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SUZANNE D. CASE
CHAIRPERSON
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COMMISSION ON WATER RESOURCE MANAGEMENT

KEKOA KALUHIWA
FIRST DEPUTY

JEFFREY T. PEARSON
DEPUTY DIRECTOR - WATER

EDWARD R. UNDERWOOD
ADMINISTRATOR
DIVISION OF BOATING AND OCEAN RECREATION

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF BOATING AND OCEAN RECREATION
4 SAND ISLAND ACCESS ROAD
HONOLULU, HAWAII 96819

BOR-E-086.16

February 19, 2016

Director
Office of Environmental Quality Control
Department of Health, State of Hawai'i
235 S. Beretania Street, Suite 702
Honolulu, Hawai'i 96813

Draft Environmental Assessment and Anticipated Finding of No Significant Impacts (FONSI)
Keauhou Bay Offshore Moorings Project
Keauhou, Island of Hawaii, Hawaii

Dear Director:

With this letter, the Department of Land and Natural Resources Division of Boating and Ocean Recreation hereby transmits the Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFONSI) for the Keauhou Bay Offshore Mooring Project situated in Keauhou Bay on the island of Hawaii for publication in the next available edition of the Environmental Notice.

Enclosed is a completed Office of Environmental Quality Control Publication Form, two copies of the DEA-AFONSI, an Adobe Acrobat PDF file of the same, and an electronic copy of the publication form in MS Word. Simultaneous with this letter, we have submitted the summary of the action in a text file by electronic mail to your office.

If there are any questions, please contact Mr. Finn McCall of the Engineering Branch at (808) 587-3250.

Sincerely,

Edward R. Underwood
Administrator

Enclosures:

- DEA-AFONSI
- Publication Form in MS Word

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**AGENCY
PUBLICATION FORM**

MAR 23 2016

Project Name:	Keauhou Bay Offshore Moorings Project
Project Short Name:	Keauhou Bay Offshore Moorings Project
HRS §343-5 Trigger(s):	HRS Chapter 343-5(a) (1) and (2): Use of State Lands and Funds
Island(s):	Hawaii
Judicial District(s):	North Kona
TMK(s):	Makai of (3) 7-8-010:044 (submerged lands)
Permit(s)/Approval(s):	USACE Section 10 Standard Individual Permit Department of Planning CZM Program Federal Consistency Review
Proposing/Determining Agency:	Department of Land and Natural Resources, Division of Boating and Ocean Recreation
Contact Name, Email, Telephone, Address	Finn McCall, finn.d.mccall@hawaii.gov, 808-587-3250, Department of Land and Natural Resources Division of Boating and Ocean Recreation, 4 Sand Island Access Road, Honolulu, HI 96819
Accepting Authority:	Not applicable
Contact Name, Email, Telephone, Address	Not applicable
Consultant:	Anchor QEA, LLC
Contact Name, Email, Telephone, Address	Rob Walker, rwalker@anchorqea.com , 808-202-1920, PO Box 756, Haleiwa, HI 96712

Status (select one) X_ DEA-AFNSI**Submittal Requirements**

Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEA, and 4) a searchable PDF of the DEA; a 30-day comment period follows from the date of publication in the Notice.

 FEA-FONSI

Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; no comment period follows from publication in the Notice.

 FEA-EISPN

Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; a 30-day comment period follows from the date of publication in the Notice.

 Act 172-12 EISPN
("Direct to EIS")

Submit 1) the proposing agency notice of determination letter on agency letterhead and 2) this completed OEQC publication form as a Word file; no EA is required and a 30-day comment period follows from the date of publication in the Notice.

 DEIS

Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEIS, 4) a searchable PDF of the DEIS, and 5) a searchable PDF of the distribution list; a 45-day comment period follows from the date of publication in the Notice.

 FEIS

Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEIS, 4) a searchable PDF of the FEIS, and 5) a searchable PDF of the distribution list; no comment period follows from publication in the Notice.

 FEIS Acceptance
Determination

The accepting authority simultaneously transmits to both the OEQC and the proposing agency a letter of its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS; no comment period ensues upon publication in the Notice.

FEIS Statutory
Acceptance

Timely statutory acceptance of the FEIS under Section 343-5(c), HRS, is not applicable to agency actions.

 Supplemental EIS
Determination

The accepting authority simultaneously transmits its notice to both the proposing agency and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and

determines that a supplemental EIS is or is not required; no EA is required and no comment period ensues upon publication in the Notice.

- Withdrawal Identify the specific document(s) to withdraw and explain in the project summary section.
- Other Contact the OEQC if your action is not one of the above items.

Project Summary

The Proposed Project involves improving the offshore moorings at Keauhou Bay Small Boat Harbor (SBH), located on the Kona side of the Island of Hawai'i. The SBH is managed by the State of Hawai'i, Department of Land and Natural Resources (DLNR), Division of Boating and Ocean Recreation (DOBOR). The proposed improvements include the removal of the existing nine moorings and associated anchors and the installation of 16 new vessel moorings that would be supported by 32 mooring anchors. The revised configuration of offshore moorings would maintain clearance from the USCG navigation channel; would more effectively accommodate vessels; and would ensure continued use of the bay by non-motorized recreational activities such as swimming, kayaking, canoeing, snorkeling, stand-up paddle boarding, and other traditional uses of the site.

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DRAFT ENVIRONMENTAL ASSESSMENT KEAUHOU BAY OFFSHORE MOORINGS

Prepared for

Department of Land and Natural Resources
Division of Boating and Ocean Recreation
333 Queen Street, Suite 300
Honolulu, Hawai'i 96813

Prepared by

Anchor QEA, LLC
P.O. Box 756
Haleiwa, Hawai'i 96712

February 2016

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LIST OF ACRONYMS AND ABBREVIATIONS

BMP	best management practice
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
DLNR	Department of Land and Natural Resources
DOBOR	Division of Boating and Ocean Recreation
DOT	Department of Transportation
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FMA	Fisheries Management Area
FONSI	Finding of No Significant Impact
HAR	Hawai'i Administrative Rule
HBMP	Hawai'i Beach Management Plan
HRHP	Hawai'i Register of Historic Places
HRS	Hawai'i Revised Statutes
KCC	Keauhou Canoe Club
km ²	square kilometer
MMPA	Marine Mammal Protection Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OEQC	Hawai'i Office of Environmental Quality Control
ORMP	Ocean Resources Management Plan
SBH	small boat harbor
SHPD	State Historic Preservation Division
SUP	stand-up paddle
USACE	U.S. Army Corps of Engineers
USC	United States Code
USCG	U.S. Coast Guard

1 PROJECT OVERVIEW

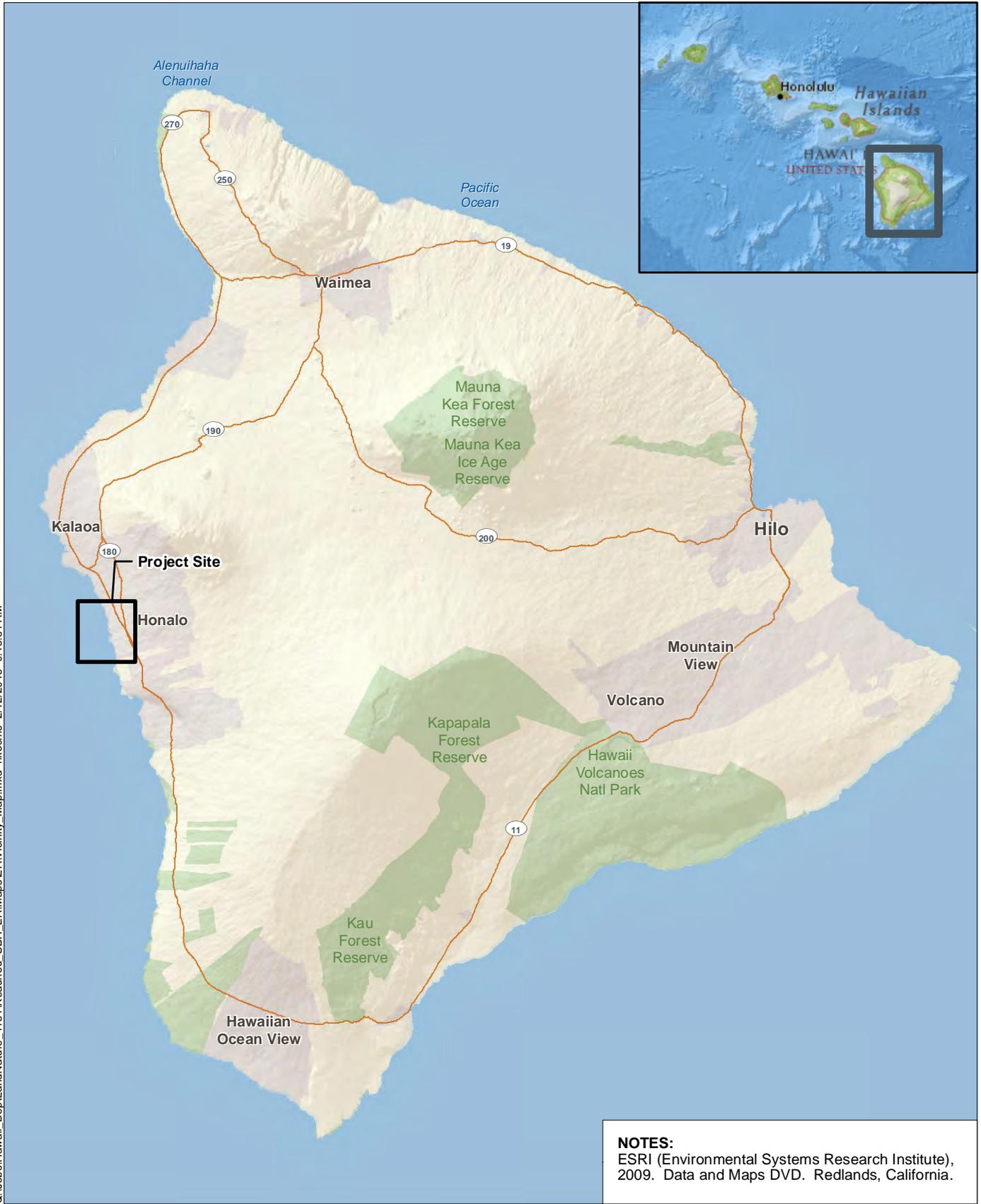
The Proposed Keauhou Bay Offshore Moorings Project (Proposed Project) involves bringing the Keauhou Bay small boat harbor (SBH) offshore moorings into compliance with state and federal regulations by obtaining necessary permits and installing new engineered moorings to accomplish the following goals:

- Replace the existing unpermitted and non-engineered makeshift anchoring systems with engineered mooring anchors, keeping with current maritime standards
- Enhance opportunities for vessel mooring within the bay by reconfiguring the mooring field in an organized grid, providing additional mooring capacity
- Reconfigure the mooring field to avoid conflict with the established U.S. Coast Guard (USCG) navigation channel
- Ensure safe, continued use of the bay by non-motorized vessel and recreational activities (e.g., canoeing, kayaking, sailing, swimming, and snorkeling)
- Protect historic native Hawai’ian traditional and cultural practices of the bay
- Preserve the historical significance of the bay by not interfering with sensitive archeological or cultural resources
- Prevent further degradation of sensitive corals and marine habitat due to the existing substandard moorings and ensure that the new moorings are placed in areas free of corals and sensitive habitats

1.1 Project Description

The Proposed Project involves improving the offshore moorings at Keauhou Bay SBH, located on the Kona side of the Island of Hawai’i (Figure 1). The SBH is managed by the State of Hawai’i, Department of Land and Natural Resources (DLNR), Division of Boating and Ocean Recreation (DOBOR). The proposed improvements include the removal of the existing nine moorings and associated anchors (Figure 2) and the installation of 16 new vessel moorings that would be supported by 32 mooring anchors (Figure 3). The revised configuration of offshore moorings would maintain clearance from the USCG navigation channel; would more effectively accommodate vessels; and would ensure continued use of the bay by non-motorized recreational activities such as swimming, kayaking, canoeing, snorkeling, stand-up paddle (SUP) boarding, and other traditional uses of the site.

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NOTES:
 ESRI (Environmental Systems Research Institute),
 2009. Data and Maps DVD. Redlands, California.

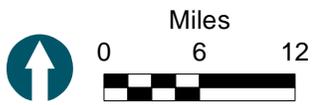


Figure 1
 Vicinity Map
 Draft Environmental Assessment
 Keauhou Bay Offshore Moorings

1.2 Purpose and Need

The overall purpose of the Proposed Project is to replace the existing unpermitted and non-engineered anchoring systems with a sufficient number of engineered, permitted moorings positioned outside the USCG navigation channel in a configuration that meets the recreational needs of the users of the bay, protects historic native Hawai'ian traditional and cultural practices of the bay, and protects the bay's marine species and habitat.

The revised configuration of offshore moorings would be laid out in an organized grid, maintaining clearance from the USCG navigation channel and enhancing opportunities for vessel mooring within the bay, while also allowing continued use of the bay by non-motorized recreational activities such as swimming, kayaking, canoeing, snorkeling, fishing, SUP boarding, and other traditional uses of the site. The mooring locations will avoid impacts to coral and the marine environment to the maximum extent possible and preserve the historical significance of the bay by not interfering with sensitive archeological or cultural resources. Corals encountered at proposed mooring anchor locations will be safely transplanted to adjacent sites in accordance with approved transplantation techniques.

The need for the project is driven by the following factors:

The Kona coastline of the Island of Hawai'i has very limited facilities for vessel mooring and berthing.

Spanning more than 60 miles of open coast between Kailua-Kona and the island's southern point at Ka Lae, only two locations offer offshore vessel mooring. One of them is Keauhou Bay, which is one of the most protected natural bays on the west side of the island, currently accommodating only nine moorings, all of which are occupied. The other facility, Kailua Bay, currently offers offshore mooring for only 10 vessels, all of which are occupied, and does not provide significant protection. There are two additional SBHs along the Kona Coast, Honokohau SBH and Kailua-Kona Wharf, which currently accommodate 262 and 3 vessel berths, respectively, all of which are occupied. Further north, approximately 34 miles up the west coast of the island, are the Kawaihae South and North SBHs, which accommodate 25 and 9 vessel berths, respectively, all of which are also occupied.

Construction of any new SBHs within this region of the state would require construction of artificial structures such as rock breakwaters and related harbor infrastructure. Due to the costs and time required for planning, permitting, design, and construction, DOBOR is not investigating such alternatives at this time.

The Keauhou Bay moorings should be located in a configuration that places them outside the USCG navigational channel, improves vessel accessibility, and supports all recreational uses of the bay.

There is a USCG navigation channel with an Approach Exclusion Zone oriented west-southwest in the center of the bay, which provides access to and from the boat launch ramp, pier, loading dock, and shoreline. Currently, several moorings are located within the boundaries of the navigable channel, which restricts movement of vessels and access to the existing dock at the mouth of the bay.

Improving the moorings at Keauhou Bay presents an opportunity to improve boat capacity within the island and the state.

The State of Hawai'i's Ocean Recreation and Coastal Areas Programs are defined in Chapter 200 of the Hawai'i Revised Statutes (HRS). SBHs and recreational boating facilities within the state are managed by DOBOR. DOBOR is charged with bringing the state's boating and ocean recreation facilities into compliance with current laws and regulations. The continued maintenance and operation of the state's boating and ocean recreation facilities ensures that the people of Hawai'i can continue to benefit from the state's natural resources by engaging in ocean-related activities, both recreational and commercial.

With its shorelines subject to coastal storms from every direction and limited natural protected harbors, Hawai'i ranks among the lowest states in the number of vessel berthing and mooring areas. Among the Main Hawai'ian Islands, the Island of Hawai'i ranks the lowest in vessel berthing and mooring areas. To improve access, DOBOR has the responsibility of seeking to enhance existing public boating access areas, as well as establish new facilities when deemed feasible.

Keauhou Bay moorings should be improved to protect the bay's marine species and habitat and ensure vessel and user safety.

The existing moorings comprise a variety of non-engineered devices, many of which pose an immediate threat and currently damage the coral-rich environment in the bay. The substandard mooring anchors and chains that have been placed throughout the bay adversely impact sensitive coral reef and other marine habitat by dragging along the ocean floor or through poor placement in sensitive areas. By replacing the existing moorings anchors with industry-standard anchors and related tackle capable of withstanding acceptable design wind and wave conditions and siting the moorings to avoid coral and other sensitive marine habitat, the proposed improvements to the offshore mooring field at Keauhou Bay will serve to further protect the marine biological resources within this sensitive environment.

1.3 Purpose of Analysis

The purpose of this Environmental Assessment (EA) is to evaluate and summarize the potential impacts of the proposed action. The EA evaluates project alternatives and measures that may be implemented to avoid, minimize, and compensate for adverse impacts to the environment. The EA has been developed pursuant to HRS Chapter 343 and the significance criteria provided in Hawai'i Administrative Rules (HAR) Section 11-200. This EA is intended to assist decision makers in determining whether the proposed action is anticipated to result in significant impacts. The EA describes potential adverse impacts to the environment and evaluates whether potentially significant impacts can be mitigated.

HAR Section 11-200-5(D) requires that an EA must assess the significance of the potential impacts of a proposed action on the existing environment. The existing environment includes the physical and socioeconomic environment as well as infrastructure and services. Potential impacts resulting from a proposed action may be direct, indirect, or cumulative in nature (HAR Section 11-200-2). The EA process is intended to inform the public and decision makers; offer alternatives to the proposed action where possible; and consider the potential impacts of the proposed action and potential measures to avoid, minimize, and/or mitigate adverse impacts to the environment.

Action that occurs in the same location and at the same time causes a direct (or primary) impact. Action that occurs later in time or at a different location, but is still a reasonably foreseeable result, causes an indirect (or secondary) impact. Indirect impacts may include impacts to the socioeconomic or natural environments. Cumulative impacts on the environment result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Such impacts can result from individually minor but collectively significant actions taking place over a period of time (HAR Section 11-200-2).

This EA considers the affected environment, the potential for environmental impacts, and proposed mitigation within a period of approximately 30 years. Short-term impacts are considered within a range of several weeks, associated with the anticipated time required to install the moorings. Because the proposed location is within Keauhou Bay, the area of analysis is the bay and the adjacent shoreline and properties, unless otherwise noted.

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

The EA process offers an opportunity for participation by the public, stakeholders, government agencies, and nearby property owners and invites their input and participation in decision-making. Should a FONSI be made by the proposing agency, additional discretionary permitting would be sought, including a Coastal Zone Management Act consistency certification, U.S. Army Corps of Engineers (USACE) Permit, and ministerial permits where applicable.

1.4 Triggers for Environmental Review

HRS Chapter 343 establishes a system of environmental review so that environmental considerations are included in decision-making, in addition to economic and technical considerations. HRS Section 343-5(a) lists seven specific instances that trigger Hawai'i

Environmental Policy Act environmental review for proposed actions not declared exempt under HAR Section 11-200-8.

The proposed action is subject to review under HRS Chapter 343-5(a) (1) and (2) because the site is State-owned land. HAR Section 11-200-6 requires preparation of an EA for applicant actions that assesses the significance of the potential impacts of the proposed action on the existing environment. The proposing agency for the EA is DOBOR because it manages the SBH and is proposing the project.

1.5 Public and Government Agency Involvement

The EA process includes a 30-day public notice and comment period that starts with an announcement of availability of the Draft EA in the Hawai'i Office of Environmental Quality Control (OEQC) Environmental Notice. The Draft EA is made available at public libraries near the affected area, in the State library in Honolulu, and online at <http://oeqc.doh.hawaii.gov>.

Applicable federal, state, and local agencies are also provided copies of the Draft EA. The OEQC distributes copies of the Draft EA to agencies and interested parties requesting copies to evaluate and comment on the potential environmental impacts associated with the proposed action. Comments on the Draft EA are addressed and subsequently incorporated into the Final EA. A Notice of Availability of the Final EA and anticipated FONSI, should it be appropriate, would be distributed in the same manner as the Draft EA.

Thereafter, the DLNR will determine whether a full EIS is needed, defer the decision pending additional itemized information, or issue a FONSI. Should DLNR issue a FONSI determination, a 30-day challenge period to the decision would commence. No action would be taken by the DLNR until the public 30-day period is complete.

1.6 Project Cost and Timeline

The total estimated cost for the project, which includes coral mitigation, removal of the existing moorings, and installation of the new moorings, was approximately \$450,000 in 2013 (Sea Engineering 2013).

The mooring installations can be completed in less than 1 week, not including operational or weather delays. Funding has already been allocated for the project, and DOBOR intends to proceed with construction of the Proposed Project, Alternative 1, or Alternative 2 at the close of the EA process and once all necessary regulatory permits and approvals have been obtained.

2 ALTERNATIVES

2.1 No Action Alternative

The No Action Alternative is an evaluation of the current conditions and impacts if no project is moved forward. The existing offshore mooring field comprises a grouping of three vessels on the north side of the USCG Approach Exclusion Zone¹ which occupy a footprint of approximately 30,000 square feet (0.7 acre; Figure 2). Six vessels are located on the south side of the USCG Approach Exclusion Zone and occupy a footprint of approximately 87,000 square feet (2.0 acres). This existing configuration of nine offshore moorings currently accommodates vessels ranging from 21 feet to 60 feet.

DOBOR has the responsibility to maintain compliance with federal regulations regarding facilities and structures within the State of Hawai'i that impact navigable waters of the United States. Because the current vessel configuration encroaches on the federal navigation channel, the No Action Alternative does not meet the key project objectives of keeping the USCG navigation channel free of moorings and improving the quality of the moorings to protect the habitat and species in the bay and facilitate use of the bay. Other impacts associated with the No Action Alternative are discussed in the following sections.

¹ Approach Exclusion Zone is the area of unobstructed navigation as defined by the USCG for vessel ingress/egress from the public facilities at Keauhou Bay.

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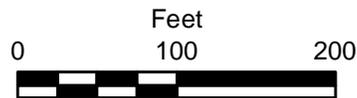
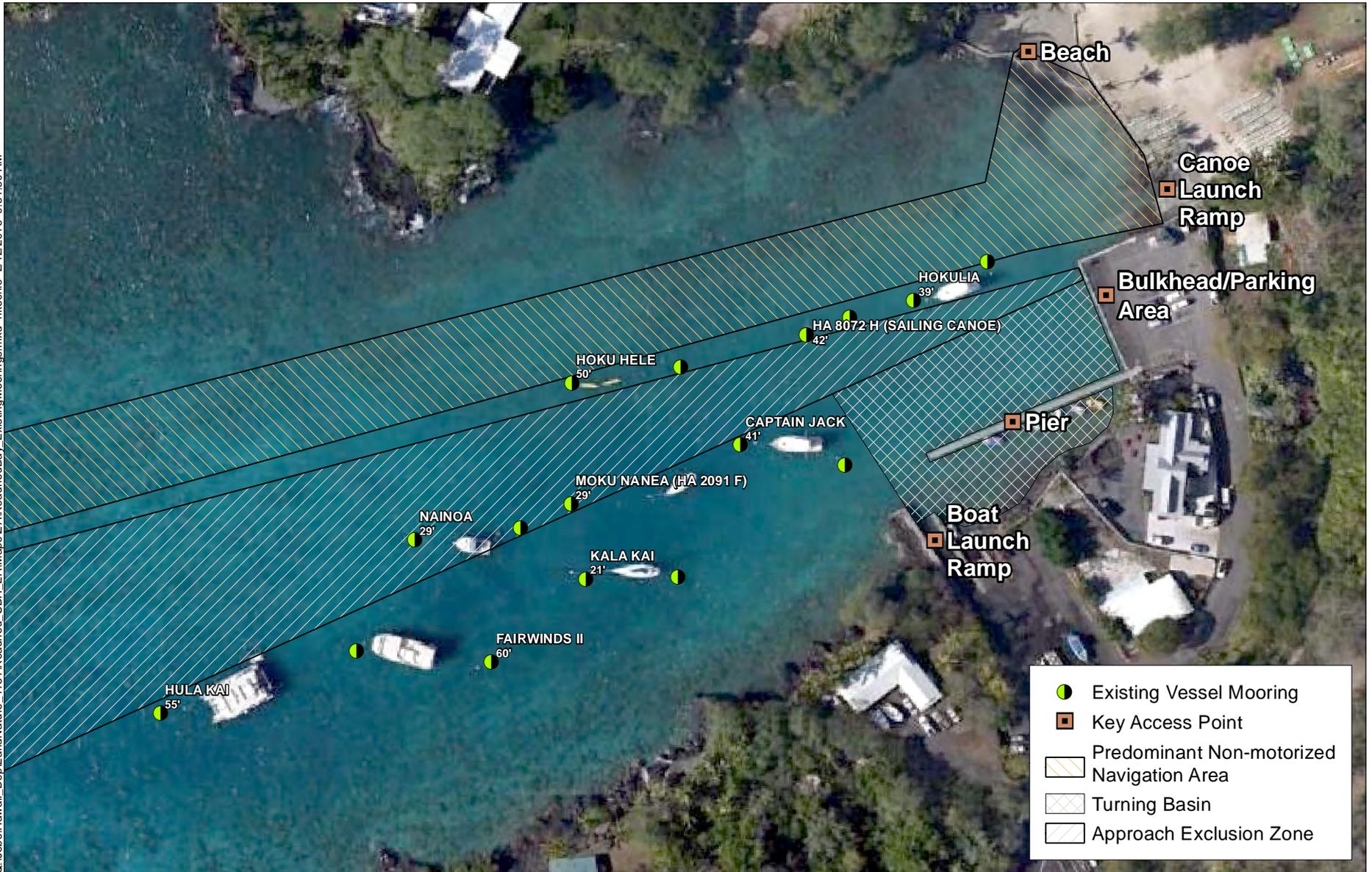


Figure 2
Existing Conditions
Draft Environmental Assessment
Keauhou Bay Offshore Moorings

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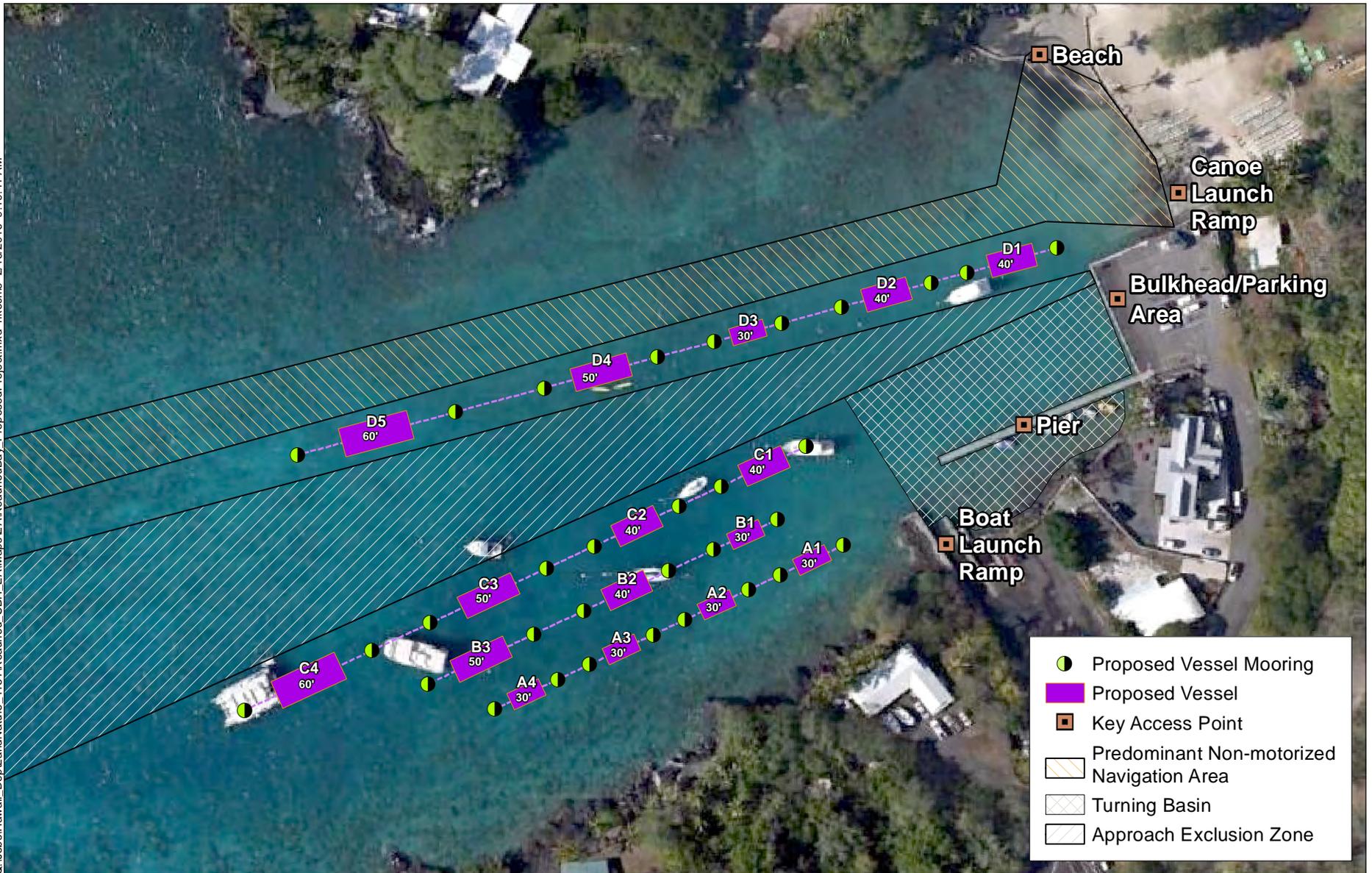
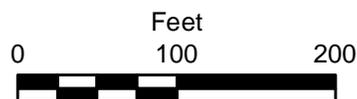


Figure 3
Proposed Project - Accommodates 16 Vessels
Draft Environmental Assessment
Keauhou Bay Offshore Moorings



2.2 Alternative Layout 1

Alternative 1 involves the removal of the existing nine vessel moorings, with the installation of 12 new vessel moorings in an organized grid on the south side of the USCG navigation channel and four new boat slips on the south side of the pier (Figure 4). This alternative eliminates Row D (from the Proposed Project), leaving the entire northern half of the bay open for a variety of activities such as outrigger canoeing, SUP boarding, kayaking, swimming, and snorkeling. This alternative accommodates a total of 16 vessels.

With Alternative 1, three parallel rows (A, B, and C) on the south side of the USCG navigation channel occupy an approximate footprint of 90,000 square feet (2.0 acres). The pier, currently set aside for temporary (less than 1 hour) loading/unloading only, would be converted to support four permanent vessel berths, occupying approximately 2,600 square feet (0.1 acre) along the south side of the pier. In total, this configuration provides vessel mooring/berthing for nine 30-foot vessels, three 40-foot vessels, two 50-foot vessels, and two 60-foot vessels.

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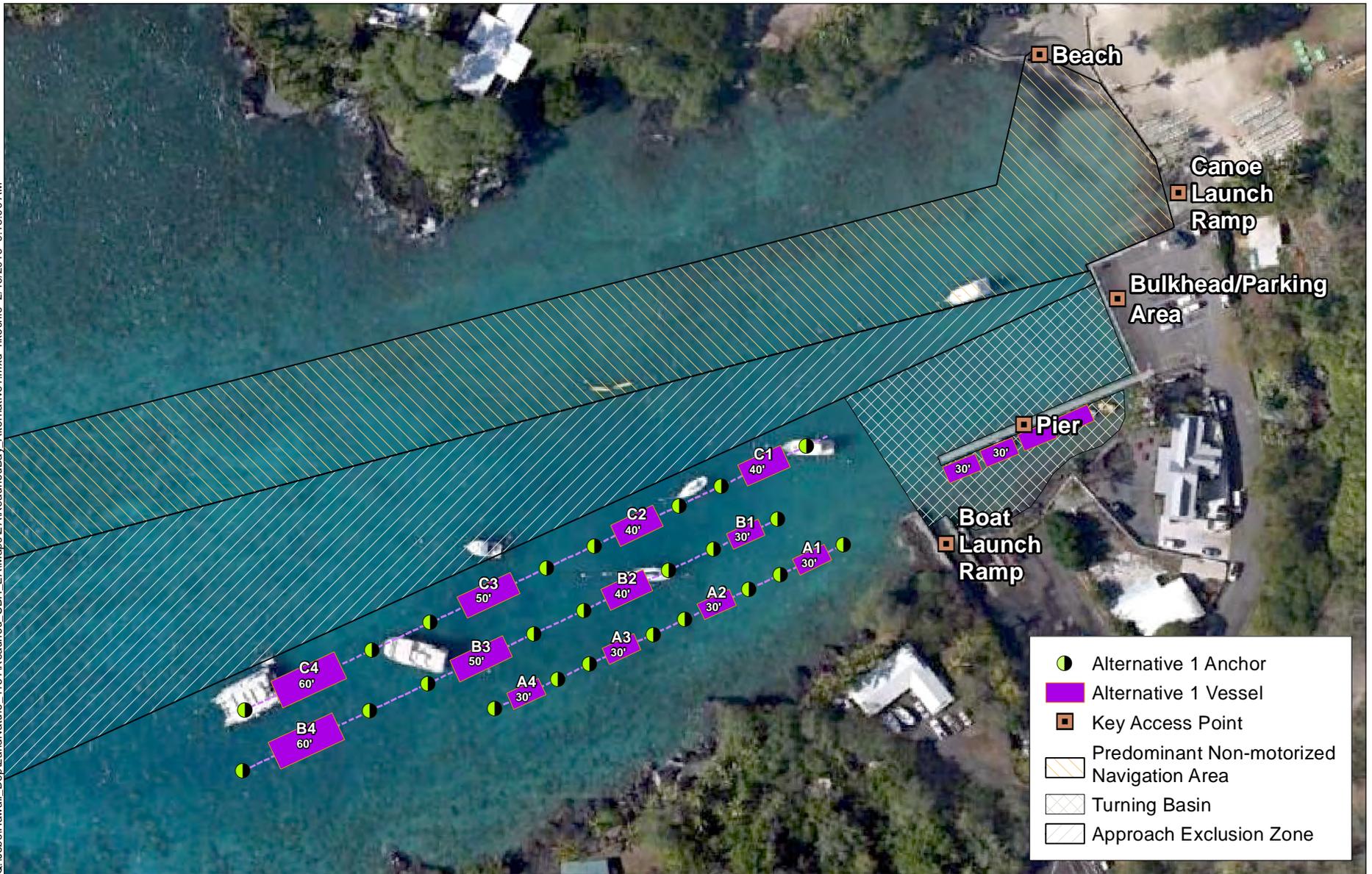


Figure 4
Alternative 1 - Accommodates 16 Vessels
Draft Environmental Assessment
Keauhou Bay Offshore Moorings



2.3 Alternative Layout 2

Alternative 2 involves the removal of the existing nine vessel moorings, with the installation of nine new vessel moorings in an organized grid on the south side of the USCG channel (Figure 5), occupying a footprint of approximately 90,000 square feet (2.0 acres).

This alternative does not improve the vessel mooring capacity within the bay. However, it achieves other project objectives and does provide sufficient capacity for the number of vessels and sizes currently moored in the bay. Similar to Alternative 1, by focusing all moored vessels to the south side of the USCG navigation channel, this alternative keeps the entire northern half of the bay open for a variety of activities such as outrigger canoeing, SUP boarding, kayaking, swimming, and snorkeling.

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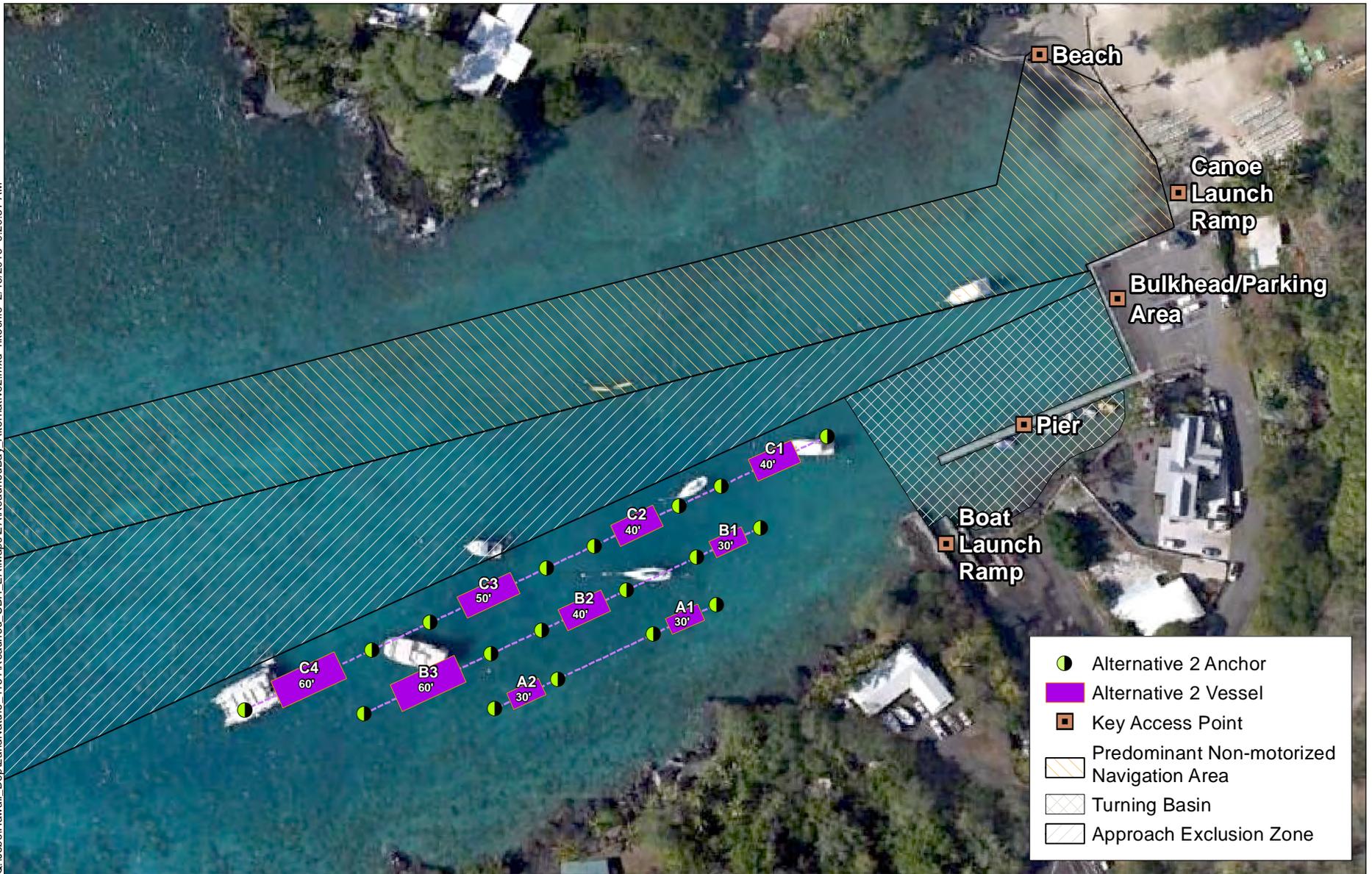


Figure 5
Alternative 2 - Accommodates 9 Vessels
Draft Environmental Assessment
Keauhou Bay Offshore Moorings

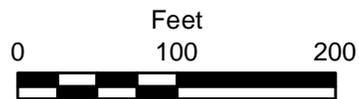


Table 1 summarizes the range of sizes of vessel mooring areas for the existing condition, Proposed Project, and alternatives.

Table 1
Proposed Project and Alternative Mooring Mixes

Mooring Size	Number of Vessels			
	Existing (No Action)	Proposed Project	Alternative 1	Alternative 2
30 feet	3	6	9	3
40 feet	3	5	3	3
50 feet	1	3	2	1
60 feet	2	2	2	2
Total	9	16	16	9
Existing boats accommodated?		Yes	Yes	Yes

3 ENVIRONMENTAL SETTING, IMPACTS, AND MITIGATION

This section discusses the terminology used in the environmental impacts analysis. The resource analysis sections discuss the possible impacts of the Proposed Project and alternatives for the specific environmental resource areas. To assist the reader in comparing information about the various environmental issues, Sections 3.2 through 3.10 each contain the following information for the specific resource area:

- **Existing conditions:** Existing physical conditions at the site, specific to the resource area
- **Impacts of the Proposed Project and alternatives:** Evaluation of potential impacts to determine level of significance
- **Mitigation measures:** Mitigation measures and findings of significance after the measures are implemented (where potentially significant impacts are identified)

In accordance with HAR Section 11-200-10(6), the environmental impacts sections of each resource section include an evaluation of the direct physical changes in the environment that may be caused by the Proposed Project and reasonably foreseeable indirect physical changes in the environment that may be caused by the Proposed Project. According to HAR Section 11-200-12, in most instances, an impact is considered significant if it:

- (1) *Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;*
- (2) *Curtails the range of beneficial uses of the environment;*
- (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;*
- (4) *Substantially affects the economic welfare, social welfare, and cultural practices of the community or State;*
- (5) *Substantially affects public health;*
- (6) *Involves substantial secondary impacts, such as population changes or effects on public facilities;*
- (7) *Involves a substantial degradation of environmental quality;*
- (8) *Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions;*

- (9) *Substantially affects a rare, threatened, or endangered species, or its habitat;*
- (10) *Detrimentially affects air or water quality or ambient noise levels;*
- (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;*
- (12) *Substantially affects scenic vistas and view planes identified in county or state plans or studies; or,*
- (13) *Requires substantial energy consumption. [Eff 12/6/85; am and comp AUG 31 1996] (Auth: HRS §343-5, 343-6)(Imp: HRS §343-2, 343-6)*

Short- and long-term impacts are also considered. Short-term impacts have a limited duration, such as impacts that occur during the construction phase. Long-term impacts have a greater duration, such as impacts that would occur during construction of the Proposed Project or alternatives and beyond. Irreversible environmental changes that would be caused by the Proposed Project or alternatives must be identified, and growth-inducing impacts must be discussed as a secondary or indirect Project impact. Lastly, cumulative impacts must be identified and discussed. Impacts to the environmental resources resulting from the Proposed Project or alternatives can be included in one of the following categories:

- **No impact** – No impact to the identified environmental resource will occur as a result of the Proposed Project or alternative.
- **Less than significant** – Some impacts to the environmental resource may result from the Proposed Project or alternative; however, the impacts do not reach the threshold of significance.
- **Potentially significant, but mitigation measures are available to reduce impacts to less than significant level** – Significant adverse impacts may occur as a result of the Proposed Project or alternatives; however, with appropriate mitigation, they can be reduced to a less than significant level.
- **Significant and unavoidable adverse impacts** – The environmental impact reaches or exceeds the threshold of significance even after mitigation measures have been applied to minimize their severity, or no mitigation is available to reduce the impacts to a less than significant level.

3.1 General Setting

Keauhou Bay is located on the North Kona coastline, approximately 5.5 miles south of Kailua Kona (Figure 1). The bay is a natural shallow-draft harbor that lies between two lava flows at the base of a gentle slope. The south side of the bay's entrance is occupied by a resort hotel, which encompasses a land area of approximately 22 acres. The remaining shoreline along the bayfront comprises private properties, DOBOR's boating facility, and a private canoe club (Figure 2).

The bay has been used for the mooring of motorized watercraft for at least the past 30 years. The existing DOBOR facility at the site comprises a 184-foot-long pile-supported pier, a 30-foot-wide concrete boat launch ramp, and nine vessel moorings. Landside facilities comprise parking areas, showers and restrooms, and the headquarters to the local outrigger canoe club. The site is a popular launch point for snorkeling and diving tours. At night, private and commercial vessels from the area bring snorkelers and divers to the mouth of the bay where manta rays can be observed.

This project focuses on improvements to the offshore vessel moorings (see Section 1). The current configuration of moorings consists of nine vessel moorings, supported by 16 mooring anchors. The existing moorings, which are supported by a variety of makeshift anchoring systems such as engine blocks, concrete debris, and coral heads, are not permitted and do not meet industry standards for the safe mooring of vessels in an ocean environment.

3.1.1 Climate

The climate in the project area on the Kona Coast is a diverse, tropical climate. The Kona Coast of Hawai'i has a very unique rainfall pattern and is the only region of the Hawai'ian Islands where the summers are wetter than the winters. The mean annual rainfall is approximately 20 inches in the immediate vicinity of the bay but steeply increases moving inland toward the mountain slopes (WRCC 2015). This region of the island has a mean annual temperature of about 75 °F.

3.1.2 Bathymetry and Substrate

The bathymetry of the bay is characteristic of a leeward bay on a volcanic island. Figure 6 presents bathymetry based on National Oceanic and Atmospheric Administration's (NOAA's) nautical chart for the bay. The bay is shallow on both the north and south sides, sloping down to depths greater than 20 feet inside of the bay. Water depths within the vessel mooring areas typically range between 10 to 20 feet, while offshore depths slope down to approximately 100 feet. There are several shallower spots within the bay, often associated with limestone outcrops and coral communities (Hawaii Mapping Research Group 2014).

The seafloor in the bay comprises basalt boulders, limestone outcrops and coral communities, and basalt sediment; no sea grasses were observed during a survey of the bay (AECOS 2013a, 2013b). The benthic substrate comprises sand, hard bottom, rubble, large limestone outcrops populated with stony corals, and stony coral communities of varying densities. In the western and southwestern part of the bay (shallower waters), there is a higher percentage of coral boulders (*Porites lobata*, *Pocillopora meandrina*, and *Montipora capitata*; AECOS 2013a, 2013b). In the center of the bay is the designated USCG Approach Exclusion Zone, which is deeper than the perimeter of the bay where the benthos is generally rubble, with more patches of sand moving west toward the boat ramp (Sea Engineering 2013). Large limestone outcrops occur mainly in the southern portion of the bay, covered in encrusting corals and smaller coral colonies (*Pavona varians*, *Pocillopora meandrina*, *Pocillopora damicornis*, *Pocillopora eydouxi*, *Cyphastrea ocellina*, *Porites compressa*, and *Leptastrea bewickensis*; AECOS 2013a, 2013b).

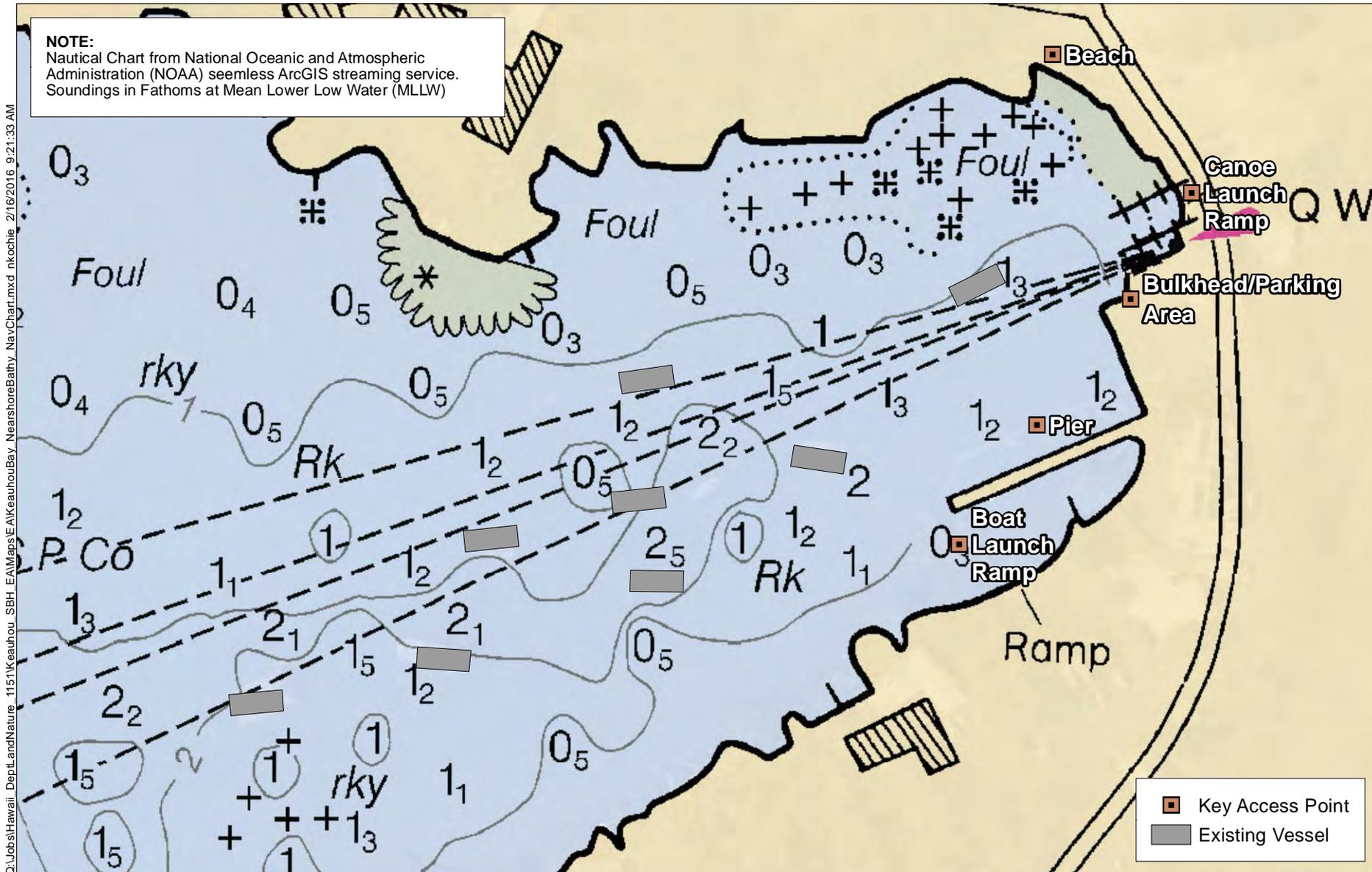


Figure 6
Nearshore Bathymetry
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Keauhou Bay Offshore Moorings

3.1.3 Water Levels and Wave Climates

Based on the NOAA tide station at Kawaihae Harbor (Station 1617433), water levels in the Keauhou Bay region experience average tidal fluctuation of approximately 2.15 feet between mean higher high water and mean lower low water.

Because the entrance to the bay faces southwest, the bay is protected from tradewind waves from the east/northeast. The bay is also protected from most directions of South and North Pacific swell due to either wave shadowing from the other Hawai’ian Islands or the orientation of the bay and adjacent shorelines. Long-period North Pacific swell arriving at angles of 310° and less will often cause waves to break along the northern coastline of the bay, which can also produce strong surges impacting the bay. The bay is exposed to Kona storms that occasionally strike the western side of the island (Sea Engineering 2013).

3.2 Nearshore Water Quality

3.2.1 Existing Conditions

Waters within the bay are listed as Class A, while waters off shore of the bay are listed as Class AA. The existing mooring area and the Proposed Project area are within the bay in the Class A area. According to HAR Section 11-54-3(c)(2), “It is the objective of Class A waters that their use for recreational purposes and aesthetic enjoyment be protected. Any other use shall be permitted as long as it is compatible with the protection and propagation of fish, shellfish, and wildlife and with recreation in and on these waters.”

3.2.2 Impacts Analysis

Proposed Project

The Proposed Project entails improvements to the existing mooring area through replacement of the existing unpermitted moorings with engineered moorings that are consistent with established design criteria. The new moorings would need to be permitted by the USACE as required under federal law. The Proposed Project mooring layout would accommodate up to 16 vessels (Figure 3) on both the north and south sides of the established USCG navigation channel. The moorings would be constructed of clean materials designed for the marine environment, including steel deadweight anchors, mooring chains, and

damper chains (Figures 7 and 8). Vessel operators using the moorings would be required to comply with applicable local, state, and federal pollution control laws, as users of the existing moorings are required to do.

During removal of the existing moorings and installation of the proposed moorings, the contractor would be required to comply with all permit terms and conditions and to implement best management practices (BMPs) required by the regulatory agencies to protect water quality. It is estimated that installation of the proposed moorings would require approximately 4 days to complete. No dredging, discharge of fill material, or stockpiling of materials would occur in the water. The mooring anchors would be placed on coarse sand, pebble, or other hard stone substrate, so turbidity during placement would be minimal, temporary, and localized.

As a result of the project design, site characteristics, and mooring installation and use described above, the Proposed Project would result in no short- or long-term impacts to water quality.

Mitigation Measures

Mitigation is not required.

Residual Impact

No impact.

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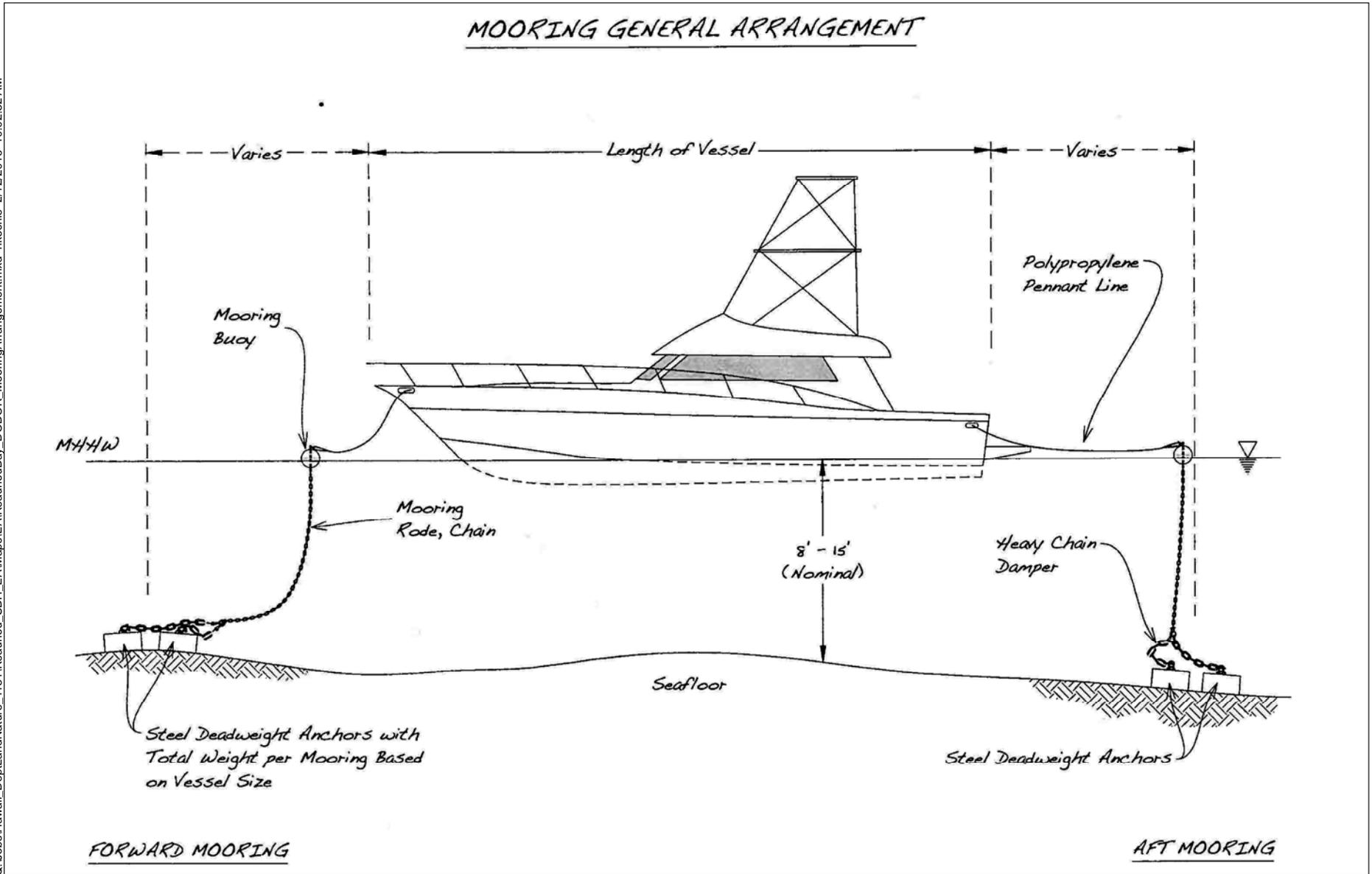
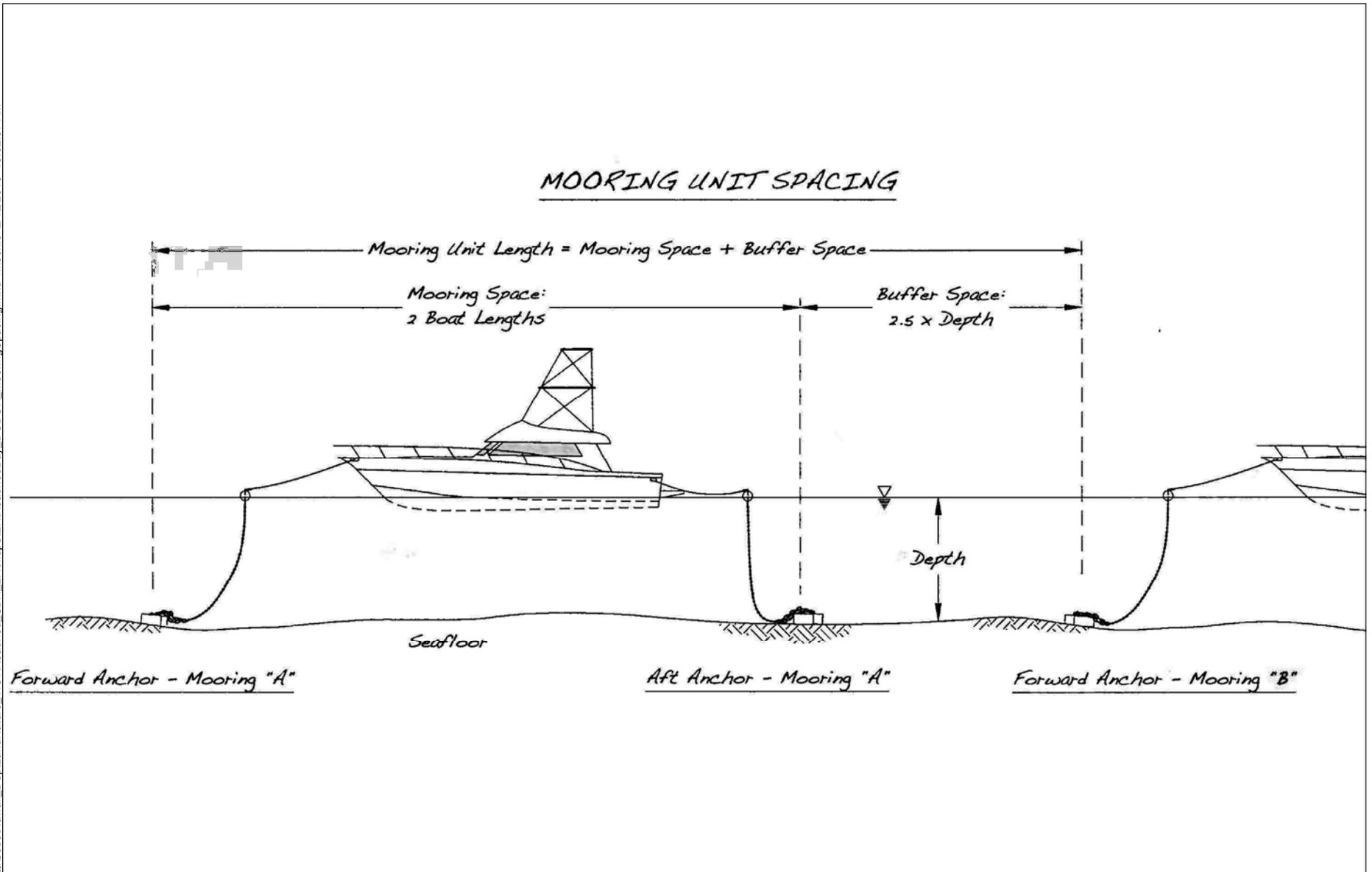


Figure 7
Mooring Arrangement Cross-Section
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Keauhou Bay Offshore Moorings

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No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. The mooring materials, which may be unsuitable for use in the marine environment, would remain in place until abandoned. Because the existing moorings were not designed and constructed to meet design guidelines and have not been properly maintained, they may be more prone to failure, which would increase the risk of vessels breaking loose and becoming damaged or damaging other vessels. Damaged vessels would pose a greater risk of leaking contaminants into the water and inflicting damage to existing coral resources in the bay. As a result of this risk, the No Action Alternative would have a potentially significant and unavoidable impact on the environment.

