations, etc.).

2.2.3.2 Field Interviews

Field interviews are conducted with individuals or in focus groups who have a similar experience or background (e.g., the members of an area club, elders, fishermen, hula dancers) and who are physically able and interested in visiting the Project area. In some cases, field visits are preceded with an off-site interview to gather basic biographical, affiliation and other information about the participant. Initially, CSH researchers usually visit the project area to become familiar with the land and recognized (or potential) cultural places and historic properties in preparation for field interviews. All field activities are performed in a manner so as to minimize impact to the natural and cultural environment in the project area. Where appropriate, Hawaiian protocol may be used before going on to the study area and may include the ho‘okupu (offering) of pule (blessing), and oli. All participants on field visits are asked to respect the integrity of natural and cultural features of the landscape and not remove any cultural artifacts or other resources from the area.

2.3 Compensation and Contributions to Community

Many individuals and communities have generously worked with CSH over the years to identify and document the rich natural and cultural resources of these islands for cultural impact, ethno-historical and, more recently, TCP studies. CSH makes every effort to provide some form of compensation to individuals and communities who contribute to cultural studies. This is done in a variety of ways: individual interview participants are compensated for their time in the form of a small honorarium and/or other makana (gift); community organization representatives (who may not be allowed to receive a gift) are asked if they would like a donation to a Hawaiian charter school or nonprofit of their choice to be made anonymously or in the name of the individual or organization participating in the study; contributors are provided their transcripts, interview summaries, photographs and—when possible—a copy of the CIA report; CSH is working to identify a public repository for all cultural studies that will allow easy access to current and past reports; CSH staff do volunteer work for community initiatives that serve to preserve and protect historic and cultural resources. Generally our goal is to provide educational

opportunities to students through internships, share our knowledge of historic preservation and cultural resources and the State and Federal laws that guide the historic preservation process, and through involvement in an ongoing working group of public and private stakeholders collaborating to improve and strengthen the Chapter 343 environmental review process.

Section 3 Cultural and Historical Background

This section draws from archaeology and ethnography, histories, mo‘olelo written by Native Hawaiians, and an archive of historic documents and images to present a portrait of Hawaiian culture and history as it relates to the specific Project area. It first explores Hawaiian cosmogonic and genealogical origins (Section 3.1). Focusing in on geographic and temporal scales, this section then traces the exploration of the Pacific Ocean and the subsequent discovery, settlement, and expansion of the Hawaiian archipelago (Section 3.2). This broad overview of Hawaiian history introduces key concepts and terms used throughout the report and leads to a general history of the moku (district) of Ko‘olaupoko (Section 3.3). The focus then narrows to the ahupua‘a of Kualoa (Section 3.4) regarding the earliest known settlement and subsistence patterns, a compilation of wahi pana and associated mo‘olelo, successions of chiefly rule, the introduction of private property, shifting land uses, and previously recorded oral histories, with particular emphasis on the Project area.

3.1 Cosmogonic and Genealogical Origins

Cosmogonic narratives and origin genealogies are indigenous forms of knowledge that account for the creation of the world and the first Hawaiians. Complementing this is an anthropological perspective informed primarily by archaeology (and genetics and linguistics) that traces the path of ancestral voyagers across the Pacific through their material remains (and genes and languages) (see Section 3.2). These two ways of understanding the past are often contrasted as “indigenous knowledge” and “Western scientific knowledge,” respectively. Recent studies, however, emphasize a plurality of knowledges that are epistemologically equivalent (Agrawal 1995; Meyer 2001). Following recent studies that blend oral traditions and archaeology to better understand Hawaiian history (Kirch 2010; Kirch and Sahlins 1992), accounting for the origins of Hawaiians is a quest that requires attention to both the stories of Hawaiian procreation and the anthropology of voyaging.

There are several founding narratives of the origin of the Hawaiian world, including the *Kumulipo*. This cosmogonic, genealogical prayer chant, which is over two thousand lines in length, was used to trace the divine origins of ali‘i through ruling chiefs, deified ancestors, and gods backwards in time through the animals, plants, and elements to the beginning of the universe. The *Kumulipo* is one of a class of such cosmological chants, but no others of such length are preserved (Silva 2004:103). This chant, titled *He Pule Ho‘ola‘a Ali‘i* (A prayer to consecrate [an] *ali‘i*) (Silva 2004:98), was composed for the Hawai‘i Island ali‘i Ka‘ī‘īmamao, also known as Lonoikamakahiki, when several kapu (sacred) rituals were performed that elevated him to the status of a god (Beckwith 1970:311), or divine king, in approximately A.D. 1600 (Kirch 2010:83). The text of the *Kumulipo* was first recorded by David Kalākaua in 1889 and translated by Queen Lili‘uokalani (1897), which was not available when folklorist Martha Beckwith completed her own translation and detailed study (1951).

Starting from, “O ke kumu o ka lipo” (At the beginning of the deep darkness), the *Kumulipo* divides the genesis of the world into 16 wā (epochs, time periods) (Beckwith 1951). These 16 wā are categorized into two periods, pō (darkness, the realm of the gods) and ao (light). During the first period of pō there was a continuous birthing of the lower life forms to sea life, plants, and

eventually mammals. During the second period of ao came the opening of light and the appearance of the first woman and man, La‘ila‘i and Ki‘i, respectively, and the coming of the gods, including Kāne and Kanaloa, which resulted in over a thousand genealogical pairs (Beckwith 1970:310–11). Significantly, Hawaiian identity today is derived from origin genealogies such as the Kumulipo: "…every aspect of the Hawaiian conception of the world is related by birth, and as such, all parts of the Hawaiian world are one indivisible lineage" (Kame‘eleihiewa 1992:2).

3.2 Discovery, Settlement, and Expansion of the Hawaiian Islands

Complementing the cosmogonic and genealogical origins of Hawaiians detailed in the *Kumulipo* is an anthropological perspective on ancient patterns of voyaging. Archaeological studies have shown that by 10,000 years ago, humans had migrated to occupy nearly all the habitable land on the planet. Aside from crossing a series of short water gaps to reach Australia and New Guinea, they had reached it all by walking. The remaining unexplored region was the vast Pacific Ocean. Approximately 4,500 years ago, coastal dwellers of southeast China began a wave of migration through the closely-spaced, inter-visible islands of Southeast Asia. Advances in sailing strategies, canoe technology, and navigation techniques enabled their descendents to sail past the familiar insular waters a millennium later. These precocious seafarers systematically explored the remote, uninhabited regions of the Pacific Ocean to the east, as well as the Indian Ocean to the west. This led to the eventual discovery and colonization of virtually every habitable island in the Pacific Ocean, as well as coastal trading along the Indian sub-continent and settlement as far west as Madagascar (Howe 2007; Irwin 2007).

The ancient wayfinders most likely employed an expansionary strategy of first staging a series of exploratory probes to find likely islands, followed by returns to the homeland, and then launching colonizing expeditions (Irwin 1992). To do so, they sailed their double-hulled voyaging canoes eastward against the direction of the dominant trade winds by waiting for westerly wind shifts. After mentally mapping the positions of newly discovered islands in terms of celestial referents, they returned to their homelands to share the sailing directions for future voyages of colonization (Finney 1996). As most of the Pacific Islands are volcanic in origin, the exploratory seafarers, also horticulturalists, necessarily transported a living landscape. They brought with them taro, yams, breadfruit, bananas, and coconuts, as well as domesticated pigs, dogs, and chickens, and, possibly with intention, rats (Irwin 2007; Kirch 2000).

Later voyagers discovered and settled the distant archipelagoes of western Polynesia (e.g., Samoa, Tonga, and Fiji), the northwestern archipelagoes of Micronesia (e.g., Marshall Islands and Caroline Islands), and eastern Polynesia (e.g. Tahiti and Marquesas), and from there settled the widely-separated archipelagoes of Hawai‘i and Aotearoa as well as the solitary island of Rapa Nui (Irwin 2007; Kirch 2000). Anthropologist Ben Finney suggests that a waxing and waning rhythm of voyaging characterized the large, high-island archipelagoes of eastern Polynesia: "a flurry of back and forth sailings as the islands are being discovered, settled and supplied; then some continued long-range travel for personal, religious or other reasons; and then by a contraction of voyaging as populations grew and rival chiefdoms fought over land and power" (Finney 2007:145).

Archeological excavations, linguistic reconstructions, and genetic studies suggest that the initial settlement of Hawai‘i came from eastern Polynesia (Kirch 2000) around A.D. 700–800 (Athens et al. 2002). Mo‘olelo link Hawai‘i to Kahiki—the generic word for the ancestral homeland of Hawaiians, not a specific island—through accounts of the discovery of certain Hawaiian islands and subsequent inter-archipelago return trips (Beckwith 1970). The first settlers of Hawai‘i from within the region of Kahiki were probably from the Marquesas Islands (Kirch 2000:291). The archaeological record suggests that early Hawaiians formed settlements of hamlets along the coasts, interred the dead, ate domesticated pigs, dogs, and chickens, and began to clear tracts of forest between A.D. 600–1100 (Kirch 2000:293). Hawaiians also cared for the dead with a variety of ilina (burials, graves) depending on the social status of the deceased, including cremation burials, burial caves, burials in the sand and earth, burials directly underneath house floors, burials in the platforms of heiau (place of worship, temples), and burials marked on the surface by stone terraces, mounds, platforms, and other monuments (Kirch 1985:238–242).

New fishhook styles discovered in Hawaiian archaeological sites and Tahitian words entering into the Hawaiian language suggest contact with Tahiti around A.D. 1200 (Kirch 2000:291). In addition, numerous mo‘olelo chronicle the era of two-way voyaging between the archipelagoes of Tahiti and Hawai‘i by detailing the feats of specific navigators (Cachola-Abad 1993). The Hawai‘i-Tahiti voyaging corridor eventually ceased as Hawaiians and Tahitians began to focus more on local initiatives, such as building, maintaining, and deploying fleets of war canoes rather than guiding them on overseas adventures (Finney 2007:145). According to Abraham Fornander's synthesis of mo‘olelo, the ali‘i La‘amaikahiki closed the era of voyaging between Tahiti and Hawai‘i when he returned to his ancestral homeland 21 generations before the 1870s (Fornander 1878:168-169). With an average of 20 years between generations, that places the cessation of Hawaiian long-distance voyaging at about A.D. 1450 (Fornander 1878:168–169).

The archaeological record suggests that Hawaiians experienced exponential population growth, intensification of production, and increased social stratification around A.D. 1100–1650. Hawaiians converted valley floors and hillsides to lo‘i (terraced fields) with ‘auwai (canals and ditches) that diverted stream water to irrigate kalo and other crops in flooded pond fields, developed dryland field systems for the cultivation of ‘uala (sweet potato) and other crops, and constructed stone-walled loko i‘a (fishponds) on shallow reef flats to grow and harvest fish (Kirch 2000:293–295). By A.D. 1600, the population, which had burgeoned to at least several hundred thousand people, expanded from the fertile windward regions into the most arid and marginal regions of the archipelago—the leeward valleys and coasts (Kirch 2007). This agricultural and aquacultural intensification supported emerging classes of ali‘i and maka‘āinana (commoners), whose labor created enduring heiau and other monumental architecture that survive in the archaeological record (Kirch 2000:295–296).

The original settlers and their descendents had likely organized themselves into kin-based social groups. The necessity of defining territorial boundaries increased as the population rapidly grew, the amount of available land diminished, voyaging spheres contracted, and the society became more differentiated, hierarchical, and competitive (Kirch 1985:306). The original lineage territories and associated chiefdoms were most likely moku‘āina (districts) (or moku) that were sequentially divided (Ladefoged and Graves 2006). Between A.D. 1400–1500, Hawaiians

developed a hierarchically nested system of land tenure that centered on the ahupua‘a, a territorial unit that typically extended from the peaks of the mountains down to the sea, encompassing the entire ecology of an island and incorporating its main resource zones, including interior uplands and mountains, coastal lowlands, and fringing reefs (Kirch 2000:296). The maka‘āinana remained on the land they cultivated, but ali‘i governed this ahupua‘a pattern of territorial units. These ahupua‘a territories changed through time; the regions in a *moku* with greater predictability of resources were most likely settled first and defined according to topographic features, and later divided into separate communities if increases in production could support larger populations (Ladefoged and Graves 2006). Based on the distribution of sites in the most arid and marginal lands, virtually all of O‘ahu was territorially claimed and possibly occupied by A.D. 1650 (Kirch 1992:15). Then, on the eve of European contact (1778), critical transformations in the social structure took place that shifted Hawai‘i from a chiefdom to an emerging state-level society, especially the rise of divine kingship legitimated in a new religious ideology (the state cults of the gods Kū and Lono) with a formal priesthood (including human sacrifice) and maintained by a monopoly of force (Kirch 2010).

3.3 Ko‘olaupoko Moku

The early settlers of the Hawaiian archipelago would have been especially attracted to windward O‘ahu with its coral reefs, bays, and sheltered inlets for fishing, dense basalt dikes for the production of stone adzes and other tools, and amphitheatre-headed valleys and broad alluvial floodplains that contained fertile soils, numerous permanently flowing streams, and abundant rainfall for the cultivation of crops (Kirch 1985:69). Excavation data from the coastal region of Waimānalo provide a glimpse into the life of the settlers' descendants. The Bellows Beach sand dune occupation site (O18) reveals a particularly rich cultural stratigraphy that has recently been radiocarbon dated after 40 years of dispute (e.g., Dye 2000; Kirch 1985:71; Pearson et al. 1971; Tuggle and Spriggs 2001) to A.D. 1040–1219 (Dye and Pantaleo 2010), several centuries after the current estimates of first settlement. Archaeological excavation data from this site indicate that the settlers' descendants, like their east Polynesian ancestors, lived in pole-and-thatch dwellings, interred the dead beneath these structures, cooked in small hearths (Figure 6), and manufactured stone tools as well as bone and shell fishhooks (Figure 7), and supported themselves by cultivating inland crops, raising domesticated animals, hunting seabirds on offshore islets, fishing, and gathering shellfish (Kirch 1985:71–74). As they adapted to local conditions, they invented distinctive Hawaiian artifacts, including two-piece fishhooks and the lei niho palaoa (lei of rock oyster shell), which, in addition to other ornaments interred with individuals, suggests a degree of social stratification (Kirch 1985:71–74).

In approximately A.D. 1310 (a time estimate based on an average length of generational intervals in chiefly genealogies), Māweke partitioned O‘ahu into three districts: the Kona region, the ‘Ewa, Wai‘anae, and Waialua region, and the windward Ko‘olau region. Then, in approximately A.D. 1490, the ‘aha ali‘i (council of chiefs) chose Mā‘ilikūkahi, an ali‘i kapu (sacred chief) who was born at the sacred site of Kūkaniloko in the uplands of Waialua to be the new ali‘i nui (paramount chief) of O‘ahu. After his paramountship was installed at the heiau of Kapukapuākea in central Waialua, Mā‘ilikūkahi instituted an explicit land division and administration structure: O‘ahu was divided into six moku—Kona, ‘Ewa, Wai‘anae, Waialua,

Ko‘olauloa, and Ko‘olaupoko—that were further divided into 86 ahupua‘a and smaller territorial units (Kirch 2010:84–90).

The cultural landscape of the moku of Ko‘olaupoko has been severely destroyed or obscured during the past two centuries, especially due to the clearing and plowing under of coastal land and sloping uplands for sugarcane and pineapple cultivation. Yet, archaeological documentation of sites in the early to mid-twentieth century based in part on the recollections of old Hawaiian residents (McAllister 1933) and more recent cultural research management surveys and excavations, combined with collected mo‘olelo and documented observations, illuminate the cultural landscape—patterns of ancient habitation, subsistence, and wahi pana—for the ahupua‘a of Kualoa.

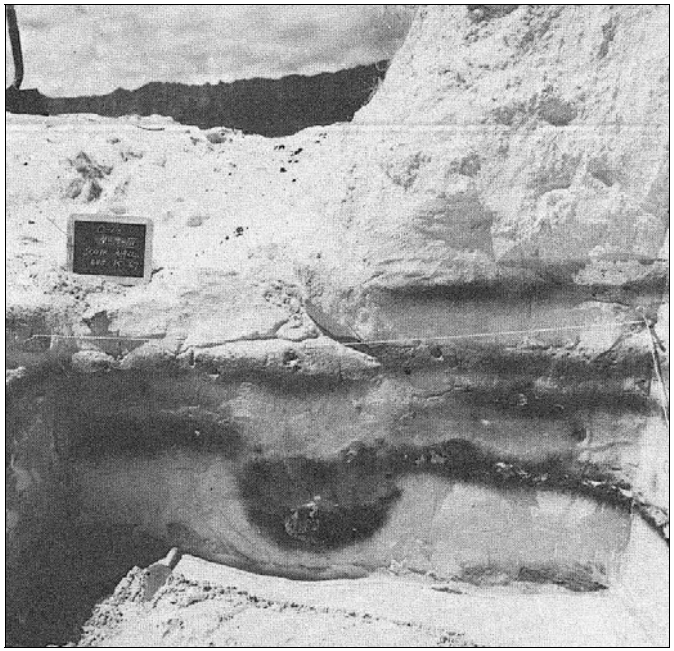


Figure 6. A hearth cuts through the early occupation levels in the Bellows Beach sand dune site, which are marked by black midden deposits and separated by layers of sand (Kirch 1985:71)

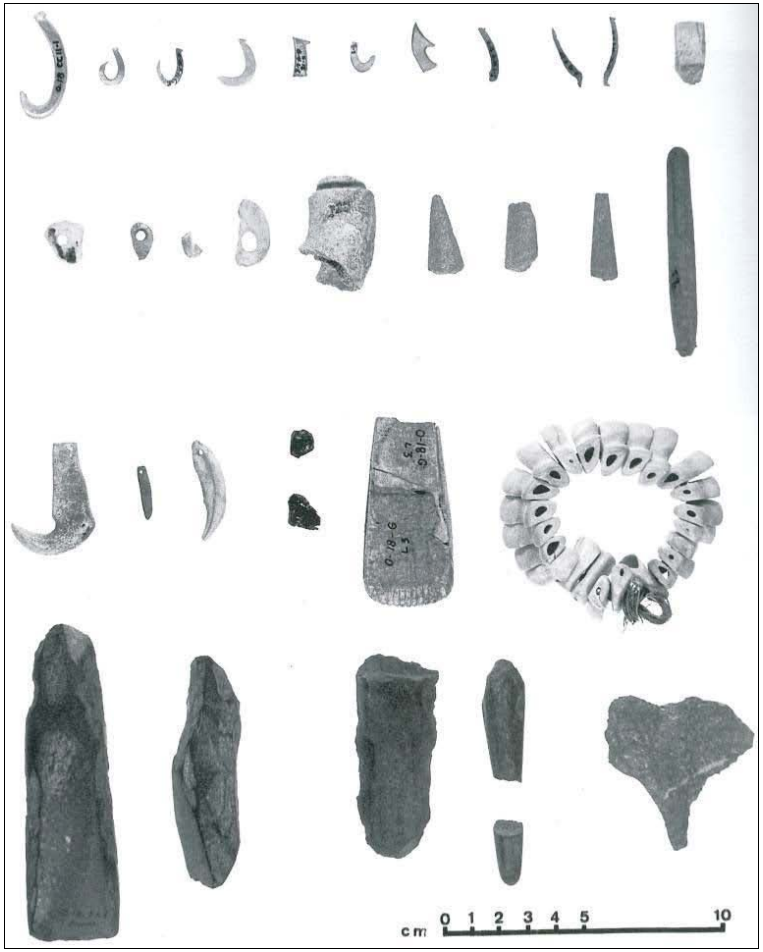


Figure 7. Artifacts from the Bellows Beach sand dune occupation site, including pearl-shell fishhooks, coral and sea-urchin-spine abraders, ornaments, a coconut grater, a bracelet of pig tusks, basalt adzes, and a basalt awl (Kirch 2000:294)

3.4 Kualoa Ahupua‘a

3.4.1 Settlement Patterns

While the surface archaeological record of Kualoa Ahupua‘a has been extensively disturbed, obscured, and, in some cases, destroyed over the past two centuries, pioneering efforts in the early twentieth century to document sites (McAllister 1933), recent archaeological research (Gunness 1987) and cultural resource management work, combined with mo‘olelo, offer a window into the ancient past. Importantly, there was a close spatial association between major heiau and intensive agriculture for the entire island of O‘ahu, and residential sites are usually distributed around the margins of irrigation systems and up into lower valleys (Kirch 1992:16–17). Thus, fragments of information about residential sites, cultivation and irrigation, trails, burials, and monumental structures and other cultural sites derived from archaeology, ethnography, and historical records illuminate ancient settlement patterns, part of the overall cultural landscape.

Reconstructing patterns of ancient settlement draws heavily from wahi pana, a term not easily defined or described. A Hawaiian wahi pana “physically and poetically describes an area while revealing its historical or legendary significance” (Landgraf 1994:v). Wahi pana are sacred places that include such cultural properties as heiau, loko i‘a, ala hele (trails), ilina and iwi kūpuna (ancestral bone remains), individual garden plots, ‘auwai, house sites, intangible phenomena such as meteorological and atmospheric effects, land divisions, and natural geographic locations (place names), such as pūnāwai (fresh-water springs), streams, peaks, pōhaku (rocks), rock formations, ridges, offshore islands and reefs, and seas that are associated with culturally significant beliefs or events. A wahi pana leaves an imprint on the landscape even if its tangible properties no longer exist, as the mana of previous people and events associated with this space continues to manifest itself. For example, the stereotypical heiau is composed of terraces, enclosures, walls, mounds, or upright stones, but heiau can also be sacred places on a landscape that lack built structures, natural landscape features such as rock outrcoppings, and earthworks where mana is concentrated and transferred between the deities and worshippers (Becket and Singer 1999:xix-xx). Further, previously documented and ongoing mo‘olelo of wahi pana that no longer have material traces are precisely the evidence of their enduring significance (Sahlins 1992:22).

For clarity, wahi pana are bolded in the text, their meanings are cited from Pukui et al. (1974) unless otherwise noted, and spelling and use of diacriticals follow Pukui et al. (1974). In addition, the locations of the various cultural sites are mapped and organized in table format as archaeological sites (Figure 8, Table 1) and place names (Figure 9, Table 2).

Wahi pana are but one class of numerous cultural properties that create a cultural attachment to the landscape for Hawaiians. Kepā Maly explains the concept of “cultural attachment” from a Hawaiian cultural worldview:

> [Cultural attachment]…embodies the tangible and intangible values of a culture. It is how a people identify with and personify the environment (both natural and manmade) around them. Cultural attachment is demonstrated in the intimate relationship (developed over generations of experiences) that people of a particular culture share with their landscape—for example, the geographic

> features, natural phenomena and resources, and traditional sites etc., that make up their surroundings. This attachment to environment bears direct relationship to beliefs, practices, cultural evolution, and identity of a people. In Hawai‘i, cultural attachment is manifest in the very core of Hawaiian spirituality and attachment to landscape, the creative forces of nature which gave birth to the islands (e.g., Hawai‘i), mountains (e.g., Mauna Kea) and all forms of nature, also gave birth to *na kanaka* (the people), thus in Hawaiian tradition, island and mankind share the same genealogy. (Maly 1999:27)

In a Hawaiian cultural worldview, a sense of place relies on keeping the integrity of the cultural landscape (Maly 2001). Maly succinctly articulates this connection between a sense of place and the cultural landscape:

> The integrity of the land- and ocean-scapes [landscape], and their sense of place depends upon the well-being of the whole entity, not only a part of it. Thus, what we do on one part of the landscape has an affect on the rest of it. (Maly 2001:2)

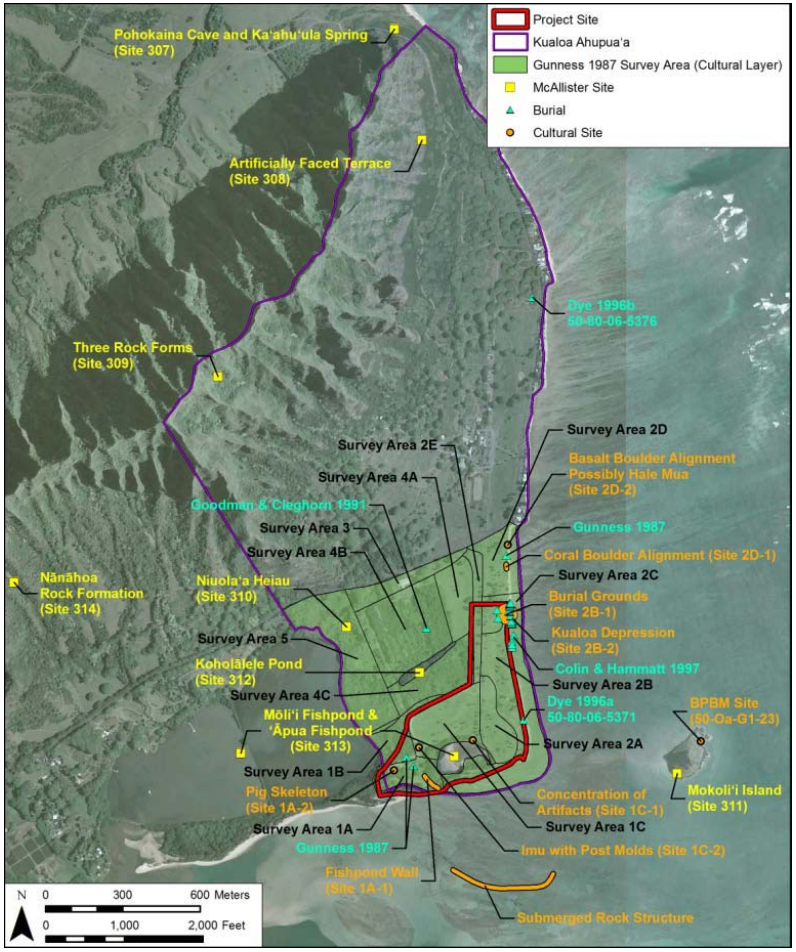


Figure 8. Archaeological sites in Kualoa Ahupua‘a (base image, 2007 Google aerial)

Table 1. Archaeological sites in Kualoa Ahupua‘a

Site Number	Site	Site Description	Source
In Project Area			
SIHP 50-80-06-528	Kualoa Ahupua‘a	Entire ahupua‘a	State and National Registers of Historic Places 1974
Survey Area 1A	Cultural Layer	Excavation uncovered numerous artifacts indicative of stone tool manufacture, an ‘ulu maika stone, pits, and human remains	Gunness 1987:68
Site 1A-1	Fishpond Wall	Excavations between ‘Āpua Pond and the beach uncovered a basalt stone alignment believed to be the remains of this former fishpond wall (Clark and Connolly 1978:5)	Clark and Connolly 1978:5
313	‘Āpua Fishpond (also called Mokoli‘i and Kualoa)	Walls are sand embankment and stone, possibly constructed originally as an offshore fishpond until accretion closed it off from Kāne‘ohe Bay	Gunness 1987:56; McAllister 1933:168
Site 1A-2	Pig skeleton (possible ahupua‘a boundary)	Excavation in the general area of the Hale Makani bathhouse uncovered an intact pig skeleton in a flexed position, which may have been an offering to mark the ahupua‘a boundary; an imu (earth oven) was uncovered as well as numerous artifacts including slingstones, a pearl-shell fishhook blank, coral abraders, a sea urchin spine abrader, a shell scraper, a double leho (cowry shell) sinker (for octopus fishing), an octopus hook, whetstone fragments, volcanic glass flakes, and a dog tooth pendant	Clark and Connolly 1978:7; Gunness 1987:57–59
Survey Area 1B	Cultural layer, stone tool manufacture	Excavation revealed a dense concentration of features including cooking fires, storage pits, and post molds indicative of structures of pole and thatch construction, and an assemblage of 2,639 artifacts including basalt flakes, hammerstone and adze fragments, scrapers, coral abraders, basalt awls, and niho palaoa; indicative of a “workshop” area where stone tools were manufactured and used in woodworking activities	Gunness 1987:87–88

Site Number	Site	Site Description	Source
Survey Area 1C	Cultural layer, habitation	Excavation and surface collection in several locations uncovered dense concentration of 7,800 artifacts including adzes and adze fragments, coral abraders, ‘ulu maika stones as well as shell midden; an imu filled with thousands of basalt flakes surrounded by at least 13 post molds radiocarbon dates to between A.D. 1670–1730	Gunness 1987:91–99
Site 1C-1	Concentration of artifacts	Dense concentration of 350 artifacts	Gunness 1987:93
Site 1C-2	Imu with post hole molds	Dense concentration of 3,920 artifacts, including an imu filled with thousands of basalt flakes surrounded by at least 13 post molds radiocarbon dates to between A.D. 1670–1730	Gunness 1987:95
Survey Area 2B	Cultural layer, various activities	The eroding eastern coastline (for at least 80 years) has revealed a cultural layer of midden, firepits, canoe fragments, and approximately 2,000 stone artifacts, as well as human burials, representing a range of activities including adze and other stone tool manufacture, wood working, fishing, food preparation, and game playing	Gunness 1987:114
Site 2B-1	Burial grounds	Burial ground around A.D. 1400–1600, followed by intense use of land for various activities (see above); features include post molds, pits and fireplaces, with numerous artifacts, including fishhook fragments, coral abraders, fishing sinkers, ‘ulu maika stones, adze fragments, whetstones, bone picks, worked bone, and shell scrapers	Clark and Connolly 1978:9; Gunness 1987:120, 141
SIHP 50-80-06-5371	Burial Area	An estimated 54 burials have been found in a stretch of the eastern beach	Barrera 1974:20; Colin and Hammatt 1997; Dye 1996a; Gunness 1987:189; see Shideler and Hammatt 2007:219 for a detailed description of sources

Site Number	Site	Site Description	Source
Site 2B-2	Kualoa Depression	Excavation uncovered waterlogged and preserved organic materials in a depression (possibly an ‘auwai for Koholālele Pond) including a carved kapa (bark cloth) beater, pandanus, strands of human hair, kukui, gourds, a net gauge, pieces of canoe plank (some of which still retain their sennet lashings), and a five foot-long wooden pole with adze markings	Gunness 1987:123
Survey Area 2C	Cultural layer, burials	Excavation revealed human burials, several imu, two stone alignments, and a water channel, as well as 606 surface-collected artifacts,, including adze blanks and fragments, abraders, hammer stones, ‘ulu maika and other lithics	Gunness 1987:144–145
Outside Project Area			
Site 2D-1	Coral boulder alignment	Erosion revealed a coral boulder alignment	Gunness 1987:155
Site 2D-2	Rectangular basalt boulder alignment, possibly hale mua (men’s house)	Erosion revealed a possible hale mua, indicated by preserved waterlogged organic materials including gourds, pandanus, kukui nuts, unidentified worked wood, melomelo (bait stick), a poi pounder fragment, fishing sinkers, basalt awls, hammerstones, whetstones, grindstones, and adze manufacturing debris, such as blanks, performs, and fragments of polished adzes	Gunness 1987:161
Survey Area 2E	Cultural layer	Excavation delimited part of the former airstrip, which had been scraped (no cultural remains found), and revealed a dog burial, probable post molds, an imu, and numerous pits beyond the airstrip	Gunness 1987:167
Survey Area 3	(none)	World War II construction activities eliminated most, if not all, evidence of former occupation of the area	Gunness 1987:180
Site 3-1	Stone platform	A stone platform found during excavations may be a remnant of Niuola‘a Heiau (Clark and Connolly 1978:9) or a mid-nineteenth century house lot adjacent to LCA 3045:2 (Gunness 1987:181)	Clark and Connolly 1978:9; Gunness 1987:181

Site Number	Site	Site Description	Source
Survey Area 4A	Cultural layer	Area was severely disturbed by previous agricultural activities and bulldozing for a flood control project in 1976; surface surveys revealed several adze performs and fragments, hammerstones, whetstones, and a slingstone	Gunness 1987:184
Survey Area 4B	Cultural layer	Area was severely disturbed by previous agricultural activities and bulldozing for a flood control project in 1976; excavations uncovered a post hole, a pit, a well remnant, a linear series of nine postholes (Goodman and Cleghorn 1991:21–28), and burials (Goodman and Cleghorn 1991:21–28; Putzi 1994:1)	Goodman and Cleghorn 1991:21–28; Putzi 1994:1
Survey Area 5	Cultural layer	Area was severely disturbed from World War II activities and a piggery in the 1930s; surveys revealed adze blanks and preforms, a polished adze fragment, a grindstone, whetstones, a basalt awl, an ‘ulu maika, a poi pounder, numerous basalt flakes, and pieces of volcanic glass	Gunness 1987:186
(none)	Submerged rock structure	A submerged rock structure off Kualoa Point may be a fishpond wall (Clark and Connolly 1978:4) named Pilihe‘e (Gunness 1987:47), a heiau (Beckwith 1970:108), or a nineteenth century breakwater (Shideler and Hammat 2007, Vol I:179)	Clark and Connolly 1978:4; Gunness 1987:47; Shideler and Hammat 2007, Vol I:179
307	Pohokaina Cave and Ka‘ahu‘ula Spring	Located on the division between Ko‘olaupoko and Ko‘olauloa Ahupua‘a	McAllister 1933:166
308	Artificially faced terrace	Terrace near Kalaeoka‘ō‘io; may be the remains of a heiau	McAllister 1933:166
309	Three rock forms	Rock forms on the cliff side include a woman with two children, a sheep, and a lion at Pu‘u o Mahia, which can be seen from the Project area	McAllister 1933:166
310	Niuola‘a Heiau	Destroyed heiau once located near the church; possibly same structure mentioned by Beckwith (1970) as a heiau for Kānehoalani	McAllister 1933:167; Beckwith 1970:108
311	Mokoli‘i Island	Associated with mo‘olelo of a mo‘o and Hi‘iaka, sister of Pele	McAllister 1933:167

Site Number	Site	Site Description	Source
312	Koholālele Pond	Narrow ditch-like feature with uncertain function and antiquity; it may be (1) a fishpond , (2) an ‘auwai built in 1852 by the Judd family between ‘Āpua and Mōli‘i Ponds, (3) a ditch excavated in 1852 for the cultivation of lo‘i kalo, a fish trap, a pre-1852 excavation of menehune (legendary race of small people) construction, a demarcation of lands, a whale ivory mining site, or the place of kauwā (low caste) drownings, called Kai Lumaluma‘i	Clark and Connolly 1978:9; Handy and Handy 1972:444; McAllister 1933:168; undated manuscript, cited in Sterling and Summers 1978:181; Morgan 1964, cited in Sterling and Summers 1978:181; Shideler and Hammatt 2007:170–171
313	Mōli‘i Fishpond	124-acre pond near western boundary of Project area	Clark and Connolly 1978:8; McAllister 1933:168
314	Nānāhoa Rock Formation	Phallic rock on the ridge of Kānehoalani connected through mo‘olelo to a stone, Kaluau, in Mōli‘i Fishpond	McAllister 1933:168
BPBM 50-Oa-G1-23	Basalt adze manufacture, volcanic glass quarry, and stone image on Mokoli‘i Island	An area of basalt flakes may have been a quarrying site (Barrera 1974:38); 13 boulders were used for grinding and polishing stone adzes (Clark and Connolly (978:4); small veins of volcanic glass indicate an exhausted volcanic glass quarry (Gunness 1987:45); and a carved rock may have been used for worship (Clark and Connolly 1978:4)	Barrera 1974:38; Clark and Connolly 1978:4; Gunness 1987:45
SIHP 50-80-06-5376	Burial Area	An estimated four individuals (burials) found north of the old sugar mill; at least two are historic interments	Dye 1996b; Spear 1996

Figure 9. Place names of Kualoa Ahupua‘a (base image, 2007 Google aerial)

Table 2. Place names of Kualoa Ahupua‘a

Place Name	Meaning	Description	Source
‘Āpua Plain	Fish basket	‘Ili‘āina; Flat land area; plain is virtually coequal with the Project area	Soehren 2010
Glen Hala	Pandanus glen	Gerrit P. Judd’s family home and ranch, named Glen Hala because it was situated in a secluded area of pandanus trees	*Family Records. House of Judd* 1930:33
Holoape‘e (or Kohoape‘e)	(undocumented)	Ridge made by the pig demigod Kamapua‘a as he fled from the volcano goddess Pele and hid in a hollow in Kānehoalani	Landgraf 1994:8; Sterling and Summers 1978:183
Ka‘ahu‘ula	(undocumented)	Pūnāwai that was one entrance to the royal burial cave of Pohokaina	McAllister 1933:166
Kalaeoka‘ō‘io Point (or Kalae‘ō‘io or Ka‘ōio)	Cape of the bonefish	Borders the ahupua‘a of Kualoa and Ka‘a‘awa	Pukui et al. 1974
Kalepeamoa (or Lepeamoa)	(undocumented)	Rock formation on Kānehoalani	*Ke Aloha ‘Āina*, *Februari* 8, 1919)
Kauakahi-a-Kaho‘owaha	Single battle of the despised	A sacred hill	*Kū‘oko‘a* 1867
Kohoape‘e	(undocumented)	A swale, perhaps a misprint for Holoape‘e	McAllister 1933:168
Ko‘olaupoko	Short Ko‘olau	Moku	Pukui et al. 1974
Kualoa	Long back	Ahupua‘a	Pukui et al. 1974
Kualoa Peak	Long back	Name of a triangulation station at 1,628 feet on a peak on Kānehoalani Ridge	*Bryon’s Sectional Maps of O‘ahu* 2011
Kualoa (or ‘Āpua) Point	Long back	Point near Mokoli‘i	Pukui et al. 1974

Place Name	Meaning	Description	Source
Kūpulupulu	(undocumented)	Hill in front of Kānehoalani named after Kūpulupulu-a-Nu‘u, the son of Lua Nu‘u, who performed sacrifices for Kānehoalani	Fornander 1919, Vol. VI, Part II:271
Mokoli‘i Island	Little *mo‘o*	An islet in Kāne‘ohe Bay commonly known as Chinaman’s Hat	McAllister 1933:167
Mo‘okapu o Hāloa	Sacred section of Hāloa (a son of Wākea, the first man)	Ridge	Pukui et al. 1974
Nānāhoa Rock Formation	(undocumented)	Phallic rock on the ridge of Kānehoalani connected through mo‘olelo to a stone, Kaluau, in Mōli‘i Fishpond	McAllister 1933:168
Palikū	Vertical cliff	An ancient name for Kualoa	Pukui et al. 1974
Pili Lua Nu‘u	Two heights joining	Hill in front of Kānehoalani named after Pili Lua Nu‘u, a servant of Lua Nu‘u, who performed sacrifices for Kānehoalani	Fornander 1919, Vol. VI, Part II:271
Pōhākea	White stone	Rock at the edge of the reef off ‘Āpua, visible at low tide, supposedly left by menehune when they were not able to finish a fishpond wall before daylight caught them	Sterling and Summers 1978:183
Pohokaina Cave	(undocumented)	Royal burial cave with underground connections to many places	McAllister 1933:166
Pu‘u Kānehoalani	Kāne, royal companion	Kānehoalani was named for an ancestor of the goddess Pele, whose female companion was the islet of Kapapa	Pukui et al. 1974
Pu‘u o Mahia	(undocumented)	Rock form	McAllister 1933:166
Wili-ka-‘ā‘ī	Twist the neck	Name of the old sugar mill and vicinity, after a one-eyed Hawaiian worker who was not used to using a shovel developed a sore neck after turning to watch each shovel load fly	Corwin 1866, cited in Sterling and Summers 1978:180

3.4.1.1 Overview

Archaeological excavation and survey data indicate a sequence of settlement patterns and cultural use of Kualoa and the Project area. Between A.D. 1100–1400, the coastline of Kualoa at the base of the ridge (Kualoa Point) widened to form a small embayment on the Hakipu‘u side. As the beach grew wider, it may have been used by early settlers as a temporary campsite for fishing and reef-gathering activities. By A.D. 1400, the southern beach was probably used as a burial ground. By this time, a fishpond wall constructed on the growing embayment, probably Mō‘ili Pond or a smaller pond that was later enlarged to form Mō‘ili Pond. By A.D. 1600, the embayment forming ‘Āpua Pond was most likely walled, and agricultural use of the lower slopes abutting the beach was intensified. At this time, the eastern beach was used as a burial ground, and agricultural use of the lower slopes abutting this beach was intensified. There is evidence of grave disturbance, possibly to supply human bone for the manufacture of fishhooks. After A.D. 1600, virtually the entire Project area was occupied, as evidenced by a nearly intact cultural layer containing numerous features such as imu, firepits and fire places, post molds indicative of pole and thatch houses, and a remarkable amount of artifacts. It appears that the use of the sandy peninsula for burials was not permitted during this time period. This was instead a community of resident stoneworking artisans and other craft specialists (manufacturing adzes, fishing equipment, and tapa cloth). This was also an occasional residence of ali‘i, as evidenced in the form of ornaments (lei niho palaoa) and leisure activity areas (‘ulu maika playing field), and possibly kāhuna, as suggested by two heiau and intact pig skeletons that were perhaps offered in the worship of Lono, the god of agriculture (Gunness 1987:237–246).