Alternative 1

Under Alternative 1, 12 new moorings would be constructed only on the south side of the USCG navigation channel, and four permanent slips would be created along the south side of the existing pier. Because the project elements are very similar to the Proposed Project, differing primarily in the absence of a row of moorings on the north side of the USCG navigation channel, this alternative would also result in no impacts to water quality.

Alternative 2

Under Alternative 2, the existing moorings would be replaced with nine new moorings south of the USCG entrance channel. Because this alternative is very similar to the Proposed Project, differing only in the absence of a row of moorings on the north side of the USCG navigation channel, this alternative would also result in no impacts to water quality.

3.3 Protected Species

Keauhou Bay is identified as a marine-protected area in the State of Hawai'i and classified as a Fisheries Management Area (FMA). This classification was put in place with the goal of maintaining sustainable fisheries production in the region. Federal and state-listed species are identified by the National Marine Fisheries Service (NMFS), Pacific Islands Regional Office, U.S. Fish and Wildlife Service, and the DLNR Division of Forestry and Wildlife. As the project site occurs within the marine environment of the bay, the focus of analysis in this

EA was placed on marine species. During two marine biological surveys of the project site in March and June 2013 (AECOS 2013a, 2013b), only one protected species was observed—one green sea turtle (*Chelonia mydas*). Stony corals are discussed in Section 3.3.3.

As recommended by DOBOR, visual surveys will be conducted each day before construction activities start and after work resumes from any break longer than 30 minutes. All in-water work will cease if a listed marine species (Table 2) is within 50 yards of the work area and will begin once the animal has voluntarily left the area. No impacts are anticipated to occur to any species currently listed as threatened, protected, endangered, or candidates for listing by either state or federal government. The following sections analyze the potential impacts to protected species most likely to occur at the project site.

Table 2
Protected Species of Keauhou Bay

Hawai'ian Name	Common Name	Scientific Name	Status	Agency Level
Honu	Green sea turtle	<i>Chelonia mydas</i>	Threatened	Federal
Honu'Ea	Hawksbill turtle	<i>Eretmochelys imbricate</i>	Endangered	Federal
--	Leatherback sea turtle	<i>Dermochelys coriacea</i>	Endangered	Federal
--	Loggerhead turtle	<i>Caretta</i>	Threatened	Federal
--	Olive ridley turtle	<i>Lepidochelys olivacea</i>	Threatened	Federal
Kohola	Humpback whale	<i>Megaptera novaeangeliae</i>	Endangered	Federal
--	Sei whale	<i>Balaenoptera borealis</i>	Threatened	Federal
--	Blue whale	<i>Balaenoptera musculus</i>	Threatened	Federal
--	Fin whale	<i>Balaenoptera physalus</i>	Threatened	Federal
--	Northern Right Whale	<i>Eubalaena japonica</i>	Threatened	Federal
Nai'a	Pacific bottlenose dolphin	<i>Tursiops truncatus</i>	Threatened	State
Palaoa	Sperm whale	<i>Physeter macrocephalus</i>	Endangered	Federal
'ilio holoh i ka uaua	Hawai'ian monk seal	<i>Neomonachus schauinslandi</i>	Endangered	Federal and state
Pa	Pearl oyster	<i>Pinctada margaritifera</i>	Protected	State
--	Stony corals	<i>Scleractinia</i>	All species protected	State
Koloa maoli	Hawai'ian duck	<i>Anas wyvilliana</i>	Endangered	Federal and state

Hawai'ian Name	Common Name	Scientific Name	Status	Agency Level
'Alae 'ula	Hawai'ian common moorhen	<i>Gallinula chloropus sandvicensis</i>	Endangered	Federal and state
'Alae ke'ō	Hawai'ian coot	<i>Fulica alai</i>	Endangered	Federal and state
Nene	Hawai'ian goose	<i>Branta sandvicensis</i>	Endangered	Federal and state
Ae'ō	Hawai'ian stilt	<i>Himantopus mexicanus knudseni</i>	Threatened	Federal and state
'Ua'u	Hawai'ian petrel	<i>Pterodroma sandwichensis</i>	Endangered	Federal and state
--	Tristram's storm petrel	<i>Oceanodroma tristrami</i>	Endangered	Federal
'A'o	Newell's shearwater	<i>Puffinus newelli</i>	Endangered	State
--	Short-tailed albatross	<i>Phoebastria albatrus</i>	Endangered	Federal and state

Note:

-- Not applicable

Of all protected species listed in Table 2, four groups of organisms of ecological importance to the bay are described in more detail in the following sections.

3.3.1 Turtles

All species of sea turtle are protected federally under the Endangered Species Act (ESA) as well as the HRS Chapter 195D and HAR 13-124.

Existing Conditions

The green sea turtle is occasionally seen in the bay (AECOS 2013a, 2013b), while the leatherback, hawksbill, loggerhead, and olive ridley are known to be in the Kailua-Kona area (NOAA 2007) but were not observed during surveys in the bay (AECOS 2013a, 2013b).

Impacts Analysis

Proposed Project

Based on the proposed BMP Plan, visual surveys will be performed for any and all protected species, and all in-water work shall halt when any protected species is within 50 yards of the proposed work until the animal has voluntarily left the area. As recommended by NMFS, vessels shall be kept at least 50 yards from sea turtles, vessel speed shall be reduced to 5 knots in areas of known or suspected turtle activity, and turtles shall not be trapped between

vessels and the shore (Sea Engineering 2013). With implementation of these project measures, the Proposed Project would have no impact on sea turtles or their use of the project area during construction.

Mitigation Measures

Mitigation is not required.

Residual Impact

No impact.

No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. The mooring materials, which may be unsuitable for use in the marine environment, would remain in place until abandoned. Because the existing moorings were not designed and constructed to meet design guidelines and have not been properly maintained, they may be more prone to failure. This would increase the risk of vessels breaking loose and becoming a threat to endangered species such as turtles, as an unmanned vessel has no way to keep its distance from the animal. Abandoned materials may also pose a risk of leaking contaminants that can harm the habitat or food source of the turtles. As a result of this risk, the No Action Alternative would result in significant, unavoidable, adverse impacts to sea turtles.

Alternative 1

Under Alternative 1, 12 new moorings would be constructed only on the south side of the USCG navigation channel, and four permanent slips would be created along the south side of the existing pier. Because the project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel, this alternative would result in no impact to turtles, as the same BMPs would be employed.

Alternative 2

Under Alternative 2, the existing moorings would be replaced with nine new moorings south of the USCG entrance channel. Because the project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel, this alternative would result in no impact to turtles, as the same BMPs would be employed.

3.3.2 *Hawai'ian Monk Seal*

The Hawai'ian monk seal was nearly hunted to extinction in the 1800s. The species is now federally listed as endangered under the Marine Mammal Protection Act (MMPA) and was the first species to be listed as depleted under MMPA in 1976 (NMFS 2015). The Hawai'ian monk seal is also listed as critically endangered by the International Union for Conservation of Nature and is protected under Hawai'i State Law. The species is endemic to the Hawai'ian Island Archipelago and ranges across all coastlines of the Main Hawai'ian Islands through the Northwestern Hawai'ian Islands. The species has become a focal point for conservation in the Main Hawai'ian Islands. The revised *DRAFT Main Hawaiian Islands Monk Seal Management Plan* (NMFS 2015) was released in August 2015 from the NMFS to help potential cooperators and partners such as state agencies, non-governmental organizations, other organizations, and communities understand how to facilitate monk seal recovery.

Existing Conditions

The *Recovery Plan for the Hawaiian Monk Seal* has identified five main management and recovery challenges: disease, fisheries interactions, human-seal interactions, habitat threats, and human dimensions (NMFS 2015). The purpose of the Recovery Plan (NMFS 2007) is to help potential cooperating organizations understand how they can help facilitate recovery. Each management challenge is addressed individually with corresponding strategies to meet the challenge, with the idea that it is necessary to have multiple strategies working together to successfully address the challenges.

Impacts Analysis

Proposed Project

Based on the proposed BMP Plan, visual surveys will be performed for any and all protected species, and all in-water work shall halt when any protected species is within 50 yards of the proposed work until the animal has voluntarily left the area. As recommended by NMFS, vessels shall stay at least 50 yards from marine mammals, vessel speed shall be reduced to 10 knots in proximity of marine mammals, and marine mammals shall not be trapped between vessels and the shore (Sea Engineering 2013). As a result of the measures incorporated into the Proposed Project, there would be no impact to Hawai'ian monk seals.

No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. The mooring materials, which may be unsuitable for use in the marine environment, would remain in place until abandoned. Because the existing moorings were not designed and constructed to meet design guidelines and have not been properly maintained, they may be more prone to failure. This would increase the risk of vessels breaking loose and becoming a threat to endangered species including all mammals, as an unmanned vessel has no way to keep its distance from the animal. Abandoned materials may also pose a risk of leaking contaminants that can harm the habitat or food source of the seal. As a result, the No Action Alternative would result in significant, unavoidable, adverse impacts to Hawai'ian monk seals.

Alternative 1

Under Alternative 1, 12 new moorings would be constructed only on the south side of the USCG navigation channel, and four permanent slips would be created along the south side of the existing pier. Because the project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel, this alternative would result in no impact to Hawai'ian monk seals, as the same BMPs would be employed.

Alternative 2

Under Alternative 2, the existing moorings would be replaced with nine new moorings south of the USCG entrance channel. Because the project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel, this alternative would result in no impact to Hawai'ian monk seals, as the same BMPs would be employed.

3.3.3 Stony Corals

All stony coral species are protected under HAR Title 13, Chapter 95. This state law prohibits any damage or take of any stony coral or rock to which coral is attached within the waters of Hawai'i. Coral reefs are an important resource for Hawai'i; they provide food and habitat for many fishes and invertebrates and are the basis of an ecosystem for the islands.

Existing Conditions

As an evaluation of the existence of protected species in the bay, this section addresses the regulatory framework for stony corals; general existing conditions of benthos are detailed in Section 3.4.4. To ensure large coral colonies within 5 feet of the mooring anchor chain radius are not impacted by mooring placement or anchor chain sweep, a coral relocation plan based on standard practices in Hawai'i has been proposed for this site (Sea Engineering 2013).

Sea Engineering, Inc.'s proposed coral relocation work plan uses a 72-foot work boat with a four-point anchor system. Divers will identify all coral colonies to be relocated and the associated receiving sites and will take photos of the colonies and the relocation sites in advance of the relocation process. The corals will be moved using soft crane slings and a crane hook off the work boat, assisted by divers underwater. Divers will help in moving and placing the coral colonies, disconnecting the slings, and ensuring stable positioning of the coral colony (Sea Engineering 2013).

Specified procedures for the coral relocation process are as follows:

- Coral colonies, kept submerged, will be moved through open water and not stored before being placed in a new location.
- Worksite conditions will be monitored to ensure adequate water clarity.

- Sea conditions will be calm or the relocation event will be postponed.
- Contact with coral tissue will be avoided as much as possible, and the edges of the coral will be protected.
- Coral colonies will be placed upright in the new location.

Impacts Analysis

Proposed Project

The bay is home to a fair amount of limestone outcrops that host coral colonies. Most of these are small branching colonies or larger boulder corals (AECOS 2013a, 2013b). Table 4 lists the genus and species of all stony corals observed in the bay. Any larger boulders hosting colonies that are within a 5-foot radius of the anchor chain sweep will be relocated, according to a plan devised by Sea Engineering, Inc., and aided by divers (Sea Engineering 2013). The plan will be adapted as needed, based on any changes resulting from modifications to the project layout. Utilizing this process will greatly reduce potential impacts to surrounding coral colonies in the bay. Divers will help to supervise underwater activities and avoid excess damage to any reef structure or marine life. As a result, the Proposed Project would result in less than significant impacts to stony corals.

No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. The mooring materials, which may be unsuitable for use in the marine environment, would remain in place until abandoned. Because the existing moorings were not designed and constructed to meet established design criteria and have not been properly maintained, they may be more prone to failure. This would increase the risk of vessels breaking loose as well as abandoned materials leaking contaminants into the water. Loose vessels increase the risk for ship groundings which can significantly impact coral colonies and populations if hit. Loose parts that may fall to the substrate may damage nearby colonies as well, and any contaminants could lead to the death of the coral or inhibit reproduction of the species. Many of the existing moorings have chains that drag along the ocean floor, increasing the potential for impacts to nearby coral colonies. As a result of these risks, the No Action Alternative would result in significant unavoidable adverse impacts to stony corals.

Alternative 1

Under Alternative 1, 12 new moorings would be constructed only on the south side of the USCG navigation channel, and four permanent slips would be created along the south side of the existing pier. Because the project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel, this alternative would result in very similar potential impacts. Carefully following the plan devised by Sea Engineering, Inc., and aid from divers (Sea Engineering 2013) would reduce potential impacts to stony coral colonies in the bay to less than significant.

Alternative 2

Under Alternative 2, the existing moorings would be replaced with nine new moorings south of the USCG entrance channel. Because the project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel, this alternative would result in very similar potential impacts. Carefully following the plan devised by Sea Engineering, Inc., as well as aid by divers (Sea Engineering 2013), would help to reduce potential impacts to stony coral colonies in the bay to less than significant.

3.3.4 Pearl Oyster

Populations of the pearl oyster were first reported in the Northwestern Hawai'ian Island in the early 1900s. The species was depleted rapidly due to harvesting of the shells and pearls. Subsequently, the taking of pearl oysters became illegal and the industry collapsed (Keenan et al. 2006).

Existing Conditions

As a result of the anthropogenic collapse, the species has remained under state protection since the 1930s. Modern surveys have confirmed that pearl oysters reside mostly in the Northwestern Hawai'ian Islands (Keenan et al. 2006) and, therefore, are not found at the project site and should not be affected by this project.

Impacts Analysis

No potential impacts exist for the pearl oyster under any of the project alternatives or the No Action Alternative, as no populations have been observed in the bay (AECOS 2013a, 2013b) and very few exist in the Main Hawai'ian Islands (Keenan et al. 2006). Therefore, no impacts would occur.

3.4 Flora and Fauna

The flora and fauna of the bay area, like most on the Island of Hawai'i are diverse and abundant. Project-specific marine biological surveys of the site were conducted by AECOS, Inc., in March and June 2013 to characterize the flora and fauna of the project area (AECOS 2013a, 2013b).

3.4.1 Mammals

All marine mammals of the Hawai'ian Islands are protected under the MMPA.

Existing Conditions

Several species listed in Table 2 are also protected under the ESA. Several whale species are often sighted outside of the bay but typically do not enter into the bay where the moorings are located and, therefore, are not anticipated to be affected by this project.

Several species of dolphins are present on the western side of the Island of Hawai'i. These dolphins may occasionally swim into the bay and are sometimes known to enter shallow marine bays to rest, mate, and give birth. As all marine mammals are federally listed species, the sensitive species survey protocol as described herein will be employed. If any marine mammal is observed within 50 yards of the project area, work will cease and not resume until after the animal has voluntarily left the project area.

The Hawai'ian monk seal is endemic to the Hawai'ian Island Archipelago and ranges across all of Hawai'i's coastlines of the Main Hawai'ian Islands through the Northwestern Hawai'ian Islands. The species has become a focal point for conservation in the Main Hawai'ian Islands. The Hawai'ian monk seal is rarely seen in or around the bay, and the sensitive species survey protocol described below will be employed to avoid impacts to this species. If

any marine mammal is observed within 50 yards of the project area, work will cease and not resume until after the animal has voluntarily left the project area.

Impacts Analysis

Proposed Project

Very few potential impacts exist toward mammals on this project as a result of the BMPs recommended by DOBOR to be implemented by Sea Engineering, Inc. Based on the proposed BMP Plan, visual surveys will be performed for any and all mammals (protected species), and all in-water work shall halt when any mammals are within 50 yards of the proposed work until the animal has voluntarily left the area. As recommended by NMFS, vessels shall stay at least 50 yards from marine mammals, vessel speed shall be reduced to 10 knots in proximity of marine mammals, and marine mammals shall not be trapped between vessels and the shore (Sea Engineering 2013). Therefore, the Proposed Project would result in no impacts to marine mammals.

Mitigation Measures

Mitigation is not required.

Residual Impact

Less than significant.

No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. The mooring materials, which may be unsuitable for use in the marine environment, would remain in place until abandoned. Because the existing moorings were not designed and constructed to meet design guidelines and have not been properly maintained, they may be more prone to failure. This would increase the risk of vessels breaking loose and becoming a threat to all mammals, as an unmanned vessel has no way to implement the BMP Plan and keep its distance. Abandoned materials may also pose a risk of leaking contaminants that can harm the habitat or food source for any mammals. As a result, the No Action Alternative would result in significant unavoidable adverse impacts to marine mammals.

Alternative 1

Under Alternative 1, 12 new moorings would be constructed only on the south side of the USCG navigation channel, and four permanent slips would be created along the south side of the existing pier. Because the project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel, this alternative would result in no impacts to marine mammals, as the same BMPs would be employed as the Proposed Project.

Alternative 2

Under Alternative 2, the existing moorings would be replaced with nine new moorings south of the USCG navigation channel. Because the project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel, this alternative would result in no impacts to marine mammals, as the same BMPs would be employed as the Proposed Project.

3.4.2 Birds

The Proposed Project site is within the marine portion of the bay and does not involve upland project elements. As a result, the project site may be used for foraging by sea birds. There are many other local and migratory bird species in the Kailua-Kona area, none of which are anticipated to be affected by this project, as their habitat, foraging, and breeding grounds are located in upland areas.

Existing Conditions

There are several species of both water birds and sea birds in the Kailua-Kona area that may be observed but are not expected to be affected by the project, as all construction activity will occur in water in a limited area and for a limited duration. The various species of water and sea bird that can be found in the region are presented in Table 3.

Table 3
Water Bird and Sea Bird Species of the Island of Hawai'i

Hawai'ian Name	Common Name	Scientific Name
Auku'u	Black-crowned night heron	<i>Nycticorax hoactli</i>
Moli	Laysan albatross	<i>Phoebastria immutabilis</i>
Ka'upu	Black-footed albatross	<i>Phoebastria nigripes</i>
Koa'e 'ula	Red-tailed tropicbird	<i>Phaethon rubricauda</i>
'Ou	Bulwer's petrel	<i>Bulweria bulwerii</i>
--	Bonin petrel	<i>Pterodroma hypoleuca</i>
'Ake'ake	Band-rumped storm petrel	<i>Oceanodroma castro</i>
'Ua'u kani	Wedge-tailed shearwater	<i>Puffinus pacificus</i>
--	Christmas shearwater	<i>Puffinus nativitatis</i>
Manu-o-Ku	White fairy tern	<i>Gygis alba</i>
'Ewa'ewa	Sooty tern	<i>Onychoprion fuscatus</i>
Pakalakala	Gray-backed tern	<i>Onychoprion lunatus</i>
Noio	Hawai'ian black noddy	<i>Anous minutus</i>
Noio-koha	Brown noddy	<i>Anous stolidus</i>
--	Blue-gray noddy	<i>Procelsterna cerulean</i>
'A	Masked (blue-faced) booby	<i>Sula dactylatra</i>
'A	Brown booby	<i>Sula leucogaster</i>
'A	Red-footed booby	<i>Sula</i>
'Iwa	Great frigatebird	<i>Fregata minor palmerstoni</i>

Note:

-- Not applicable

Impacts Analysis

Proposed Project

All work will occur in water in a small, concentrated area for a short duration, making any impact on foraging negligible. Therefore, the Proposed Project would result in no impacts to birds.

No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. The mooring materials, which may be unsuitable for use

in the marine environment, would remain in place until abandoned. Because the site of possible damage and/or degradation would be within the waters of the bay, there would be potential impacts to bird species that make use of the bay. These impacts would be localized, and as a result, the No Action Alternative would result in less than significant impacts to birds.

Alternative 1

Under Alternative 1, 12 new moorings would be constructed only on the south side of the USCG navigation channel, and four permanent slips would be created along the south side of the existing pier. All work will occur in water in a small, concentrated area for a short duration, leaving the majority of the bay and all surrounding waters available to birds. Therefore, this alternative would result in no impacts to birds.

Alternative 2

Under Alternative 2, the existing moorings would be replaced with nine new moorings south of the USCG entrance channel. All work will occur in water in a small, concentrated area for a short duration, leaving the majority of the bay and all surrounding waters available to birds. Therefore, this alternative would result in no impacts to birds.

3.4.3 Fish

The majority of the bay has been designated the Keauhou Bay FMA and is the portion of the bay bounded by a straight line from Haiku'ua Point to the Kaukala'ela'e Point of the entrance to the bay (Figure 9). It is prohibited to feed fish, herd fish by swimming or with a boat, possess a net larger than 3 feet in any direction, or attempt to snag any fish. In addition, normal state fishing regulations apply to the bay (NOAA 2009).



Figure 9
 Fisheries Management Area
 Draft Environmental Assessment
 Keauhou Bay Offshore Moorings

Existing Conditions

The benthic and water column environments within the bay were surveyed by AECOS, Inc., marine biologists in March and June 2013 to document all species and habitat present. A report was produced and is available in full in Appendix A. A variety of bony fishes are present in the bay, with most residing in the limestone outcroppings. There were no protected fish species observed and with a large majority of the bay being sandy bottom, the project should have little impact on local fish habitat or feeding (AECOS 2013a, 2013b).

Impacts Analysis

Proposed Project

The principal substrate in the bay is largely sand and rubble with interspersed limestone outcrops. These outcrops provide small areas of specific fish habitat away from where the moorings will be placed (Sea Engineering 2013). No protected species of fish were observed, and the temporary construction activities associated with the Proposed Project would have less than significant short-term impacts on fish populations (i.e., behavior disruption from briefly increased noise). The Proposed Project, however, would have positive long-term impacts to fish populations by alleviating potential impacts to any fish populations resulting from existing mooring conditions in the bay.

No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. The mooring materials, which may be unsuitable for use in the marine environment, would remain in place until abandoned. Because the existing moorings were not designed and constructed to meet design guidelines and have not been properly maintained, they may be more prone to failure. Degradation of moorings or vessels that may break loose provide an increased threat to any fish habitats in the bay. Abandoned materials may also pose a risk of leaking contaminants that can harm the fish or their food sources. As a result, the No Action Alternative would result in significant unavoidable impacts to fish.

Alternative 1

Under Alternative 1, 12 new moorings would be constructed only on the south side of the USCG navigation channel, and four permanent slips would be created along the south side of the existing pier. Because the project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel, this alternative would also result in less than significant impacts.

Alternative 2

Under Alternative 2, the existing moorings would be replaced with nine new moorings south of the USCG entrance channel. Because the project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel, this alternative would also result in less than significant impacts.

3.4.4 Benthos

The benthic environment was surveyed by AECOS, Inc., marine biologists in both March and June 2013 to document benthic species and habitat present. A survey report was produced and is available in full in Appendix A.

Existing Conditions

In a coral reef habitat assessment for marine-protected areas in Hawai'i, the benthic cover of Keauhou Bay was assessed by NOAA. The total area of the bay was measured at 0.026 square kilometer (km²), and 0.016 km² or 62% was noted as coral cover. Of the remaining area of the bay, 0.007 km² or 28% was noted as turf, which is characterized as a community of low-lying species of marine algae and can include rubble covered in filamentous algae, and 0.003 km² or 10% was noted as unclassified, which is characterized as an area of geomorphological structure that is primarily artificial such as anchors or mooring debris (NOAA 2009). Various other benthic species were observed and are shown in Table 4.

Table 4
Benthos Observed in Keauhou Bay

Hawai'ian Name	Common Name	Scientific Name
--	Cauliflower coral	<i>Pocillopora meandrina</i>
--	Antler coral	<i>Pocillopora eydouxi</i>
--	Lace coral	<i>Pocillopora damicornis</i>
--	Rice coral	<i>Montipora capitata</i>
--	Lobe coral	<i>Porites lobata</i>
--	Finger coral	<i>Porites compressa</i>
--	Corrugated coral	<i>Pavona varians</i>
--	Bewick coral	<i>Leptastrea bewickensis</i>
--	Feather duster worm	<i>Sabellastarte spectabilis</i>
--	Medusa spaghetti worm	<i>Loimia medusa</i>
pupu loloa, 'oi 'oi	White-spotted auger	<i>Terebra guttata</i>
--	Cone shells	<i>Conidae spp.</i>
pu puhi	Horned helmet	<i>Cassis cornuta</i>
--	Shingly hoof shells	<i>Hipponix imbricatus</i>
--	Variable worm snail	<i>Serpulorbis variabilis</i>
nahawele	Brown purse shell	<i>Isognomon perna</i>
--	Hawai'ian oyster	<i>Ostrea sandvicensis</i>
--	Snapping shrimp	<i>Alpheus deuteropus</i>
--	Coral guard crab	<i>Trapezia sp.</i>
--	Brittle star	<i>Ophiocoma erinaceus</i>
--	Banded urchin	<i>Echinothrix calamaris</i>
'ina kea	Rock-boring urchin	<i>Echinometra mathaei</i>
'ina	Oblong-boring urchin	<i>Echinometra oblonga</i>
ha'uke'uke'ula'ula	Red pencil urchin	<i>Heterocentrotus mammillatus</i>
hawa'e maoli	Collector urchin	<i>Tripneustes gratilla</i>
--	Black sea cucumber	<i>Holothuria atra</i>

Note:

-- Not applicable

Impacts Analysis

Proposed Project

As a result of the in-water work for this project, there is potential for impact on the benthic community defined by the AECOS, Inc., surveys of 2013. Divers shall deploy from the dive

boat anchored on the work site to survey the area and benthic community before any work begins. A four-point mooring will be established for the work boat, aided by divers to avoid anchor dragging or misplacement of any materials. Large coral colonies will be relocated according to the coral relocation plan to avoid major impact and mitigate for habitat loss (Sea Engineering 2013). The construction period would be brief (approximately 1 week), and construction activities would be restricted to the surveyed area proposed for moorings. Standard BMPs would be implemented during construction to avoid impacts to the benthos. The moorings would be constructed of inert materials such as steel that are suited for use in the marina environment. As a result, the Proposed Project would result in less than significant impacts to the benthic community during construction.

No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. The mooring materials, which may be unsuitable for use in the marine environment, would remain in place until abandoned. Because the existing moorings were not designed and constructed to meet design guidelines and have not been properly maintained, they may be more prone to failure. This would increase the risk of vessels breaking loose as well as abandoned materials leaking contaminants into the water. Loose vessels increase the risk for ship groundings which can significantly impact any benthic organisms or populations if hit. Abandoned materials may also pose a risk of leaking contaminants that can harm the organisms themselves or their food sources. The existing makeshift ground tackle results in disturbance to the benthic community through direct contact and abrasion. For these reasons, the No Action Alternative would result in significant unavoidable adverse impacts to the benthic community.

Alternative 1

Under Alternative 1, 12 new moorings would be constructed only on the south side of the USCG navigation channel, and four permanent slips would be created along the south side of the existing pier. Because the project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel, this alternative would result in very little potential impact. Using the plan devised by Sea Engineering, Inc., as well as aid by divers (Sea Engineering 2013), would

help to reduce potential impacts to surrounding benthic organisms and coral colonies in the bay. As a result, this alternative would result in less than significant impacts to the benthic community during construction.

Alternative 2

Under Alternative 2, the existing moorings would be replaced with nine new moorings south of the USCG navigation channel. Because the project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel, this alternative would result in the same very little potential impact. Using the plan devised by Sea Engineering, Inc., as well as aid by divers (Sea Engineering 2013), would help to reduce potential impacts to surrounding benthic organisms and coral colonies in the bay. As a result, this alternative would result in less than significant impacts to the benthic community during construction.

3.5 Invasive Species

During the surveys of March and June 2013, AECOS, Inc., marine biologists surveyed the benthic and pelagic habitats of the bay. Observations included only those species present and visible on the substrate or within the water column; no organisms living under the surface of the substrate (e.g., infauna or cryptic species) were included.

3.5.1 Existing Conditions

Only one invasive species was observed during both AECOS, Inc., marine biological surveys. The Moano or Manybar goatfish (*Parupeneus multifasciatus*) was noted in the water column of the project site.

3.5.2 Impacts Analysis

Proposed Project

For the in-water work of this Proposed Project, the work vessel, equipment, and employees are to be held locally, minimizing the risk of any invasive species introduction to the area. As a result, invasive species are not likely to be introduced to the project site and impacts would be less than significant.

No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. This would have no impact on invasive species in the area because only one fish species was observed and would not lead to any introductions of more invasive species.

Alternative 1

Under Alternative 1, 12 new moorings would be constructed only on the south side of the USCG navigation channel, and four permanent slips would be created along the south side of the existing pier. The project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel. This alternative would result in minimal risk of introduction of invasive species, as all vessels, equipment, and employees would be held locally. As a result, invasive species are not likely to be introduced to the project site and impacts would be less than significant.

Alternative 2

Under Alternative 2, the existing moorings would be replaced with nine new moorings south of the USCG entrance channel. The project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel. This alternative option would result in minimal risk of introduction of invasive species, as all vessels, equipment, and employees would be held locally. As a result, invasive species are not likely to be introduced to the project site and impacts would be less than significant.

3.6 Air Quality

3.6.1 Existing Conditions

The air quality is typical of residential, boat launch, and resort areas, with motor vehicles and vessel traffic generally being the only source of air pollutants (Sea Engineering 2013).

Normal wind patterns assist in dispersing emissions from vehicles and vessels at and around the site.

3.6.2 Impacts Analysis

Proposed Project

No permanent impacts to air quality are anticipated as a result of this project. Because of the short duration of construction activities associated with the Proposed Project and the limited equipment required to complete the work, temporary impacts to air quality resulting from the proposed action are anticipated to be less than significant.

Mitigation Measures

Mitigation is not required.

Residual Impact

No impact.

No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. There would be no impacts to air quality as a result of the No Action Alternative.

Alternative 1

Under Alternative 1, potential impacts to air quality would be similar to the Proposed Project and would be less than significant.

Alternative 2

Under Alternative 2, potential impacts to air quality would be similar to the Proposed Project and would be less than significant.

3.7 Noise

3.7.1 Existing Conditions

Noise within the bay is typical of residential, boat launch, and resort areas and generally originates from local vehicle and vessel traffic (Sea Engineering 2013). When motor vehicles and vessels are not in operation, the primary noise sources are natural wind and waves.

3.7.2 Impacts Analysis

Proposed Project

Implementation of the proposed action will result in very little noise output because of the nature of the vessels and equipment and will only persist for several days during the project construction. The proposed action would not result in long-term changes in noise because the small boat anchorage would continue to support similar vessels and uses as it currently does. As a result, the Proposed Project would result in less than significant impacts to noise at the project site.

Mitigation Measures

Mitigation is not required.

Residual Impact

No impact.

No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. Existing vessel use and associated site uses would remain unchanged from existing conditions. As a result, noise levels would remain unchanged from existing conditions. The No Action Alternative would result in no impacts to noise at the project site.

Alternative 1

Under Alternative 1, potential impacts to noise would be similar to the Proposed Project because use of the bay would be similar in nature and would be less than significant.

Alternative 2

Under Alternative 2, potential impacts to noise would be similar to the Proposed Project because use of the bay would be similar in nature even though the number of moorings would differ. This alternative would result in less than significant impacts to noise at the project site.

3.8 Natural Hazards

The bay is exposed to a variety of natural hazards. Examples of natural hazards that may impact upland resources around the bay include flooding, earthquake, fire, and volcanic hazards (i.e., lava or plume). Because the scope of this EA is focused on improvements to the offshore mooring field only, terrestrial-based natural hazards that would not typically impact the location of the mooring area have not been included in this assessment.

The bay is exposed to the vast Pacific Ocean to the west and is vulnerable to a variety of natural coastal hazards, including tsunamis, hurricanes and localized coastal storms, and seabed and shoreline erosion.

3.8.1 Tsunami

Existing Conditions

The generally low-lying coastal areas around the bay are located in a high tsunami risk area, as identified in Fletcher et al. 2004. At least nine tsunamis have impacted this region of the island since 1868, causing varying degrees of damage to shoreline infrastructure. In 1946, a tsunami impacted the bay, destroying the wooden pier that had been in existence since the early 1900s, as well as destroying private homes along the bay's shoreline (ASM Affiliates 2015). The bay was also impacted by the Tohoku tsunami on March 11, 2011, when water overtopped the existing seawall, causing inundation of the nearshore upland areas and extensive water and structural damage to buildings near the site. The force of the water also damaged structural and supporting elements of the harbor, which were later repaired with the assistance of Federal Emergency Management Administration funding.

Impacts Analysis

Proposed Project

The Proposed Project (Figure 3) entails improvements to the existing mooring area by replacement of the existing, non-engineered, and unmaintained moorings with engineered moorings consistent with current design guidelines. These improvements are not anticipated to have any impact on tsunami events. Because of the relatively exposed location of the bay, it is expected that during a tsunami or other extreme coastal storm event, all vessels would exit the harbor and seek shelter elsewhere as appropriate. The design criteria used for the proposed moorings do not account for forces exerted on the moorings due to ocean conditions created by tsunamis. Damaged vessels or vessels that experience mooring failure during a tsunami would pose a risk to the environment, such as leaking contaminants into the water or causing damage to corals or shoreline infrastructure due to vessel collision.

Mitigation Measures

Mitigation is not required.

Residual Impact

No impact.

No Action Alternative

Under the No Action Alternative, the existing moorings would be left in place, if permitted by the regulatory agencies. Because of the relatively exposed location of the bay, it is expected that during a tsunami or other extreme coastal storm event vessels would exit the harbor and seek shelter elsewhere as appropriate. Damaged vessels or vessels that experience mooring failure during a tsunami would pose a risk to the environment, such as leaking contaminants into the water or causing damage to corals or shoreline infrastructure due to vessel collision.

Alternative 1

Under Alternative 1 (Figure 4), 12 new offshore moorings would be constructed only on the south side of the USCG navigation channel. Because of the relatively exposed location of the

bay, it is expected that during a tsunami or other extreme coastal storm event, vessels would exit the harbor moorings and seek shelter elsewhere as appropriate. Similar to the Proposed Project, the proposed offshore vessel moorings associated with Alternative 1 are not anticipated to have any impact on tsunami events. Damaged vessels or vessels that experience mooring failure during a tsunami would pose a risk to the environment, such as leaking contaminants into the water or causing damage to corals or shoreline infrastructure due to vessel collision. As with the Proposed Project, the design criteria used for the proposed moorings in Alternative 1 do not account for forces exerted on the moorings due to ocean conditions created by tsunamis.

Alternative 1 also includes the creation of four new permanent slips along the south side of the pier. If vessels are berthed at the pier during a tsunami event, damage could occur to either the vessel, the pier, or the nearby shoreline infrastructure.

Alternative 2

Under Alternative 2 (Figure 5), improvements would be limited to replacement of the offshore moorings. Similar to the Proposed Project, Alternative 2 is not anticipated to have any impact on tsunami events. Because of the relatively exposed location of the bay, it is expected that during a tsunami or other extreme coastal storm event vessels would exit the harbor moorings and seek shelter elsewhere as appropriate. Damaged vessels or vessels that experience mooring failure during a tsunami would pose a risk to the environment, such as leaking contaminants into the water or causing damage to corals or shoreline infrastructure due to vessel collision.

3.8.2 Shoreline Erosion

Existing Conditions

Most of the shoreline surrounding the bay is either naturally rocky or has been artificially hardened by the construction of seawalls.

Impacts Analysis

Proposed Project

The proposed improvements to the offshore moorings (Figure 3), including the addition of seven vessels over what currently exists in the harbor as well as a reconfiguration of the mooring layout, are not expected to have an impact on the shoreline and upland areas surrounding the bay. Although vessel boat wakes may increase over what currently exists in the harbor, the proposed number of moorings (16) is less than the number of vessels that have historically moored in the harbor as documented in previous reports (RMTC 1992; USACE 1985). In addition, the impacts of longer-period waves arriving from the southwest (summer) or northwest (winter) would far outweigh any impacts resulting from boat wakes.

The Proposed Project includes three rows of vessel moorings located on the south side of the USCG Approach Exclusion Zone (Figure 3). Proposed mooring lanes A, B, and C, with a total of 11 moorings in three parallel lanes positioned in an orientation of northeast to southwest, may provide some wave attenuation effects to the southern shoreline of the bay for locally generated (short-period) wind waves. In this sense, the organized grid of moored vessels represented in the Proposed Project could act as a floating breakwater when all vessels are present, dissipating short-period waves before they reach the shoreline during that time. However, long-period waves that are typical in both summer and winter would be expected to pass through the mooring field with no attenuation. Thus, any potential short-term wave dampening to short-period waves as a result of the vessels moored within the new mooring field is not be expected to have any measureable impact to the shoreline.

The installation of offshore moorings along Row D, located on the north side of the USCG navigation channel, is similar to the existing condition and is not anticipated to have any impact on shoreline erosion compared to existing conditions.

Mitigation Measures

Mitigation is not required.

Residual Impact

No impact.

No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. As a result, impacts to shoreline erosion from the mooring field would remain unchanged from existing conditions.

Alternative 1

Under Alternative 1 (Figure 4), 12 new moorings would be constructed only on the south side of the USCG navigation channel, and four permanent slips would be created along the south side of the existing pier. The project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel. Because the proposed offshore moorings associated with Alternative 1 are very similar to the Proposed Project, potential impacts related to shoreline erosion would be similar to the Proposed Project.

Alternative 2

Under Alternative 2 (Figure 5), the existing moorings would be replaced with nine new moorings south of the USCG entrance channel. Because this alternative is very similar to the Proposed Project, potential impacts related to shoreline erosion would be similar to the Proposed Project.

3.8.3 Hurricanes and Coastal Storms

Existing Conditions

The shorelines of Hawai'i are vulnerable to hurricanes, tropical storms, and high wave events caused by distant storms in the Northern and Southern hemispheres. High waves arrive annually from north swell in the winter and range between 10 and 20 feet, and waves from south swell arrive in the summer and typically range between 4 and 6 feet (Fletcher et al. 2004). Kona storms from the southwest in winter occasionally produce damaging waves ranging from 4 to 6 feet along south and southwest shores, and tropical storms and hurricanes during fall and summer are capable of bringing 10- to 30-foot waves to shorelines of Hawai'i several times in a decade (Fletcher et al. 2004).

Most high wind activity on the western shore of the Island of Hawai'i occurs due to regular winter Kona winds. However, Pacific Ocean storm systems (i.e., tropical storms, tropical depressions, and hurricanes) can also have significant impacts on these coastal areas through flooding, wind action, and wave action. Although the Island of Hawai'i has not sustained a direct hit by a hurricane, several strong tropical storms have caused considerable damage. Since 1871, 56 high wind events have affected the entire island, and many of these were associated with passing hurricanes or tropical storms (Fletcher et al. 2004).

Although the bay is one of the more protected natural harbors on the western side of the island, it is still subject to the impacts of hurricanes and coastal storms. Because of the bay's exposure to storm impact, it is expected that during a hurricane or other extreme coastal storm event, vessels would exit the harbor and seek shelter elsewhere as appropriate. For smaller storms due to seasonal wave activity, vessels that decide to occupy the mooring will be subject to additional forcing and loading on the mooring lines.

To assist in the evaluation of the Proposed Project, community stakeholders hired Coast & Harbor Engineering (Coast & Harbor) in 2014 to evaluate wave conditions in the bay with respect to proposed mooring improvements. Various bathymetry data were compiled to build a numerical modeling grid to simulate wave propagation from off shore into the bay. Wave modeling results demonstrated that a 5-year return period storm event (based on wave height data at NOAA buoy 515002) can produce waves up to 3 to 4 feet within the interior of the bay (Coast & Harbor 2014). The report estimated that waves up to 10 feet could exist in the interior of the bay outside of the wave breaking zone. These modeling results further substantiated the fact that the harbor is exposed to coastal storms and that vessels should vacate the bay during extreme storm events. The current practice of vessel operators in the bay is to exit the bay during coastal storms and hurricanes.

Impacts Analysis

Proposed Project

The Proposed Project entails improvements to the existing mooring area by replacement of the existing non-engineered, unmaintained moorings with engineered moorings consistent with established design criteria. Because of the bay's exposure to hurricanes and coastal

storms, it is expected that during extreme hazard events, vessels would exit the harbor and seek shelter elsewhere as appropriate. The proposed moorings were not designed to withstand wind and wave forces exerted on the moorings under extreme coastal storm and hurricane conditions. It is anticipated, as is the current practice of vessel operators in the bay, that vessel owners would remove their vessels from the bay and seek safe shelter elsewhere under such conditions. Damaged vessels or vessels that experience mooring failure during a coastal storm or hurricane would pose a risk to the environment, such as leaking contaminants into the water or causing damage to corals or shoreline infrastructure due to vessel collision.

The wave modeling performed by Coast & Harbor evaluated potential storm wave heights in the bay at the locations of existing moorings and at locations of the new proposed moorings. Storm wave conditions associated with the 1-year and 5-year return period events, used as input to the Coast & Harbor model, were determined using offshore deep water wave data collected at NOAA wave buoy 515002. These input wave conditions were propagated through a bathymetric grid based on an NOAA digital elevation model and other sources (Coast & Harbor 2014).

The results of the Coast & Harbor modeling study suggested that some vessels located in the proposed Row D (Figure 3), on the north side of the USCG navigation channel, may be subject to significant surge and roll motions due to wave breaking. The Coast & Harbor report shows the estimated maximum breaking zone for a 5-year event and the anticipated limit of wave breaking (shaded red). The report notes that four of the proposed new mooring locations (in Row D) may be more prone to capsizing, breaking lines, and dragging of anchors (Coast & Harbor 2014).

Coast & Harbor also evaluated the potential for vessels in the Proposed Project mooring field arrangement to be impacted by side waves during a storm event. The report estimated that most of the vessel mooring locations of the Proposed Project (total of 16 boats) may be affected by side waves during a storm event, while vessels moored at locations A1 to A4 would be at an unacceptably high angle (i.e., broadside) to predicted wave action. The report notes that the distance between boats for the Proposed Project may be insufficient when

considering potential motion of boats, possible dragging of anchors, and concern of collision with neighboring moored vessels.

The Proposed Project was further evaluated in preparation of this EA. Based on a comparison of existing conditions and the Proposed Project with respect to wave modeling results from Coast & Harbor, vessel mooring locations are generally consistent with existing conditions and do not create an increased adverse hazard due to wave breaking, with the exception of vessel D5 on the makai (seaward) end of Row D of the Proposed Project. Because the Proposed Project involves engineered mooring systems that will follow industry-accepted design guidelines, the proposed improvements to the offshore mooring field are expected to improve performance of the mooring systems related to possible hazards of wave and surge within the bay in comparison to the performance of the existing moorings under the same conditions. Vessel D5, located more makai than vessels currently moored within the bay, may require additional mooring weight to compensate for possible increased wave activity as demonstrated in the Coast & Harbor results.

Mitigation Measures

Mooring permits will be conditioned to state that the moorings are for fair weather use and that it is the responsibility of mooring permit holders to relocate their vessels to safe locations in advance of predicted storm events.

Residual Impact

No impact.

No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. Because the existing moorings were not designed and constructed to meet design guidelines and have not been properly maintained, they may be more prone to failure during hurricanes or coastal storms, which would increase the risk of vessels breaking loose and becoming damaged or damaging other vessels or the environment. Damaged vessels would also pose a greater risk of leaking contaminants into the water as well as damage to the shoreline infrastructure and aquatic resources in the bay.

Alternative 1

Under Alternative 1, 12 new moorings would be constructed only on the south side of the USCG navigation channel, and four permanent slips would be created along the south side of the existing pier.

As discussed above, the results of the Coast & Harbor modeling study suggested that some vessels located in the proposed Row D of the Proposed Project (Figure 8), on the north side of the USCG navigation channel, may be subject to significant surge and roll motions due to wave breaking. The report notes that four of the proposed new mooring locations (in Row D) may be more prone to capsizing, breaking lines, and dragging of anchors (Coast & Harbor 2014). Because Alternative 1 eliminates all moored vessels from the north side of the USCG navigation channel, this alternative mitigates the potential risk of increased wave activity on these (Row D) vessels.

Similar to the Proposed Project, the new engineered moorings associated with Alternative 1 would be consistent with established design criteria and would therefore be less prone to failure or damage during a hurricane or coastal storm event as compared to the existing moorings. The proposed moorings were not designed to withstand wind and wave forces exerted on the moorings under extreme coastal storm and hurricane conditions. It is anticipated, as is the current practice of vessel operators in the bay, to remove their vessels from the bay and seek safe shelter elsewhere under such conditions. Similar to the mitigation measure for the Proposed Project, mooring permits would be conditioned to require that permit holders move their vessels to safe locations in advance of predicted storms.

Alternative 2

Under Alternative 2, the existing moorings would be replaced with nine new moorings south of the USCG entrance channel. The configuration of moored vessels in Rows A, B, and C with Alternative 2 is very similar to that of Alternative 1, with the only difference being that Alternative 2 has one less 30-foot vessel in Row A. Thus, the potential impacts related to hurricanes and coastal storms would be similar to Alternative 1.

3.9 Public Services and Infrastructure

3.9.1 Medical, Fire, and Police Services

Existing Conditions

The nearest police station is the Kailua-Kona police located at the Kona station, approximately 9 miles north of the bay. Multiple medical and fire response teams will have uninhibited access to the bay during project construction and in the long term.

Impacts Analysis

Proposed Project

The Proposed Project does not involve any modifications to upland infrastructure and will not have an impact on medical, fire, and police surfaces associated with shoreline features.

With respect to emergency vessel traffic (such as the USCG), the Proposed Project involves the removal of vessel moorings that currently obstruct the USCG Approach Exclusion Zone (Figure 3). The designated USCG Approach Exclusion Zone provides critical emergency access to the bay, and keeping this navigation channel clear of obstructions is a matter of public safety so that emergency vessels can adequately maneuver through the channel as needed in crisis situations. With the Proposed Project, the new layout of moorings in the bay in an organized arrangement with vessels moored on either side of the USCG navigation channel will be an improvement to emergency (medical, fire, and police) access to the site. With limited boating access facilities along this stretch of coast, this is important for maintaining adequate emergency services in the region. The Proposed Project does not present any other potential impacts to medical, fire, and police services.

Mitigation Measures

Mitigation is not required.

Residual Impact

No impact.

No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. The mooring materials, which may be unsuitable for use in the marine environment, would remain in place until abandoned. The existing layout of moored vessels in the harbor encroach into the designated USCG Approach Exclusion Zone. This important navigation feature provides critical emergency access to the bay, and maintaining its clearance is a matter of public safety.

In addition, because the existing moorings were not designed and constructed to meet design guidelines and have not been properly maintained, they may be more prone to failure. This may increase the risk of vessels or mooring lines either moving or breaking loose altogether. Since vessels are moored on both sides of the USCG Approach Exclusion Zone and already encroach into the USCG navigation channel, the potential shifting of vessels in the harbor under the No Action Alternative is not preferred from an emergency access and response perspective. As a result, the No Action Alternative would result in significant unavoidable adverse impacts.

Alternative 1

Under Alternative 1, 12 new moorings would be constructed only on the south side of the USCG navigation channel, and four permanent slips would be created along the south side of the existing pier. The project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel. All work will remain in water with no upland portion. The USCG Approach Exclusion Zone exists within the bay and will not be altered or inhibited in any way, providing continual clear access through the bay and to the launch ramp via the water. Similar to the Proposed Project, this alternative would result in long-term improvements to emergency vessel traffic.

Alternative 2

Under Alternative 2, the existing moorings would be replaced with nine new moorings south of the USCG entrance channel. The project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG

navigation channel. All work will remain in water with no upland portion. The USCG Approach Exclusion Zone exists within the bay and will not be altered or inhibited in any way, providing continual clear access through the bay and to the launch ramp via the water. Similar to the Proposed Project, this alternative would result in long-term improvements to emergency vessel traffic.

3.9.2 Solid and Construction Waste

Existing Conditions

There are currently no in-water construction or improvement projects within the bay and, therefore, no construction waste or disposal facilities in the immediate area.

Impacts Analysis

Proposed Project

The contractor is responsible for proper handling and disposal of all waste generated by the project. Work will be performed in a manner to minimize pollution or environmental debris, as dictated by project permits and the approved BMP plan.

The BMP Plan for the project (Sea Engineering 2013) discusses the means and methods that will be employed to prevent impact of solid or construction waste during the project:

- All floating or submerged construction materials shall be moved at the end of each day.
- No contamination (defined as trash, debris, and alien species introductions) shall be introduced in the adjacent marine environments.
- Any construction debris that may pose an entanglement hazard to marine life must be removed at the end of all work or if not being used.

With implementation of the BMPs, and given the short (less than 4 days) duration of construction activities, the Proposed Project will have no impact on the environment as the result of construction-generated waste.

Mitigation Measures

Mitigation is not required.

Residual Impact

No impact.

No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. This would have no impact on construction waste as no project would occur to create waste. The mooring materials, which may be unsuitable for use in the marine environment, would remain in place until abandoned. Because the existing moorings were not designed and constructed to meet design guidelines and have not been properly maintained, they may be more prone to failure and would create solid waste within the bay if pieces of the moorings were to degrade and detach from their anchors.

Alternative 1

Under Alternative 1, 12 new moorings would be constructed only on the south side of the USCG navigation channel, and four permanent slips would be created along the south side of the existing pier. The project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel. Anticipated impacts of Alternative 1 are similar to those associated with the Proposed Project. Employment of BMPs and the use of divers, per the proposed BMP Plan, will help to minimize construction waste. As a result, this alternative would result in no impact on the environment as a result of construction waste.

Alternative 2

Under Alternative 2, the existing moorings would be replaced with nine new moorings south of the USCG navigation channel. The project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel. Similar to the Proposed Project, employment of BMPs and the use of divers, per the proposed BMP Plan, will help to minimize debris from the project. As a

result, this alternative would result in no impact on the environment as a result of construction waste.

3.9.3 Lighting

This project involves improvements to the existing offshore moorings and does not include any modifications to existing lighting at the site. The objective of this project is to improve an existing anchorage rather than establish a new site.

Existing Conditions

There are limited light sources in the SBH. Limited lighting exists in the parking lot of the harbor and launch ramp.

Impacts Analysis

Proposed Project

The Proposed Project does not include any upland components and will have no impact on lighting within the bay or on adjacent landside commercial, residential, or recreational facilities. No new lighting sources are proposed, and no change is expected to occur with any lighting source as a result of this project.

Mitigation Measures

Mitigation is not required.

Residual Impact

No impact.

No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. This would have no impact on lighting sources in the vicinity of the bay.

Alternative 1

Under Alternative 1, 12 new moorings would be constructed only on the south side of the USCG navigation channel, and four permanent slips would be created along the south side of the existing pier. The project elements are very similar to the Proposed Project and, therefore, no change in lighting is expected to occur.

Alternative 2

Under Alternative 2, the existing moorings would be replaced with nine new moorings south of the USCG entrance channel. The project elements are very similar to the Proposed Project and, therefore, no change in lighting is expected to occur.

3.9.4 Harbor Facilities

Existing Conditions

Existing harbor facilities within the bay include a 184-foot-long pile-supported pier, two concrete boat launch ramps with loading docks, a 100-foot-long bulkhead, and nine offshore vessel moorings. Landside facilities include vehicle and boat trailer parking areas, a comfort station, and a boat washdown area. In addition to the state's harbor facilities are a small beach, boat launch ramp, and the headquarters to the local outrigger canoe club, all of which are situated on private lands. The site beach and private boat launch ramp are a popular launch point for snorkeling and diving tours. At night, private and commercial vessels from the area bring snorkelers and divers to the mouth of the bay where manta rays can be observed on any given night of the year.

Impacts Analysis

Proposed Project

The Proposed Project focuses on improvements to the offshore vessel moorings only and does not include changes to other facilities within or adjacent to the SBH. With the addition of seven new vessels moored in the harbor—all of which will be designated for recreational use only—there could be a slight increase in the use of landside facilities directly associated with moored vessels, (e.g., pier, comfort station, and parking area). Any increase is expected

to be minimal, as recreational offshore moorings are generally used much less frequently than commercial offshore moorings.

There will be short-term impacts associated with the construction activities of the Proposed Project. These include temporary displacement of those vessels currently moored in the bay, as well as temporary restricted access within the bay during the first 3 days of mooring block replacement. During these 3 days, construction equipment would be staged in the center of the USCG navigation channel with mooring lines extending across much of the navigable area of the bay. During the fourth day of construction, it is anticipated that impacts to harbor use will be limited to localized areas only, as the attachments are being connected to each mooring with divers.

The proposed modifications to the existing offshore field are considered to improve the existing conditions of vessel moorings in the bay. The current configuration of moorings comprises nine vessel moorings supported by 16 mooring anchors. The existing moorings, which are supported by a variety of makeshift anchoring systems such as engine blocks, concrete debris, and coral heads, were not designed and constructed to meet design guidelines and have not been properly maintained. Therefore, existing vessel moorings in the harbor may be more prone to failure when compared to new, engineered moorings. It is anticipated that the Proposed Project will provide for improved vessel mooring in the bay and that vessels will be less likely to break loose or move in the harbor, although careful consideration should be made to provide adequate space between vessels in Rows A, B, and C. As a result, the Proposed Project would result in temporary, less than significant impacts to harbor facilities during construction but long-term improvements to the facilities upon completion of construction.

Mitigation Measures

Mitigation is not required.

Residual Impact

No impact.

No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. This alternative would have no impact on existing harbor facilities.

Alternative 1

Under Alternative 1, 12 new moorings would be constructed only on the south side of the USCG navigation channel, and four permanent slips would be created along the south side of the existing pier. The project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel. Similar to the Proposed Project, Alternative 1 does not include changes to landside facilities and would provide for improved vessel mooring conditions when compared to existing conditions. The impacts to the landside infrastructure noted for the Proposed Project, such as vehicle parking, would be the same for Alternative 1. This alternative would also result in temporary, less than significant impacts during construction.

Alternative 2

Under Alternative 2, the existing moorings would be replaced with nine new moorings located on the south side of the USCG entrance channel. The project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel. Similar to the Proposed Project, Alternative 2 does not include changes to landside facilities and would provide for improved vessel mooring conditions when compared to existing conditions. This alternative would also result in temporary, less than significant impacts during construction.

3.9.5 Traffic and Parking

Existing Conditions

The bay hosts two boat launch ramps with associated parking for trailers and vehicles. Additional parking is provided along Kaleiopapa Street to the south and also in a small parking lot on the north side of the pier. From the north, additional access is provided by Kamehameha III Road, which passes through a residential area before terminating at the bay.

Community members often park along this road and access the bay from the small beach at the end of the road at this location.

Impacts Analysis

Proposed Project

During the construction phase of the proposed action, construction materials will be temporarily stockpiled within a designated area of the parking lot, which will be known as the upland staging area. Several parking spaces may be occupied during in-water work to hold supplies such as rigging hardware or mooring blocks, as no stockpiling is to occur within waters of the United States (Sea Engineering 2013). The temporary staging area would not result in an immediate change in traffic to, from, or into the bay.

The construction barge to be used for removal and installation of moorings will be brought to the bay via the ocean; therefore, there will be no impacts to landside facilities.

With the addition of seven new vessels moored in the harbor, additional recreational vessels will have use of the bay. This may lead to a slight long-term increase in traffic to and from the bay by way of the upland parking lot area, specifically in heavy tourist seasons for fishing and diving vessels. However, because recreational vessels typically are used much less frequently than commercial vessels, the addition of new recreational slips would only slightly increase vehicle trips to the site. As a result, the Proposed Project would result in less than significant impacts to traffic and parking.

Mitigation Measures

Mitigation is not required.

Residual Impact

No impact.

No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. This would have no impact on traffic and parking in the vicinity of the bay.

Alternative 1

Under Alternative 1, 12 new moorings would be constructed only on the south side of the USCG navigation channel, and four permanent slips would be created along the south side of the existing pier. The project elements are very similar to the Proposed Project, differing mainly in the absence of a row of moorings on the north side of the USCG navigation channel. Similar to the Proposed Project, Alternative 1 would include temporary impacts to the parking area during construction activities. However, such impacts would be less than significant. With the addition of seven vessels, Alternative 1 may lead to a less than significant, long-term increase in traffic and parking demands at the bay, specifically in heavy tourist seasons for fishing and diving vessels.