3.4.1.2 Place Names

Ko‘olaupoko, the traditional name for the moku encompassing Kualoa, translates literally as “the short windward” in contrast to the northern half of this coastline known as Ko‘olauloa, “the long windward.” This may reflect the relative short distance from the sea to the great pali (cliffs) of the Ko‘olau Mountains, which seem to loom directly over much of this district. The mountainous sections of the ahupua‘a of Waimānalo contain wahi pana connected to the stunning landscape of the pali, with towering pu‘u (peaks) over the sheer cliff rock faces overlooking the upland forests, as well as smaller hills toward the coast. The beauty of the pali is captured in the following ‘ōlelo no‘eau: “Na pali hāuliuli o ke Ko‘olau,” which means “The hills and cliffs of the windward side of O‘ahu are always dark and beautiful with trees and shrubs” (Pukui 1983:249).

The ahupua‘a of **Kualoa** (long back) is partially delineated by place names of ridges, peaks, and hills. The peak of **Pu‘u Kānehoalani** (Kāne, royal companion) is located on the ridge of **Mo‘okapu o Hāloa** (sacred section of Hāloa [a son of Wākea, the first man]) (Figure 10). Kānehoalani was named for an ancestor of the goddess Pele, whose female companion was the islet of Kapapa in Kahalu‘u Ahupua‘a (Pukui et al 1976:84). Ka‘ōpulupulu is said to have recounted that Kualoa should not be given away for it contains the sacred hill of (Pali-kapu o) **Kauakahi-a-Kaho‘owaha** (single battle of the despised) (*Kū‘oko‘a* 1867), which may be an epithet for Kānehoalani.

Three rock forms on the ridge of Pu‘u Kānehoalani were reported to resemble a woman with two children, a sheep (hipa), and a lion at **Pu‘u o Mahia** (Site 309, McAllister 1933:166). A

traveler’s account names a rock formation on Kānehoalani as **Kalepeamoa (Lepeamoa)** (*Ke Aloha ‘Āina*, Februari 8, 1919). **Kualoa Peak is** the name of a mountain peak on some maps (*Bryon’s Sectional Maps of O‘ahu* 2011), corresponding to what appears to be the name (Kualoa) of a triangulation station at 1,628 feet on a peak on Kānehoalani Ridge. Fornander relates that one or more smaller hills called **Kūpulupulu** and **Pili Lua Nu‘u** (two heights joining) in front of Kānehoalani were named after Kūpulupulu-a-Nu‘u, the son of Lua Nu‘u, and Pili Lua Nu‘u, a servant of Lua Nu‘u, respectively, who each performed sacrifices for Kānehoalani (or variously was the god Kānehoalani) (Fornander 1919, Vol. VI, Part II:271). Another ridge called **Holoape‘e** (also Kohoape‘e) was made by the pig demigod Kamapua‘a as he fled from the volcano goddess Pele and hid in a hollow in Kānehoalani (Landgraf 1994:8) (Figure 11).

Several landscape features are located along the boundary separating the moku of Ko‘olaupoko and Ko‘olauloa and the ahupua‘a of Kualoa and Ka‘a‘awa. A pōhaku named **Nānāhoa** was a rock formation near the top of a high spur dividing the moku of Ko‘olaupoko and Ko‘olauloa (Site 314, McAllister 1933:168). The stone was formerly a taboo child not allowed to look upon a woman until he was married; however, he stared at a naked beauty sleeping on the beach and was turned to stone (Pukui et al. 1976:162). Another division of the two moku is a cliff named **Palikū** (vertical cliff), also an ancient name for Kualoa (Pukui et al 1976:177). A pūnāwai named **Ka‘ahu‘ula** is located near the point of **Kalaeka‘ō‘io** (also **Kalae‘ō‘io** or **Ka‘ōio**, cape of the bonefish) on the border of the ahupua‘a of Kualoa and Ka‘a‘awa (Figure 12), which was one entrance to the royal burial cave of **Pohokaina** (Site 307, McAllister 1933:166) until the spring was filled with rubble during the construction of a gun site during World War II (Landgraf 1994:4). Another entrance to the cave was in the cliffs of Kalaeoka‘ō‘io (Landgraf 1994:4). One of McAllister’s informants, Mrs. Taylor, describes an underground connection between Pohokaina Cave and the palace grounds in Honolulu, and McAllister also reports an underground connection to Poha Cave in Keawa‘ula in the *moku* of Wai‘anae (1933:167). Other entrances to the cave are reported to be located at Moanalua, Kalihi, Pū‘iwa, Waipahu, and Kahuku (Kamakau 1964:38; Landgraf 1994:4).

Mokoli‘i (little mo‘o [lizard, water spirit]), commonly known as Chinaman’s Hat, is an islet in Kāne‘ohe Bay that is part of Kualoa Ahupua‘a (Figure 13). It is associated with mo‘olelo of a mo‘o and Hi‘iaka, sister of Pele (see Section 3.4.2.3).

The flat coastal area of Kualoa is an ‘ili ‘āina (an ‘ili land division whose chief pays tribute to the chief of the ahupua‘a of which it is a part, rather than directly to the king) called **‘Āpua** (fish basket) (Soehren 2010). This plain is virtually coequal with the Project area. **Kualoa** (or ‘Āpua) **Point** is located on the southern edge of the Project area.

Wili-ka-‘ā‘ī (twist the neck) was the name of the old sugar mill (built in 1864 by G.P. Judd and S.G. Wilder) and vicinity, after a one-eyed Hawaiian worker who was not used to using a shovel developed a sore neck after turning to watch each shovel load fly (Corwin 1866, cited in Sterling and Summers 1978:180).

Figure 10. Kānehoalani and the ridge of Mo‘okapu O Hāloa (Landgraf 1994:7)

Figure 11. Holoap‘e (Landgraf 1994:9)

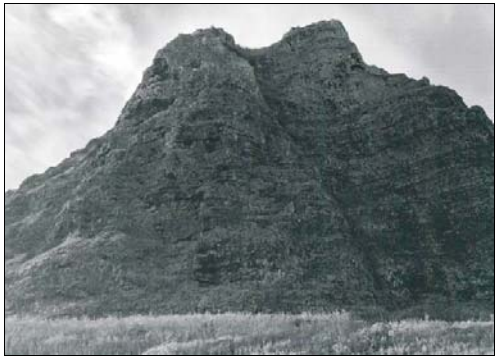


Figure 12. Kalaeoka‘ō‘io (Landgraf 1994:5)

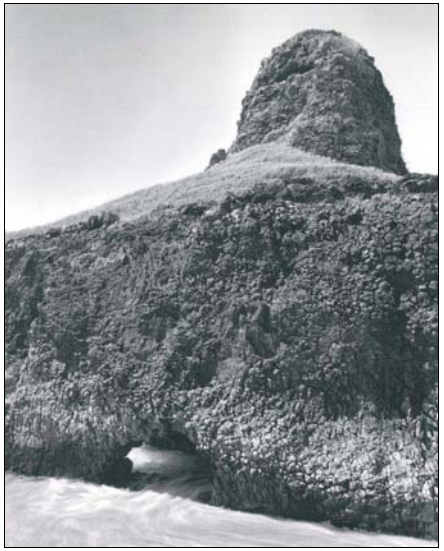


Figure 13. Mokoli‘i (Landgraf 1994:11)

3.4.1.3 Subsistence, Habitation, and Stone Tool Manufacturing

Intensive archaeological excavations and surveys have revealed an extraordinary large number of lithics and debitage associated with adze manufacturing (e.g., adzes, hammerstones, anvil stones, grindstones, whetstones) in the Project area and vicinity. This predominant industry of stone working and wood working was spread out over the southeastern peninsula. In addition, the islet of Mokoli‘i was also a site of adze manufacturing as well as a quarry for volcanic glass. The Project area had a second specialized use as a game field (‘ulu maika). In addition, people lived there and used the area as an ocean or reef fishing base (Gunness 1987:232–233). The following description of subsistence, habitation, and stone tool manufacturing at Kualoa is based largely on Gunness’ (1987) synthesis of archaeological fieldwork conducted between 1975 and 1985 through the Kualoa Archaeological Research Project.

Near Mōli‘i Pond and the vicinity of the southern beach (Survey Area 1), an intact pig skeleton in a flexed position was uncovered during an excavation near the Hale Makani bathhouse (Site 1A-2, Gunness 1987:57–59) (Figure 14). Since the pig burial orientated along a direct line running down from the mountain ridge to the eastern side of Mō‘ili Fishpond, the burial might have acted as an ahupua‘a (literally referring to a “heap of stones associated with a pig”) boundary offering separating the ahupua‘a of Kualoa from that of neighboring Hakipu‘u Ahupua‘a (Gunness 1987:62). Associated features included an imu and numerous artifacts including slingstones, a pearl-shell fishhook blank, coral abraders, a sea urchin spine abrader, a shell scraper, a double leho sinker (for octopus fishing), an octopus hook, whetstone fragments, and a dog tooth pendant (Clark and Connolly 1978:7; Gunness 1987:57–59).

Adjacent to Mōli‘i Pond, excavation revealed a dense concentration of features including cooking fires, storage pits, and post molds indicative of structures of pole and thatch construction, and an assemblage of 2,639 artifacts including basalt flakes, hammerstone and adze fragments, scrapers, coral abraders, basalt awls, and niho palaoa (Survey Area 1B, Gunness 1987:87–88). Gunness suggests that these features and artifacts are indicative of a “workshop” area where stone tools were manufactured and used in woodworking activities (1987:88).

Excavation immediately north of ‘Āpua Pond uncovered dense concentrations of 7,800 artifacts including adzes and adze fragments, coral abraders, ‘ulu maika stones as well as shell midden (Survey Area 1C, Gunness 1987:91–99). In addition, the excavation uncovered an imu filled with thousands of basalt flakes surrounded by at least 13 post molds that radiocarbon date to between A.D. 1670–1730 (Site 1C-2) (Figure 15).

Along the eastern beach, the eroding eastern coastline (for at least 80 years) has revealed a cultural layer of midden, firepits, canoe fragments, and approximately 2,000 stone artifacts, as well as human burials (Survey Area 2, Gunness 1987:114). The central beach area was used as a burial ground in the period A.D. 1400–1600 (Survey 2B-1, Gunness 1987:141). Around A.D. 1600 the same area was used intensively for specialized activities including adze and other stone tool manufacture, wood working, fishing, food preparation, and game playing (Gunness 1987:114). This is suggested by the uncovering of postmolds, pits and fireplaces, as well as numerous artifacts including fishhook fragments, coral abraders, fishing sinkers, ‘ulu maika stones, adze fragments, whetstones, bone picks, worked bone, and shell scrapers (Site 2B-1, Clark and Connolly 1978:9; Gunness 1987:120).

In the same area is the Kualoa Depression, variously referred to as an ‘auwai for Koholālele Pond, a water channel or a swale (Site 2B-2, Gunness 1987:123). Waterlogged and preserved organic materials were recovered from this depression, including a carved kapa beater, pandanus, strands of human hair, kukui, gourds, a net gauge, pieces of canoe plank (some of which still retain their sennet lashings), and a five foot-long wooden pole with adze markings (Gunness 1987:123). Changes in faunal assemblages (snails) from the depression suggests that it was made by Polynesians relatively late in pre-European times (Kirch and Christensen 1979).

Farther north along the eastern beach, excavation revealed human burials, several imu, two stone alignments, and a water channel, as well as 606 surface-collected artifacts,, including adze blanks and fragments, abraders, hammerstones, ‘ulu maika and other lithics (Site 2C, Gunness 1987:144–145). At the northeast coast of the beach (Survey Area 2D), erosion at the wave-cut bank revealed a coral boulder alignment (Site 2D-1) (Figure 16) and a rectangular basalt boulder alignment (Site 2D-2). Preserved waterlogged organic materials within the latter alignment included gourds, pandanus, kukui nuts, unidentified worked wood, melomelo (bait stick), a poi pounder fragment, fishing sinkers, basalt awls, hammerstones, whetstones, grindstones, and adze manufacturing debris, such as blanks, performs, and fragments of polished adzes, which suggested to Gunness that the site may have been a hale mua (men’s house) (1987:161) (Figure 17). Excavations also delimited part of the former airstrip, which had been scraped (no cultural remains were found), and revealed a dog burial, probable post molds, an imu, and numerous pits beyond the airstrip (Survey Area 2E, Gunness 1987:167). In a layer of soil with no other cultural remains, a large mammal bone, believed to be a whale and naturally deposited, was discovered (Gunness 1987:171)

In the northern region of the park (Survey Area 3), World War II construction activities eliminated most, if not all, evidence of former occupation of the area (Gunness 1987:180). However, a stone platform found during excavations at Kualoa Park may be a remnant of Niuola‘a Heiau (Clark and Connolly 1978:9) or a mid-nineteenth century house lot adjacent to LCA 3045:2 (Site 3-1, Gunness 1987:181) (Figure 18).

The central portion of the park was severely disturbed by previous agricultural activities and bulldozing for a flood control project in 1976, such that archaeological sites were most likely destroyed (Gunness 1987:184). Yet, surface surveys revealed several adze performs and fragments, hammerstones, whetstones, and a slingstone (Survey Area 4A, Gunness 1987:184), and excavations uncovered a post hole, a pit, a well remnant, a linear series of nine postholes (Goodman and Cleghorn 1991:21–28), and burials (Goodman and Cleghorn 1991:21–28; Putzi 1994:1) (Survey Area 4B).

The northwestern region of the park adjacent to Mō‘ili Pond (Survey Area 5) was also severely disturbed from World War II activities and a piggery in the 1930s. Yet, surveys revealed adze blanks and preforms, a polished adze fragment, a grindstone, whetstones, a basalt awl, an *‘ulu maika*, a *poi* pounder, numerous basalt flakes, and pieces of volcanic glass (Gunness 1986:186).

The islet of Mokoli‘i contains several archaeological features and artifacts on its eastern side facing the ocean. An area of basalt flakes was designated as a possible quarrying site (BPBM 50-Oa-G1-23, Barrera 1974:38), and 13 boulders may have been used for grinding, polishing, and

finishing basalt adzes (Clark and Connolly 1978:4) (Figure 19), which suggests that the island was used in part for the manufacture of stone adzes (Gunness 1987:43). Veins of volcanic glass appear to be the remnants of an exhausted volcanic glass quarrying site; this was most likely the source of much of the volcanic glass excavated in the Project area (Gunness 1987:45). In addition, a carved rock in the image of two heads resembling sharks may be a kū‘ula stone (stone used for worship of a fishing god) or an ‘aumakua stone (representing a family god) (Clark and Connolly 1978:4) (Figure 20).

Figure 14. Excavated probable ahupua‘a boundary marker (pig skeleton) and associated imu (Gunness 1987:61)

Figure 15. Excavated imu surrounded by 13 post molds (Wendell Kam, in Gunness 1987:99)

Figure 16. Coral alignment eroding from beach edge (Gunness 1987:156)

Figure 17. Basalt boulder alignment, possibly a hale mua (Gunness 1987:163)

Figure 18. Stone platform (Site 3-1) after stripping overlying soil from top of basalt rocks (Gunness 1987:182

Figure 19. Grindstone, Mokoli‘i Island (Gunness 1987:44)

Figure 20. Carved stone, Mokoli‘i Island, possibly a ku‘ula or ‘aumakua stone (Gunness 1987:46)

3.4.1.4 Loko I‘a

An inland linear depression named **Koholālele** (leaping whale) is located in the central portion of the Project area (Site 312, McAllister 1933:168) (Figure 21 to Figure 22). This long, narrow pond or ditch-like feature measures 885 feet in length, with the northeast end 30 feet wide and the southwest end 85 feet wide. Its function and antiquity remain uncertain. Various sources describe it as a pu‘uone (inland fishpond) with possible outlet to the ocean (Clark and Connolly 1978:9), an ‘auwai built in 1852 by the Judd family between ‘Āpua and Mōli‘i Ponds (Morgan 1964, cited in Sterling and Summers 1978:181), a ditch excavated in 1852 for the cultivation of lo‘i kalo (Handy and Handy 1972:444; McAllister Ms, cited in Sterling and Summers 1978:181), a fishtrap to catch the running schools of mullet for which Kualoa was known (*Kū‘oko‘a* 1919), or a pre-1852 excavation (Francis Morgan interview, Shideler and Hammatt 2007, Vol. II:86–87), possibly of menehune (legendary race of small people) construction (McAllister, undated manuscript, cited in Sterling and Summers 1978:181). Possibilities other than food production include a demarcation of lands to set apart the pu‘uhonua (place of refuge) on the tip of ‘Āpua Point, a site for excavating ivory from whale skeletons that became incorporated into the accreting beach sands of ‘Āpua Point, or the site of the kauwā (low caste) drownings, called **Kai Lumaluma‘i** (Shideler and Hammatt 2007:170–171).

A fishpond called **Mōli‘i** (small section) lies within Hakipu‘u Ahupua‘a but abuts Kualoa Ahupua‘a to form its western border (Site 313, McAllister 1933:168). The eastern sand embankment and southwestern portion of wall, which is of stone construction with mākāhā (sluice gates), are part of a 4,000 foot long wall that encircles 124 acres of water. This site, possibly of menehune construction (Morgan, 1964, cited in Sterling and Summers 1978:185), was originally a single pond that was divided in the early 1900s (Landgraf 1994:16) to have at least three holding ponds (Clark and Connolly 1978:8). A particular stone named **Kaluau** in the wall of Mōli‘i Pond was the female counterpart of the phallic Nānāhoa Stone on the ridge above (McAllister 1933:168).

A submerged structure in Kāne‘ohe Bay is located off the southern end of Kualoa Point. Although McAllister (1933) did not record this site, aerial photographs and underwater reconnaissance has revealed an archaeological site, most likely a fishpond wall, with concentrations of basalt rocks, intact sections of walls that measure three meters in height and extend about 300 meters (980 feet) in length, and a platform paved with small rocks that may have been used to hold a guard or caretaker’s house (Clark and Connolly 1978:4; Gunness 1987:47,49). According to Gunness (198a:47), a local resident recalls being told as a child that the name of the pond was **Pilihe‘e**. Rosamond S. Morgan, an informant for Sterling and Summers (1978:183), mentioned a rock, **Pōhākea** (white stone) at the edge of the reef off ‘Āpua, visible at low tide, supposedly left by menehune when they were not able to finish a fishpond wall before daylight caught them.

In addition to its possible use as a fishpond wall, the submerged structure may have been a heiau or a nineteenth century breakwater. Martha Beckwith’s (1970:108) description of the location of Pahulu Heiau indicates the general area of this underwater site, and Tai Crouch, in a previously recorded interview, indicates that this structure was also the location of Pahulu Heiau, which was named after a Moloka‘i family (Shideler and Hammatt 2007, Vol. II:7). In a previously recorded interview, Francis Morgan suggests that the submerged structure may have

been built in association with the operations of the sugar plantation in the 1860s as a breakwater to facilitate the shipping of materials and refined sugar (Shideler and Hammatt 2007, Vol. I:179).

A coastal pond called **‘Āpua** (also Mokoli‘i and Kualoa) with walls of sand embankment and stone is located in the southern portion of the Project area (Site 313, McAllister 1933:168). Excavations between ‘Āpua Pond and the beach uncovered a basalt stone alignment (Figure 24), which contains a mākāhā, (Figure 25) believed to be the remains of this former fishpond wall (Site 1A-1, Clark and Connolly 1978:5). Although currently landlocked, Gunness notes that early maps of the area show that the makai wall of ‘Āpua Pond was exposed and in the waters of Kāne‘ohe Bay until the mid-1920s (Gunness 1987:56). She explained her belief that ‘Āpua Pond was originally constructed as an offshore fishpond, but as sand began to build up along the seawall, the larger Pilihe‘e fishpond was constructed. After the completion of Pilihe‘e Fishpond, ‘Āpua Pond was then probably utilized as a holding pond for the newer, larger Pilihe‘e Fishpond (Personal communication, cited in Shideler and Hammatt 2007:180).

Figure 21. 1940 photo of Koholālele (named ‘Āpua Ditch in the original caption) (Mission Houses Museum)

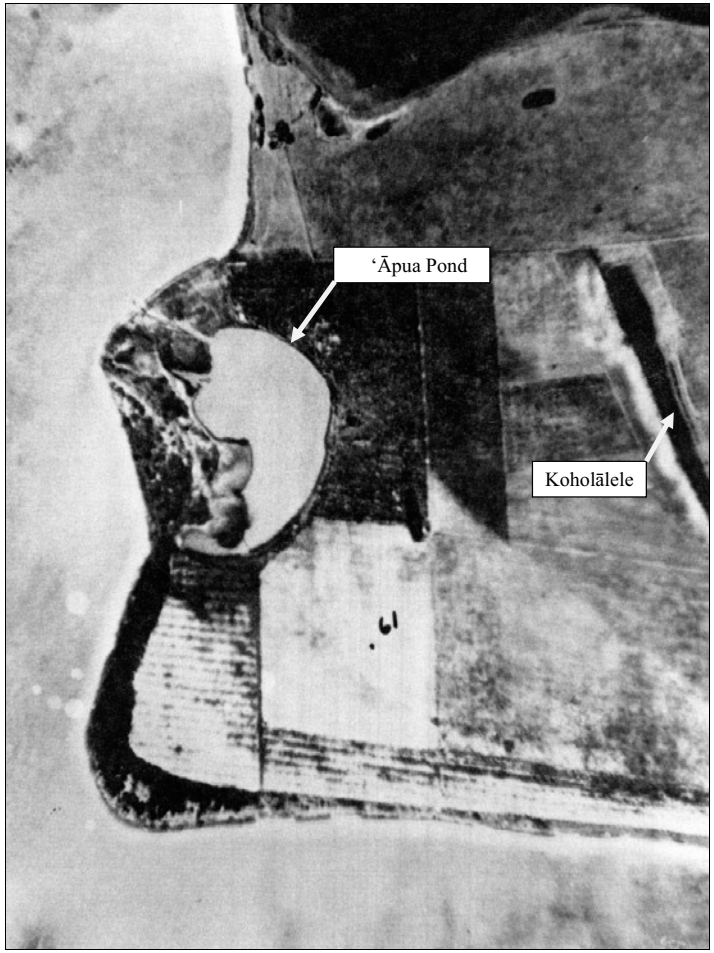


Figure 22. 1926/1927 aerial photo showing extensive agricultural fields, linear depression of Koholālele, and ‘Āpua Pond (U.S. Army Corps of Engineers District Honolulu 1977:C-4)

Figure 23. 1940 aerial photo showing the changing field configurations. Submerged wall-like feature is visible in lower left corner (U.S. Army Corps of Engineers)

Figure 24. ‘Āpua Pond wall following excavation (Gunness 1987:54)

Figure 25. ‘Āpua Pond mākāhā following excavation (Gunness 1987:55)

3.4.1.5 Heiau and other Religious Structures

Niuola‘a Heiau (coconut of La‘a) was formerly located near the Mormon Church in Kualoa, but nothing remained of the site during McAllister’s survey (Site 310, McAllister 1933:167). This may have been the same structure mentioned by Beckwith (1970) as a heiau for Kānehoalani. A stone platform found during excavations at Kualoa Park may be a remnant of Niuola‘a Heiau, or a mid-nineteenth century house lot adjacent to LCA 3045:2 (TS-26, Site Area 3-1, Clark and Connolly 1978:9; Gunness 1987:181). An artificially faced terrace near the point of Kalaeoka‘ō‘io may be the remains of a heiau (Site 308, McAllister 1933:166). Visible at low tide, **Pahulu (Pahu‘ulu) Heiau** (nightmare, exhausted) is located just offshore in shallow water. Becket and Singer (1999:134) note that Pahulu Heiau was reported to have been the source of a school of sorcery. Beckwith’s (1970:108) description of the location of Pahulu Heiau indicates the general area of the underwater structure.

Figure 26. Pahulu Heiau; a group of stones visible at low tide closely resembles one description of Pahulu (Becket and Singer 1999:135)

3.4.1.6 Ilina

Numerous human remains have been documented throughout and near the Project area, which were scattered along the beach and recovered or uncovered through excavation (Barrera 1974:20; Colin and Hammatt 1997; Gunness 1987:189; see Shideler and Hammatt 2007, Vol. I:219 for a detailed description of sources). The number of individuals that these human remains represents is estimated at 85 (Shideler and Hammatt 2007, Vol. I:219). Of this total, an estimated 54 burials have been found scattered along the eroding shoreline of the eastern beach (SIHP 50-80-06-5371, Dye 1996a; Colin and Hammatt 1997). With a high concentration of human remains, this may have been a relatively discrete burial area some distance inland. The extreme erosion first reached this burial ground in the 1970s. In addition to this possible burial ground, an estimated 31 burials have been found within other areas of the park (outside of SIHP 50-80-06-5371), but 13 appear to have no provenience. No structural features (e.g., grave markers) have been found associated with the documented burials (Gunness 1987:196). Other burials have been found inland near the depression of Koholālele (Goodman and Cleghorn 1991:21–28; Putzi 1994:1) and inland of ‘Āpua Pond (Gunness 1987).

At least four burials were formerly disturbed (Pietrusewsky and Douglass 1989:26), most likely to collect bones for the manufacture of fishhooks and other tools, a practice documented by Native Hawaiian historian Kamakau (1964:38). In one burial, it appears that basalt flakes were used to de-flesh the bones and an ‘ulu maika stone was used as a hammerstone to break the bones. After the desired bones were collected, these stone tools and bone fragments were buried with sand in a small pit (Gunness 1987:199–200). This and other evidence suggests “it would appear that an individual was targeted at death as a potential bone donor and the remains were vandalized shortly after interment, requiring defleshing to access the bone” (Douglas 1990:44–45).

In addition to the burials within the Project area, human remains have been found north of the old sugar mill outside the Project area (SIHP 50-80-06-5376, Dye 1996b; Spear 1996). These remains may represent four individuals (burials), with at least two of these being interments from historic times (Shideler and Hammatt 2007, Vol. I:220). Thus, the total estimated number of individuals represented by documented human remains in the *ahupua‘a* of Kualoa is 89.

3.4.2 Remembered Landscape

The wahi pana of Kualoa are associated with numerous mo‘olelo. This section offers mo‘olelo of wahi pana in the vicinity of the Project area.

3.4.2.1 Hāloa and Mo‘okapu o Hāloa

Hāloa was the first born of Wākea, a “shapeless mass” that was buried beside Wākea’s house and from which grew the first kalo, while the second born, also called Hāloa, was the first man, according to one mo‘olelo (Pukui and Elbert 1971:382). Hāloa is a creation story of the Hawaiian people that complements the Kumulipo (Beckwith 1951, see Section 3.1), and a genealogical tie to kalo and the land itself. Kalo, a main staple in the Hawaiian diet, is the kinolau (body form) of the god Kāne and a symbol of Hāloa from which all taro plants descended (Ibid.74–75). In addition to these accounts of Hāloa, Hawaiian language newspapers denote Mo‘okapu o Hāloa, the sacred ridge of Hāloa (*Ka*

Na‘i Aupuni 1906; *Kū‘oko‘a* 1896).

3.4.2.2 Kamapua‘a, Pele, and the Formation of Holoape‘e

Kamapua‘a was a kupua (demi-god) who took many forms, ranging from a handsome man to a pig. The birth of this mischievous pig demi-god is first mentioned in the *Kumulipo*, (Beckwith 1951:200). Fornander places Kamapua‘a in the migratory period, about A.D. 1100 (Elbert 1959:196). According to Beckwith’s compilation of mo‘olelo, Fornander describes that Kamapua‘a attempts to court the goddess Pele in his human form, but that the goddess refuses Kamapua‘a and insults him by calling him “a pig” and “the son of a pig,” resulting in an argument of insults. In Kalākaua’s version, he and his followers raid an underground cavern her family lives in. Both stories end with Pele vengefully sending flames and streams of lava over Kamapua‘a (Beckwith 1970:206-207). Mr. A.F. Judd, an informant of McAllister (1933:168), reported a “swale just above the government road and now on the Swanzy estate, known as Koho-a-pe‘e,” which was reportedly made by Kamapua‘a as he fled from Pele. Kamapua‘a hid in a hollow below Kānehoalani, burrowing through the ridge as Pele passed by (Landgraf 1994:8). There are slight variations of the name. Rayna Raphaelson calls the swale Halo-a-pe‘e (1929:28). In 1964, informant Rosamond S. Morgan stated that the name should be Holo-a-pe‘e (run and hide), referring to Pele chasing Kamapua‘a and hiding behind Kānehoalani Ridge. Enraged, Pele did not notice him and continued down the windward coast (Sterling and Summers 1978:183).

3.4.2.3 Mokoli‘i Island

Several mo‘olelo offer various accounts of the genesis of Mokoli‘i Island. In one mo‘olelo, the deity Hi‘iaka, Pele’s younger sister, traveled throughout the Hawaiian Islands, often embarking on perilous journeys encountering supernatural beings. Fornander provides an account of the goddess slaying the large lizard, which created Mokoli‘i, the islet offshore of Kualoa:

> From Hakipu‘u, going *mauka* (inland), because the *pali* projected in the sea, Hi‘iaka found and killed Mokoli‘i, a *mo‘o* (lizard), cut off his tail and threw it in the sea and hence the island of Mokoli‘i, near Kualoa. His body formed the lowland *makai* (towards the sea), below the *pali* of Kualoa (Fornander 1919, Vol. VI:344).

Raphaelson provides another account of the creation of Mokoli‘i Island:

> It was Hi‘iaka, Pele’s sister, who made that island with its three lone palms. Before it had been a vicious dragon who lived on the shore.
>
> It happened this way. She came up the trail, singing her song, and Mokoli‘i, the terrible dragon, reared himself up to challenge her passing. She was so insulted she killed the beast, scattering great rocks of him over the landscape (it is claimed he was used to make part of this road). She put his tail out in the sea. For years it was bare, but now its three palms show black on the sky (Raphaelson 1929:24).

In 1964, Rosamond S. Morgan recalled the legend of the mo‘o who was slain by Hi‘iaka and whose remains created Mokoli‘i Island. As a child, Rosamond Morgan remembered hearing the story from George Roberts sometime in the 1930s. Roberts, a

cantoneer, took a break to retell the story to Morgan:

> "They didn't fight with weapons, but with forces. They fought all over the mountain with forces," said Roberts as he looked up and waved his arms to indicate the back and forth of battle. Morgan was unsure if the story was passed down from his grandmother or "an idea of his own." (Sterling and Summers 1978:182)

A variation of the creation of Mokoli‘i involves Kū-‘īlio-loa, Lono-ka-ehu, and Kaula. Kū-‘īlio-loa (Kū long dog) is described as a dog with a human body who had supernatural powers that made him "a great solider and famous warrior" (Beckwith 1970:347). In some variations, Lono-ka-ehu or Lono-ka-‘eho (the stone god) is said to be Kū-‘īlio-loa's master. Kū-‘īlio-loa accompanied Lono-ka-ehu from Kahiki to O‘ahu to seek his brother (*Kū‘oko‘a* 1867; Kamakau 1991:111). Presumably Kū-‘īlio-loa was with Lono-ka-ehu "when he pierced the hill Kānehoalani at Kualoa" (Beckwith 1970:347). Kaulu, a trickster and hero of windward O‘ahu similar to Kamapua‘a, battles with Lono-ka-‘eho and kills him in the ahupua‘a of Kailua, O‘ahu and continues to Kualoa where he plans to kill Kū-‘īlio-loa. Kaulu lifts Kū-‘īlio-loa and throws him, breaking the dog into pieces, one of which forms the islet of Mokoli‘i. By adding "elided sounds and transposing," the name of Mokoli‘i changes to Moku-‘ilio (dog island) (Beckwith 1970:347–348, 437).

3.4.2.4 Kalepeamoa

A portion of the phallic spire Nānāhoa on the ridge of Kānehoalani is called Kalepeamoa, a "symbolic rooster, who is perched on the ridge, a short distance away from the mother hen, watching her egg" (Raphaelson 1929:29). The belief among some kūpuna is that the rooster or chicken formation is connected to Nānāhoa, who had a chicken as a companion (Maly et al. 1978:21). The newspaper *Ke Aloha ‘Āina* (1919) mentions three legendary places (pana kaulana ma kēia wahi) located on the cliffs of Kualoa, including Lepeamoa (comb [acquired] by [a] chicken, which may refer to a "cockscomb" or to a demi-god by that name (Pukui et al. 1974).

3.4.2.5 Kupua Manō of Kualoa (Kualoa Shark Demi-god)

Mo‘olelo of benevolent sharks that are protective of people and guard resources from misappropriation are well documented in windward O‘ahu. McAllister recorded a tunnel that was said to be dug by a shark that connected Hui-lua Pond at Kahana Mōli‘i Pond at Kualoa (McAllister 1933:165–166). In 1923, a tsunami broke the fishpond wall in Kahana. Assuming that many fish were lost, nets were thrown across the bay in attempt to save what was left. No fish appeared in the pond. As the fishpond was reconstructed, fish began to reappear indicating that there was some sort of passageway.

Raphaelson recalls a similar mo‘olelo of a spring where a shark god resided. The shark god, son of a shark and a human woman, befriended the people of Kualoa who fed him with fish from a nearby pond. This shark was particularly friendly to people, but grew hostile towards other sharks. However, a new chief ruled the land "with a stingy and petty soul" who refused to feed the shark, claiming the fish from the pond was his by right (Raphaelson 1929:30–31). The shark god's father was so enraged by the chief's greed that the flooded the land with a tidal wave. The people of Kualoa Point escaped,

but the pond was destroyed and the selfish chief was swept away (Raphaelson 1929:30–31).

3.4.2.6 Ahu o Laka

Ahu o Laka (altar of Laka), a three-acre patch of sand in Kāne‘ohe Bay known as the Kāne‘ohe Sandbar, has been a popular recreational area accessible at low tide by boat (Pukui et al. 1976:6). An alternate name, Ahua-a-Laka (sand bank of Laka), is suggested in a portion of a chant relating to the Maui chief, Laka, born in Kīpahulu, Maui (other suggestions have been Hilo, Hawai‘i) and from the Ulu genealogy:

> Ha‘ule I Kualoa.
> I Mokoli‘i, i Mokuahukele,
> I kai lo ‘ilo ‘i i ‘Āpua, i kai malino;
> I Makami la i Waiāhole,
> I Hale‘ula la I Waikāne,
> I Hakipu‘u, I Kualoa,
> I kai, i‘ō Ahua-a-Laka,
> ‘O Laka ho‘i a Wahieloa;
> Nāna ho‘i ‘o Lu‘anu‘u. (Kamakau 1991:145–146)

Translation of this chant:

> He (Laka) died at Kualoa.
> To Mokoli‘i, Mokuahukele,
> To the pooled sea at ‘Āpua, the calm sea;
> To Makami there in Waiāhole,
> To Haleula there in Waikāne,
> To Hakipu‘u, to Kualoa,
> To sea, to Ahua-a-Laka,
> Laka-a-Wahieloa was taken;
> Taken by Luanu‘u. (Kamakau 1991:145–146)

Raphaelson describes that the men of Kualoa began to fish in Kailua Bay, depleting resources that resulted in people dying of famine. The god of Kailua became enraged, proposing a battle with the god of Kualoa. The battle proved the god of Kailua to be the winner. After the two gods made a pact to fish on their own grounds, the sandbar was put into the sea as a marker (Raphaelson 1929:23).