Alternative 2

Under Alternative 2, the existing moorings would be replaced with nine new moorings located on the south side of the USCG navigation channel. The project elements are very similar to the existing conditions; therefore, the proposed improvements associated with Alternative 2 are not expected to have any impacts to traffic or parking.

3.9.6 Navigation

Existing Conditions

A navigable channel, as defined by the USCG, consists of an Approach Exclusion Zone oriented west-southwest. The USCG navigation channel is defined by an entrance directional light (19°33'43"N, 155°57'43"W) located 25 feet above water from a post at the head of the bay. The USCG navigation channel (Figure 2) is approximately 150 feet wide where the vessel mooring area begins and reduces to less than 50 feet wide upon reaching the pier.

The USCG navigation channel is the primary access way for vessels entering and leaving the bay (Figure 2), and it provides access to and from the boat launch ramps, the pier, and the bulkhead/parking area where larger vessels sometimes tie up for loading and unloading operations. Non-motorized vessels such as kayaks, outrigger canoes, and SUP boards also use the USCG navigation channel for accessing the boat launch ramps, canoe launch ramp, and beach area on the north side of the bay. Keeping the USCG navigation channel clear from obstructions is a key objective of the proposed improvements.

The majority of non-motorized vessels access the shoreline to the north of the USCG navigation channel. Swimmers, outrigger canoes, kayaks, and SUP boards frequently traverse this area, which is bound to the north by a shallow reef outcrop and to the south by several moored vessels.

The existing navigation practices within the bay consist of a defined USCG navigation channel in the center of the bay with adequate depths for motorized vessels using the boat launch ramp and pier. An undesignated shallow-water navigation area on the north side of the USCG navigation channel provides access for the majority of non-motorized activity.

Impacts Analysis

Proposed Project

The Proposed Project presents a potential impact to current navigation within the bay. While this alternative achieves the project objective of maintaining clearance of the USCG Approach Exclusion Zone defined by the USCG navigation channel, the introduction of Row D with five vessels moored to the north of the USCG navigation channel has the potential to adversely impact navigation of non-motorized vessels in this area. Figure 3 shows the Proposed Project overlain with typical navigation areas for motorized and non-motorized vessels. Due to a reef outcrop on the north side of the bay that causes water depths to reach as little as 1 to 2 feet at low tide conditions, the Proposed Project may create a condition of constricted access for two-way navigation between Row D and shallow-water areas to the north, particularly during conditions of two-way navigation with multiple vessels.

A second area of potentially constricted access in the Proposed Project with respect to current navigation practices exists at the corner of the bulkhead/parking lot and the first vessel on Row D. Non-motorized vessels frequently transit between the turning basin (near the pier and bulkhead/parking area) and the shoreline access areas (canoe launch ramp and beach) on the north side of the bay. Vessel D1 of the Proposed Project sits on the east side of Row D, approximately 45 feet from the corner of the bulkhead/parking area. The proximity of vessel D1 to the bulkhead/parking area may create challenging navigation conditions for non-motorized vessels traversing through this area, with inadequate maneuvering area for outrigger canoes leaving or returning to the canoe launch ramp.

Based on consultations with the Keauhou Canoe Club (KCC), another concern of the Proposed Project with respect to navigation is restricted visual access between the bulkhead/parking area and the non-motorized navigation area to the north of the USCG navigation channel. KCC members often observe and direct training activities from the parking area, so the introduction of five vessels along Row D may have an impact on their ability to adequately see and direct these activities within the bay. This concern may possibly be mitigated by a reduction in the number of vessels along Row D, opening up the two primary locations of potential restricted vessel access.

Mitigation Measures

Vessel moorings in Row D would be modified or reduced to provide for improved navigation of non-motorized vessels to the north of Row D and between the bulkhead/parking area and the first moored vessel.

Residual Impact

Even with modification or reduction in the number of moorings in Row D, the location of the moorings on the north side of the USCG navigation channel would still result in potential adverse impacts to navigation as a result of restricting space to navigate in the northern part of the bay and reducing lines of sight within the bay.

No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. The No Action Alternative, therefore, involves no changes to the current navigation conditions within the bay. Because several vessels are currently moored within the USCG navigation channel, this alternative does not meet a key project objective of keeping the USCG navigation channel clear of obstructions. In addition, because the existing moorings were not designed and constructed to meet design guidelines and have not been properly maintained, they may be more prone to failure or movement that may allow further encroachment into the USCG navigation channel.

Alternative 1

With Alternative 1, Row D (from the Proposed Project) is removed, leaving the entire northern half of the bay open for non-motorized vessel navigation and recreational activities such as outrigger canoeing, SUP boarding, kayaking, swimming, and snorkeling. With this alternative, navigation concerns about constricted access both near the reef outcrop to the north and the bulkhead/parking area near the canoe launch ramp are resolved. This alternative also alleviates the concern of KCC members regarding reduced visual observations from their vantage point at the bulkhead/parking area.

By eliminating Row D vessels, Alternative 1 also improves the lines of site among both motorized and non-motorized vessel operators. With the inclusion of Row D vessels in the Proposed Project, similar to existing conditions, potential exists for non-motorized vessel operators, such as SUP boarders or kayakers, to be partially obscured from vision behind moored vessels that traverse across the bay and enter into the USCG navigation channel. Alternative 1 improves the line of sight for incoming/outgoing motorized vessel operators, enabling them to better identify non-motorized vessels. Similarly, the elimination of Row D vessels allows non-motorized vessel operators accessing the northern part of the bay to more easily identify motorized vessels traversing the USCG navigation channel, increasing situational awareness by all and improving safety within the bay.

Alternative 2

Similar to Alternative 1, this alternative removes Row D (from the Proposed Project) from the north side of the USCG navigation channel, alleviating navigation concerns associated with the Proposed Project. A total of nine vessels are proposed with Alternative 2, consistent with the number of vessels currently mooring in the bay. Similar to Alternative 1, the proposed layout of nine vessels in Rows A, B, and C provides adequate clearance between adjacent vessels.

3.10 Social and Economic Considerations

3.10.1 Archaeological and Cultural Resources

HRS Chapter 343 requires evaluation of impacts to archaeological and cultural resources (historic properties). HRS Chapter 6E and its implementing regulations at 13 HAR 13-275 also require historic preservation review of projects funded or undertaken by state agencies. Historic properties are those that are eligible for listing on the Hawai'i Register of Historic Places (HRHP).

The Proposed Project has the potential to directly affect underwater archaeological resources, if encountered, where the existing moorings will be removed and new moorings installed. The Proposed Project also has the potential to directly or indirectly affect traditional cultural resources associated with the use and maintenance of sacred sites in the vicinity and the traditional activity of outrigger canoeing.

The cultural resources study area (Figure 10) includes the following areas:

- The area where moorings will be removed and replaced in the bay
- Areas of traditional cultural use in the bay

As described in Section 3.8.2, the Proposed Project is not expected to impact the shoreline; therefore, erosion of archaeological sites is not expected. As described in Section 3.9.5, only a slight increase in traffic is expected as a result of the Proposed Project. This slight increase is not expected to impact cultural uses of the bay or archaeological sites. Therefore, the study area does not include adjacent uplands. Ethnographically and historically reported

sites, as well as recorded sites, are discussed in the following sections to fully describe the cultural context of the bay.

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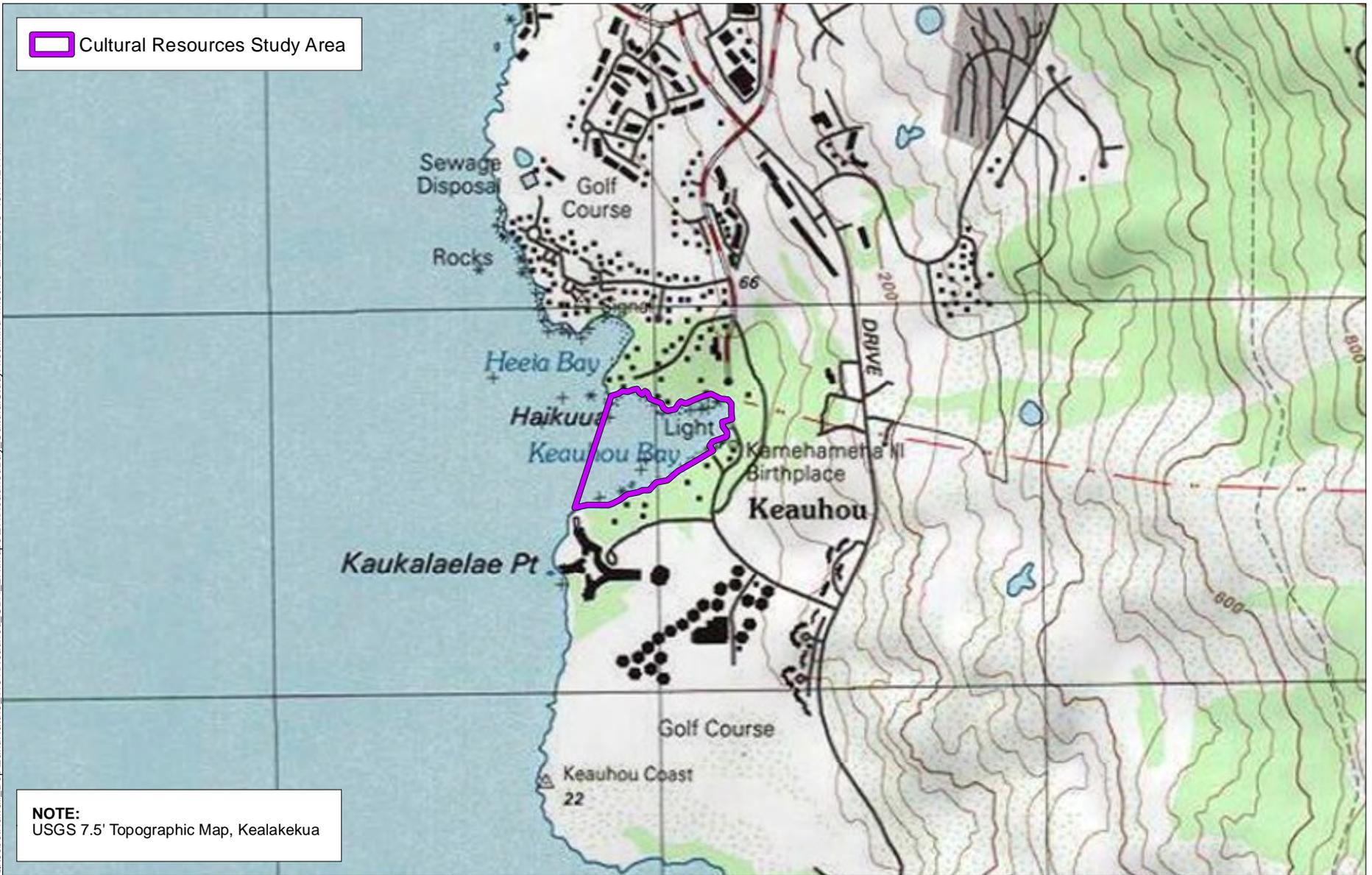


Figure 10
Cultural Resources Study Area
Draft Environmental Assessment
Keauhou Bay Offshore Moorings

Existing Conditions

Cultural Context

The cultural context of the Keauhou Bay area is described in detail in the Cultural Impact Assessment and Underwater Archaeological Survey (Appendices B and C). The context is briefly summarized here directly from those reports.

Polynesian voyagers reached the Hawai'ian Islands about 900 years ago, and possibly 600 to 700 years earlier, though undisputed archaeological evidence has not been found for the earlier dates. The Settlement or Colonization period, from arrival to about 850 years ago, is characterized by settlements at sheltered bays and a reliance on subsistence level agriculture and fishing. The succeeding Developmental period (about 850 to 600 years ago) includes the development of characteristically Hawai'ian tools such as the quadrilateral adze, two-piece fishhook, and breadloaf sinker. Traditional status items, such as *'ulu maika* stones and *lei niho palaoa* appear during this stage and are thought to indicate intensifying social stratification. This trend continues during the Expansion period (about 600 to 300 years ago), with the establishment of chiefly centers, intensification of agriculture, and the establishment of the *ahupua'a* system of land tenure. This system was in place at the time of the first Euro-American contact with the Hawai'ian Islands and is important to understanding the archaeological and cultural context of the bay.

Mokopuni (islands) were divided into *moku* (districts), which were, in turn, made up of smaller units. These were originally *'okana* or *kalana* (regions) but by about 500 years ago, had shifted to *ahupua'a*. An *ahupua'a* is a section of land in an approximate wedge shape that includes a section of the coast and narrows through the uplands. Each *ahupua'a* was traditionally governed by an *ali'i ai ahupua'a* (*ali'i* refers to the chiefly class). *Ahupua'a* could be further divided into two or three *'ili* (chiefly estates) governed by *konohiki* (lesser chiefs). Keauhou Bay is located in the Keauhou *ahupua'a*, which was administratively divided into Keauhou 1st and Keauhou 2nd in 1848 to 1849. Together with 42 other *ahupua'a*, these make up the Kona *moku*. The bay and shoreline are located in the *kula* zone of the Kona Field System. The shoreline area of the *kula* zone in the bay once included the residential complexes of the *ali'i* and *konohiki*, as well as smaller *maka'ainana* (commoners') residences. In addition to residences, the shoreline area would have been used for fishing, recreation,

ceremonies, canoe storage, and burials. Associated structures could include fishing shrines and *heiau* (places of worship), in addition to more expedient structures related to resource gathering.

The bay was known as a particularly important chiefly center and residence of several important individuals and families. Kauikeaouli (Kamehameha III), the son of the sacred wife of Kamehameha, was born on the shores of the bay in 1813. Kuakini (governor of Hawai'i from 1820 to 1844) was raised at Keauhou, and Kekauluhoi (renowned chiefess and premier of Hawai'i from 1839 to 1845) was born and raised there. Five heiau were reported historically in the Keauhou 1st and 2nd apuhua'a, one of which has been mapped in Keauhou Bay. Ho'okuku (or Kaleiopapa) heiau was located just southeast of the bay, east and north of Ka-hala-lua Spring.

A large *holua*, or slide, once entered the bay from the east. Holua were used by ali'i men in a competition where sleds were piloted down rock slides made slippery with oil and grasses. The Keauhou Holua has been partially destroyed by development; only the portion east of the Ali'i highway remains. It is a National Historic Landmark.

The first recorded Euro-American contact was in 1778, when Captain James Cook arrived in the Hawai'ian Islands. Trading intensified quickly, and by the 1790s, Keauhou Bay was noted as a shipping location. In 1790, the trading schooner *Fair American* was besieged in North Kona by Kame'eiamoku, Kamehameha I's uncle. Kamehameha I took control of the vessel, made her the first foreign vessel in his war fleet, and secured her at the bay. In 1794, a surgeon on board Cook's *HMS Discovery* visited the bay and described the *Fair American* in poor condition; that was the last description of the vessel in historic literature known to date.

By the early 1800s, missionaries were travelling the islands. In 1823, missionary William Ellis visited the bay. Walking between Kailua-Kona (about 5 miles north) and Keauhou, he described 19 heiau, a number of smaller shrines, and a village at Keauhou Bay; he estimated the population of the area he traversed at around 3,550 people. Shortly after Ellis' visit, the population of the area began to decline rapidly when the center of Hawai'ian government moved from Kailua-Kona to Honolulu. A shift began toward coffee and tobacco cultivation,

as well as livestock raising, resulting in population movement away from the coast and toward the uplands.

In the mid-19th century, a series of land claims settlement actions took place. In 1848, the Mahele ‘Aina (land division) occurred. It was the process used to assign lands to the crown, the Hawai’ian government, and residents (ali’i and konohiki, as well as commoners). Ali’i and konohiki could receive Land Commission Awards, and commoners could be awarded small parcels called *kuleana*. Both Keauhou 1st and Keauhou 2nd ahupua’a were awarded as konohiki land, the former to Victoria Kamamalu and the latter to her brother Lot Kapuwiwa (Kamehameha IV). Within the ahupua’a, a number of kuleana claims were awarded; twenty of these are along the shores of the bay, in proximity to the project area. At the time of the land awards and subsequent surveys, Hawai’ian families lived around the shoreline of the bay in small house lots, some with garden areas.

The population around the bay dwindled in the late 19th century, as people moved to the uplands to take part in plantation agriculture and ranching activities. Only a few houses, a school, and a store are noted in maps and descriptions through the early 20th century when the bay became a tourist destination. In 1914, Queen Lili’uokalani attended the dedication of a plaque, the Kauikeaouli Tablet, marking the birthplace of Kamehameha III at Keauhou Bay (Appendix B, Figure 32). Currently the Daughters of Hawai’i maintain the birthplace and signage. There is an interpretive trail with signage that passes the birthplace as well as the remnant of Kualalua Spring.

In the early 1900s, a wooden pier was built along the eastern shore of the bay (the head of the bay); it was in place until the 1940s. Between 1950 and 1954, Charles Machado built a dry dock and wooden pier to serve his small fleet of fishing boats. Moorings for vessels were created in the bay in the 1950s and 1960s in a disorganized manner, often by using discarded metal objects as anchors.

Resort development began in the 1960s, resulting in the current configuration of the bay. The wooden pier was upgraded from 1973 to 1974, and the concrete boat ramp was constructed in the early 1980s. The Hawai’i Department of Transportation (DOT)

administered the harbor until 1992, when it transferred administration to the DLNR. At the time of the transfer, there was moorage for 19 vessels.

The KCC, located at the head of the bay, was founded in 1980 by Louis and Mary Jane Kahanamoku as the Kauikeaouli Canoe Club. KCC's facilities are located on land that is owned by the Kamehameha Schools Bishop Estate and leased yearly to the club. The club was founded to perpetuate Hawai'ian culture through water sports. Though membership is not limited to Native Hawai'ians, KCC promotes traditional Hawai'ian activities, including competitive and recreational paddling of outrigger canoes and coaching and instruction for adults and children. Native Hawai'ian residents also engage in other cultural activities in the bay, such as gathering traditional foods.

Interviews were conducted to develop the Cultural Impact Assessment (Appendix B). Two organizations (KCC and the Ahu Moku Advisory Committee and Council) and three individuals (Barbara Nobriga, Lili Namakaokai'a Ha'ani 'o-Kong, and Lionel Machado) were contacted to request interviews. Four interviews were conducted: two by phone (Barbara Nobriga and Lionel Machado) and two in person (Lili Namakaokai'a Ha'ani 'o-Kong and a group interview with 12 KCC members and one non-member community member). Group interviewees were Bill Armer, Terry Trinidad, Cindy Armer, Jane Bockus, Rupert Adarme, Jackie Frames, Tandy Kualii, Dennis Mihalka, Fred Giannini, Stephanie Amick, Kalani Delovio, Moke Hauani'o, and Bill Murtagh. The Ahu Moku Advisory Committee and Council did not respond to requests for interviews. In total, 16 individuals were interviewed.

Appendix B reports the results of the interviews. The primary concerns of interviewees are that additional moorings would increase vessel traffic, with the following impacts:

- Creating a safety risk for non-motorized vessel operators, who would be forced into shallower waters, which is especially dangerous when surf is high
- Degrading the cultural landscape of the bay
- Interfering with subsistence fishing and gathering activities
- Increasing pollution

Recorded Archaeological and Cultural Sites and Surveys

A number of archaeological surveys have been conducted in the bay area. Table 5 summarizes the early surveys that identified archaeological and cultural features prior to significant development. Additional details can be found in Appendices B and C.

Approximate locations for resources on file with the Hawai'i State Historic Preservation Division (SHPD) are shown in Figure 11.

Table 5
Selected Early Archaeological Surveys in Keauhou Bay

Survey	Findings in the Project Vicinity
Survey of <i>heiau</i> on the island of Hawai'i for the Bishop Museum by J. Stokes, 1906	<ul style="list-style-type: none"> • Five heiau around Keauhou Bay reported from documentary sources (Ka'io'ena, Opukaha, Kamau'ai, Ho'okuku, and Aju a 'Umi) • Only one located, the Ho'okuku heiau, which is also called Kaleiopapa
Bishop Museum survey by J. Reinecke, 1929 – 1930	<ul style="list-style-type: none"> • Site 66 – Heiau called Kamohoalii, which this survey places at the location of Ho'okuku/Kaleiopapa heiau, described above • Site 51 – Another large heiau at the south entrance to the bay, called Kaukulaelae (later called Kanika'ula or Kanikani-ka'ula) • Site 68 – A low-lying area thought to be the location of Kamau'ai heiau mentioned above • Sites 56, 64, and 71 – Three areas thought to have been smaller fishing heiau • Sites 67 and 70 – Two caves, Moikeha Cave and Ke-eku-a-ka-puaa Cave • Site 69 – Kualalua Spring • Sites 52, 53, 54, 59, 60, 61, 65, and 73 – Eight house platforms • Sites 55 and 57 – Two sets of pens • Sites 62, 63, and 74 – Three areas of unidentified activity (rubble piles and cleared areas) • Site 58 – An area of possible burials; locations not mapped • Site 72 – Hale o Lono, house of Lonoikamakahiki
Henry E. P. Kekahuna maps, 1954 – 1955	<ul style="list-style-type: none"> • Ka-moho-alii heiau, which this survey places on the cliff above the heiau that is the location of Kamehameha III's birth (elsewhere, it is shown at the location of Ho'okuku/Kaleiopapa heiau, at the base of the cliff) • Four house foundations associated with noted families • The birthplace of Kamehameha III, near the site of the now-filled Ho'okuku Pond • Mo'i-keha Cave • The monument to Kamehameha III • A location where feather cloaks and capes were aired in the sun near where women bathed for ceremonial cleansing

Survey	Findings in the Project Vicinity
Bishop Museum Survey by K. Emory, 1979	<ul style="list-style-type: none"> • A pit on the seafloor called Ka-imu-ki • D3-35: Possible habitation enclosure • D3-36: Platform; undetermined function • D3-37: Rock wall • D3-38: Mound; possible burial • D3-39: Platform; undetermined function • D3-40: Possible house terrace • D3-41: Possible house terrace • D3-42: Moikeha Cave • D3-43: The birthplace of Kamehameha III • D3-44: Open midden

Notes:

Spelling is from original sources.

See Appendices B and C for detailed descriptions and references.

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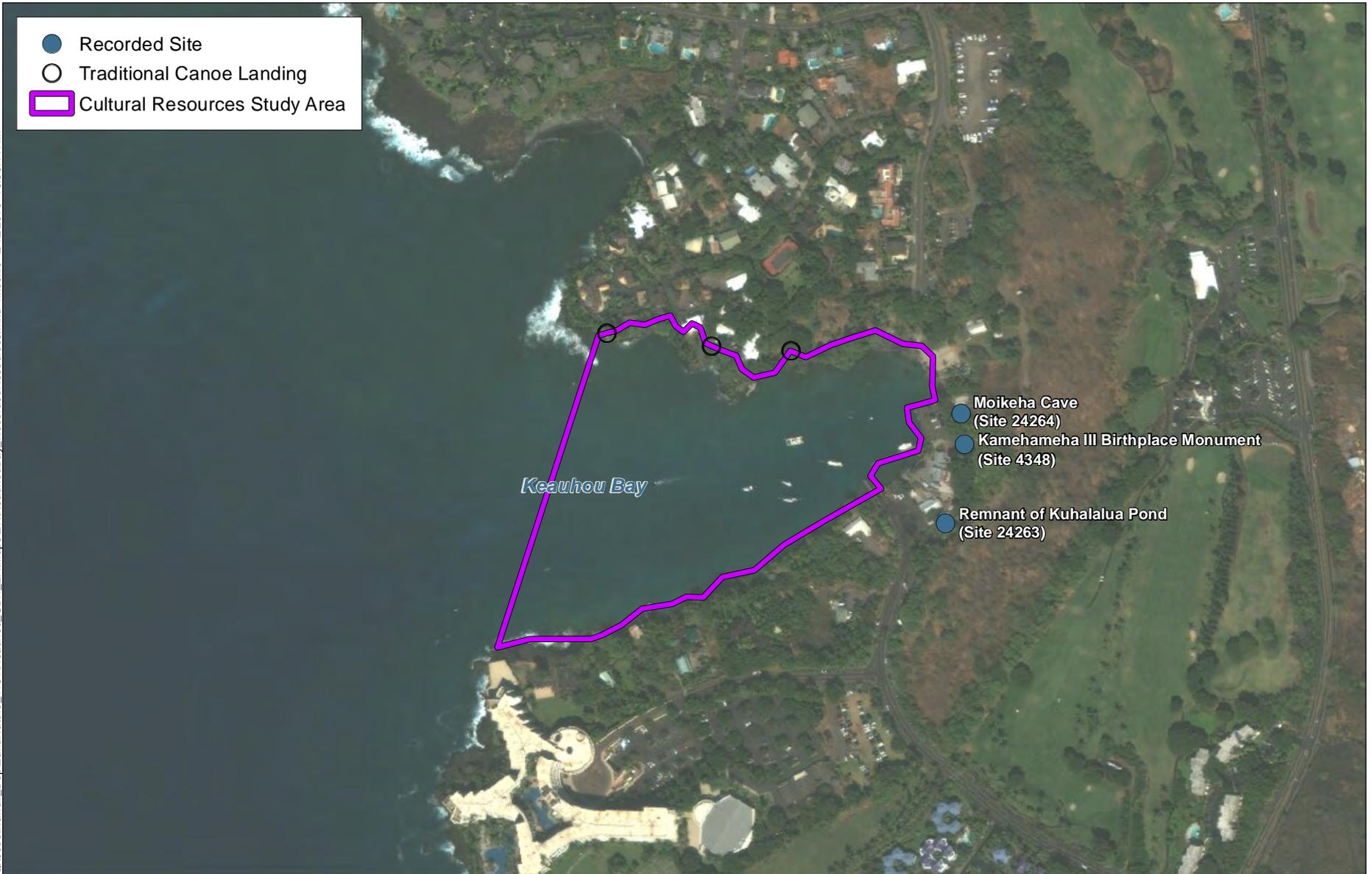


Figure 11
Recorded Cultural Resources in the Study Area Vicinity
Draft Environmental Assessment
Keauhou Bay Offshore Moorings

Since the 1980s, a number of archaeological projects have been conducted in the area, revisiting locations recorded earlier. Many sites have been destroyed by road grading and other development. Table 6 shows the sites in the Keauhou Bay vicinity that are currently on file with SHPD.

Table 6
SHPD-listed Sites Around Keauhou Bay

SHPD Number	Previous Number	Site Type	Recommendation
Site 4348	Emory site D3-43	Kamehameha birthplace shrine	Preservation
Site 5674	Emory sites D3-36 and D3-37	Platform and rock wall	Data Recovery
Site 5695	N/A	Precontact lithic manufacture site, recorded in 1989	N/A
Site 23911	Reinecke site 51	Heiau	N/A
Site 23912	Reinecke site 52	House platform	N/A
Site 23913	Reinecke site 53	Fishing heiau	N/A
Site 24215	N/A	Small overhang and wall used in the precontact and early historic era, recorded in 2004	N/A
Site 24215	N/A	A collection of historic agricultural and residential features and a precontact component, recorded in 2004	N/A
Site 24256	Emory site D3-41	Possible house terrace	N/A
Site 24261	N/A	Historic residential site	Data Recovery
Site 24262	Emory site D3-40	Possible house terrace	N/A
Site 24263	Reinecke site 69	Ho'okuku Pond	Preservation
Site 24264	Emory site D3-42	Moikeha Cave	Preservation
Site 24264	N/A	Historic residential site	N/A
Site 24267	Emory site D3-39	Platform	N/A

Notes:

N/A Not applicable

SHPD State Historic Preservation Division

An underwater survey was conducted for the project (Appendix C). Survey methods included scuba and snorkeling. First, divers surveyed circular transects around each mooring site, to approximately a 30-foot radius. Second, divers surveyed three transects at 10-foot intervals along all four proposed mooring rows plus 50 feet on either end. Third, three divers

snorkeled the outside edges of the bay, spaced at approximately 10 feet, to conduct a 100% visual survey of the project area. Visibility was excellent, and surge was minimal. Although DOBOR has identified 16 current moorings, the survey identified and evaluated 17 moorings.

The survey located the following objects:

- Four piles likely associated with the 1957 version of the wooden pier
- A concrete slab and railing, probably part of a private sunning platform
- Existing mooring anchors: a mix of concrete blocks, metal anchors, heavy chain drags, and miscellaneous metal objects including machinery and engine parts
- Likely abandoned mooring anchors: a cement block with a ring, a truck axle and wheels, pieces of machinery, an automobile engine block, and part of a diesel ship's engine
- A long metal pipe running parallel with the shoreline

These objects were determined to be modern in origin and in tertiary context. They are not considered historic properties under HAR 13 13-275-2. The seafloor was found to be devoid of historic or modern small refuse; this is ascribed to the effects of a 2011 tsunami, plus the ongoing bay cleanup efforts of the KCC. A shallow depression in the seafloor can be seen on bathymetric maps between proposed rows B and C. It is in the vicinity of the pit identified by Kekahuna as Ka-imu-ki but appears to be too broad and shallow to match the description. It is possible that Ka-imu-ki has been filled in and covered. In summary, no historic properties were located during the underwater survey.

Interviews and historical research conducted for the Cultural Impact Assessment (Appendix B) indicate that the bay has historical and traditional value to Native Hawai'ians and is also the location of a number of important archaeological and historic sites. It is recommended eligible for listing in the HRHP. Therefore, one significant resource has been identified in the study area: the potential Keauhou Bay Historic District.

Impacts Analysis

The three potential impacts from the Proposed Project and alternatives are as follows:

- Direct impacts to archaeological resources, if removal of existing moorings or installation of new moorings disturbs in-water sites or artifacts
- Impacts to traditional cultural uses, including fishing, gathering, and use of non-motorized vessels such as outrigger canoes, or impacts to use of sacred sites

Proposed Project

Direct Impacts to Archaeological Resources

No historic properties were found during the underwater archaeological survey. Therefore, there will be no direct impacts to in-water archaeological sites or artifacts.

Impacts to Traditional Cultural Uses

As described in Appendix C, if the Proposed Project has the following impacts, it would adversely affect the potential Keauhou Bay Historic District:

- Impacts to the marine environment of the bay that could affect subsistence activities
- Changes to the visual character of the bay that could alter the historic landscape
- Impacts to the ability of the KCC to safely conduct traditional non-motorized uses

As described in Sections 3.2, 3.3, and 3.4, there are no changes expected to the marine environment from the Proposed Project. As described in Section 3.10.2, the visual character of the bay is not expected to change. Therefore, there would be no changes to subsistence or the historic landscape from the Proposed Project.

The Proposed Project has the potential to significantly impact traditional non-motorized uses of the bay because mooring vessels north of the USCG navigational channel (Row D) could have the following impacts:

- Interfere with the line of sight that is traditionally used for navigating
- Force non-motorized vessels into shallower, less safe areas in the northernmost portion of the bay

Mitigation Measures

These potential impacts will be mitigated to a less than significant level by developing mitigation measures in consultation with the KCC and other Native Hawai'ian residents. Measures could include development of an HRHP nomination for the potential Keauhou Bay Historic District and development of a preservation plan for the district.

Residual Impact

No impact.

No Action Alternative

If the project is not constructed, mooring will continue to occur at the current locations. Impacts to cultural and historical resources are not expected.

Alternative 1

Under Alternative 1, a total of 12 offshore moorings are proposed on the south side of the USCG navigation channel and four permanent berths are being added at the loading pier. This configuration eliminates moorings on the north side of the USCG navigational channel, providing increased access for traditional cultural users of the bay.

Like the Proposed Project, this alternative is not expected to have impacts to the visual character of the bay or the marine environment. Subsistence fishing activities, conducted from the north side of the pier and the bulkhead to the south of the canoe ramp, could continue with no interference.

Alternative 1 would not create interference with the line of sight used for navigation by non-motorized vessel operators, nor would it move non-motorized traffic into shallower, less safe waters. Therefore, the impacts of Alternative 1 would be less than significant.

Alternative 2

Alternative 2 further reduces the number of moorings to nine, eliminating moorings on the north side of the USCG navigational channel and eliminating one mooring in Row A. Alternative 2 is not expected to result in impacts to the marine environment, the historical

visual character of the bay, or the traditional practices of non-motorized vessel operators. Therefore, the impacts of Alternative 2 would be less than significant.

In summary, the Proposed Project and the two alternatives are expected to have less than significant impacts to cultural resources, though the Proposed Project would require the development and implementation of mitigation measures.

3.10.2 Visual Resources

Existing Conditions

The bay has been occupied by modern vessels since at least the 1950s, so the visual character of the bay has included vessels and moorings for more than 60 years. When the harbor was transferred from the control of the DOT to the DLNR in 1992, the harbor provided offshore moorings for 19 vessels (RMTC 1992). Furthermore, a 1985 USACE report identified the bay as accommodating 24 moorings, all of which were occupied at that time (USACE 1985). Currently, there are moorings for up to nine vessels, with three of these on the north side of the USCG navigation channel and six on the south side of the channel.

Impacts Analysis

Proposed Project

The Proposed Project, with a total of 16 proposed vessels, is not expected to significantly change the visual landscape of the bay. The number of vessels is consistent with previous mooring capacities within the bay, as documented in RMTC 1992 and USACE 1985. Thus, the Proposed Project would not result in impacts to the visual resources of the bay.

Section 3.9.6 describes potential impacts to navigation that would result from the presence of vessels in Row D by interfering with the lines of sight from the beach to the USCG navigation channel and from the USCG navigation channel to the northern portion of the bay. Because these potential impacts to navigation are related to lines of sight rather than the visual character and aesthetics of the bay, they are addressed in the navigation section of this environmental assessment.

Mitigation Measures

Mitigation is not required.

Residual Impact

No impact.

No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. This would have no impact on existing visual resources within the bay.

Alternative 1

Under Alternative 1, 12 new moorings would be constructed only on the south side of the USCG navigation channel, and four permanent slips would be created along the south side of the existing pier. Because this alternative would eliminate the moorings on the north side of the USCG navigation channel, it would result in positive impacts to the visual character of the bay by placing the moorings only on the south side of the USCG navigation channel.

Alternative 2

Under Alternative 2, the existing moorings would be replaced with nine new moorings south of the USCG entrance channel. Because this alternative would eliminate the moorings on the north side of the USCG navigation channel, it would result in positive impacts to the visual character of the bay by placing the moorings only on the south side of the USCG navigation channel.

3.10.3 Recreational Resources

Existing Conditions

The bay is heavily used for recreation by both motorized and non-motorized vessels. Vessels that frequent the bay include commercial tour boats, private fishing boats, outrigger canoes, and kayaks. Additional in-water activities that occur within the bay on any given day include swimming, snorkeling, SUP boarding, and fishing from the pier or bulkhead.

In November 2015, observations of use at the bay were documented to better understand the various users and type of vessel activities (Anchor QEA 2015). Based on the number of vessels using the bay, observations showed that approximately 50 to 60% of vessel activity is related to motorized vessels, and 40 to 50% is associated with non-motorized vessels, depending on the day of the week. A summary of site usage by vessel type/use is provided in Table 7.

Table 7
Site Usage based on Vessel Count

Vessel Type/Use	Percentage of Site Use on Friday, November 6, 2015	Percentage of Site Use on Saturday, November 7, 2015
Power	59%	49%
Non-power	41%	51%
Private	64%	69%
Commercial	36%	31%

Recreational activities occurring within the bay are focused around five primary public access locations. The majority of motorized vessel activity happens around the boat launch ramp and pier; larger motorized vessels use the offshore moorings and bulkhead/parking area to service tour groups out of the bay. The majority of non-motorized activity originated from the northeast corner, with less frequent departures and arrivals of outrigger canoes at the canoe ramp next to the bulkhead. Swimmers and snorkelers typically remain within the confines of the bay, while all other activities involve leaving the bay. A summary of site usage by location is provided in Table 8.

Table 8
Activity Locations based on Vessel Count

Activity Location	Percentage of Site Use on Friday, November 6, 2015	Percentage of Site Use on Saturday, November 7, 2015
Beach	43%	36%
Boat ramp	33%	32%
Pier	14%	16%
Bulkhead/parking	6%	10%
Canoe ramp	4%	6%

Impacts Analysis

Proposed Project

The Proposed Project focuses on improvements to the offshore vessel moorings only. The proposed modifications to the existing offshore field are considered to improve the existing conditions, as the new moorings would accommodate seven additional vessels when compared to the existing condition.

The Proposed Project may have an adverse impact on navigation when compared to existing conditions, which could inhibit non-motorized recreational activities occurring in the north side of the bay such as SUP boarding, kayaking, and outrigger canoes. Potential impacts to navigation that may affect recreational activities are further discussed in Section 3.9.6. No adverse impacts are anticipated to motorized vessel activity as a result of the Proposed Project.

Mitigation Measures

Vessel moorings in Row D would be modified or reduced to provide for improved navigation of non-motorized vessels to the area north of Row D and between the bulkhead/parking area and the first moored vessel.

Residual Impact

No impact.

No Action Alternative

Under the No Action Alternative, the existing makeshift moorings would be left in place, if permitted by the regulatory agencies. The No Action Alternative, therefore, involves no changes to the current recreational conditions within the bay.

Alternative 1

With Alternative 1, Row D (from the Proposed Project) is removed, leaving the entire northern half of the bay open for non-motorized vessel navigation and recreational activities such as outrigger canoeing, SUP boarding, kayaking, swimming, and snorkeling. With this alternative, potential impacts to recreational activities due to restricted navigation concerns

both near the reef outcrop to the north and the bulkhead/parking area near the canoe launch ramp are resolved. This alternative also alleviates the KCC's concern about reduced visual observations from their vantage point at the bulkhead/parking area, further eliminating concerns of impacts to recreational activities.

Alternative 2

Similar to Alternative 1, this alternative removes Row D (Proposed Project) from the north side of the USCG navigation channel, alleviating potential impacts to recreational activities occurring in the northern part of the bay. A total of nine vessels are proposed with Alternative 2, consistent with the number of vessels currently mooring in the bay.

4 RELATIONSHIP TO LAND USE PLANS AND POLICIES

4.1 Ocean Resource Management Plan

The Hawai'i Ocean Resources Management Plan (ORMP) is a statewide plan that sets forth ocean and coastal resource management priorities. The ORMP supports effective management, beneficial use, protection, and development of the state's coastal zone, which includes all lands of the state and the area extending seaward from the shoreline to the limit of the state's police power and management authority, including the U.S. territorial sea. The ORMP is a requirement under HRA §205A-3 and is a major component of Hawai'i's Coastal Zone Management (CZM) Program.

There are 11 management priorities and perspectives included in the ORMP related to connecting land and sea, preserving ocean heritage, and promoting collaboration and stewardship. The Proposed Project is consistent with the ORMP because its intentions are as follows:

- Replace the existing unpermitted and non-engineered makeshift anchoring systems with engineered mooring anchors, keeping with current maritime standards
- Enhance opportunities for vessel mooring within the bay by reconfiguring the mooring field in an organized grid, providing additional mooring capacity
- Reconfigure the mooring field to avoid conflict with the established USCG navigation channel
- Ensure the safe, continued use of the bay by non-motorized vessel and recreational activities (e.g., canoeing, kayaking, sailing, swimming, snorkeling, and SUP boarding)
- Protect historic native Hawai'ian traditional and cultural practices of the bay
- Preserve the historical significance of the bay by not interfering with sensitive archeological or cultural resources
- Prevent further degradation of sensitive corals and marine habitat due to the existing substandard moorings and ensure that the new moorings are placed in areas free of corals and sensitive habitats

4.2 Coastal Zone Management

In October 1972, the Coastal Zone Management Act (CZMA) was passed by Congress to address beneficial use, protection, and development of land and water resources in coastal areas. The Hawai'i CZM Program of 1977 was established in response to the federal legislation. The CZM Program was enacted to provide a common focus for state and county actions dealing with land and water uses and activities. As the State's resource management policy umbrella, it is the guiding perspective for the design and implementation of allowable land and water uses and activities. The objectives of the CZM Program are to provide recreational resources; protect historic, scenic, and coastal ecosystem resources; govern economic use; reduce coastal hazards; and manage coastal development.

This project site is not within a Special Management Area for the State of Hawai'i. Special Management Areas are designated along coastal shorelines, and the moorings are located offshore. The Proposed Project is consistent with the policies of the CZM Program. A federal consistency determination from the Department of Business, Economic Development & Tourism, Office of Planning, CZM Program will be obtained prior to the Proposed Project beginning.

4.3 Beach Management Plan

The Office of Conservation of Coastal Lands under the DLNR is responsible for the Hawai'i Beach Management Plan (HBMP). This plan was proposed in order to implement beach conservation policies of the State of Hawai'i pursuant to Part VII (Restoration of Beach Lands) of HRS Chapter 171. The HBMP was formed with the intent to identify and evaluate site-specific management options for coastal regions throughout the state. The specific goals and obligations of the HBMP are as follows:

- Concern with a beach's relationship to the upland region
- Current state and development of the beach
- Response of the beach to coastal erosion
- Priority of coastal resources as they pertain to various governmental agencies and development plans

The beach in Keauhou Bay is not currently part of the HBMP; therefore, the HBMP's policies would not apply to the Proposed Project.

4.4 Commercial Harbor Master Plans

The Commercial Harbor Master Plans were developed as long-range strategic plans to provide guidance for development of commercial harbors to accommodate future needs and improvements of harbor facilities, to meet current and future demand for cargo, aid congestions, ensure safety of operations, and protect facilities from natural or anthropogenic threats. There are two commercial harbors on the Island of Hawai'i: Hilo and Kawaihae. None of the alternatives in Keauhou Bay would affect either of the two harbors. The Commercial Harbor Master Plans would have no impact on any of the alternatives.

5 FINDINGS AND CONCLUSIONS

5.1 Overview

HRS Chapter 343 establishes a system of environmental review so that environmental considerations are included in decision-making, in addition to economic and technical considerations. The proposed action is subject to review under HRS Chapter 343-5(a)(1) and (2) because the site is State-owned land. HAR Section 11-200-6 requires that an EA be prepared for applicant actions that assesses the significance of the potential impacts of the proposed action on the existing environment. Significance criteria are described in Section 12 of the Administrative Rules, Title 11, Chapter 200. An analysis of the Proposed Project compared to the significance criteria is summarized Section 5.2.

5.2 Significance Criteria

HAR Chapter 11-200-12 outlines factors agencies must consider when determining whether an Action has significant impacts:

- 1. The proposed project will not involve an irrevocable commitment or loss or destruction of any natural or cultural resources.*

The Proposed Project entails improvement of an existing anchorage in the bay and has been designed to avoid impacts to natural and cultural resources. However, the Proposed Project may result in adverse impacts to traditional cultural use of the bay for non-motorized navigation as a result of the location of moorings in Row D affecting navigation. This potential adverse impact is anticipated to be less than significant and would not result in permanent destruction of cultural resources. The Proposed Project will not result in an irrevocable commitment or permanent loss or destruction of any natural or cultural resources.

Alternatives 1 and 2 would avoid the potential impact to traditional cultural use of the bay and would also not result in an irrevocable commitment or permanent loss or destruction of any natural or cultural resources.

2. The proposed project will not curtail the range of beneficial uses of the environment.

The project proposes to improve and reconfigure existing anchorage in the bay, which will not curtail the range of beneficial uses of the environment. The Proposed Project is anticipated to ensure the safe, continued use of the bay by motorized and non-motorized vessel and recreational activities. However, as described in Sections 3.9.6, 3.10.1, and 3.10.3, the Proposed Project may result in adverse impacts to non-motorized navigation and recreational and traditional cultural use of the bay as a result of the location of the moorings in Row D. The location of Row D moorings has the potential to adversely affect navigation and use of the northern part of the bay and navigation between the mooring area and the bulkhead. It is anticipated that these impacts would be less than significant with implementation of the proposed mitigation measures.

Alternatives 1 and 2 would avoid the potential impacts to non-motorized navigation and recreational and traditional cultural use of the bay because they do not include moorings north of the USCG navigation channel (Row D). As a result, Alternatives 1 and 2 would not curtail the range of beneficial uses of the environment.

3. The proposed project will not conflict with the State's long-term environmental policies.

The State's long-term environmental policies are set forth in HRS Chapter 344. The broad goals of this policy are to conserve natural resources and enhance the quality of life. The Proposed Project will bring existing offshore moorings into compliance with state and federal regulations while preventing further degradation of sensitive corals and marine habitat from the existing moorings. Because the Proposed Project is intended to improve environmental and recreational conditions, it is consistent with the elements of the State's long-term environmental policies.

Similar to the Proposed Project, Alternatives 1 and 2 would not conflict with the State's long-term environmental policies and would improve environmental and recreational conditions in the bay.

4. The proposed project will not substantially affect the economic or social welfare of the community or State.

The Proposed Project entails improvements to an existing mooring area operated by the State, which would collect fees for use of the moorings. The bay and the moorings would continue to support the same commercial and recreational uses. The project will not adversely affect the social welfare of the community and will contribute to the economy and to shoreline access.

Similar to the Proposed Project, Alternatives 1 and 2 would not adversely affect the economic or social welfare of the community or the State because both alternatives would entail continued use of the bay and moorings for commercial and recreational purposes.

5. The proposed project does not substantially affect public health in any detrimental way.

The Proposed Project entails improvements to an existing mooring area by replacing the existing unpermitted moorings with moorings that incorporate established design criteria. Water quality will be protected through adherence to permit requirements and BMPs that will be implemented during construction. The contractor will implement appropriate safety measures during construction to protect public health. As described in Section 3.9.6, the Proposed Project may result in adverse impacts to navigation as a result of the Row D moorings on the north side of the USCG navigation channel. While these potential impacts could potentially be mitigated through a reduction in number or reconfiguration of the moorings in Row D, the potential adverse impacts would not be completely eliminated. The adverse impact to safe navigation, primarily of non-motorized craft, could result in a substantial adverse impact to public health.

Similar to the Proposed Project, Alternatives 1 and 2 would also not adversely affect public health.

6. *The proposed project will not involve substantial secondary impacts, such as population changes or effects on public facilities.*

No secondary impacts are expected to result from the Proposed Project. The revised configuration of offshore moorings will maintain clearance from the USCG navigation channel and more effectively accommodate vessels, while ensuring continued use of the bay by non-motorized recreational activities such as swimming, kayaking, canoeing, snorkeling, fishing, and other traditional uses of the site.

Similar to the Proposed Project, Alternatives 1 and 2 would not result in secondary impacts such as population changes or impacts on public facilities. Both Alternatives 1 and 2 entail improvements to the existing mooring area rather than new development or changes in types of use.

7. *The proposed project will not involve a substantial degradation of environmental quality.*

The Proposed Project is taking place in an area already supporting unpermitted moorings that will be replaced with engineered moorings that meet current design and environmental standards. Installation of the moorings is subject to review and regulation to avoid and minimize potential environmental impacts. The proposed action will not result in substantial degradation of environmental quality.

Both Alternatives 1 and 2 would improve environmental quality by replacing the existing unpermitted moorings with new moorings that meet established design criteria and environmental standards.

8. *The proposed project is not one which is individually limited but cumulatively may have considerable effect upon the environment or involves a commitment for larger actions.*

The improvement and realignment of the existing anchorage will result in only slight changes to the anchorage and will not result in significant adverse impacts to the environment. The proposed action is not part of a larger action. Thus, the Proposed Project

does not involve a commitment for larger action and is not anticipated to have any cumulative impacts on the environment.

Similar to the Proposed Project, Alternatives 1 and 2 are improvements to an existing mooring area and are not part of a commitment for a larger action. Alternatives 1 and 2 would avoid the potential less than significant impacts identified for the Proposed Project. As a result, these alternatives would not result in cumulative impacts.

9. The proposed project will not substantially affect any rare, threatened or endangered species of flora or fauna or habitat.

The existing moorings comprise a variety of non-engineered equipment, many of which currently damage the coral-rich environment in Keauhou Bay. The substandard mooring anchors and chains that have been placed throughout the bay adversely impact sensitive coral reef and other marine habitat by dragging along the ocean floor or through poor placement in sensitive areas. By replacing the existing moorings anchors with industry-standard anchors and related tackle capable of withstanding acceptable design wind and wave conditions, as well as siting the moorings to avoid coral and other sensitive marine habitat, the proposed improvements to the anchorage will further protect the marine biological resources within this sensitive environment. Monitoring and standard BMPs will be employed during the short construction period to avoid impacts to sensitive species and habitat. Substantial impacts to rare, threatened, or endangered species of flora or fauna are not anticipated.

Alternatives 1 and 2 entail replacement of the existing moorings similar to the Proposed Project, differing only in the layout of the moorings. Thus, as described for the Proposed Project, Alternatives 1 and 2 would not result in substantial impacts to rare, threatened, or endangered species of flora or fauna.

10. The proposed project will not detrimentally affect air or water quality or ambient noise levels.

The Proposed Project has been designed to avoid and minimize adverse impacts to the environment, and standard BMPs will be employed during construction to further protect air and water quality and manage noise levels. The existing anchorage will continue to be used in a similar fashion following implementation of the Proposed Project and will not detrimentally affect air or water quality or ambient noise levels.

Alternatives 1 and 2 entail replacement of the existing moorings similar to the Proposed Project, differing only in the layout of the moorings. Thus, as described for the Proposed Project, Alternatives 1 and 2 would not result in detrimental impacts to air or water quality or ambient noise levels.

11. The project does not affect nor would it likely to be damaged as a result of being located in environmentally sensitive areas such as a flood plain, tsunami zone, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal area.

Although the Proposed Project is located in a coastal area with tsunami risk, many coastal areas of Hawai'i share this risk. The Proposed Project will improve the existing anchorage as a result of using properly engineered moorings in an organized array.

Similar to the Proposed Project, Alternatives 1 and 2 entail replacement of the existing unpermitted moorings with engineered moorings designed to meet established design criteria. Alternatives 1 and 2 would not change the general use of the mooring area or be subject to greater damage than the existing moorings. These alternatives would not affect sensitive areas or increase the risk of damage to such areas.

12. The project will not substantially affect scenic vistas and viewplanes identified in county or state plans or studies.

The Proposed Project entails improvements to an existing anchorage. The moorings would continue to be used by the same size range of commercial and recreational vessels that

currently use the moorings. The overall number of moorings is consistent with historical use of the mooring area, though there would be an increase in the number of moorings overall and on the north side of the USCG navigation channel compared to existing conditions. Due to the Proposed Project being an improvement to an existing mooring area, it is not anticipated to substantially affect scenic vistas and viewplanes identified in county or state plans or studies. However, the Proposed Project would result in an increase in the number of vessels on the north side of the USCG navigation channel, which would result in a less than substantial adverse impact to the viewplane and visual character of the bay.

Similar to the Proposed Project, Alternatives 1 and 2 entail improvements to an existing mooring area without a change in type of use or intensity. These alternatives differ from the Proposed Project only in the layout of the moorings, with the primary difference being the omission of Row D of the moorings. As a result, the moorings and vessels would be located only south of the USCG navigation channel and along the existing pier, thus occupying a smaller portion of the bay and a smaller viewplane. As a result, Alternatives 1 and 2 would result in positive impacts to scenic vistas and viewplanes and the visual character of the bay.

13. The project will not require substantial energy consumption.

Because the Proposed Project is improvement of an existing facility, substantial energy consumption is not anticipated. The project construction period is very short, and substantial energy will not be required to mobilize equipment to the site, remove the existing moorings, and install new ones. In the long term, vessels using the moorings will not be provided with power via the moorings or other facilities at the site.

Similar to the Proposed Project, Alternatives 1 and 2 would require a short construction period and would not result in changes to long-term energy use. As a result, these alternatives would not require substantial energy consumption.

5.3 Summary

Based on the information discussed in this EA, DOBOR anticipates that the Proposed Project will **not** significantly affect the environment. However, DOBOR has identified potential adverse impacts that that may result from the Proposed Project. Through the evaluation of alternative project designs described in this EA, DOBOR has determined that Alternative 1 would meet the project objectives, while avoiding the potential impacts to navigation, recreation, and traditional cultural practices associated with the Proposed Project. As a result, DOBOR is selecting Alternative 1 as the preferred project. It is therefore anticipated that an EIS is not warranted and that DOBOR will issue a FONSI for Alternative 1. A final determination will be made by DOBOR, in consultation with the DLNR, after consideration of comments on the Draft EA.

6 PERMITS, APPROVALS, AND CONSULTATIONS

6.1 Required Federal and State Approvals and Applicable Regulatory Requirements

DOBOR is applying for the following permits for the proposed mooring improvements:

- USACE Section 10 Standard Individual Permit
- Department of Planning CZM Program Federal Consistency Review

The Proposed Project will require the preparation of both a Draft and Final EA pursuant to the State's EIS process (HRS Chapter 343) and its implementing regulations. HAR Title 11, Chapter 200, addresses the determination of significance and contents of an EA. If the Final EA and FONSI are approved by the DLNR, the project may then proceed to implementation once all other required permits and approvals are obtained.

6.2 Applicable Federal Laws, Regulations, and Executive Orders

Laws and regulations requiring analysis, or approvals from, or consultations with federal agencies other than the USACE are as follows:

- National Historic Preservation Act of 1966 (16 United States Code [USC] Section 470[F])
- Clean Air Act (42 USC Section 7506[C])
- CZMA (16 USC Section 1456[C][1])
- ESA (16 USC Section 1536[A] [2] and [4])
- Fish and Wildlife Coordination Act of 1934, as amended (16 USC Section 661-666[C] et seq.)
- Magnuson Stevens Fishery Conservation and Management Act (16 USC Section 1801 et seq.)
- MMPA of 1972, as amended (16 USC Section 1361-1421[H] et seq.)
- Migratory Bird Treaty Act of 1918, as amended (16 USC Section 703 et seq.)
- Executive Order 13089, Coral Reef Protection (63 Federal Regulation 32701)

The Honolulu District of the USACE will be the lead federal agency ensuring compliance with these statutes. Additionally, the State accepting agency (DLNR) will review the

analyses and conclusions drawn in this Draft EA and will decide whether to issue the necessary permits and approvals that the applicant has requested, to issue the permits and approvals with special conditions, or to deny the permits and approvals.

6.3 Consulted Parties

Early consultation with agencies, organizations, and individuals was conducted during initial project planning and during preparation of the Draft EA for the Proposed Project. Early consultations included public meetings, discussions, and correspondence with state and federal agencies, as well as separate meetings with community members and stakeholders.

A number of individuals and groups were contacted for interviews during the development of the Cultural Impact Assessment (Appendix B) and Draft EA. These include:

- KCC
- Ahu Moku Advisory Committee and Council
- Barbara Nobriga
- Lili Namakaokai'a Ha'ani 'o-Kong
- Lionel Machado

Four interviews were conducted: two by phone (Barbara Nobriga and Lionel Machado) and two in person (Lili Namakaokai'a Ha'ani 'o-Kong and a group interview with 12 KCC members and one non-member community member). In total, 16 individuals were interviewed.

Appendix B reports the results of the interviews. The primary concerns of interviewees are that additional moorings would increase vessel traffic, with the following impacts:

- Creating a safety risk for non-motorized vessel operators, who would be forced into shallower waters, which is especially dangerous when surf is high
- Degrading the cultural landscape of the bay
- Interfering with subsistence fishing and gathering activities
- Increasing pollution

6.4 Community Meetings

The following five meetings have been held with community members to discuss DOBOR's plans for improvements to the offshore moorings at Keauhou Bay:

- January 7, 2013: Preliminary findings of the initial mapping and survey of Keauhou Bay were presented to existing mooring permittees of Keauhou Bay.
- May 13, 2013: Revised mooring layout/design was presented to existing mooring permittees of Keauhou Bay.
- July 2, 2013: Community meeting was held at the Keauhou Canoe Club Hale and was attended by boaters and other users of the bay.
- November 5, 2013: Community meeting was held at Kealakehe High School and was attended by boaters, canoe paddlers, other users of the bay, and members of the general public.
- July 24, 2014: Pre-EA public meeting was held at Kealakehe High School and was attended by boaters, canoe paddlers, and other users of the bay. An overview of the EA process and schedule was provided to community members.

The following concerns were highlighted in the community meetings:

- The need for additional moorings was questioned
- Concerns that the inclusion of Row D in the Proposed Project may create a safety risk for non-motorized vessels, which would be forced into shallower waters due to the proposed Row D vessels located on the north side of the USCG Approach Exclusion Zone
- Degradation of the cultural landscape of the bay
- Increased pollution and/or degraded water quality

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APPENDIX A
MARINE RESOURCE SURVEY



Sea Engineering, Inc.

Makai Research Pier • 41-305 Kalanianaʻole Hwy • Waimanalo, Hawaii 96795-1820
Phone: (808) 259-7966 • FAX (808) 259-8143 • E-mail: sei@seaengineering.com • Website: www.seaengineering.com

Exhibit 3

**Marine Resource Survey of Keauhou Small Boat Harbor, Keauhou, Hawaii
Keauhou Bay Mooring Buoys
Initial and Follow-up Site Visit Reports**

**Keauhou Bay, Keauhou, North Kona, Island of Hawaii
Seaward of TMK (3) 7-8-012:008**

**Department of Land and Natural Resources
Division of Boating and Ocean Recreation**

**Prepared by:
AECOS, Inc.**



AECOS, Inc.

45-939 Kamehameha Hwy, Suite 104
Kāneʻohe, Hawai'i 96744

Phone: (808) 234-7770 Fax: (808) 234-7775

Email: aecos@aecos.com

March 26, 2013

AECOS No. 1347

To: Chris Goody
Sea Engineering Inc.

Marine Resources Survey of Keauhou Small Boat Harbor, Keauhou, Hawai'i

On March 6 and 7, 2013, AECOS biologist, Stacey Kilarski, conducted a reconnaissance survey in Keauhou Small Boat Harbor (KBH). The SCUBA survey was performed to assess marine resources at twenty-eight proposed mooring anchor locations. Figure 1 presents the proposed mooring anchor locations, which are arranged in rows labeled A through D. Eight anchor locations (labeled 1 through 8) were surveyed in each of rows A and C, and six anchor locations (labeled 1 through 6) were surveyed in rows B and D. The survey encompassed the harbor bottom in an approximate 12-ft (4-m) radius from each proposed mooring anchor location. Based on likely mooring design, a 5-ft (1.5-m) swath of chain would rest on the seafloor at each anchor location (Goody, pers. comm. 2013). Therefore, the biologist noted coral (visual size estimate, morphology, and ease of removal) within a 5-ft (1.5-m) radius from the center of each mooring location.