3.4.2.7 Kaha‘i

Kaha‘i, born in I‘ao Valley on Maui and also from the Ulu line, is the grandfather of Laka, chief of Maui (Beckwith 1970:238). The chant of Kaha‘i tells how he goes "by the path of the rainbow" and is guided by cloud signs to seek his father who had his eyes gouged out while on an expedition to foreign lands. A daring man and skilled sailor, Kaha‘i sailed through uncharted territory guided only by the stars at night until he landed in Samoa. Upon his return to Hakipu‘u, he told tales of the people of Samoa and brought back some seeds. Kaha‘i planted these seeds, including the first breadfruit tree. Kaha‘i

was honored and raised by the chiefs to their own rankings, never needing to lower his sail for anyone of stately rank. Many journeys were made by Kaha‘i. It is said in 1795 when Kamehameha sailed around the island of O‘ahu that he lowered his sail to show respect for Kaha‘i (Raphaelson 1929:29)

3.4.3 Cultural Traditions

Mo‘olelo and Hawaiian language newspaper accounts detail several cultural traditions at Kualoa, including the use of the land as a pu‘uhonua (place of refuge), the lowering of sails, and sacrificial drowning.

3.4.3.1 Pu‘uhonua

Pu‘uhonua are places of refuge where kapu-breakers or non-combatants during times of war could find culturally sanctioned asylum and safety from which they might be allowed to leave at a later time and reintegrate within society. According to Kamakau, ruling chiefs were regarded as pu‘uhonua incarnate. Their lands (‘āina pu‘uhonua), as well as their consorts and deities, were also regarded as sacrosanct. Ten places on O‘ahu were regarded as pu‘uhonua, six of which were in the Ko‘olau districts. One of several such sanctuaries was the ahupua‘a of Kualoa (Kamakau 1992:17–18). As Shideler and Hammatt (2007:62) detail, however, there is a notable lack of reference asserting that Kualoa was a pu‘uhonua other than Kamakau, especially among Hawaiian language newspaper accounts.

3.4.3.2 Lowering Sails

In ancient times and today, voyagers and sailors passing by Kualoa honored its sacred land of high chiefs by lowering their canoes’ sails (Fornander 1919, Vol. IV:370). This is tradition is associated with the ruling chief Kūali‘i:

> During his youth Kūali‘i was brought up sometimes at Kailua, at other times at Kualoa. One of the special tabus attached to Kualoa, whenever the chief resided there, was that all canoes, when passing by the land of Kualoa, on arriving at Makawai, should lower their masts and keep them down until they had passed the sea off Kualoa and got into that of Ka‘a‘awa. I note the tabu and the custom, but I am not certain of the underlying motive. It may have been a religious observance on account of the sacred character of the “Pali o Kualoa,” or a conventional mode of deference to the high chief residing there. It was strictly observed however, and woe to the infractor of the tabu (Fornander 1969:278).

3.4.3.3 Sacrificial Drowning

Ritualized drowning is commonly associated with Kualoa through mo‘olelo of Hi‘iaka’s transit of Kualoa and ruling chiefs (*Ka Loea Kalaiaina* 1899; *Ka Loea Kalaiaina* 1900; *Ka Na‘i Aupuni* 1906; Fornander 1917, Vol. IV:549; *Hōkū o Hawai‘i* 1926), as well as the following ‘ōlelo no‘eau: “Ka limu lana o Kawahine,” which Pukui (1983:156) translates as “The floating seaweed of Kawahine,” and glosses as “A term applied to the kauwā who were drowned at Kualoa, O‘ahu, before serving as sacrifices.” The practice of kauwā sacrificial drownings at Kualoa may have resembled those of Kewalo, in which priests performed the drowning and designated the kauwā for a heiau associated with a form of the deity Kāne (Shideler and Hammatt 2007:73).

3.4.4 The Māhele

To try to maintain sovereignty of the land, the Mōī (King) Kauikeaouli (Kamehameha III) in 1846–1848 supervised the Māhele—the division of Hawaiian lands—that transformed the land system in Hawai‘i from collective to private ownership. Modeled after Western concepts, certain lands to be reserved for himself and the royal house were known as Crown Lands, lands claimed by ali‘i and their konohiki were called Konohiki Lands, and lands set aside to generate revenue for the government were known as Government Lands. In 1850, these three categories of land were subject to the rights of the maka‘āinana and other tenants (naturalized foreigners, non-Hawaiians born in the islands, or long-term resident foreigners), who could make claims for their habitation and agricultural plots, known as kuleana (Native land rights) parcels (Chinen 1958:8–15).

Under the Kuleana Act of 1850, the maka‘āinana were required to file their claims with the Board of Commissioners to Quiet Land Titles (Land Commission) within a specified time period in order to apply for fee-simple title to their lands. The claim could only be filed after the claimant arranged and paid for a survey, and two witnesses testified that they knew the claimant and the boundaries of the land, knew that the claimant had lived on the land since 1939, and knew that no one had challenged the claim. Then, the maka‘āinana could present their claims to the Land Commission to receive their Land Commission Award (LCA) (Kame‘eleihiwa 1992).

Not everyone who was eligible to apply for kuleana lands did so and not all of those claims were awarded. Some claimants failed to follow through and come before the Land Commission, some did not produce two witnesses, and some did not get their land surveyed. In addition, some maka‘āinana may have been reluctant to claim ‘āina that had been traditionally controlled by their ali‘i, some may have not been familiar with the concept of private land ownership, and some may have not known about the Māhele, the process of making claims (which required a survey) or the strict deadline for making claims. Further, the Land Commission was comprised largely of foreign missionaries, so the small number of claimants and awards may reflect only those maka‘āinana who were in good standing with the church. Significantly, the surveying of the land was not standardized (Kame‘eleihiwa 1992:296–297).

A total of 14,195 claims were filed and 8,421 awards were approved to about 29 percent of the 29,220 adult Native Hawaiian males living at the time of the Māhele, averaging three acres each (Kame‘eleihiwa 1992:295). Out of the potential 2,500,000 acres of Crown and Government lands, 28,658 acres of land were awarded to the maka‘āinana, less than one percent of the total acreage of Hawai‘i (Kame‘eleihiwa 1992:295). The small number of kuleana awards and their small size prevented the maka‘āinana from maintaining their independent subsistence (Chinen 1958:32), often forcing them to abandon their newly acquired property (Lyons 1875)

Although many Hawaiians did not submit or follow through on claims for their lands, the distribution and written testimonies of LCAs can provide insight into patterns of residence and agriculture. Many of these patterns probably had existed for centuries. By examining the patterns of kuleana LCA parcels in the vicinity of the Project area, insight can be gained to the likely intensity and nature of Hawaiian activity in the area.

In 1848, the Crown, the Hawaiian government, and the ali‘i received their land titles. Kamehameha III claimed the entire ahupua‘a of Kualoa (Kualoha 1 and Kualoa 2) to be part of

his private lands. On November 20, 1850, missionary Gerrit P. Judd bought Kualoha 1 and Kualoa 2, a total of 622 acres, from Kamehameha III. The deed also included Mokoli‘i Island and the adjoining fishing grounds.

The maka‘āinana received their kuleana awards (individual land parcels) in 1850 and thereafter. There were 37 LCA kuleana claims filed within Kualoa Ahupua‘a, of which 35 were awarded (Figure 27 and Table 3). Some of these claims also had multiple ‘āpana (lots) in nearby Hakipu‘u, Waikāne, Ka‘a‘awa Ahupua‘a, and even as far as Waipi‘o. Claims consisted of a pā hale (house lot), lo‘i kalo, and kula ‘āina (field or pasture land). Records show that the most commonly grown crops in the Kualoa region were sweet potato, wauke (paper mulberry), beans, and melons. The majority of pā hale (25 homes) were located near the coastline. Of these homes near the shoreline, five were located within the boundaries of Kualoa Regional Park and two bordered the Project Area: LCA 3011 (Mahiole) and LCA 3052 (Kaneakalau). The remainder (ten homes) were located further inland near their lo‘i kalo or kula ‘āina. Of the homes located further inland, eight were located within the boundaries of Kualoa Regional Park, as well as 11 lo‘i kalo and two kula‘āina within the park. The remaining 26 kula ‘āina parcels were located outside of Kualoa Regional Park, closer to the Ko‘olau Mountain Range, spanning from the Hakipu‘u Ahupua‘a boundary to Kānehoalani Ridge (Waihona ‘Aina 2000).

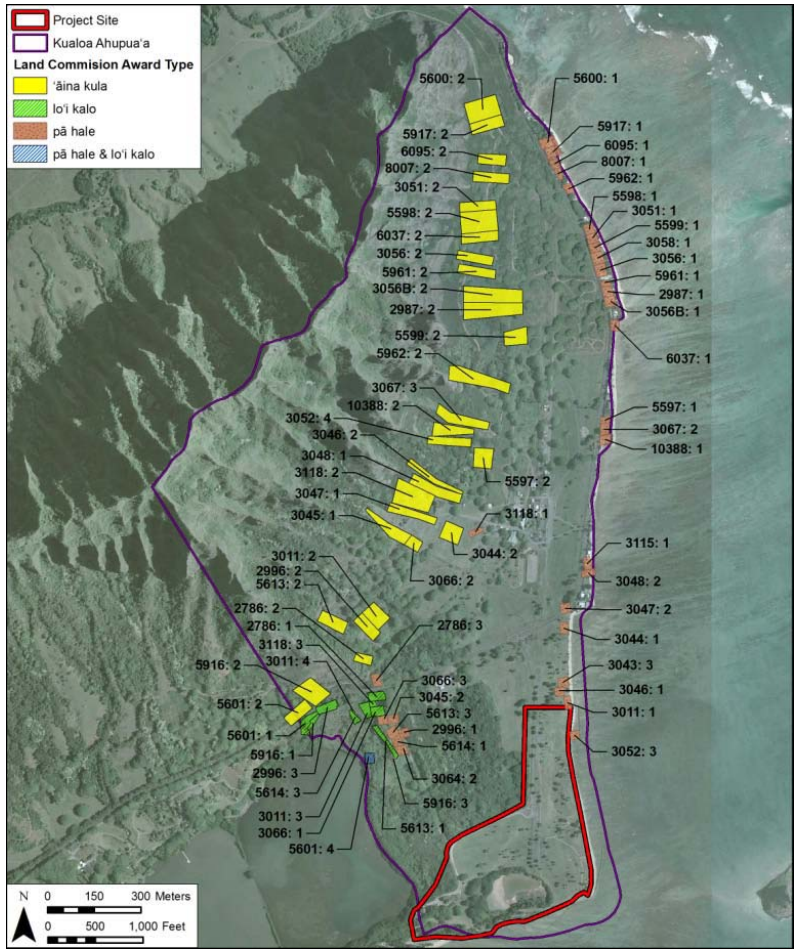


Figure 27. LCAs in Kualoa (base image, 2007 Google aerial)

Table 3. LCAs in Kualoa

LCA	RP	Claimant	Ahupua‘a	Land Use	Notes
2786	617	Ma‘alea	Kualoa	House lot, lo‘i, sweet potatoes, wauke	
2987	1431	Laumania (Laumanea)	Kualoa Hakipu‘u	House lot, ‘āina kula (two ‘ili in one piece), lo‘i	
2996	492	Nawahinekaunu	Kualoa	House lot, sweet potatoes, melons, wauke, lo‘i	
3011	620	Mahiole	Kualoa	House lot, sweet potatoes, lo‘i	Unclear reference to a pond; located in the Project area
3043	499	Kapi‘ioho (Kapi‘ipo)	Haikupu‘u	House lot	
3044	6952	Kamakai	Kualoa	House lot, sweet potatoes, wauke	
3045	6950	Keli‘iokahonua	Kualoa	House lot, sweet potatoes, wauke	
3046	1126	Kamanu	Kualoa	House lot, two ‘ili kula, partially cultivated	
3047	624	Kauaiwahine	Kualoa	House lot, sweet potatoes	
3048	616	Kekihe	Kualoa	House lot, sweet potatoes	Claimant died in 1848, leaving his land to his child Analuhi
3051	621	Keli‘ikuhiau (Keli‘ikuiau)	Kualoa Hakipu‘u	House lot, ‘āina kula, lo‘i	
3052	292	Kaneakalau	Kualoa	House lot, lo‘i, sweet potatoes, wauke	Located in the Project area
3056	481	Kailihewa	Kualoa	House lot, sweet potatoes, wauke	
3056B	482	Kona‘aihele	Kualoa Haikpu‘u	House lot, sweet potatoes, lo‘i	
3057	N/A	Kaiwinui			Not awarded
3058	487	Kuewa	Kualoa Hakipu‘u	House lot, lo‘i	

LCA	RP	Claimant	Ahupua‘a	Land Use	Notes
3064	1134	Kaulahea	Hakipu‘u	House lot, lo‘i	
3066	618	Kae	Kualoa	House lot, lo‘i, wauke	Claimant died in 1849, leaving his land to his sister Wahinenui
3067	485	Kukolo (Kukola)	Kualoa	House lot, sweet potatoes, lo‘i	Pā hale distinct and enclosed with an adobe fence
3115	615	Kamaohao (Namakaohao)	Kualoa Hakipu‘u	House lot	
3118	65	Haole		House lot, sweet potatoes, lo‘i	Pā hale included in the ‘āina kula, not enclosed
5597	627	Keanu	Kualoa	House lot, sweet potatoes, wauke, lo‘i	
5598	488	Kanakanui	Kualoa Hakipu‘u	House lot, ‘aina kula, lo‘i	Died, date unknown. Left his land to his son, Newa.
5599	489	Kua	Kualoa Hakipu‘u	House lot, sweet potatoes, lo‘i	Inherited land from his brother
5600	491	Konohili	Kualoa	House lot, sweet potatoes, wauke, lo‘i	Pā hale, makai of the road, enclosed with a mud wall
5601	484	Kau	Kualoa	House lot, sweet potatoes, melons, lo‘i	
5613	290	Kamali‘i	Kualoa	House lot, sweet potatoes, wauke, lo‘i	Claimant died in 1848, leaving his land to his wife Po‘opu‘u
5614	291	Kepa‘a	Kualoa	House lot, sweet potatoes, lo‘i	Lo‘i includes a fish pond in Hakipu‘u. Kepa‘a is the caretaker; however, the King’s land agent claims the fish pond
5916	483	Pupuka	Kualoa	House lot, sweet potatoes, lo‘i	Inherited land from Kamakahonu, a former Konohiki

LCA	RP	Claimant	Ahupua‘a	Land Use	Notes
5917	486	Po‘ohiwi	Kualoa Hakipu‘u	House lot, sweet potatoes, wauke, lo‘i	Claimant died in 1848; his brother Kakiana was the heir; Kakiana became the caretaker of claimant’s land, wife, and child
5953	none	Mahina	Kualoa		Claimant died in 1848; Hulue took the children to Ka‘a‘awa to live; the land was returned to the konohiki of Kualoa as the claimant did not have any relatives to go to the po‘alima or to work the land.
5961	622	Mahoe	Kualoa	House lot, sweet potatoes,	
5962	626	Maliu	Kualoa	House lot, sweet potatoes, lo‘i	
6037	623	Aweau	Kualoa	House lot, sweet potatoes	Claimant received land from Kamakahonu, a former Konohiki; claimant died in 1848, widow abandoned the land; a relative named Newa has reclaimed the property.
6095	490	Ululani	Kualoa	House lot, previously planted in sweet potatoes	Due to the claimant being ill, the witness stated the two ‘ili were not planted at the time the statement was given
6949	none	Kona‘aihele	Kualoa	House lot, sweet potatoes, lo‘i	
8007	619	Aihulu	Kualoa Ka‘a‘awa Hakipu‘u	House lot, sweet potatoes, wauke, lo‘i	
10388	493	Nalino	Kualoa Hakipu‘u	House lot, sweet potatoes, lo‘i	

3.4.5 Shifting Landscape

The cultural landscape at Kualoa has been severely impacted by shifts in the use of the land since the Māhele, including ranching, the rise of a sugar plantation, the construction and use of military infrastructure, and massive erosion. These changes can be seen in a progression of historic maps and images (Figure 28 to Figure 34). Significant places of historic interest are Glen Hala (the home of Gerrit P. Judd), Wili-ka-‘ā‘ī (the sugar mill), Kualoa Church, Hale Makani, and the Morgan family beach house (now the Park Office building) (Figure 35, Table 4).

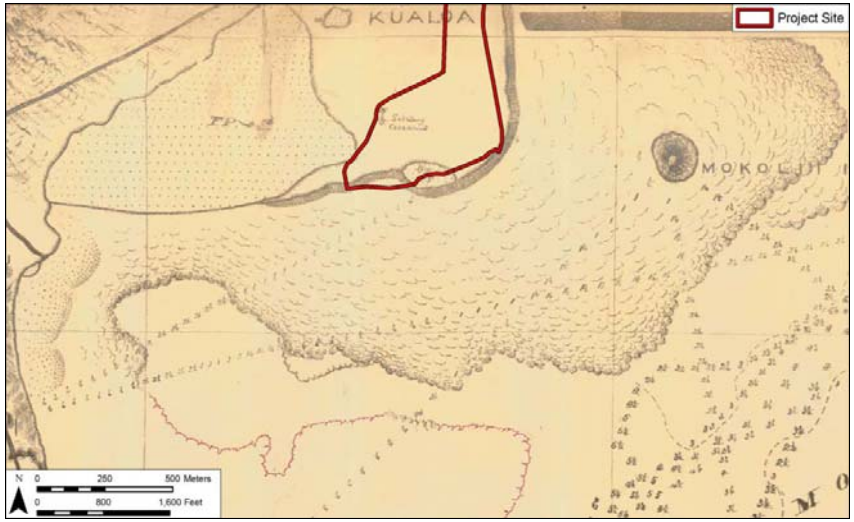


Figure 28. 1882 map of Kāne‘ohe Bay, including the area of Kualoa Regional Park, by George Jackson

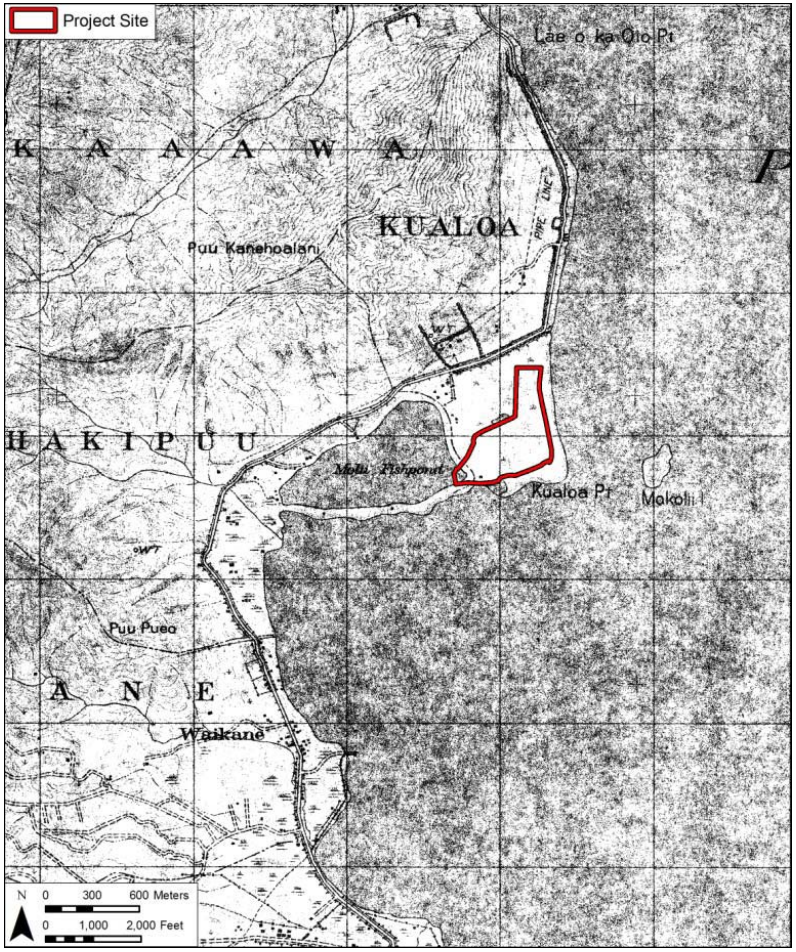


Figure 29. Portion of 1919 U.S. War Department map, Kāne‘ohe quadrangle, showing the Project area

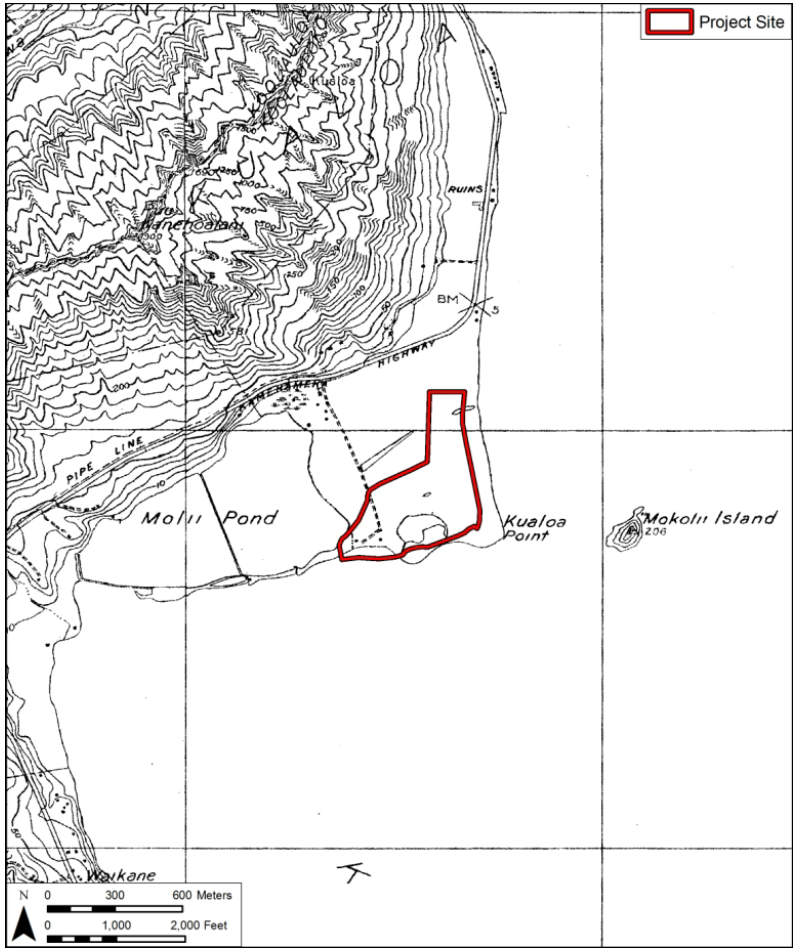


Figure 30. Portion of 1928–1930 USGS 7.5-minute topographic map, Waikāne quadrangle, showing the Project area

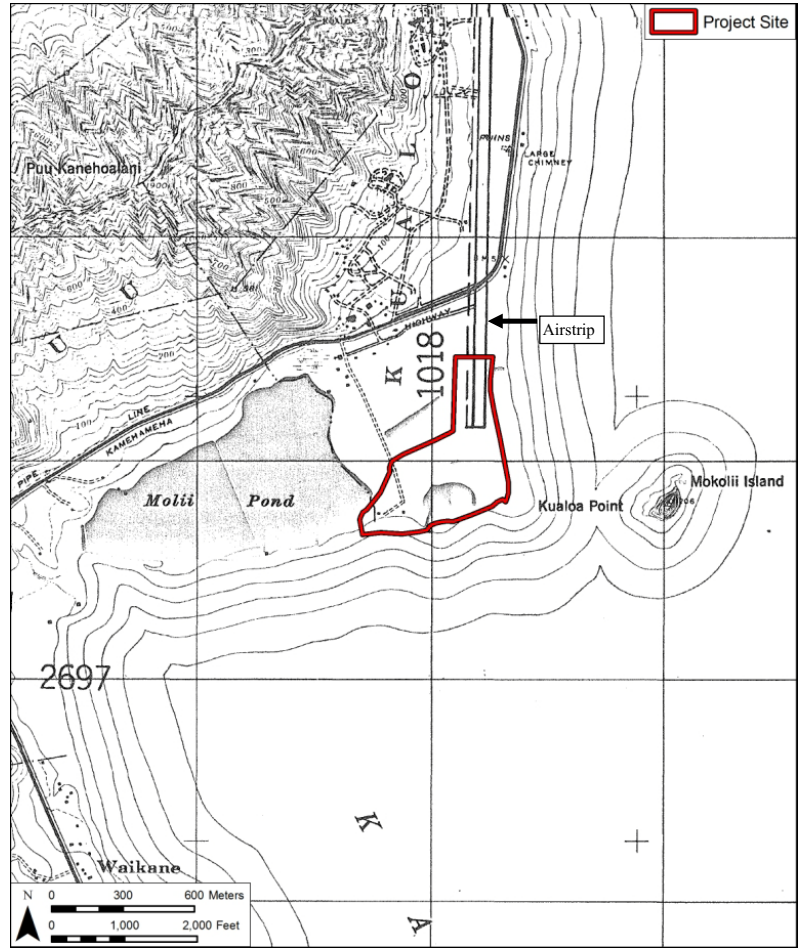


Figure 31. Portion of 1943 U.S. War Department map, Waikāne and Kahana quadrangles, showing the Project area

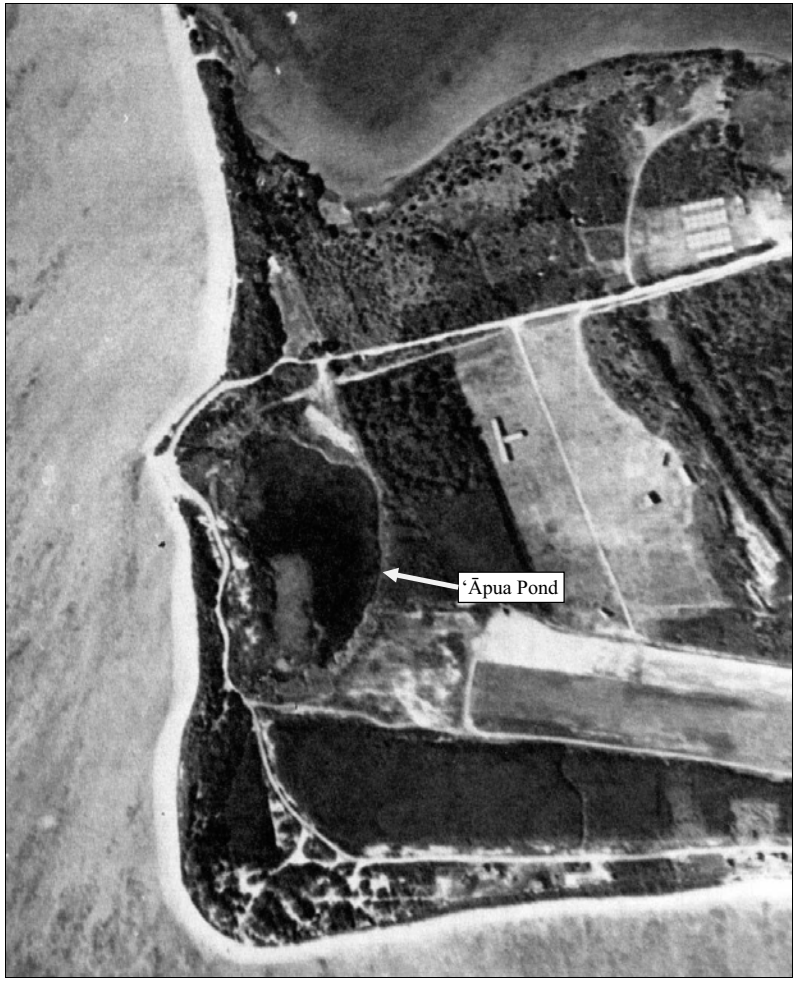


Figure 32. 1945 aerial view of Kualoa Point showing accretion south of ‘Āpua Pond (U.S. Army Engineer District Honolulu 1977:C-4)

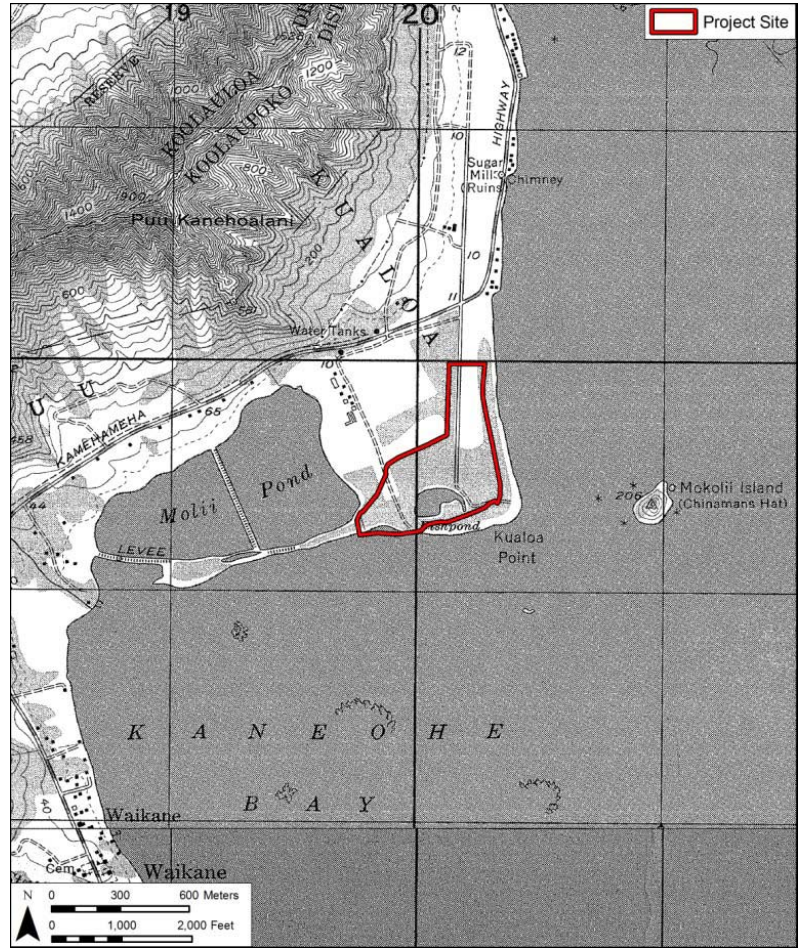


Figure 33. Portion of 1954 U.S. Army Mapping Service (AMS) map, Kāne‘ohe and Kahana quadrangles, showing the Project area

Figure 34. Portion of the orthoimagery of the 1977–1978 USGS 7.5-minute topographic map, Kahana quadrangle, showing the Project area

Figure 35. Historic-era sites in Kualoa (base image, 2007 Google aerial)

Table 4. Historic-era Sites in Kualoa

Site	Site Description	Source
Glen Hala	Gerrit P. Judd's family home and ranch, named Glen Hala because it was situated in a secluded area of pandanus trees	*Family Records. House of Judd* 1930:33
Kualoa Church	Built in 1865 by the Judd family and torn down in 1945	*Kū‘oko‘a* 1865
Morgan family beach house	Built in the 1950s, now the Park Office Building	Shideler and Hammatt 2007, Vol. II, Francis Morgan interview
Hale Makani	Stone bathhouse built in 1916 by the Morgan family, which they knew as Hale Makani (House of Winds)	Shideler and Hammatt 2007, Vol. II:101, Francis Morgan interview
Sugar Mill	Built in 1864; named Wili-ka-‘ā‘ī (twist the neck) after a one-eyed Hawaiian worker who was not used to using a shovel developed a sore neck after turning to watch each shovel load fly	*Family Records. House of Judd* 1930:33

3.4.5.1 Kualoa Sugar Plantation

In his first decade of land ownership at Kualoa, Gerrit P. Judd developed a farm and ranch at Kualoa named Glen Hala (Figure 36). The Judd family maintained as many as 25 head of cattle, five geese, 100 chickens, and 34 horses, and cultivated 28–30 acres of corn and 20 acres of beans, as well as squashes, sweet potatoes, pineapples, garden vegetables, melons, grapes, figs, peanuts, and apples. Recreational activities included hunting rabbits on Mokoli‘i Island, sailing on Kāne‘ohe Bay, and shooting plovers (*Family Records. House of Judd* 1930:83–83).

In 1863, a partnership among Gerrit P. Judd, his son Charles H. Judd, and his son-in-law, Samuel G. Wilder, had accrued enough capital and lands in Kualoa, Hakipu‘u and Ka‘a‘awa to launch the Kualoa Sugar Plantation, which began with 627 acres under cultivation. In 1864, they built a sugar mill—the first such mill on O‘ahu—which was named Wili-ka-‘ā‘ī (twist the neck), after a one-eyed Hawaiian worker who was not used to using a shovel developed a sore neck after turning to watch each shovel load fly (Corwin 1866, cited in Sterling and Summers 1978:180) (Figure 37). The first Chinese contract laborers arrived in the Hawai‘i in 1865, and many began working almost immediately as plantation workers for the Kualoa Sugar Plantation (Kuykendall 1953:181). By 1867, 97 workers were employed, including several Japanese contract laborers (Wight 1909:142) and Hawaiians (*Kū‘oko‘a* 1865). The number of Hawaiians working at the Kualoa Sugar Plantation may have encouraged Dr. Judd to build a church on his lands (*Kū‘oko‘a* 1865) (Figure 38). The collapse of the plantation most likely contributed to the decline of the Kualoa Church, or the Church of ‘Āpua.

Several factors contributed to the abandonment of commercial sugar production at Kualoa in 1871, including low rainfall and difficulties in transportation (*Star-Bulletin*, April 4, 1959). Under the direction of Charles H. Judd, the Judd family returned to ranching on 4,000 acres, including most of Hakipu‘u, Kualoa, and Ka‘a‘awa. At the death of Charles H. Judd in 1890, ownership of Kualoa Ranch passed on to his daughter Julie Judd Swanzy. She had married the affluent Francis Mills Swanzy in 1887 and was able to buy out her siblings. Julie Swanzy ran the ranch for 48 years until 1938. Three years before Julie Swanzy died (at the age of 80), the ranch passed to her daughter, Rosamond Swanzy Morgan. Under the leadership of George Y. Bennett, Kualoa Ranch sought approval from the city planning commission for the development of a forty-acre subdivision (26 lots) on the makai side of the highway near the Ka‘a‘awa Beach Park in 1940 (Peet 1940). These lots were first leased in the 1940s and 1950s (Twigg-Smith 1989).

In addition to Glen Hala and the sugar mill, other sites of historic interest Hale Makani (House of Winds), a stone bathhouse built in 1916 by the Morgan family, and the Morgan family beach house, constructed in 1950, which became the site of the Kualoa Regional Park's office building (Francis Morgan interview, Shideler and Hammatt 2007, Vol. II:101).

Figure 36. Glen Hala, the Gerrit P. Judd family home at Kualoa (Mission Houses Museum)

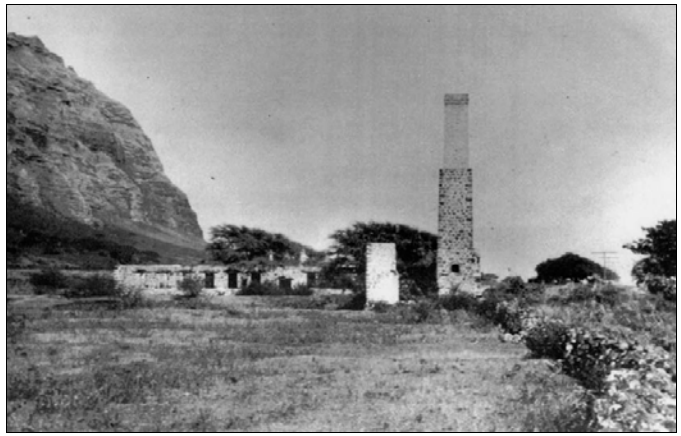


Figure 37. Ruins of Kualoa Sugar Mill (Hawai‘i State Archives)

Figure 38. Church at ‘Āpua, 1940 (Mission Houses Museum)

3.4.5.2 Military infrastructure

Immediately after the Japanese attack on Pearl Harbor on December 7, 1941, the U.S. Army viewed Kualoa as a strategic position for protecting Kāne‘ohe Bay and the Navy airbase on Mōkapu peninsula (Dorrance 1993:6). During World War II, the military used Kualoa as an air strip for fighters and bombers, as a place for coastal fortifications including bunkers, a control center and strung barbed wire, as a center for motor vehicle maintenance, and as a barracks and recreation center. Significantly, the army built a grassed emergency airstrip 6,000 feet long and 150 feet wide parallel to the eastern beach extending across the main road (now Kamehameha Highway (Figure 39). Bulldozing for the airstrip disturbed a number of human burials were disturbed, but no records were kept concerning their discovery and disposal (Gunness 1986:9). A series of camouflaged aircraft bays were excavated perpendicular to the runway, back into the hillside north of the sugar mill ruin, to shelter bomber-sized aircraft (Figure 40). Other military infrastructure included a coastal artillery battery located above Kalaeka‘ō‘io Point (named Battery Cooper after the guns were removed in 1946), with tunnels behind the guns that stored electrical power generators, a galley, latrine, first aid and radio rooms, sleeping quarters, radio and radar apparatus, and ammunition magazines. In addition, concrete bunkers were constructed in the uplands of Kualoa to protect parked airplanes, numerous small fortifications were established from the edge of the shore to the base of the steep pali, and a series of small cement pillboxes were constructed on the edge of Mōli‘i Pond (Dorrance 1996:18).

Figure 39. Aerial view of Kualoa, circa 1943, showing the airstrip and extensive infrastructure (U.S. Army Museum of Hawai‘i)

Figure 40. Aerial view of north portion of Kualoa airstrip during World War II, showing extensive camouflaged bays for aircraft (U.S. Army Museum of Hawai‘i)

3.4.5.3 Erosion

Massive erosion along the eastern beach of the Kualoa Regional Park has uncovered coastal archaeological features, including burials. Between 1949 and 1979, the eastern beach and Kualoa Point lost approximately six acres (80,000 cubic yards) of sand, with an average loss of beach width of over 120 feet of sand. Although sand accretion has occurred along the southern beach and at the wall of Mōli‘i Fishpond, the net pattern was substantial loss, with the eastern shoreline receding at a rate of four feet per year and Kualoa Point receding at a rate of about seven feet per year (Connolly 1977).

The pattern of change of the coastline prior to 1949 is less clear. Mokoli‘i Island is a sea stack that has been isolated from the main shoreline by erosion (Macdonald et al. 1983:269), but when this isolation occurred is unclear. A map by George Jackson in 1882 indicates that Kualoa Point had a blunted shape at that time, with virtually no land extending south of ‘Āpua Pond (see Figure 28). Maps and aerial photographs indicate that during the first decades of the twentieth century, a substantial point of land had accreted south of the fishpond (see Figure 29 to Figure 32), but during the mid twentieth century, there had been a progressive return to the blunted shape of the point (as down in the 1882 map) (see Figure 33 and Figure 34). This suggests a long-term pattern in which the configuration of sand deposits at the point waxes and wanes.

Short-term and long-term measures were suggested to reduce the severe erosion and uncovering of cultural resources. The interim measure involved constructing a discontinuous breakwater system, but this actually increased erosion in some areas (Connolly 1978:5–7). The proposed long-term measure involved a 3,500-foot long protective beach, which would require

sand replenishment every four years through massive dredging from an offshore sand deposit 1,000 feet south of Mōli‘i Pond (Connolly 1977). This project was effectively terminated with the protests by fishermen that the dredging would destroy fishing grounds, create noise and other pollution, render neighboring beaches and recreation spots unusable, and produce ciguatera fish toxin (McCoy 1979:6; Tong 1980:19). In 1982, concrete pylons were placed along the beach in front of the bathhouse at the point and backfilled with basalt boulders to form a defensive revetment and preserve the facility (Whitten 1982:8) In 1984, “surgebreaker” modules were installed to dissipate wave energy, but erosion has continued (Tune 1994:1).

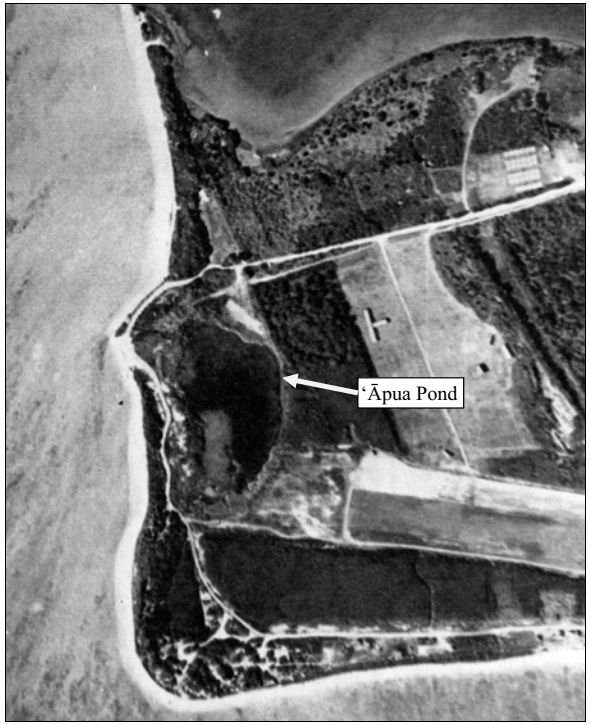


Figure 41. 1945 aerial view of Kualoa Point showing accretion south of ‘Āpua Pond (U.S. Army Engineer District Honolulu 1977:C-4)

3.4.6 Contemporary Cultural Practices

In recent years, Kualoa has been the site of efforts to revitalize cultural practices, including worship with the Temple of Lono, and voyaging traditions with the launching and sailing of *Hōkūle‘a*. Places associated with these practices include an area occupied by the Temple of Lono between 1981 and 1985, Hōkūle‘a Beach, and an ahu constructed after a 16,000 mile voyage by *Hōkūle‘a* between 1985–1987 (Figure 42, Table 5).

Table 5. Contemporary Cultural Sites

Site	Site Description	Source
Hōkūle‘a Beach	South Beach, in reference to the launching of Hōkūle‘a in 1976, its subsequent landing in 1987 Hōkūle‘a, and its legacy of the Polynesian revival of voyaging	Finney 1994
ahu	Constructed near Hōkūle‘a Beach to commemorate the 13 years (at the time) of voyaging of *Hōkūle‘a*	Finney 1994
Temple of Lono	In 1981, Samuel H. Lono, a kahuna, and his haumāna (students) occupied an area within Kualoa Regional Park to practice the sacred rites of the Temple of Rono (the god Lono); the practicioners were evicted and the camp destroyed	Scott 1981a:5, 1981b:7

Figure 42. Contemporary cultural practices in Kualoa (base image, 2005 USGS orthoimagery)

3.4.6.1 Temple of Lono (1981-1985)

In 1981, Samuel H. Lono, a kahuna, and his haumāna (students) occupied an area within Kualoa Regional Park to practice the sacred rites of the Temple of Rono (the god Lono) (see Section 3.4.7.4 for a previously recorded interview with Palani Nobriga. A student of Samuel Lono). Maintaining that Kualoa is a pu‘uhonua and that a heiau had existed there from ancient times, they began constructing/restoring a heiau, as well as cultivating vegetables and erecting tents. Kahuna Lono maintained “the inherent right of freedom to believe, express and exercise” traditional religious beliefs, guaranteed by the American Indian Religious Freedom Act of 1978, supported his encampment and worship at the Kualoa Park (Scott 1981a:5). Kahuna Lono was issued a notice for eviction, several of his followers were arrested, and a crew of workers, two front-loaders and a two-ton truck quickly obliterated the camp with its three large tents and extensive plantings. Within an hour of the arrival of the police, nothing remained of the Temple of Lono (Scott 1981b:7). The Kāne‘ohe District Court cleared Lono and his followers of all charges (*Advertiser*, January 29, 1982:11).

In 1985, the Temple of Lono group re-occupied Kualoa for the purpose of practicing hō‘ike ka pō (the showing of the night), a religious ritual involving meditation and prayer, seeking advice from the gods. The police issued 54 citations for illegally camping at Kualoa Regional Park, which the State Supreme Court affirmed (*Star-Bulletin*, April 4, 1985:8).

3.4.6.2 Polynesian Voyaging Society and the Legacy of *Hōkūle‘a*

On March 8, 1975, a 62-foot performance replica of a double-hulled Polynesian voyaging canoe, *Hōkūle‘a*, was launched from Hakipu‘u near the border of Kualoa into Kāne‘ohe Bay (Figure 43) (see Section 3.4.7.5 for a previously recorded interview with Gordon Pi‘ianaia, a captain of *Hōkūle‘a* who was present at its inaugural launch). The canoe was named after the star Hōkūke‘a (Star of Gladness; Acturus), which rises at its zenith above the Hawaiian Islands and may have been used as a navigational referent to ascertain the latitude of the archipelago. The Polynesian Voyaging Society, which was founded in 1973 by anthropologist Ben Finney, artist Herb Kane, and director of the Hawai‘i Maritime Center, Tommy Holmes, built *Hōkūle‘a* in order to investigate the performance characteristics of ancient voyaging canoes and understand non-instrumental navigation in an attempt to understand how ancient mariners explored the Pacific Ocean and discovered and settled virtually every habitable island. In 1976, the Satawalese navigator Mau Piailug successfully guided *Hōkūle‘a* to Tahiti, a distance of over 2,000 miles (Finney 1979). This and subsequent voyages demonstrated that long-distance voyaging and navigation were possible and supported the idea that the Pacific was intentionally settled through two-way voyages that exploited seasonal wind shifts (Finney 1994)

Since the launching of *Hōkūle‘a* at Kualoa and the first voyage to Tahiti in 1976, *Hōkūle‘a* has logged 100,000 miles at sea, sailing to Tahiti and back again in 1980, through Tahiti, the Cook Islands, Aotearoa, Tonga, and Samoa between 1985–1987, in the Cook Islands in 1992, to the Marquesas and back with the newly built *Hawai‘iloa* and *Makali‘i* in 1995, along the west coast of the U.S. with *Hawai‘iloa* in 1995, to Rapa Nui and back between 1999–2000, through the northwest Hawaiian Islands to Papahanaumokuakea between 2003–2004, to Satawal and Yap with the gift of *Alingano Maisu* for Mau Pialug in 2007, from Yap to Okinawa and Japan in 2007, and to Palmyra Atoll in 2009 (Polynesian Voyaging Society 2011)

Hōkūle‘a and its legacy of voyaging revivals throughout the Pacific were, and continue to be, connected to Kualoa since its launching at Kualoa in 1975. After returning home from most of its voyages, *Hōkūle‘a* sailed into Kualoa Regional Park. After the 1985-1987 voyage to Aoteara, nine new chants were written for the welcome home ceremonies, including one that praised Kualoa. South Beach at Kualoa Regional Park was renamed Hōkūle‘a Beach. Everyone who had sailed with the canoe over its thirteen-year history held stalks of *ti* leaves as they sat before an ahu (shrine) that was constructed near the beach (Finney 1994) (Figure 44). Most recently, seven voyaging canoes representing Tahiti, Samoa, Fiji, Tonga, Aotearoa, New Guinea, Vanuatu, Kiribati, and the Solomon Islands sailed together in a voyage called Te Mana O Te Moana from the Marquesas to Hawai‘i, and were welcomed on June 25, 2011 at Kualoa Regional Park with speeches, dances, and a traditional *pwo* (titled navigator; Satawalese) ceremony (Polynesian Voyaging Society 2011) (Figure 45).

Figure 43. Launching of *Hōkūle‘a* at South Beach (later renamed Hōkūle‘a Beach) in 1975 (Polynesian Voyaging Society 2011)

Figure 44. Ahu at Hōkūle‘a Beach constructed in 1987 (CSH June 25, 2011)

Figure 45. Two of seven voyaging canoes at Hōkūle‘a Beach as part of a voyage called Te Mana O Te Moana (CSH June 25, 2011)

3.4.7 Previous Oral History Research

This section concludes the cultural and historical background by highlighting the voices of individuals who were previously interviewed with various connections to Kualoa, including a resident of Hakipu‘u (Herbert Hoe), a resident of Kualoa Ranch (Francis Morgan), a captain of *Hōkūle‘a* (Gordon Pi‘ianaia), and a representative of the Temple of Lono (Palani Nobriga), a priesthood dedicated to the god Lono (see Shideler and Hammatt 2007, Vol. II for full transcripts of these and other previous interviews). Their mo‘olelo color the cultural and historical background with nuanced recollections and add a depth to the information provided by kūpuna and kama‘āina who were recently interviewed for this CIA (see Section 5).

3.4.7.1 Herbert Hoe

Herbert Hoe, a member of the Hoe ‘ohana (family) of Hakipu‘u Ahupua‘a, was born in 1938. Mr. Hoe grew up in Hakipu‘u and the surrounding ahupua‘a. Mr. Hoe and his ‘ohana have helped organize cultural celebrations at Hakipu‘u and Kualoa, including the Makahiki and the welcoming home of the voyaging canoe *Hōkūle‘a*. Herbert Hoe was interviewed by CSH in Kailua, O‘ahu on June 16, 1998 (Shideler and Hammatt 2007, Vol. II:49–69).

As a child, Mr. Hoe and his family utilized the marine resources of Kāne‘ohe Bay. He fished with gill nets, hunted crabs and squid, and gathered limu. He also mischievously stole fish from Mōli‘i Fishpond, which was maintained by the Uyemura family. His family also gathered mountain resources:

> We used to go up and get the bark of the *kukui* nut tree and use [it] as the dye for the fishnets. So that was another activity that I thought became significant later on in my life. Not only was it used for coloring, but it was used for preserving the fishnets, too. But that was quite significant, I thought. There was always taro plants throughout the mountain side, actually. And it was a place that we would always go and pick up *lū‘au* [young taro tops] leaves, actually, and taro too. (Shideler and Hammatt 2007, Vol. II:49)

Mr. Hoe describes the significance of *Hōkūle‘a* and the division of the ahupua‘a of Hakipu‘u and Kualoa:

> …The canoe, in itself, the *Hōkūle‘a* was launched there. So it has a sense of history. It has a sense of purpose. And the development of canoe *hālau*, a place to have it in Kualoa or Hakipu‘u. It’s just a ridgeline, one way or the other. Kualoa Park, half of it is in, actually, Hakipu‘u, you know, [as far as the] boundary line is concerned. And we’re very aware of that because we don’t like to think of us as Kualoa [but] as Hakipu‘u. The park — half of it is actually in Hakipu‘u. You know there was an *ahu* built for the last group of voyagers, you know, when they came to put all of the rocks on it. And if you look at it, it's in Hakipu‘u. And it was very purposeful. We looked at the ridgeline, and we made steps go this way. Whatever you might want to call it is up to you. But for us, because we were responsible for that, we put it in Hakipu‘u, actually. And all of these kinds of things, you know. They found the so-called burial of the “ceremonial pig” right there on the line. So there's all those historical things that’s there. But for us

> there’s that slight, you know, identification. When the canoes all came, they said they were coming to Kualoa Park but we were the ones that were responsible for bringing in all the canoes and we were from Hakipu‘u. Because *Hōkūle‘a* was launched in Hakipu‘u, not in Kualoa. Although, it said it was launched in Kualoa, in reality it was in Hakipu‘u. (Shideler and Hammatt 2007, Vol. II:55)

3.4.7.2 Francis Swanzy Morgan

Francis S. Morgan, the president of Kualoa Ranch, was the great, great-grandson of Gerrit P. Judd, who purchased Kualoa Ahupua‘a in the nineteenth century during the Māhele. Mr. Morgan was born in 1919 in Chicago, as his father, James P. Morgan, was stationed there during World War I. His mother, Rosamond Swanzy, was the daughter of Julie Judd, who was the daughter of Charles H. Judd, who was the son of G. P. Judd. During most of his adult life, Mr. Morgan directed Kualoa Ranch’s development. Francis Morgan was interviewed by CSH on May 22, 1998 (Shideler and Hammatt 2007, Vol. II:70–113). Mr. Morgan died on August 1, 1999. His family kindly consented to the inclusion of the interview transcript in this previous ethnographic study, key portions of which are summarized in this CIA for ease of readership.

Mr. Morgan shared a mo‘olelo of Mokoli‘i Island:

> Well, you know, there's another story I can tell you of how Mokoli‘i Island got [created]. This is a story told by B. [Charles H. Judd Jr.; called Barney or “B”] and my grandmother and all that. But this was way the hell back. And the goddess Pele was living on the Big Island. Well, she somehow knew about or heard about a very handsome young chief that lived on Kaua‘i. So she wanted the chief to come over to the Big Island and visit. So she sent her younger half-sister whose name was Hi‘iaka to go to Kaua‘i to get him and bring him back to the Big Island. So she was traveling through the islands. Or, actually, there’s several stories, different adventures she had. But anyway she got Kualoa, was walking through. And you know there’s this big mountain, little strip of beach. She got there and there was a monster dragon.
>
> They call it a *mo‘o*. And it was sound asleep, but it was stretched all the way from the mountain to the sea. And she couldn't get by because this goddamn big dragon. And so she jabs it, makes it wake up.
>
> Well, she had a hatchet but she didn’t hit him with the hatchet. Maybe kicked him. And so the *mo‘o* woke up. [Hi‘iaka said:] “I wanna get through. Get out of the way.” He said: “No, I'm the *mo‘o* of Kualoa. And I’m sleeping and I’m not going to get up until I'm ready and you just wait.” She said: “Wait a minute. I'm Hi‘iaka. I'm the half-sister of Pele. I'm on an official mission for Pele. You get out of the way.” So he said, no he was’’t going to get out. Well, this altercation grew and grew and finally ended up in a massive fight. But it wasn’t a physical fight. It was primarily power. The dragon had power. She had power. So there’s a massive uproar with the power. Eventually, the dragon’s power was totally wiped out. And so he was lying there, I guess. So she had this ax. She went up to him and biffed him right behind the ear, with this ax. Bang. So he realized he was mortally wounded. So in his final death throes he rolled out in the ocean. And his head

> stuck out on one side—round and round and round [with the] tail at the top. And that's Mokoli‘i Island. And actually, [if] you go out there, you can see there is a little blob that sticks out on one side. When you're looking out, it's on the left, Kahuku side, you know. And actually if you go over there, on the seaward side of that. The blob is here. Right next to the main part, there's a big deep cove. Nice, sandy cove.
>
> Yeah, you can land there. And that's where she hit him with the ax. And, actually, right next to that is a blowhole. And of course when it blow holes, you know, a big noise and it spouts out and all. Well, that's his—some damn thing. And he died there. So that's how Mokoli‘i got there.
>
> Well, that's how Mokoli‘i got—the Hawaiian legend is how Mokoli‘i got there. I remember when my kids were little, I told that story. They said, "Gee, dad, is that true?" I said, "Well, that's what the Hawaiians say and they were here before us." I forgot that it was a story that very definitely is to do with that area. Originally, we owned Mokoli‘i too. But when they condemned the park, they took that. (Shideler and Hammatt 2007, Vol. II:112–113)

Mr. Morgan described the purchase of Kualoa by Gerrit P. Judd during the Māhele, the introduction of cattle, and the start of the sugar mill and plantation:

> So I think that when he [Gerrit P. Judd] bought . . . of course, Kualoa was the personal property of the King. It was not crown land. Crown land is totally different. Crown land is land that the King owned as chief of the state and all the revenues went to support the government. And, as a matter of fact, they had a Supreme Court in those days and one time he wanted to sell some crown land to use the money for his own personal purposes. Went to court, no you can't do that. But in the Great *Māhele*, of course, a hell of a lot of the land was given to mainly all the chiefs and Kamehameha's a big chief, you know, so they got a whole bunch of land. Now ultimately that land went to the Bishop Estate because Pauahi Bishop was the last remaining, Kamehameha royal line. And so as they died off they left—and she ended up with the whole bloody works. And so she had what was the Kamehameha land. Well, Kualoa Ranch had been that. It was not crown land. And so he bought it from Kamehameha, you know, before that. If he'd never bought it, it would have ended up in Bishop Estate right now. And so he bought it and when he bought it, as I say, in 1850, there was some cattle — they started to develop cattle in the area. And then eventually his son Charles Hastings started . . . And his son-in-law Samuel G. Wilder wanted to start, to try a sugar plantation. So he leased it to them and they started up, Judd and Wilder, which is the sugar plantation. Actually, it was the first sugar mill on this island, the very first one ever. Of course, prior to that, they have these real primitive stuff with oxen going round and round and boiling up the stuff and just letting it drain there for days and days, you know, and no centrifugals, no nothing. And so this is the first sugar mill on this island. So they started that up. And actually there's a—I don't if you saw the smoke stack, you know, it goes up in big rocks and then on top of that is bricks, you know. Well, he had the local Hawaiians building this thing.

> Incidentally, the name of that spot where the mill is, is "Wili-ka-‘ā‘ī" and the Hawaiians weren't used to digging things, you know. I mean they had *‘ō‘ō*'s [digging sticks] but . . . And so they had to be explained how to shovel, you know, like that. And they shovelled and they turned around . . . No don't do that. Kept yelling at them "*Wili ka‘ā‘ī.*" which means turn your neck, you know, turn your neck. And so they kept yelling this all the time so that's the name of that little spot where the old mill is. *Wili ka ‘ā‘ī. Wili* is "turn," *ka* is "the," and *‘ā‘ī*" is "neck."
>
> And so those that dig the foundation, I mean, you know . . . Well they start building the smoke stack. And they're getting up pretty high and, after a while, the Hawaiians [said] "hey this is high enough." They're scared to go any more. So the two partners, Judd and Wilder, had to build the top themselves. So they climbed up and did that themselves. I don't know if they were going to make bricks anyway or if they—why they changed to bricks. But anyway that part was done by them.
>
> But right next to the mill there were great big sheds. And my grandmother remembers the goddamn things. And she said those sheds were for drying bagasse. Because the mills, although they had modern type mills, steam engines and all that, the mills weren't as good as modern mills. So the stuff was kind of, a little bit wet. And so to dry it enough to burn, they had to put it in big drying sheds. (Shideler and Hammatt 2007, Vol. II:74–75)

Mr. Morgan explained the sugar cane was hauled by ox carts, and that lighters were used to bring coal in the from the schooners and to haul out the sugar for transport to Honolulu. His mother believed that rather than transport the material across open ocean, the schooners came to the calm water behind the submerged structure just south of ‘Āpua.

Mr. Morgan describes the World War II transformation of Kualoa:

> They actually, they took most of the Kualoa area which was for the airfield. Then the place where they kept the bombs was around the corner in the area we call "Pīlali " which is right next to that in part of the Hakipu‘u area. But they had a road that went over there and then a whole bunch of tunnels into the ground.
>
> In Pīlali. Not down by the road but it's a little bit up, and they put in a road to get to it. Then after I left, they also put this big gun emplacement [Battery Cooper] at Kalaeoka‘ōi‘o, which is the point between Ka‘a‘awa and Kualoa. (Shideler and Hammatt 2007, Vol. II:83)

He elaborates on the barracks and the long runway with about ten farily large bays bulldozed for aircraft:

> Well there was a whole gang of them, all along the way. And they had both bombers and fighter planes. And actually in the Battle of Midway, it's my understanding, bombers from here, this airport, went and dropped bombs in the Battle of Midway. But the bombers weren't the real big ones, they were kinda medium-sized, and it's my understanding they just had barely enough fuel to get over there, drop the bombs, come back and land.

> Yeah, it was a hell of a long way, and they just barely had enough time but they did, you see. But they couldn't stay around there, you know, fiddle around. (Shideler and Hammatt 2007, Vol. II:84–85)

Mr. Morgan described several place names of Kualoa, including the peaks of Kānehoalani and Nānāhoa. Whale bones were also found at ‘Āpua (Shideler and Hammatt 2007, Vol. II:101–103). The old rock bathhouse was called Hale Makani, or House-of-the-Wind (Shideler and Hammatt 2007, Vol. II:101). The depression of Koholālele is an ancient feature, according to what Hawaiians told Mr. Morgan's ancestors:

> Well, my grandmother had no idea [why it was named Koholālele, or leaping whale], but it's just an ancient thing. It was there from pre-Hawaiian days. Yeah, Koholālele, that was the name. But it was obviously dug because there was this trench, it was full of water. And then on the sides, it was built up. I mean, you could see they dug it and piled it around the side. And it was just there, all my life, in the early days. (Shideler and Hammatt 2007, Vol. II:87)

Mr. Morgan offered his thought on why the erosion started when the City and County of Honolulu converted the part of Mr. Morgan's property into Kualoa Regional Park:

> Well, when this erosion came . . . erosion up along the beach. It was coming down and our accretion was growing like crazy. And so the government retained some people from the mainland, Chicago, I think. Anyway, they put some things out in the water to hold it. Well, it just eroded behind them. And so finally somebody from the Park Department, it was a woman, and I could see she was a little bit Hawaiian. But she came and said: "You know, we took it immediately and made it erode. Did you experience that?" I said: "No, I've never seen that." "Well, you must have been doing something to avoid the erosion. So what were you doing that we can do to prevent this erosion? Because, under you, there wasn't any erosion. You must have been doing something." I said: "No, we weren't doing anything. I mean, nothing. It was just sitting there." "Well, how the hell would this happen?" I said: "Well, I know what the cause was." "Oh. What?" I said: "Well, you know, in the old days this was very sacred ground. And the common people had to be very circumspect to come in here. And this is where they trained *ali‘i* and all that. And it was very sacred land." I said: "When my great-great-grandfather bought it from the King, the King realizing this, beseeched the gods and told ‘em ‘I'm selling it to the nice strong supporter and this is good and it was okay.' So the gods [said] ‘Okay, this was fine.' So we bought it. I think everything's run along fine." I said: "You come along and you just grab the damn thing, we don't want to sell it, you take it anyway. And you grabbed this thing and everybody can go in there." I said: "The gods are mad. They're taking the land away from you and giving it back to me." So I had a hell of a time trying to avoid laughing. But she was, as I say, part Hawaiian. Her eyes got big and [she said]: "Do you think that's true?" I said: "Well, what other reason could there possibly be?" So she went out, and I'm glad she left right away because I couldn't stop laughing if she'd stayed much longer. (Shideler and Hammatt 2007, Vol. II:111)

3.4.7.3 Palani Nobriga

CSH previously interviewed Palani Nobriga, a representative of the Temple of Lono, in Honolulu on February 25, 1999 (Shideler and Hammatt 2007, Vol. II:129–135). Mr. Nobriga's direct involvement in Kualoa dates to the 1970s when he became a haumāna (student) of Sam Lono, a kahuna lā‘au lapa‘au (teacher of medicinal plants). Mr. Lono instructed Mr. Nobriga in Kualoa's significance to the Temple of Lono and to Hawaiian culture and spirituality. Since Mr. Lono's death in 1985, Mr. Nobriga has continued the work initiated by his teacher.

Mr. Nobriga explained his background in the Temple of Lono:

> My connections to the doctrines and the practices of the Hawaiian religion started with my father's background. He grew up with a contemporary practice of ancestral worship. So he had that child's knowledge of all the areas of ancestral worship. He became a Catholic two hours before he married my mother. But he knew and understood the religious culture of the Hawaiians of which the Temple of Lono is a part. And although I was raised a Catholic, he taught me a lot about the connections of nature and man and the spirituality of both, when he took me hunting and fishing as I was growing up.
>
> In 1973 after I had returned from the Viet Nam War, I was working for a local travel agency and through that wound up meeting other Viet Nam vets. Some of them were studying bi-location of the soul or soul travel. It was the war that made me begin to question who or what God was, and triggered my desire to look to my own culture, the Hawaiian culture, for those answers. When I was studying at the University of Hawai‘i, a religion class identified the ninth of the twelve levels of enlightenment as "Maulani" which is Hawaiian. So in pursuit of finding out the meaning of "Maulani", a good friend of mine, Tommy Borges, and I sought out Kahuna Sam Lono. That was the first time I met Sam.
>
> At that point in time I did not realize the significance of who he was, since my purpose in meeting him was only to learn why there was a Hawaiian word in the twelve levels of enlightenment. We met Sam and asked him the question—it was in 1973 about two years after Sam Lono had come out as a practicing *kahuna*. Now, when I say "practicing kahuna," *kahuna* in the non-Christian sense. I think he was first identified in the newspapers in 1971 as a *kahuna lā‘au lapa‘au*. He had started a school in ‘Ioleka‘a. This was at the beginning of the *‘Ohana* movement. When I first met him, as I was leaving, he asked me what my Hawaiian name was and I said *Kamehameha Kamealoha* given to me by *ho‘ikipō* (showing of the night, night vision). He said to me, "You come back anytime." It was this point in time I became a *haumāna* of the Temple of Lono and remained a practitioner and student of Kahuna Sam Lono until his death in December, 1985.
>
> Some of the things that Kahuna Lono, and the Temple of Lono, accomplished were rededication of temples. The first one Kahuna Lono opened up was the Temple of *Kū* and *Hina* at Hakioawa, Kaho‘olawe. Sam Lono was able to accomplish this because he was recognized by the federal government as being a traditional religious practitioner of the Hawaiian religion, non-Christian. Then he

rededicated the Temple of *Kū* and *Hina* at Mōkapu on O‘ahu, which is situated in the *ahupua‘a* of Lono in the district of *Ko‘olau Poko.* This was done in October, 1980. Then he wanted to accomplish access to and rededication of the *Pu‘uhonua* Lehua at Kualoa. This was done in June, 1981. The Temple of Lono, including Kahuna Lono and several of the *haumanas*, encamped at Kualoa and were arrested for camping without a permit. The whole point of the encampment was to draw attention to and demand our rights as Hawaiians to worship again on our spiritual land base.

Sam Lono felt it was very important to have access and use of *Kualoa* to maintain access and use of our temples and to exercise our religious rights. He also taught people in the traditional use of medicinal plants and practice of traditional Hawaiian agricultural methodologies to achieve a perspective on the role of the natural elements with our religious understanding.

So it gives you a kind of understanding of the younger generation, my generation and his generation. Here you have for the first time in over 200 years native Hawaiians having the right to religious access accepted by the federal government. And the beginning of the relationship of our people back to their cultural temple rights.

Kahuna Lono realized that if the Hawaiian religion was going to continue to exist, he must make certain that people were aware of it. And in that regard, he finally decided that he should register the Temple of Lono. So he sent me to the Department of Regulatory Agencies to do that. He did this in order to set a precedent according to the Freedom of Religion Act 95-341, which applies to Hawaiians and gives us the right to have access to our spiritual land base.

What does this have to do with Kualoa? You see Kualoa is a *pu‘uhonua*. *Pu‘uhonuas* were specific land areas designated by the chiefs and *kahunas*. These areas were known as *pu‘uhonua* within the context of a sanctuary of peace—a refuge. A spiritual land base.

There are four indigenous primal *pu‘uhonuas*: Hale o Keawe on Hawai‘i, Hale o Pi‘ilani on Maui, Mano Kalani Po on Kaua‘i and Pu‘uhonua Lehua in the district of Ko‘olau Poko, from Hakipu‘u/Kualoa to Mōkapu on O‘ahu. Their names relate to the last reigning *Pali-tu* (high priest) of these temples. Their origins are from a time preceding Pa‘ao and relate to the reign of Mu.

This sanctuary of peace therefore is a traditional cultural land base, a sacred place for meetings of the council of chiefs and for ceremonies and celebrations, a sacred birthing place, a sacred burial place, a place for training to perpetuate the deep spiritual knowledge of staff of life and the foundation of the four gods.

As the cultural land base representing the spiritual sovereignty of the Hawaiian people, the *pu‘uhonua*, this portion of land was set aside for the preservation and teaching of the traditional cultural relationship between man and earth. The foundation of the four gods is at the spiritual core of this relationship.

Kū, the god of the ocean, was chronologically recognized first in the relationship to staff of life. From the ocean our evolutionary life began and we continue to receive sustenance from this source.

Kanaloa, the god of the sun whose light gives energy to all living things on earth, the source of heat that evaporates the ocean and forms the clouds in the atmosphere.

Lono, the god of agriculture, is the spiritual reflection of nature in man. From the earth, we receive the staff of life. *Lono* calls the water of life from the clouds down to earth.

Tāne is the god of fresh water. He is the water of life that sustains all living things. *Tāne* nourishes the land and its people as he travels and reunites with *Kū*, completing the *Kumulipo* of the four gods.

These temple lands represent the sovereignty of the people of the island. In the time before *Pa‘ao*, the council of chiefs would meet within the sacred boundaries of the *pu‘uhonua*. The *kahuna* (*Pali Tū*) would counsel them in their deliberations by calling the gods and their *‘aumakua* to assist them in making decisions that would affect the well being of the people.

The god *Kū* is worshiped as a protector of the staff of life of the ocean. He sat at the oceanfront. That’s why he reigned. That’s why it is said “*Kū*, stand tall, stand alone, stand fast.” The god *Lono* represents the earth. His responsibility is to provide the staff of life for the world. They co-existed for the preservation of the people and the *pu‘uhonua*.

This is the most intense spiritual place where the bones of ancestral priests are buried. It sanctifies the place. You put the *mana* into the land to protect it. It was the place where warriors and priests sat down in peace. It was a place where the chiefs were educated in the ways of the religion. The *pu‘uhonua* contained all the different types of temples used to teach the foundation of the gods, *Pā Hālau Otea Atua*, the square. The teachings were about offerings and dedications and the healing of oneself. Knowledge that they could take back to their own *ahupua‘a* and promulgate the practices. It was a land area set aside for these purposes.

According to Hawaiian usage, Kualoa was a religious center for the Ko‘olau Poko district. It traditionally served the district of Ko‘olau Poko as a religious center, to which residents could retire for ceremonial purification whenever they had angered the gods. E. Handy wrote about this in a piece called *Native Planters of Old Hawai‘i* [1972], and in this article, Handy says that Kualoa has special significance to the Temple of Lono because *Kualoa* “was the seat of the hierarchy of the priestly Order of Lono…” He goes on to say that the Lono Order also believes that Kualoa was the cradle of mankind, the Hawaiian Garden of Eden.

> (h)ere lived Wakea the sky-father and Haumea (sometimes called Papa…) the earth mother; here were born of their union the progenitor of the taro

> plant, Haloa-naka, and of the human race the younger son Hāloa. [Mr. Nobriga is citing a passage from *Native Planters…*]

Handy also said that "(it) is of significance to note that Kāne-hoa-lani . . . , who is the equivalent of Wakea . . . , in his mountain "form" juts out in exact orientation with the eastern sky, so that his forehand receives over the ocean the direct rays of the rising sun at the summer solstice. To a priesthood, themselves wholly oriented to the great cosmic forces of the season, this phenomenon would in itself have sufficed to designate Paliku (now Kualoa) as the home of the sky-father and a place of extraordinary sanctity."

Another piece by a guy named Fornander in *An Account of the Polynesian Race* [copyrighted] in 1969 says:

> One of the special tabus attached to Kualoa, whenever the chief resided there, was that all canoes, when passing by the land of Kualoa…should lower their masts, and keep them down until they had passed the sea off Kualoa . . . a religious observance on account of the sacred character of the "Pali O Kualoa"…It was strictly observed.

Handy interprets this taboo as evidence that Kualoa was the site of a sacred Lono shrine, which was according to Handy's writing, "The most sacred *heiau* on Oahu."

So you can see that the beliefs of the Temple of Lono are based on ancient tradition, and the sacredness of Kualoa has been recorded in several historical works. Kualoa is the focal point of the creation of mankind and of the foundation and development of the priestly Order of Lono.

This is a long explanation about Kualoa. But it's important so you can understand why Kualoa became the center of focus in the Hawaiian spiritual movement. When the federal government passed the 95-341 law, the Freedom of Religion act for native Americans, Kahuna Sam Lono decided to rededicate the Temple of *Kū* and *Hina* at Mōkapu as he had done on Kaho‘olawe. Pyramid Rock at Mōkapu is a ceremonial point in the transfer of priestly rights from the *Kū* priesthood to the *Lono* priesthood. So in 1980 we pursued access into Kane‘ohe Marine Corps Air Station to dedicate the Temple of *Kū* and *Hina*.

At that point, in my study with uncle, I studied the areas where the sacred temple sites within Mōkapu and Kualoa were located (Shideler and Hammatt 2007, Vol. II:129–132)

Mr. Nobriga continues to narrate the history and meaning of the Temple of Lono:

The Temple of Lono is the surviving remnant of a line of priests who dedicated themselves to the god *Lono*. Kualoa has special significance to the Temple of Lono because Kualoa was the seat of the hierarchy of the priestly Order of Lono.