An inventory was made for any corals, invasive species, seagrass, marine protected species (DLNR, 1998, 2007; NOAA-NMFS, 2010; USFWS, 2008, 2012), and other non-coral macro-invertebrates at each mooring anchor location. A list of species observed and their relative abundances is presented as Appendix A. A summary of the bottom composition, including coral distribution within the 12-ft (4-m) and 5-ft (1.5-m) radii is provided in Appendix B. Photos taken at each mooring anchor location are presented in Appendix C. Photos show a horizontal transect along the seafloor, which represents the distance from anchor center point (12 ft; 4 m).

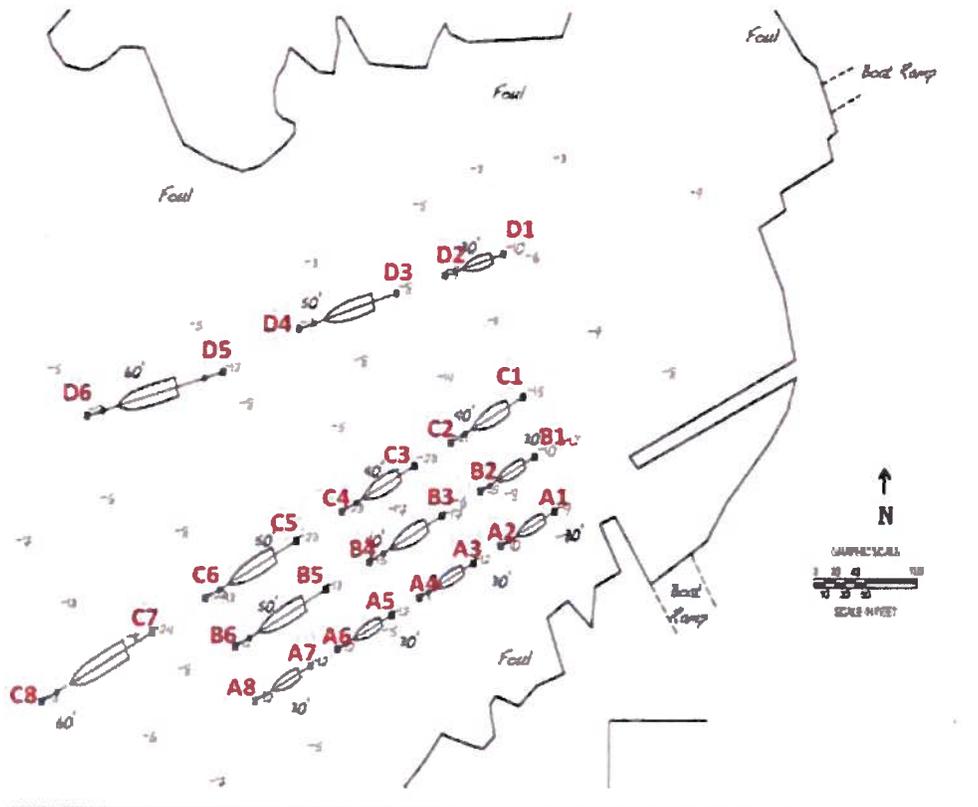


Figure 1. Keauhou Harbor proposed mooring anchor locations.

Anchor location A1

The harbor bottom within a 12-ft (4-m) radius of the proposed anchor location A1 consists of sand, loose rubble, and scattered boulders. Within the 5-ft (1.5-m) radius of the anchor location, one moveable colony of *Porites lobata* (50 cm) was encountered. Beyond the 5-ft (1.5 m) radial distance, boulders and loose rubble host some coral (*Porites lobata* and *Cyphastrea ocellina*). Collector urchins (*Tripneustes gratilla*) are common. No sea grasses or invasive species were observed.

Anchor location A2

The harbor bottom within a 12-ft (4-m) radius of anchor location A2 consists of sand, loose rubble and large boulders. Within 5 ft (1.5 m) of the anchor location, several difficult-to-move large boulders host corals (*P. lobata* and *Poc. meandrina*). Beyond 5 ft (1.5 m), large boulders and loose rubble host other corals (*P. lobata*, *Poc. meandrina*, *Poc. damicornis*, and *Montipora capitata*). At

12 ft (4 m) northwest from the anchor location, a large cluster of debris (concrete slabs) with encrusting coral colonies was observed. No sea grasses or invasive species were seen.

Anchor location A3

The harbor bottom within 12 ft (4-m) of proposed anchor location A3 consists of sand and small boulders. At 5 ft (1.5 m) from the anchor location, one moveable colony each of *P. lobata* (55 cm) and *Poc. meandrina* (15 cm) were encountered. Beyond 5 ft (1.5 m), small colonies (1 to 5 cm and 6 to 10 cm diameter size class) of *Poc. meandrina*, *P. lobata*, and *M. capitata* occur on the loose rubble and scattered small boulders. At 8 ft (2.4 m), debris (concrete slabs) with encrusting corals was observed. No sea grasses or invasive species were observed.

Anchor location A4

The harbor bottom within 12 ft (4 m) of proposed anchor location A4 consists of sand and large boulders. Within 5 ft (1.5 m) of the anchor location, three moveable boulders and one difficult-to-move boulder, all with several coral colonies (*P. lobata* and *Pavona varians*) were encountered (see Table 1 for colony details). Beyond 5 ft (1.5 m) occur several large, difficult-to-move boulders with high coral cover. No sea grasses or invasive species were observed.

Anchor location A5

The harbor bottom within 12 ft (4 m) of proposed anchor A5 consists of sand and coral. Within 5 ft (1.5 m) of the anchor location, coral dominates the bottom. Cover is high (estimated 70%), with large (>80 cm diameter size class) colonies of *P. lobata*, and colonies of *Pav. varians*, *M. capitata*, and *P. compressa*. Urchins (*T. gratilla* and *Echinothrix calamaris*) and sea cucumbers (*H. atra*) are common on limestone outcrops. One lei triggerfish (*Sufflamen bursa*) was seen foraging on the bottom. No sea grasses or invasive species were observed.

Anchor location A6

The harbor bottom within 12 ft (4 m) of anchor location A6 consists of sand and few small coral colonies. Within 5 ft (1.5 m) of the anchor location, two moveable boulders with several coral colonies (*P. lobata*) were encountered (see Table 1 for colony details). The bottom beyond 5 ft (1.5 m) is all sand out to 12 ft (4 m). No sea grasses or invasive species were observed.

Anchor location A7

The harbor bottom within 12 ft (4 m) of anchor location A7 comprises sand, gravel, loose rubble, and remnant chains and anchors. No coral colonies were encountered. No sea grasses or invasive species were observed.

Anchor location A8

The harbor bottom within 12 ft (4 m) of proposed anchor A8 consists of sand and large boulders. Within the 5 ft (1.5 m) of the anchor location, no corals occur. At 6 ft (1.8 m) southwest from the anchor location, large, difficult-to-move boulders with several colonies of *P. lobata* occur. Also, at 6 ft (1.8 m) northwest from the anchor location is an approximate (2.4-m; 8-ft) wide limestone outcrop. One oriental flying gurnard (*Dactyloptena orientalis*) was seen swimming over the sand bottom. No sea grasses or invasive species were observed.

Anchor location B1

The harbor bottom within 12 ft (4 m) radius of the center point of proposed anchor location B1 consists of sand and loose rubble with encrusting *Leptastrea bewickensis* and *P. lobata*. Within the 5 ft (1.5 m) radius of the center point of the anchor location, no corals occur. At 11 ft (3.4 m) northeast from the anchor location, one difficult-to-move boulder with *P. lobata* colonies occurs. No sea grasses or invasive species were observed.

Anchor location B2

The harbor bottom within 12 ft (4 m) of proposed anchor location B2 consists of sand, loose rubble and debris (including a large horizontally laid pile and anchor line). Within the 5 ft (1.5 m) radius of the center point of the anchor location, no corals occur. At 8 ft (2.4 m) southwest from the anchor location, an old concrete pile lies horizontal on the seafloor. Corals (*P. lobata*, *Poc. meandrina*, and *Poc. damicornis*) encrust the pile. Also at 8 ft (2.4 m) from the anchor location is an anchor line, with several small (<5 cm) *Poc. damicornis* colonies. No sea grasses or invasive species were observed.

Anchor location B3

The harbor bottom within 12 ft (4 m) of proposed anchor location B3 consists of sand and limestone outcrops with coral cover. Within 5 ft (1.5 m) of the anchor location, no corals occur. Two large (10-ft; 3-m) wide limestone outcrops occur at 8 ft (2.4 m) northwest and 11 ft (3.3 m) northeast from the anchor location. Large (>80 cm) *P. lobata* and *P. compressa* colonies and *M. capitata*, *Pav. varians*, and *Pocillopora* spp. are common in the outcrops. Urchins (*T. gratilla*) are common on the reef outcrops. Two white-spotted augers (*Terebra guttata*) were encountered in the sand. No sea grasses or invasive species were observed.

Anchor location B4

The harbor bottom within 12 ft (4 m) of proposed anchor location B4 consists of sand, gravel and loose rubble. No coral colonies were encountered within the survey area for this anchor. No sea grasses or invasive species were observed.

Anchor location B5

The harbor bottom within 12 ft (4 m) of proposed anchor location B5 consists of sand and gravel. No coral colonies were encountered within 12 ft (4 m) of the proposed anchor location. At 12 ft (4 m) from the anchor location, a pile of derelict boat lines lies on the seafloor.

Anchor location B6

The harbor bottom within 12 ft (4 m) of proposed anchor location B6 consists of sand, gravel, debris, and some coral. No coral colonies were encountered within 5 ft (1.5 m) of the center point of the anchor location. A limestone outcrop occurs at 7 ft (2.1 m); also at 7 ft (2.1 m) from the anchor location is a large debris conglomeration (anchor lines, plastic buckets and rebar) with encrusting (*P. lobata*) and branching (*Poc. meandrina* and *Poc. damicornis*) corals. No sea grasses or invasive species were observed.

Anchor location C1

The harbor bottom within 12 ft (4 m) of proposed anchor location C1 consists of sand, loose rubble, and boulders with coral. Within 5 ft (1.5 m) of the anchor location, moveable, loose rubble with corals (*Pocillopora* spp.) were encountered. At 6 ft (1.8 m) from the anchor location, two large, difficult-to-move boulders with encrusting (*Pav. varians*) and mound (*P. lobata*) corals occur. No sea grasses or invasive species were observed.

Anchor location C2

The harbor bottom within 12 ft (4 m) of proposed anchor location C2 consists of sand and limestone outcrops. Within 5 ft (1.5 m) of the anchor location, the bottom is sand and no live coral heads occur. At 7 ft (2.1 m) northeast and 8 ft (2.4 m) east from the anchor location, large (1-m wide) difficult-to-move limestone outcrops occur and these have encrusting (*Pav. varians* and *M. capitata*) and mound (*P. lobata*) corals. One large boulder with several mound and encrusting *P. lobata* occurs at 10 ft (3 m) south from the anchor location. No sea grasses or invasive species were observed.

Anchor location C3

The harbor bottom within 12 ft (4 m) of proposed anchor location C3 comprises sand, loose rubble, and limestone outcrops. Within 5 ft (1.5 m) of the anchor location, the bottom is sand and loose rubble; no corals occur. At 8 ft (1.8 m) north, 8 ft (2.4 m) west, and 10 ft (3 m) southwest from the anchor location are large (1-m wide), difficult-to-move limestone outcrops with encrusting (*Pav. varians* and *M. capitata*) and mound (*P. lobata*) corals growing on them. No sea grasses or invasive species were observed.

Anchor location C4

The harbor bottom within 12 ft (4 m) of proposed anchor location C4 comprises sand. No coral colonies, sea grasses, or invasive species were observed.

Anchor location C5

The harbor bottom within 12 ft (4 m) of proposed anchor location C5 consists of sand and few scattered small boulders and corals. Within 5 ft (1.5 m) of the anchor location, the bottom is sand; no corals occur. At 11 ft (3.4 m) from the anchor location, three 25-cm *P. lobata* colonies are present. No sea grasses or invasive species were observed.

Anchor location C6

The harbor bottom within 12 ft (4 m) of proposed anchor location C6 consists of sand and scattered loose rubble. No coral colonies, sea grasses, or invasive species were observed.

Anchor location C7

The harbor bottom within 12 ft (4 m) of proposed anchor location C7 consists of sand, scattered loose rubble with corals, and a limestone outcrop. Several small (10 to 20-cm) colonies of *P. lobata* occur within 5 ft (1.5 m) from the anchor center point. At 8 ft (2.4 m) north from the proposed anchor is a 3-m wide limestone outcrop with live coral (*P. lobata*, *P. compressa*, *Pocillopora* spp., *Pav. varians*). No sea grasses or invasive species were observed.

Anchor location C8

The harbor bottom within 12 ft (4 m) of proposed anchor location C8 consists of sand, small boulders, and a limestone outcrop. Within 5 ft (1.5 m) of the anchor location, the bottom is sand and no corals occur. Urchins (*T. gratilla*) are common in this area. At 7 ft (3.4 m) north from the anchor location, is a limestone outcrop with corals (*P. lobata*, *Poc. meandrina*, *P. eydouxi*, *P. compressa*). No sea grasses or invasive species were observed. Mooring location could be positioned to avoid impacts to corals.

Anchor location D1

The harbor bottom within 12 ft (4 m) of proposed anchor location D1 consists of sand, rubble, and several moveable boulders with coral. Within 5 ft (1.5 m) of the anchor location, no corals occur. At 8 ft (2.4 m) and 12 ft (4 m) north from the anchor location, occur several moveable boulders with encrusting colonies of *P. lobata*. No sea grasses or invasive species were observed.

Anchor location D2

The harbor bottom within 12 ft (4 m) of proposed anchor location D2 consists of sand, rubble and many moveable boulders with coral. Within the 5 ft (1.5 m) radius of the center point of the anchor, there is one small moveable boulder with encrusting and mound *P. lobata* colonies. At 6 ft (1.8 m) and 12 ft (4 m) north from the anchor location, there are many moveable boulders with encrusting colonies of *P. lobata*. No sea grasses or invasive species were observed.

Anchor location D3

The harbor bottom within 12 ft (4 m) of proposed anchor location D3 consists of sand, rubble, and many boulders (some moveable, some difficult-to-move) with coral. Within the 5 ft (1.5 m) of the proposed anchor occur several small boulders with *P. lobata* colonies. Extending north from 5 ft (1.5 m) to 12 ft (3.0 m) are several large and difficult-to-move and some moveable boulders with coral colonies (*P. lobata*, *Poc. eydouxi*, and *Poc. meandrina*). No sea grasses or invasive species were observed.

Anchor location D4

The harbor bottom within 12 ft (4 m) of proposed anchor location D4 consists of sand, rubble, and several moveable corals. Within 5 ft (1.5 m) of the anchor, the bottom is loose rubble and lacks coral growth. At 10 ft (3.0 m) from the anchor location is a large moveable boulder with coral colonies (*P. lobata*) and debris with encrusting (*P. lobata*) and branching (*P. compressa*) corals. No sea grasses or invasive species were observed.

Anchor location D5

The harbor bottom within 12 ft (4 m) of proposed anchor location D5 consists of sand, rubble and several moveable coral. Within the 5 ft (1.5 m) radius of the center point of the anchor, the bottom is loose rubble and no coral. At 9 ft (2.7 m) from the anchor location, there are several moveable boulders with coral colonies (*P. lobata*, *Pav. varians*, and *Poc. meandrina*). No sea grasses or invasive species were observed.

Anchor location D6

The harbor bottom within 12 ft (4 m) of proposed anchor location D5 consists of sand, rubble, and several moveable coral heads. Within the 5-ft (1.5-m) radius of the proposed anchor location, the bottom is loose rubble and has no live coral. At 6 ft (1.8 m) from the anchor location, there are several moveable boulders with coral colonies (*P. lobata*). No sea grasses or invasive species were observed.

No federally-listed (USFWS, 2012) threatened or endangered species were encountered during the survey (e.g., sea turtles, monk seal, cetaceans). No candidate species of coral for listing (NOAA-NMFS, 2010) were observed. One state protected (DLNR, 1998, 2007) species was observed in the Project vicinity: pearl oyster.

Signed,



Stacey Kilarski
AECOS Marine Biologist

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Appendix A

Inventory of aquatic biota observed in Keauhou Small Boat Harbor, March 6 & 7, 2013

PHYLUM, CLASS, ORDER, FAMILY	Common name, <i>Hawaiian name</i>	Status	Relative abundance
<i>Genus species</i>			
ALGAE			
RHODOPHYTA	RED ALGAE		
<i>Porolithon gardineri</i>	coralline algae	Ind.	O
<i>Porolithon onkodes</i>	coralline algae	Ind.	O
<i>Hydrolithon gardineri</i>		Ind.	C
<i>Hydrolithon onkodes</i>		Ind.	O
<i>Pneophyllum conicum</i>		Ind.	O
INVERTEBRATES			
SCELRACTINIA	HARD CORALS		
POCILLOPORIDAE			
<i>Pocillopora meandrina</i>	cauliflower coral	Ind.	C
<i>Pocillopora eydouxi</i>	antler coral	Ind.	O
<i>Pocillopora damicornis</i>	lace coral	Ind.	O
ACROPORIDAE			
<i>Montipora capitata</i>	rice coral	Ind.	R
PORITIDAE			
<i>Porites lobata</i>	lobe coral	Ind.	A
<i>Porites compressa</i>	finger coral	Ind.	R
AGARICIIDAE			
<i>Pavona varians</i>	corrugated coral	Ind.	O
FAVIIDAE			
<i>Leptastrea bewickensis</i>	bewick coral	Ind.	U
ANNELIDA, POLYCHAETA,			
SABELLIDAE	WORMS		
<i>Sabellastarte spectabilis</i>	feather duster worm	Ind.	U
TEREBELLIDAE			
<i>Lomia medusa</i>	Medusa spaghetti worm	Ind.	U
MOLLUSCA, GASTROPODA			
TEREBRIDAE,			
<i>Terebra guttata</i>	white-spotted auger; <i>pūpū loloa, 'oi'oi</i>	End.	R
CONIDAE			
<i>Conus sp.</i>		Ind.	U

PHYLUM, CLASS, ORDER, FAMILY	Common name, <i>Hawaiian name</i>	Status	Relative abundance
<i>Genus species</i>			
CASSIDIDAE			
<i>Cassis cornuta</i>	horned helmet; <i>pū puhi</i>	Nat.	R
HIPPONICIDAE			
<i>Hipponix imbricatus</i>	shingly hoof shells	End.	C
VERMETIDAE			
<i>Serpulorbis variabilis</i>	variable worm snail	Ind.	O
MOLLUSCA, BIVALVIA			
PTERIIDAE			
<i>Pinctada margaritifera</i>	black-lipped pearl oyster, <i>pā</i>	Ind.	O
ISOGNOMONIDAE			
<i>Isognomon perna</i>	brown purse shell, <i>nahawele</i>	Ind.	C
OSTREIDAE			
<i>Ostrea sandvicensis</i>	Hawaiian oyster	End.	C
ARTHROPODA, CRUSTACEA,			
DECOPODA			
ALPHEIDAE			
<i>Alpheus deuteropus</i>	snapping shrimp (in <i>P. lobata</i>)	Ind.	R
TRAPEZIIDAE			
<i>Trapezia sp.</i>	coral guard crab	Ind.	R
ECHINODERMATEA,			
OPHIUROIDEA			
OPHIOCOMIDAE			
<i>Ophiocoma erinaceus</i>	brittle star	Ind.	U
<i>Ophiocoma pica</i>	brittle star	Ind.	U
ECHINODERMATA,			
ECHINOIDEA			
DIADEMATIDAE			
<i>Echinothrix calamaris</i>	banded urchin	Ind.	C
ECHINOMETRIDAE			
<i>Echinometra mathaei</i>	rock-boring urchin, <i>'ina kea</i>	Ind.	C
<i>Echinometra oblonga</i>	oblong boring urchin; <i>'ina</i>	Ind.	U
<i>Heterocentrotus mammillatus</i>	red pencil urchin; <i>hā'uke'uke'ula'ula</i>	Ind.	O
TOXOPNEUSTIDAE			
<i>Tripneustes gratilla</i>	collector urchin; <i>hāwa'e maoli</i>	Ind.	A
ECHINODERMATA,			
HOLOTHUROIDEA			
<i>Holothuria atra</i>	black sea cucumber	Ind.	O

PHYLUM, CLASS, ORDER, FAMILY	Common name, <i>Hawaiian name</i>	Status	Relative abundance
<i>Genus species</i>			
VERTEBRATES			
VERTEBRATA, PICES	BONY FISHES		
FISTULARIIDAE	CORNETFISH		
<i>Fistularia commersonii</i>	bluespotted cornetfish, <i>nūnū</i>	Ind.	R
DACTYLOPTERIDAE	GURNARD		
<i>Dactyloptena orientalis</i>	oriental flying gurnard; <i>loloa'u</i>	Ind.	R
MULLIDAE	GOATFISH		
<i>Mulloidichthys vanicolensis</i>	yellowfin goatfish; <i>weke 'ula</i>	Ind.	C
<i>Mulloidichthys flavolineatus</i>	square-spot goatfish; <i>weke'ā</i>	Ind.	C
<i>Parupeneus multifasciatus</i>	manybar goatfish, <i>moano</i>	Ind.	R
CHAETODONTIDAE	BUTTERFLYFISH		
<i>Chaetodon auriga</i>	threadfin butterflyfish; <i>kikākapu</i>	Ind.	C
<i>Chaetodon lunula</i>	raccoon butterflyfish, <i>kikākapu</i>	Ind.	R
<i>Chaetodon ornatissimus</i>	ornate butterflyfish, <i>kikākapu</i>	Ind.	U
<i>Chaetodon quadrimaculatus</i>	fourspot butterflyfish, <i>lauhau</i>	Ind.	U
<i>Forcipiger flavissimus</i>	Common longnose butterflyfish, <i>lauwiliwili nukunuku</i> <i>'oi'oi</i>	Ind.	R
POMOCENTRIDAE	DAMSELFISH		
<i>Abudefduf abdominalis</i>	Hawaiian sergeant, <i>Mamo</i>	End.	O
<i>Abudefduf vaigienensis</i>	Indo-Pacific sergeant	Ind.	O
<i>Abudefduf sordidus</i>	blackspot sergeant <i>kūpipi</i>	End.	O
<i>Dascyllus albisella</i>	Hawaiian dascyllus, <i>ālo'ilo'i</i>	Ind.	C
<i>Chromis vanderbilti</i>	blackfin chromis	Ind.	O
<i>Chromis ovalis</i>	oval chromis	End.	C
<i>Plectroglyphidodon imparipennis</i>	bright-eye damselfish	Ind.	O
<i>Stegastes marginatus</i>	Hawaiian gregory	End.	O

PHYLUM, CLASS, ORDER, FAMILY	Common name, Hawaiian name	Status	Relative abundance
<i>Genus species</i>			
LABRIDAE	WRASSE		
<i>Gomphosus varius</i>	bird wrasse; <i>hīnālea</i> <i>'iwi</i>	Ind.	R
<i>Thalassoma duperrey</i>	saddle wrasse, <i>hinalea</i> <i>lauwili</i>	End.	O
BOTHIDAE			
<i>Bothus mancus</i>	flowery flounder; <i>pāki'i</i>	Ind.	R
SCARIDAE	PARROTFISH		
<i>Chlorurus spilurus</i>	bullethead parrotfish, <i>uhu</i>	Ind.	R
<i>Scarus psittacus</i>	palenose parrotfish, <i>uhu</i>	Ind.	R
ZANCLIDAE			
<i>Zanclus cornutus</i>	moorish idol; <i>kihikihi</i>	Ind.	R
ACANTHURIDAE	SURGEONFISH		
<i>Acanthurus achilles</i>	achilles tang	Ind.	C
<i>Acanthurus guttatus</i>	whitespotted surgeonfish; <i>api</i>	Ind.	C
<i>Acanthurus nigroris</i>	bluelined surgeonfish	Ind.	U
<i>Acanthurus olivaceus</i>	orangeband surgeonfish; <i>na'ena'e</i>	Ind.	C
<i>Acanthurus triostegus</i>	convict tang; <i>manini</i>	Ind.	C
<i>Ctenochaetus strigosus</i>	goldring surgeon, <i>kole</i>	Ind.	O
<i>Naso unicornis</i>	bluespine unicornfish, <i>kala</i>	Ind.	O
<i>Acanthurus guttatus</i>	whitespotted surgeonfish; <i>'api</i>	Ind.	O
<i>Acanthurus leucopareius</i>	whitebar surgeonfish; <i>māikoiko</i>	Ind.	O
<i>Acanthurus nigrofuscus</i>	brown tang, <i>mā'i'i'i</i>	Ind.	C
<i>Acanthurus nigricans</i>	goldrim tang	Ind.	O
BALISTIDAE			
<i>Rhinecanthus rectangulus</i>	wedgetail triggerfish; <i>humuhumu-</i> <i>nukunuku-ā-pua'a</i>	Ind.	R
OSTRACIIDAE	BOXFISH		
<i>Ostracion meleagris</i>	spotted boxfish; <i>moa</i>	Ind.	C
TETRAODONTIDAE			
<i>Canthigaster jactator</i>	Hawaiian whitespotted toby	End.	C
<i>Canthigaster amboinensis</i>	Ambon toby	Ind.	O
BLENNIIDAE	BLENNIES		
<i>Cirripectes obscurus</i>	gargantuan blenny, <i>pāo'o</i>	End.	R

PHYLUM, CLASS, ORDER, FAMILY	Common name, <i>Hawaiian name</i>	Status	Relative abundance
<i>Genus species</i>			
GOBIIDAE	GOBIES		
<i>Psilogobius mainlandi</i>	Hawaiian shrimp goby	End.	O
BALISTIDAE	TRIGGERFISH		
<i>Sufflamen bursa</i>	lei triggerfish; <i>humuhumu lei</i>	Ind.	R
VERTEBRATA, REPTILIA	reptiles		
CHELONIIDAE			
<i>Chelonia mydas</i>	green sea turtle, <i>honu</i>	Ind.	O

KEY TO SYMBOLS USED:

Abundance categories:

- R - Rare - only one or two individuals observed.
- U - Uncommon - several to a dozen individuals observed.
- O - Occasional - seen irregularly in small numbers
- C - Common - observed everywhere, although generally not in large numbers.
- A - Abundant - observed in large numbers and widely distributed.

Status categories:

- End - Endemic - species found only in Hawaii
- Ind. - Indigenous - species found in Hawaii and elsewhere
- Nat. - Naturalized - species were introduced to Hawaii intentionally, or accidentally.

Appendix B

Summary of the bottom composition and relative coral distribution within the 12 ft (4-m) and 5 ft (1.5 m) radii

Proposed anchor location	Within 5 ft (1.5 m) from anchor center point	5- 12 ft (1.5-4 m) from anchor center point	Other bottom composition notes
A1	Moveable <i>P. lobata</i> (50 cm)	Scattered small colonies of <i>Cyphastrea ocellina</i> (<5 cm)	Sand and loose rubble, <i>T. gratilla</i>
A2	Several large, difficult-to-move boulders with coral (<i>P. lobata</i> , <i>Poc. meandrina</i>). Several small moveable boulders with coral (<i>P. lobata</i> , <i>Poc. meandrina</i>).	Large boulders with coral (<i>P. lobata</i> , <i>Poc. spp.</i> , <i>M. capitata</i>)	Sand, loose rubble and moveable boulders with and without coral. At 12 ft from anchor location, debris with encrusting coral.
A3	Moveable <i>P. lobata</i> (60 cm); Moveable <i>Poc. meandrina</i> (15 cm)	Scattered (~8) coral colonies (<i>Poc. damicornis</i> , <i>Poc. meandrina</i> , <i>P. lobata</i>)	Sand and moveable boulders. At 8 ft from anchor location, debris with encrusting coral
A4	Moveable boulder with <i>P. lobata</i> (40 cm) and <i>Pav. varians</i> (5cm, 15 cm); Moveable boulder with <i>P. lobata</i> (15 cm, 25 cm); Moveable boulder with <i>P. lobata</i> (15 cm, 25 cm) Difficult to move <i>P. lobata</i> (25 cm)	Several large difficult-to-move boulders with coral (<i>P. lobata</i> , <i>Poc. meandrina</i> , <i>M. capitata</i>)	Sand and large boulders
A5	Limestone outcrop with large (>80 cm) colonies of <i>P. lobata</i> , and numerous colonies of <i>Pav. varians</i> (25 cm),	Limestone outcrop	Coral dominates bottom
A6	Moveable boulder with <i>P.</i>	Sand, no coral	

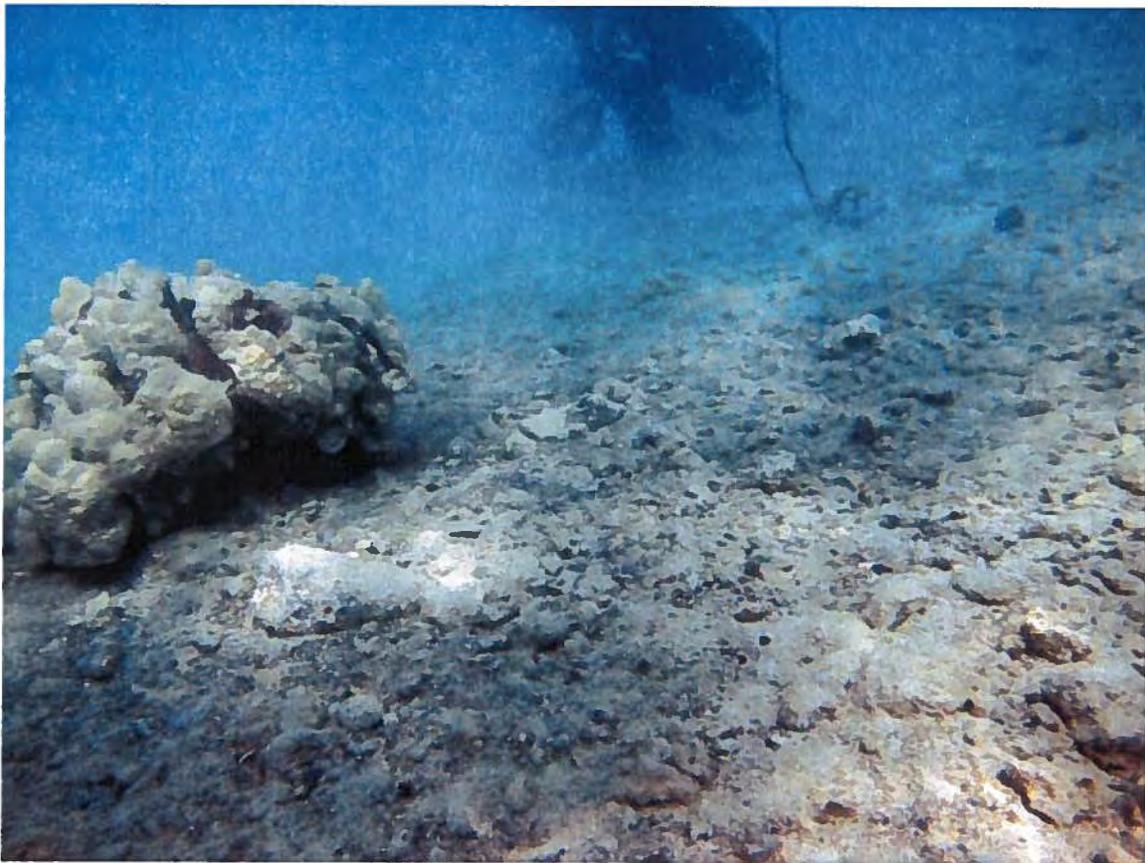
Proposed anchor location	Within 5 ft (1.5 m) from anchor center point	5- 12 ft (1.5-4 m) from anchor center point	Other bottom composition notes
	<i>lobata</i> (5 cm, 10 cm) Moveable boulder with <i>P. lobata</i> (40 cm)		
A7	Sand; no coral	Sand, scattered loose rubble; no coral	Remnant chains and anchors
A8	Sand; no coral	Limestone outcrop with high coral (NW and SE of anchor location)	
B1	Rubble and sand, no coral	Scattered loose rubble with <i>Leptastrea bewickensis</i> . Small boulder with <i>P. lobata</i> (15 cm, 10 cm and 5 cm)	Sand, loose rubble with encrusting coral
B2	Rubble and sand, no coral	Old pile horizontal on seafloor with corals: <i>Poc. meandrina</i> (10 cm), <i>Poc. damicornis</i> (5 cm) and several 30 cm <i>P. lobata</i> . Anchor line with <i>Poc. damicornis</i> (5 cm)	Rubble and sand, scattered debris (pile and anchor line) with coral growth
B3	Sand; no gravel	Limestone outcrop with high coral cover	Sand and two large limestone outcrops with high coral cover
B4	Sand, gravel and loose rubble; no coral	Sand, gravel and loose rubble; no coral	
B5	Sand and gravel; no coral	Sand and gravel and derelict boat lines; no coral	
B6	Sand and gravel; no coral	Limestone outcrop with high coral cover Debris (anchor lines, plastic buckets and rebar) with encrusting coral	

Proposed anchor location	Within 5 ft (1.5 m) from anchor center point	5- 12 ft (1.5-4 m) from anchor center point	Other bottom composition notes
C1	Sand and loose rubble. Moveable loose rubble with <i>Poc. meandrina</i> (10 cm, 10 cm), <i>Poc. damicornis</i> (10 cm)	Sand, rubble and hard bottom. Large, difficult-to-move boulders with encrusting coral (<i>Pav. varians</i>) and mound coral (<i>P. lobata</i>)	Loose rubble and boulders
C2	Sand and gravel; no coral	Several large, difficult-to-move boulders with encrusting coral (<i>Pav. varians</i> and <i>M. capitata</i>) and mound coral (<i>P. lobata</i>)	Coral, debris
C3	Sand and loose rubble; no coral	Several large, difficult-to-move boulders with encrusting coral (<i>Pav. varians</i> and <i>M. capitata</i>) and mound coral (<i>P. lobata</i>)	Coral
C4	Sand; no coral	Sand; no coral	Sand bottom extends 15 ft (4.6 m) from anchor center point
C5	Sand; no coral	Three moveable 25 cm <i>P. lobata</i> colonies	
C6	Sand, scattered loose rubble; no coral	Sand, scattered loose rubble; no coral	Sand bottom extends 14 ft (4.3 m) from anchor center point
C7	Sand, loose rubble with coral (<i>P. lobata</i> and <i>Pocillopora</i> spp.), and small (10-20 cm) <i>P. lobata</i> colonies	Sand and limestone outcrop with high coral cover	Coral
C8	Rubble and small boulders	Sand and limestone outcrop with high coral cover	Rubble and coral
D1	Sand and rubble; no coral	Sand, rubble and moveable boulders with <i>P. lobata</i> (10 cm, 20 cm)	

Proposed anchor location	Within 5 ft (1.5 m) from anchor center point	5- 12 ft (1.5-4 m) from anchor center point	Other bottom composition notes
D2	Sand, rubble and many moveable boulders with encrusting <i>P. lobata</i> (10 cm, 10 cm, 10 cm, 10 cm, 10 cm, 5 cm)	Sand, rubble and moveable boulders with coral	Many moveable boulders with coral
D3	Sand, rubble and several small, moveable boulders with <i>P. lobata</i> (20 cm). Several difficult-to-move boulders with large (80 cm) <i>P. lobata</i> colonies.	Several difficult-to-move boulders with coral (<i>P. lobata</i> , <i>Poc. meandrina</i>)	Many moveable boulders with coral Several difficult-to-move boulders with coral
D4	Sand and loose rubble; no coral	Large moveable boulder with <i>P. lobata</i> and debris with encrusting corals	Sand channel to south
D5	Sand and loose rubble; no coral	Several small moveable boulders with <i>P. lobata</i>	Sand channel to south
D6	Sand and loose rubble; no coral	Sand, loose rubble and several small boulders with <i>P. lobata</i>	Sand channel to south

Appendix C.

Photos of Keauhou Small Boat Harbor potential mooring anchor locations, March 6 & 7, 2013. Weighted vertical lines in photos represent proposed anchor center points.



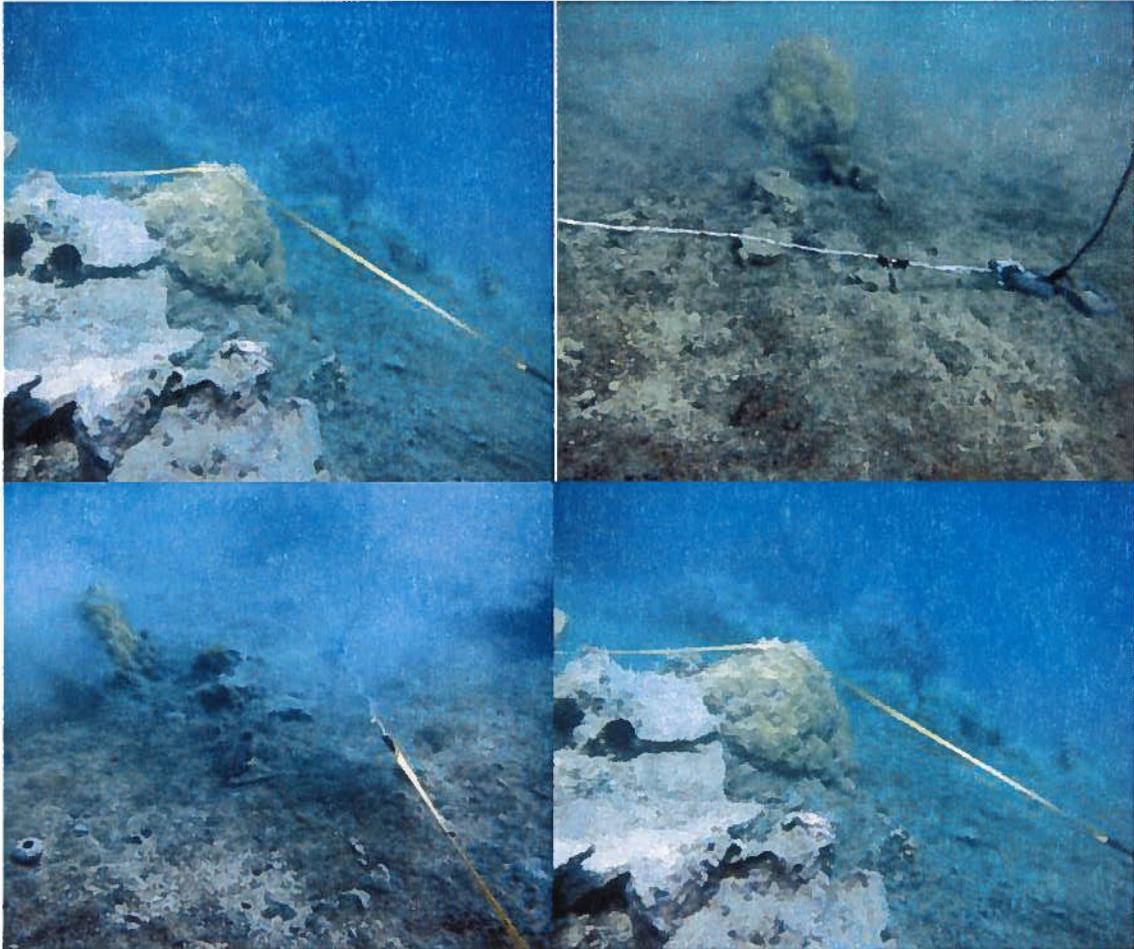
Proposed mooring anchor location A1 bottom is sand and loose rubble. One 50- cm coral colony (*Porites lobata*) is within a 5 ft (1.5 m) from proposed anchor location.



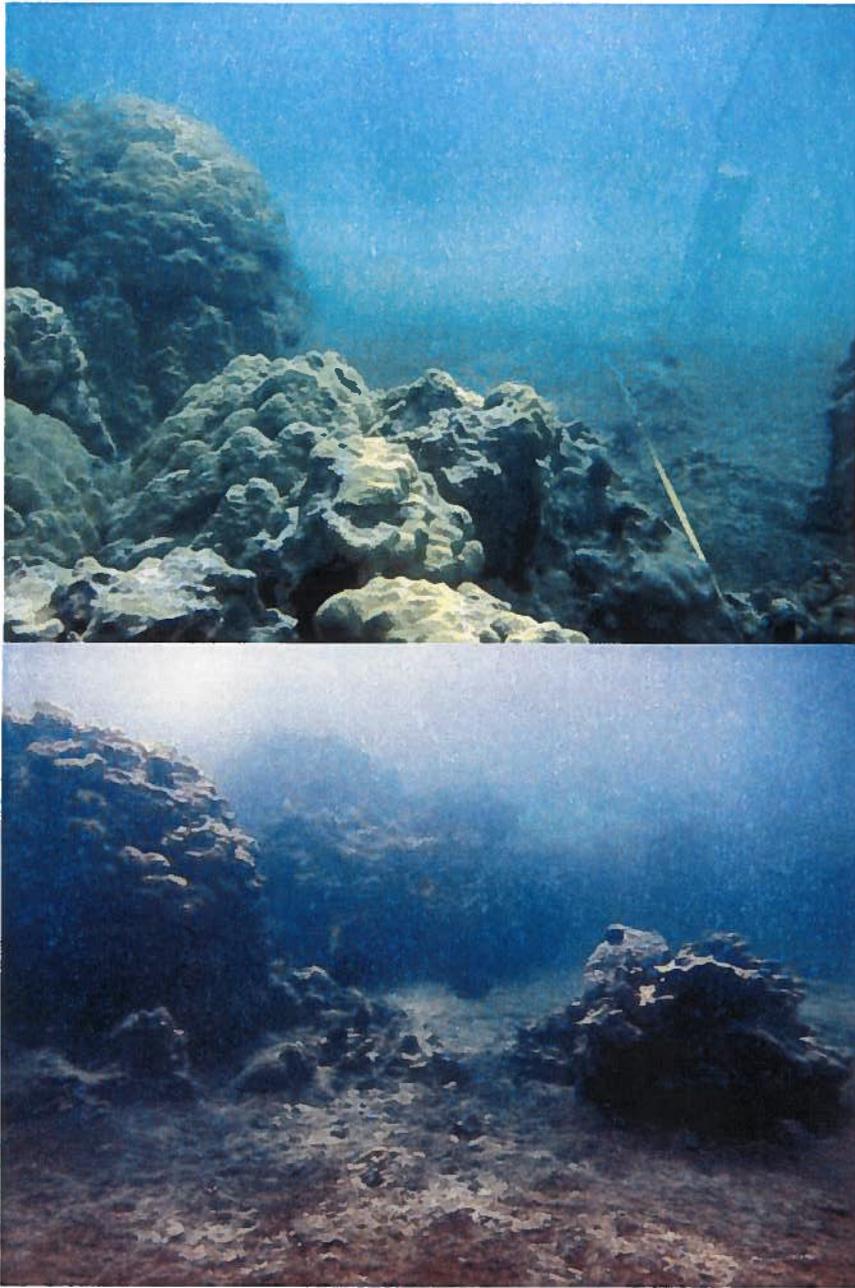
Proposed mooring anchor location A2 bottom is sand and boulders. Several large difficult-to-move boulders encrusted with coral (*P. lobata*) occur within 5 ft (1.5 m) of anchor center (top). Large boulders and debris with encrusting coral (*P. lobata* and *Poc. meandrina*) was encountered within 12 ft (4 m) of anchor center (bottom)



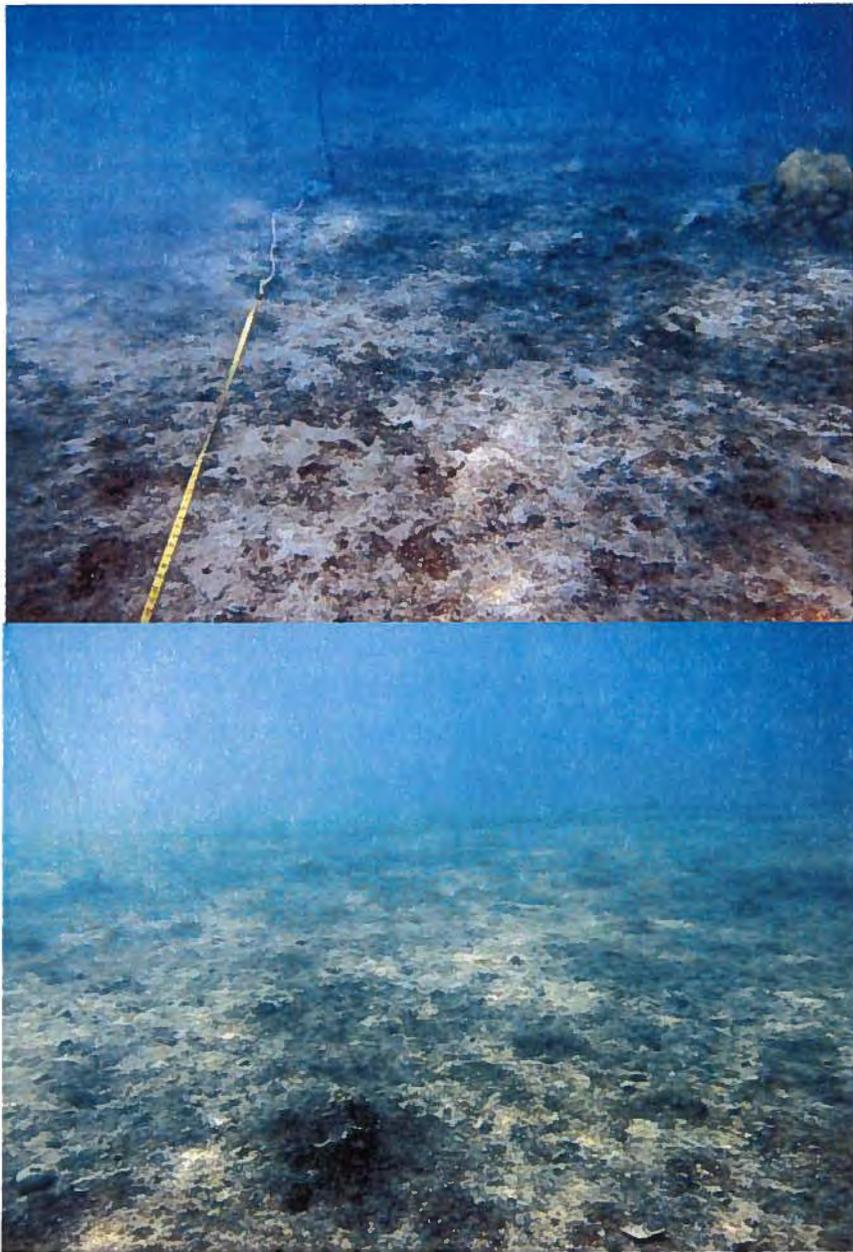
Proposed mooring anchor location A3 bottom is sand and boulders (top). One moveable, 60-cm mound coral (*P. lobata*) and moveable 15-cm branching *Poc. meandrina* occur within 5 ft (1.5 m) from the anchor center point (bottom).



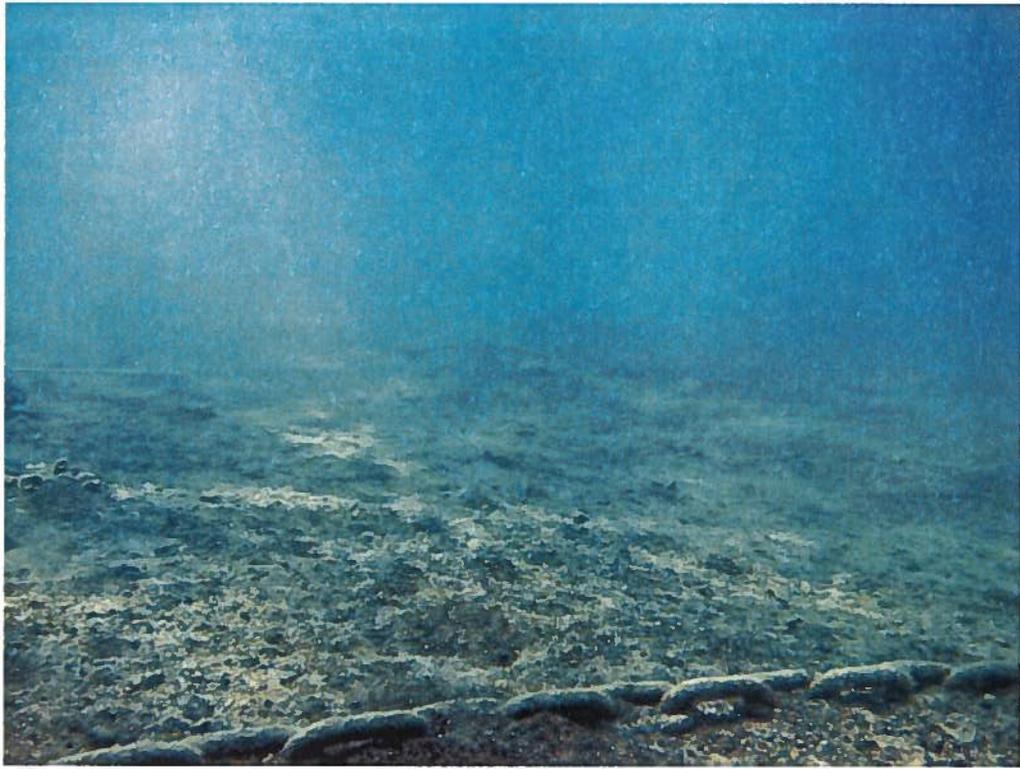
Proposed mooring anchor location A4 bottom is sand and many boulders with coral (*P. lobata*, *Poc. spp.*).



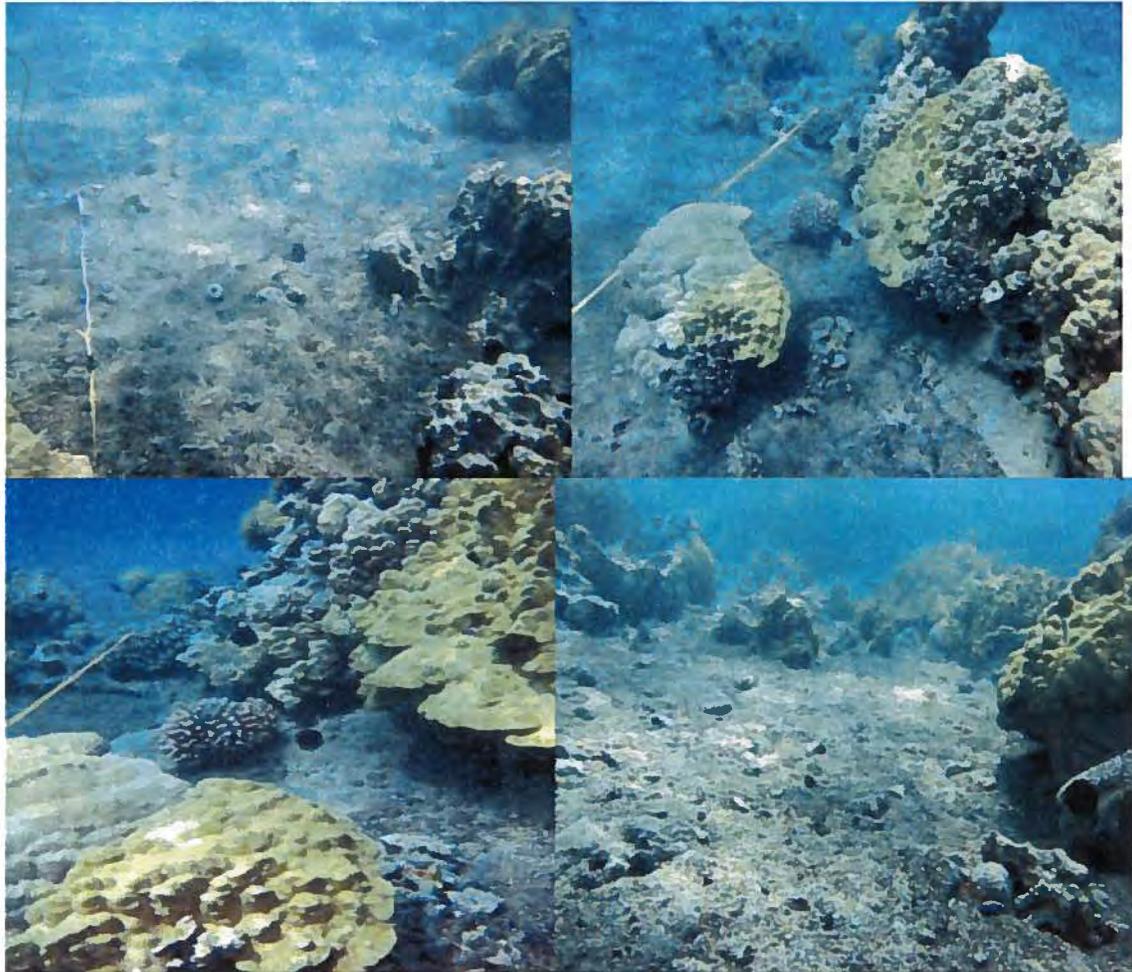
Proposed mooring anchor location A5 bottom is sand with several limestone outcrops with high coral cover.



Within 5 ft (1.5 m) of the proposed mooring anchor location A6 bottom is sand with few moveable boulders with coral (top). Sand dominates the bottom beyond the 5-ft (1.5 m) radius.



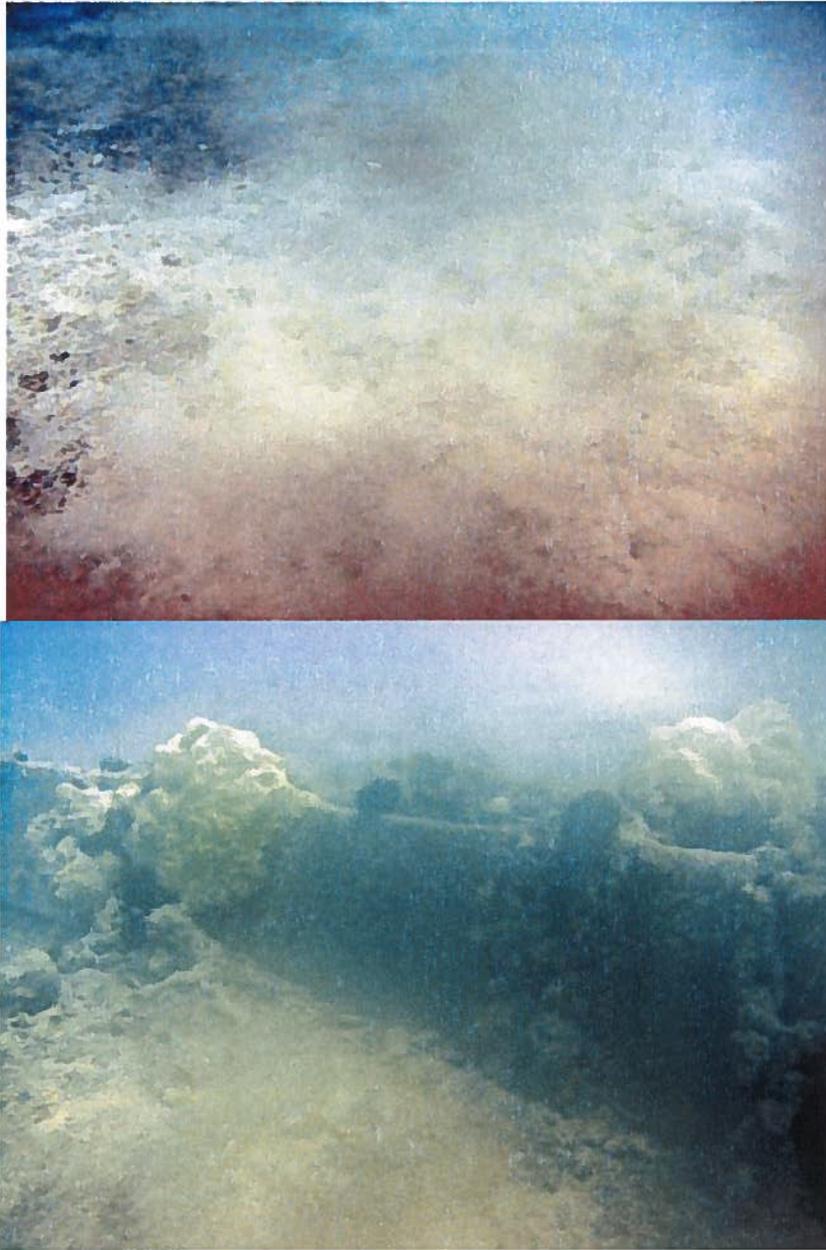
Proposed mooring anchor location A7 bottom is sand and gravel, with several remnant chains and anchors.