It was formed in 1978 by Tamuela Hoopi‘i Otamatahiti Lono Tahuna Nui Pari Tu Po Paki and *haumana* in the valley ‘Ioleka‘a. The Temple is dedicated to

> promoting a greater practice and understanding of the traditional Hawaiian religion and traditional Hawaiian thinking. Kahuna Lono opened up the practice of traditional Hawaiian religion on sacred sites throughout Hawaii. He taught that these religious sites are important to protect. He taught the understanding of traditional Hawaiian thinking and helped many with healing in the traditional ways.
>
> The Temple of Lono teaches that Hawaiian religion and thought from the perspective of a traditionalist is an understanding of the *pu‘uhonua, pā hālau otea atua, maiola, ‘aumakua*, staff of life, and the individual in relation to the gods. Because the knowledge of the traditional religion was a day-to-day part of life, it is essential to the understanding of traditional Hawaiian thinking.
>
> The Temple of Lono had the responsibility of the earth and what the earth provided and for maintaining the staff of life. I can best explain this in the ancient temple chant to their god: *He Lono, He Lono, He ulu ka Mea’‘i, o ka po he honua*. Which means, "You, the god of agriculture, must provide the staff of life for the world." So what you see in the *pu‘uhonua* is the boundary of property where there is a profusion of things like fishponds, ‘*ulu* and *taro* maintained. You see this is the area, Kualoa, where the staff of life is preserved.
>
> Battles would occur in other areas of the island, and much of the land and what it provided would be destroyed or neglected. And after the battles, the survivor would go to the *pu‘uhonua* to get what was needed to replant and restock his land. And this is also where he came to cleanse his spiritual self and retrieve his family. This gives you a sense of why Kualoa is very important for our people as a *pu’uhonua*. (Shideler and Hammatt 2007, Vol. II:132–133)

Mr. Nobriga describes the encampment at Kualoa:

> There are lots of lessons we learned from him. One of my good memories was when we were encamped at Kualoa trying to restore it as the Pu‘uhonua Lehua, the sanctuary of our religion. The first day we got to Kualoa, and uncle said: "Go out there in the water and you goin' find black stones. Bring the black stone out." See, these stones were remnants of a shrine that had existed many years ago. We brought them out to reconstruct a shrine that existed on that spot. It was a spot where we camped that used to have chain-link fence surrounding a small area. And inside that chain-link fence were all these bones, buried, but no one knew except Kahuna Lono. So we do what he says. We go and get the black stones and bring them out. Then we circled the area with black stones. And then he says that this is the bones of our ancestors of the *Pali tū*. So here we are and we are to sleep with our ancestors and wait for the *ho‘ike a ka pō*. (Shideler and Hammatt 2007, Vol. II:134)

Kualoa has also been important for the sovereignty of O‘ahu:

> Kualoa—no matter who you are, you go there and spend a day or night and sit there. You will smell that old ancient, ancient essence of who we are as human

> beings. Kualoa is the sacred spot. It goes back to the story of Kahekili and Kahahana. If you look at the old interpretation of this, it says Kahekili wanted the lands of Kualoa. Kahekili, the Chief of Maui raised Kahahana, who eventually ascended the throne of O‘ahu. When Kahekili asked Kahahana to give him the lands of Kualoa, in gratitude Kahahana was willing to do this. But the priesthood of Lono objected. They said “If, Kahahana, you had ascended the throne of O‘ahu as king by battle you could do anything you want with this land. But because you ascended the throne through your blood right, you cannot give this land to Kahekili.” See, Kahekili was a great chief of Maui. He held the temples of Pi‘ilani. The Lono priesthood at Kualoa told Kahahana you cannot do this, because if you do this you give up the sovereignty of the people of Oahu.
>
> So you see how the resurgence of the Temple of Lono in the seat of Lono at Pu‘uhonua Lehua at Kualoa is the resurgence and the identity of the truth of our history. Who we are as a people. That’s how important Pu‘uhonua Lehua at Kualoa, Mano Kalani Po in Kaua‘i, Hale o Pi‘ilani in Maui, and Hale o Keawe in Kona are to our people. Let our people look back in our history and see the words of sovereignty spoken by the priests of the Temple of Lono. It is there. (Shideler and Hammatt 2007, Vol. II:135)

3.4.7.4 Gordon Pi‘ianaia

Gordon Pi‘ianaia was interviewed by CSH on December 21, 1998 (Shideler and Hammatt 2007, Vol. II:162–182). Growing up on the windward side of O‘ahu, Mr. Pi‘ianaia boated and fished in the waters off Kualoa and the surrounding *ahupua‘a*:

> I just used to go out for *he‘e* mainly. Kāne‘ohe Bay is mainly for *he‘e*. Then Punalu‘u: I used to lay my net . . .
>
> The biggest *he‘e* I’ve caught was [off Kualoa]. Caught about a 12 to 13 pounder. It was just luck. A bunch of us would always go diving. I just went under and it wasn’t that deep. But I went under and—a big hole—and I just—fooling around—and I put my spear in. I knew I was poking something. Boy, that bugger came out of there . . . so big. And that’s the biggest *he‘e* I’ve ever caught. Must have been fifteen years ago. Maybe longer—twenty years ago. (Shideler and Hammatt 2007, Vol. II:176)

Mr. Pi‘ianaia served as captain of the voyaging canoe *Hōkūle‘a*, and sailed *Hōkūle‘a* into Kāne‘ohe Bay for the welcoming home ceremonies in Hakipu‘u and Kualoa. He watched the launching of *Hōkūle‘a* at Kualoa in 1975:

> I think it was arranged, and I may be wrong, but I think what probably contributed to Kualoa was the fact that they were starting to build the canoe along the waterfront [in Honolulu] and that property belongs to the state. And space-wise you run into problems. And liability and all of that. And that may have been one factor. But the other thing was that, I think people like Herb and Dr. Emory probably, and maybe Ben Finney too, proposed that the canoe should be worked on at a more . . . somewhere that's more appropriate for something like this type

> of vessel. And, boy, let me tell you Kualoa is a hell of a place. With what stories we know about the area. Kāne‘ohe Bay—what a beautiful place. The Ko‘olaus in the background. The joining of Ko‘olauloa and Ko‘olaupoko. I guess just the name of the place: Waikāne. That in itself is significant. That's very strong and powerful. And it is sort of protected and ideal for something that enormous. That’s not housed in a warehouse or down in concrete on the waterfront with trucks and cars and pollution and all that. So I think it was probably Herb and Kenneth Emory and some other people who were on the board at that time . . . I think the selection [of Kualoa] was an outstanding selection.
>
> Of course there was a lot of . . . I remember the hauling of the hulls out there by these long trailer tractor trucks. And the police escorts and all that. I guess it could have been just as easy to say: “We’ll finish the canoe in town.” But whoever made that decision [to launch from Kualoa], that was a great decision. (Shideler and Hammatt 2007, Vol. II:163)

Upon returning to Kualoa with *Hōkūle‘a*, Mr. Pi‘ianaia, as captain, observed the tradition of lowering the sails:

> …That’s a real interesting tradition because that generally occurred when there was the presence of a high *ali‘i* there. There’s no high *ali‘i* out there as far as I know. [Laughing] Although some of the Hoe family, I hold in great respect. And the other part of that tradition is canoes lowering their sails . . . where? Beyond the reef? Or inside the reef? Or off the beach?
>
> …it was really hit and miss, you know. You don’t want to lower your sail when you’re under wind power and run up on the reef out there when the surf’s too big. There’s a lot of reef out there, too. Hōkūle‘a’s not an easy canoe to paddle. I can see a smaller canoe. I think protocol and regards to what’s appropriate was seriously considered. (Shideler and Hammatt 2007, Vol. II:165–166)

Mr. Pi‘ianaia reflected on the emotional and spiritual significance of the near-shore sailing of *Hōkūle‘a* and other vessels in Kāne‘ohe Bay:

> Every place is special but I think Kualoa has that nice inland water passage which you can’t find in any other place in Hawai‘i. Which makes it even that much more unique. You find that in the South Pacific when you go to places like Raiatea and Bora Bora. You can sail inside the reef or around the island and stuff like that. Kāne‘ohe, Waikāne—that area—that’s the only place where we find that [in the Hawaiian Islands]. And I think that makes it special. Very special. (Shideler and Hammatt 2007, Vol. II:172)
>
> The feeling, whether it’s on my three-man canoe or on *Hōkūle‘a* or on a powerboat: when you come into that panorama of the Ko‘olaus there, it’s just kind of neat. It welcomes you but it’s so darn strong. It’s powerful. But there’s something about it . . . A lot of us have that same feeling. It’s just something that I’m in awe of. I can see why that area is an important place. (Shideler and Hammatt 2007, Vol. II:170)

Section 4 Community Consultation

Throughout the course of this assessment, an effort was made to contact and consult with Hawaiian cultural organizations, government agencies, and individuals who might have knowledge of and/or concerns about traditional cultural practices specifically related to the Project area. This effort was made by letter, email, telephone and in-person contact. The initial outreach effort was started in May 2011 and completed in October 2011. In the majority of cases, an aerial photograph (see Figure 1), maps (see Figure 2), a site plan (Figure 4) and a letter (Appendix D) of the Project area were mailed.

In most cases, two to three attempts were made to contact individuals, organizations, and agencies apposite to the CIA for this Project. The results of the community consultation process are presented in Table 6. Written statements are presented in Section 4, and excerpts from interviews are presented in Section 5.

Table 6. Results of Community Consultation

Name	Affiliation, Background	Comments
Ahuna, Gladys Pualoa	Resident	July 5, 2011 CSH met with Ms. Ahuna at a lineal descendent meeting at Kualoa Park and sent letter
Ailā, William	Hui Mālama I Nā Kūpuna ‘O Hawai‘i Nei	May 12, 2011 CSH sent letter by email
Ayau, Halealoha	Hui Mālama I Nā Kūpuna ‘O Hawai‘i Nei	May 12, 2011 CSH sent letter by email
Becket, Jan	Photographer, Kamehameha Schools	July 30, 2011 CSH sent letter by email September 4, 2010 CSH conducted field interview with Mr. Becket and John Morgan at Puakea Heiau September 15, 2011 Mr. Becket approved interview summary
Brown, Steve	Hawaiian Trail and Mountain Club	May 12, 2011 sent inquiry through website

Name	Affiliation, Background	Comments
Cayan, Phyllis Coochie	History and Culture Branch Chief, SHPD	May 12, 2011 CSH sent letter August 19, 2011 CSH sent letter by email October 18, 2011 Ms. Cayan responded (see Section 4.1), who referred the Kualoa Park Advisory Council, Cy Bridges, Aaron Mahi, Hinaleimoana Wong, Mapuana De Silva, the Hoe family, and Hawaiian Studies at the University of Hawai‘i-Mānoa (who was not contacted due to time limitations)
Chang, Lianne	Resident	May 12, 2011 CSH sent letter June 2, 2011 CSH sent letter
Crouch, Tai	Punahou School, Former Caretaker of Kualoa Park	June 2, 2011 CSH sent letter June 3, 2011 Mr. Crouch replied by email, describing the massive erosion at the park July 1, 2011 CSH conducted interview by telephone (see Section 5.3) July 6, 2011 Mr. Crouch approved interview summary
Cypher, Mahealani	President, O‘ahu Council of the Association of Hawaiian Civic Clubs	May 12, 2011 CSH sent letter by email June 9, 2011 CSH interviewed Ms. Cypher (see Section 5.5), who referred Alice Hewett, Rocky Kaluhiwa, Keoki Fukumitsu, Elizabeth Lau, John Morgan, and Lilikala Kameeleihiwa (who was not contacted due to time constraints) July 19, 2011 Ms. Cypher approved interview summary
Fukumitsu, Keoki	Caretaker of Mōli‘i Pond	June 13, 2011 CSH called Mr. Fukumitsu to arrange interview June 21, 2011 CSH conducted interview (See Section 5.2) June 24, Mr. Fukumitsu approved interview summary

Name	Affiliation, Background	Comments
Delacruz, James	Kumu Hula, Na ‘Opio ‘O Ko‘olau	May 13, 2011 CSH sent letter by email June 2, 2011 CSH sent letter by email
Gunness, Jo Lynn	Former Archaeologist at Kualoa Park	June 9, 2011 CSH sent letter by email July 15, 2011 CSH conducted interview (see Section 5.7) August 4, 2011 Ms. Gunness approved interview summary
Hewitt, Alice	Kupuna	June 13, 2011 CSH called Aunty Alice, who stated she will speak with Aunty Rocky Kaluhiwa
Hoe, Calvin	Hakipu‘u Learning Center	July 5, 2011 CSH met with Mr. Hoe at a lineal descendent meeting at Kualoa Park July 7, 2011 CSH called and left message July 11, 2011 CSH called and left message July 13, 2011 CSH sent letter August 8, 2011 CSH called and left message, and sent letter by email August 15, 2011 CSH called and left message August 30, 2011 CSH called and left message
Hopkins, Geri	Former resident of Hakipu‘u	May 19, 2011 CSH sent letter June 2, 2011 CSH called and left message
Kāne, Shad	OIBC, Nā Koa ‘O Pālehua, Association of Hawaiian Civic Club’s Historic Preservation Committee	May 12, 2011 CSH sent letter by email June 2, 2011 CSH sent letter by email June 4, 2011 Mr. Kāne replied by email, stating that over 30 years ago he crabbed for white crab and Samoan crab near Mōli‘i Pond, and that since the inadvertent discovery of burials is minimal since the repair work is mainly above ground and the area was previously disturbed

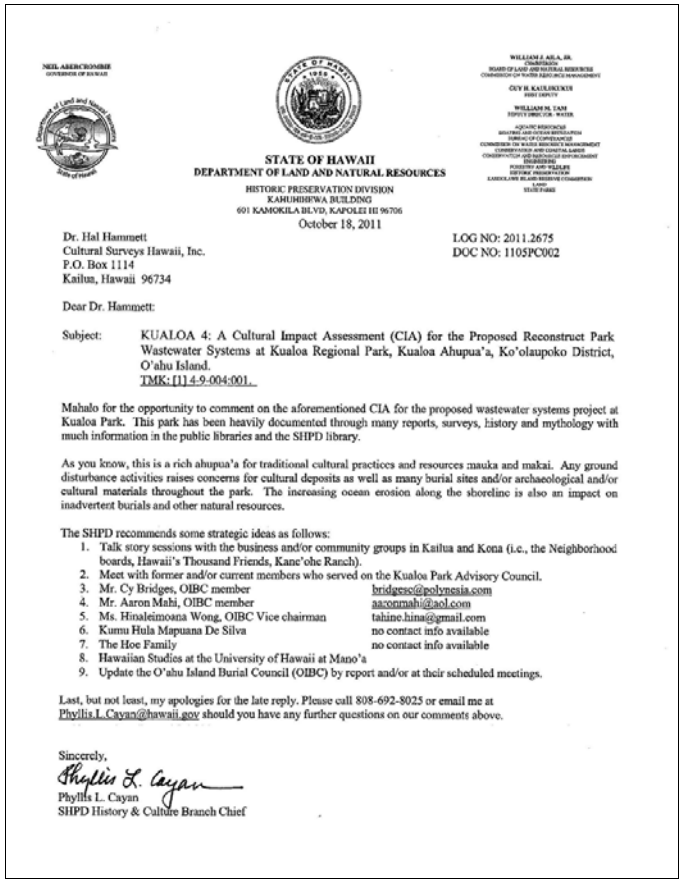
Name	Affiliation, Background	Comments
Kia, Ewa	Resident, Waikāne	May 19, 2011 CSH sent letter June 8, 2011 CSH conducted interview (see Section 5.6) July 11, 2011 Ms. Kia approved interview summary
Ko‘olaupoko Hawaiian Civic Club		June 8, 2011 CSH presented Project information at general meeting
Lau, Elizabeth	Former President, Ko‘olaupoko Hawaiian Civic Club	June 20, 2011 CSH called to arrange interview June 16, 2011 CSH conducted interview (see Section 5.4) July 15, 2011 Ms. Lau approved interview summary
Logan, Roland “Ahi”	Kupuna	July 5, 2011 CSH met with Mr. Logan at a lineal descendent meeting at Kualoa Park
Mahi, Aaron	OIBC, Ko‘olaupoko Representative	May 13, 2011 CSH sent letter June 2, 2011 CSH sent letter
Mahoe, Chinky	Kumu Hula	May 13, 2011 CSH sent letter June 2, 2011 CSH sent letter
McKeague, Kawika	President, OIBC	May 12, 2011 CSH sent letter by email June 2, 2011 CSH sent letter
Morgan, John	Kualoa Ranch	June 24, CSH sent letter by email September 4, 2010 CSH conducted field interview with Mr. Morgan and Jan Becket at Puakea Heiau October 1, 2011 Mr. Morgan approved interview summary

Name	Affiliation, Background	Comments
Nāmu‘o, Clyde	Administrator, OHA	May 13, 2011 CSH sent letter July 1, 2011 Mr. Nāmu‘o responded (see Section 4.2)
Ogata, Charlie	Resident, Kāne‘ohe	May 13, 2011 CSH sent letter by email June 2, 2011 CSH sent letter by email
Paglinawan, Richard	Queen Lili‘uokalani Children’s Center	June 2, 2011 CSH sent letter by email August 1, 2011 CSH conducted interview November 1, 2011 Mr. Paglinawan approved interview summary
Reppun Ohana	Residents, Waiahole Valley	May 19, 2011 sent letter June 2, 2011 CSH sent letter by email
Sailors, Damion	Kāne‘ohe Canoe Club	June 3, 2011 sent letter by email June 5, 2011 Mr. Sailors responded responded by email, referring Calvin Hoe
Silva, Carol	Former Resident, Kualoa	June 2, 2011 CSH sent letter
Siu, Leon	Resident	May 13, 2011 sent letter June 2, 2011 CSH sent letter by email
Smith, Tammy	Hale Kealoha ‘Ai Pono, Waiahole Poi Factory, Resident of Hakipu‘u	May 13, 2011 CSH sent letter
Yanagihara, Roy	Chair, Kāne‘ohe Neighborhood Board	May 13, 2011 sent letter June 2, 2011 CSH sent letter by email

4.1 State Historic Preservation Division

CSH contacted Phyllis “Coochie” Cayan, History and Culture Branch Chief of SHPD, on February 10, 2011, and Ms. Cayan responded to CSH on Octoe 18, 2011. According to Ms. Cayan, the SHPD states that any ground disturbance activities raises concerns for cultural deposits and burials throughout the Project area, and increasing erosion along the shoreline may also have an impact on inadvertent discovery of burials or other natural resources. Ms. Cayan

refers community groups, the Kualoa Park Advisory Council, Cy Bridges, Aaron Mahi, Hinaleimoana Wong, Mapuana De Silva, the Hoe family, and Hawaiian Studies at the University of Hawai‘i-Mānoa, as well as update the OIBC.



NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

GUY H. KAULUKUKUI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
HISTORIC PRESERVATION DIVISION
KAHUHIHFWA BUILDING
601 KAMOKILA BLVD, KAPOLEI HI 96706

October 18, 2011

Dr. Hal Hammett
Cultural Surveys Hawaii, Inc.
P.O. Box 1114
Kailua, Hawaii 96734

LOG NO: 2011.2675
DOC NO: 1105PC002

Dear Dr. Hammett:

Subject: KUALOA 4: A Cultural Impact Assessment (CIA) for the Proposed Reconstruct Park Wastewater Systems at Kualoa Regional Park, Kualoa Ahupua'a, Ko'olaupoko District, O'ahu Island.
TMK: [1] 4-9-004:001.

Mahalo for the opportunity to comment on the aforementioned CIA for the proposed wastewater systems project at Kualoa Park. This park has been heavily documented through many reports, surveys, history and mythology with much information in the public libraries and the SHPD library.

As you know, this is a rich ahupua'a for traditional cultural practices and resources mauka and makai. Any ground disturbance activities raises concerns for cultural deposits as well as many burial sites and/or archaeological and/or cultural materials throughout the park. The increasing ocean erosion along the shoreline is also an impact on inadvertent burials and other natural resources.

The SHPD recommends some strategic ideas as follows:

1. Talk story sessions with the business and/or community groups in Kailua and Kona (i.e., the Neighborhood boards, Hawaii's Thousand Friends, Kane'ohe Ranch).
2. Meet with former and/or current members who served on the Kualoa Park Advisory Council.
3. Mr. Cy Bridges, OIBC member — bridgesc@polynesia.com
4. Mr. Aaron Mahi, OIBC member — aaronmahi@aol.com
5. Ms. Hinaleimoana Wong, OIBC Vice chairman — tahine.hina@gmail.com
6. Kumu Hula Mapuana De Silva — no contact info available
7. The Hoe Family — no contact info available
8. Hawaiian Studies at the University of Hawaii at Mano'a
9. Update the O'ahu Island Burial Council (OIBC) by report and/or at their scheduled meetings.

Last, but not least, my apologies for the late reply. Please call 808-692-8025 or email me at Phyllis.L.Cayan@hawaii.gov should you have any further questions on our comments above.

Sincerely,

Phyllis L. Cayan
SHPD History & Culture Branch Chief

Figure 46. SHPD response letter

4.2 Office of Hawaiian Affairs

CSH contacted Clyde Nāmu‘o, Administrator of OHA, on May 12, 2011, and Mr. Nāmu‘o responded to CSH on July 1, 2011. According to Mr. Nāmu‘o, OHA urges that all people involved in the proposed Project should reflect on the traditional significance of the sacred lands of Kualoa, which lie within the boundaries of the Kualoa Archaelogical District that is listed on the National Register of Historic Places. Since iwi kupuna have been identified within the park and adjacent areas due to shoreline erosion and ground disturbance, and other iwi kupuna are believed to be located in the park, OHA asserts that there is a high potential for this Project to encounter iwi kupuna during ground disturbing actibies. The design of the Project should be done with full consideration of this high potential for encountering iwi kupuna, and that the City and County of Honolulu should consider alternative plans and designs that incorporate the results of the CIA and AIS.

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

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

HRD11/5755

July 1, 2011

Joe Genz, Cultural Researcher
Cultural Surveys Hawai'i, Inc.
P.O. Box 1114
Kailua, Hawai'i 96734

Re: Pre-Cultural Impact Assessment Consultation
Kualoa Regional Park Wastewater System Improvement Project
Island of O'ahu

Aloha e Joe Genz,

The Office of Hawaiian Affairs (OHA) is in receipt of your May 12, 2011 letter requesting comments ahead of a cultural impact assessment (CIA) to support a wastewater system improvement project (project) at Kualoa Regional Park (park) proposed by the City and County of Honolulu-Department of Design and Construction (City). OHA is also in receipt of a June 6, 2011 letter from Group 70 International, Inc. seeking comments ahead of a draft environmental assessment which will be prepared to support this project.

The summary of the project included within your letter describes that the individual wastewater treatment systems at park facilities will be replaced with a centralized wastewater treatment system. Approximately 3, 750 linear feet of force main, a 5, 000 gallon tank and three (3) 15, 000 gallon aerobic treatment units will be installed. Comfort Station #3 will be demolished and its individual wastewater treatment system removed. A replacement comfort station will be constructed. The remaining individual wastewater treatment systems will be abandoned "in place".

Overall, OHA recognizes that this project intends to provide necessary infrastructure to support the high volume of visitors who enjoy this popular park and ensure public health and protection of resources. Visitors to the park include cultural practitioners who may be there for personal reasons or large group gatherings.

The project is within the boundaries of the Kualoa Archaeological District, which is listed on the National Register of Historic Places. This should give all involved cause to reflect upon the traditional significance of these sacred lands. OHA is aware that iwi kupuna have been identified within the park and adjacent areas due to shoreline erosion and ground disturbing activities. Additional iwi kupuna are believed to be situated throughout the park. This has been issue of concern for the community for some time now. With this in mind, OHA is alarmed at

Joe Genz, Cultural Researcher
Cultural Surveys Hawai'i, Inc.
July 1, 2011
Page 2 of 2

the potential this project has for encountering iwi kupuna during ground disturbing activities. Your letter suggests that project design and planning will utilize "*…partially mound system components to minimize excavation during construction*". OHA requests clarification whether this effort to minimize excavations is being implemented to address the potential for encountering iwi kupuna.

While OHA is not opposed to seeing preliminary planning and design for this project move forward, it should be done with full consideration of the potential for encountering iwi kupuna in mind. The City should consider multiple alternative project plans and designs which incorporate the results of community consultation and the findings of an archaeological inventory survey (AIS). OHA advocates that if the City intends to conduct an AIS to support this project, an archaeological inventory survey plan should be prepared.

Thank you for providing the opportunity to comment on this project at this early stage. We look forward to reviewing the CIA and providing additional comments at that time. Should you have any questions or concerns, please contact Keola Lindsey at 594-0244 or keolal@oha.org.

'O wau iho nō me ka 'oia'i'o,

Clyde W. Nāmu'o
Chief Executive Officer

C: Pua Aiu, Administrator- State Historic Preservation Division
Jeffrey H. Overton, Group 70 International, Inc.

Figure 47. OHA response letter

Section 5 Interviews

Kama‘āina and kūpuna with knowledge of the proposed Project and study area participated in semi-structured interviews from May 2011 to October 2011 for this CIA. CSH attempted to contact 33 individuals for this CIA report; of those, 16 responded and nine participated in formal interviews. CSH initiated the interviews with questions from the following five broad categories: wahi pana and mo‘olelo, agriculture and gathering practices, freshwater and marine resources, cultural and historic properties, and burials. Participants' biographical backgrounds, comments, and concerns about the proposed development and Project area are presented below. The interviews represent the cultural wisdom and mana‘o of a caretaker of Mōli‘i Pond, a former worker at Kualoa Regional Park who learned from kūpuna, current and past presidents of the Ko‘olaupoko Hawaiian Civic Club, a former resident of Waikāne with childhood memories of Kualoa, an archaeologist with the Kualoa Archaeological Research Project between 1975 and 1990, a former resident of the area of the Kualoa Regional Park's headquarters, and a photographer with an interest in wahi pana. Two of the interviewees estimated the locations of cultural sites and burials, and two other interviewees indicated the locations of cultural sites through site visits and sharing of Global Positioning System (GPS) coordinates (Figure 48).

5.1 Acknowledgements

The authors and researchers of this report extend our deep appreciation to everyone who took time to speak and share their mana‘o (thoughts, opinions) with CSH whether in interviews or brief consultations. We request that if these interviews are used in future documents, the words of contributors are reproduced accurately and not in any way altered, and that if large excerpts from interviews are used, report preparers obtain the express written consent of the interviewee/s.

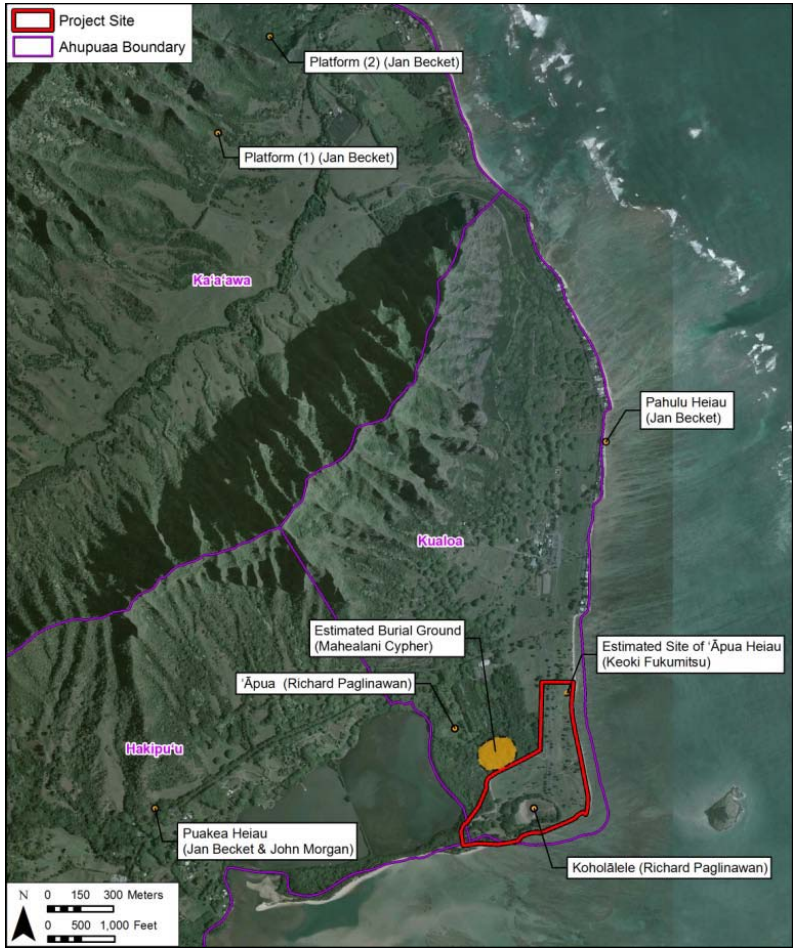


Figure 48. Cultural sites in Kualoa Ahupuaʻa, estimated by community participants based on maps, and located by community participants through current and previous sites visits (base image, 2007 Google Earth)

5.2 Keoki Fukmitsu

CSH interviewed Keoki Fukumitsu on June 20, 2011 at his home near the western wall of Mōliʻi Fishpond, which forms part of the ahupuaʻa boundary with Kualoa and abuts the western section of Kualoa Regional Park and the Project area. Mr. Fukumitsu's family has lived in this section of Hakipuʻu Ahupuaʻa for at least 200 years, and Queen Kalama transferred the ʻili of Kanohoanahopu during the Māhele. From the teachings of his kūpuna, as well as his own archival research and archaeological experience (on Kahoʻolawe), Mr. Fukumitsu shares moʻolelo of Hakipuʻu and Kualoa, and describes cultural and archaeological sites. Mr. Fukumitsu describes generations of experience cultivating taro, maintaining Mōliʻi Fishpond and raising fish, and hunting and gathering of marine and forest resources. He also explains insights on mauka-makai relationships, describes the special cultural significance of the area, and shares his manaʻo regarding the proposed Project at Kualoa Regional Park.

The cultivation of taro is of central importance to Mr. Fukumitsu and his family. The Fukumitsu property contains 30 loʻi (Figure 49), which are fed from two ʻauwai diverted from Hakipuʻu Stream and a spring. Mr. Fukumitsu and his siblings, children, and grandchildren primarily cultivate the fast maturing varieties of lehua and moi, but they have tried over 50 other varieties, including piko, lehua maoli, maui lehua, manalauloa, haʻakea, piʻialiʻi, pololū, and ʻapuwai.

A loʻi has, on average, about 2,000 taro plants, and with full production of the 30 loʻi, Mr. Fukumitsu's family can produce between 30,000–40,000 pounds of taro per year. When Mr. Fukumitsu first cultivated taro as a business, he sold taro at nine cents per pound. Today he sells his taro for $2 to $3 per pound, and the current market price for processed taro as poi is $10 per pound. Mr. Fukumitsu primarily obtains taro seedlings from other taro farmers. Since the University of Hawaiʻi at Mānoa began patenting varieties of taro for profit, Mr. Fukumitsu started traveling to Kauaʻi and Maui to gather between 3,000 and 5,000 taro seedlings to start a huli bank or nursery.

A number of factors have contributed to a decline in taro production that is currently limited to a few taro patches. High levels of iron and nitrogen in the spring water has resulted in bigger leaves but smaller corms. In addition, invasive species, such as the golden apple snail, eat the taro plants, and diseases, such as pocket rot and blight, destroy the plants. To maintain proper growth, Mr. Fukumitsu must factor the proper timing and weather patterns, as well as control of the snails, which are picked by hand.

In addition to the cultivation of taro, Mr. Fukumitsu has grown bananas, beans, eggplants, tomatoes, and cucumbers, which have been temporary alternatives as cash crops. His grandmother also successfully grew tropical flowers. While it has been important to diversify agriculture for economic reasons, Mr. Fukumitsu in the last 10 years returned full time to taro cultivation in order to sustain his water rights, which date to Queen Kalama's transfer of the ʻili during the Māhele and require the primary production of taro.

Mr. Fukumitsu explains that water is essential to taro production. Mr. Fukumitsu and his family continue to maintain the water system (Hakipuʻu Stream, the two diverted ʻauwai, and springs) by cutting overgrown hau bushes and clearing nearby springs. The community in fact

relies on this type of maintenance for their water since half of the water supply in Hakipu‘u is diverted through a tunnel to the Waiāhole Ditch without a gated, controlled system.

According to Mr. Fukumitsu, the flow of water through Hakipu‘u connects it and creates a mauka-makai relationship. The Hawaiians used an ahupua‘a land management system that connected each part of the ‘āina because like the people, what it provides is dependent on each other. He elaborates that the mountain waterfalls and springs contain microorganisms that feed freshwater fish and ‘ōpae (shrimp) in Hakipu‘u Stream, as well as fish that thrive in the brackish water at the interface of the muliwai, the two ‘auwai, and the fishpond. With surrounding mangroves providing protection from predators, this estuary is a pu‘uhonua, or place of sanctuary for the pua (young baby moi [threadfish]), ‘anae (mullet), awa (milkfish), pāpio (infant stage of ulua [crevalle, jack, or pompano]), and ‘ō‘io (ladyfish, bonefish). Significantly, the freshwater fish of the muliwai and the saltwater fish of the fishpond are both attracted to this brackish water, called “sweet water,” for the right conditions to procreate, as well as to get rid of their respective bacteria. Mr. Fukumitsu shares a mo‘olelo of how mature ‘anae in Mōli‘i Fishpond used to travel through a lava tube toward the leeward side of the island, which was aptly named Wai‘anae. In addition to the productive growth of fish and taro, the wetlands of Hakipu‘u are also havens for the ‘alae ‘ula (Hawaiian moorhen) and ae‘o (Hawaiian stilt bird).

Mōli‘i Fishpond, which encompasses 125 acres, was constructed at least 800 years ago before the advent of ahupua’a boundaries according to oral history. Mr. Fukumitsu’s ancestors received rights to the fishpond from Queen Kalama, as did other kuleana tenants. Now, Mōli‘i Fishpond continues to be operational. Mr. Fukumitsu’s family harvests fish on a weekly basis. Once matured, the awa, ‘ō‘io, and other fish are easily caught at the three mākāhā. The family also maintains the fishpond wall near their home, replacing lost grout with ‘ili‘ili (small cobbles) gathered from the lo‘i and reinforcing the outer sections of the walls (Figure 50). Near the first mākāhā (Figure 51), Mr. Fukumitsu pointed out a kū‘ula, although the largest stone was missing (Figure 52). He also indicated that a fourth mākāhā that had been filled in and the most recent fishpond caretaker, George Uyemura, had constructed a small dwelling (no longer present) on this widened section of the fishpond wall (Figure 53). Closer to shore, Mr. Fukumitsu pointed to a medicinal plant, haue (purple vervain), growing on the fishpond wall, the leaves of which were gathered to heal large cuts (Figure 54).

Mr. Fukumitsu shares several mo‘olelo of Mōli‘i Fishpond. One mo‘olelo in particular tells of a woman who was the grandmother of his cousin Raymond Kamaka, who was lost at sea. After three days she was seen on the shore of the fishpond, but never again. The family believed that the mo‘o of the pond swallowed her and took her into a lava tube.

In addition to harvesting fish in Mōli‘i Fishpond, Mr. Fukumitsu and his family catch saltwater ‘ōpae, flounder, weke (goatfish) ‘oama (young of the weke), and mullet in the ocean, hunt Samoan and white crabs, and gather clams and several varieties of seaweed along the beach, including limu ‘ele‘ele, manuweu, limu kohu, waiwaiole. He has also raised mullet, moe, awa, tilapia, catfish, and grass carp in fish tanks to generate income.

Several cultural sites have been either exposed due to erosion or inundated with water. Mr. Fukumitsu describes how the construction of facilities of the park initiated massive erosion along the eastern shore of Kualoa Regional Park, such that the lost sand is accumulating along the

southern beach area. This erosion along the eastern beach has unearthed grave sites. The recovered iwi have been relocated to a tree nursery site just outside of the Project area mauka of the entrance road to the park. In contrast, a submerged structure, most likely a fishpond wall, extends offshore from the southeastern point of the park, which dates to the time of Queen Kalama in the 1850s, according to Mr. Fukumitsu.

The islet of Mokoli‘i, also called Chinaman’s Hat, was once used as a quarry site for basalt adzes and tools and volcanic glass, according to Mr. Fukumitsu. He relates several mo‘olelo of Mokoli‘i Island. One mo‘olelo tells of Kupuna Kaopulupulu who would often drop a young Libby Parash at the sand cove of Mokoli‘i when he went fishing. On a particular day after a shadow crossed their canoe, the guardian of the area—a large shark—approached and although not seen is believed to guard the area. In another mo‘olelo, a boy named Keoni and his family maintained lo‘i in the area. Once, while swimming, a shark attacked him. He swam to shore, ran to the taro patch, grabbed his poi pounder, and swam back to the shark. After beating the shark with the poi pounder, the shark turned into a boy, who pleaded for mercy. The shark boy became Mokoli‘i. The most known mo‘olelo tells of how the goddess Pele sent the pig god Kamapua‘a to defeat a giant mo‘o, whose tail became Mokoli‘i and whose body became the ridge of Palikū, the traditional name for Kānehoalani.

With archaeological training on Kaho‘olawe in the 1970s, Mr. Fukumitsu was able to identify a red ‘ulu maika stone recovered from one of his lo‘i in Hakipu`u. Based on its color and soft material, the Bishop Museum estimated that it dates to A.D. 1300. Mr. Fukumitsu also discovered a blue basalt ‘ulu maika stone on the hillside behind his home, which he thought could have been used as an anchor for a cowry shell lure. He has also found sling stones on the sandbars as well as an ancient poi pounding board that was used by his grandmother Nawahine and has since then become the family board.

The ridge of Palikū (Figure 55) is associated with several mo‘olelo and place names. For example, Nanahoa stone, keeper of the Mōli‘i Fishpond, was actually a young boy forbidden to look upon a woman until he married, but he stayed out too late at night watching a young woman sleeping on the beach and became petrified as a mountain peak at sunrise. Behind this ridge towers Pu‘u ‘Ōhulehule, which connects the Ko‘olau ahupua‘a of Waiāhole, Waikāne, Kualoa, Kahana, Ka‘a‘awa, and Punalu‘u. Hakipu`u which means broken hill, is between Waikāne and Kualoa, and is where Ko‘olaupoko ends and Ko‘olauloa begins.

The area of Hakipu‘u and Kualoa holds a powerful cultural significance for Mr. Fukumitsu: “There is a whole cosmos system here, of unseen powers.” He explains that the navigator Kaha‘i first sighted the peak of Kānehoalani when he voyaged across the Pacific Ocean. He made Hakipu‘u his home and made many expeditions for Kamehameha I. Kaha‘i is credited with bringing the first ‘ulu plant on one of his journeys to Samoa. In addition, the god Maui is supposedly buried in the mountains of Hakipu‘u which generates great mana. A lunar alignment also exists between Kualoa and the sacred birthing site of Kūkaniloko in central O‘ahu. A heiau called ‘Āpua, located in the northeast corner of the Project area, was once connected to the burial grounds, but has since been destroyed (see Figure Figure 48 for Mr. Fukumitsu’s estimated location of ‘Āpua Heiau). The area had attained such significance that Kahekili received instruction from the prophet Kaopulupulu that he should not give away the land.

Mr. Fukumitsu’s main recommendations for the Project are to recognize that the wetlands connecting Hakipu‘u Stream and Mōli‘i Fishpond, including his family’s lo‘i, constitute the last intact sustainable cultural and natural resource system in Ko‘olaupoko Moku that extends from the mountains to the ocean, and to preserve this system through a variety of measures. Mr. Fukumitsu has worked with over 20,000 children on his lo‘i, and believes that the key to sustainability is through educating and training youth about a traditional lifestyle and use of resources. He asserts that such education should connect traditions and ancient customs with current development, possibly through museum exhibits, a cultural center, and monitoring of archaeological sites. He also stresses that this area is connected to Mōli‘i Fishpond, which, in turn, is connected to Kualoa Regional Park and the Project area, and thus promotes zoning this area as a cultural and natural resource sanctuary in perpetuity.

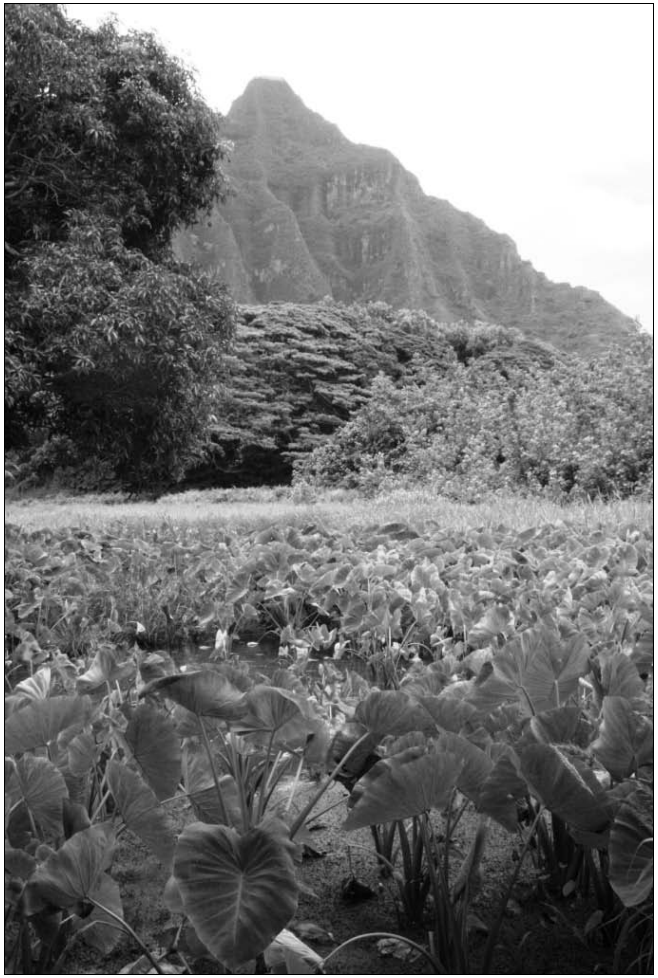


Figure 49. Lo‘i near Mōli‘i Pond (CSH June 20, 2011)

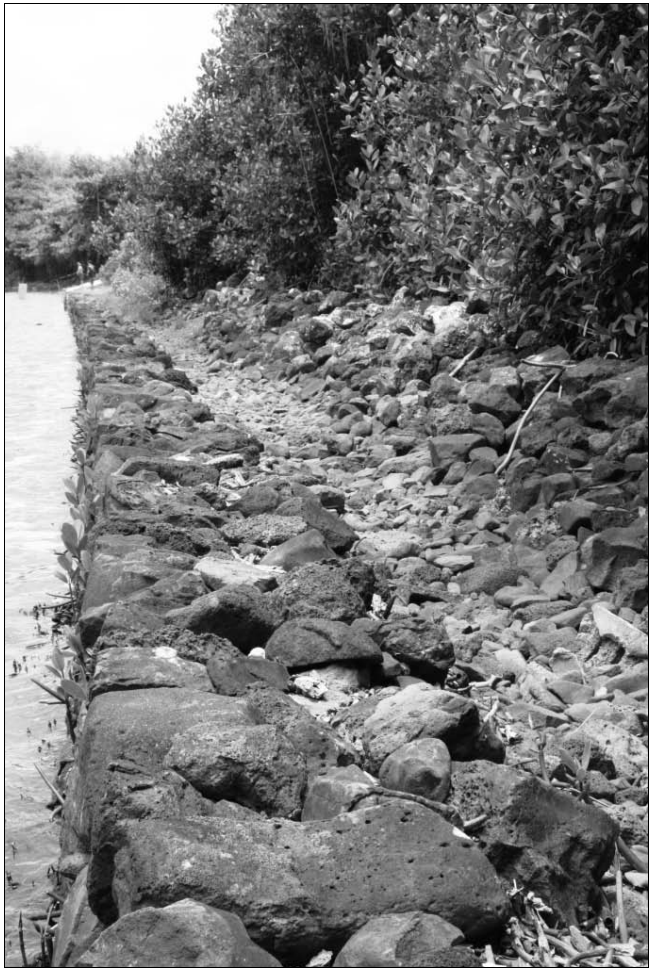


Figure 50. Wall of Mōli‘i Pond with ‘ili‘ili grout (CSH June 20, 2011)

Figure 51. Mākāhā of Mōli‘i Pond (CSH June 20, 2011)

Figure 52. Kū‘ula on Mōli‘i Pond (largest stone is missing) (June 20, 2011)

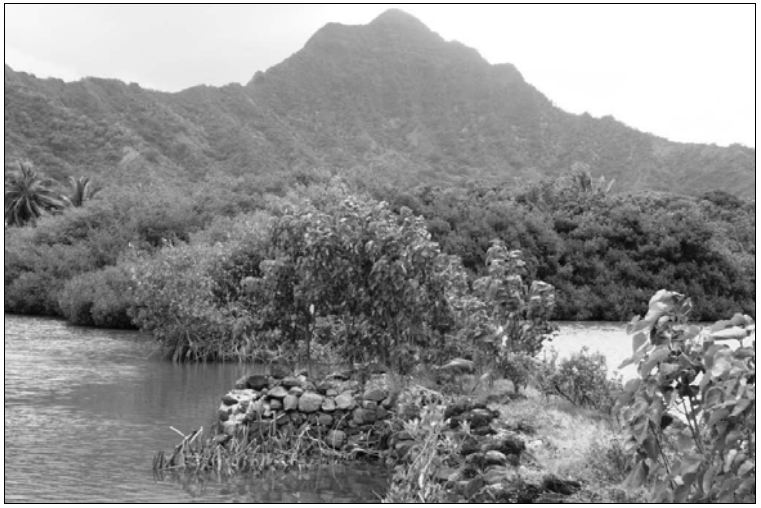


Figure 53. Filled mākāhā of Mōli‘i Pond that had been a small dwelling (no longer present) for former caretaker George Uyemura (CSH June 20, 2011)

Figure 54. Haue, growing on the fishpond wall, the leaves of which were gathered to heal large cuts (CSH June 20, 2011)

Figure 55. Ridge of Palikū, view from Mōli‘i Pond (CSH June 20, 2011)

5.3 Tai Crouch

Cultural Surveys Hawai‘i interviewed Tai Crouch by phone on July 1, 2011 and previously on February 14, 2000. Mr. Crouch grew up in Wahiawā, graduated from Leilehua High School, and later graduated from the University of Hawai‘i. Mr. Crouch worked at Kualoa Regional Park from 1974 to 1981. While at the park, he helped develop the curriculum for the Hawaiian cultural program, which is still in use. Mr. Crouch came in contact with many kūpuna and long-time residents who passed on their mo‘olelo and experiences to him, such as Francis Morgan, the foreman at Kualoa Ranch, George Uyemura, the caretaker of Mōli‘i Fishpond, Tūtū Kawelo from Kahalu‘u, John Ka‘ohelauli‘i from Ni‘ihau, Sam Lono, Kilohana Mitchell, and Bill Whaley. He emphasizes that the knowledge he has about Kualoa came from many sources, including books, and by no means should it be construed as his own, and he is very grateful to the many kūpuna who shared their stories with him. Since 1981, Mr. Crouch has taught at Punahou School, including classes on Hawaiian history and culture, and is currently the coordinator for the Outdoor Education Program.

From 1974 to 1981, Mr. Crouch used to see large schools of mullet, akule (big-eyed scad), and nehu (smelt, anchovy) come into the bay. He fished for āholehole (young stage of āhole, Hawaiian flagtail), awa, and kala (surgeon fish), the skin of which was used to make pūniu (a small knee drum, used in hula, made of coconut shell and usually covered with the skin of the kala fish). He also found puhi (eels) inside discarded tires, notably the kāpā (mottled eel). He remembers that older residents of the area talked about numerous he‘e, especially Francis Morgan, caught 100 he‘e in a day, each weighing about five or six pounds.

Pilihe‘e Pond, which was destroyed by the 1868 tsunami and is now submerged, used to be an ‘umeiki, a type of fish trap. The pond was attached to the southern shoreline and constructed with a hooked shape, so that the southwest portion remained open to the bay waters. At high tide, waves—and fish such as ‘ō‘io and ‘anae—flowed over the rock walls, but at low tide the fish became trapped in the enclosure. Mr. Crouch describes his discovery and appearance of the submerged structure:

> We used to go out there and surf the canoe. We would dive and that’s where we would find he‘e. One person came by, at one point when we were out there, and he says, “[Did] you guys find he‘e?” And we said, “Oh, we find it once in awhile.” “Yeah, well, this is the place, because it’s Pilihe‘e.” And then he said, “It used to be a pond.” You know, the whole time we were out there, we never noticed, but at low tide, [when] you go out there, you can see [that] it’s all basalt rock. And we thought it was just reef.
>
> You could see the wall at low tide. It’s kind of L-shaped. Then, once you go out there and look, it’s perfectly obvious that it’s all basalt rock.
>
> You can walk out at low tide. And, you can see it at low tide just standing here at the toilet at the point by ‘Āpua Pond. You can see it’s kind of an L-shape. We normally just take the canoes out, and you can just stand right on top.

A heiau named Pahulu is visible at low tide. According to Mr. Crouch, extensive loss of sand along the eastern beach has eroded the foundation of this heiau, but the rocks have settled down

in the remaining sand. Kilohana Mitchell, who used to work at Kamehameha Schools, shared mo‘olelo about several heiau in the area with Mr. Crouch, including Pahulu:

> There’s one out here that you can still see at low tide, in the water. At the time, it was built on land because, of course, the land has receded. And that was named after a Moloka‘i family, Pahulu. The story was that there was a kahuna, Lanikāula, that was gaining power on Moloka‘i. And, they were kahuna also and they were being the ‘anā‘anā [evil sorcerers]. Every so often a member of their family would die. So they decided to leave and they landed at Kualoa. They weren’t permitted to stay, but they were permitted to build a heiau there to commemorate their arrival. From there, I heard they moved to Hale‘iwa, to Kapukapuākea and then they couldn’t stay there, so they moved inland to Līhu‘e, up in that area. The name of the heiau is the name of the family.

Niuola‘a is another heiau at Kualoa. Mr. Crouch believes that Niuola‘a Heiau means “sacred coconut” rather than referring to La‘amaikahiki. Niuola‘a Heiau was destroyed for the construction of a church, but two kamani (native trees) several hundred years old most likely mark the location of the heiau, possibly the entryway into the heiau. When Mr. Crouch was involved in the archaeology of Kualoa Regional Park from 1974 to 1981, the outline of the heiau could still be discerned by a few rocks. Excavations to 80 centimeters in depth revealed one edge of the heiau.

Regarding the pronunciation and meaning of the coastal point north of the park, Mr. Crouch has heard both, Ka Lae o ka ‘Ō‘io and Ka Lae o ka ‘Oi‘o. He believes the correct pronunciation is ‘oi‘o (procession of ghosts of a departed chief and his company) in reference to night marchers rather than being associated with the bonefish (‘ō‘io). He describes the procession of the night marchers along the border between the ahupua‘a of Kualoa and Hakipu‘u:

> That’s the exact point where they come down. There’s a bunker there and that was probably one of the places where they came out and began the huaka‘i [procession].
>
> They would come right over to the stone house and then turn around and go back. That is where the archaeologists found the ahupua‘a marker. When I was living there, we would hear all kinds of things. Especially the dogs and cats. Because there were lots of wild dogs and cats in the park. Whenever they started, usually, I would know ahead of time. I would keep track when it was coming.
>
> At night, the cats would run underneath the house. The dogs would run down the beach this way. And you could tell something [was up], you know, sounds that animals don’t normally make. I think the dogs could see them.

The depression of Koholālele, according to Mr. Crouch, was a site where whales were beached. He relates that according to Fornander, Kualoa was called pae palaoa. He believes that after the tsunami of 1868, this depression, which measures about 15 feet wide by about 60 feet long, may have been dug to re-connect Mōli‘i Fishpond to the bay. Mr. Crouch was also involved in excavations of Koholālele that revealed taro along the bottom layers of the depression.

Kānehoalani is the highest point on the mountain ridge mauka of the park, with Palikū extending south and Mo‘okapu o Hāloa extending north. These ridges contain several wahi pana. Lepeamoa was a person who could change into a rooster and hide in the mountains of Kānehoalani when being chased. Pohukaina is the name of a cave in the mountain. Kaluau is a pōhaku in the wall of Mōli‘i Fishpond that is connected to Nānāhoa. This cave supposedly had three or four entrances, including Ka‘ahu‘ula Pūnāwai, which came out in Waipahu. Holoape‘e is the name of distinctive cliff formations. Mo‘olelo describe that Olopana’s men were chasing Kamapua‘a and he made the holes of Holoape‘e. At one point, Kamapua‘a is in a hole and Pele points to him, saying, “Ē, aia lā o‘ia ma‘ane‘i.”

Voyaging was, and continues to be, a significant component of the history of Kualoa. Mr. Crouch shares that the area became sacred because of La‘amaikahiki. To show respect for where he stayed, sailors lowered their sails as they went by. In addition, Kaha‘i supposedly brought the ‘ulu to this area. Mr. Crouch was inspired by Ben Finney, a UH anthropology professor and co-founder of the Polynesian Voyaging Society, to become involved in the construction and sailing efforts of *Hōkūle‘a* in 1975. While Herb Kane, another co-founder of the PVS, wanted to launch *Hōkūle‘a* at Waikīkī for more publicity, Mr. Crouch, based on his experiences and knowledge of Kualoa, suggested that the launching of this reconstructed double-hulled voyaging take place on the southern shores of Kualoa.

Tūtū Kawelo told Mr. Crouch the story of Mokoli‘i and Hi‘iaka. A battle between these two goddesses started at the base of Mōli‘i Fishpond, and continued up the ridge. When Hi‘iaka killed Mokoli‘i, her body fell back to become part of the ridge of Kānehoalani, and her tail became the island of Mokoli‘i

Measures to control beach erosion were disastrous, according to Mr. Crouch:

> It was the worse thing they could have done. When I was there, the beach was eroding. And, after they put the controls in, it eroded at twice the rate.
>
> They just put these big surge breakers in over here and they didn’t continue them around the point. They just put a line here and, of course, where the surge breakers ended is where the erosion started occurring with much more rapidity. I have pictures of kids sitting out at the point, with the point being another 100 yards or 300 feet out. So, there’s the island, about 300 feet less walking distance. And you go out there now and you can see the lid of the—actually, you can see the whole thing. I have pictures in varying stages. And I have one picture with the lid, and that sewage kind of pipe, right on the edge of the beach. Another one where it’s ten feet off the land, another one where it’s thirty feet off the land and so forth. So it’s just incredible. The bath house there was ready to get washed out and then they went back and did another little thing. And Bob Connolly and I built a little wall out of rocks just to see if that would have an effect. And it did. So we called up the City and County engineers and said, “Look, we just built this little wall here and it slowed down the erosion because we angled it out this way.” And they said, “We’ll look into it.” They never did. And then they had to come out and sand bag and then they started putting pilings out here. But that was like five years later.

> But what’s happening is that this area is eroding out to where it probably was at one time. Talking to John Morgan, when that house was built, where the park headquarters is now, that was approximately ten feet off the beach. And he remembers just running literally off the house and right into the water. So that was [19]50s. So all this accrued in 25 years, to [19]75.

Kualoa is an especially sacred place, according to Mr. Crouch:

> I can just feel it for one. With all the documentation going back to La‘amaikahiki, the name Palikū, the association of Kānehoalani with Pele, my source says there’s over 400 chiefs buried in the cave [Pohukaina]. And some are in *kapa* wrappings, some are in ka‘ai [sennit baskets], some are in things that look like *ka‘ai*, but nothing like they have at the Bishop Museum, but just kind of like regular—not regular baskets—but, they look like baskets. They’re tubular-shaped baskets. And there’s all sorts of artifacts in there, spears, and the cape(s).
>
> They found the cape [Ka‘ahu‘ula] in the water so it could have just fallen. This lady, one of the chiefesses, was over here drawing water. And there was this cape just floating underneath the surface. And, of course, the spring just kind of bubbles up, so it was just kind of keeping it bubbled up. So she takes it out and here’s this red ‘ahu [cape]. And that’s how the spring got its name. People have been going in there. And, evidently, you can dive under and swim to a passage and then you come up in a cave and you’re in water about this deep [motions to chest-level]. After a while, you just walk up and you’re in another section where it’s dry. And that’s where some of these artifacts are. Evidently, the water could have got high and washed this particular cape down into the spring.

Regarding the burials at Kualoa, Mr. Crouch suggests that the high chiefs were buried in the mountain at Pohukaina or in the caves on the lower slopes. He does not believe that the sand burials are of great antiquity. More likely, they are associated with LCAs within the last 150 years.

Mr. Crouch’s main recommendation is to develop a long-term monitoring plan for the inadvertent uncovering of human remains through continuing beach erosion. He would also like protective measures for submerged cultural resources, such as Pahulu Heiau. He also recommends restoring cultural sites, such as Niuola‘a Heiau, and developing interpretive areas.

5.4 Elizabeth Lau

CSH interviewed Elizabeth Cypher Lau on June 16, 2011 at her home in Kahalu‘u. Ms. Lau, nearly 92 years old, was born in 1919 to George K. Cypher, of Chinese descent, and Elizabeth Lum Ho, of Hawaiian and Chinese descent. She spent most of her childhood in the moku of Ko‘olaupoko. Ms. Lau was only 17 years old when the Ko‘olaupoko Hawaiian Civic Club began and is still currently involved for a total of 74 years of membership, including over 50 years as the president. Her experience with this civic club and teachings from her Hawaiian elders provide insight into the early twentieth century lifestyle of windward O‘ahu, including Kualoa and the Project area.

George K. Cypher, Ms. Lau’s father, was born with the surname Sai Fu, which was changed to “Cypher.” He was born and raised in Kalihi. At 14 years of age, Mr. Cypher became the youngest and best butcher at Hawai‘i Meat Company. Later, Mr. Cypher became a sheriff and eventually the Chief of Police for the area that stretched between Makapu‘u and Waimea. Ms. Lau and her sister often assisted her father with typing the police reports. Their father told them, “Don’t read the story, just copy.” Her father later founded the Ko‘olaupoko Hawaiian Civic Club with George Houghtailing.

Elizabeth Lum Ho, Ms. Cypher’s mother, was born on the island of Hawai‘i and the youngest of nine children. Her mother, Holokahiki, was a neighborhood midwife, and her Chinese father owned a poi shop in Hilo, preferring to raise their daughter with Chinese rather than Hawaiian customs and food. Her father raised his daughter on his own, away from her mother and eight siblings. After her father’s death, Elizabeth was raised by her father’s best friend, a tailor. Her hanai (adopted) father sent her to Honolulu to live with her older sister and attend school to become a teacher; however, her newly adopted sister failed to send her to school and fed her Hawaiian food, a cuisine she was not accustomed to.

During the 1930s, George Cypher moved his family to the windward side of O‘ahu. Ms. Lau attended McKinley High School where she graduated in 1937. Ms. Lau describes the drive up the Pali as “a long ride up” and preferred being in town, referring to Kāne‘ohe as being “so country.” She recalls that the ahupua‘a of Kāne‘ohe had two vegetable stands at the bottom of the Pali and the small town of Kāne‘ohe contained a courthouse, a Japanese church, two stores (Yoshimoto Store and Yim Store), and a doctor named Dr. Clarence Ching whose actual profession as a veterinarian earned him the nickname “The Horse Doctor.”

Ms. Lau spoke with and understood the Hawaiian language from her grandmother, Holokahiki. She also learned Hawaiian superstitions, the reasoning behind these superstitions, and about the different traditional medicinal plants and their remedies. Ms. Lau recalls an incident as a toddler that required the urgent need for medicinal plants. Ms. Lau was at her grandmother’s home on the island of Hawai‘i when she crawled and fell off the porch. A rock became lodged in her forehead. Her grandmother removed the dislodged the rock and began to pound honohono (dayflower) grass with the juices of chewed tobacco and applied the mixture to the injury. The would healed, but Ms. Lau still has a scar from the injury. Ms. Lau explained that if her grandmother had another grass instead of honohono, there would be no scar. In addition to these grasses, her grandmother regularly pounded the flower of the kukui tree and dropped the liquid into her eyes to make them strong; when she was 85 years old, “she could still thread a needle.”

One mo‘olelo shared by Ms. Lau connects the larger fishpond of Kualoa to Mokoli‘i Island, also known as Chinaman’s Hat. George Cypher had told his children that the fishpond was owned by a Japanese couple who sold their fish in Honolulu. This caretaker was very fond of George Cypher and invited him over one evening to witness a peculiar event. As the two men stood at the edge of the fishpond during sunset, a large squid came out of the pond and crawled to Chinaman’s Hat. Ms. Lau recalls her father as a large man—six feet tall, weighing 500 pounds, and “solid” because of he played soccer. According to Ms. Lau, her father described the tentacle as being as big as his leg and only crawling up from one side of the fishpond. Ms. Lau

returned to the fishpond during sunset later in life and camped on Mokoli‘i Island, but she never saw the squid.

Ms. Lau’s knowledge of the Kualoa area extends to ancient times. She recalls that her grandmother, Holokahiki, shared with her that this area was an important port where ships docked, a place where battles were fought, and burial ground for those who died fighting. Her grandmother instilled in her that Kualoa was more sacred than Waikīkī.

Regarding Kualoa Regional Park and the Project area, Ms. Lau remembers as a child that the area was “all bushes growing up.” She recalls that the Kualoa area had an airfield for the military that extended from the ranch to the area now occupied by the park. Local traffic often had to stop when planes landed. She also remembers a bunker built for the military near the Kualoa-Ka‘a‘awa boundary marker. Her family interacted with the military in Kualoa during World War II. Since George Cypher was the Chief of Police for the windward area and a chef, he befriended many officers in the military and often threw many lū‘au (feasts) at the Cypher home. Ms. Lau recalls that some officers helped her family tape their windows during the war.

Ms. Lau’s only suggestion for the proposed Project is to commemorate all who died there and describe the history of the area with a memorial or plaque.

5.5 Mahealani Cypher

CSH interviewed Mahealani Cypher at the office of the Ko‘olaupoko Hawaiian Civic Club in He‘eia on June 9, 2011 and previously on July 13, 2010. Ms. Cypher, born in 1946, refers to herself as a “baby boomer” due to her birth being a product of World War II. Her biological father was stationed on O‘ahu during World War II and left without knowing she was ever to be born. Her grandparents, whom she calls Papa and Mama Cypher, subsequently adopted her and her younger sister. They raised the two sisters as their own in Kāne‘ohe, where Ms. Cypher has since spent her whole life. She considers them her parents and credits them for sharing their cultural knowledge with her.

Papa Cypher was born in Hana, Maui, and later moved to O‘ahu. He was a police sergeant and then lieutenant for the entire windward side of O‘ahu from Makapu‘u to Waimea. Ms. Cypher recalls that everyone knew this man, who weighed over 300 pounds and was over six feet tall. After retiring from the police force, he became a distributor for the Honolulu *Star-Bulletin* on the windward side of O‘ahu. Ms. Cypher recalls driving along the coast when he distributed the newspapers and visiting all the windward ahupua‘a. Ms. Cypher recalls that he always protected the family but, in his later years, he developed gout and had heart problems and eventually passed away when Ms. Cypher was only six years old.

Mama Elizabeth Cypher was a strong woman—“tiny but tough.” Her mother was Holokahiki Na-kapuahi Kukila, and her father was Lum Ho from Beijing, China. She grew up in Hilo with her father, but when he passed away she became the foster child of his best friend, the tailor Ah Ping. When she was 12 years old, her Hawaiian family sent her to Kalihi on O‘ahu to live with her eldest sister Koiwiloa Manewa. Instead of being able to attend school, which she deeply loved, she was forced to work as if she were the house servant. So, when she was old enough, she married George Cypher when she was 17 or 18, thereby gaining her independence. They had six children of their own, as well as many foster children that Papa Cypher brought home. Mama

Cypher died in 1983 at 86 years old. Ever since her passing, Ms. Cypher feels that Mama Cypher is with her, as her ‘aumakua for her, a protecting spirit making Mahealani feel safe and cared for at all times.

A key part of Ms. Cypher’s upbringing was spending time with Mama Cypher and listening to her stories. Due to her granddaughter’s asthmatic condition as a young child, Mama Cypher took extra care to watch over Mahealani’s health. This allowed Ms. Cypher to spend more time with Mama Cypher than the other children. Mama Cypher shared with her a great deal of family mo‘olelo, which Ms. Cypher has preserved in writing. She often went driving with Mama Cypher along the windward coast. Her grandmother described its various ahupua‘a as they passed through, and shared stories of the area and the people.

Ms. Cypher’s experiences extend throughout the windward coast, including the Project area and vicinity. While in her early 30’s, Ms. Cypher and her family rented a beachside home from the Magoon family. During this time, Ms. Cypher was working for the Teamsters and Hotel Workers Unions. Her family gathered lobster offshore of Kualoa during lobster season and she remembers that the Japanese community fished for ‘oama (juvenile weke) along the roadside adjoining Kualoa Beach Park during ‘oama season.

Ms. Cypher’s knowledge of the Kualoa area prior to the development of the ranch and park extends back to ancient times. According to Ms. Cypher, the area was traditionally named Palikū after a section of vertical cliffs, and was re-named Kualoa by the Judd family, of which the Morgan family members are descendants. She describes several peaks and caves in and near Kualoa, including Pu‘u Kānehoalani, Pohukaina Cave, Pu‘u Ohulehule, and Ka‘ōb. Pu‘u Kānehoalani is the mountain range behind the current site of the ranch. Pohukaina Cave is a large cave system that was home to ancient royal burials with entrances in different parts of the island. According to Ms. Cypher, the cave opening in Kualoa was located near the Ka‘a‘awa boundary but the military sealed large sections of it during WWII. Pu‘u Ohulehule is a pyramid shaped mountain surrounded by five watersheds: Waiāhole, Waikāne, Haikpu‘u, Ka‘a‘awa, and Kualoa. Ka‘ō‘io Ridge is the dividing line between the districts of Ko‘olaupoko and Ko‘olauloa. In addition to these natural features of the landscape, Ms. Cypher describes two fishponds, Mōli‘i and ‘Āpua. Mōli‘i Fishpond is actually a part of Hakipu‘u Ahupua‘a. She suggests that Mōli‘i Fishpond was utilized to feed the population within the ahupua‘a while ‘Āpua Fishpond, which was kapu, was reserved for the ali‘i and kahuna classes. In addition, Mōli‘i Fishpond forms a division between the ahupua‘a of Hakipu‘u and Kualoa.

The cultural significance of Kualoa extends beyond wahi pana and cultural sites. Ms. Cypher describes how Kualoa was so sacred that passing canoes lowered their sails out of respect. In fact, a portion of Kualoa was used as a pu‘uhonua, or a place of refuge, for those who were to be punished or killed. Certain sections of Kualoa were used as a training ground for young ali‘i to learn how to become a chief or as burial grounds. She estimates the location of a large concentration of ‘iwi (a burial ground) immediately mauka of the Project area, adjacent to the entrance road north of ‘Āpua Fishpond (see Figure 48). Ms. Cypher is concerned that there may be other burials throughout the property now occupied by the park, and advises that cultural monitoring would be needed should there be any excavation during the project. In addition, mo’olelo describe how Kualoa once contained (and may still continue to contain) various artifacts that symbolized the sovereignty of O‘ahu during the time of Kahekili.

One personal, family mo‘olelo shared by Ms. Cypher connects Mōli‘i Fishpond and the islet of Mokoli‘i. Ms. Cypher relates that Papa Cypher, who was a police chief for the windward side during the 1930s and 1940s, knew the caretaker of Mōli‘i Fishpond. This Japanese caretaker was so fond of Papa Cypher that, one day, he invited him to stop by the pond during twilight, just before sunset. Papa Cypher returned the following day at twilight, and the two men stood on the shoreline of the fishpond, watched and waited. Suddenly a large, black shape emerged out of the fishpond. This huge “blob” traveled over the beach and crawled up Mokoli‘i Island, eventually covering the entire top of the island. Ms. Cypher is unsure of what this “blob” could possibly have been, but she suggests it could have been a giant squid or sea slug.

Ms. Cypher is supportive of the Project, as a new wastewater infrastructure is needed. Her main recommendations are to conduct cultural monitoring during any digging or excavation to ensure proper respect for possible burials in the area, and to develop a reinterment plan for any inadvertent uncovering of ‘iwi, which includes building an on-site mausoleum for any ‘iwi found in the Project area.

5.6 Ewa Kia

CSH met with Ewalani “Ewa” Kia on June 8, 2011 at her home in Waimānalo. Born in 1966, Ms. Kia resided at Kuhio Park Terrace (also known as KPT in the ahupua‘a of Kalihi) and Waimānalo before moving to Waikāne during the late 1970s. Her paternal grandmother and aunt lived on the makai side of Waikāne on a private road known as Star Route Lane. Ms. Kia’s parents and four siblings lived there for about four or five years. Ms. Kia’s childhood memories center on activities on Kāne‘ohe Bay and in the mountains of Waikāne. She shares her recollections of fishing and gathering marine resources, swimming in Waikāne Stream and diving in Kāne‘ohe Bay, and paddling to Kualoa Beach Park and Mokoli‘i Island, as well as hiking, and gathering mountain resources.

Ms. Kia recalls how she fished with poles and nets for kala, mullet, and pāpio when in season. She and her siblings hunted for crabs, including the Samoan crab and “7-11” crabs, in the Waikāne and Kualoa areas, as well as ‘ōpae and tako (octopus). She also remembers gathering, clams and ogo (seaweed). In the Waikāne area, Ms. Kia caught ‘ōpae and gathered clams and ogo in natural beds during low tide. Ms. Kia relates that years later people took the entire rock from these natural ocean beds. This depleted the marine resources. As a result, the neighborhood on Star Route Lane has limited the number of visitors. For instance, on a recent visit to the lane, Ms. Kia was denied access from the neighborhood. According to Ms. Kia, her family preferred to dive for ogo, which was readily available in the Kualoa area. They also caught tako with a scoop net.

Ms. Kia and her siblings often hiked into Waikāne Valley either on a school excursions for Waiāhole Elementary or on their own. They gathered several plants from the valley, including “baby tears” (also called Pele’s tears), bananas, ti (kī) leaves, and ‘awapuhi (ginger, also called shampoo ginger). She recollects how she strung the “baby tears” to make necklaces and bracelets, and collected the flowers from ‘awapuhi to give to her mother. The bananas and ti leaves were used at home for cooking. She also made offerings in the mountains with ti leaves while gathering, and wove the ti leaves into leis or hula skirts for her friends. In addition, she picked and squeezed the fruit of the ‘awapuhi and bottled the liquid to use as shampoo. Their

father taught them to live off the land and to only pick what was needed. Plants that were gathered from the mountains were transplanted into their yard for home use. Ms. Kia and her siblings often hiked to Waiāhole Valley with family member Calvin Hoe (also called Uncle Ioane) to visit taro patches.

Several places at and near Kāne‘ohe Bay were special to Ms. Kia in her youth. She remembers swimming and building dams in Waikāne Stream across from the Waikāne Store with her siblings. She also recalls how they bathed in and drank the relatively clean water. After they bottled the water, the sediments would sink and they could drink the water. The stream was lined with sour plum trees, which Ms. Kia and her siblings picked and pickled in a soy sauce and vinegar solution. Ms. Kia asserts that Waikāne Stream never overflowed nor was polluted as it is today. In addition to Waikāne Stream, Ms. Kia and her siblings played at two piers near their home. She remembers a short pier with a depth of six feet and a longer, deeper pier. The children often jumped off the longer pier into the water, where they saw hammerhead sharks, stingrays, and mullet. The Kia family also had family pets including a cow and a duck named Jacko, which often swam in the ocean.

During her youth, Ms. Kia visited the Project area by sea. She and her siblings paddled their surfboards, a small wooden boat, or an inner-tube that had a piece of wood tacked onto the bottom from Waikāne to Kualoa Beach Park. The children fished and gather tako, ogo, and ‘ōpae. They were instructed by Uncle Ioane to stay away from Mōli‘i Fishpond. They also traveled to Mokoli‘i Island (Chinaman’s Hat). They would climb to the top of the island or go to the beach on the opposite side of the island (not facing Kualoa Beach Park), which had a small cove. In addition, the Kia family also attended the Hoe family reunions held at Kualoa Beach Park. Most of the food for the lū‘au was caught or gathered from the ocean or land by the Hoe family members.

Ms. Kia is not aware of any cultural sites or mo‘olelo of the area. However, she did show CSH several artifacts that either washed ashore or that she found while paddling between Kualoa Beach Park and Mokoli‘i Island, including two poi pounders (Figure 56), two ‘ulu maika stones (Figure 57), and a small collection of glass floats (round and rolling-pin styles) (Figure 58).

Figure 56. Poi pounders found in Kāne‘ohe Bay by Ms. Kia (CSH June 8, 2011)

Figure 57. ‘Ulu maika stones found in Kāne‘ohe Bay by Ms. Kia (CSH June 8, 2011)

Figure 58. Glass floats found in Kāne‘ohe Bay by Ms. Kia (CSH June 8, 2011)

5.7 Jo Lynn Gunness

CSH met with Jo Lynn Gunness at the University of Hawai‘i-Mānoa campus on July 15, 2011. Ms. Gunness conducted archaeological research at Kualoa Regional Park for 15 years between 1975 and 1990 as part of the Kualoa Archaeological Research Project. This project was initiated following the placement of Kualoa on the State and National Registers of Historic Places in 1974 [Kualoa was later removed from the State Register along with many other sites after a legal opinion that adequate notification had not been given]. Ms. Gunness based her M.A. thesis in anthropology on this archaeological research project, and has also published several reports. She reviewed with CSH the major findings, especially within the proposed area for the centralized wastewater treatment center (Survey Area 1C), and shared her mana‘o on the Project’s potential impact on cultural resources.

Based on historical sources and archaeological work, Gunness believes that the names of the two small ponds within Kualoa Park have been confused in historic times. Mention is made in the Judd journals of an attempt over a period of several days in November and December 1852, “to dig a canal from Apua to Moolii.” This was likely an attempt to extend an earlier man-made pond and/or to drain the low lying, and frequently rain-flooded, central area of the peninsula—referred to in early historic times as ‘Apua (meaning “bread basket”). Site 2B-2 may be the ocean end of the pond/ditch. The rich loamy sand in the ‘Apua area of Kualoa was used historically for growing watermelons and corn. It’s possible that sweet potatoes were earlier grown on the low mounding around the ditch; however, research on kuleana awards during the

Māhele show no plots in the immediate area at that time. The pond near Kualoa Point was the original Koholālele (meaning “leaping whale”). The leaping whale can be seen very clearly from the top of Mokoli’i Island, and in aerial photographs. Gunness was told by Rosamond Morgan that the source of this confusion of the pond names was G.J. McAllister in *Sites of Oahu*.

The Kualoa peninsula was originally formed by coral sand accumulating on the underlying coral reef. Over time, a gray to black loamy sand layer formed on the top of the coral sand, partly resulting from human occupation of the area. In the inland area of Kualoa Regional Park this cultural layer has been heavily disturbed over the years by farming activities, construction and use of the military airfield during WWII, sand mining and filling in the late 1960s, and by extensive park development activities since 1974.

Based on the recorded historic disturbance, and on excavation of a number of archaeological test trenches in the general area between 1984 and 1989, Ms. Gunness believes that the proposed location for the wastewater treatment center is probably least likely to cause damage to whatever remains of intact archaeological stratigraphy in the park.

Ms. Gunness expressed two concerns regarding this Project, one archaeological, and one environmental. First, it’s always possible that trenching for pipelines carrying the sewage to the treatment center may disturb some previously unidentified intact archaeological stratigraphy. Second, because the entire park area is very near sea level, high tides and heavy rains bring the water table quite near the ground surface. To avoid duplicating problems the Project is intended to correct, the system would need to be monitored and maintained properly. Any waste injected, leeched, or leaking into the ground has potential to rise to the surface during high tides and heavy rains, and to seep into the nearby fishponds.

5.8 Richard Paglinawan

Cultural Surveys Hawai‘i (CSH) interviewed Richard Paglinawan in Waimānalo on September 20, 2011 and previously on July 1, 1998 (Shideler and Hammatt 2007, Vol. II:136–148), and conducted a site visit at Kualoa Regional Park on September 27, 2011. Portions of the previously recorded interview are integrated with the current interview and site visit. Mr. Paglinawan, who was born in 1936 and raised in Waiāhole Ahupua‘a, is a special assistant at the Queen Emma Foundation and was formerly the administrator of OHA. In addition to his childhood experiences at Kualoa, Mr. Paglinawan learned about the area from Emma Kamahoahoa, Tūtū Mary Pukui, the Kawelo family, and other kūpuna.

The cultural significance of Kualoa for Mr. Paglinawan rests on its sanctity as one of the only two wahi kapu (sacred place) on O‘ahu (the other being Kūkaniloko). He describes and elaborates many facets of the sacredness of Kualoa, including its sovereignty, land divisions, regal learning, rituals, cultivation, and wahi pana, as well his personal recollections of subsistence, recreation, and World War II during his youth.