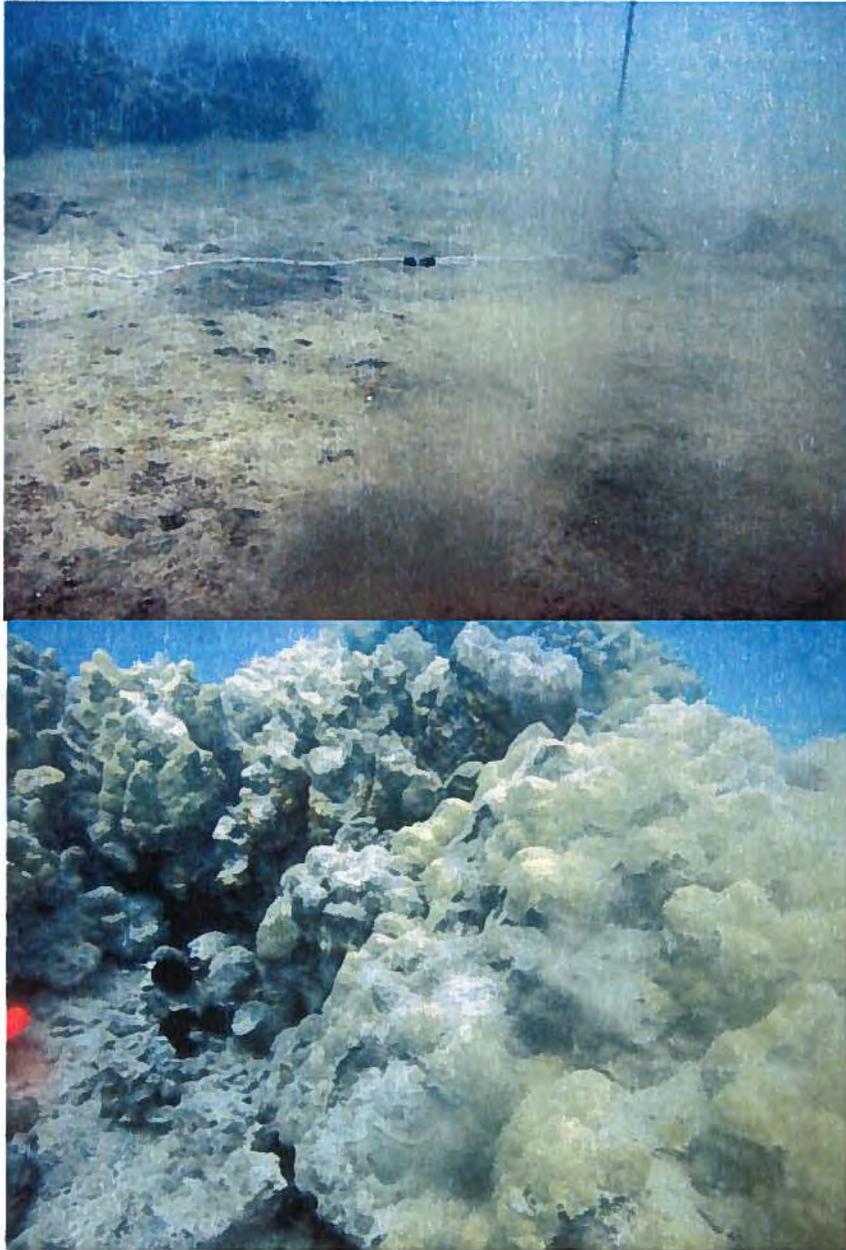
Within 5 ft (1.5 m) of the proposed mooring anchor location A8 is sand (top, left). Beyond 5 ft (1.5 m) of the anchor location, large limestone outcrops with high coral cover occur (top right and bottom).



Within 5 ft (1.5 m) of the proposed mooring anchor location B1, the bottom is loose rubble and sand; no coral observed (top). Scattered rubble with encrusting *L. bewickensis* colonies and one boulder with several colonies of *P. lobata* occur within 12 ft (4 m) of the anchor location (bottom).



Within 5 ft (1.5 m) of the proposed mooring anchor location B2, the bottom is loose rubble and sand (top). Within 12 ft (4 m) of the anchor location, an old pier pile with several coral colonies (*P. lobata*, *Pocillopora* spp.) was encountered..



Within 5 ft (1.5 m) of the proposed mooring anchor location B3, the bottom is sand and no coral (top). Beyond 5 ft (1.5 m) of the anchor location, large limestone outcrops with high coral cover occur (bottom).



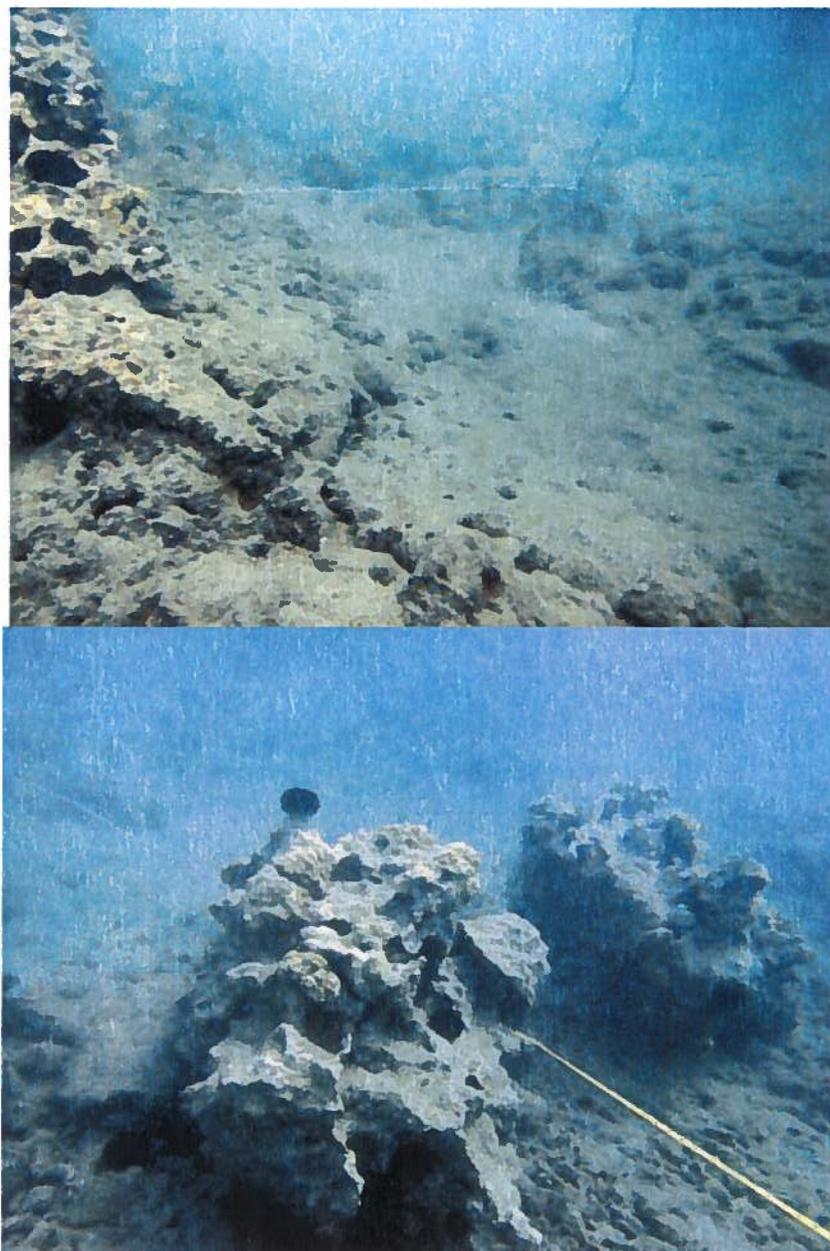
Within 12 ft (4 m) of the proposed mooring anchor location B4, the bottom is sand and gravel. No corals were observed.



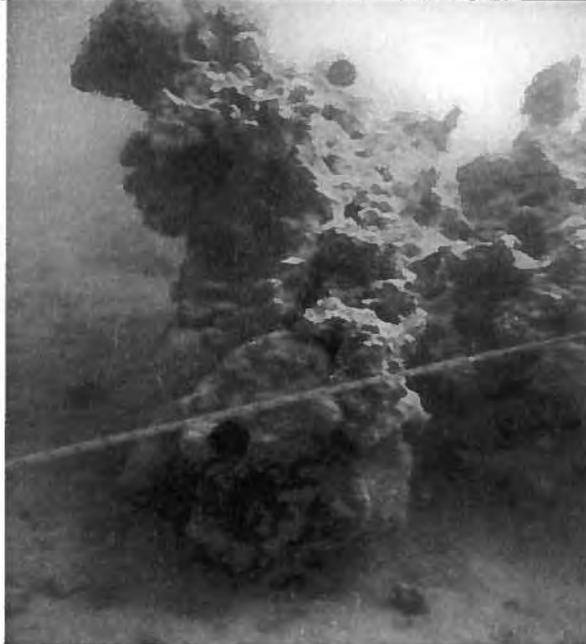
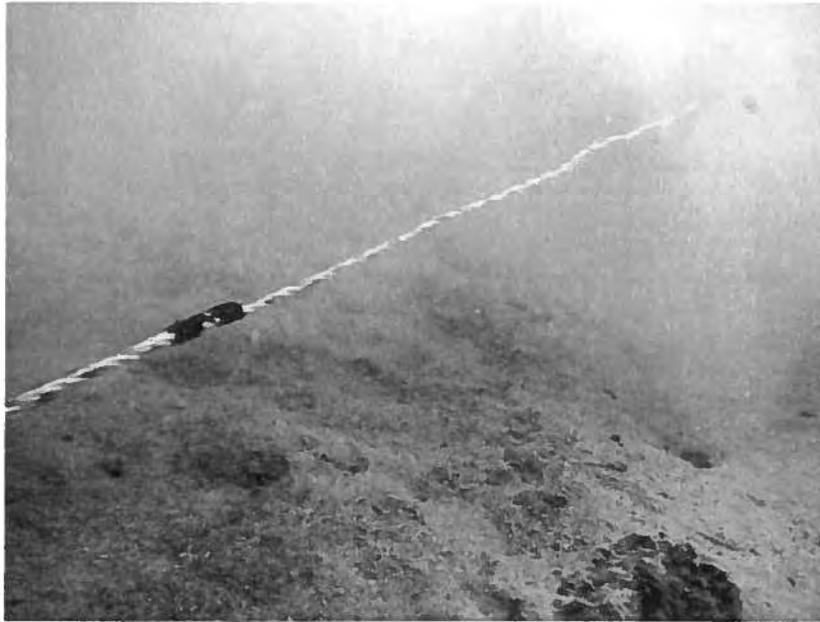
Within 12 ft (4 m) of the proposed mooring anchor location B5, the bottom is sand and gravel. No corals were observed. At 12 ft (4 m) from the anchor location, a pile of derelict boat lines lies on the seafloor.



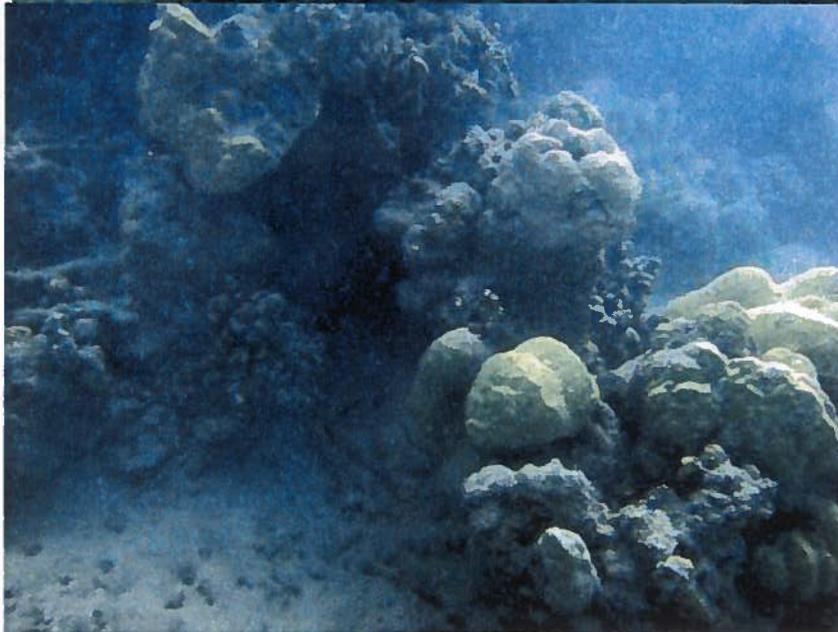
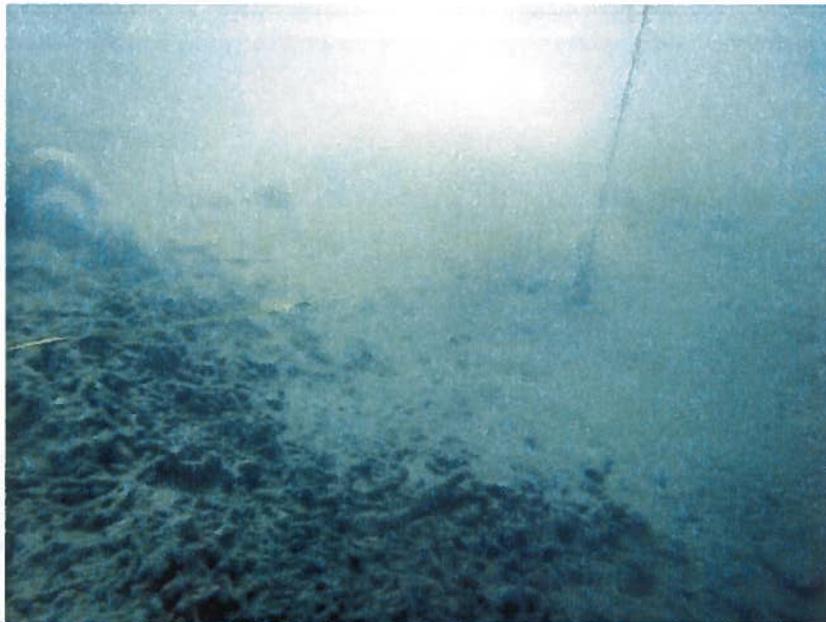
Within 5 ft (1.5 m) of the proposed mooring anchor location B6, the bottom is sand and no coral (top). Beyond 5 ft (1.5 m) of the anchor location there is a limestone outcrop with high coral cover (bottom, left) and pile of debris (plastic buckets and anchor lines) with coral growth (bottom, right).



Within 5 ft (1.5 m) of the proposed mooring anchor location C1, the bottom is sand and loose rubble with small (<10 cm) corals (top). Beyond 5 ft (1.5 m) of the anchor location, limestone outcrops with coral colonies occur (bottom).



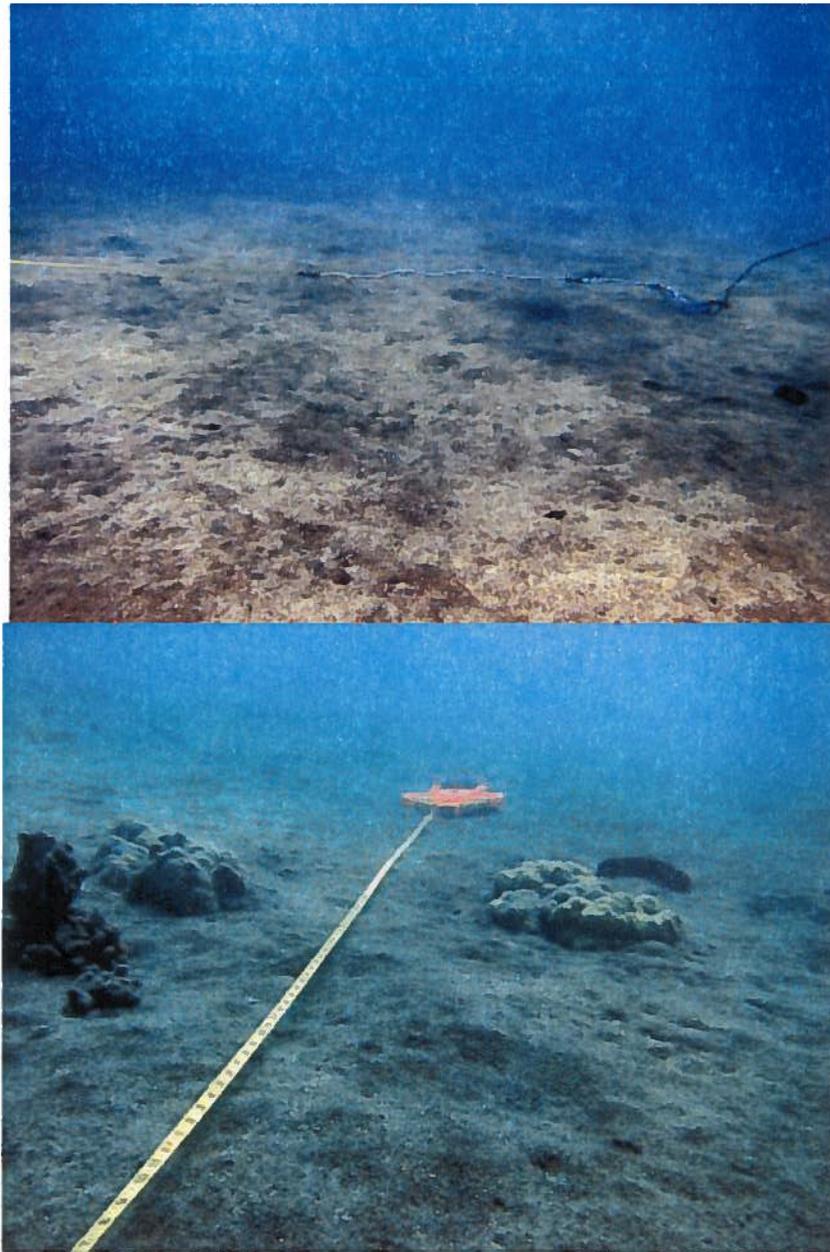
Within 5 ft (1.5 m) of the proposed mooring anchor location C2, the bottom is sand; no corals observed (top). Beyond 5 ft (1.5 m) of the anchor location, several limestone outcrops with coral are present (bottom).



Within 5 ft (1.5 m) of the proposed mooring anchor location C3, the bottom is sand and loose rubble; no corals observed (top). Beyond 5 ft (1.5 m) of the anchor location, large limestone outcrops with high coral cover occur (bottom).



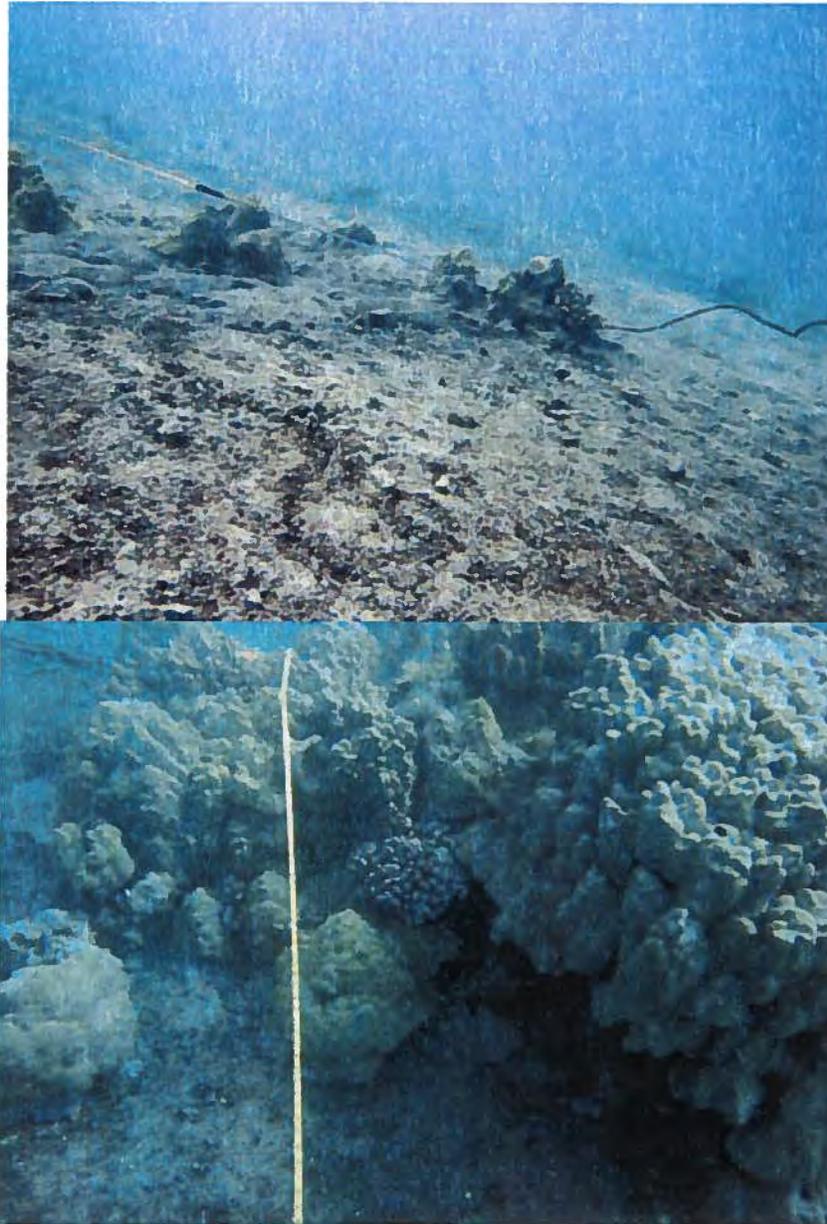
Within 12 ft (4 m) of the proposed mooring anchor location C4, the bottom is sand and gravel. No corals were observed.



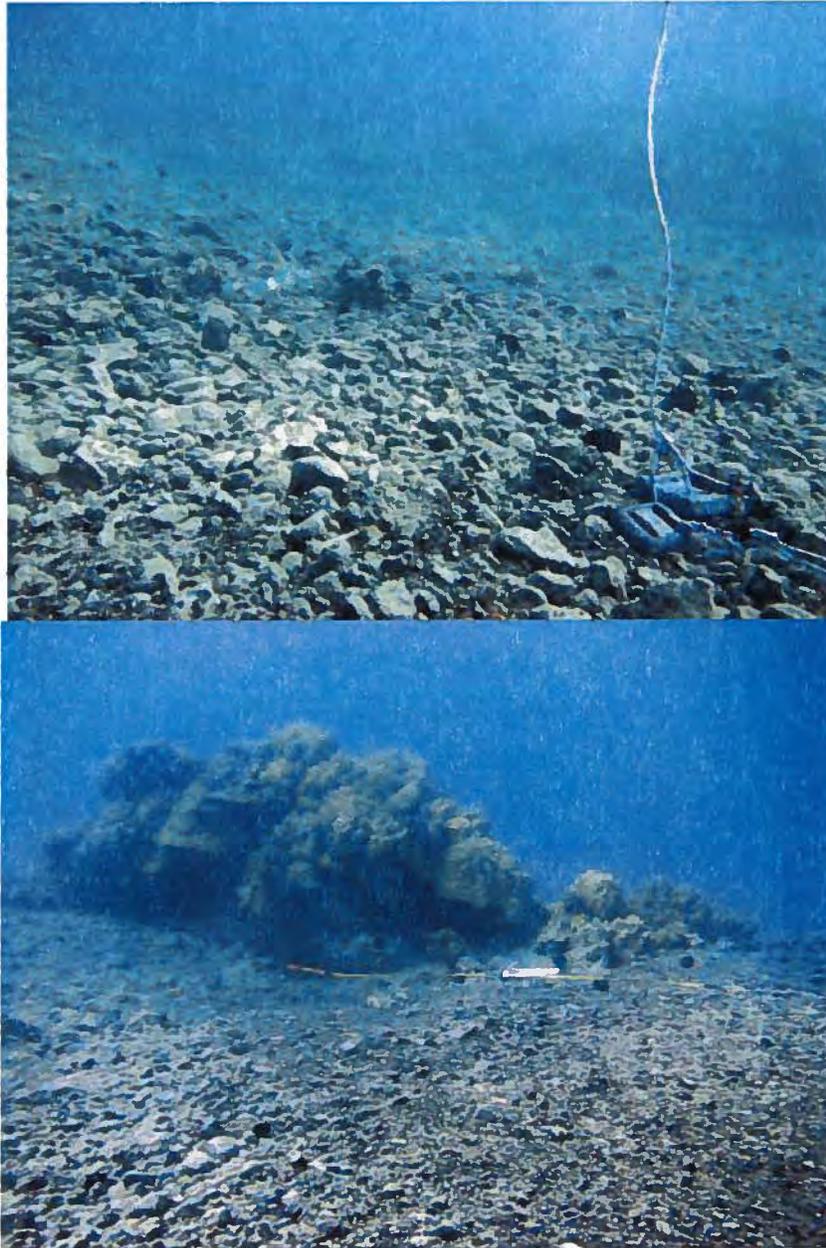
Within 5 ft (1.5 m) of the proposed mooring anchor location C5, the bottom is sand; no corals observed (top). Beyond 5 ft (1.5 m) of the anchor location, several small boulders and 25 cm *P. lobata* colonies encountered (bottom).



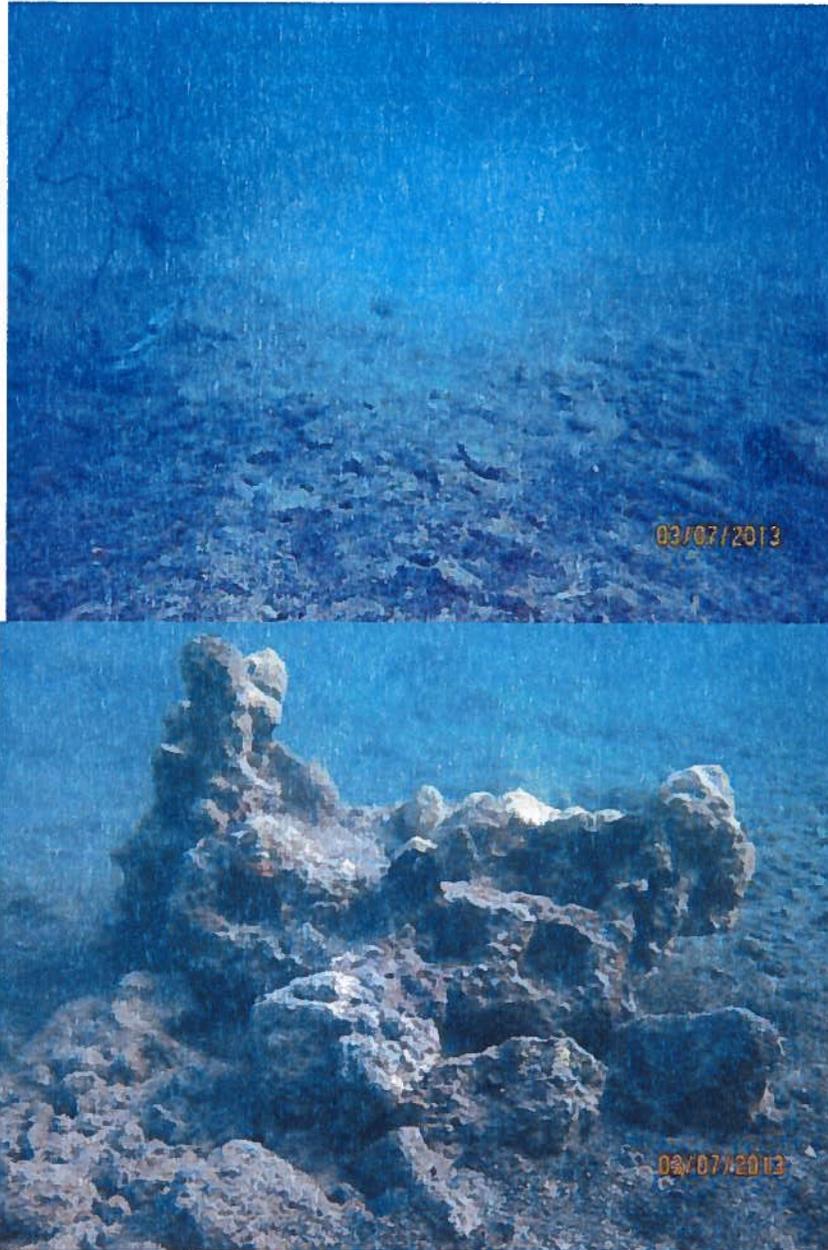
Within 12 ft (4 m) of the proposed mooring anchor location C6, the bottom is sand and loose gravel. No corals were observed.



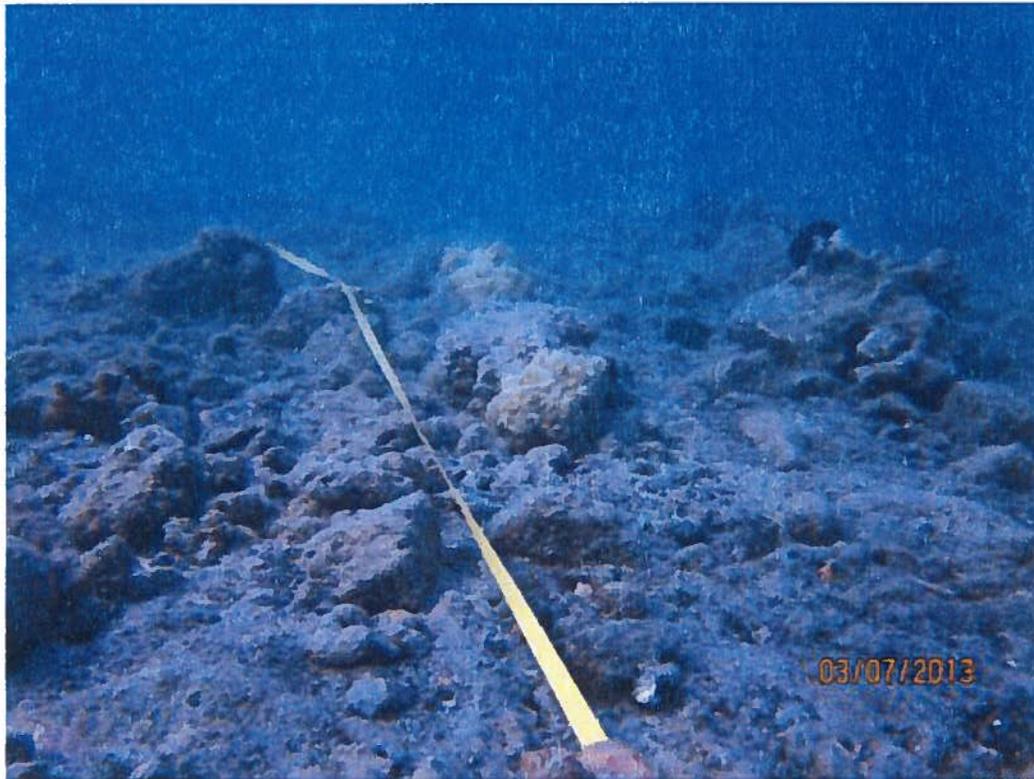
Within 5 ft (1.5 m) of the proposed mooring anchor location C7, the bottom is sand and several small *P. lobata* colonies (top). Beyond 5 ft (1.5 m) of the anchor location, a large limestone outcrop with high coral cover was encountered (bottom).



Within 5 ft (1.5 m) of the proposed mooring anchor location C8, the bottom is rubble and no corals (top). Beyond 5 ft (1.5 m) of the anchor location, a limestone outcrop with high coral cover is present (bottom).



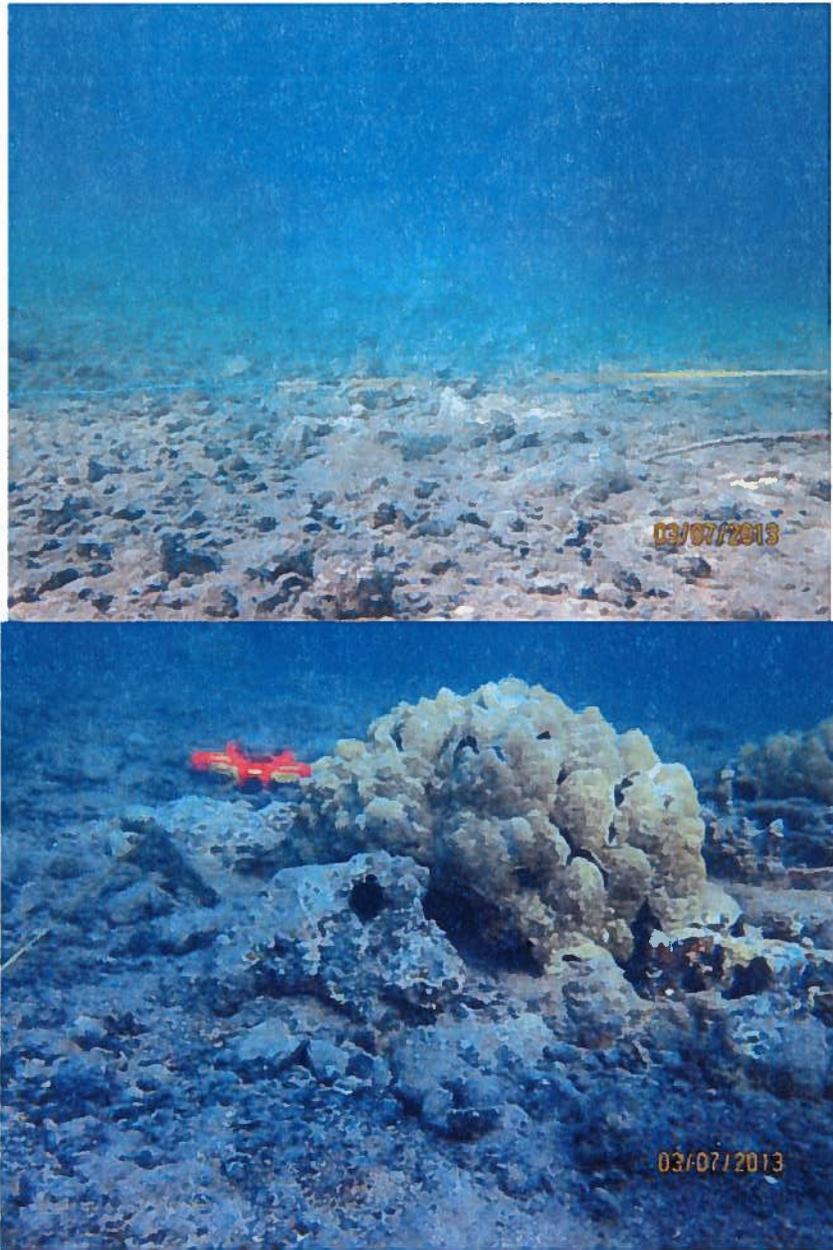
Within 5 ft (1.5 m) of the proposed mooring anchor location D1, the bottom is rubble and no corals (top). Beyond 5 ft (1.5 m) of the anchor location, several moveable boulders with encrusting coral colonies (*P. lobata*) were encountered (bottom).



Within 12 ft (4 m) of the proposed mooring anchor location D2, the bottom is sand, loose rubble and small moveable boulders with *P. lobata* coral colonies.



Within 12 ft (4 m) of the proposed mooring anchor location D3, the bottom is sand, loose rubble and many small moveable boulders with *P. lobata* coral colonies and several large difficult-to-move boulders with corals (*P. lobata*, *Poc. meandrina*, *Poc. eydouxi*).



Within 5 ft (1.5 m) of the proposed mooring anchor location D4, the bottom is rubble and no corals (top). Beyond 5 ft (1.5 m) of the anchor location, a large moveable boulder with *P. lobata* was encountered (bottom).



Within 5 ft (1.5 m) of the proposed mooring anchor location D5, the bottom is rubble and no corals. Beyond 5 ft (1.5 m) of the anchor location, several moveable boulders with encrusting *P. lobata* and *Pav. varians* were encountered.



Within 5 ft (1.5 m) of anchor location D6, the bottom is sand and no corals. Beyond 5 ft (1.5 m) of the anchor location, several small moveable boulders with *P. lobata* were encountered (bottom).



AECOS, Inc.

45-939 Kamehameha Hwy, Suite 104

Kāne'ohe, Hawai'i 96744

Phone: (808) 234-7770 Fax: (808) 234-7775

Email: aecos@aecos.com

June 19, 2013

AECOS No. 1347B

To: Chris Goody
Sea Engineering Inc.

Marine resources survey of Keauhou Small Boat Harbor, Keauhou, Hawai'i

On March 6 and 7, 2013, AECOS biologist, Stacey Kilarski, conducted a reconnaissance survey in Keauhou Small Boat Harbor (KBH). The SCUBA survey was performed to assess marine resources at twenty-eight proposed mooring anchor locations (AECOS, 2013). Since that report, two additional mooring locations were proposed and adjustments made to row B mooring locations. Figure 1 presents the latest mooring plan. On June 12, 2013, a survey was conducted to assess the marine resources at these new locations. Surveyed were four anchor locations (labeled 1 through 4) in row W and six anchor locations (labeled 1 through 6) in row B'.

The survey encompassed the harbor bottom in an approximate 12-ft (4-m) radius centered on each proposed mooring anchor location. Based on likely mooring design, a 5-ft (1.5-m) swath of chain would rest on the seafloor at each anchor location (Goody, pers. comm. 2013). Therefore, the biologist noted any corals (visual size estimate, morphology, and ease of removal) within a 5-ft (1.5-m) radius from the center of each mooring location.

An inventory was made for any corals, invasive species, seagrass, marine protected species (DLNR, 1998, 2007; NOAA-NMFS, 2010; USFWS, 2008, 2012), and other non-coral macro-invertebrates at each mooring anchor location. A list of species observed and their relative abundances is presented as Appendix A. A summary of the bottom composition, including coral distribution within the 12-ft (4-m) and 5-ft (1.5-m) radii is provided in Appendix B. Photos taken at each mooring anchor location are presented in Appendix C. Photos of the bottom show a horizontal transect line representing a distance out from the anchor center point of 12 ft (4 m).

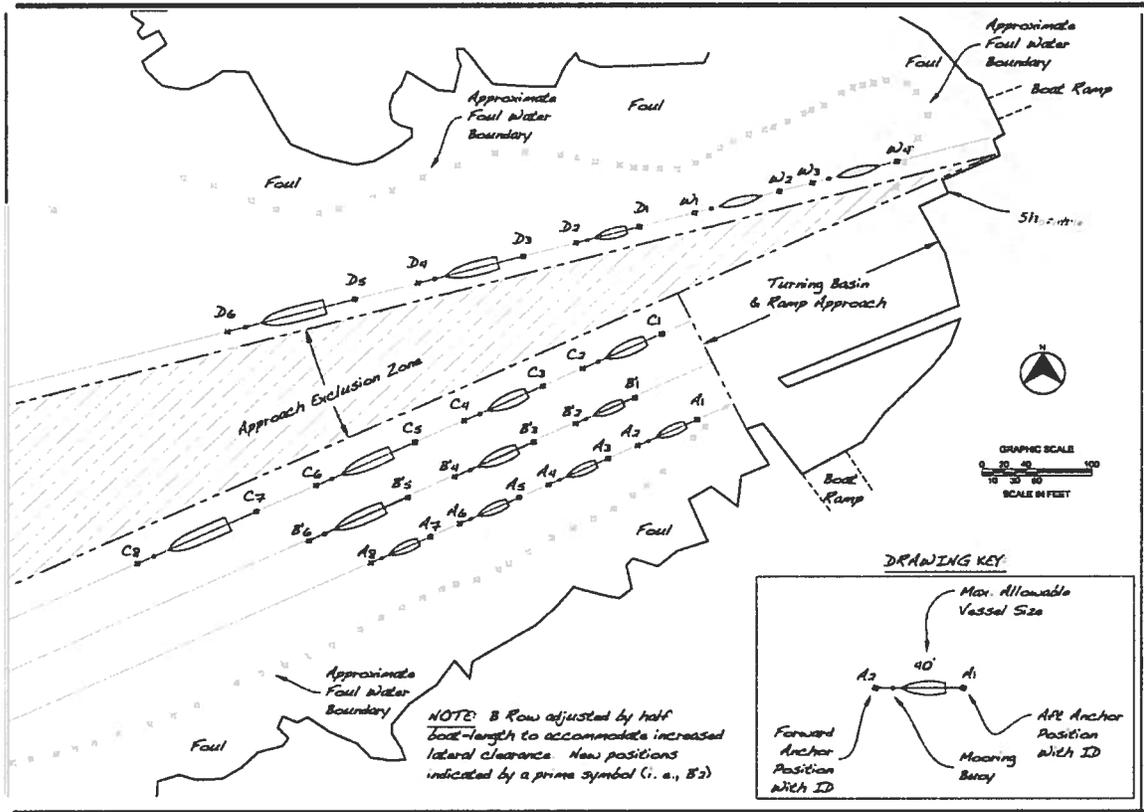


Figure 1. Revised Keauhou Harbor proposed mooring locations. Our June 12, 2013 survey included anchor locations W1 through W4 and row B'.

Anchor location W1

The harbor bottom within a 12-ft (4-m) radius of the proposed mooring anchor location W1 consists of sand and loose rubble, and scattered small boulders. No corals were encountered within the 5-ft (1.5-m) radius of the anchor location. Beyond the 5-ft (1.5 m) radial distance, moveable boulders and loose rubble host some coral (*Pocillopora meandrina*). Collector urchins (*Tripneustes gratilla*) are common. No sea grasses or invasive species were observed.

Anchor location W2

The harbor bottom within a 12-ft (4-m) radius of anchor location W2 consists of sand, loose rubble, and scattered large boulders. No corals were encountered within 5 ft (1.5 m) of the anchor location. Beyond 5 ft (1.5 m), large boulders and loose rubble host other corals (*P. lobata*, *Poc. damicornis*, and *Pavona varians*). No sea grasses or invasive species were observed.

Anchor location W3

The harbor bottom within 12 ft (4-m) of proposed anchor location W3 consists of sand and small boulders. No corals were encountered within 5 ft (1.5 m) from the anchor location. Beyond 5 ft (1.5 m) occur several large, difficult-to-move boulders with encrusting coral colonies (*P. lobata* and *Montipora capitata*). One oriental flying gurnard (*Dactyloptena orientalis*) was seen foraging on the bottom. No sea grasses or invasive species were observed.

Anchor location W4

The harbor bottom within 12 ft (4 m) of proposed anchor location W4 consists of, gravel, loose rubble and small boulders. Within 5 ft (1.5 m) of the anchor location, no corals were encountered. Urchins (*T. gratilla*) are abundant. Beyond 5 ft (1.5 m) occur several moveable boulders with encrusting coral colonies (*P. lobata*). No sea grasses or invasive species were observed.

Anchor location B'1

The harbor bottom within 12 ft (4 m) of proposed anchor location B'1 consists of sand, gravel and scattered outcrops with coral cover. One moveable colony of *Pocillopora meandrina* (10 cm) was encountered within the 5-ft (1.5-m) radius of the anchor location. Beyond the 5-ft (1.5 m) radial distance, boulders and loose rubble host some coral (*Porites lobata*). At 12 ft (4 m) northwest from the anchor location, an old concrete pile lies horizontal on the seafloor. Corals (*P. lobata*, *Poc. meandrina*, and *Poc. damicornis*) encrust the pile. Collector urchins (*Tripneustes gratilla*) are common. No sea grasses or invasive species were observed.

Anchor location B'2

The harbor bottom within 12 ft (4 m) of proposed anchor location B'2 consists of sand and scattered boulders. Moveable boulders with corals (*P. lobata*.) were encountered within 5 ft (1.5 m) of the anchor location. One large (10-ft; 3-m) limestone outcrop occurs 11 ft (3.3 m) northeast from the anchor location. One large (>80 cm) *P. lobata* colony and *M. capitata*, *Pav. varians*, and *Pocillopora* spp. colonies are common on the outcrops. No sea grasses or invasive species were observed.

Anchor location B'3

The harbor bottom within 12 ft (4 m) of proposed anchor location B'3 consists of sand loose rubble with coral cover. One moveable colony of *P. lobata* (50 cm) occurs within 5 ft (1.5 m) of the anchor location. The bottom beyond 5 ft (1.5 m) is all sand out to 12 ft (4 m). A spotted eagle ray (*Aetobatus narinari*) was seen foraging on the sand bottom. No sea grasses or invasive species were observed.

Anchor location B'4

The harbor bottom within 12 ft (4 m) of proposed anchor location B'4 consists of sand. No corals occur within the 5 ft (1.5 m) of the anchor location. Beyond 5

ft (1.5 m) occur several moveable boulders with encrusting coral colonies (*P. lobata*). No sea grasses or invasive species were observed.

Anchor location B'5

The harbor bottom within 12 ft (4 m) of proposed anchor location B'5 consists of sand, gravel, and rubble. No coral colonies were encountered within 5 ft (1.5 m) of the proposed anchor location. Beyond 5 ft (1.5 m) occur several moveable boulders with encrusting coral colonies (*P. lobata*). At 12 ft (4 m) from the anchor location, a pile of derelict boat lines lies on the seafloor. No sea grasses or invasive species were observed

Anchor location B'6

The harbor bottom within 12 ft (4 m) of proposed anchor location B'6 consists of sand, gravel and rubble. No coral colonies were encountered within 5 ft (1.5 m) of the proposed anchor location. Beyond 5 ft (1.5 m) occur several small, moveable boulders with encrusting coral colonies (*P. lobata* and *Poc. damicornis*). No sea grasses or invasive species were observed.

No federally-listed (USFWS, 2012) threatened or endangered species were encountered during the June 12, 2013 survey (e.g., sea turtles, monk seal, cetaceans). No candidate species of coral for listing (NOAA-NMFS, 2010) were observed.

Signed,



Stacey Kilarski
AECOS Marine Biologist

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Appendix A

Inventory of aquatic biota observed in Keauhou Small Boat Harbor, March 6 & 7, 2013 and June 12, 2013.

PHYLUM, CLASS, ORDER, FAMILY <i>Genus species</i>	Common name, <i>Hawaiian name</i>	Status	Relative abundance
ALGAE			
RHODOPHYTA			
RED ALGAE			
<i>Porolithon gardineri</i>	coralline algae	Ind.	O
<i>Porolithon onkodes</i>	coralline algae	Ind.	O
<i>Hydrolithon gardineri</i>	coralline algae	Ind.	C
<i>Hydrolithon onkodes</i>	coralline algae	Ind.	O
<i>Pneophyllum conicum</i>	coralline algae	Ind.	O
INVERTEBRATES			
SCELRACTINIA			
HARD CORALS			
POCILLOPORIDAE			
<i>Pocillopora meandrina</i>	cauliflower coral	Ind.	C
<i>Pocillopora eydouxi</i>	antler coral	Ind.	O
<i>Pocillopora damicornis</i>	lace coral	Ind.	O
ACROPORIDAE			
<i>Montipora capitata</i>	rice coral	Ind.	R
PORITIDAE			
<i>Porites lobata</i>	lobe coral	Ind.	A
<i>Porites compressa</i>	finger coral	Ind.	R
AGARICIIDAE			
<i>Pavona varians</i>	corrugated coral	Ind.	O
FAVIIDAE			
<i>Leptastrea bewickensis</i>	bewick coral	Ind.	U
ANNELIDA, POLYCHAETA,			
SABELLIDAE			
WORMS			
<i>Sabellastarte spectabilis</i>	feather duster worm	Ind.	U
TEREBELLIDAE			
<i>Lomia medusa</i>	Medusa spaghetti worm	Ind.	U
MOLLUSCA, GASTROPODA			
TEREBRIDAE,			
<i>Terebra guttata</i>	white-spotted auger; <i>pūpū loloa, 'oi'oi</i>	End.	R
CONIDAE			
<i>Conus sp.</i>		Ind.	U

PHYLUM, CLASS, ORDER, FAMILY <i>Genus species</i>	Common name, <i>Hawaiian name</i>	Status	Relative abundance
CASSIDIDAE <i>Cassis cornuta</i>	horned helmet; <i>pū puhi</i>	Nat.	R
HIPPONICIDAE <i>Hipponix imbricatus</i>	shingly hoof shells	End.	C
VERMETIDAE <i>Serpulorbis variabilis</i>	variable worm snail	Ind.	O
MOLLUSCA, BIVALVIA PTERIIDAE <i>Pinctada margaritifera</i>	black-lipped pearl oyster, <i>pā</i>	Ind.	O
ISOGNOMONIDAE <i>Isognomon perna</i>	brown purse shell, <i>nahawele</i>	Ind.	C
OSTREIDAE <i>Ostrea sandvicensis</i>	Hawaiian oyster	End.	C
ARTHROPODA, CRUSTACEA, DECOPODA ALPHEIDAE <i>Alpheus deuteropus</i>	snapping shrimp (in <i>P. lobata</i>)	Ind.	R
TRAPEZIIDAE <i>Trapezia</i> sp.	coral guard crab	Ind.	R
ECHINODERMATEA, OPHIUROIDEA OPHIOCOMIDAE <i>Ophiocoma erinaceus</i>	brittle star	Ind.	U
<i>Ophiocoma pica</i>	brittle star	Ind.	U
ECHINODERMATA, ECHINOIDEA DIADEMATIDAE <i>Echinothrix calamaris</i>	banded urchin	Ind.	C
ECHINOMETRIDAE <i>Echinometra mathaei</i>	rock-boring urchin, <i>'ina kea</i>	Ind.	C
<i>Echinometra oblonga</i>	oblong boring urchin; <i>'ina</i>	Ind.	U
<i>Heterocentrotus mammillatus</i>	red pencil urchin; <i>hā'uke'uke'ula'ula</i>	Ind.	O
TOXOPNEUSTIDAE <i>Tripneustes gratilla</i>	collector urchin; <i>hāwa'e maoli</i>	Ind.	A

PHYLUM, CLASS, ORDER, FAMILY <i>Genus species</i>	Common name, <i>Hawaiian name</i>	Status	Relative abundance
ECHINODERMATA, HOLOTHUROIDEA	SEA CUCUMBERS		
<i>Holothuria atra</i>	black sea cucumber	Ind.	O
	VERTEBRATES		
VERTEBRATA, PICES	BONY FISHES		
FISTULARIIDAE	CORNETFISH		
<i>Fistularia commersonii</i>	bluespotted cornetfish, <i>nūnū</i>	Ind.	R
DACTYLOPTERIDAE	GURNARD		
<i>Dactyloptena orientalis</i>	oriental flying gurnard; <i>loloa'u</i>	Ind.	R
MULLIDAE	GOATFISH		
<i>Mulloidichthys vanicolensis</i>	yellowfin goatfish; <i>weke 'ula</i>	Ind.	C
<i>Mulloidichthys flavolineatus</i>	square-spot goatfish; <i>weke'ā</i>	Ind.	C
<i>Parupeneus multifasciatus</i>	manybar goatfish, <i>moano</i>	Ind.	R
CHAETODONTIDAE	BUTTERFLYFISH		
<i>Chaetodon auriga</i>	threadfin butterflyfish; <i>kīkākāpu</i>	Ind.	C
<i>Chaetodon lunula</i>	raccoon butterflyfish, <i>kīkākāpu</i>	Ind.	R
<i>Chaetodon ornatissimus</i>	ornate butterflyfish, <i>kīkākāpu</i>	Ind.	U
<i>Chaetodon quadrimaculatus</i>	fourspot butterflyfish, <i>lauhau</i>	Ind.	U
<i>Forcipiger flavissimus</i>	Common longnose butterflyfish, <i>lauwiliwili nukunuku</i> <i>'oi'oi</i>	Ind.	R
POMOCENTRIDAE	DAMSELFISH		
<i>Abudefduf abdominalis</i>	Hawaiian sergeant, <i>Mamo</i>	End.	O
<i>Abudefduf vaigienensis</i>	Indo-Pacific sergeant	Ind.	O
<i>Abudefduf sordidus</i>	blackspot sergeant <i>kūpīpī</i>	End.	O
<i>Dascyllus albisella</i>	Hawaiian dascyllus, <i>ālo'ilo'i</i>	Ind.	C
<i>Chromis vanderbilti</i>	blackfin chromis	Ind.	O
<i>Chromis ovalis</i>	oval chromis	End.	C
<i>Plectroglyphidodon imparipennis</i>	bright-eye damselfish	Ind.	O
<i>Stegastes marginatus</i>	Hawaiian gregory	End.	O

PHYLUM, CLASS, ORDER, FAMILY <i>Genus species</i>	Common name, <i>Hawaiian name</i>	Status	Relative abundance
LABRIDAE	WRASSE		
<i>Gomphosus varius</i>	bird wrasse; <i>hīnālea</i> <i>‘iwi</i>	Ind.	R
<i>Thalassoma duperrey</i>	saddle wrasse, <i>hinalea</i> <i>lauwili</i>	End.	O
BOTHIDAE			
<i>Bothus mancus</i>	flowery flounder; <i>pāki‘i</i>	Ind.	R
SCARIDAE	PARROTFISH		
<i>Chlorurus spilurus</i>	bullethead parrotfish, <i>uhu</i>	Ind.	R
<i>Scarus psittacus</i>	palenose parrotfish, <i>uhu</i>	Ind.	R
ZANCLIDAE			
<i>Zanclus cornutus</i>	moorish idol; <i>kihikihi</i>	Ind.	R
ACANTHURIDAE	SURGEONFISH		
<i>Acanthurus achilles</i>	achilles tang	Ind.	C
<i>Acanthurus guttatus</i>	whitespotted surgeonfish; <i>api</i>	Ind.	C
<i>Acanthurus nigroris</i>	bluelined surgeonfish	Ind.	U
<i>Acanthurus olivaceus</i>	orangeband surgeonfish; <i>na‘ena‘e</i>	Ind.	C
<i>Acanthurus triostegus</i>	convict tang; <i>manini</i>	Ind.	C
<i>Ctenochaetus strigosus</i>	goldring surgeon, <i>kole</i>	Ind.	O
<i>Naso unicornis</i>	bluespine unicornfish, <i>kala</i>	Ind.	O
<i>Acanthurus guttatus</i>	whitespotted surgeonfish; <i>‘api</i>	Ind.	O
<i>Acanthurus leucopareius</i>	whitebar surgeonfish; <i>māikoiko</i>	Ind.	O
<i>Acanthurus nigrofuscus</i>	brown tang, <i>mā‘i‘i</i>	Ind.	C
<i>Acanthurus nigricans</i>	goldrim tang	Ind.	O
BALISTIDAE			
<i>Rhinecanthus rectangulus</i>	wedgetail triggerfish; <i>humuhumu-</i> <i>nukunuku-ā-pua‘a</i>	Ind.	R
OSTRACIIDAE	BOXFISH		
<i>Ostracion meleagris</i>	spotted boxfish; <i>moa</i>	Ind.	C
TETRAODONTIDAE			
<i>Canthigaster jactator</i>	Hawaiian whitespotted toby	End.	C
<i>Canthigaster amboinensis</i>	Ambon toby	Ind.	O
BLENNIIDAE	BLENNIES		
<i>Cirripectes obscurus</i>	gargantuan blenny, <i>pāo‘o</i>	End.	R

PHYLUM, CLASS, ORDER, FAMILY	Common name, <i>Hawaiian name</i>	Status	Relative abundance
<i>Genus species</i>			
MYLIOGATIDAE			
<i>Aetobatus narinari</i>	spotted eagle ray; <i>hailepo</i>	Ind.	R
GOBIIDAE	GOBIES		
<i>Psilogobius mainlandi</i>	Hawaiian shrimp goby	End.	O
BALISTIDAE	TRIGGERFISH		
<i>Sufflamen bursa</i>	lei triggerfish; <i>humuhumu lei</i>	Ind.	R
VERTEBRATA, REPTILIA	reptiles		
CHELONIIDAE			
<i>Chelonia mydas</i>	green sea turtle, <i>honu</i>	Ind.	O

KEY TO SYMBOLS USED:

Abundance categories:

- R – Rare – only one or two individuals observed.
- U – Uncommon – several to a dozen individuals observed.
- O – Occasional – seen irregularly in small numbers
- C – Common – observed everywhere, although generally not in large numbers.
- A – Abundant – observed in large numbers and widely distributed.

Status categories:

- End – Endemic – species found only in Hawaii
- Ind. – Indigenous – species found in Hawaii and elsewhere
- Nat. – Naturalized – species were introduced to Hawaii intentionally, or accidentally.

Appendix B

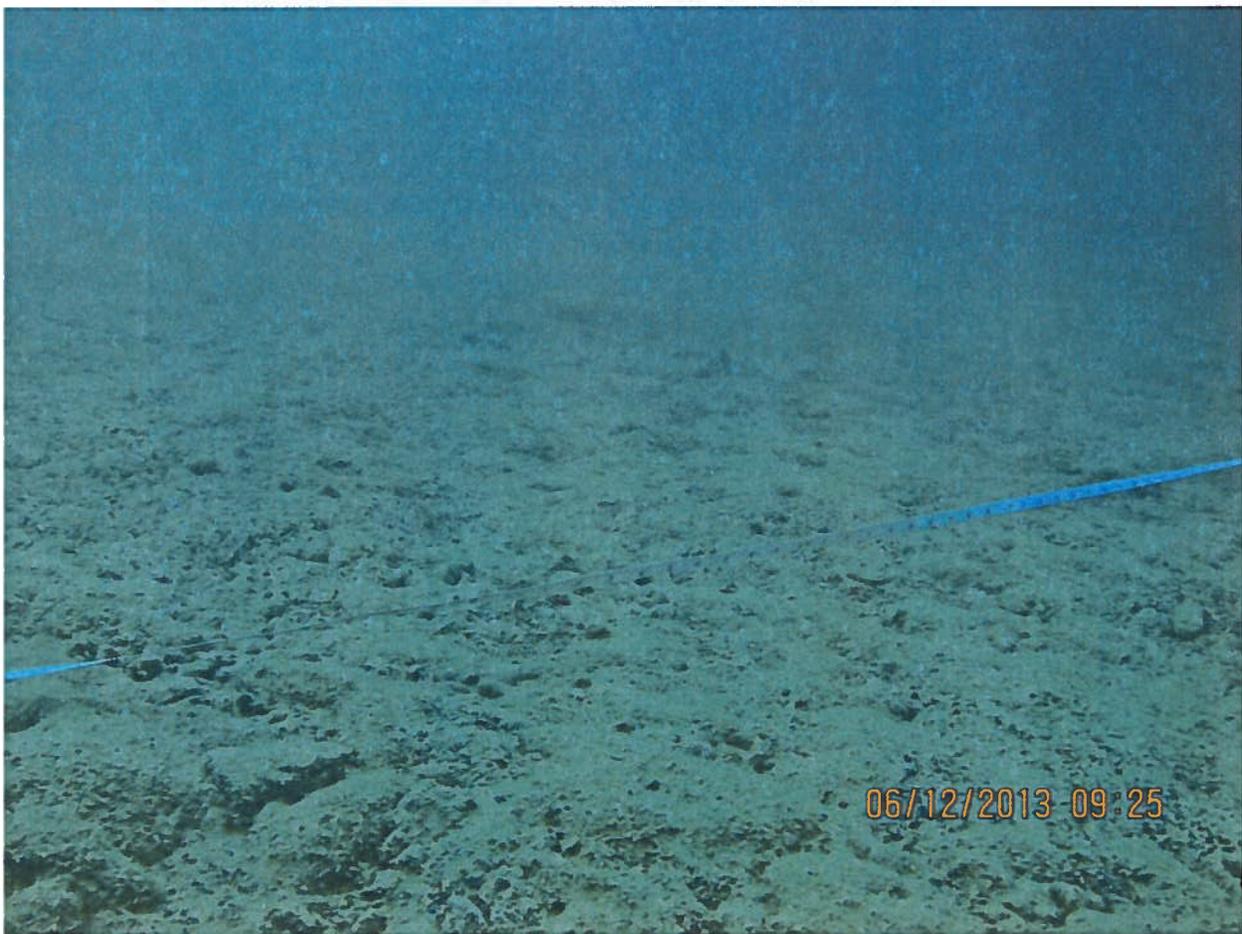
Summary of the bottom composition and relative coral distribution within the 12 ft (4-m) and 5 ft (1.5 m) radii

Proposed anchor location	Within 5 ft (1.5 m) from anchor center point	5- 12 ft (1.5-4 m) from anchor center point	Other bottom composition notes
W1	Sand and rubble, no coral	Scattered boulders with small colonies of <i>Poc. meandrina</i> (<5 cm)	Sand and loose rubble. Urchins (<i>Tripneustes gratilla</i>) common.
W2	Sand, small outcrop, no coral	Limestone outcrop with coral (<i>P. lobata</i> , <i>Poc. damicornis</i> , <i>Pav. varians</i>).	Sand, loose rubble, and moveable boulders with and without coral.
W3	Sand, no coral	Several boulders with coral (<i>P. lobata</i> and <i>M. capitata</i>)	Sand and moveable boulders.
W4	Rubble, gravel, and small boulders. No coral	Limestone outcrop with <i>P. lobata</i> colonies.	Sand and outcrops. Urchins (<i>T. gratilla</i>) common.
B'1	Sand and gravel. One 10 cm moveable <i>Poc. meandrina</i> .	Limestone outcrop with <i>P. lobata</i> colonies.	Sand, gravel, and limestone outcrops with coral cover. Urchins (<i>T. gratilla</i>) common. Horizontal pile with coral growth
B'2	Small moveable boulders with <i>P. lobata</i> (5 cm, 10 cm)	Several boulders with encrusting coral (<i>P. lobata</i> , <i>Poc. damicornis</i> and <i>Pav. varians</i>).	Sand and boulders with encrusting corals.
B'3	Sand. One moveable 50 cm (50% mortality) <i>P. lobata</i> colony.	Sand, no coral	
B'4	Sand; no coral	Sand and several moveable boulders with encrusting <i>P. lobata</i> colonies.	