Most important to Mr. Paglinawan, Kualoa once contained the symbols of O‘ahu sovereignty, including sacred whale teeth, drums, and tapa. Mr. Paglinawan offers a mo‘olelo shared by Mary Pukui of the high priest Ka‘ōpulupulu, who advised the ruling chief of O‘ahu, Kahāhana, that he should not forsake the sovereignty of O‘ahu to his uncle on Maui (Kahekili), and who, upon

learning that Kahāhana had not heeded his advice, prophesized their deaths and the future invasion of ruling chiefs from Hawai‘i Island (Kamehameha) and foreigners:

> But there's all kinds of stories about Kualoa. And that's why I feel it's really special. Another story that Tūtū Pukui told me . . . and this has to do with the story of Ka‘ōpulupulu who was the high priest of O‘ahu. And what is interesting in Tūtū's version is that, as the story goes, as you've probably heard, Kahāhana had through the grace of the chiefs of O‘ahu, had put him into rulership because of the uncle's, Kumahana's, mismanagement. And they weren't satisfied with him. But Kahāhana was raised by Kahekili on Maui, so that became his hānai father (kahu hānai). The chiefs finally called him back and said: "Hey you got duty over here." So he came back. And Kahekili then asked his nephew that he would want the lands of Kualoa. Now, according to the story Ka‘ōpulupulu, in counsel with the chiefs, had told him no, because to do so would mean to give up the whale tooth, the sacred drums, the tapa and all of that that goes with sovereignty. And he'd be giving up his sovereignty. Now, then it came to pass that Kahekili finally came in and took over. According to Tūtū's version, which is interesting, Ka‘ōpulupulu, when making that prophecy, was in Nānākuli. What he did was to tattoo his knee. And in tattooing his knee, because he had given advice to Kahāhana [who] did not heed his advice, he tattooed his knee so that when people would look and say "Ka‘ōpulupulu, how come your knee is tattooed?", he said "My chief was deaf, kuli, to my advice." And the prophecy that he gave that he would be killed, Ka‘ōpulupulu would be killed, and that Kahāhana himself would also be killed and offered as a human sacrifice on the same heiau. To seal that fate, he had told his son, Kahulupue, to go out on Pōka‘ī Bay and drown himself. Now it's very rare to see [a] Hawaiian drown himself because they're good fishermen. So he must have swam way the hell out. But did, in fact, drown himself. And according to Ka‘ōpulupulu the prophecy was sealed at that time. And of course the rest became history, came to pass. So I thought that was kind of an interesting version of what happened over here.

One of the specific sites of O‘ahu sovereignty was Koholālele (Figure 59), a pond near the point, which, according to Emma Kamahoahoa, is mistakenly called ‘Āpua Pond (see Figure 48). Any whale that beached in this area was kapu and belonged to the chief. The wall of a fishpond called Pilihe‘e at the point would have likely blocked any drifting dead whales. In inland depression currently known as Koholālele is a drainage area that is actually called ‘Āpua, since it means "basin, basket," and fills with brackish water during rains, which would have been an prime location for the settlers' cultivation. Mr. Paglinawan elaborates on the site and meaning of Koholālele:

> There's a lot of makaloa (sedge used to make fine mats) in this area, in the current what they call ‘Āpua but I call it Koholālele. And Koholālele . . . you've got to understand the legend. As you know, whenever the whales beach, the chief had access to that whale teeth and bones. "Koholā" is similar to Pu‘ukoholā, it's whale. Lele is "to leap" but in this case, lele is "to beach, or land." So it ties in to the legend of beached whales. So that's why I say, in looking at it, that it has to be

> in this area here. And Kamahoahoa said: "Yeah, that was where." But again, you know, recorded history puts it as ‘Āpua. But if you read some of those things, they're not sure. And talking to Francis Morgan, he says they're not sure. But the name came in and they just perpetuated it.

In addition to makaloa, Mr. Paglinawan mentions another sedge, kohekohe, and indicates ‘ae (sap wrung from leaves), a type of small plant with succulent leaves used in food preparation, in the marshy areas of ‘Āpua and Koholālele (Figure 60). He also indicates ‘ākulikuli (a coastal herb), used in traditional medicine for an upset stomach.

The sacredness of Kualoa also derives from its location as a dividing line between the moku of Ko‘olaupoko and Ko‘olaulau. It was also a place for the training of chiefs, including the thirteenth century chief Kūali‘i, in such activities as lua, a type of dangerous hand-to-hand fighting in which the fighters broke bones, dislocated bones at the joints, and inflicted severe pain by pressing on nerve centers. In addition, Kualoa was also a pu‘uhonua, or place of refuge, and the starting point for the Makahiki ritual.

Numerous wahi pana and associated mo‘olelo are located within Kualoa that testify to the significance of the area. Mr. Paglinawan shares mo‘olelo of two tidal waves, one that relates to the submerged structure of a fishpond called Pilihe‘e, and another that relates to Pu‘u Kānehoalni and the islet of Kapapa:

> And then this fishpond, which you can see over here, real clear. This fishpond over here is called "Pilihe‘e." Now, according to legend this was destroyed by tidal waves, according to Kamohoali‘i. And the tidal wave that destroyed it supposedly because of an ‘aumakua shark that was a protector of the inhabitants of Kāne‘ohe Bay. But because the people fed it, the shark, one version of course was that the shark had one tooth, lived here in a cave at Mokoli‘i. And he would protect the people from man-eaters by nibbling on their feet while swimming as a warning. But his reward was that they would feed him awa. But this new chief practiced that and this shark almost died. And the father of the shark got really angry and sent tidal waves and destroyed this portion of the island
>
> …And also about Kānehoalani, which is the peak, the high peak: Kānehoalani being the father of Pele. And if you go in Kāne‘ohe Bay there's a flat island out there: Kapapa. According to stories that were told, Kānehoalani and Kapapa were husband and wife. They came with their entourage with Pele, when Pele left Kahiki along with Kānehoalani and all of the other brothers and sisters, Hi‘iaka. And what happened, as they traveled, they stopped where Makapu‘u is and a relative decided to stay there. "Makapu‘u" means the "bulging eyes." So that's where she stayed. And, when they came around the bay, Kānehoalani and Kapapa decided to stay where [the places named for them are located]. Now the significant part of this: Kānehoalani is the male figure that stands out; Kapapa is a female symbol of a flat, reclinging island . . . So it's kind of interesting. Also, there is a story that they talk about Haumea when she defeated a chief. And, in the ensuing battle when there was a tidal wave, what happened they got washed out. On Kapapa island is a fishing koa. And, supposedly, the way the story goes was

> that when the waves had washed the people out to sea, they were swimming around, the kahuna had asked for an offering. They didn't have any offering with them but he says: "No, there is." So he told one of the . . . well, he, I think so, was the one that made like a triangle by joining his pointer fingers and thumbs with the other. And then there was a humuhumunukunukuāpua‘a fish that swam and he was the representation of a pig (kinolau; many forms taken by a supernatural body). So symbolically that became the offering for this, quotes, heiau. And as a result of that, they built on Kapapa a fishing koa to commemorate that. And that whole area, on the Kāne‘ohe side, became known as He‘eia as a result of that tidal wave. So the relationship becomes very important. Like I said, Pele then decided to go around and then you get down at Crouching Lion, which became Kauhi‘īmakaokalani, he's an uncle to Pele also. He stayed there. Then as you go down to Pūpūkea, Paka‘a and his relatives stayed there. So it seems like these were colonizers, Pele's family that went down. That's why this one became very important in this particular area.

Mr. Paglinawan shares another mo‘olelo that focuses on the formation of the island of Mokoli‘i and the ridge of Palikū:

> …[Mokoli‘i] was a mo‘o out there. Of course, as you know, mo‘o has a glottal and so there's a drop of the "k". So Mokoli‘i was, I guess, a tyrant mo‘o that was in the area. And anybody that passed through there, he would challenge. And if they fight, he would defeat them. And Hi‘iaka, the story of Hi‘iaka . . . When Hi‘iaka was requested by Pele to fetch Lohiau, she journeyed along the coastline with her friend Hopoe. According to Emma, there's a big battle. He reared up and challenged her. And, of course, she with her sacred pā‘ū [skirt] that was given to her by Pele, cut him in half. So his tail landed there [Mokoli‘i Island]. According to her . . . I heard different versions but . . . his back is all of this over here, the mountain, Palikū. That's another name for the area. But that's his back area and that's why this area is called Kualoa, "the long back." I guess from the makai side, if you're looking . . . If you're a fisherman you come out and look over there you can see that this is just huge, like a back. So that's her version of that.

Another mo‘olelo centers on a connection between the phallic stone of Nānāhoa and Mōli‘i Fishpond:

> There's an interesting story, you know, and it's kind of confirmed in Tahiti. According to the story, there's a sacred chief, a young chief. Because he was so sacred, they isolated him up in the Hakipu‘u area, in the mountain area. And so the kāhuna kept watch over him, he had no contact with people, or whatever it is. [Then] in Kahiki, there's this baby girl that was born and they put her in the water and then she just swam away, straight to Hawai‘i. By the time she reached Hawai‘i, she was a grown woman and so Mōli‘i Fishpond…She laid down on the rock, exhausted, and her legs was wide open. [Then] here comes this young chief, he climbs over the ridge and he comes down and he sees this wahine with her legs wide open and a strange emotion [laughs]…he had a hard-on! And the rock remains. He turned to rock. He met that female, Kala‘au, and…. Nānāhoa. So you

> still see that phallic stone over there on the side of the ridge. Then off to the right of it, when you're looking towards the mountain, there's these little balls of stone and that is the Mua-a-kāne, the chickens of Kāne. To this day I've tried to find where Kala‘au is, you know the stone that's on the fishpond wall, but I haven't found it. And I suspect it may be a more recent legend because the pond is historic, so to speak, for Hawaiians. So the pond must've been there when she came.

A final mo‘olelo describes the formation of Holoape‘e through Pele's bombardment of fire balls to destroy Kamapua‘a:

> According to legend, the mo‘o was the original ones that came to Hawai‘i, then Pele came, fire. So you had water, fire, and they clashed! And so they clashing occurs even after the time when she was trying to find her home in Kilauea, because her craters would always be filled with water, and that's the mo‘o. The constant fighting between, what we call it is physical manifestations, that's so important. Then of course Kamapua‘a enters the picture, he is associated with erosion. So in Kualoa we had some cave that supposedly he taunted Pele, and Pele got so angry, he ran for it and he hid in the cave and he escaped and then she would bombard him with the…fireballs. But, again, that's called Holoape‘e, those caves.

Beyond the wahi pana of Kualoa, another level of significance to the broader area is the unique form of taro cultivation in neighboring Hakipu‘u Ahupua‘a. Mr. Paglinawan describes how taro cultivation in this area once resembled that of Tahiti, a process called pu‘u in which mounds were built for individual taro. For Mr. Paglinawan, the similarity between Hakipu‘u and Tahitian taro cultivation suggests an ancient connection between these distant lands, possibly that the first settlers used this land.

Expanding beyond Kualoa and Hakipu‘u, Mr. Paglinawan draws attention to the cultural landscape of the Kāne‘ohe Bay region. Standing on the southern shoreline of Kualoa, Mr. Paglinawan points to various wahi pana on the distant landscape, starting with Moku Manu and Moku Lua off the coast of Mōkapu, where fishermen hunted fledgling ‘ua‘u (shearwater birds) and salted the meat. Moving makai, the cliff face of Ulupa‘u crater on Mōkapu was known as Kahekili's Leap to test the strength of warriors. Past the saltpans of Mōkapu, the peaks of Lanihuli and Keahiakahoe rise in succession against the sheer pali of Kāne‘ohe. The name of Keahiakahoe stems from a conflict between two brothers: Pahu, a fisherman, did not adequately share his catch with his older brother, Kahoe, who farmed in the mountains, so Kahoe, upon learning this deceit from their sister Lo‘e, channeled the smoke from his fire far up the cliff during a famine so that his brother would not request any food of him. Other successive peaks include Kū‘ole, Kū‘ole‘a, and Kū‘olani, all associated with the god Kū. The low peak of Mā‘eli‘eli on the border of He‘eia and Kahalu‘u was the destination of a race between Kāne and Kanaloa, in which Kanaloa unknowingly crawled into feces left by Kāne to prove that Kanaloa was not an all-knowing god. He‘eia itself is divided into two regions by a leina, in which souls leaping off from this world go to He‘eia kea (the area of the harbor) if deemed pono (correct), and stay in He‘eia uli (the area of He‘eia Fishpond), a place of damnation, if judged not pono. In Waiāhole, settlers from Kaua‘i buried their descendents in a hill called Pu‘u Kaua‘i, which drops

down to a makawai (water source). On the border of Waiakāne and Hakipu‘u, Pu‘u Pueo was a site where owls fought against a tyrant chief. Separating Waiakāne, Hakipu‘u, Kualoa, Ka‘a‘awa, and Kahana is the peak of Puuohulihuli. Coming back to Kualoa, Mr. Paglinawan highlights the ridge of Kānehoalani with the phallic stone Nānāhoa and the cliffs of Holoape‘e, and notes that, similar to Moku Manu, fishermen hunted fledgling ‘ua‘u on Mokoli‘i, as well as koa‘e kea (white-tailed tropic bird) and koa‘e ula (red-tailed tropic bird), which are the deities of lua fighting (akua po‘o lua) since their flights emulate the fluid motion of the lua fighting.

A more personal significance of Kualoa to Mr. Paglinawan is based on his childhood memories and experiences. He and his family often went to Kualoa, especially the White Sands Beach area near Mōli‘i Pond, for fishing and gathering, and for recreation, and would line up a kamani tree on the coast with inland coconut trees to sight an elevated path along the reef and walk to Mokoli‘i:

> We’d camp out on the beach and also at Mokoli‘i Island, and then would lay out kākā lines which runs parallel to the beach on the Waiāhole side, all the way down towards what they call “White Sand” by Mōli‘i fishpond area. We would do that . . . usually we go fishing every week in the area. So that’s how I became very familiar with that area. And then also we did a lot of camping in the area, at what we call the “Kamani Grove.” Kamani Grove is not the old Hawaiian kamani, but it’s the kamani haole and it’s about part-way where the housing area is on the makai side. That used to be a camping area, and the Boy Scouts used to go over there and so we used to go camp over there.
>
> And we did a lot of lamalama, which is torch fishing. That was an excellent area for kala, weke, kūhonu (a crab), ‘ala‘eke (a crab), uhu (parrotfish), ‘ala‘ihi (squirrelfish), and night octopus, the he‘e. And we used to go there. I mean that area was really excellent for it.
>
> And then, fishing, of course, in laying the kākā lines they would catch sharks. And the area used to be real blue water, used to be deep. Unfortunately, when some of the people put [a] groin into the water, the sand started shifting and filled up that deep area. So we used to catch hīhīmanu, which is stingray. Once we caught about a 350-pound hīhīmanu, shark, and all kinds of fishes that would go after this bait. And I don’t know if you know, kākā line is really a long line with hooks baited at intervals. And so you’d anchor end of the line and then you’d bait the other side . . . And then afterwards, after so many hours, then you’d go back, pick it up, check your fishing line. So we’d do a lot of that.
>
> And then also White Sand Beach, which is, we called it White Sand Beach, it’s a little sand area that has been built up just part-way on the seaward side of Mōli‘i fishpond. And what it is, that used to be a popular swimming place for the residents of the area, some as far as Kahalu‘u. People would come down and would go over there, go swimming. Nearly every weekend. The sand was beautiful and white. It was kind of [a] protected area so that you could swim and not be afraid of sharks or anything else around there. And the setting was beautiful. So kids would do that. And from Waiāhole, sometimes what we’d do is,

> with our canoes, which were made of “totong,” or tine roofs, and we’d paddle all the way from Waiāhole, all the way, just skirting the beach. And then we’d end up at Kualoa. And some times we’d try to shoot at the ducks in the fishpond. Unsuccessful because the bb’s would bounce off the duck’s back. But that’s okay, we had good fun doing it. And we’d also climb up on Mokoli‘i, on the top of the sea stack, and watch the cowboys playing polo. The ranchers used to do that and sometimes on Sundays, I think, they would do that.

Mr. Paglinawan also remembers the military in Kualoa during World War II, especially the Grumman F-4-F Wildcats stationed in dugout embankments, and connects the military activities to the cave of Pohukaina, which, according to a kupuna, contained burials and canoes with burials.

> Well, I remember when I was . . . it was during the war years so I was still in elementary school. I remember that, at that time, the military used it as temporary Mōkapu naval airbase. I recall that the F-4-F Wildcats . . . and the reason why I know it’s the F-4-F Wildcats ‘cause I’m interested in military planes, especially World War II. . . . And these were Grumman Wildcats that were stationed there. If you look on the side of the hill [at] Kualoa you will see dugout embankments. These were where the planes would be parked and [with] camouflage nets over [them].
>
> The Army Air Corps. used Kualoa as a base for P-38s. There’s a reef right off here, what we call a “P-38 Reef” because, what happened, a fighter took off—the P-38 is an Army twin-boom fighter dubbed “Lightning”—[and] crashed somewhere out here. And so every time we’d go dive for fishes, we’d say: “Hey, go to P-38 Reef.” Also, the wooden pier at Waiakāne was constructed as a station to retrieve downed airmen.
>
> And then also I remember we used to hike up Ka‘a‘awa and we’d go by that artillery battery which is over here, the gun emplacement battery. It’s outside Ka lae o ka ‘ō‘io. Ka lae o ka ‘ō‘io is . . . right here there’s a surfing area . . . that’s where the gun emplacement is. And I understand they took the canons from the battleships that were sunk in Pearl Harbor. And did coastal defense, but they never did use it. And so if you look you can see the observatory on the *pali* and the gun emplacement in a man-made tunnel. But I understand they took a lot of the debris and filled up this cave that used to be, according to Hawaiian tradition, used to be the tunnel that hooks up to Pohukaina, which is in Kaka‘ako, Honolulu. The cave is still there but it’s all covered with rocks just thrown all inside.

Mr. Paglinawan recommends that alternative sites for the wastewater treatment center be considered, notably the area close to the entrance to the park by the maintenance building. Mr. Paglinawan feels that the current proposed location of this facility is too close to ‘Āpua Pond and Mōli‘i Pond and could result in inadvertent contamination in the future, which would impact any future attempts to restore the ponds.

Figure 59. Koholālele (mistakingly called ‘Āpua Pond, according to Richard Paglinawan (CSH September 27, 2011)

Figure 60. A sedge called ‘ae at Koholālele and ‘Āpua Pond (CSH September 27, 2011)

5.9 John Morgan and Jan Becket

CSH conducted a site visit with John Morgan, owner of Kualoa Ranch, and Jan Becket, a teacher of photography with Kamehameha Schools, at Puakea Heiau on the property of Kualoa Ranch on September 4, 2011. Mr. Morgan lived within the current Project area in his youth, and has learned about the many cultural traditions of the area, including Puakea Heiau, while Mr. Becket has conducted extensive archival research on sites of cultural significance, learned from kūpuna, and photographed many undocumented sites on O‘ahu, which resulted in a co-written book, *Pana O‘ahu* (Becket and Singer 1999). Mr. Morgan led a site visit to Puakea Heiau, and Mr. Becket obtained permission from Mr. Morgan to share with CSH previous photographs and GPS coordinates of two agricultural heiau near Ka‘a‘awa (see Figure 48).

Puakea Heiau once covered an extensive area and would have commanded an expansive view of Kāne‘ohe Bay (Figure 61) with a backdrop of the sheer cliffs of Kānehoalani prior to the encroaching vegetation (Figure 62). Mr. Morgan pointed out the western rock outline of the lower terrace, which would have been several hundred feet in length and width but is now mostly covered with vegetation. Mr. Morgan also indicated a hill on the eastern side of the lower platform blanketed with grass, which was once used as a sacrificial hill, or lele (Figure 63), for this luakini-class heiau. More pronounced rocks are scattered throughout the area of what would have been the middle and upper terraces, now punctuated with large trees (Figure 65 to Figure 67). Mr. Morgan remembers hearing that in 1927 rocks from the heiau were removed for the construction of the nearby highway, which contributed greatly to its deterioration. Mr. Morgan has general plans to restore Puakea Heiau to its former sanctity through culturally appropriate protocols.

Mr. Morgan’s family moved to the southeastern portion of the Project area, at the current Kualoa Regional Park Headquarters, when he was one year old. In his youth he encountered numerous artifacts in the area, including sling stones and ‘ulu maika stones, reminiscent of the former training grounds for young chiefs. Mr. Morgan also remembers quite vividly stories from his childhood about his family often hearing drums, which were said to be beaten by nightmarchers.

Based on his archival research, Mr. Becket notes that two other heiau may be located at the base of Kānehoalani Ridge—an agricultural heiau of Lono and a “joy” heiau once associated with sexual activities. Mr. Becket’s knowledge of the “joy heiau” stems from Rosamond S. Morgan, who shared with Elspeth P. Sterling and Catherine C. Summers in 1964 that George Roberts’ grandmother once described an artificially faced terrace 98 feet in length in the general Kualoa area as “not very reputable by Christian standards” (Sterling and Summers 1978:179). Mr. Becket also showed the location of Pahulu Heiau, a heiau once associated with sorcery and now partially submerged at the Kualoa coast about 600 feet north of the sugar mill. Mr. Becket also describes two platforms (Figure 68 to Figure 71), possibly agricultural heiau, in Ka‘a‘awa that he previously visited.

Mr. Morgan is supportive of the current Project. Based on his memories as a child of vast mining for sand in the general location of the proposed centralized wastewater collection system, Mr. Morgan believes that this previously disturbed area is the best possible location for these needed facilities.

Figure 61. View from the mauka lands of Kualoa, in the vicinity of Puakea Heiau, toward Kāne‘ohe Bay, with Mōli‘i Fishpond in foreground (Photo by Jan Becket 2011)

Figure 62. View from the mauka lands of Kualoa, in the vicinity of Puakea Heiau, toward the sheer cliffs of Kānehoalani, with the Nānāhoa rock formation (right) (Photo by Jan Becket 2011)

Figure 63. Lele of Puakea Heiau (Photo by Jan Becket 2011)

Figure 64. Large rock in middle terrace of Puakea Heiau, now punctuated with large trees (Photo by Jan Becket 2011)

Figure 65. Upper terrace of Puakea Heiau, view from the southwest (Photo by Jan Becket 2011)

Figure 66. A small area of intact ‘ili‘ili on the northeast edge of Puakea Heiau (Photo by Jan Becket 2011)

Figure 67. Stones at the northwest corner of Puakea Heiau (photo by Jan Becket 2011)

Figure 68. Platform (1) in Ka‘a‘awa (Photo by Jan Becket 2011)

Figure 69. Platform (1) in Ka‘a‘awa (Photo by Jan Becket 2011)

Figure 70. Platform (2) in Ka‘a‘awa (Photo by Jan Becket 2011)

Figure 71. Platform (2) in Ka‘a‘awa (Photo by Jan Becket 2011)

Section 6 Cultural Landscape

Discussions of specific aspects of traditional Hawaiian culture as they may relate to the Project area are presented below. This section integrates information from Sections 3–5 in order to examine cultural resources and practices identified within or in proximity to the Project area in the broader context of the encompassing landscape of Kualoa Ahupua‘a.

6.1 Voyaging and Settlement

The early settlers of the Hawaiian archipelago would have been especially attracted to windward O‘ahu (Kirch 1985:69), and excavation data from the coastal region of Waimānalo suggests first settlement in the Ko‘olaupoko region between A.D. 1040 and 1219 (Dye and Pantaleo 2010). Between A.D. 1100 and 1400, the early settlers used the coastline of Kualoa as a temporary campsite for fishing and reef-gathering activities (Gunness 1987:237–246). Mo‘olelo indicate several voyaging traditions associated with the area, including voyages of La‘amaikahiki and Kaha‘i, who returned from Samoa to plant the first breadfruit tree (Beckwith 1970:238), and the lowering of sails when passing Kualoa to honor its sacred land and high chiefs (Fornander 1919, Vol. IV:370). Voyaging traditions have continued at Kualoa, with the launching of *Hōkūle‘a* in 1975, subsequent return visits, and, in June 2011, the arrival of a fleet of Polynesian canoes called Te Mana O Te Moana (Polynesian Voyaging Society 2011).

6.2 Habitation

By A.D. 1600, virtually the entire Project area was occupied, as evidenced by a nearly intact cultural layer containing numerous features and a remarkable amount of artifacts that indicate a community of resident stone working artisans and other craft specialists. This was also an occasional residence of ali‘i, as evidenced in the form of ornaments and leisure activity areas, and possibly kāhuna, as suggested by two heiau and intact pig skeletons (Gunness 1987:237–246). According to Mr. Crouch, the outline of Niola‘a Heiau was still discernable in the 1970s, and Pahulu Heiau is still visible at low tide. Mr. Crouch estimates the location of another former heiau called ‘Āpua in the northeast portion of the Project area. In addition, Mr. Becket maps the locations of Puakea Heiau in Hakipu‘u and two platforms, possibly agricultural heiau, in the mountains of Ka‘a‘aws. Land claims of the Māhele of 1850 reveal that Hawaiian pā hale were largely located along the coast, including two along the northeast border of the Project area (Waihona ‘Aina 2000). Between 1981 and 1985, a section of the Project area was occupied by the Temple of Lono for religious purposes (*Star-Bulletin* 1985:8).

6.3 Subsistence and Natural Resources

Mr. Paglinawan describes how taro cultivation in Hakipu‘u once resembled that of Tahiti, a process called pu‘u in which mounds were built for individual taro. For Mr. Paglinawan, the similarity between Hakipu‘u and Tahitian taro cultivation suggests an ancient connection between these distant lands, possibly that the first settlers may have used this land. By A.D. 1400, the fishpond wall of Mō‘ili Pond was constructed, and by A.D. 1600, the embayment forming ‘Āpua Pond was most likely walled and agricultural use of the lower slopes abutting the southern and eastern beaches was intensified (Gunness 1987:237–246). Land claims of the

Māhele of 1850 reveal that residents cultivated lo‘i kalo near Mōli‘i Pond and several crops (sweet potato, wauke, beans, and melons) on their kula ‘āina at the base of Kānehoalani Ridge (Waihona ‘Aina 2000). After the Māhele, Gerrit P. Judd maintained a cattle ranch and sugar plantation in Kualoa. Richard Paglinawan describes how fishermen once hunted fledling ‘ua‘u, koa‘e kea, and koa‘e ula on Mokoli‘i. He and other community participants recall how in their youth they gathered forest resources (Pele’s tears, bananas, ti leaves, ‘awapuhi, and haue), makai resources (makaloa, kohekohe, and a type of plant called ‘ae), freshwater resources (‘ōpae) and ocean resources (seaweed and clams), harvested fish in Mōli‘i Pond (pua, ‘anae, awa, pāpio, and ‘ō‘io), hunted in the nearshore waters (kūhonu, ala‘eke, and he‘e) and on Mokoli‘i Island (‘ua‘u, koa‘e kea, and koa‘e ula), and fished in Kāne‘ohe Bay (‘anae, akule, nehu, āholehole, awa, kala, ‘ōpae, flounder, weke, uhu, ‘ala‘ihi, ‘oama, hīhīmanu, and sharks).

6.4 Sacred Land

Kualoa was undoubtedly a place of extraordinary sanctity. It was a religious center for the moku of Ko‘olaupoko—the seat of the hierarchy of the priestly Order of Lono that governed the pu‘uhonua of Lehua (named after the last high priest, or palikū; Palikū is the ancient name of Kualoa (Palani Nobriga interview, Shideler and Hammatt 2007, Vol. II:129–132). This was a sanctionary of peace for births, instruction, and burials of nobility (Palani Nobriga interview, Shideler and Hammatt 2007, Vol. II:129–132), as well as a refuge for those to be punished or killed (Kamakau 1992:17–18) and was the place of sacrificial drownings of the kauwā caste (Fornander 1917, Vol. IV:549. This was the home of the god Wakea, with the ridge of Kānehoalani as his mountain form (Palani Nobriga interview, Shideler and Hammatt 2007, Vol. II:129–132). According to Mr. Fukumitsu, the god Maui is supposedly buried in the mountains of Hakipu‘u, and a lunar alignment exists between Kualoa and the sacred birthing site of Kūkaniloko in central O‘ahu. According to Mr. Crouch, over 400 ancient royal burials are located in the cave of Pohukaina, and the coastal area was a burial ground. The sacredness of Kualoa also derives from its location as a dividing line between the moku of Ko‘olaupoko and Ko‘olaulau, a place for the training of chiefs in such activities as lua, and the starting point for the Makahiki ritual, according to Mr. Paglinawan. Ms. Cypher testifies that Kualoa once contained (and may still continue to contain) various artifacts that symbolized the sovereignty of O‘ahu during the time of Kahekili. Standing on the southern shoreline of Kualoa, Mr. Paglinawan identifies numerous wahia pana of the Kāne‘ohe Bay region and shares their mo‘olelo, starting with Moku Manu and Moku Lua off the coast of Mōkapu, moving past the saltpans of Mōkapu toward the successive peaks of Lanihuli, Keahiakahoe, Kū‘ole, Kū‘ole‘a, Kū‘olani, Mā‘eli‘eli, Pu‘u Kaua‘i, Pu‘u Pueo, Puuohulihuli, and Kānehoalani with the phallic stone Nānāhoa and the cliffs of Holoape‘e, and ending with the island of Mokoli‘i.

6.5 Burials

Kualoa contains discrete human burial grounds, numerous individual burials, and reported royal burial caves. By A.D. 1400, the southern beach at Kualoa was probably used as a burial ground, and by A.D. 1600, the eastern beach was used as a burial ground with evidence of grave disturbance (Gunness 1987:237–246). Scattered and excavated human remains in Kualoa represent 89 individuals, with 85 located along the eastern beach of the park (Dye 1996a; Colin and Hammatt 1997; Goodman and Cleghorn 1991:21–28; Gunness 1987:120; Putzi 1994:1).

Section 7 Summary and Recommendations

CSH undertook this CIA at the request of Kennedy/Jenks Consultants, Inc. The cultural survey broadly included the entire ahupua‘a of Kualoa including the specific Project area.

7.1 Results of Background Research

Background research for this Project yielded the following results (presented in approximate chronological order):

1. Archaeological excavation and survey data indicate a sequence of settlement patterns and cultural use of Kualoa and the Project area. Between A.D. 1100 and 1400, the early settlers used the coastline of Kualoa as a temporary campsite for fishing and reef-gathering activities. By A.D. 1400, the southern beach was probably used as a burial ground, and the fishpond wall of Mō‘ili Pond was constructed. By A.D. 1600, the embayment forming ‘Āpua Pond was most likely walled, agricultural use of the lower slopes abutting the southern and eastern beaches was intensified, and the eastern beach was used as a burial ground with evidence of grave disturbance. After A.D. 1600, virtually the entire Project area was occupied, as evidenced by a nearly intact cultural layer containing numerous features and a remarkable amount of artifacts that indicate a community of resident stone working artisans and other craft specialists. This was also an occasional residence of ali‘i (chiefs), as evidenced in the form of ornaments such as the lei niho palaoa (whale tooth pendant) and leisure activity areas such as an ‘ulu maika (bowling) playing field. It was also possibly a residence of kāhuna (priests), as suggested by two heiau (place of worship) and intact pig skeletons that were perhaps offered in the worship of Lono, the god of agriculture (Gunness 1987:237–246).
2. Several archaeological sites are located in the Project area. ‘Āpua Pond, with walls of sand embankment and stone, is located in the southern portion of the Project area (Site 313, McAllister 1933:168). Excavations uncovered a basalt stone alignment, which contains a mākāhā (sluice gate) (Site 1A-1, Clark and Connolly 1978:5). Excavation immediately north of ‘Āpua Pond locations uncovered dense concentrations of 7,800 artifacts (Survey Area 1C, Gunness 1987:91–99), and an imu (earth oven) filled with thousands of basalt flakes surrounded by at least 13 post molds that radiocarbon date to between A.D. 1670–1730 (Site 1C-2). Near Mōli‘i Pond on the border of Kualoa and Hakipu‘u Ahupua‘a, an intact pig skeleton in a flexed position was uncovered in association with an imu and numerous artifacts (Site 1A-2, Gunness 1987:57–59), which may have acted as an ahupua‘a (literally referring to a “heap of stones associated with a pig”) boundary offering (Gunness 1987:62). The Kualoa Depression, variously referred to as an ‘auwai (ditch) for Koholālele Pond, a water channel or a swale, contained preserved organic materials (Site 2B-2, Gunness 1987:123).
3. Numerous human remains have been documented within and near the Project area, which were scattered along the beach and recovered or uncovered through excavation. These remains represent 85 individuals (Shideler and Hammatt 2007, Vol. I:219), with a discrete burial area along the eroding shoreline of the eastern beach (2B-1, Gunness 1987:120, 141; SIHP 50-80-06-5371, Dye 1996a; Colin and Hammatt 1997). Other burials have been found inland near the depression of Koholālele (Goodman and Cleghorn 1991:21–28; Putzi 1994:1) and inland of ‘Āpua Pond (Gunness 1987).
4. Mo‘olelo are associated with several wahi pana (storied places) in Kualoa and detail several cultural events and traditions, such as Kaha‘i returning from Samoa to plant the first breadfruit tree in Hakipu‘u Ahupua‘a (Beckwith 1970:238), the lowering of sails when passing Kualoa to honor its sacred land and high chiefs (Fornander 1919, Vol. IV:370), the use of Kualoa as a pu‘uhonua (place of refuge) (Kamakau 1992:17–18), and sacrificial drowning of kauwā (a low caste) (Fornander 1917, Vol. IV:549; *Hōkū o Hawai‘i* 1926; *Ka Loea Kalaiaina* 1899; *Ka Loea Kalaiaina* 1900; *Ka Na‘i Aupuni* 1906; Pukui 1983:156).
5. Land Commission Award (LCA) documentation of the Māhele indicates habitation and subsistence practices within and near the Project area prior to 1850. The land claims reveal that Hawaiian pā hale (households) were largely located along the coast, including two along the northeast border of the Project area (LCA 3011 to Mahiole and LCA 3052 to Kaneakalau), with lo‘i kalo (irrigated taro fields) concentrated near Mōli‘i Pond and kula ‘āina (field or pasture land) inland at the base of Kānehoalani Ridge where sweet potato, wauke (paper mulberry), beans, and melons were cultivated (Waihona ‘Aina 2000).
6. The cultural landscape at Kualoa has been severely impacted by shifts in the use of the land since the Māhele, including Gerrit P. Judd’s ranch (later Kualoa Ranch) and sugar plantation. Significant places of historic interest within the Project area include Hale Makani (House of Winds), a stone bathhouse built in 1916 by the Morgan family, and the Morgan family beach house, constructed in 1950, which became the site of the Kualoa Regional Park’s office building (Francis Morgan interview, Shideler and Hammatt 2007, Vol. II:101). During World War II, the military fortified Kualoa, including a grassed emergency airstrip 6,000 feet long and 150 feet wide parallel to the eastern beach that extends into the Project area and across the main road (now Kamehameha Highway) (Dorrance 1993:6). Massive erosion between 1949 and 1979 along the eastern beach of Kualoa Regional Park uncovered coastal archaeological features, including burials (Gunness 1987). Maps and aerial photographs suggest a long-term pattern of accretion and erosion.
7. In recent years, Kualoa has been the site of efforts to revitalize cultural practices, including worship with the Temple of Lono (Palani Nobriga interview, Shideler and Hammatt 2007, Vol. II:129–135), and voyaging traditions with the launching and sailing of *Hōkūle‘a* (Gordon Pi‘ianaia interview, Shideler and Hammatt 2007, Vol. II:162–182; Herbert Hoe interview, Shideler and Hammatt 2007, Vol. II:55). Places associated with these recent practices within the Project area include an area occupied by the Temple of Lono between 1981–1985, Hōkūle‘a Beach, and an ahu (shrine) constructed after a 16,000 mile voyage by *Hōkūle‘a* between 1985–1987.

7.2 Results of Community Consultation

CSH attempted to contact 33 community members and government agency and community organization representatives. Of the 16 people that responded, nine kūpuna (elders) and/or kama‘āina (Native-born) participated in formal interviews for more in-depth contributions to the CIA. This community consultation indicates:

1. The flow of water through the ahupua‘a of Hakipu‘u creates a mauka-makai (mountain-sea) relationship, according to Mr. Fukumitsu, from the mountain waterfalls and streams with ‘ōpae (freshwater shrimp) to the brackish waters of Mōli‘i Pond, in which grow pua (young baby moi [threadfish]), ‘anae (mullet), awa (milkfish), pāpio (juvenile stage of ulua [crevalle, jack, or pompano]), and ‘ō‘io (ladyfish, bonefish). Diverted ‘auwai (ditches) from Hakipu‘u Stream and springs irrigate 30 lo‘i on the Fukumitsu property west of Mōli‘i Pond, and the wetlands of Hakipu‘u also serve as haven for the ‘alae ‘ula (Hawaiian moorhen) and ae‘o (Hawaiian stilt bird), according to Mr. Fukumitsu. In Kualoa, Mr. Paglinawan indicates several plants that grow in the marshy areas of ‘Āpua and Koholālele: ‘ae (sap wrung from leaves), a type of plant with succulent leaves used in food prepration; makaloa (a sedge), which is used to make fine mats; and kohekohe, which is used in food prepration.

2. Kāne‘ohe Bay provides many resources to community participants. Mr. Fukumitsu catches saltwater ‘ōpae, flounder, weke (goatfish) ‘oama (young of the weke), and mullet in the ocean, hunts Samoan and white crabs, and gathers clams and several varieties of seaweed along the beach, including limu ‘ele‘ele, manuweu, limu kohu, waiwaiole. Mr. Crouch remembers fishing for āholehole (young stage of āhole, Hawaiian flagtail,) awa, and kala (surgeon fish), and seeing schools of mullet, akule (big-eyed scad), and nehu (smelt, anchovy), as well as kāpā (mottled eel) and he‘e (octopus). Mr. Paglinawan remembers fishing for kala, weke, uhu (parrotfish), ‘ala‘ihi (squirrelfish), and hīhimanu (stringray), and hunting kūhonu (a crab), ‘ala‘eke (a crab), and he‘e. In addition, Ms. Kia hunted crabs and gathered ogo (seaweed).