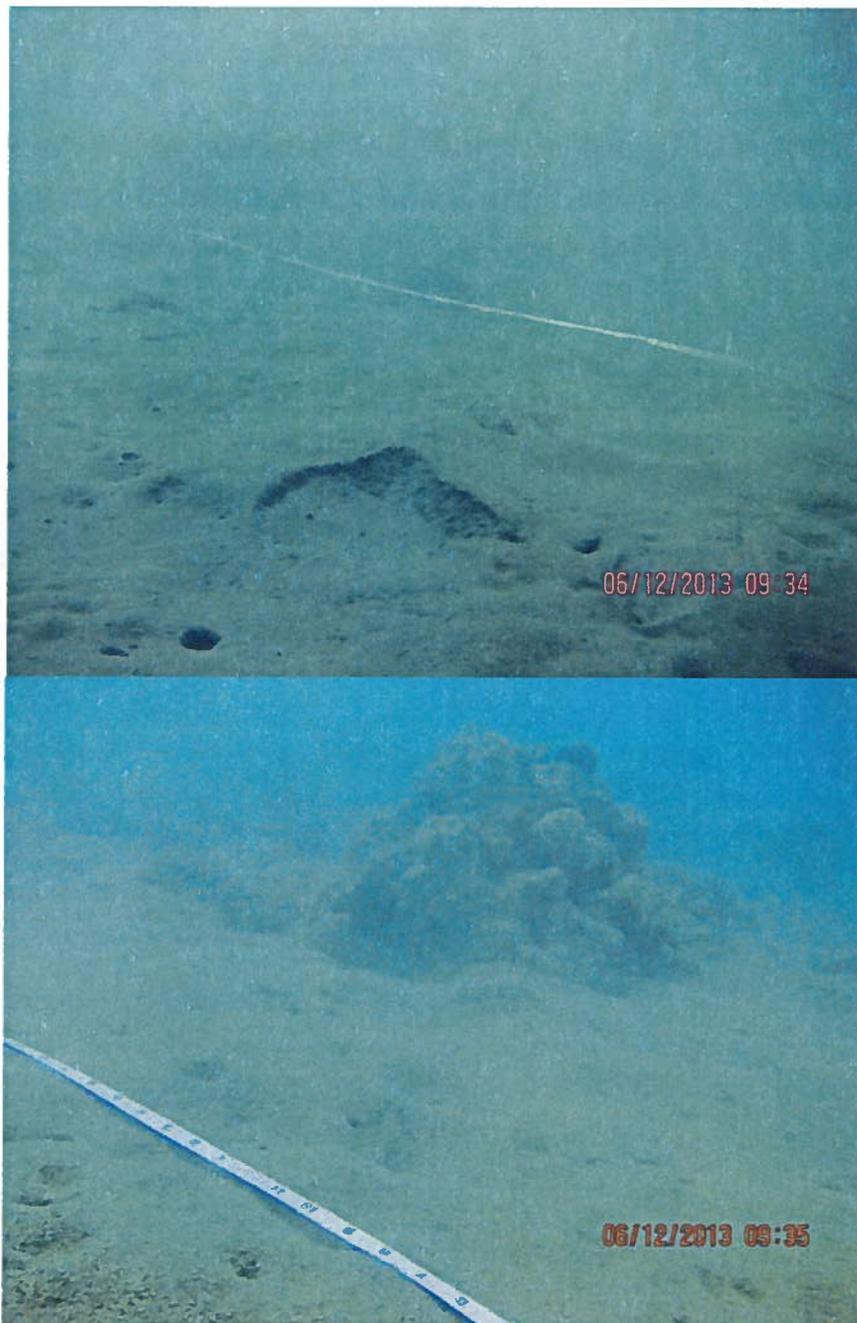
Proposed anchor location	Within 5 ft (1.5 m) from anchor center point	5- 12 ft (1.5-4 m) from anchor center point	Other bottom composition notes
B'5	Sand, rubble. No coral	Sand and several moveable boulders with encrusting <i>P. lobata</i> colonies.	
B'6	Rubble and sand, no coral	Sand and several moveable boulders with encrusting <i>P. lobata</i> and <i>Poc. damicornis</i> .	

Appendix C.

Photos of Keauhou Small Boat Harbor potential mooring anchor locations, June 12, 2013. Weighted vertical lines in photos represent proposed anchor center points.



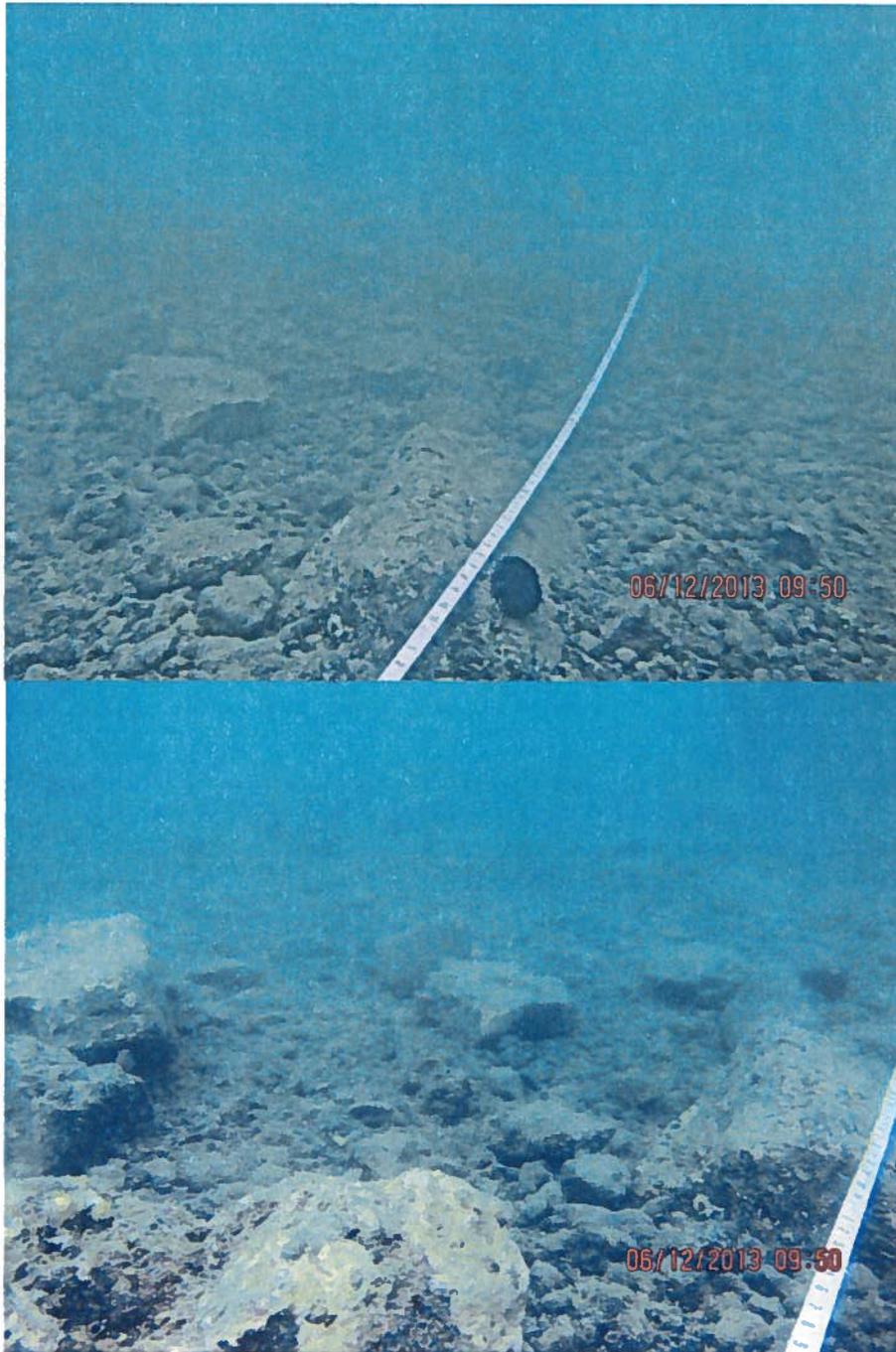
Proposed mooring anchor location W1 bottom is sand and loose rubble.



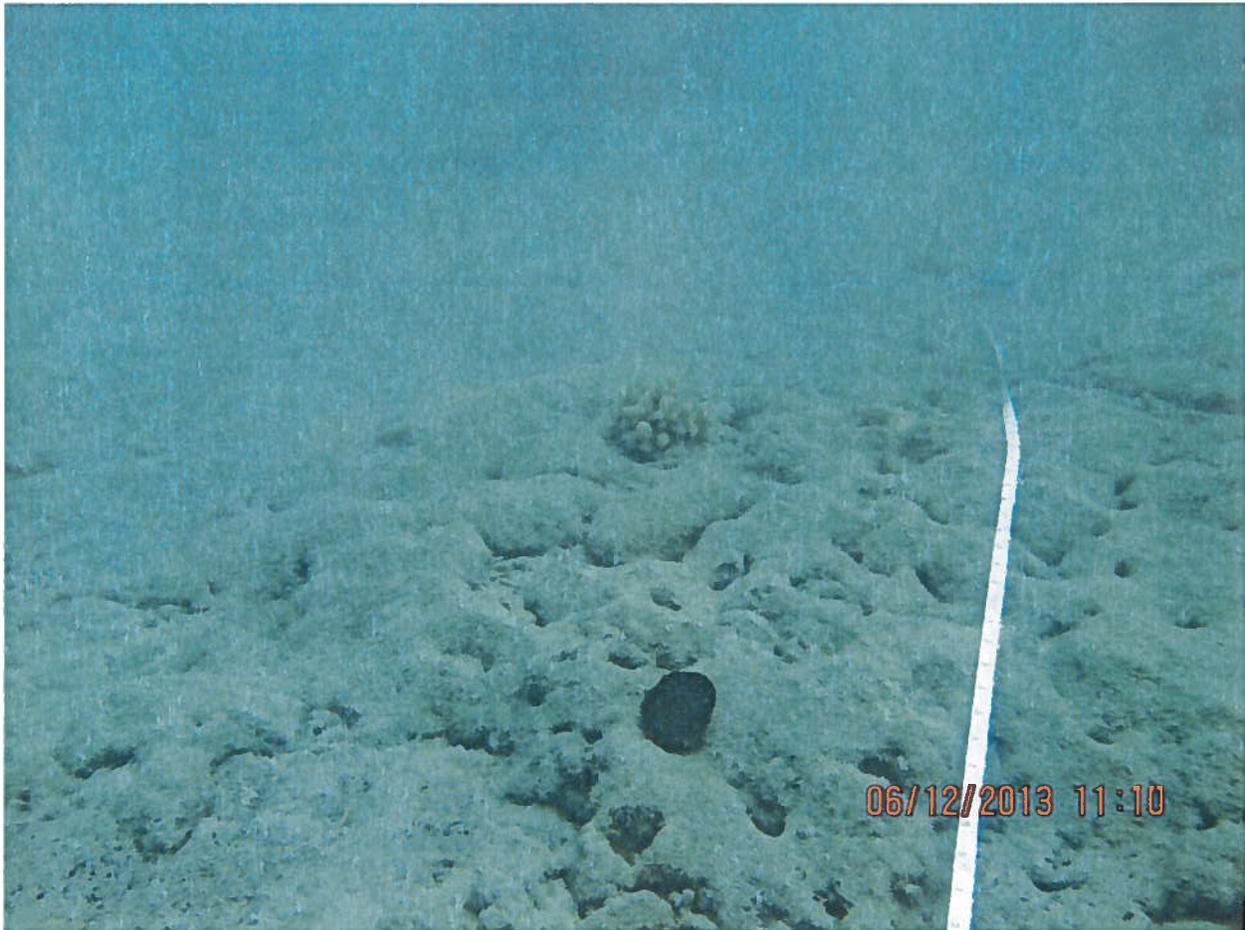
Proposed mooring anchor location W2 bottom is sand and boulders. Within 5 ft (1.5 m) of the anchor location, no corals were encountered (top). Beyond 5 ft (1.5 m), large boulders and loose rubble host other corals (*P. lobata*, *Poc. damicornis*, and *Pavona varians*; bottom).



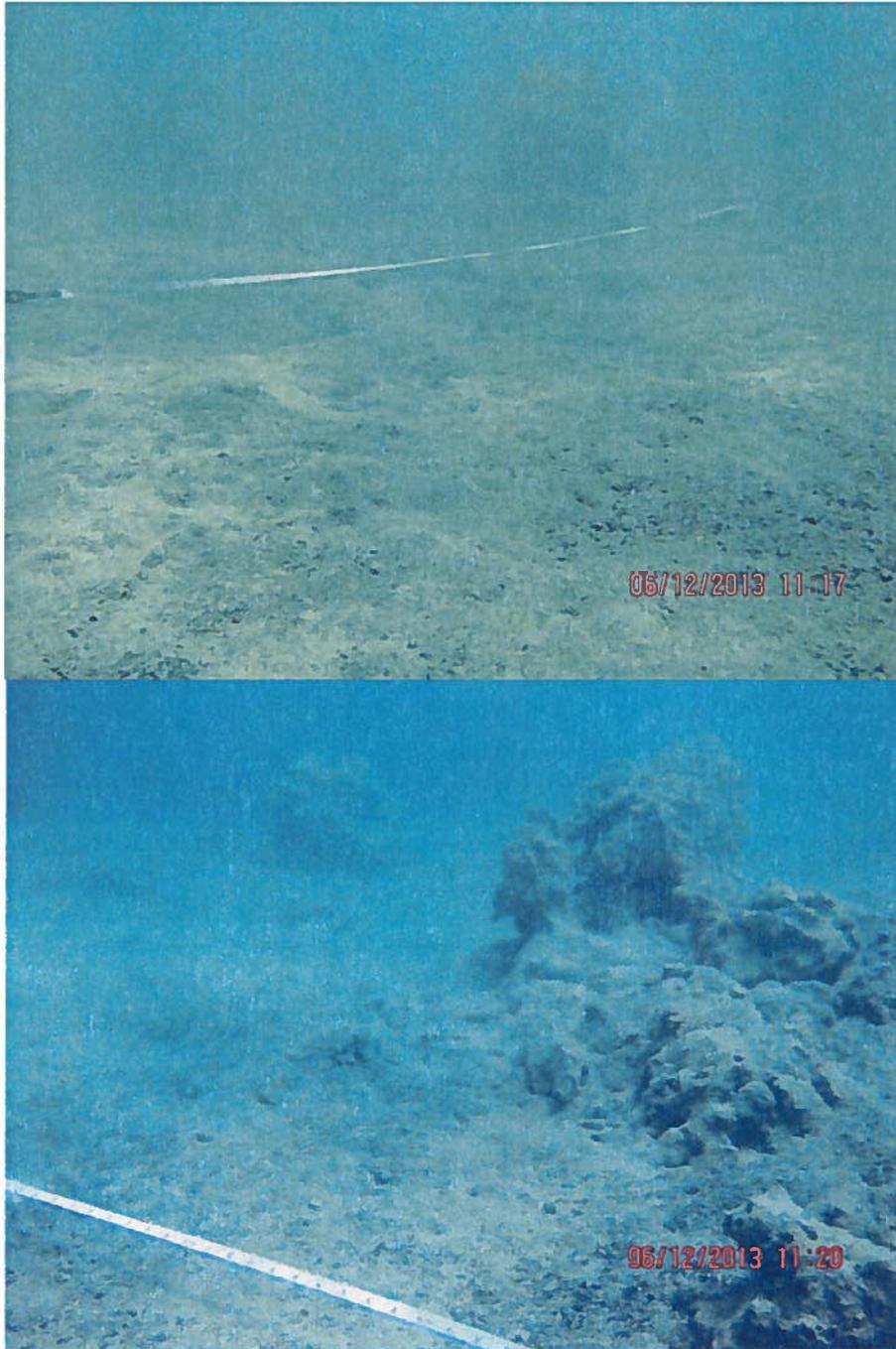
Within 5 ft (1.5 m) of the proposed mooring anchor location W3 bottom is sand and no corals. Beyond 5 ft (1.5 m) occur several large, difficult-to-move boulders with encrusting coral colonies (*P. lobata* and *Montipora capitata*).



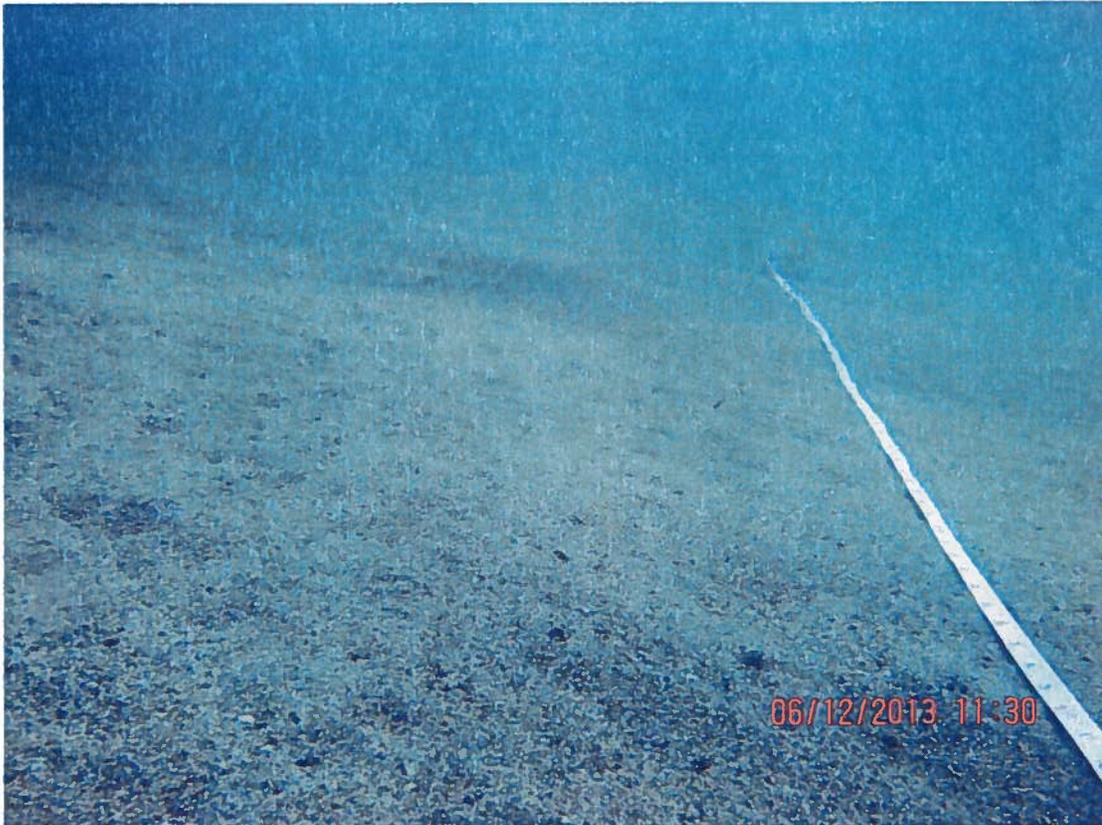
Within 5 ft (1.5 m) of the proposed mooring anchor location W4 bottom is gravel, loose rubble and small boulders. Beyond 5 ft (1.5 m) occur several moveable boulders with encrusting coral colonies (*P. lobata*).



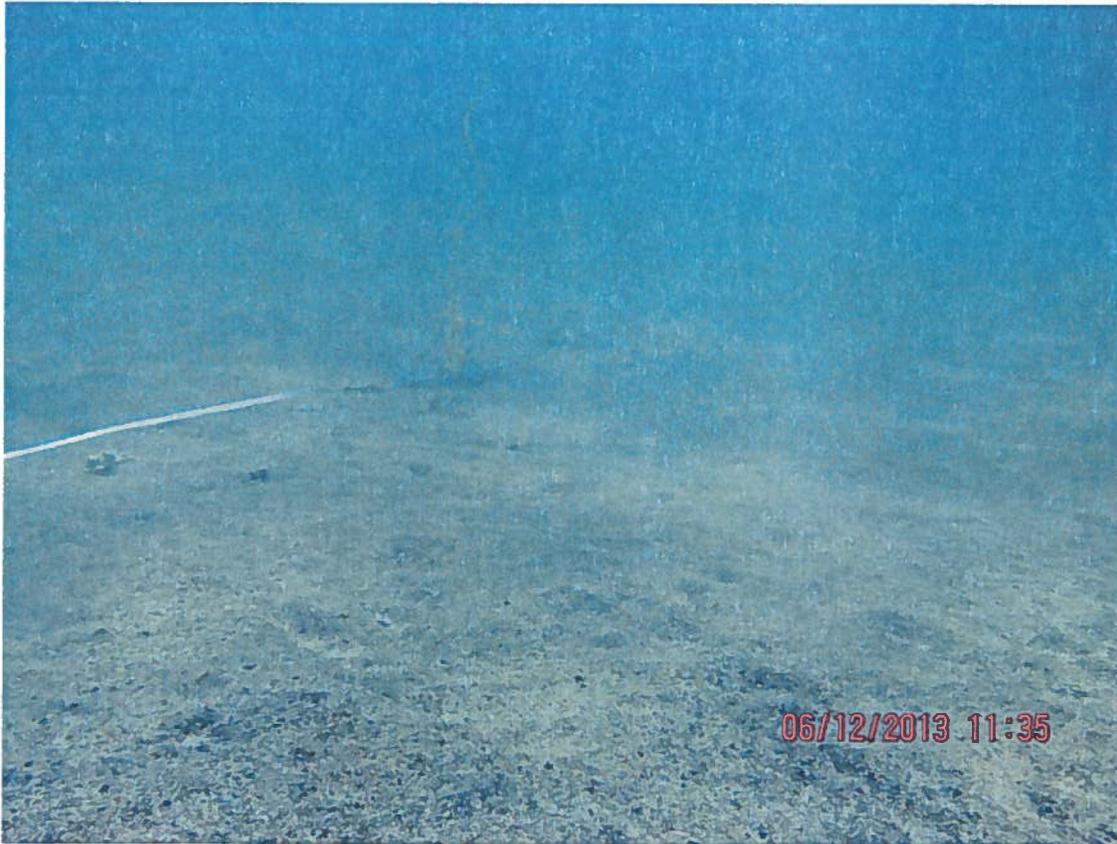
Proposed mooring anchor location B'1 bottom is sand and gravel. One 10 cm moveable *Poc. meandrina* occurs within 5 ft (1.5 m) of the proposed mooring location.



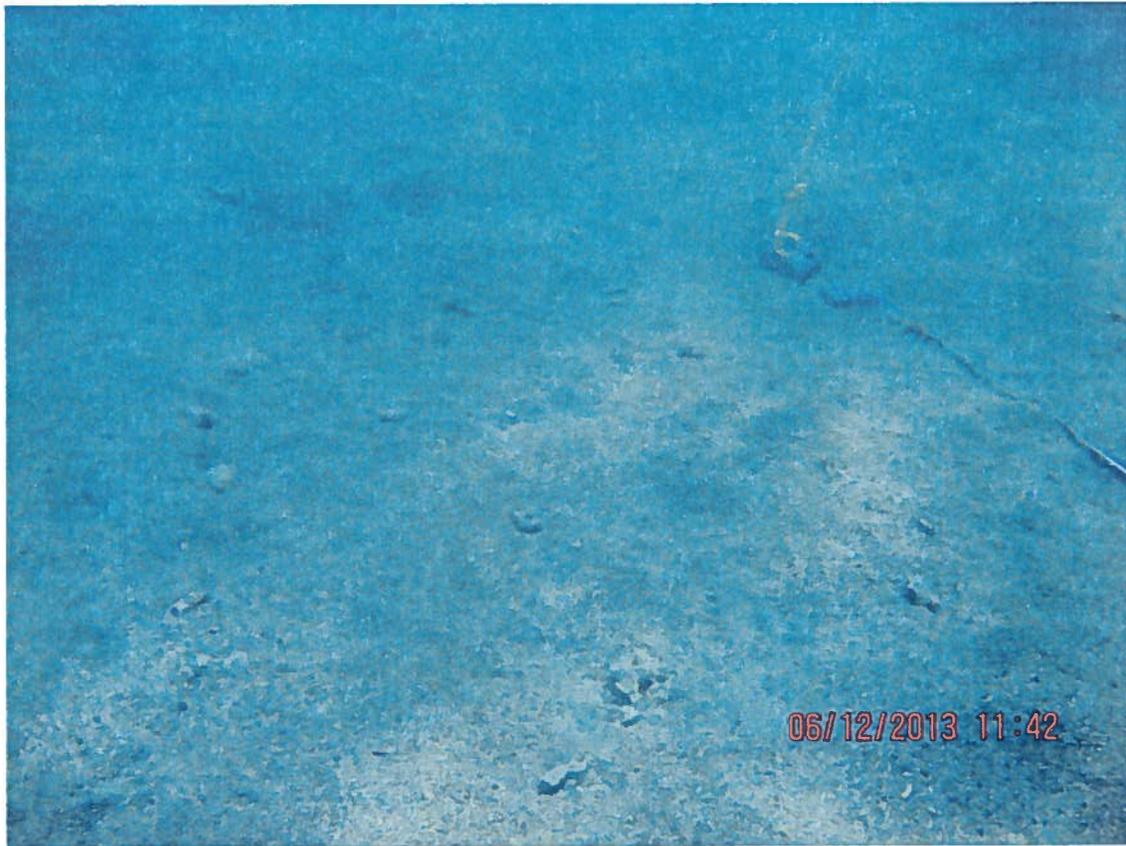
Within 5 ft (1.5 m) of the proposed mooring anchor location B'2 bottom is gravel, loose rubble and small boulders (top). Beyond 5 ft (1.5 m) occurs a limestone outcrop with encrusting coral colonies (bottom).



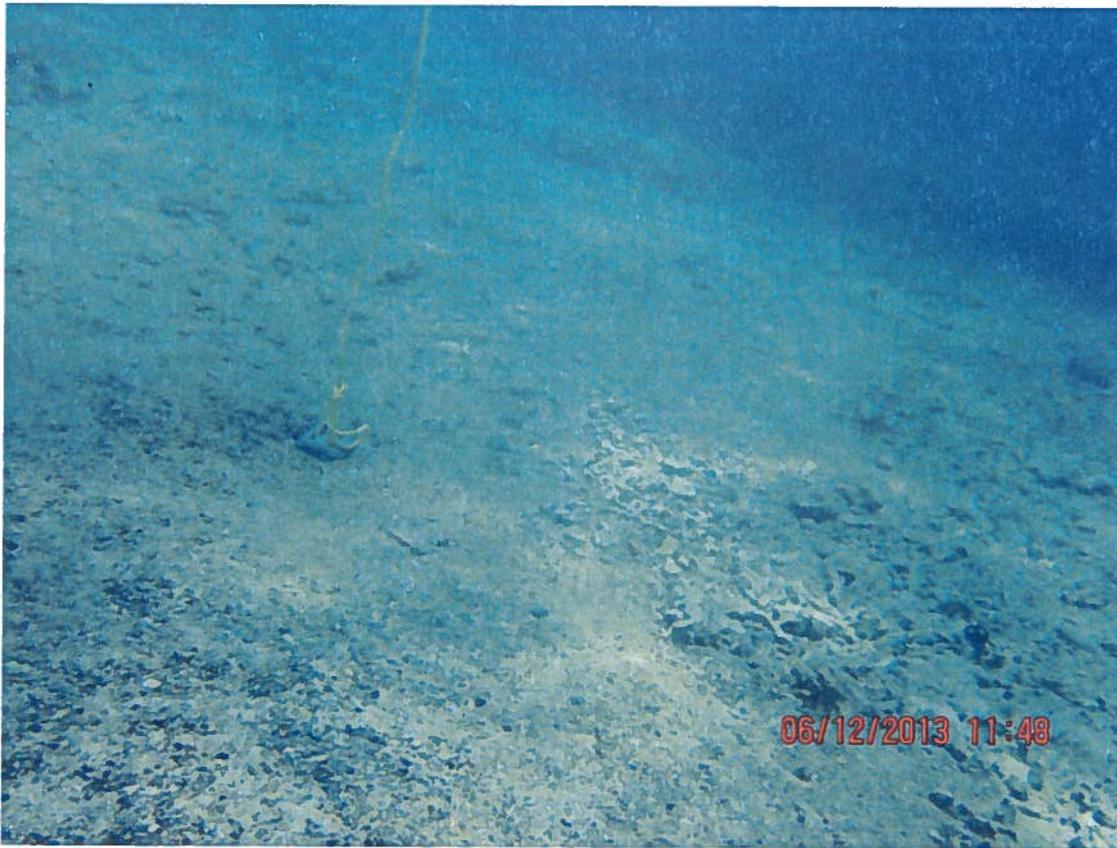
Within 12 ft (4 m) of the proposed mooring anchor location B'3, the bottom is sand and gravel. No corals were observed.



Within 12 ft (4 m) of the proposed mooring anchor location B'4, the bottom is sand and gravel. No corals were observed within 5 ft (1.5m) of the anchor location. Beyond 5 ft (1.5m), several moveable boulders with corals occur.



Within 5 ft (1.5 m) of the proposed mooring anchor location B'5, the bottom is sand and gravel, with no corals. Beyond 5 ft (1.5m) of the anchor location, several moveable boulders with corals were observed.



Within 12 ft (4 m) of the proposed mooring anchor location B'6, the bottom is sand and gravel. No corals were observed within 5 ft (1.5 m) of the anchor location. Beyond 5 ft (1.5m), several moveable boulders with corals occur.

APPENDIX B
CULTURAL IMPACT ASSESSMENT

Cultural Impact Assessment for the Proposed DOBOR Mooring Improvements Project at the Keauhou Bay Small Boat Harbor

Keauhou Ahupua'a
North Kona District
Island of Hawai'i

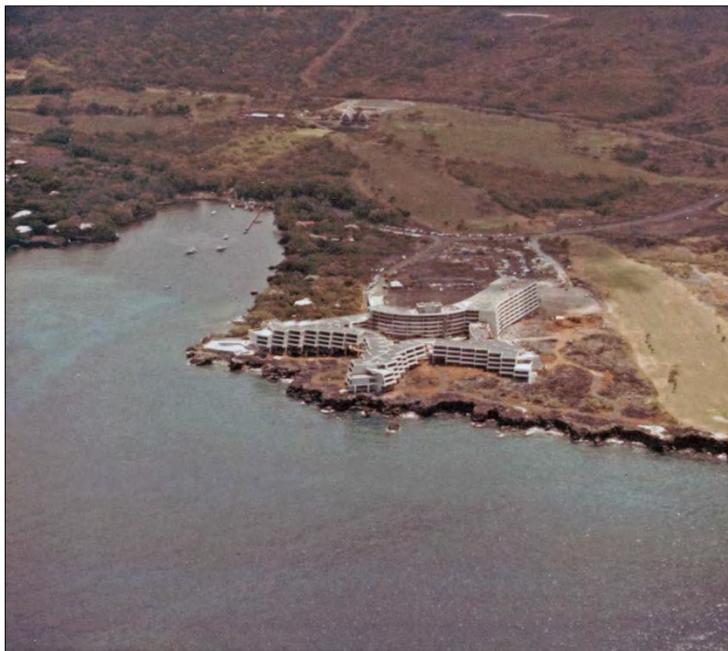


Photo courtesy of NHERC Heritage Center Paul Christensen Collection

Prepared By:

Robert B. Rechtman, Ph.D.

Prepared For:

Anchor QEA, LLC
PO Box 699
Haleiwa, HI 96712

November 2015



ASM Project Number 24760.00

Cultural Impact Assessment for the Proposed DOBOR Mooring Improvements Project at the Keauhou Bay Small Boat Harbor

Keauhou Ahupua‘a
North Kona District
Island of Hawai‘i



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1. INTRODUCTION

At the request of Anchor QEA, LLC, on behalf of the Department of Land and Natural Resources-Division of Boating and Ocean Recreation (DOBOR), ASM Affiliates (ASM) conducted a Cultural Impact Assessment (CIA) for DOBOR's proposed mooring improvements project at the Keauhou Bay Small Boat Harbor (Figures 1 and 2). The proposed improvements include the removal of the existing nine moorings and associated anchors (which are unpermitted and of substandard design) and the installation of sixteen new vessel moorings that would be supported by thirty-two mooring anchors (Figure 3). The revised configuration of offshore moorings is intended to maintain clearance from the United States Coast Guard (USCG) navigation channel, more effectively accommodate vessels, and improve vessel and user safety, while at the same time ensuring continued use of the bay by non-motorized recreational activities such as swimming, kayaking, canoeing, snorkeling, fishing, and other traditional uses.

The current report was prepared in support of an Environmental Assessment (EA) in compliance with Hawai'i Revised Statutes (HRS) Chapter 343, and in accordance with the Office of Environmental Quality Control (OEQC) *Guidelines for Assessing Cultural Impact*, adopted by the Environmental Council, State of Hawai'i, on November 19, 1997. As stated in Act 50, which was proposed and passed as Hawai'i State House of Representatives Bill No. 2895 and signed into law by the Governor on April 26, 2000, "environmental assessments . . . should identify and address effects on Hawaii's culture, and traditional and customary rights . . . native Hawaiian culture plays a vital role in preserving and advancing the unique quality of life and the 'aloha spirit' in Hawai'i. Articles IX and XII of the state constitution, other state laws, and the courts of the State impose on governmental agencies a duty to promote and protect cultural beliefs, practices, and resources of native Hawaiians as well as other ethnic groups."

Beginning in Precontact times Keauhou Bay served as a safe harbor for ocean-going vessels, with no less than three traditional canoe landing locations on the north side of the bay. The bay continued to be used by native populations for boat anchorage during the early Historic Period when the control of European sailing vessels became the prerogative of Hawai'i *ali'i*. Keauhou Bay was further developed as a commercial and tourist port with the construction of a succession of wharfs and piers beginning in the early 1900s. Up until the 1940s, Keauhou Bay remained a community resource used and cared for primarily by the Keauhou Village residents. During the 1950s and 1960s, the passage into the bay was artificially enhanced and Keauhou became a popular recreational and commercial fishing port with numerous boat moorings haphazardly established within the shallow waters of the bay. Renovations to the wharfs and piers continued through the 1970s and in 1978 the Hawai'i Department of Transportation assumed administration of the Keauhou Bay Small Boat Harbor. Within a few years thereafter, the present day concrete boat ramp was constructed on the southern side of the bay. Administration of the Keauhou Bay Small Boat Harbor was transferred again in 1992 to the Department of Land and Natural Resources, at which time there were "slips and moorings for 19 vessels" (DOT Boating Program transfer to DLNR document, dated August 1992).

From precontact to modern times, the maritime use and development of Keauhou Bay took place within a significant cultural and historical backdrop. The traditional village around Keauhou Bay was a residential location for numerous *ali'i*, many of whom were born there and a few of which are buried there. Perhaps the most famous of the *ali'i* births that took place around the bay was that of Kauikeaouli (Kamehameha III) born in ca. 1813, which was commemorated a century later by the placement of a stone tablet signifying the birthplace during a ceremony attended by Queen Lili'u'okalani. The traditional significance of Keauhou Bay was also recognized during the *Māhele* of 1848 as both of the Keauhou *ahupua'a* (Keauhou 1st and Keauhou 2nd), of which the bay was a part, were awarded respectively to the siblings Victoria Kamāmalu and Lot Kapuāiwa (grandchildren of Kamehameha I) and royalty (Kahina Nui and Kamehameha V, respectively) in their own. Thus, any assessment of impacts that may result from proposed activities in the bay needs to be informed through a culture-historical lens.

The current report contains a detailed background section providing setting and context (cultural, historical, and archaeological) to facilitate a more complete understanding of the significance of the Keauhou Bay area, and the historic and cultural properties within that landscape. The consultation process is described and the results of consultation are presented, which is followed by a discussion of potential cultural impacts and the appropriate actions and strategies necessary to mitigate any potential impacts.

1. Introduction



Figure 1. Project area location.



Figure 2. Google Earth™ satellite image of the project area.

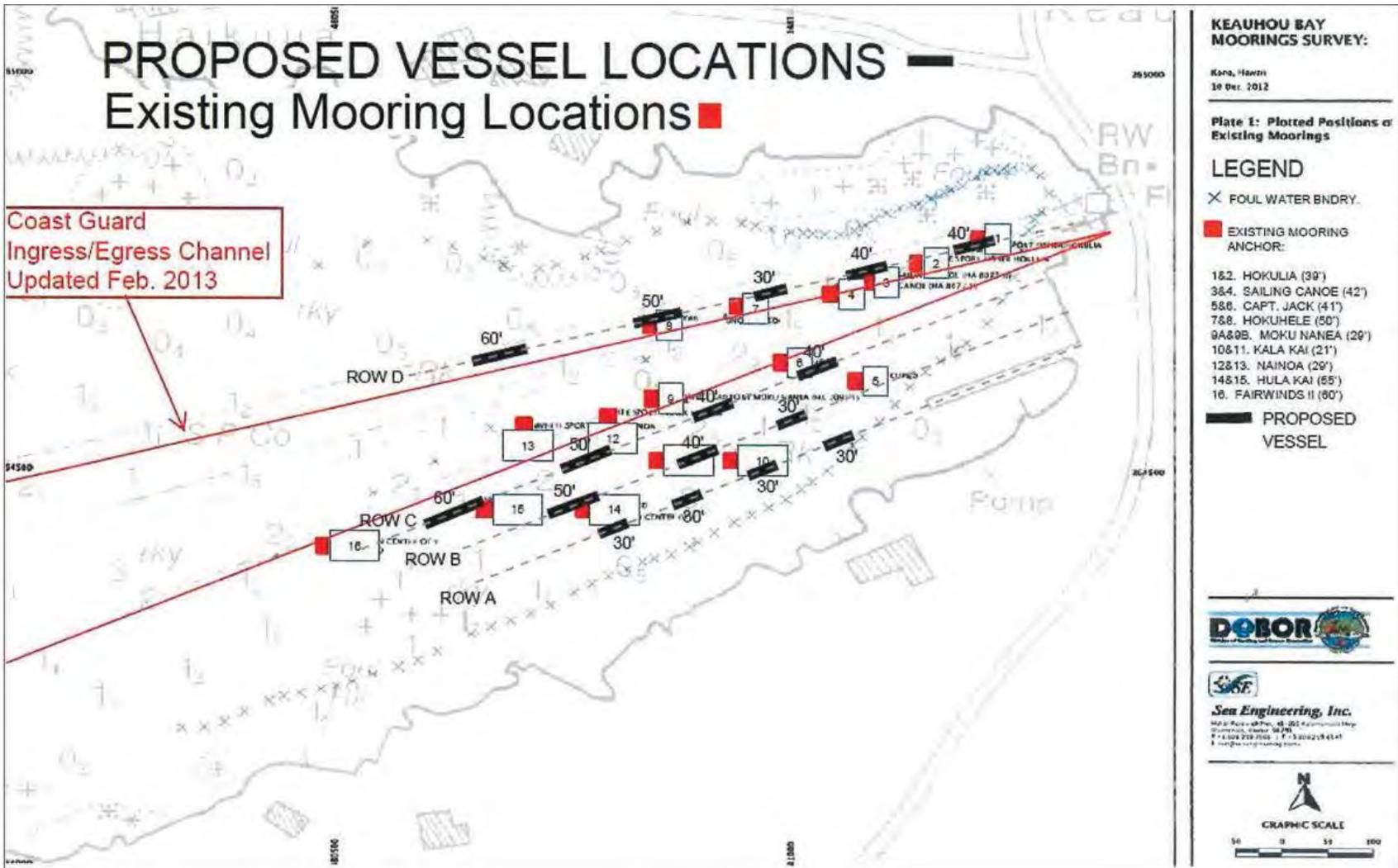


Figure 3. Mooring Development Plan.

2. BACKGROUND

This section of the report includes a discussion of the cultural-historical background for the Keauhou Bay area as well as a synthesis of relevant prior archaeological and historical research. This information is presented in order to provide a comprehensive understanding of the significance of the area, and to establish an analytical basis for the assessment of any potential cultural impacts.

CULTURE-HISTORICAL CONTEXT

Environment and Settlement Patterns

While the question of the timing of the first settlement of Hawai‘i by Polynesians remains unanswered, several theories have been offered that derive from various sources of information (i.e., genealogical, oral-historical, mythological, radiometric). However, none of these theories is today universally accepted (c.f., Kirch 2011). The three most popular theories place the first settlement at around A.D. 300, A.D. 600, and A.D. 1000, respectively. What is more widely accepted is the answer to the question of where Hawaiian populations came from and the transformations they went through on their way to establish a uniquely Hawaiian culture. The initial settlement in Hawai‘i is believed to have occurred from the southern Marquesas Islands (Emory in Tatar 1982). In these early times, Hawai‘i’s inhabitants were primarily engaged in subsistence level agriculture and fishing (Handy et al. 1991). This was a period of great exploitation and environmental modification, when early Hawaiian farmers developed new subsistence strategies by adapting their familiar patterns and traditional tools to their new environment (Kirch 1985; Pogue 1978). Their ancient and ingrained philosophy of life tied them to their environment and kept order; which was further assured by the conical clan principle of genealogical seniority (Kirch 1984). According to Fornander (1969), the Hawaiians brought from their homeland certain universal Polynesian customs and belief: the major gods Kāne, Kū, and Lono; the *kapu* system of law and order; cities of refuge; the *‘aumakua* concept; and the concept of *mana*.

The initial permanent settlements were established at sheltered bays with access to fresh water and marine resources. These communities shared extended familial relations and there was an occupational focus on the collection of marine resources. Over a period of few centuries the areas with the richest natural resources became populated and perhaps even crowded, and there was an increasing separation of the chiefly class from the common people. As populations increased so too did societal conflict, the result was hostility and war between neighboring groups (Kirch 1985). Soon, large areas of Hawai‘i were controlled by a few powerful chiefs.

As time passed, a uniquely Hawaiian culture developed. The portable artifacts found in archaeological sites of this period reflect not only an evolution of the traditional tools, but some distinctly Hawaiian inventions. The adze (*ko‘i*) evolved from the typical Polynesian variations of plano-convex, trapezoidal, and reverse-triangular cross-section to a very standard Hawaiian rectangular quadrangular tanged adze. A few areas in Hawai‘i produced quality basalt for adze production. Mauna Kea, on the island of Hawai‘i, possessed a well-known adze quarry. The two-piece fishhook and the octopus-lure breadloaf sinker are Hawaiian inventions of this period, as are *‘ulu maika* stones and *lei niho palaoa*. The latter was a status item worn by those of high rank, indicating a trend toward greater status differentiation (Kirch 1985). As population continued to expand so did social stratification, which was accompanied by major socioeconomic changes and intensive land modification. Most of the ecologically favorable zones of the windward and coastal regions of all major islands were settled and the more marginal leeward areas were being developed. Additional migrations to Hawai‘i occurred from Tahiti in the Society Islands. Rosendahl (1972) has proposed that settlement at this time was related to seasonal, recurrent occupation in which coastal sites were occupied in the summer to exploit marine resources, and upland sites were occupied during the winter months, with a focus on agriculture. An increasing reliance on agricultural products may have caused a shift in social networks as well; as Hommon (1976) argues, kinship links between coastal settlements disintegrated as those links within the *mauka-makai* settlements expanded to accommodate exchange of agricultural products for marine resources. This shift is believed to have resulted in the establishment of the *ahupua‘a* system sometime during the A.D. 1400s (Kirch 1985), adding another component to an already well-stratified society. The implications of this model include a shift in residential patterns from seasonal, temporary occupation, to permanent dispersed occupation of both coastal and upland areas.

The *ahupua‘a* became the equivalent of a local community, with its own social, economic, and political significance. *Ahupua‘a* were ruled by *ali‘i ‘ai ahupua‘a*; who, for the most part, had complete autonomy over this generally economically self-supporting piece of land, which was managed by a *konohiki*. *Ahupua‘a* were usually wedge or pie-shaped, incorporating all of the eco-zones from the mountains to the sea and for several hundred yards beyond the shore, assuring a diverse subsistence resource base (Hommon 1986). The *ali‘i* and the *maka‘āinana* (commoners) were not confined to the boundaries of the *ahupua‘a*; when there was a perceived need, they also shared

2. Background

with their neighbor *ahupua'a 'ohana* (Hono-ko-hau 1974). The *ahupua'a* was further divided into smaller sections such as the *'ili*, *mo'o 'aina*, *pauku 'aina*, *kihapai*, *koele*, *hakuone*, and *kuakua* (Hommon 1986, Pogue 1978). The chiefs of these land units gave their allegiance to a territorial chief or *mo'i* (king). *Heiau* building flourished as religion became more complex and embedded in a sociopolitical climate of territorial competition. Monumental architecture, such as *heiau*, “played a key role as visual markers of chiefly dominance” (Kirch 1990:206).

Within the greater Kona region, primary “chiefly” centers were established at several locations including Kailua, Kahalu'u-Keauhou, Ka'awaloa-Kealakekua, and Hōnaunau. By this time the Island of Hawai'i appears to have been divided into six traditional districts or *moku* (Cordy 2000). The current project area falls within the central region of the traditional *moku* of Kona, in what is today known as North Kona or Kona *'akau*, on the dry leeward side of the island. Kona extends from the shore across the entire volcanic mountain of Hualālai, and continues to the summit of Mauna Loa. The *moku* of Kona has over 100 *ahupua'a*, and approximately forty-four of these fall within the fertile central region of Kona, including Keauhou 1st and 2nd (Figure 4), where the current project area is located. The literal translation of Ke-au-hou is “the new era *or* the new current.” (Pukui et al. 1976:04). The majority of the *ahupua'a* in central Kona are fairly narrow and include a combination of forest lands, upland farms, coastal *kula*, and offshore resources. The current project area, situated in the shallow waters of Keauhou Bay, lies near the coastal edge of the Kona Field System (Cordy 1995, Newman 1970, Schilt 1984). The Kona Field System extends north at least to Kaū Ahupua'a and south to Hōnaunau, west from the coastline and east to the forested slopes of Hualālai (Cordy 1995). A large portion of this area is designated in the Hawai'i Register of Historic Places as Site 50-10-37-6601 and has been determined eligible for inclusion in the National Register of Historic Places. The basic characteristics and elevationally delimited zones (Table 1) within this agricultural/residential system as presented in Newman (1970) have been confirmed and elaborated on by archaeological (Kelly 1983; Cordy 1995; Johnson and Wolforth 2006) and ethnohistorical investigations (Kelly 1983).

Table 1. Traditional Hawaiian agricultural zones.

<i>Zone</i>	<i>Annual Rainfall (cm.)</i>	<i>Elevation (m.)</i>	<i>Primary Crops</i>
<i>Kula</i>	75-125	Sea level-150	<i>Uala, wauke, and ipu</i>
<i>Kalu'ulu</i>	100-140	150-300	<i>Ulu, uala, and wauke</i>
<i>'Āpa'a</i>	140-200	300-750	Dry land <i>kalo, uala, kī</i> and <i>kō</i>
<i>'Ama'u</i>	> 200	750-1,200	<i>Maia</i> (both plantain and banana)

Cordy (1995) presents a summary of archaeological settlement patterns for Kona that is based on previous archaeological work as well as on observations made by explorers and missionaries during the late eighteenth and early nineteenth centuries. Cordy bases his reconstruction on the Hawaiian terms for the major vegetation zones used to define and segregate space within an *ahupua'a*. It was these native terms (*kula*, *kalu'ulu*, *āpa'a* and *'āma'u*) that were used during the *Māhele Āina* of 1848 in the description of land claims. Cordy also describes a narrow shoreline zone within the *kula* that included the lands at the immediate coastline, which typically fell outside the four traditional agricultural zones, “where most houses were located and which is rarely identified in the records as crop land” (1995:4). Cordy further defined the zone as follows:

Shoreline: This land is considered here to be that above the high-tide line extending inland 200 meters or so (600+ feet). Typically in Kailua this is from the shore back to Ali'i Drive and perhaps 100 meters farther inland. (Cordy 1995:4)

The current project area occupies the shallow waters offshore, near the primarily residential shoreline portion of the Kona Field System, which may be interpreted as a *makai* division of the larger *kula* zone. The *kula* zone is the area from sea level to 150 meters in elevation. This lower elevation zone is traditionally associated with habitation and the cultivation of *wauke*, *ipu*, and *'uala*. The settlers in the Kona district developed agricultural techniques suited for the dry environment and produced staple and supplemental crops by exploiting all the *ko kula kai* (coastal *kula*) and *ko kula uka* (upland *kula*) had to offer (Maly 1998). These dryland techniques included planting taro in built up mounds known as *pu'epu'e* and planting in small holes or larger pits known as *'umoki* and *mākālua*, respectively (Maly 1998).

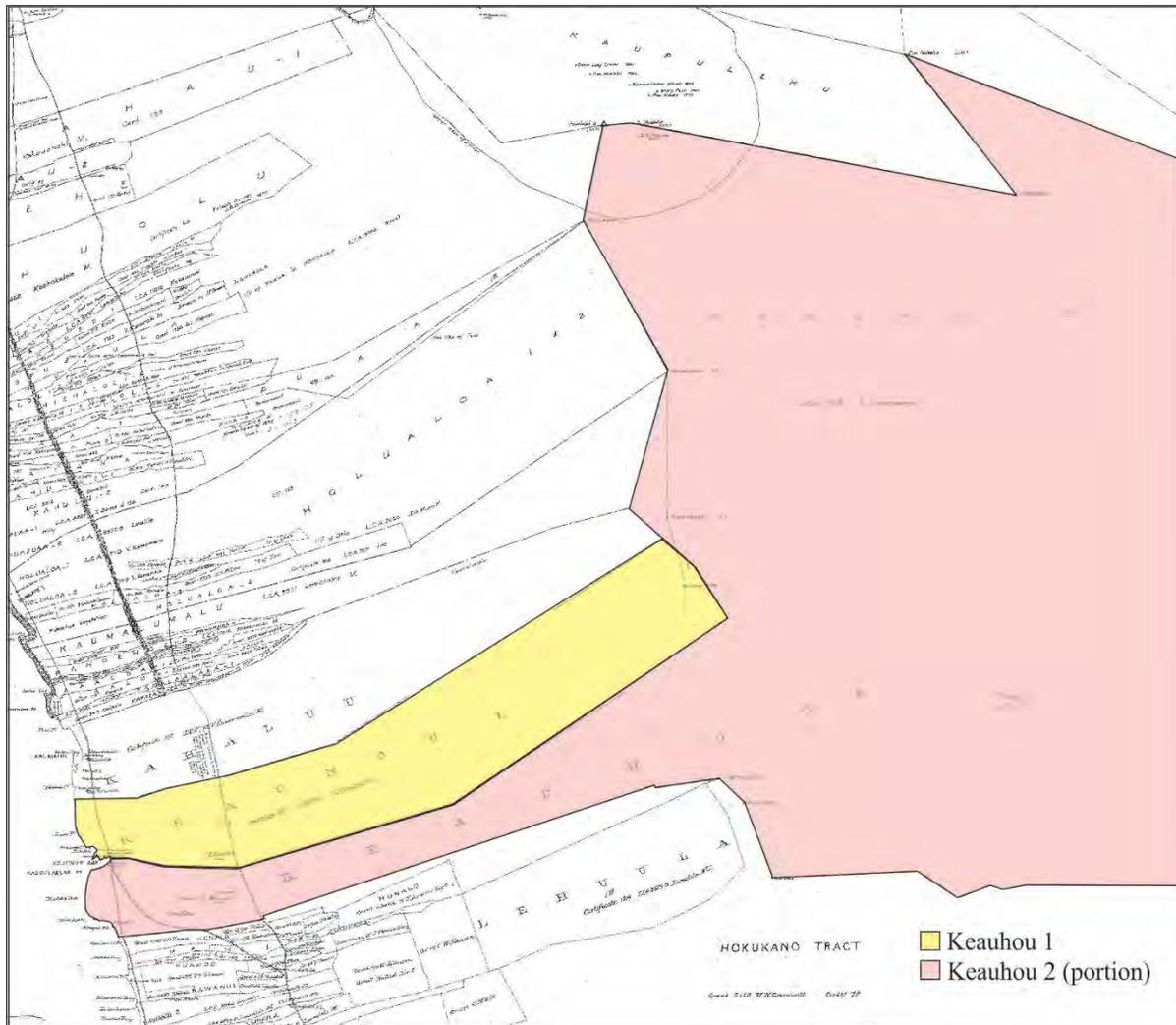


Figure 4. Composite of Hawaii Reg. Maps No. 1280 and 1281 (ca. 1877 and 1891, respectively) showing Keauhou 1st Ahupua‘a and a portion of Keauhou 2nd Ahupua‘a.

According to the archaeological record, historic documentation, and legendary accounts, the shoreline zone of the Kona Field System was home to many *ali‘i* and *konohiki*. Their associated habitation sites typically consisted of complexes of various, separate structures associated with specific functions often based on gender divisions. The *maka‘ainana* (commoners) also lived in residential complexes during prehistoric times, albeit with fewer structures of reduced size compared to those of the *ali‘i* and *konohiki*.

In addition to permanent habitation, the shoreline zone was also used for non-agricultural activities, such as recreation, ceremonial practices, canoe storage, fishing and related rituals, and burial (Johnson and Wolforth 2006). Smaller temporary habitations associated with fishing activities were also common along the shore (Cordy 1995). Numerous ceremonial structures such as fishing shrines and traditional places of worship or *heiau* are found along the Kona coastline (Stokes and Dye 1991). Precontact burial practices in central Kona were most commonly performed along the shore and the lower *kula* zone, with few scattered burial sites further inland and still less with an increase in elevation (Cordy 1995). Furthermore, according to Cordy:

In the case of coastal housing in Central Kona often burials are found behind and among the houses in small square platforms – nicely made and too small for houses. Occasionally, burials are in low mounds, or below pavings flush with the ground. Usually in Central Kona burials are in small clusters – one to perhaps 10 or 15 structures. Occasionally, larger sets of burials are present together in one place . . . Typically, however, large cemeteries do not seem to be the norm in Central Kona. (Cordy 1995:14)

The district of Kona figures prominently as a royal center in the Proto-Historic Period. Beginning around A.D. 1600-1620, Hawaiian royalty resided within the shoreline zone of central Kona at Kailua, Hōlualoa, Kahalu‘u, and Keauhou. Such royal and high chiefly centers included dwellings for chiefs, their court, and local *maka‘āinana* in addition to public structures, such as *heiau*, sporting grounds and places of refuge (Cordy 1995). As a result of the presence of these royal and high chiefly centers, population size increased for a time, as did the density of habitations and public structures within the *makai* area of the *kula* zone. However, during the early nineteenth century, following the death of Kamehameha I and the adoption of Western introduced religious practices, *heiau* no longer held their significance as elements of a state-sponsored religion. In fact, at many of these sites in central Kona, the wooden god images were burned and the structures themselves were dismantled (Kelly 1983). The stones of the destroyed *heiau* were often used for other building projects such as the Kuakini Wall.

The settlement patterns described above persisted into the early Historic Period, but with the introduction of new crops and rapid population loss in the early 1800s, major changes were well underway. During the nineteenth century, the traditional Hawaiian residential complexes evolved into multi-room structures built on stone platforms with clearly defined internal divisions (O’Hare and Wolforth 1998). Historic Period burials often incorporated historic-era artifacts and architecture, such as mortar and corrugated tin as part of isolated structures or interments within stone platforms (O’Hare and Wolforth 1998). Another change to the landscape came with the introduction of ranching to the *kula* zone in the mid-1800s, which persisted well into the twentieth century in much of the district of North Kona, including within Keauhou 1st and 2nd *ahupua‘a*.

Keauhou 1st and 2nd Ahupua‘a

Traditional Accounts

Prior to first contact with Europeans in the late eighteenth century and the development of a written Hawaiian language, the history of ancient Hawai‘i was transmitted orally from generation to generation. The following section presents a selection of such traditional accounts associated with Keauhou 1st and 2nd, many of which mention specific historical figures, place names, and historically significant locales.