3. Forest resources gathered by Ms. Kia in Waikāne Valley include Pele’s tears, bananas, ti leaves, and ‘awapuhi (ginger). Coastal resources indicated by Mr. Fukumitsu and Mr. Paglinawan include medicinal plants called haue (purple vervain) and ‘ākulikuli (a coastal herb). On the island of Mokoli‘i, Mr. Paglinawan describes how fishermen once hunted fledgling ‘ua‘u (shearwater), koa‘e kea (white-tailed tropic bird), and koa‘e ula (red-tailed tropic bird).

4. Several cultural sites in Kualoa retain significance for community participants, who have also found several artifacts on land and at sea. Mr. Crouch identified the outline of Niuola‘a Heiau during archaeological excavations at the park between 1974 to 1981, and notes a heiau called ‘Āpua located in the northeast corner of the Project area that was once connected to the eastern beach burial grounds, but has since been destroyed. Mr. Becket notes that two other heiau may be located at the base of Kānehoalani Ridge—an agricultural heiau of Lono and a “joy” heiau once associated with sexual activities. In addition to the partially submerged heiau of Pahulu north of the Project area, Mr. Becket

describes two platforms, possibly agricultural heiau, in the mountains of Ka‘a‘awa and the heiau of Puakea in Hakipu‘u.

In addition to heiau, Mr. Fukumitsu observes a kū‘ula (fishing shrine) and the site of a former dwelling of the previous fishpond caretaker, George Uyemura, on the western wall of Mōli‘i Pond. Mr. Fukumitsu has recovered ‘ulu maika stones near his home in Hakipu‘u, sling stones on the sandbars, and an ancient poi pounding board, and Ms. Kia has recovered poi pounders, ‘ulu maika stones, and a small collection of glass floats on the shores and waters of Kualoa Beach Park and Mokoli‘i Island.

5. The cultural layer resulting from human occupation in the inland area of Kualoa Regional Park has been severely disturbed by farming activities, construction and use of the military airfield during WWII, sand mining and filling in the late 1960s, and by extensive park development activities since 1974, according to Ms. Gunness.

   Several cultural sites have been exposed due to beach erosion or inundated with water. Mr. Fukumitsu describes how the construction of facilities of Kualoa Regional Park initiated massive erosion along the eastern shore of Kualoa Regional Park that has unearthed grave sites. The recovered iwi have been relocated to a tree nursery site just outside of the Project area mauka of the entrance road to the park. In contrast, a submerged structure, most likely a fishpond wall, extends offshore from the southeastern point of Kualoa Regional Park. According to Mr. Crouch, this pond, called Pilihe‘e, was an ‘umeiki, a type of fish trap for ‘ō‘io and ‘anae. According to Mr. Crouch, extensive loss of sand along the eastern beach has eroded the foundation of this Pahulu Heiau (still visible at low tide), but the rocks have settled down in the remaining sand.

6. The area of Kualoa and Hakipu‘u holds special cultural significance for all the community participants: The ridge of Palikū is associated with several mo‘olelo of wahi pana (including the goddess Pele); the area is associated with the voyaging of La‘amaikahiki, which resulted in the tradition of lowering sails when canoes passed by; Kaha‘i is credited with bringing the first breadfruit to the Hawaiian Islands with the first planting in Kualoa; the god Maui is supposedly buried in the mountains of Hakipu‘u; a lunar alignment exists between Kualoa and the sacred birthing site of Kūkaniloko in central O‘ahu; over 400 ancient royal burials are located in the cave of Pohukaina; the coastal area was a burial ground; Ka‘ō‘io Ridge is the dividing line between the districts of Ko‘olaupoko and Ko‘olauloa; a portion of Kualoa was used as a pu‘uhonua for those who were to be punished or killed; sections were used as a training ground for young ali‘i to learn how to become a chief; Kualoa once contained (and may still continue to contain) various artifacts that symbolized the sovereignty of O‘ahu during the time of Kahekili; former mounded taro cultivation in Hakipu‘u resembled that of Tahiti, suggesting an ancestral connection; Kualoa was the starting point of the Makahiki ritual; and numerous wahi pana can be seen in the Kāne‘ohe Bay region from the southern shoreline of Kualoa. More recently, Kualoa was the site of the launching of *Hōkūle‘a* in 1975 at Mr. Crouch’s suggestion.

7. Community participants express five concerns and recommendations:

a. Mr. Fukumitsu observes that the wetlands connecting Hakipu‘u Stream and Mōli‘i Fishpond, including his family’s lo‘i, constitute the last intact sustainable cultural and natural resource system in Ko‘olaupoko Moku, and recommends preserving this system through education (museum exhibits and a cultural center), monitoring of archaeological sites, and zoning as a cultural and natural resource sanctuary.

b. Ms. Cypher, Mr. Nāmu‘o, and Ms. Cayan are concerned that there may be other burials throughout the Project area—Ms. Cypher advises that cultural monitoring would be needed should there be any excavation during the Project, and Mr. Nāmu‘o advises that the design of the Project should take into full consideration the high potential to encounter burials. Mr. Crouch and Ms. Cypher recommend developing a long-term monitoring plan for the inadvertent uncovering of human remains through continuing beach erosion, which for Ms. Cypher includes building an on-site mausoleum for any ‘iwi found in the Project area. Ms. Lau similarly recommends developing a memorial to commemorate those who died at Kualoa.

c. Ms. Gunness, Mr. Kāne, and Mr. Morgan believe that the proposed location for the wastewater treatment center is probably least likely to cause damage to whatever remains of the intact archaeological stratigraphy in the park. On the other hand, Mr. Paglinawan believes that the current proposed location of the wastewater treatment center is too close to ‘Āpua Pond and Mōli‘i Pond, and could result in inadvertent contamination in the future, which would impact any future attempts to restore the ponds; he recommends that alternative sites for the wastewater treatment center be considered, notably the area close to the entrance to the park by the maintenance building. In addition, Ms. Gunness is concerned of the possibility that trenching for pipelines carrying the sewage to the treatment center may disturb some previously unidentified intact archaeological stratigraphy.

d. Mr. Crouch would also like protective measures for submerged cultural resources, such as Pahulu Heiau. He also recommends restoring cultural sites, such as Niuola‘a Heiau, and developing interpretive areas.

e. Ms. Gunness notes that since the entire park area is very near sea level, high tides and heavy rains bring the water table quite near the ground surface. To avoid duplicating problems the Project is intended to correct, the system would need to be monitored and maintained properly. Any waste injected, leeched, or leaking into the ground has potential to rise to the surface during high tides and heavy rains, and to seep into the nearby fishponds.

7.3 Impacts and Recommendation

Based on the information gathered for the cultural and historic background and community consultation detailed in this CIA report, the proposed Project may potentially impact Native Hawaiian cultural resources and burials. CSH identifies these potential impacts and makes the following recommendations:

1. Numerous human remains, cultural and historic sites, cultural layers, and artifacts have been documented within the Project area. These include discrete burial grounds (Site 2B-

1, Gunness 1987:120, 141; SIHP 50-80-06-5371, Dye 1996a; Colin and Hammatt 1997) and individual burials (Gunness 1987), ‘Āpua Pond (Site 313, McAllister 1933:168) and its former wall (Site 1A-1, Clark and Connolly 1978:5), a depression (Site 2B-2, Gunness 1987:123), an imu with post molds (Site 1C-2), a pig skeleton (Site 1A-2, Gunness 1987:57–59), cultural layers indicative of habitation and stone tool production (Survey Areas 1A, 1B, 1C, 2A, 2B, and 2C, Gunness 1987), the former site of ‘Āpua Heiau (Mr. Crouch interview), sites of two former pā hale (LCA 3011 and 3052, Waihona ‘Aina 2000), a historic bathhouse (Francis Morgan interview, Shideler and Hammatt 2007, Vol. II:101), an ahu for Hōkūle‘a (Herbert Hoe interview, Shideler and Hammatt 2007, Vol. II:55), and an area occupied by the Temple of Lono (Palani Nobriga interview, Shideler and Hammatt 2007, Vol. II:129–135).

While the proposed location for the wastewater treatment center is probably least likely to cause damage to the intact cultural layer in the park, land-disturbing activities during construction may uncover presently undetected burials or other cultural finds. Personnel involved in the construction activities of the Project should be informed of the possibility of inadvertent cultural finds, including human remains. Should burials (or other cultural finds) be identified during ground disturbance, the construction contractor should immediately cease all work and the appropriate agencies notified pursuant to applicable law.

The Department of Parks and Recreation, City and County of Honolulu, should consult with community members to develop a reinterment plan and cultural preservation plan in the event that any human remains or cultural sites or artifacts be uncovered during construction or long-term maintenance for the Project.

2. The community has expressed concerns about the Project’s impact to ‘Āpua Pond. CSH recommends that the City and County of Honolulu and community have discussions specific to this concern and work towards a compromised resolution.

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Appendix A Glossary

To highlight the various and complex meanings of Hawaiian words, the complete translations from Pukui and Elbert (1986) are used unless otherwise noted. In some cases, alternate translations may resonate stronger with Hawaiians today; these are placed prior to the Pukui and Elbert (1986) translations and marked with “(common).”

Diacritical markings used in the Hawaiian words are the ‘okina and the kahakō. The ‘okina, or glottal stop, is only found between two vowels or at the beginning of a word that starts with a vowel. A break in speech is created between the sounds of the two vowels. The pronunciation of the ‘okina is similar to saying “oh-oh.” The ‘okina is written as a backwards apostrophe. The kahakō is only found above a vowel. It stresses or elongates a vowel sound from one beat to two beats. The kahakō is written as a line above a vowel.

Hawaiian Word	English Translation
‘ae	A small plant with succulent leaves used in food preparation
ae‘o	Hawaiian stilt bird
ahupua‘a	land division usually extending from the uplands to the sea, so called because the boundary was marked by a heap (ahu) of stones surmounted by an image of a pig (pua‘a), or because a pig or other tribute was laid on the altar as tax to the chief
āholehole	young stage of āhole, Hawaiian flagtail
ahu	heap, pile, collection, mound, mass; altar, shrine, cairn
‘āina	land, earth
akule	big-eyed scad
‘ākulikuli	a coastal herb
‘ala‘eke	a crab
‘alae ‘ula	common Hawaiian moorhen
ala hele	pathway, route, road, way to go, itinerary, trail, highway, means of transportation
‘ala‘ihi	squirrelfish
ali‘i	chief, chiefess, officer, ruler, monarch, peer, headman, noble, aristocrat,

Hawaiian Word	English Translation
	king, queen, commander
ali‘i kapu	sacred chief (common)
‘anae	mullet
ao	light, day, daylight, dawn; to dawn, grow light; enlightened; to regain consciousness
‘āpana	piece, slice, portion, fragment, section, segment, installment, part, land parcel, lot, district, sector, ward, precinct
‘āpana	piece, slice, portion, fragment, section, segment, installment, part, land parcel, lot, district, sector, ward, precinct
‘aumakua	deified ancestor
‘auwai	ditch, canal
awa	milkfish
‘awapuhi	ginger shampoo
hale mua	men’s house
he‘e	octopus, squid
heiau	pre-Christian place of worship, shrine; some heiau were elaborately constructed stone platforms, others simple earth terraces
hīhīmanu	stringray
ho‘ikipō	the showing of the night, night vision (common)
honohono	dayflower (grass).
‘ili	land section, next in importance to an ahupua‘a and usually a subdivision of an ahupua‘a
imu	earth oven
ilina	grave, tomb, sepulcher, cemetery, mausoleum, plot in a cemetery
iwi kūpuna	ancestral bone remains (common)

Hawaiian Word	English Translation
kahuna	priest, sorcerer, magician, wizard, minister, expert in any profession; kāhuna—plural of kahuna
kahuna nui	supreme spiritual leader (common); high priest and councilor to a high chief
kala	surgeon fish
kalo	taro
kama‘āina	Native-born, one born in a place, host; native plant; acquainted, familiar, Lit., land child.
kamani	a native tree
kapa	bark cloth (common); tapa, as made from wauke or māmaki bark
kapu	taboo, prohibition; special privilege or exemption from ordinary taboo; sacredness; prohibited, forbidden; sacred, holy, consecrated; no trespassing, keep out
kauwā	outcast, pariah, slave, untouchable, menial; a caste which lived apart and was drawn on for human sacrifices
koa‘e kea	white-tailed tropic bird
koa‘e ula	red-tailed tropic bird
kohekohe	a sedge
konohiki	headman of an ahupua‘a land division under the chief
kūhonu	a crab
kukui	candlenut tree
kula	dryland agriculture (common). Plain, field, open country, pasture
kuleana	Native Hawaiian land rights (common). Right, privilege, concern, responsibility, title, business, property, estate, portion, jurisdiction, authority, liability, interest, claim, ownership, tenure, affair, province
kula ‘āina	field or pasture land

Hawaiian Word	English Translation
kupuna	elders (common). Grandparent, ancestor, relative or close friend of the grandparent's generation, grandaunt, granduncle; kūpuna—plural of kupuna
ku‘ula	stone used for worship of a fishing god
lā‘au lapa‘au	traditional medicine
leho	cowry shell
lei niho palaoa	whale tooth or rock oyster shell pendant
limu	seaweed
limu ‘ele‘ele	seaweed, algae
limu kohu	seaweed, algae
lo‘i	irrigated terrace, especially for taro, but also for rice; paddy
loko	pond, lake, pool
loko i‘a	fishpond (common)
maka‘āinana	commoners
mākāhā	sluice gate
makaloa	a sedge
makai	seaward
mana	supernatural or divine power
mana‘o	thought, idea, belief, opinion, theory, thesis, intention, meaning, suggestion, mind, desire, want; to think, estimate, anticipate, expect, suppose, mediate, deem, consider
manini	convict tang
mele	song, anthem, or chant of any kind
melomelo	bait stick

Hawaiian Word	English Translation
menehune	legendary race of small people who worked at night, building fish ponds, roads, temples
mō‘ī	king, sovereign, monarch, majesty, ruler, queen
moku	district, island, islet, section
mo‘o	lizard, reptile of any kind, dragon, serpent; water spirit
mo‘olelo	story, tale, myth, history, tradition, literature, legend, journal, log, yarn, fable, essay, chronicle, record, article; minutes, as of a meeting (From mo‘o ‘ōlelo, succession of talk; all stories were oral, not written)
nehu	smelt, anchovy
‘oama	juvenile weke
ogo (Japanese)	seaweed
‘ōlelo no‘eau	proverb, wise saying, traditional saying
‘ō‘io	bonefish
oli	chant that was not danced to, especially with prolonged phrases chanted in one breath, often with a trill at the end of each phrase; to chant thu.
‘ōpae	shrimp
pā hale	house lot
pali	cliff, precipice, steep hill or slope
pāpio	young stage of ulua (crevalle, jack, or pompano)
pō	night, darkness, obscurity; the realm of the gods; pertaining to or of the gods, chaos, or hell; dark, obscure, benighted; formerly the period of 24 hours beginning with nightfall (the Hawaiian “day” began at nightfall)
pōhaku	rock, stone, mineral, tablet
poi	pounded taro.
pua	young baby moi

Hawaiian Word	English Translation
puhi	eel
puhi kāpā	mottled eel
pūnāwai	fresh-water springs
pu‘uhonua	place of refuge, sanctuary, asylum, place of peace, and safety
tī (kī)	a woody plant in the lily family
‘uala	sweet potatoe
‘ua‘u	shearwater
uhu	parrotfish
‘ulu	breadfruit
‘ulu maika	ball for bowling game
wā	epoch, time period
wahi pana	storied place (common); legendary place
weke	goatfish

Appendix B Common and Scientific Names for Plants and Animals Mentioned by Community Participants

Common Names		Possible Scientific Names		Source
Hawaiian	Other	Genus	Species	
ae‘o	Hawaiian stilt bird	*Himantopus*	*mexicanus knudseni*	Hawaii DLNR 2005
āholehole	juvenile āhole (Hawaiian flagtail)	*Kuhlia*	*xenura*	Hoover 1993
akule	big-eyed scad	*Selar*	*crumenophthalmus*	Hoover 1993
‘ākulikuli	a coastal herb	*Sesuvium*	*portulacastrum*	Pukui and Elbert 1986
‘ala‘eke	a crab	*Portunus*	spp. *	Pukui and Elbert 1986
‘ala‘ihi	squirrelfish	*Neoniphon*	spp.	Randall 1996
‘alae ‘ula	Hawaiian moorhen	*Gallinula*	*chloropus*	Pukui and Elbert 1986
‘anae	mullet	*Mugil*	*cephalus*	Hoover 1993
awa	milkfish	*Chanos*	*chanos*	Hoover 1993
‘awapuhi	shampoo ginger	*Zingiber*	*zerumbet*	Wagner et al. 1999
haue	purple vervain	*Stachytarpheta*	spp.	Whistler 1995

he‘e	octopus, squid	multiple families and species		Pukui and Elbert 1986
hīhīmanu	stringray	multiple families and species		Pukui and Elbert 1986
honohono	dayflower	*Commelina*	spp.	Imada et al. 2005
kala	surgeonfish	*Naso*	spp.	Randall 1996
kalo	taro	*Colocasia*	*esculenta*	Wagner et al. 1999
kamani	a native tree	*Calophyllum*	*inophyllum*	Pukui and Elbert 1986
kī	ti	*Cordyline*	*fruticosa*	Wagner et al. 1999
koa‘e kea	white-tailed tropic bird	*Phaethon*	*lepturus*	Pukui and Elbert 1986
koa‘e ula	red-tailed tropic bird	*Phaethon*	*rubricauda*	Pukui and Elbert 1986
kohekohe	sedge	*Eleocharis*	spp.	Pukui and Elbert 1986
kūhonu	a crab	*Portunus*	*sanguinolentus*	Pukui and Elbert 1986
kukui	candlenet	*Aleurites*	*moluccana*	Wagner et al. 1999
limu ‘ele‘ele	seaweed, algae	*Entermorpha*	*prolifera*	Abbott and Williamson 1974
limu kohu	seaweed, algae	*Asparagopsis*	*taxiformis*	Abbott and Williamson 1974
makaloa	sedge	*Cyperus*	*laevigatus*	Pukui and Elbert 1986
nehu	smelt, anchovies	*Stolephorus*	*purpureus*	Titcomb 1972

‘oama	juvenile weke	*Mulloidichthys*	spp.	Hoover 1993
‘ō‘io	bonefish	*Albula*	spp.	Hoover 1993
‘ōpae	shrimp	general name for shrimp		Pukui and Elbert 1986
pāpio	juvenile bigeye jack	*Caranx*	*sexfasciatus*	Hoover 1993
pua	young baby moi	*Polydactylus*	*sexfilis*	Hoover 1993
puhi kāpā	eel	*Echidna*	*nebulosa*	Pukui and Elbert 1986
‘u‘au	wedge-tailed shearwater	*Puffinus*	*pacificus*	Pukui and Elbert 1986
uhu	parrotfish	Multiple genera and species in the family Scaridae		Hoover 1993
‘ulu	breadfruit	*Artocarpus*	*altilis*	Imada et al. 2005
weke	goatfish	*Mulloidichthys*	spp.	Hoover 1993

*spp. = multiple species

Appendix C Authorization and Release Form

Cultural Surveys Hawai‘i, Inc.
Archaeological and Cultural Impact Studies
Hallett H. Hammatt, Ph.D., President

P.O. Box 1114 Kailua, Hawai‘i 96734 Ph: (808) 262-9972 Fax: (808) 262-4950

Job code: KUALOA 4 jgenz@culturalsurveys.com nishihara@culturalsurveys.com www.culturalsurveys.com

AUTHORIZATION AND RELEASE FORM

Cultural Surveys Hawai‘i appreciates the generosity of the *kūpuna* and *kama‘āina* who are sharing their knowledge of cultural and historic properties, and experiences of past and present cultural practices for the Cultural Impact Assessment for the *ahupua‘a* of Kualoa.

We understand our responsibility in respecting the wishes and concerns of the interviewees participating in our study. Here are the procedures we promise to follow:

1. You will have the opportunity to review the written transcript of our interview with you. At that time you may make any additions, deletions or corrections you wish.
2. You will be given a copy of the interview notes for your records.
3. You will be given a copy of this release form for your records.

For your protection, we need your written confirmation that:

1. You consent to the use of the complete transcript and/or interview quotes for reports on cultural sites and practices, historic documentation, and/or academic purposes.
2. You agree that the interview shall be made available to the public.

I, _____, agree to the procedures outlined above and, by my
(Please print your name here)
signature, give my consent and release for this interview to be used as specified.

_____
(Signature)

_____
(Date)

Appendix D Community Consultation Letter

Cultural Surveys Hawai‘i, Inc.
Archaeological and Cultural Impact Studies
Hallett H. Hammatt, Ph.D., President

P.O. Box 1114 Kailua, Hawai‘i 96734 Ph: (808) 262-9972 Fax: (808) 262-4950

Job code: KUALOA 4 jgenz@culturalsurveys.com nishihara@culturalsurveys.com www.culturalsurveys.com

May 12, 2011

Aloha mai e kāua,

At the request of Kennedy/Jenks Consultants, Cultural Surveys Hawai‘i Inc. (CSH) is conducting a Cultural Impact Assessment (CIA) for the proposed Project referred to as Reconstruct Park Wastewater Systems at Kualoa Regional Park, Kualoa Ahupua‘a, Ko‘olaupoko District, O‘ahu Island, TMK: [1] 4-9-004:001. Please see the attached figures: Aerial Photograph (Figure 1), USGS Map (Figure 2), and Site Plan (Figure 3) of the proposed Project area.

Kualoa Regional Park has four comfort stations that were constructed in 1973. Each comfort station was built with its own wastewater system including a treatment and disposal component. All four of the wastewater systems have reached their useful life and need to be replaced. Comfort Station #3 was closed due to the eroding shoreline.

This Project involves constructing a replacement bath house for Comfort Station #3, and a centralized wastewater system away from the eroding shoreline. Four pump stations will be installed to convey the wastewater flows from each comfort station (including the replacement bath house) and the food service building to the centralized wastewater system. The centralized wastewater system will be sized to treat and dispose of approximately 29,000 gallons per day. The system will be designed to use pumping systems and partially mound system components to minimize excavation during construction. It is estimated that the system will consist of 3,750 linear feet of force main, a 5,000 gallon pre-loader tank, three (3) 15,000 gallon aerobic treatment units, and an elevated mound for disposal. The Project will involve abandoning the existing wastewater treatment systems in place except for the system serving Comfort Station #3 which will be demolished and removed. Comfort Station #3 will be demolished.

The purpose of the CIA is to gather information about the Project area and its surroundings through research and interviews with individuals that are knowledgeable about this area in order to assess potential impacts to the cultural resources, cultural practices and beliefs identified as a result of the planned Project. We are seeking your *kōkua* (assistance) and guidance regarding the following aspects of our study:

- **General history and present and past land use of the Project area. Although the redevelopment will be within the boundaries as stated above, this study will include the entire *ahupua‘a* of Kualoa.**
- **Knowledge of cultural sites which may be impacted by future development of the Project area - for example, historic sites and / or archaeological sites and burials.**

- **Knowledge of traditional gathering practices in the Project area vicinity, both past and ongoing.**
- **Cultural associations of the Project area, such as legends and traditional uses.**
- **Referrals of *kāpuna* or elders and *kama‘āina* who might be willing to share their cultural knowledge of the Project area and the surrounding *ahupua‘a* lands.**
- **Any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the Project area.**

In advance, we appreciate your assistance in our research effort. Please don't hesitate to contact Joe Genz at jgenz@culturalsurveys.com and/or Nicole Ishihara at nishihara@culturalsurveys.com or by phone at (808) 262-9972.

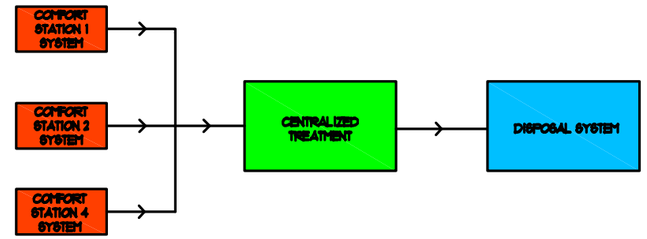
Mahalo nui loa,

Joe Genz
CSH Cultural Researcher

And

Nicole Ishihara
CSH Cultural Researcher

Appendix E
Summary of Alternatives
Presented to Stakeholder Groups

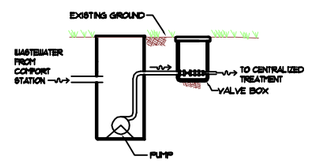


POSSIBLE CENTRALIZED COMBINATIONS	
A - 1 - b	A - 4 - d
A - 2 - a	B - b
A - 2 - b	B - c
A - 2 - c	C - a
A - 3 - a	C - b
A - 3 - b	C - c
A - 3 - c	

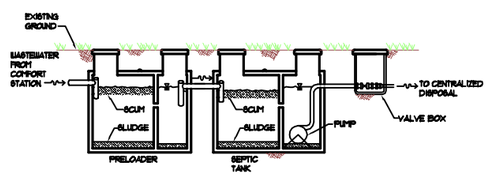
CENTRALIZED SYSTEM CONCEPTUAL FLOW DIAGRAM

COMFORT STATION SYSTEMS

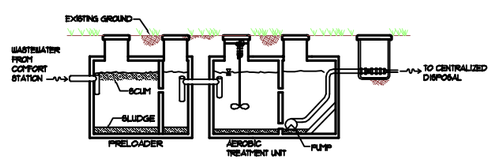
(* NEW COMPONENTS TO BE INSTALLED IN THE SAME LOCATION AS EXISTING SYSTEM)



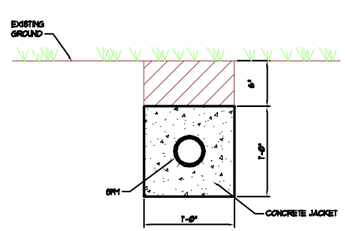
A. PUMP STATION SYSTEM (5 FT DIAMETER)*



B. SEPTIC TANK SYSTEM*
(SEE DECENTRALIZED SHEET FOR SIZE)

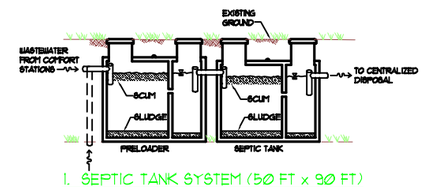


C. AEROBIC TREATMENT UNIT SYSTEM*
(SEE DECENTRALIZED SHEET FOR SIZE)

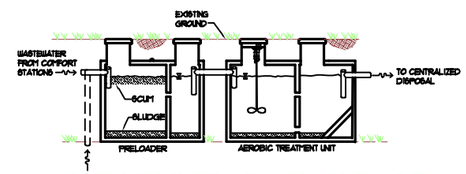


TYPICAL SEWER FORCE MAIN TRENCH

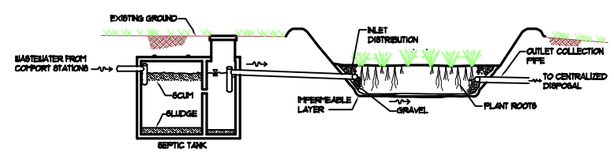
CENTRALIZED TREATMENT SYSTEMS



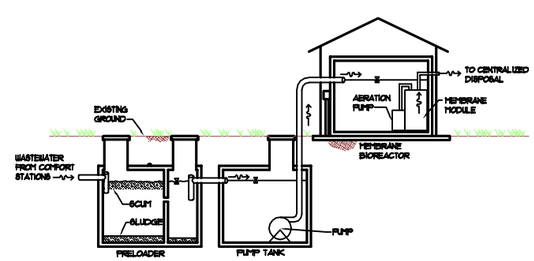
1. SEPTIC TANK SYSTEM (50 FT x 90 FT)
(MINIMUM WATER QUALITY)



2. AEROBIC TREATMENT UNIT SYSTEM (55 FT x 115 FT)

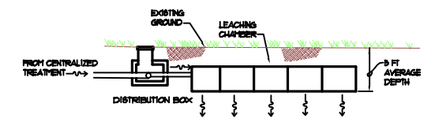


3. CONSTRUCTED WETLANDS SYSTEM (190 FT x 115 FT)

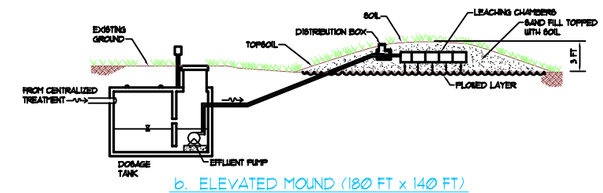


4. MEMBRANE BIOREACTOR SYSTEM (150 FT x 150 FT)
(BEST WATER QUALITY)

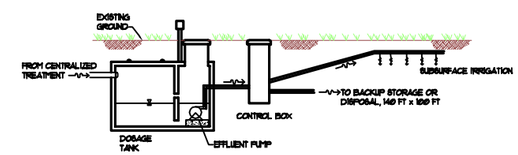
CENTRALIZED DISPOSAL SYSTEMS



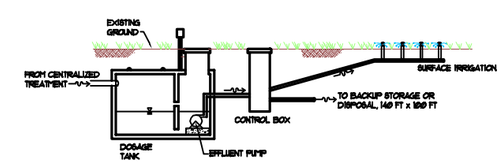
a. LEACH FIELD (140 FT x 100 FT)



b. ELEVATED MOUND (180 FT x 140 FT)



c. SUBSURFACE IRRIGATION (14 ACRES)



d. SURFACE IRRIGATION (14 ACRES)

Prepared for :
CITY & COUNTY OF HONOLULU
DEPARTMENT OF DESIGN & CONSTRUCTION
WASTEWATER DESIGN AND ENGINEERING DIVISION

RECONSTRUCT WASTEWATER SYSTEMS AT KUALOA REGIONAL PARK
KO'OLAU POKO DISTRICT, OAHU, HAWAI'I
CENTRALIZED WASTEWATER TREATMENT ALTERNATIVES

JULY 23, 2007

ENGINEERING SOLUTIONS, INC.
98-1268 Kaahumanu Street, Suite C-7
Pearl City, Hawaii 96782

KUALOA REGIONAL PARK WASTEWATER SYSTEMS ALTERNATIVES
COMPARISON OF ALTERNATIVE SOLUTIONS
February 2009

	CURRENT SYSTEM	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
DESCRIPTION OF ALTERNATIVE SOLUTIONS	CONTINUE TO PUMP OUT TANKS WITH REGULAR SYSTEM FAILURES & FINES o ILLEGAL CONDITION VIOLATES STATE LAW o DOH requires a new long-term solution. o Currently pumping tanks 3 or 4 times/week. o Pumping costs increase o Systems undersized under DOH standards	NEW CENTRALIZED WW SYSTEM AND NEW CENTRALIZED COMFORT STATION o Close and demolish all existing comfort stations 1, 2, 4 and pavilion.	NEW CENTRALIZED WWS AND COMFORT STATION WITH EXISTING COMFORT STATIONS 1, 2 & 4 CONNECTED o Same as Alternative1, except providing pump station at each comfort and pavilion with 2-inch sewer force main to connect to new centralized WWS.	NEW DECENTRALZIED WASTEWATER SYSTEM o Construct new individual wastewater system (aerobic unit and leach fields) for each of the usable, existing Comfort Stations 1, 2 and 4 & Pavilion. o Comfort Stations are old and deteriorating. Built in1960s.
PARK FUNCTIONS AND OPERATION	Impact by potential spills. Have had to shut down comfort stations.	Requires closing down portions of the park and limiting operations	Park functions not affected.	Park functions not affected.
CONDITION OF INFRASTRUCTURE	Comfort Stations and wastewater system is 35 years old and failing. Will need to be replaced within 10 years.	Install all new facilities.	Install new centralized facility, can replace 3 comfort stations in future.	Connect old comfort stations to new wastewater treatment system.
CULTURAL IMPACT	No effect to subsurface remains. Ongoing cultural impact due to improper wastewater management, creating odors, unsafe areas and park closures.	Impacts would be limited to the subsurface area of the new centralized comfort station. New location would be a less sensitive cultural location	Requires digging a small trench for new wastewater collection system extending over 3,000 ft throughout the park. Sensitive cultural areas would be avoided.	Comfort Station No. 1 Leach field near archaeologically sensitive area. Comfort Station No. 2 Require construction of disposal field in new, undisturbed area.

February 3, 2009

	CURRENT SYSTEM	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
AREA OF DISTURBANCE	None	Total area: 31,600 sf for Treatment and Disposal Least area of disturbance. Treatment system (55' x115'). Elevated mound (180' x 140')	Total area: 31,600 SF for Treatment and Disposal system plus 3,100 LF of 2-inch SFM, install at max. 2 feet depth.	Over 40,000 SF of Treatment and Disposal system disturbance 3 locations. Comfort Station No. 1: Expanded treatment to 1,121sf Expanded disposal area 11,400 sf Comfort Station No. 2: New treatment area to 1,961sf New disposal area to 10,200 sf (Needs to be relocated. Cannot use existing area.) Comfort Station No. 4 & Pavilion Expand treatment area: 3,873 sf Expand disposal area: 15,700 sf
WATER QUALITY IMPACT	Potential for spill greatest. On-going subsurface disposal via cesspools Provides little or no removal of nitrogen and bacteria in effluent. Presently overloaded systems fails and effluent enters nearshore waters.	Least potential for water quality impact with disposal field in the interior of the park.	Least potential for water quality impact with disposal field in the interior of the park. Force mains will be concrete jacketed to avoid potential of accidental pipe breaks.	Comfort Station No. 2 Leach field can not be in the same place as the existing leach field. Needs to be relocated to be 50 feet from shoreline. Comfort Station No. 4 and Pavilion Leach field needs to be raised out of low-lying area
COST IMPACTS: CONSTRUCTION & OPERATIONS			Requires additional maintenance with pump stations.	
REGULATORY IMPACTS	Will continue to be in violation and fined by DOH	In compliance	In compliance	In compliance, but may not be in future as the shoreline retreats.
OTHERS				

February 3, 2009

Kualoa Regional Park Wastewater Treatment Matrix
August 4, 2011

	HOLDING TANKS	COMPOSTING TOILETS	SEPTIC TANK	AEROBIC TREATMENT UNIT	CONSTRUCTED WETLANDS (Subsurface Flow)	RECIRCULATING SAND FILTER FOR REUSE
ADVANTAGES	• Electrical power not required. • Will not discharge nutrients or pathogens into the environment.	• Does not require water. • Will not discharge nutrients or pathogens into the environment • Environmentally friendly.	• Simple operation.	• Better quality effluent provided. • Effluent is allowed to be discharged to groundwater with disinfection.	• Better quality effluent provided. • Subsurface design minimizes odors, vector attraction and potential of public contact within the wetlands. • Passive, natural treatment process.	• Recycled water is considered zero discharge. • High quality effluent provided. • Effluent is allowed to be discharged to groundwater. • Reduces potable water demand for irrigation.
DISADVANTAGES	• Does not satisfy resolution of NOV between City and State DOH Content of tank must be pumped on a regular basis and disposed of off-site. • Must be monitored and routinely checked to assess water level. • No treatment provided. • Possible odors from wastewater going septic. Greatest risk for potential of wastewater spill. Capacity	• If not properly maintained, composting toilets have a potential for odors and vector attraction. • Purchase cost for specific organic materials to properly maintain the composting system. • Without proper ventilation or maintenance, odors may be generated. Requires power. • Possible odors from wastewater going septic. Require extensive replacement of existing plumbing fixtures Composting toilets have minimal capacity Maintenance intensive.	• Only primary treatment is provided. • Treatment process is easily upset with the introduction of toxic substances, like chemicals and bleach into wastewater; shortening the life of disposal systems. • DOH requires a 3 foot vertical separation between the disposal system and groundwater. • The soil absorption area in a septic system must remain unsaturated to function properly.	• Electrical power is required for continuous operation of the aerobic units. • The aerobic treatment process is sensitive to temperature, location, tank geometry, tank material, concentration of solids, and type of mixing. • Treatment process is easily upset with the introduction of toxic substances, like chemicals and bleach into wastewater; shortening the life of disposal systems. • Increased operation and maintenance with the potential of equipment malfunctions and failures.	• Large footprint required. • Phosphorus, metals and other organics removed from the wastewater are bound in wetland sediments and accumulate over time. • Requires pretreatment. • Effluent quality not totally dependable or consistent. • Requires startup times for plants to get established.	• Electrical power is required and backup generator. • Cost of media. • Maintenance required for sand bed and pumps. • Requires pretreatment. • Requires backup disposal and/or storage in the event of a system failure, per DOH.
IMPACT ON PARK FUNCTIONS AND OPERATION	None	Additional park area is required	None	None	Area must be fenced and will be restricted from park usage.	Areas where recycled water applied may be temporarily restricted from public use.
AREA OF DISTURBANCE	• Minimal	• Medium	Estimated 50 feet X 90 feet.	Estimated 55 feet X 115 feet	Estimated 190 feet X 115 feet (does not include required pretreatment)	• Large
WATER QUALITY IMPACT ON ENVIRONMENT	None with greatest risk for potential of wastewater spill	None	Medium-High	Medium	Medium	Medium
CONSTRUCTION COST IMPACTS	Low	Medium	Medium	Medium-High	Medium-High	Medium-High
OPERTION & MAINTENANCE COST IMPACTS	High	Medium-High	Low	Medium	Medium	Medium-High
SPECIAL MAINTENANCE REQUIREMENTS	Continuous monitoring of tank water level	Requires continuous ventilation	None	Requires continuous application of compressed air	Requires maintenance and upkeep of plants	Requires high energy consumption Requires certified operator
REGULATORY IMPACTS (Monitoring, recording and special operations)	• Continuous monitoring of tank water level	• Quarterly inspection	• Quarterly inspections for public facilities	• Quarterly inspections	• Requires special approval from DOH. • Quarter inspections	• Monitoring and recordkeeping required by the DOH. • A wastewater grade operator license is required.