As previously mentioned, the current project area is located within the district of Kona, which extends from the western shores of Hawai‘i Island across the entire volcanic mountain of Hualālai to the summit of Mauna Loa, where Kona is joined by the districts of Ka‘ū, Hilo, and Hāmākua. One traditional reference to the northern and southern-most coastal boundaries of Kona tells us of the district’s extent:

Mai Ke-ahu-a-Lono i ke ‘ā o Kani-kū, a hō‘ea i ka ‘ūlei kolo o Manukā i Kaulanamauna e pili aku i Ka‘ū!—From Keahualono [the Kona-Kohala boundary] on the rocky flats of Kanikū, to Kaulanamauna next to the crawling (tangled growth of) ‘ūlei bushes at Manukā, where Kona clings to Ka‘ū! (*Ka‘ao Ho‘oniua Pu‘uwai no Ka-Miki in Ka Hōkū o Hawai‘i*, September 13, 1917; Translated by K. Maly)

In Kona, where there were no regularly flowing streams to the coast, access to potable water (*wai*), was of great importance and played a role in determining areas of settlement. The waters of Kona were found in springs and caves (from shoreline to the mountain lands), or procured from rain catchments and dewfall. Traditional narratives abound with descriptions and names of water sources, and also record that the forests were more extensive and extended much further seaward than they do today. These forests not only attracted rains from the clouds and provided shelter for cultivated crops, but also in dry times drew the *kēhau* and *kēwai* (mists and dew) from the upper mountain slopes to the low lands (Rechtman et al. 2001). Also of interest to the current study, is how Native Hawaiians would dive down to freshwater seeps and springs that surface in saltwater in order to collect drinking water in calabashes. Charles Henry Hitchcock (1909) mentions finding such freshwater springs off Keauhou.

In the 1920s-1930s, Handy et al. (1991) conducted extensive research and field interviews with elder native Hawaiians. In the lands of North and South Kona, they recorded native traditions describing agricultural practices and rituals associated with rain and water collection. Primary in these rituals and practices was the lore of Lono—a god of agriculture, fertility, and the rituals for inducing rainfall. Handy et al. observed:

The sweet potato and gourd were suitable for cultivation in the drier areas of the islands. The cult of Lono was important in those areas, particularly in Kona on Hawaii . . . there were temples dedicated to Lono. The sweet potato was particularly the food of the common people. The festival in honor of Lono, preceding and during the rainy season, was essentially a festival for the whole people, in contrast to the war rite in honor of Ku which was a ritual identified with Ku as god of battle. (Handy et al. 1991:14)

Handy et al. (1991) noted that the worship of Lono was centered in Kona. Indeed, it was while Lono was dwelling

at Keauhou, that he is said to have introduced taro, sweet potatoes, yams, sugarcane, bananas, and *‘awa* to Hawaiian farmers (Handy et al. 1991). The rituals of Lono—“The father of waters”—and the annual *makahiki* festival (honoring Lono) preceding and during the rainy season, were of great importance to the native residents of this region (Handy et al. 1991:14). The significance of rituals and ceremonial observances in cultivation and indeed in all aspects of life was of great importance to the well-being of the ancient Hawaiians, and cannot be overemphasized, or overlooked when viewing traditional sites of the cultural landscape.

One of the earliest accounts that directly mentions the Keauhou area pertains to ‘Umi-a-Līloa, who briefly united the warring chiefs of Hawai‘i Island under his rule during the early 1600s (Cordy 2000). Like many rulers before and after him, ‘Umi built and re-built many *heiau* throughout his rule (ibid.). Ahu-a-‘Umi Heiau, located in upland Keauhou, is the most famous *heiau* built by ‘Umi (ibid.). ‘Umi apparently relocated his court to the site of Ahu-o-Umi, the remains of which can still be found today, far from the coast at an elevation of about 5,200 feet, in the saddle between Hualalai and Mauna Loa (Cordy 2000). ‘Umi’s grandson Lonoikamakahiki, also resided at Kahalu‘u and Keauhou (Elmore and Kennedy 2001).

As previously mentioned, the Kona coast was host to several chiefly centers, the Keauhou Bay area was no exception. Several high ranking chiefs were said to have been born and/or resided in Keauhou and nearby Kahalu‘u, including Kuakini, Miriam Kekāuluohi, and Keopuolani the “sacred” wife of Kamehameha who gave birth to Kamehameha III along the shores of Keauhou Bay, in the vicinity of the current project area. In an *‘ōlelo no ‘eau* (Hawaiian proverb), Pukui refers to Keauhou citing its significance as a chiefly center and the many associated *kapu*:

Keauhou i ka ‘ihi kapu

Keauhou, where the strict kapu were observed.

Keauhou, Kona. This was the place where many of the highest chiefs resided and where Kamehameha III was born. (Pukui 1994:181-182)

In his book *Ruling Chiefs of Hawaii*, Kamakau (1992) provides several accounts of chiefly activities that occurred in Keauhou and nearby Kahalu‘u. One of Kamakau’s earliest accounts of Keauhou mentions Kalani‘ōpu‘u, the *ali ‘i-nui* of Hawai‘i Island from 1754-1782:

After the death of Captain Cook and the departure of his ship, Ka-lani-‘ōpu‘u moved to Kainaliu near Honua‘ino and, after some months, to Keauhou where he could surf in the waves of Kahalu‘u and Holualoa, and then to Kailua. (ibid.:105)

Another chiefly account presented by Kamakau (1992) is the ca. 1789 birth of Kuakini who would grow up to be governor of Hawai‘i from 1820-1844, and who was raised by Kamehe‘aiku (female cousin of Ke‘eaumoku) at Keauhou:

At the birth of the child [Kua-kini] there was a great hula at Kahalu‘u, and the name hula (*hula inoa*) was being danced for the birth of the new son to Na-mahana and Ke‘e-au-moku. Visitors came to bring gifts (*ho‘okupu*), and among them was Ka-mehe-‘ai-ku who had gone away and hidden in the country and slept with a man and given birth to a child. She was a cousin of Ke‘e-au-moku, and when she was discovered among the spectators at the hula Ke‘e-ai-moku gave the child to her to suckle and gave with him the land of Keauhou; and Ka-mehe-‘ai-ku took the little chief to Keauhou and there nourished him until he was grown. (ibid.:388)

Kamakau (1992) also writes about Kekāuluohi, premier of Hawai‘i from 1839-1845, who was born in Keauhou in 1794. According to Kamakau, Kekāuluohi was a revered chiefess and a favorite above all the others of her generation thanks to her link to numerous chiefly ancestral lines of Kaua‘i, O‘ahu and Hawai‘i. The following excerpt demonstrates just how special Kekāuluohi was considered to be:

Ke-ka-ulu-ohi was brought up at Kahalu‘u and Keauhou by Na-mahana and Ke‘e-au-moku, her grandparents, who fondled her as if she were a feather lei made from the precious *mamo* bird. (ibid.:394)

Kekāuluohi went on to marry Kamehameha I in 1809 in Waikiki. Upon his death, she became one of Liholiho’s five wives until she was given to Kana‘ina, with whom she bore her first male child (W.C. Lunalilio) in 1834.

Keauhou also figures in the life story of another prominent chiefess, Queen Keōpūolani known as the sacred wife of Kamehameha I and mother of Liholiho. She was born on Maui in 1780 and lived there until the age of nine or ten, at which time the ‘Iao Valley battle forced her and some relatives to flee to Moloka‘i (Kamakau 1992). Shortly thereafter in 1813, Kamehameha I brought Keopuolani from Moloka‘i to Hawai‘i:

At Keauhou in North Kona, Ke-opu-o-lani was brought up under the name of Wahine-pio until she was a grown girl. With her mother she accompanied Kamehameha on his expedition to make war upon Ka-lani-ku-pule on Oahu, where in 1795 was fought the battle Nu‘uanu. Here one of the Oahu chiefs gave her the name of Ke-opu-o-lani in place of that of Ka-lani-kau-i-ka-‘alaneo by which she had been previously called. (ibid.:260)

One of the most well-known stories that features Keauhou is the birth ca. 1813 of Keopuolani’s third child Kauikeaouli (Kamehameha III). The legend holds that the baby was stillborn and brought back to life by a *kahuna* named Kapihe. Gutmanis describes the birth and ceremony, including the chant (*Ho ‘iho ‘i ana i ka ‘uhane*- a chant used to return the spirit to the body) used by Kapihe to bring Kauikeaouli back to life:

Some births are not easy and the child is still-born. On those sad occasions every effort is made to bring life to the small body. When Ke‘opu-o-lani was expecting the child that would later rule as Kamehameha III, she was at Ke-au-hou, Kona, Hawaii. One day, after swimming in the bay, she was seized with violent cramps as she walked back to her house on the grounds of Ka-lei-o-papa heiau and she gave birth in the open. The child appeared dead with afterbirth that was very flabby.

Ka-pihe, the high priest, was called. He instructed Ke‘opu-o-lani’s attendants to stand in a circle with their forefingers locked with each other, a fire was built in the center of the ring and after the embers were brushed aside the afterbirth was turned over and over above the hot rocks.

At one point, Ka-pihe looked up and saw the image of a child in the dark clouds and he knew that the baby would live. He gave the boy the name Kau-ike-ke-ao-uli, which means, “Stationed-in-the-firmament.” Some say Ka-pihe used a kite in this ceremony.

The following is said to be one of the prayers used by Ka-pihe as he worked over the body.

Hulia ka lani i ke akua	Flashes the heavens to the god,
Lapalapa ka honua i ke keiki	The earth blazes by the child
E ke keiki e ho‘oua i ka punohu lani,	O child, cause the small black clouds of the heavens to give rain
Aia I ka lani hoku e	The star is in the heavens
O ku‘u ‘uhane e kahe mau,	O my spirit continually flows,
I la‘a i kou kanawai.	That your ti leaves be sacred.

(Gutmanis 1983:38-40)

Burtchard (1995) suggests that as a result of the presence of Kamehameha’s court in greater Kona area beginning in 1813, high status features of monumental construction were developed in the region. A prime example of such high status features is the massive Kāneaka Hōlua, or Pu‘u-o-Kaomi-la‘o slide (Figure 5), which was constructed in Keauhou around this time. This “Royal Slide at Keauhou” (SIHP Site 1669) was one of the longest and best preserved of its kind, and Burtchard offered the following details:

Soehren (1966), in his article on the Royal Slide at Keauhou, notes that “. . . According to the Rev. A.S. Baker (1921) [sic 1916] it [the slide] was built by Kamehameha for his son Kauikeaoli, [later Kamehameha III], born to Keopuolani at nearby Keauhou Bay in 1814 (Kamakau 1961:260). Soehren cites Kamakau (1961:242) and Kekahuna (n.d.) to apply the alternative names Ka holua o Kaneaka and Pu‘u-oKaomi-la‘o to this dramatic National Register archaeological feature. (Burtchard 1995:40)

A 1953 sketch map (Figure 6) by Kekahuna shows a detailed plan view of the *hōlua* at Keauhou with associated historical notes. The original length of the slide was almost 6,000 feet, extending *makai* from Pu‘u o Kaomilā‘ō to He‘eia Bay, located to northwest of the current study area (Hammatt et al. 1981).



Figure 5. The *hōlua* slide at Keauhou ca. 1905 (from the A.S. Baker collection).

2. Background

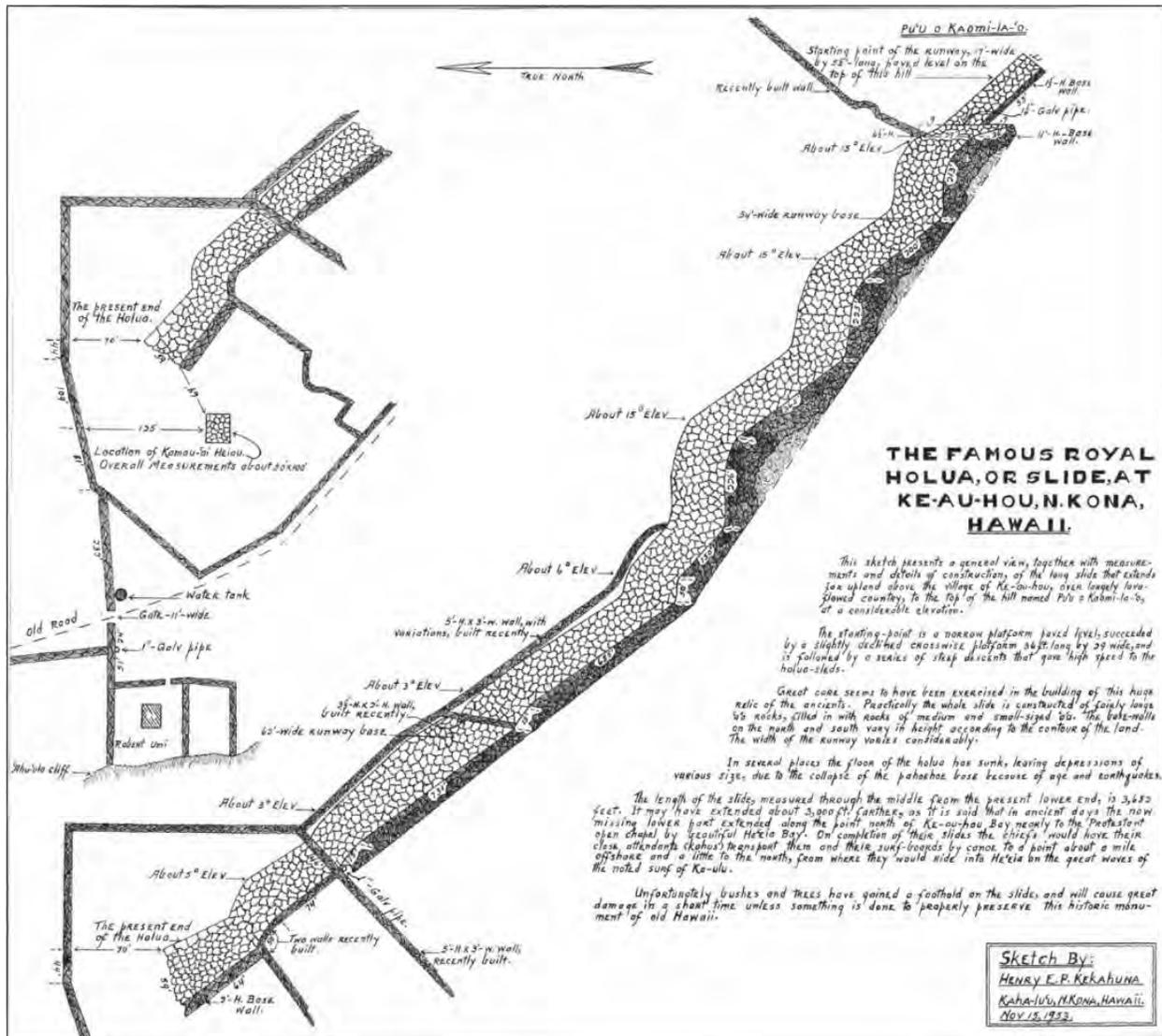


Figure 6. Kekahuna’s 1933 plan view of the *hōlua* slide at Keauhou by Kekahuna.

Kamakau provides the following description of the sport of sledding with specific mention of the sled at Keauhou:

Sledding (*he'e holua*) was another favorite sport, carried on sometimes over a cliffside, sometimes on the slope of a hill over a course either laid out on the ground or artificially built up, like that at Kaneaka at Keauhou in north Kona, Hawai'i. This was a vigorous sport in which beginners suffered, but those who were accustomed to it guided the board with legs and arms and could keep their balance and breathe lightly as they sped faster than a racehorse or a railroad train. . . The course was covered with stalks of pili grass stripped of the blade and laid evenly. Midday was the favorite time for the sport when the heat of the sun made the grass slippery and the sled could then attain terrific speed. (Kamakau 1992:242-243)

In addition to the Kāneaka Holua numerous *heiau* were erected in the district of Kona including within the *ahupua'a* of Keauhou 1st and 2nd over the centuries before contact as a demonstration of chiefly rank and authority. According to Stokes and Dye (1991), there were five *heiau* (Ka'io'ena Heiau, Ōpūkaha Heiau, Kamau'ai Heiau, Ho'okuku Heiau, Ahu a 'Umi Heiau) located within Keauhou 1st and 2nd Ahupua'a. However, by 1906 when Stokes conducted his island-wide survey of Hawaiian *heiau*, only the ruins of Ka'io'ena Heiau remained. This *heiau* was attributed to Lonoikamakahiki and was of the agricultural class. Kamau'ai Heiau (SIHP Site 3812), believed to have been built in ancient times by the god Kāne himself, and “connected, traditionally, with the introduction and propagation of vegetables in these islands” was allegedly located on top of the cliff that overlooks Keauhou Bay, but

was not found during Stokes fieldwork (Stokes and Dye 1991:85). Ho'okuku Heiau (SIHP Site 3811) is sometimes referred to as Kaopa Heiau or Ka-lei-o-papa Heiau (see Kekahuna map Figure 7). Stokes (1991) reported that the *heiau* of Ho'okuku was the site of the aforementioned miracle that provided life to the stillborn Kamehameha III. Figure 7 shows the detailed plan view portion of a 1955 sketch map by Kekahuna. In his map, Kekahuna refers to Ho'okuku Heiau as Ka-lei-o-papa Heiau, because Kaleiopāpā was another name of Kamehameha III. Kekahuna's maps were part of a newspaper serial (printed in thirty-seven installments in the Hilo Tribune Herald) about the history and historic sites of Kailua-Kona entitled *Kamehameha in Kailua*, which was authored by Theodore Kelsey and Henry Kekahuna with cultural assistance from Kekahuna's uncle Naluahine Ka'opua. Various high status features discussed above are found on this 1954 sketch map of Keauhou Bay with associated historical notes gathered by Kekahuna (Figure 8). This map also illustrates the locations and names of various coastal points and coves, the Ho'okuku Spring, house and wall locations as they appeared in the early 1950s, in addition to the location of the then present dry-dock and boat pier within Keauhou Bay.

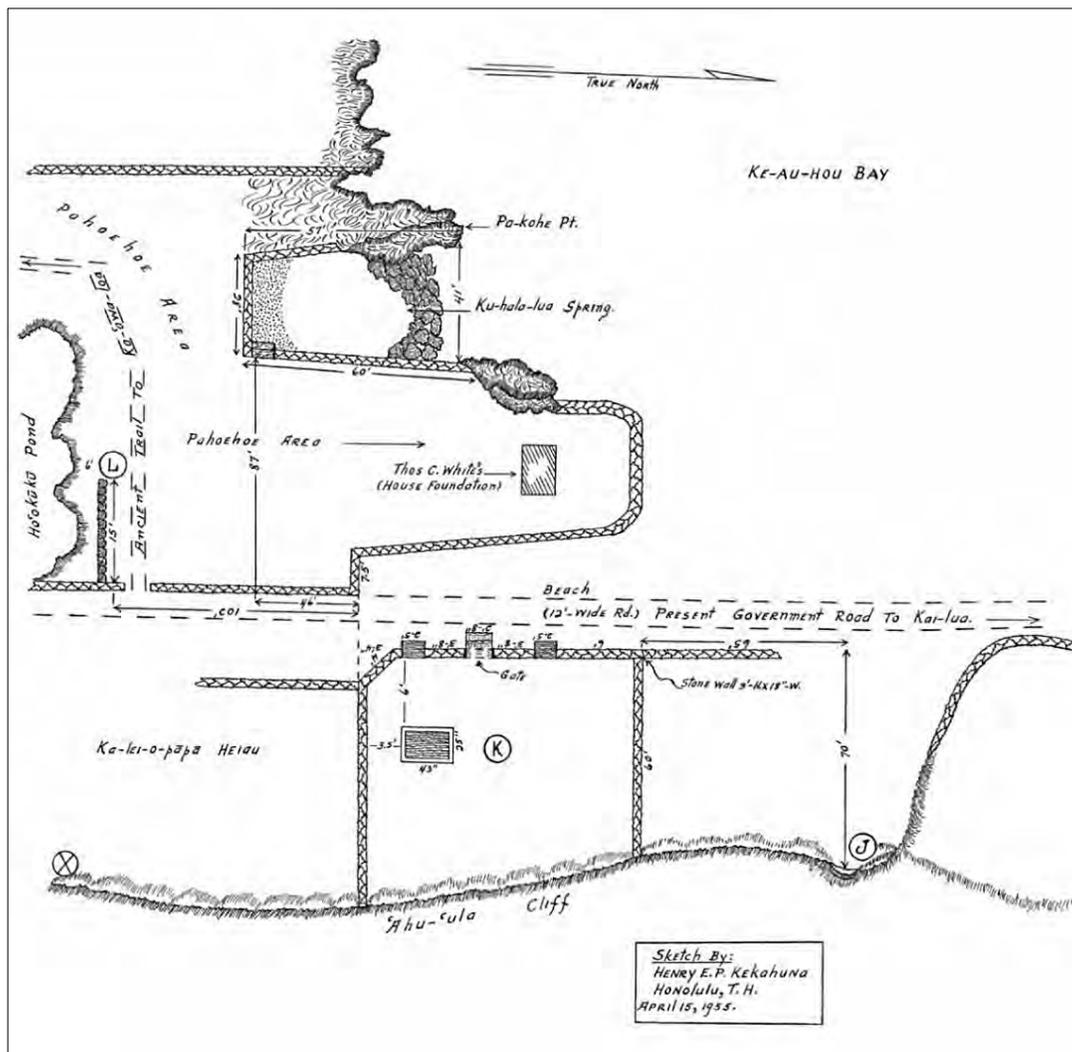


Figure 7. Portion of 1955 sketch map by Kekahuna, showing Kaleiopāpā Heiau, also known as Ho'okuku and Kaopa Heiau.

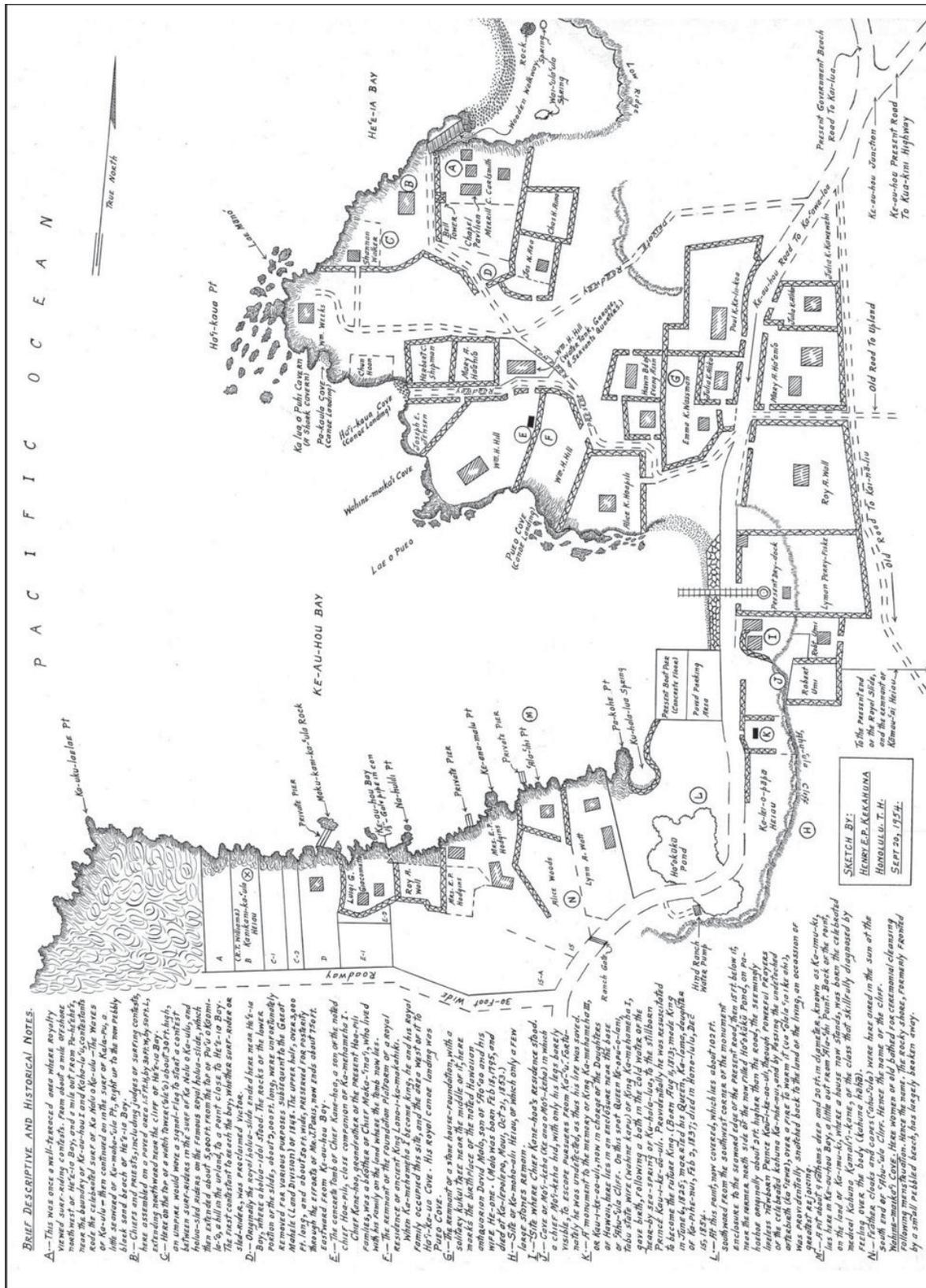


Figure 8. Map of Keaouhou Bay with historic notes and descriptions of features prepared by Kekahuna 1954.

Keauhou Bay as an Early Shipping Center

The use of Keauhou Bay as a shipping locus was noted as early as 1794; as according to Menzies (1920) there was a foreigner in residence at Keauhou engaged in the manufacture of charcoal to supply visiting western ships (Menzies 1920). Concerning the anchorage of vessels at Keauhou Bay, Mackintosh reported that the bay “is resorted to by vessels for cargoes of firewood, sandalwood and other commodities of produce” (1838:2). According to Folk et al., “Keauhou may have been always particularly well suited geographically for the transportation of forest resources to the coast and the sandalwood of a vast interior could have been funneled down through Keauhou to the waiting holds of Keauhou Bay” (2003:7).

Of particular relevance to the current project area is the story of the *Fair American*, an American trading schooner whose final history is closely linked to Keauhou Bay. In 1788, Captain Simon Metcalf of the ship *Eleanora* appears to have purchased the fifty-foot vessel in Macao. Shortly thereafter, under his son Thomas’ command the *Fair American* set sail as tender for the *Eleanora* to the Pacific Northwest on a trade venture (Howay 1926). The *Fair American* arrived in North Kona in 1790 with her six man crew, and swiftly became the victims of a brutal siege disguised as trade gestures, orchestrated by Kamehameha I’s uncle Kame’eiamoku; Isaac Davis was the only crewman left alive (Rogers 1999). According to Kuykendall (1967), Kame’eiamoku’s act of vengeance was in response to an episode in which he had been shamed by Captain Metcalf aboard the *Eleanora* and vowed to take his revenge on the next foreign ship to enter his waters.

As a result of the siege, Kamehameha placed a *kapu* on trade with the Americans in order to keep the news of the *Fair American*’s fate from Metcalf, who was prone to violence (Rogers 1999). One of the *Eleanora* crewmen, John Young, was captured when he was sent ashore by Metcalf to find some willing trade partners. Metcalf made some vain attempts to drum up trade and recover his lost crewman, but set sail for China within a few days without ever seeing John Young, his son Thomas, or the *Fair American* again. After reprimanding Kame’eiamoku for his actions, Kamehameha took command of the *Fair American*, and secured her at Keauhou Bay (ibid.). Kuykendall (1967) goes on to report that the *Fair American* became the first foreign vessel to be included in Kamehameha’s war fleet and Rogers (1999) recounts the story of the 1791 sea battle known as the Battle of the Red Mouthed Gun, in which the *Fair American* was outfitted with a gun called Lopaka and crewed by Young, Davis, Kamehameha and a Hawaiian crew. Young and Davis also apparently used the vessel for trade in 1793 (Rogers 1999).

Between 1790 and 1795 Captain George Vancouver sailed the ship *Discovery* and her tender *Chatham* on an exploration voyage throughout the Pacific Ocean. He and his crew made several visits to the Hawaiian Islands and had interactions with Kamehameha I and his retinue, as well as John Young and Isaac Davis. Vancouver kept a journal throughout his voyage, which was published in three volumes. Volume II published in 1798 contains the equivalent of eyewitness accounts of the siege of the *Fair American* and its aftermath. Vancouver recorded two separate entries that deal directly with the captured vessel. In the first entry dated February 1793, Vancouver recounts the following version of events as told to him by Young:

On the 17th of March, Young had permission to be on shore until the next day, when the snow [the *Eleanora*] stood close in, and fired a gun as a signal for him to return on board; but, to his very great astonishment, he found the canoes all *tabooed*, and hauled up on the shore, and was informed by *Tamaahmaah* [Kamehameha I], that if he attempted to take a canoe himself, he would be put to death, but that he should have a canoe the next day. Having no other resource, Young was obliged to submit; and in the evening he was informed, that the schooner *Fair American* had been captured by *Tamaahmootoo* [Kame’eiamoku], to the southward of Toeaigh [Kawaihae] bay; and that Mr. Metcalf’s son, and the four men composing the crew, had been barbarously murdered. (1798:137)

Vancouver goes on to explain the courtesy and kindness with which Kamehameha treated Young and how on the 22nd of March, Young accompanied the King to investigate the circumstances of the previous events. Regarding the state of the *Fair American* at that time, Vancouver recounts:

The schooner was found in the situation already described, destitute of almost every thing that was moveable. *Tamaahmaah* demanded the vessel should instantly be delivered up to him, that he might restore her to the proprietor Mr. Metcalf, should he ever again visit Owhyhee [Hawai’i]. This was complied with by *Tamaahmootoo*, who received from the king a very sharp rebuke for the great impropriety of his late conduct in the capture of the schooner, and his unpardonable barbarity in murdering the commander and the people; in excuse for which, he alledged [sic] he had been struck and otherways ill treated by the father of the unfortunate young man. (1798:137)

2. Background

According to Vancouver, it was at this time that Kamehameha first encountered Davis after the attack, alive but in bad shape. Vancouver collected the following account of the siege of the *Fair American* from Davis himself:

“The Schooner, being close in with the land, and nearly or intirely [sic] becalmed, she was visited by *Tamaahmootoo*, a very powerful chief, who was attended by a great number of the inhabitants. Many of these, as well as their chief, made considerable presents to the young commander, and others sold their hogs and vegetables for little or nothing; and in order to ingratiate themselves further in the good opinion of Mr. Metcalf, and to gain his permission for their entering his vessel, they told him that the snow [the *Eleanora*] was but a little way to the westward, and that he would see his father before night . . .” (1798:138)

Davis went on to tell Vancouver about how the commander and his men were thrown overboard and that he himself was thrown overboard when his pistol misfired (Vancouver 1798). He also described his struggle for survival on his way to the shore, and the subsequent care he received in addition to being paraded around the village by Kame'eiamoku. Davis also told Vancouver that Kame'eiamoku had stripped the vessel before Kamehameha and Young had gotten to her. In addition, Davis confirmed Young's account of the king having scolded his uncle before he “took possession of the schooner for the right owner” (ibid.:139).

In his second entry that mentions the *Fair American*, dated March 1793, Vancouver relates the following account of the location and condition of the vessel:

On the morning of the 8th the weather being pleasant, with a gentle breeze from the land, we sailed from Karakakoo [Kealakekua], and stood along shore to the northward; about four miles from our last station we passed a small creek, where we saw the captured schooner laid up, and house built over it to protect her from the sun. About this time *Tamaahmaah*, with his queen and most of his attendants, had overtaken us. I took this opportunity of resuming this unfortunate subject, and understood from *Tamaahmaah*, that it was his intention to return the schooner to Mr. Metcalf her owner. This, *Tamaahmaah* promised to do; either to Mr. Metcalf himself, or to the commander of any vessel authorized by Mr. Metcalf to receive her. Young bore witness to the king's sincerity, and said that this had been his constant language, from the moment he became acquainted with the melancholy cause of her detention. From Young we learned, that the schooner was now of little value, having nearly fallen to pieces for want of the necessary repairs (1798:164-165).

Archibald Menzies, the surgeon and naturalist aboard Vancouver's ship, also kept a journal during his time on board *Discovery*. A selection of his journal entries documenting his three visits to the Hawaiian Islands between 1792 and 1794 was published in 1920. Menzies also interacted with Kamehameha I and his retinue as well as Young and Davis (whom he refers to as Davies in his accounts) while anchored off the Kona coast in March of 1793. Menzies had the following to say about Young and Davis and the repercussions of the siege of the *Fair American*:

They had no wish to leave the island as they said they expected their commander, Mr. Metcalf [sic], to touch this way again, and were desirous of joining him in preference to any other. The king was also anxious to detain them till Mr. Metcalf [sic] should come, that they might inform him that he had no previous knowledge or any hand in the unfortunate affair of taking the schooner, which they both declared was actually the case. For John Young assured us that he was ashore at Kealakekua with the king at the time he received the intelligence of it, and that he appeared much agitated and truly grieved for the barbarous and cruel transaction for which he so much dreaded Mr Metcalf's [sic] vengeance, that he instantly ordered all the shore to be tabooed, and not a single canoe suffered to go to his vessel, by which means John Young was detained on the island. Mr. Metcalf [sic] finding the intercourse with the shore entirely cut off, sailed without being able to discover the cause of it, or having the least idea of his schooner being at the islands, for she had been captured at Nootka at the same time Mr. Meares's vessels were and carried to St. Blas by Dr. Joseph Martinez, and came here in hopes of meeting the Eleanor. (Menzies 1920:96-97)

In a separate entry, Menzies describes the events surrounding the siege of the *Fair American*:

The business of taking the schooner was accomplished at noon day by some double canoes under the direction of a treacherous chief named Kameeiamoku, who under the disguise of a friendship got on board with his diabolical party, and at a signal given seized the unfortunate crew and threw them overboard, while those in the canoes knocked them with clubs and paddles till they put an end to their existence, except Isaac Davies, who from his being a very strong and stout man, struggled so hard that he had the good fortune of reaching the shore alive after receiving many wounds and bruises, and his life was afterwards spared at the instigation of the king.

The schooner was at this time lying in a small cove [Keauhou Bay] about two leagues to the northward of Kealakekua, and roofed over with thatch to preserve her, in order to be delivered to Mr. Medcalf [sic] when he came to the island.(ibid.:97)

The *Fair American* appears again in Menzies account of his third journey to Hawai‘i with the *Discovery*, which occurred in 1794, when he briefly visited the current study area on his way to summit Hualālai. Kamehameha had arranged for chief Haalou to be his escort and recommended their voyage begin by canoe. Menzies recounts the events thusly:

January 16th. Everything being ready, we set out from the vessels in the forenoon of the 16th in company with Keeaumoku and his wife in a large double canoe, followed by Haalou and our attendants in another. As we were passing the village of Kaawaloa, we were joined by Mr. Howell and his attendants in his own canoe. After this we proceeded to the northward close along the shore for about four or five miles from Kealakekua when we entered a small cove surrounded by a scattered village belonging to Keeaumoku. In this cove we found the American schooner [*Fair American*], which the natives had captured, belonging to Mr. Medcalf [sic]. She was secured and housed over to preserve her from the weather, but we did not examine her condition very closely for fear of giving offense. They told us that she made a great deal of water, which they were obliged to pump out daily, otherwise that she would sink. (ibid.:148-149)

Despite numerous visitors to the islands in the following decades who penned descriptions, we found no further observations of the *Fair American* within our review of the literature, nor was the vessel noted during nineteenth century land surveys of Keauhou Bay. The most likely place to nearshore moor, or careen a vessel, would have been in the southeastern-most corner of the bay where the vessel would have been subjected to less swell and surf action (the same reason a modern boat ramp and pier exist there today).

Missionary Accounts of Keauhou Bay in the early 1800s

Much of the Hawaiian Island historic data available for review comes from the early post-contact writings of missionaries and traders generated during the late eighteenth and early nineteenth centuries. The following excerpts from British missionary William Ellis’ journals originally published in 1825 offer important glimpses into the Kona region in the vicinity of the current study area at that time, including the history and legends he heard spoken during his visit.

In 1823, Ellis, accompanied by Joseph Goodrich and Reverends Asa Thurston and Artemas Bishop, toured the Island of Hawai‘i seeking out communities in which to establish church centers and schools for the Calvinist mission. On July 18, 1823 Ellis and his missionary companions started their tour of Hawai‘i heading south along the coast of the district of Kona. Of the overall environment of the district of Kona, Ellis opined that:

Kona is the most populous of the six great divisions of Hawai‘i, and being situated on the leeward side, would probably have been the most fertile and beautiful part of the island had it not been overflowed by flood of lava... (1963:174).

Ellis made the following observations of the countryside on his approach to Keauhou and the vicinity of the current study area:

We passed another large heiau, and travelled about a mile across a rugged bed of lava, which had evidently been ejected from a volcano more recently than the vast tracts of the same substance by which it was surrounded. It also appeared to have been torn to pieces, and tossed up in the most confused manner, by some violent convulsion of the earth, at the time it was in a semifluid state.

There was a kind of path formed across the most level part of it, by large smooth round stones, brought from the sea-shore, and placed about three or four feet apart. By stepping from one to another of these, we passed over the roughest piece of lava we had yet seen; and soon after five p.m. we arrived at Keauhou, a pleasant village containing one hundred and thirty-five houses, and about eight miles from Kairua [Kailua]. Messrs. Bishop and Harwood reached the same place about an hour earlier, and here we proposed to spend the night.

We had not been long in the village, when about one hundred and fifty people collected round the house in which we stopped.

After singing and prayer, Mr. Thurston preached to them. They gave good attention; and though we conversed with them a considerable time after the service was ended, they still thronged our house, and seemed unwilling to disperse. (1963:103-104)

2. Background

Ellis went on to describe the central Kona region as an area of dense population with extensive cultivation inland compared to the southern reaches of Kona, which supported smaller populations made up mostly of fishermen. According to Ellis, during their walk from Kailua to Keauhou they generated a population estimate based on the following observations:

We counted six hundred and ten houses, and allowed one hundred more for those who live among the plantations on the sides of the hills. Reckoning five persons to each house, which we think not far from a correct calculation, the population of the tract though which we have travelled today will be about 3550 souls (1963:104)

In their travels between Kailua and Keauhou, Ellis' group "passed nineteen heiaus, of different dimensions" (Ellis 1963:104). Ellis also noted various smaller temples (likely fishing shrines) along the coast where fishermen made offerings to the gods of the sea. However, no specific mention of a *heiau* or shrine was made pertaining to Keauhou. Ellis did mention Keauhou in his discussion of Hawaiian burial customs, thusly:

. . . Their artificial graves were either simple pits dug in the earth, or large enclosures. One of the latter, which we saw at Keauhou, was a space surrounded with high stone walls, appearing much like an ancient heiau or temple. We proposed to several natives of the village to accompany us on a visit to it, and give us an outline of its history; but they appeared startled at the thought, said it was a wahi ino, (place evil,) filled with dead bodies, and objected so strongly to our approaching it, that we deemed it inexpedient to make our intended visit. (ibid.:364)

Beginning in the 1820s, when the center of government moved from Kailua-Kona to Honolulu, the Keauhou area began to see a rapid decline in coastal village settlement. The uplands of Kona saw a boom in the coffee and tobacco industries as well as more diversified agriculture, including the rearing of livestock (e.g., cattle, goats, and pigs). These events were a mere precursor to significant land tenure changes that were soon to take place.

The *Māhele* 'Āina of 1848

Profound religious, socioeconomic, and demographic changes took place in the early 1800s that resulted in the establishment of a Euro-American style of land tenure, and the *Māhele* 'Āina of 1848 or Great *Māhele* was the vehicle used to divide the land between the crown, government, *konohiki*, and native tenants. Prior to this land reformation, all the land and natural resources of Hawai'i were held in trust by the *ali'i* who, in concert with *konohiki* land agents, meted out use rights to the native tenants. During the *Māhele* all lands were placed in one of three categories: Crown Lands (for the occupant of the throne), Government Lands, and *Konohiki* Lands; all three types of land were subject to the rights of the native tenants therein.

The *ali'i* and *konohiki* were required to present their claims to the Land Commission to receive a Land Commission Award (LCAw.) for lands provided to them by Kamehameha III. They were also required to provide commutations to the government in order to receive royal patents on their awards. The lands were identified by name only, with the understanding that the ancient boundaries would prevail until the land could be surveyed. This process expedited the work of the Land Commission and subsequent land transfers (Chinen 1961). In 1862, the Commission of Boundaries (Boundary Commission) was established to legally set the boundaries of all the *ahupua'a* that had been awarded as a part of the *Māhele*. Boundary descriptions were collected for Keauhou 1st and 2nd, as these were awarded at *Konohiki* lands, and will be discussed in further detail below.

Native commoners could also register claims for land with the Land Commission, and if substantiated, they would receive awards referred to as *kuleana*. Upon confirmation of a claim, a survey was required before the Land Commission could issue a *kuleana* award. According to Kelly (1983), several prominent *konohiki* related in some way to the Kamehameha dynasty received land awards in North Kona District.

In 1848-1849, the *ahupua'a* of Keauhou was divided into two sections: Keauhou 1st to the north, and Keauhou 2nd to the south. During the *Māhele*, both *ahupua'a* were awarded as *Konohiki* Land. Victoria Kamāmalu (LCAw. 7713) received the *ahupua'a* of Keauhou 1st, while her brother, Lot Kapuāiwa (Kamehameha IV) (LCAw. 7715, Apana 12) received Keauhou 2nd. Hammatt et al. (1981) believe that since the land of Keauhou was retained by the Kamehameha dynasty, it reflects their perceived value of the land and resources.

In addition to these divisions, according to Elmore and Kennedy (2001) numerous land claims were made and fifty LCAws. were awarded in Keauhou 1st Ahupua'a; according to Maly and Maly (2001). Twenty-one claims were made, which resulted in the award of sixteen LCAws. in Keauhou 2nd Ahupua'a. Tomonari-Tuggle summarized land use and residential life in Keauhou 1st Ahupua'a thusly:

Residences were primarily along the coast, generally occurring as stone wall-enclosed house lots containing up to five houses. Within house-lots were a variety of garden plants, including kou, hala,

hau, papaya, loulou palm, pineapples, noni, coconut trees, and “some flowers for beautification”. . . At Keauhou Bay, houselots are located primarily on the promontory between Keauhou and He‘eia Bays, with seven situated on the south side of the bay. One lot is isolated on the southern coast of Keauhou 2. There were at least four trails in Kahalu‘u and Keauhou 1 which led to the upland cultivation areas. There do not appear to be any similar trails in Keauhou 2. Upland agriculture occurred primarily between 1000 to 1700 ft above sea level . . . Only in Keauhou 1 do agricultural parcels extend all the way to the coast. This occurs in a strip of shallow gullies with well-drained, thin organic soils overlying an aa base...(Tomonari-Tuggle 1985:27)

The awarded *kuleana* claims within Keauhou 2nd Ahupua‘a ranged in size from 1.5 to 6.28 acres with an average of 3.34 acres. Twelve of the awards consisted of two or three lots (usually at different elevations), while the remaining awards consisted of single lots (Haun and Henry 2004). According to Haun and Henry (2005a), the awarded lots are concentrated in two areas; eight claims were along the coast on the south side of the bay, and the remaining claims were situated upland between 880 feet and 1750 foot elevation. As the current study area is the underwater portion of Keauhou Bay, the following discussion will focus on those LCAws. that surround the bay (Figure 9). Of the over sixty *kuleana* lots awarded during the *Māhele*, twenty *kuleana* (Table 2) are found in close proximity to Keauhou Bay (see Figure 9). Of these, eight are located north of the bay (LCAw. 5781:1, 7428:1, 7738:2, 8046:2, 8526:2, 9700:1, 9759, 9946:1); five are located on or near the southern shore of the bay (LCAw. 5785:2, 7319:2, 7365:2, 7366:2); and nine are situated to the east of Keauhou Bay, *mauka* of Kamehameha III Road (LCAw. 5781:2, 7361:2, 7362:2, 7372:2, 9753:2, 10734:2; 11046:2, 11047:2, 11048:2; see Figure 9).

Table 2. LCAws. in the vicinity of the current study area.

LCAw. No.	Awardee	Ahupua‘a	Land Use
5781:1 and 2	Kanehoa	Keauhou 1 st	Garden and house lot
5785:2	Keehualauumoku	Keauhou 2 nd	House lot
7319:2	Naholowaa	Keauhou 2 nd	House lot
7361:2	Kapuipui	Keauhou 1 st	House lot
7362:2	Kaanoano	Keauhou 1 st	House lot
7365:2	Keohoaeae	Keauhou 2 nd	House lot
7366:2	Kukahi	Keauhou 2 nd	House lot
7372:2	Kaikuaana	Keauhou 1 st	House lot
7428:1	Kaihe	Keauhou 1 st	House lot
7738:2	Aoao	Keauhou 1 st	House lot
8046B:2	Hawaawa	Keauhou 1 st	House lot
8526:2	Keone	Keauhou 1 st	House lot
9698:2	Kapela	Keauhou 2 nd	House lot
9700:1	Kaaukelemoku	Keauhou 1 st	House lot
9753:2	Kaluahinenui	Keauhou 1 st	House lot
9759	Kailiakaale	Keauhou 1 st	House lot
9946:1	Keiki Lono	Keauhou 1 st	House lot
10734:2	Paiki	Keauhou 1 st	10 partially cultivated plots
11046:2	Molale	Keauhou 1 st	House lot
11047:2	Poopuu	Keauhou 1 st	House lot
11048:2	Haluapo	Keauhou 1 st	House lot

2. Background

The majority of the *kuleana* claims on or near the shore of Keauhou Bay are referred to as *hale* (house) or *pahale* (house lots) in the native testimonies, as Table 2 shows. Many of the *kuleana* claimants also had corresponding *mauka* agricultural *apana* awarded. The majority of the house lots are often described as enclosed with or surrounded by a wall. The native testimony also provides residence information pertaining to the house lots. Such information included the number of houses located within the land being claimed, typically between one and three houses and the names of their residents. Some of the claimants themselves resided in houses on their land as in the case of LCAw. 9700: “Kaaukelemoku had enclosed the house lot. He has one house there within he is living” (N.T. 648 v. 4). Another claimant planned to do so, as in the testimony for LCAw 7319:2, which states that the house lot, “is enclosed by a wall which they made, there is no house, they are preparing to build it. It was a vacant place, enclosed by them” (N.T. 4:660-661).



Figure 9. Portion of modified TMK map illustrating location of LCAw’s in the vicinity of the current study area.

In some instances there are references to specific things planted within these house lots; such as LCAw 7365 in which 3 *loulou* trees and 1 *kou* tree were planted at the time the testimony was given. (N.T. 4:662-663). Another example is LCAw 5781:2 in which, “Kanehoa has built a fence he has planted 3 coconut trees and 15 palm trees” (N.T. 659-660 v. 4). A review of the native testimonies also reveals mention of different *‘ili* (land sections) in the vicinity of the current study area. The *kuleana* claimants of lands located *mauka* of Kamehameha III Road, mention the *‘ili* of Maili (LCAw 10734), Makakanalii (LCAw. 7362). While the *‘ili* mentioned in association with *kuleana* claims on the north shore of the Bay (*makai* of Kamehameha III Road) include Puuloa 3 and Laulauhili (LCAw 7738), Opukaha 2 (LCAw. 8526). The south shore *kuleana* claimants also mention the *‘ili* of Puuloa (LCAw 7365) in addition to the *‘ili* of Pakohe (LCAw. 5785).

As previously mentioned, in 1862, the Boundary Commission was responsible for legally setting the boundaries of all the *ahupua‘a* that had been awarded as a part of the *Māhele*. Subsequently, in 1874, the Boundary Commission was authorized to certify the boundaries for lands brought before them. The primary informants for the boundary descriptions were older native residents of the lands, many of which had also been claimants for *kuleana* during the *Māhele*. This information was collected primarily between A.D. 1873 and 1885 and was usually given in Hawaiian and transcribed in English as they occurred. Boundary descriptions were not collected for all *ahupua‘a*. The boundary testimonies and survey records provide a good summary of traditional knowledge of places, and identify localities ranging from the shore to the upper most boundaries of the *ahupua‘a*. The narratives describe: fishing *heiau*, the royal *holua* slide, marine resources of Keauhou; the occurrence of historical features, including residences; sandalwood harvesting; and name many localities on the land in addition to traditional origin stories. The following excerpts of two Boundary Commission testimonies and one judgment pertaining to the current study area vicinity illustrate the informative value of these documents:

Volume 1, No.A, pp. 318-320

Keauhou 1, North Kona, Hawaii,

August 8th, A.D. 1873

Testimony:

Lono kane, sworn,

I was born at Keauhou at the time of Kaoku and have lived here most of my life; . . . The boundary at the shore between Keauhou 1st and Keauhou 2nd is at Kamanae, a heiau for fishermen situated above the beach, on the hill where the houses stand; . . . Keauhou is bounded by the sea and the land has ancient fishing rights extending out to sea.

Volume A, No.1, pp. 266-268

Keauhou 2, North Kona, Hawaii,

August 8th, A.D. 1873 (evening)

Testimony:

Kakio, kane, sworn,

I was born at Keauhou at the time Kamehameha I came from Hilo to Kealakekua and from there to Honolulu, at the time of Oku. I have always lived here and know the land of Keauhou 2d and its boundaries. I used to go after sandalwood on the mountain, . . . The boundary at shore between the two Keauhous is at a place called Kamanae at the beach; Thence it runs mauka to the head of Holua (an old sliding place); . . . They say in the days of Keauaumoku the Akule used to belong to Keauhou 2d and the birds to Keauhou 1st, but the Chief of Keauhou 2 married a chief of Keauhou 1st and after that all the fish were given to Keauhou 1st and the birds and land mauka to Keauhou 2nd.

June 15, 1886

Judgment

Beginning at the Southwest corner of Keauhou 1st at a rock marked by crosses and situated in the bank mauka of the shore and South of the Cavern Anamoikeha, thence the boundary runs along Keauhou 1st to the head of the Holua

Life in Keauhou 1st and 2nd Ahupua‘a in the late Nineteenth and Early Twentieth Centuries

This section presents a discussion of life in Keauhou 1st and 2nd Ahupua‘a during the late nineteenth and early twentieth century based on observations made by visitors to the area. In 1880, George Bowser, editor of *The Hawaiian Kingdom Statistical and Commercial Directory and Tourist Guide*, wrote about the various statistics and places of interest around the Hawaiian Islands, including Keauhou:

...[S]ituated on a small inlet of the sea... It is a romantic spot, with pretty local scenery and a fine view of Mauna Hualalai as a background. All the way from Kailua I found the road was good, with cocoanut groves every mile or so, and plenty of pineapples, which are in season all the time, from June to December. (Bowser 1880 in Maly and Maly 2001:68)

A few years later, between 1882 and 1884, Kingdom Surveyor, Joseph S. Emerson conducted a survey of the Keauhou-Keel vicinity. He generated letters and field notebooks in addition to recording survey map coordinates. While in the field, Emerson, who was able to communicate in Hawaiian, used native residents of the land as guides. As a result, he was able to record traditional place names for the trails and various natural and cultural features that he encountered (Maly and Maly 2001). Emerson was also accompanied by one of his assistants, J. Perryman, a talented young artist who prepared detailed sketches of the landscape during the time of the surveys. Figure 10 below is a reproduction of one of their maps, recorded on October 31, 1883 in the Field Book 255:61, which shows three distinct views of the coast of North Kona from the vantage point of Keauhou. The uppermost portion depicts the view to the north with Kailua Bay in the distance. The middle portion depicts the view to the west, which shows the current study area. In particular, one notices the concentration of vegetation and houses along the shores of bay and the “open space” and “pāhoehoe covered with brush” *mauka* the shore. The bottom portion is the view to the southwest and depicts a solitary house in the foreground, as well as a road.

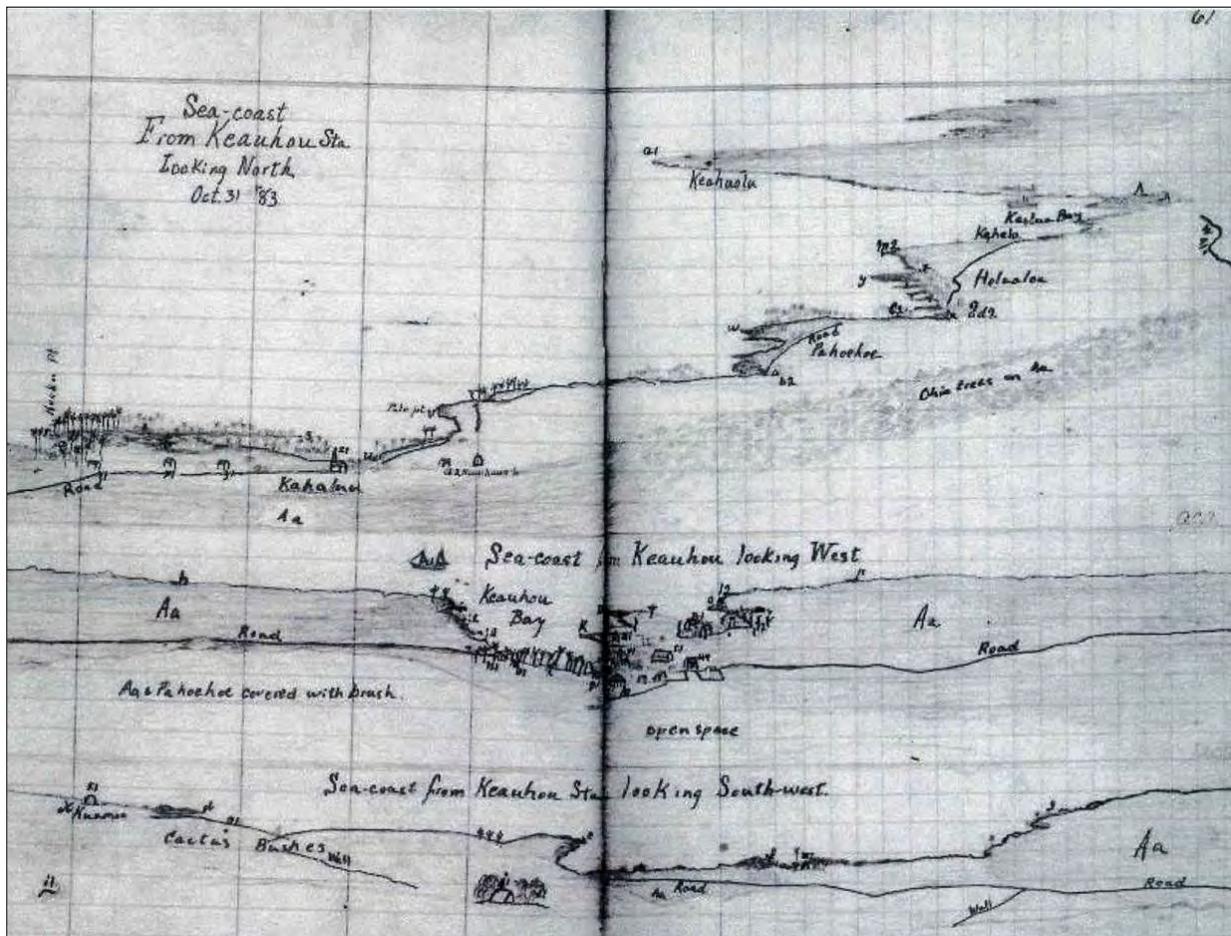


Figure 10. 1883 Perryman sketch of the sea coast from Keauhou station (from Maly and Maly 2001:265).

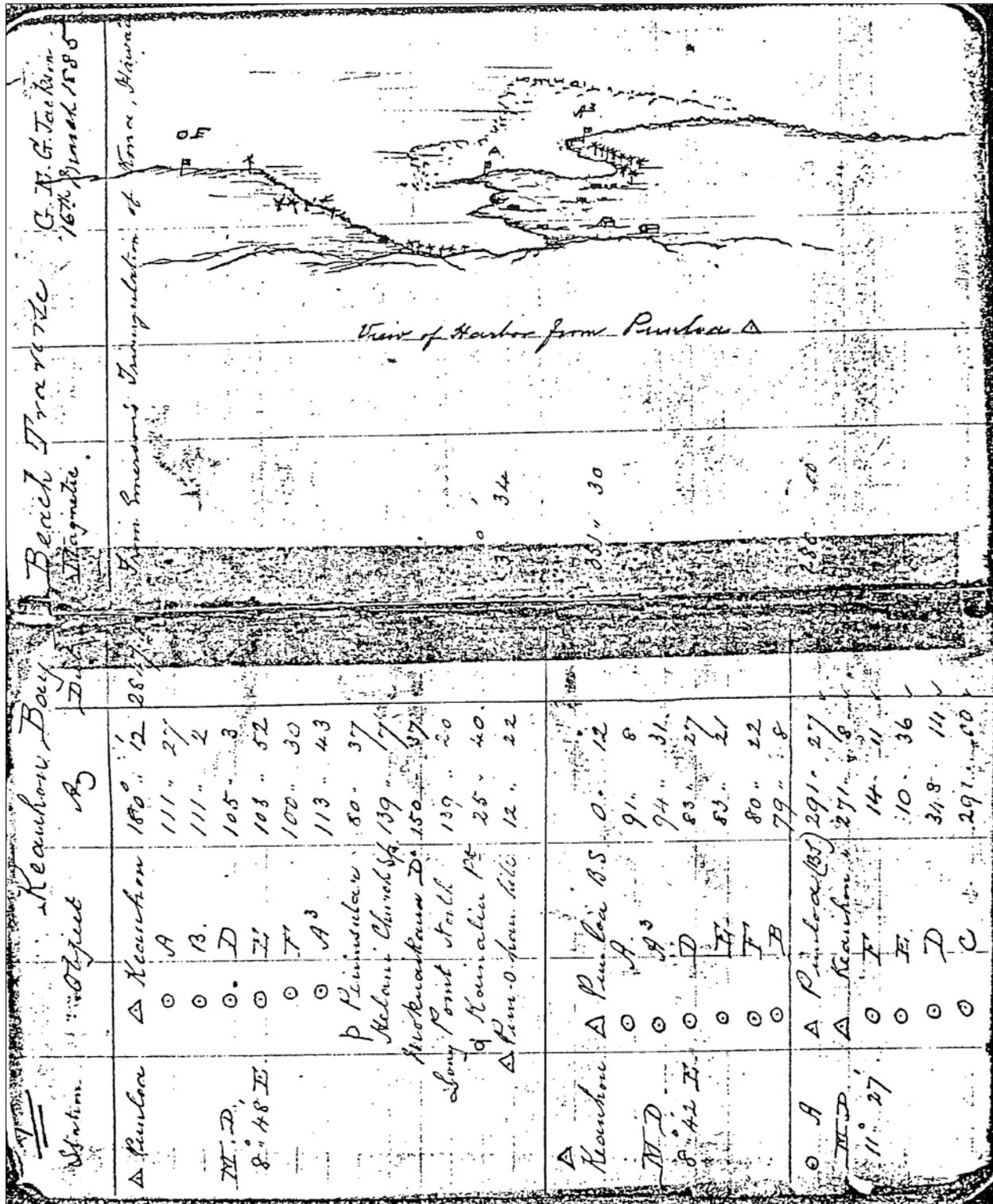


Figure 12. Copy of G.E.G. Jackson's March 16, 1885 survey of Keauhou Bay showing view of harbor from Puuloa triangulation station, note his Datum "E" at top left of sketch.

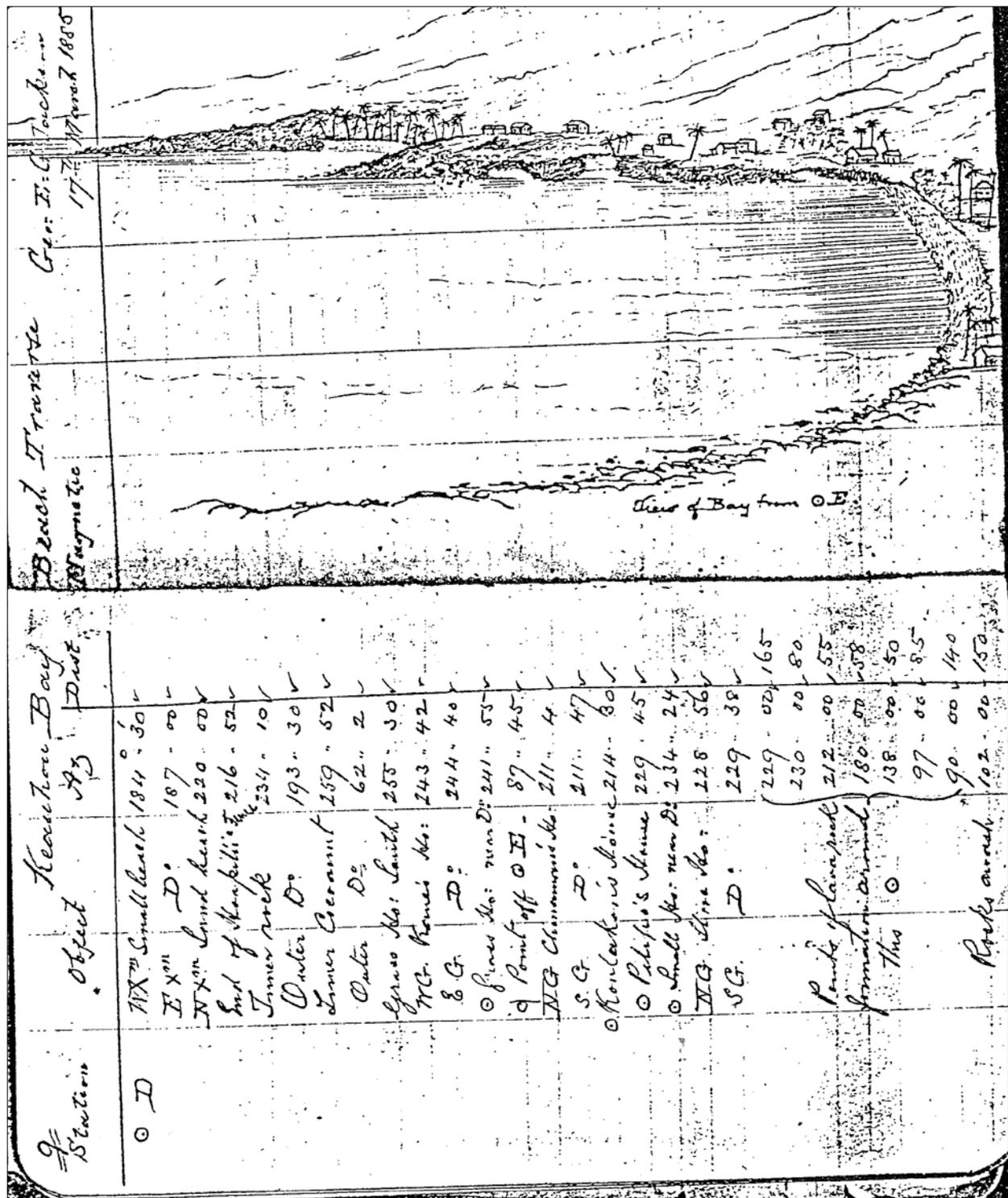


Figure 13. Copy of G.E.G. Jackson's March 17, 1885 survey of Keauhou Bay showing view from his Datum E.

2. Background

By the early twentieth century development of the Kona uplands as an agricultural and ranching center was in full swing. According to Tomonari-Tuggle (1985), Keauhou was literally the end of the road from Kailua because to the south of Keauhou the so-called road was not much more than a trail. This is evidenced by a review of early twentieth century maps of the area such as the 1928 USGS Kailua Quadrangle (Figure 14) that illustrates the numerous paths, trails, and roads connecting the coast with the uplands. Within Keauhou 1st and 2nd Ahupua'a, Cordy (1989) notes four *mauka-makai* trails, in addition to two trails that cut across the *ahupua'a* in the coastal zone as follows:

Two major trails cross the ahupua'a dating to prehistoric and early historic times. These are the coastal trail and the inland trail, the latter approximating the Kona Belt Road... Six inland-heading trails extend from the shore up to the agricultural field—labelled 1-6 on Figure 10. Two trails (Trails 1 and 2) are in the north, identified by Reinecke [1930]. Two (3 and 4) are in the central and south areas, both visible on the tax maps (e.g., 7-8-10)—connecting to the Heeia and Keauhou Bay housing areas, Trail 4 being the “Keauhou Trail”. Two more (Trails 5 and 6) are identified in the uplands. One (6) appears on TMK map 7-8-07, to the south of the “Keauhou Trail”. The other (5) identified in the Awards Books, seems to lie between the “Keauhou Trail” and the southern trail. These latter two trails may not have extended all the way to the shore; they may have been branches off the “Keauhou Trail”. In the Awards Books, when noted, these trails are labeled “ala nui”... Reinecke’s maps suggest that ca. 1929, the “Keauhou Trail” may have been the only inland-heading trail still in use, because he labeled it “path used now”. But this is not verified. (Cordy 1989:14 in Sweeny and Burtchard 1995:15-16)

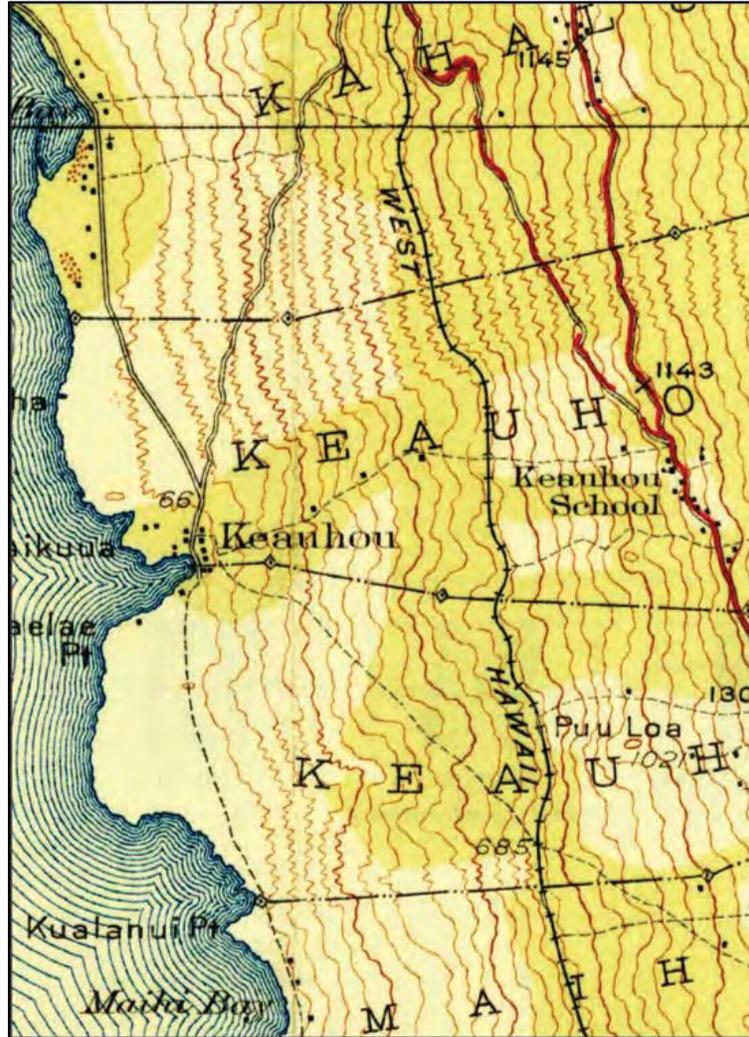


Figure 14. Portion of 1928 USGS Kealakekua Quadrangle map showing the trails and roads around Keauhou.

In 1913, H.W. Kinney published a visitor's guide to the island of Hawai'i. In his guide he includes the descriptions of the land at the time, historical accounts of events, and descriptions of sites and practices that might be observed by the visitor (Maly and Maly 2001). Kinney provides the following description of Keauhou in 1913:

KEAUHOU is the next village south of Kahaluu. It is a steamer landing and is of particular interest. It was the birthplace of Kamehameha the Third, the place of his birth being shown as a big rock immediately mauka of the big monkeypod stump about 200 feet south of the wharf. The king lived, in childhood, where the White house now stands makai of the stone mentioned. It was tabu for the people to walk on the cliff above the house in the morning, when their shadows would fall on the house. Those who wanted to cross, had to swim. Mauka of the village is seen the most famous papa holua in the Islands, a wide road-like stretch, which was laid with grass steeped in kukuinut oil so as to allow the prince and his friends to coast down in their sleighs constructed for the purpose. At the end of the slide was a *lanai*, where the prince and his friends would don malos and go with their surfboards far out to the sea, where the surf would carry them right to the prince's house. Here are also the remnants of the heiau Puu-o-Kaloo. The Hawaiians still look for a dumbbell-shaped cloud to connect it with the heiau of Keeku [Kahalu'u area], which is a certain sign of rain. When it appears it is a good time to plant (Kinney 1913:63 in Maly and Maly 2001:70-71).

As illustrated in the above excerpt, Keauhou appears to have become a tourist destination by the early 1900s that offered visitors a glimpse of Hawaiian history and culture.

Photographs from the A.S. Baker collection (Figures 15-18) taken at Keauhou Bay on August 15, 1914, document the dedication ceremony of the Kauikeaouli Tablet. These historic images provide a glimpse of how the current project area vicinity appeared in the early 1900s. Queen Lili'uokalani (Figure 19) attended the dedication of the plaque, which commemorated the birth of Kamehameha III at his birthplace.



Figure 15. Procession of canoes in Keauhou Bay for the dedication ceremony of the Kauikeaouli Tablet, August 15 1914 (A.S. Baker collection).



Figure 16. Landing the Kauikeaouli Tablet at Keauhou Bay for the dedication ceremony, August 15, 1914 (A.S. Baker collection).



Figure 17. Scene of Kauikeaouli Tablet procession, August 15, 1914 (A.S. Baker collection).



Figure 18. Close-up of Kauikeaouli Tablet procession, August 15, 1914 (A.S. Baker collection).



Figure 19. Queen Lili'uokalani at Keauhou, August 15, 1914 (A.S. Baker collection).

2. Background

Based on a review of archival documents and photographs, it appears that a wooden pier was constructed at some time during the early 1900s along the eastern shore of Keauhou Bay. Figure 20 below is a photograph found in the digital archive of the Hawaii State Archives, which dates to ca. 1916. Another photograph (Figure 21) taken by the Pacific Press and accessed through the same digital Hawaii State Archive depicts the same pier nearly twenty years later, ca. 1935. According to both Lily Kong and Barbara Nobriga (both interviewed as a part of the current study) this pier was destroyed by the 1946 *tsunami*, which matches the archival record as it is no longer in existence in 1950 as evidenced in Figure 22, which shows that by that time the dry-dock shown on the 1954 Kekahuna map (see Figure 8) was already established. This dry-dock was operated by Charles Machado, who also had a small fleet of fishing boats that operated out of Keauhou Bay. The area labeled “present boat pier” (this is actually a wharf) on the 1954 Kekahuna map (see Figure 8) appears to have been built sometime between 1951-1954 as is not seen in 1950 photographs of the area (see Figure 22, Figures 23 and 24). The original wooden version of the current pier may have been built around 1957 (Lionel Machado and Barbara Nobriga, interviewed as a part of the current study), and was clearly operational by 1963 as can be seen in a photograph (Figure 25) taken in November of that year.

According to Barbara Nobriga (interviewed as a part of the current study), in the early 1950s the passage into the bay was enhanced by exploding the natural coral heads that protected the bay. During the late 1950s and early 1960s there were numerous boats moored in the bay and housed in the Machado dry-dock; and as related by Lionel Machado (interviewed as a part of the current study), the moorings were haphazardly created and anchored using all kinds of discarded metal debris (i.e., machinery parts, old boat engines, anchors, etc.) found in the immediate vicinity of the bay. Such potential items can be seen littering the beach in Figure 24.



Figure 20. The pier at Keauhou Bay, ca. 1916 (Hawaii State Archives).



Figure 21. Keauhou Bay pier ca. 1935 (Hawaii State Archives).



Figure 22. Keauhou Bay shore in 1950 (Hawaii State Archives), note dry-dock area and tracks to haul boats out of the water at center of photo.



Figure 23. Keauhou Bay shore in 1950 (Hawaii State Archives), looking toward current concrete wharf area.



Figure 24. Keauhou Bay shore in 1950 (Hawaii State Archives), at current wharf area.



Figure 25. November 1, 1963 photograph (Kona Historical Society) of the then new pier at Keauhou Bay, note Charles Machado house in right background.

Modern Use at Keauhou Bay

Beginning the 1960s, resort and tourist-related development in the Keauhou area has altered the landscape, particularly along the coast. Such has resulted in the construction of resort hotels and golf courses in addition to the construction and upgrading of roadways beginning in the 1970s (see cover photo). Ongoing residential and resort development has taken over many of the beachfront properties in the vicinity of the current project area. The former Machado drydock area was converted for boat storage associated with the Keauhou (Kauikeaouli) Canoe Club (Figure 26), and the former Charles Machado house is now the retail and booking headquarters of the Fair Wind Cruises tour company (Figure 27). In 1973-74, the wooden pier was shortened by the removal of two of piles and reconstructed with metal piles and a new deck surface (John Moore personal communication). In 1978 the Hawai'i Department of Transportation assumed administration of the Keauhou Bay Small Boat Harbor, and within a few years thereafter, the present day concrete boat ramp was constructed on the southern side of the bay. Administration of the Keauhou Bay Small Boat Harbor was transferred again in 1992 to the Department of Land and Natural Resources, at which time the following description was prepared:

This very well protected small boat harbor includes slips and moorings for 19 vessels, a double-lane, 30 foot wide launching ramp which was donated to replace a former marina railway, and fishing hoist. (DOT Boating Program transfer to DLNR document, dated August 1992)

In recent years, there has been a concerted effort on the parts of Kamehameha Schools (a majority land owner in the area), the Daughters of Hawai'i, and the Hawai'i Tourism Authority to highlight the cultural and historical significance of the Keauhou Bay area through the establishment of a public walking path (Figure 28) and the placement of interpretive signs (Figures 29-31) in the vicinity of the Kamehameha III birthplace. Kamehameha Schools has deeded the land where the Kamehameha III birth site monument is located to the Daughters of Hawai'i, who not only maintain the monument (Figure 32), but who, with the assistance of Kamehameha Schools, are currently planning a landscape restoration project (Figure 33).



Figure 26. Keauhou Canoe Club inland of Keauhou Bay.



Figure 27. Current Fair Wind office, former Machado house.

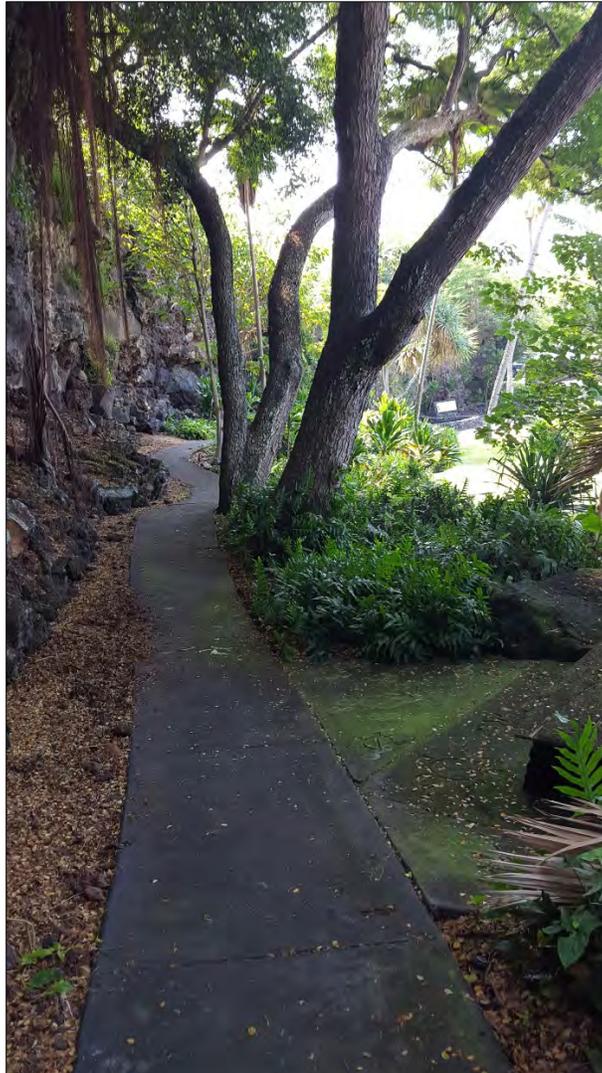


Figure 28. Public interpretive walking path at the base of the cliff at Keauhou Bay.



Figure 29. Interpretive signage near the remnant of Kūhalalua Pond.



Figure 32. Kamehameha III birthplace monument.



Figure 33. Banner describing current restoration project proposal.

PRIOR STUDIES

Since the early 1900s, the Keauhou Bay region has been included in various island-wide thematic or regional surveys (Stokes 1906; Reinecke n.d.; Emory 1932). These first few studies were mostly conducted under the auspices of the Bishop Museum or Bishop Estate, and the early site descriptions, oral traditions, and place name information records are currently on file at the Department of Anthropology at the Bishop Museum in Honolulu. Major resort development in the 1970s spawned a surge of archaeological studies in the vicinity of Keauhou Bay carried out by the Bishop Museum as well as private archaeological consultants. These studies began to focus on individual parcels slated for development, most of which were situated along the coast. The number of studies undertaken in the Keauhou Bay area has continued to increase over the last forty years, and have revealed evidence of habitation and resource acquisition as well as ceremonial and recreational use of the land. The following discussion centers on previous archaeological studies in close proximity to the current study area.

As previously mentioned, in 1906 Stokes (Stokes and Dye 1991) conducted fieldwork traversing around Hawai‘i Island with the sole purpose of recording *heiau* for the Bishop Museum. Stokes observed and recorded no less than 25 *heiau* in the Kona district, five of which (Ka‘io‘ena Heiau, Ōpūkaha Heiau, Kamau‘ai Heiau, Ho‘okuku Heiau, Ahu a ‘Umi Heiau) were believed to have been located in the vicinity of the current study area within Keauhou 1st and 2nd *ahupua‘a*. However, they were only able to locate and observe the ruins of one of these five *heiau* during their 1906 field survey. The ruins of Ka‘io‘ena (BPBM Site D4-100) consisted of a few pavements or low platforms along the edge of an *a‘ā* flow, about 3000 feet from the sea at an elevation of 400 feet above sea level, on the boundary between Kahalu‘u and Keauhou. Regarding Ōpūkaha Heiau (Site 3813), Stokes provided only locational data and report that the *heiau* was not seen during the fieldwork. Of Kamau‘ai Heiau (Site 3812) it was suggested (Stokes and Dye 1991) that the *heiau* may actually have stood at the base of the high cliff at the site known as Ho‘okuku or Kaopa Heiau, rather than on top of the cliff overlooking Keauhou Bay as previously believed. This conclusion is likely due in part to the fact that the purported site of Kamau‘ai *heiau* had become a house lot and, “the owner said that he and his people had lived there for a long time and had never heard of a *heiau* being there” (1991:85). Stokes offered the following description of Ho‘okuku (Kaopa) Heiau:

Heiau of Ho‘okuku or Kaopa, land of Keauhou 2, North Kona, near the boundary of Keauhou I. Keauhou wharf bears 168°, 250 feet. This place owes its interest in modern times to the tradition that the royal child (later Kamehameha III) who was stillborn here then was miraculously brought to life. There is nothing suggestive of a *heiau* in the appearance of the place. A low, rambling wall encloses a space of about 1.5 acres at the foot of a high cliff. The contour of the ground inside is similar to that outside, and within are breadfruits, *loulou*, and other trees. Also inside, however, is a large rock to which marvelous revivifying powers were attributed, and it was stated that the dead baby was placed on the stone for some days and came to life by virtue of the stone, with the aid of the priest’s parayers. It is not improbable, if all were known, that this would prove to be the site of the *heiau* of Kamau‘ai Heiau mentioned above. (Stokes and Dye 1991:85)

Of Ahu-a-‘Umi Heiau, Stokes and Dye (1991) only mention its location within Keauhou 2nd *Ahupua‘a* and that it was not visited. However, the *heiau* was first recorded in 1830 by Bingham and has been included in many studies in the decades since. For further information, the reader is referred to Cordy (2000) for a detailed discussion of this inland *heiau*.

In 1929 and 1930, Reinecke conducted fieldwork in the coastal portions of Keauhou 1st and 2nd and identified twenty-four sites (Sites 51-74) surrounding the current study area (Table 3). Reinecke recorded these twenty-four nearby sites in sequence, moving from south to north along the edge of Keauhou Bay. Portions of the maps associated with this survey are reproduced in Figures 34 and 35, below. A detailed view of Sites 51 through 57 (see Figure 35), which are located toward the southwestern end of Keauhou Bay, was presented as an inset of a map of another area. In his preamble to the site descriptions of Sites 51-74, Reinecke states the following:

There is a gap of about 1400’ [from Site 50] to the next ruins, those of the old *heiau* [Site 51]. The Hawaiians evidently disliked building on the smooth *pāhoehoe* of this section. (n.d.:80)

Table 3. Sites recorded by Reinecke in 1929 around Keauhou Bay.

Site #	Notes (reproduced from Reinecke n.d.:80-82)
51	Kaukulaelae Heiau
52	Platform in good condition, 26x18x2, with foundations and wall behind and makai. Probably a modern house platform.
53	A similar platform in rougher condition. Has three layers of retaining wall makai. Roughly 20 plus 4 plus 4x20-24x6. Behind it a small pen, about 12x12x3.
54	Well-built platform, for house of public building, about 78x30x2, with a makai section (part of main platform) 18x18x2.
55	Pen about 38x20x3 before it was broken down.
56	Platform on knoll, about 43x30x4. Pointed out by a fisherman as fishing heiau known as Pohakukanikaula or Mokukanikaula.
57	Two smooth-floored pens, side by side with ruined rubble walls. Inside dimensions 36x28 and 32x22.
58	Probably puoa [burials] or just plain heaps on the pāhoehoe [8 rock mounds of various size]
59	Modern house platform site, about [33?]x25
60	Modern house platform site, about 32x33
61	Modern house platform site, about 34x23.5
62	Heaps of rubble 8x9 and 5x5
63	Low heap of rubble about 20x20. Round holes have been ground in the pāhoehoe slabs.
64	Alaihi, a fishing heiau. Now merely part of a house yard.
65	A medium-sized, modern house platform, not measured.
66	Kamohalii Heiau
67	Moikeha Cave
68	Low ground behind the wharf. In ancient times the site of Kamauai Heiau. (the legend connected with it is found in Thrum's Annual for 1908)
69	Kualalua, the brackish seepage W. of Mr. Tommy White's beach house, used for bathing.
70	Mouth of burial cave Ke-eku-a-ka-puaa. Used for a burial as recently as 1913, when a very poor Hawaiian man was strapped between two sheets of galvanized iron roofing and thrust into the cave. 2 rather rough double platforms near its mouth. Their use is puzzling.
71	Puu o Kaloa, an upheaved mass of pāhoehoe blocks with no evidence of construction, claimed to be a heiau sacred to the god Loa
72	Hale o Lono, likely the house of Lonoikamakahiki, only a few large stones and no foundation to indicate a heiau
73	House site on level ground, 20x16
74	Space about 40x40, strewn with ilili, part of it probably one a [house?] site

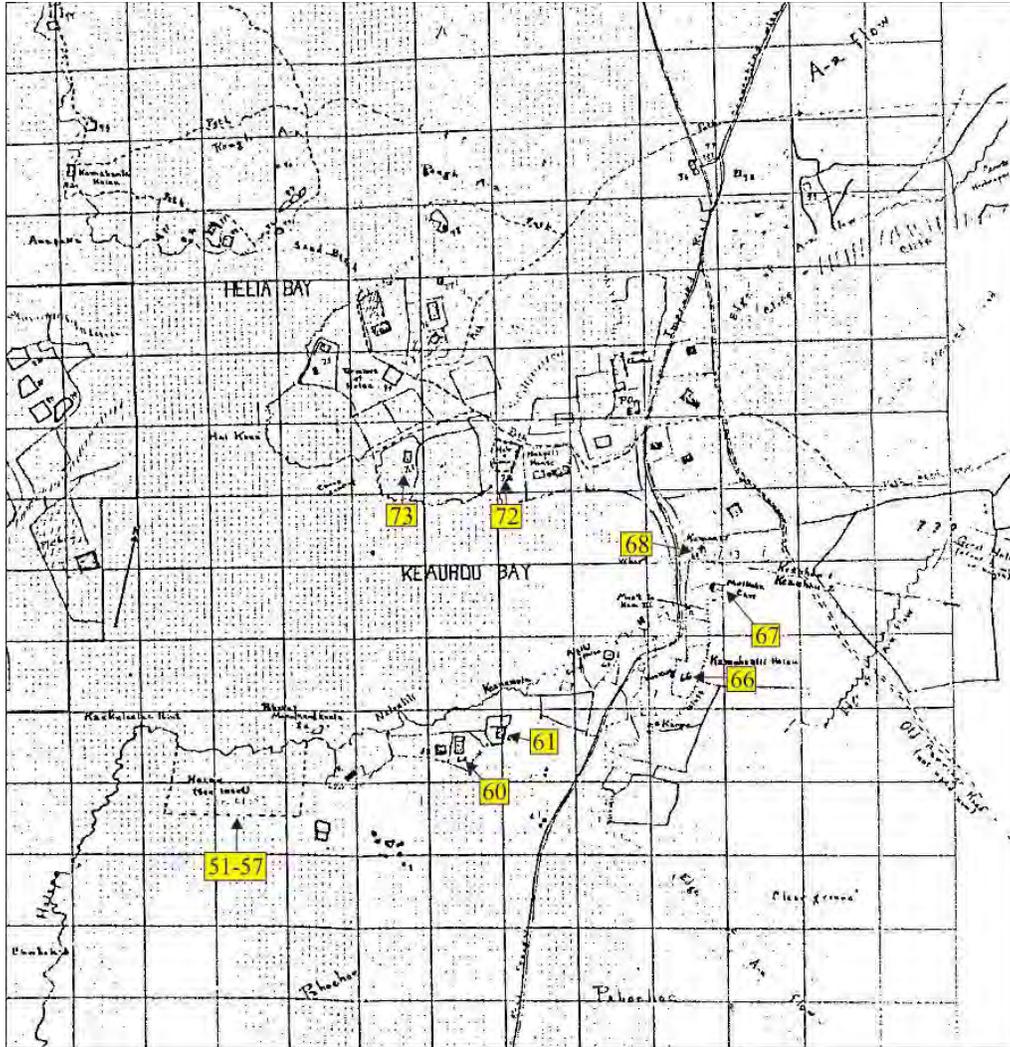


Figure 34. Portion of site map taken from Reinecke (n.d.) showing the location of Sites 51-74 along Keauhou Bay.

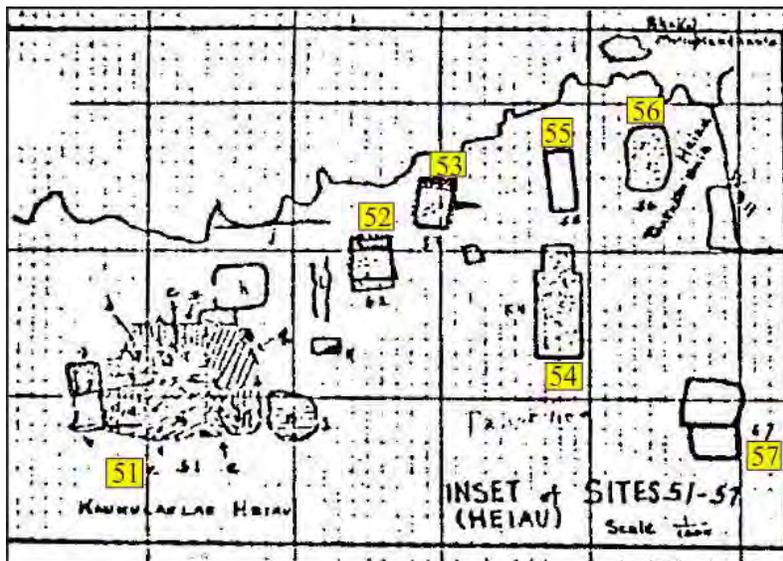


Figure 35. Inset of map showing a detailed view of Sites 51-57.

Reinecke recorded 12 distinct features (features a through l) as part of Kaukulaelae Heiau (Site 51), and provided the following description:

- a. A section paved with large stones, surrounded by walls 3' thick and 4' high. Divided into two parts, 18x5 and 18x16.
- b. Remains of a platform 222111' wide N. and S., width E. and W. unknown, but the ruins extend about 21'. Remains of retaining wall on S.
- c. Platform 1116x14x3.
- d. Shelf roughly 16x16x2
- e. Main platform of various levels. From the wall to the east end is about 90'; width at the wall is 43', at other end about 34'. A trough 6' wide between e and d. It contains three or four little pits.
- f. Platform about 12x50.
- g. Platform about 30x40, merging into the debris from e.
- h. Modern appearing pen 21x35, with walls 4' high and 4' thick.
- i. Walls 50 and 36 feet long, which once joined and inclosed [sic.] an area about 60x10 (may not be part of the heiau).
- j. Retaining wall; platform between it and heiau proper.
- k. Knoll made into rough platform about 18x12 (may not be part of the heiau)
- l. Debris 25 or 30 feet each direction, about a small platform, about 7-6x1/2.

Reinecke reported the condition of Site 51 as follows:

The whole platform of the heiau is so rough and dilapidated that it is hard to trace its original form and limits carefully. Apparently it was oriented E. and W., with dimensions over all of about 110x40. There apparently have been later additions (n.d.:80)

Reinecke also documented another *heiau* called Kamohoalii (Site 66; see Figure 34) at the base of a cliff, which was “utterly in ruins, nothing remaining except the foundation of the outer wall” (n.d.:81). Reinecke goes on to recount that Kamehameha III was born in the vicinity of this ruin:

Kauikeouli was born on the stone which now supports the tablet to his memory, just N. of the heiau. According to the story. . . Kauikeouli's mother was bathing in the bay when she felt her pangs, and staggering out of the water, she supported herself against the boulder. Kauikeouli was stillborn. A runner was at once dispatched to fetch a noted kahuna, Kapihi-nui (Great Lamentation). . . He [the kahuna] ordered the runner to return and notify the queen that he would soon arrive, but when the runner came back to Keauhou he was astounded to find that the kahuna, with his supernatural powers, had arrived before him. Kapihi-nui resuscitated Kauikeouli by warming his body (according to Kanalioumi) or by breathing into his nostrils and reciting spells (Kawewehi). . .

Mr. Kahalioumi says that the front of the heiau stood ten feet in height. Mr. Kawewehi adds that the stones from it have been used four times in attempts to build up a sea wall to protect the road, but that the stones, put to such a profane use, have every time been washed down, although there have been no storms. (Reinecke n.d.:81)

Another site that deserves further mention is Site 67, which is listed as Moikeha Cave (see Figure 34) and described thusly:

This is a famous cave. The story is that a king, flying [fleeing] from his enemies, hid himself in the cave, standing erect and motionless with all his body above his legs hidden in a high pocket of the cave. His enemies, looking inside, did not observe his legs, and passed him by. (Reinecke n.d.: 81-82)

As previously mentioned, Kekahuna and Kelsey documented the history of Kailua-Kona. The sketch maps they generated based on informant accounts, contain references to various archaeological features located along the coast of Keauhou Bay. These maps provide a glimpse of where archaeological sites were known to be located as well as how Keauhou Bay area appeared in the early 1950s. In his brief description and historical notes that accompanied the maps, Kekahuna provided a sample of the s associated with the different features as well as updated observations on the condition of the sites ca. 1949-1954. Many of these descriptions harken back to Reinecke's original documentation of sites along the shores of Keauhou Bay. The following are excerpts of relevant notes; refer to Figure 36 for location:

2. Background

- E. Concrete tomb of Chief Kane-hoa, a son of the noted chief Hoa-pili, close companion of Kamehameha I. Chief Kane-hoa, grandfather of the present Hoa-pili families, was a brother of Chief Maka-‘ina‘i, who lived with his family on the land where the tomb now lies.
- F. The remnant of the foundation platform of a royal residence of ancient King Lono-i-ka-makahiki. When Kamehameha I became king, he and his royal family occupied this site, and the area west of it to Ha‘i-ka-ua Cove. His royal canoe landing was Pueo Cove.
- G. The remnant of a stone house foundation . . . here marks the birthplace of the noted Hawaiian antiquarian David Malo . . . [born 1795].
- H. Site of Ka-moho-alii Heiau, of which only a few large stones remain.
- I. Site where Chief Kane-hoa’s residence stood.
- J. Cave of Mo‘i-keha. . .
- K. A monument to the memory of King Ka-mehameha III. . . here lies an enclosure near the base of ‘Ahu-‘ula Cliff. . .
- L. At this point, now covered, which lies out about 102 ft. southward from the southwest corner of the monument enclosure to the seaward edge of the present road, then 15 ft. below it, near the former north side of the now filled Ho‘okūkū Pond, on pāhoehoe originally about 2 ft. higher than the road, the seemingly lifeless newborn Prince Kau-i-ke-ao-uli, through powerful prayers of the celebrated kahuna Ka-pihe-hui, and by passing the undetached afterbirth (ka ‘iewe), over a fire to warm it (ua ‘olala ‘io I ke ahgi), was providentially snatched back to the land of the living, an occasion of great rejoicing.
- M. A pit about 9 fathoms deep and 20 ft. in diameter, known as Ka-imu-ki, lies here in Ke-au-hou Bay, a little out from ‘ala-‘ihi Point. Back of the point on the land of Ka-imu-ki, where a house now stands, was born the celebrated medical kahuna Kamali‘i-kane . . .
- N. Feather cloaks and capes (‘ahu-‘ula) were here aired in the sun at the south end of ‘Ahu-‘ula Cliff. . . Wahine-maikai Cove. Here women of old bathed for ceremonial cleansing following menstruation. . . The rocky shore, formerly fronted by a small pebbled beach, has largely broken away.

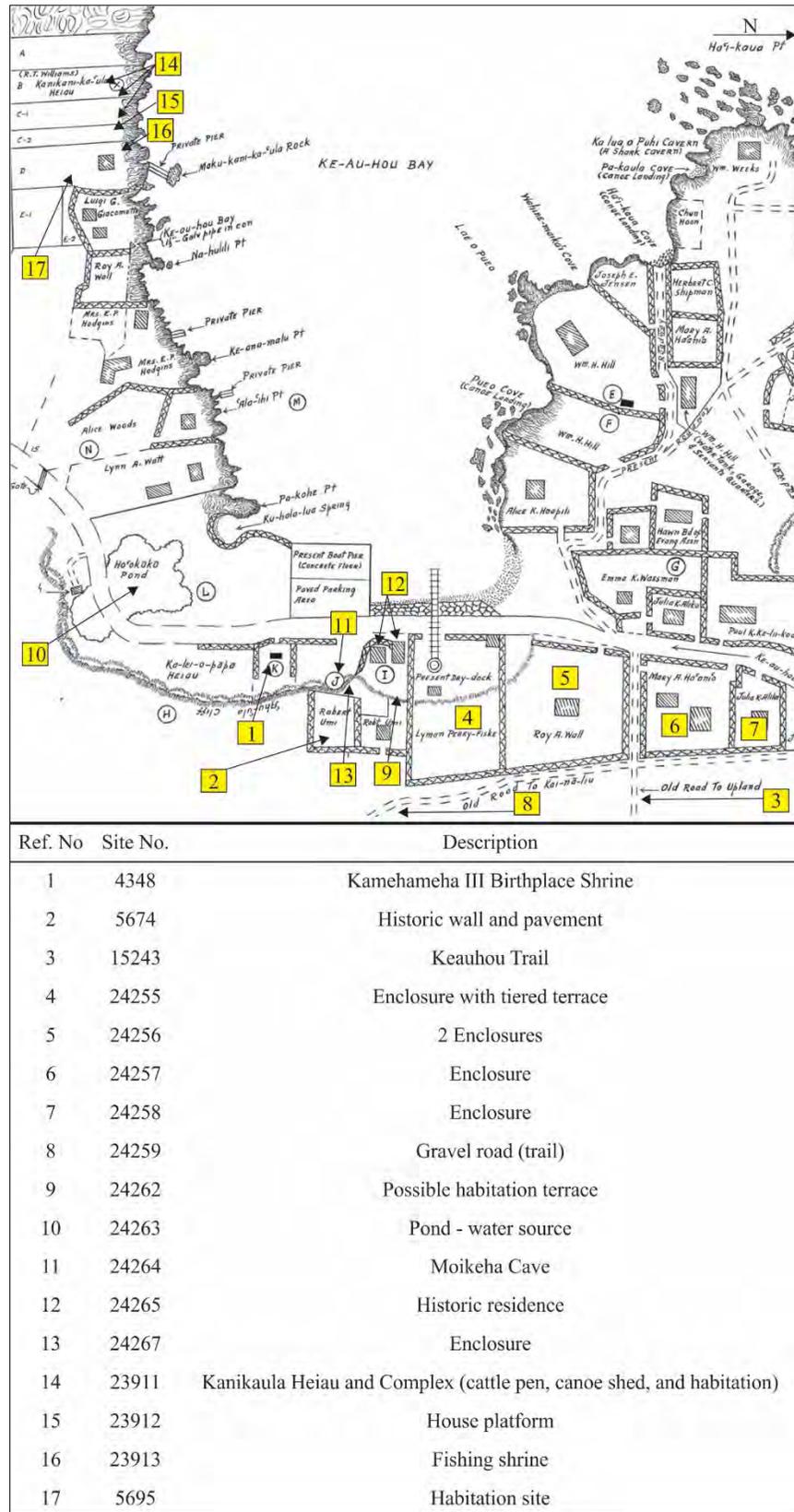


Figure 36. Portion of Kekahuna’s 1954 sketch map of Keauhou Bay showing corresponding site numbers of features recorded near the current study area.

2. Background

In 1971, the Bishop Museum conducted a reconnaissance survey (Emory et al. 1971) of four partially developed areas (Areas 1, 7, 9, and 13B) of Bishop Estate land in the Keauhou-Kahaluu Bay region. Area 1 extended *mauka* of Kamehameha III Road from the shores of Keauhou Bay adjacent to the current study area (Figure 37). Emory et al. reported:

Area 1, largely because of extensive bulldozing, has been rendered the least important, archaeologically, of the four survey areas. The prime sites around Keauhou Bay have already been built on or cleared by bulldozers. Our search through the brush revealed few sites, all of them near the edge of the bluff immediately back of the bay. The recommendations for this area are therefore not as encompassing or as strong as for previous areas. (1971:43)

As a result of their study, ten sites were recorded and assigned Bishop Museum site numbers D3-35 through D3-44 within the *makai* portion of Area 1. Site types included a possible habitation enclosure (D3-35), two platforms of undetermined function (D3-36 and 39), a rock wall (D3-37), a mound that may possibly contain a burial (D3-38), two possible house terraces (D3-40 and 41), and an open midden site that likely corresponds with a campground for fishermen (D3-44). In addition, they recorded Moikeha Cave (D3-42) as provided the following description:

Kekahuna (1954) described this natural cave as the place where Moikeha (a traditional chief who lived some 28 generations ago) hid to escape pursers from Ka-‘u. The cave is at the base of the cliff directly back of Keauhou Bay. It is presently being used for the storage of wood and other article. (1971:45)

Site D3-43 was assigned to the location of the Birthplace of Kamehameha III (Kauikeaouli), which has been commemorated by the Daughters of Hawai‘i with an inscribed plaque set in a concrete block within a small rock enclosure (Emory et al. 1971). This site was included in Kekahuna’s 1954 and 1955 maps; and was placed on the National Register of Historic Places in 1978 (Tomonari-Tuggle 1985). Emory et al. summarized their findings for Area 1 thusly:

The ten sites recorded for Area 1 are only a vestige of what must have existed formerly (before bulldozing), including the lowest surviving section of the great holua runway of which the upper part, above the Alii Highway, is still to be seen.

The most prominent archaeological site remaining in Area 1 is the level land [D3-44] along the base of the vertical bluff a short distance back of the head of Keauhou Bay. (1971:46)

In 1979, Soehren conducted a reconnaissance survey (Soehren 1979) of a 0.66 acre parcel (TMK: (3) 7-8-012:032), located on the *makai* side of Kamehameha III road to the north of Keauhou Bay (see Figure 37). As a result of his study, Soehren reported that the area was mostly bulldozed but remnants of structures and midden were still observable, and he reported observing an octopus lure and a coral disc (Tomonari-Tuggle 1985).

Also in 1979, Archaeological Research Center Hawaii, Inc. (ARCH) conducted a reconnaissance survey (Hammatt 1979) of an area along the south shore of Keauhou Bay for the Kona Surf Hotel. As a result of this study, Hammatt identified five features, two of which he interpreted as modern foundations. All five features had been originally recorded by Reinecke (n.d.) as part of Sites 51, 52, and 53. Hammatt recommended additional documentation and subsurface testing of Features H and I of Site 51, and Site 53. As Walker and Haun (1989:4) pointed out, “Hammatt evidently was not aware the modern foundations had been constructed above older platforms identified by Reinecke (Site 52-Feature K and Site 52).”

In 1980, ARCH revisited Area 1 of the Bishop Estate Lands and conducted another reconnaissance survey (Hammatt 1980; see Figure 31). As a result of that survey, seven of the ten sites recorded by Emory et al. (1971) were identified, while sites D3-35, D3-40, and D3-44 were recorded as destroyed by road grading operations in the decade since the Bishop Museum study. Hammatt (1980) recommended that only site D3-43, the birthplace of Kamehameha warranted further study or preservation efforts.

In 1983, PHRI conducted a reconnaissance survey (Rosendahl et al. 1983) in the vicinity of the Kamehameha III Birth Site Memorial within Area 1 of Bishop Estate Lands, *mauka* of Kamehameha III Road to the east of the current study area (see Figure 37). Their survey was undertaken in conjunction with preparation of a cultural resources management plan for the Keauhou Resort. As part of their study, they tried and were unable to locate the remains of Kaleiopapa Heiau atop Ahu‘ula Cliff. Additionally, the excavation of nine test units in three separate areas at the base of Ahu‘ulu Cliff revealed that Site D3-44 (originally recorded by Emory et al. 1971) had been markedly disturbed prior to their study.

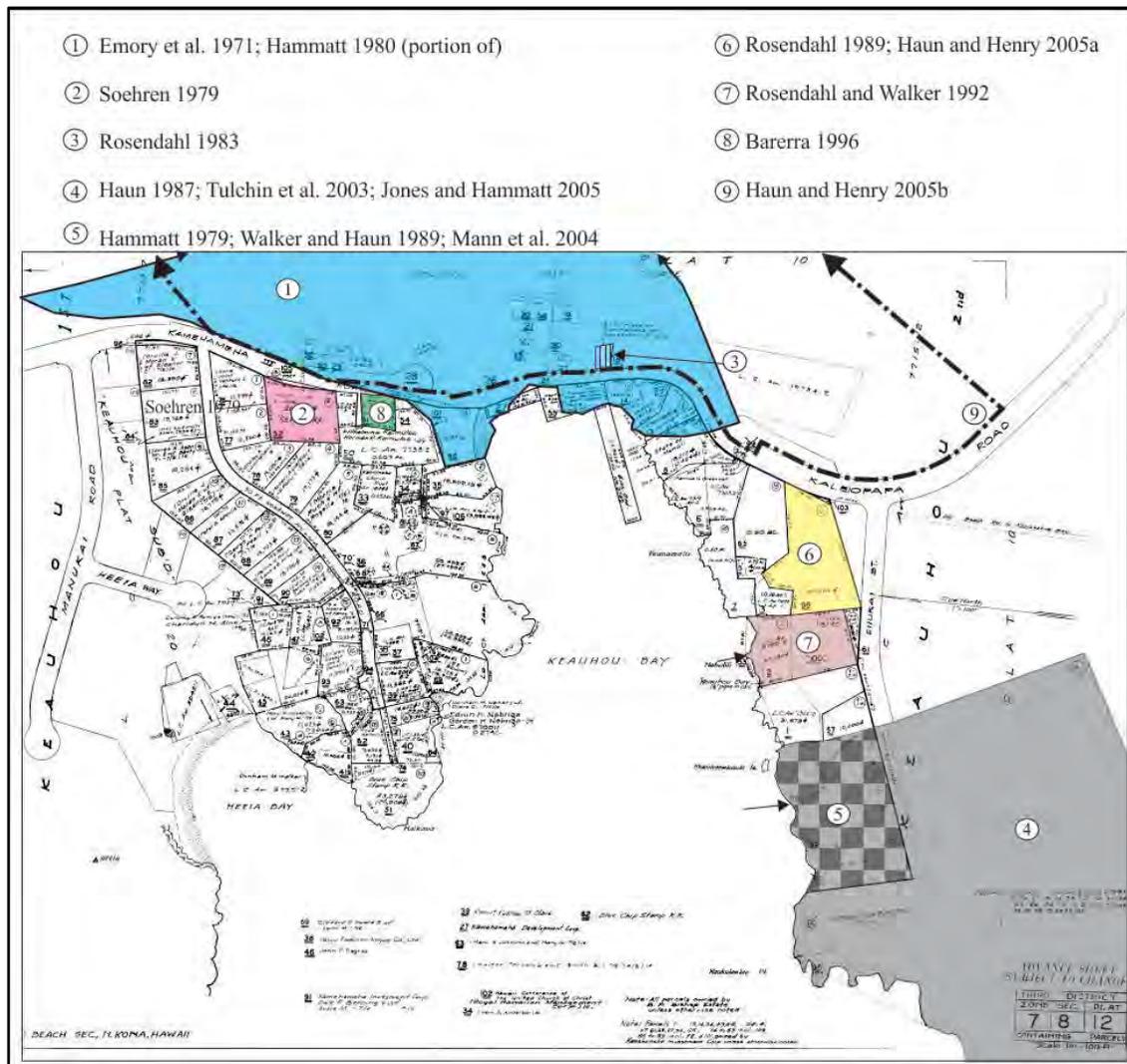


Figure 37. Portion of TMK map showing locations of previous archaeological studies in the vicinity of the current study area.

Although the focus of the following study falls well *mauka* of the current study area, the cultural resource management plan for Keauhou Resort developed by PHRI (Tomonari-Tuggle 1985), is a valuable source of information for the general Keauhou area. Tomonari-Tuggle provides an annotated bibliography of archaeological and historical research conducted in the Keauhou area that spans over eighty years of investigations. She also provides detailed inventories of sites recorded in the various development parcels that comprised Keauhou Resort. However, the two parcels closest to the current study area (Parcels 1 and 6) are not featured in the plan.

In 1987, PHRI conducted a reconnaissance survey and limited subsurface testing (Haun 1987) of the entire Kona Surf Resort property (TMKs: (3) 7-8-010: 38 por. and (3) 7-8-012: 058-060) for a proposed wedding chapel site. The Kona Surf Hotel property is located along the southern coast of Keauhou Bay and includes Kaukulaelae Point (see Figure 37). As previously mentioned, this area had been surveyed by ARCH in 1979 (Hammatt 1979). As a result of the 1987 survey, PHRI were able to relocate three of the seven sites (Sites 51-57) that Reinecke recorded on the Kona Surf Hotel property in 1929 or 1930, including Features H, I, and K of Site 51 as well as Sites 52 and 53. In addition, PHRI identified two previously unrecorded sites, consisting of a *papamū* and a subsurface cultural deposit with waterworn pebbles, midden, historic glass and ceramic fragments, and a coral abrader. Haun (1987) recommended that further intensive survey and testing be conducted in the proposed wedding chapel site.

Subsequently, in 1989, PHRI (Walker and Haun 1989) conducted intensive archaeological survey and testing at the proposed wedding chapel site located on a 2.3 acre portion of the Kona Surf Hotel grounds (TMK: (3) 7-8-012:058-60 Por.). As a result of their study, five archaeological sites with seven component features were identified. Formal

2. Background

feature types recorded include: a previously unrecorded *papamū* and a newly identified subsurface cultural deposit (SIHP Site 5695); in addition to five previously recorded features: a platform (Site 53), two terraces (Sites 51-K and 52), a U-shaped wall (Site 51-I), and an enclosure (Site 51-H). Subsurface testing consisted of the excavation of ten test units within Reinecke sites 51, 52, 53, and SIHP Site 5695 that were added to the three test units, which had been excavated during the earlier PHRI study of the same area (Haun 1987). As a result of their study, more than 450 portable artifacts were recovered, including 348 that were classified as indigenous types and 110 historic. The indigenous portable artifacts were comprised primarily of volcanic glass fragments, with some coral, urchin, and scoria abraders, a few basalt flakes, modified bone and marine shell ornaments. A partial stone *poi* pounder and the mammal bone point of a two-piece bonito lure were also recovered. Historic artifacts included fragments of metal, glass, and plastic. A large amount of faunal remains (5,648 grams) comprised primarily of marine shell, followed by bone, *kukui* nut, and charcoal was also recovered. Radiocarbon testing yielded a date range of A.D. 1440-1748. Based on their findings, PHRI suggest prehistoric use of the area around Sites 53 and 5695. In particular, they suggest Site 5695 was the site of lithic manufacture, based on the volume of volcanic glass debitage present and that marine exploitation was the focus for Sites 51 and 53.

In 1989, PHRI conducted an archaeological field inspection (Rosendahl 1989) of a parcel along the south shore of Keauhou Bay (TMK: (3) 7-8-012:098). As a result of that study, one site (PHRI Temporary Site 736-1) was identified, consisting of several walls that probably served as property boundaries during the Historic Period. These walls likely correspond with a series of walls oriented parallel and perpendicular to the shoreline that Hammatt (1979) mentioned as a result of his aforementioned survey of the south shore of Keauhou Bay. However, Hammatt had interpreted the walls as modern in origin (Haun and Henry 2005a).

In 1992, PHRI conducted an archaeological field inspection (Rosendahl and Walker 1992) of three parcels (TMKs: (3) 7-8-012:002, 053, and 100), located along the southern shore of Keauhou Bay (see Figure 37). No sites were identified within their study area, as a result of their investigation.

In 1996, William Barrera Jr. conducted an archaeological investigation (Barrera 1996) of a parcel (TMK: (3) 7-8-012:031), located on the *mauka* side of Kamehameha III Road to the north of Keauhou Bay (see Figure 37). As a result of his study, Barrera noted that the entire parcel had been graded.

In 2003, Cultural Services Hawaii (CSH) conducted an archaeological inventory survey (Tulchin et al. 2003) of the entire Kona Surf Resort parcel (TMKs: (3) 7-8-012: 58 and (3) 7-8-010: 038 and 039; see Figure 37). Four previously recorded archaeological sites were relocated on the northeast side of the Kona Surf Resort property during their study. As a result three SIHP Site designation numbers were assigned to the site numbers given by Reinecke (n.d.). Reinecke's field site numbers 51-53 correspond to the currently numbered SIHP Sites 23911-23913. Features recorded during their study included the following: an enclosure (Site 23911 Feature A), a canoe shed (Site 23911 Feature B), two terraces (Site 23911 Features C and D), a Historic House Platform (Site 23912), a fishing shrine (Site 23913), and sub-surface cultural deposits related to a habitation (Site 5695).

Subsequently, in 2004, CSH prepared a preservation plan (Mann et al. 2004) for a 0.5 acre parcel (TMK: (3) 7-8-012:058) within the Kona Surf Resort property (see Figure 37). A cultural preserve was proposed for the northeast side of the Kona Surf property, where the four aforementioned archaeological sites (SIHP Sites 23911-23913, and 5695), are located. According to a local *kupuna*, Reinecke was mistaken when he called Site 51 the remains of *Kaukulaelae Heiau*, and that the correct name is actually *Kanika'ula Heiau* (Mann et al. 2004). Interestingly, on the 1954 sketch map of Keauhou Bay (see Figure 28), *Kekahuna* has a site labeled "*Kanikani-ka'ula Heiau*" in the vicinity of Reinecke's Site 51, which closely resembles the name used in the preservation plan fifty years later. Preservation measures include the creation of a 50-foot buffer zone around the four sites, stabilization of sites, with the goal of providing visitors with an informative experience. The plan also proposed that all out-of-context artifacts on and off the property be reclaimed and relocated within the cultural preserve area. In addition, a burial reinterment site consisting of an above-ground burial crypt was suggested, to be constructed only if burials are encountered during construction renovations of the hotel. No future archaeological research was to be allowed within the cultural preserve without the prior written approval of a research plan by SHPD.

In 2004, Haun & Associates conducted an archaeological inventory survey (Haun and Henry 2005a) of a 1.08-acre parcel (TMK (3) 7-8-012:098), located on the southern side of Keauhou Bay (see Figure 37). Portions of their study area had already been surveyed by Hammatt (1979) and Rosendahl (1989). Haun and Henry augmented their pedestrian survey with seven shovel tests and one trowel probe. As a result of their study, two sites were identified (SIHP Sites 24215 and 24216). Site 24215 consists of a small overhang with a wall adjacent to it. Two shovel tests excavated within Site 24215 revealed the following habitation debris: marine shell fragments, *kukui* nut shells, and sea urchin fragments, which suggested to them the use of the site during Precontact through early Historic times. Site

24216 is a historic complex comprised of five features, which likely corresponds with PHRI temporary Site 736-1, originally recorded by Rosendahl (1989). The features of Site 24216 include: two stacked rock walls (Features A and B), a modified outcrop (Feature C), a retaining wall (Feature D), and a prepared niche (Feature E). One of the rock walls (Feature A) was interpreted as a historic livestock control feature, the crude modified outcrop (Feature C) was interpreted as a possible historic agricultural clearing mound, while the historic retaining wall (Feature D) appears to have supported a gravel and concrete roadway and concrete path. The walled-in overhang (Feature E) was interpreted as a storage feature that was used in Prehistoric and Historic times based on the cultural material recovered from five shovel tests, which included marine shell remains and waterworn basalt pebbles within and outside of the overhang, based on their review of historic maps, Haun and Henry suggest that the features of Site 24216 were likely built between 1928 and 1954 and associated with a concrete house foundation and gazebo located on an adjacent parcel, which was owned by Mrs. E.P. Hodgins ca. 1954. Both sites were assessed as significant under Criterion “d” based on their informational content and Haun and Henry’s treatment recommendation was no further work or preservation needed.

In 2004, Haun & Associates conducted an archaeological inventory survey (Haun and Henry 2005b) of a 25-acre parcel (TMK (3) 7-8-010:044), located *mauka* of Kamehameha III Road along Keauhou Bay (see Figure 37). This same study parcel corresponds with a portion of Area 1 of the Bishop Estate Lands, which has been the subject of various archaeological investigations, discussed above. A total of twenty-two sites with thirty-nine features had previously been documented within their project area. Seven of these previously recorded sites appear to have been destroyed prior to their survey. During their study, fifteen sites were recorded including six previously recorded sites (D3-37, and D3-39 through D3-43) and nine newly identified sites, comprised of twenty-two features. As a result, four of the sites given temporary Bishop Museum field numbers by Emory et al. (1971) were assigned the following new SIHP Site designation numbers: Site 24256 (D3-41), Site 24262 (D3-40), Site 24264 (D3-42), and Site 24267 (D3-39); in addition to the two SIHP Site designations that had been assigned sometime in the 1980s: Site 4348 (Kamehameha III birthplace shrine, D3-43) and Site 5674 (D3-36 and D3-37). Site 24262 (D3-40), a disturbed terrace, had previously been recorded as destroyed by Hammatt (1980). Also, Site 24267 (D3-39), which was originally recorded as a platform, was reclassified by Haun and Henry as a low enclosure. The twenty-two recorded features include paved house foundations, various enclosures, walls, terraces, platforms, midden scatters, mounds, a fresh water pool, a cave, a staircase, and a road. The range of feature function includes ranching, habitation (temporary and permanent), ceremonial, transportation, water acquisition, recreation, and possible burial, all of which conform to documented use of the *kula* zone. Evidence of Precontact use of the study area is evidenced by the temporary habitation cave (Moikeha Cave, Site 24264) and the pool designated Site 24263 that may be a remnant of Ho’okuku Pond, which appears in legends of Keauhou as well as on Kekahuna’s 1954 Map (see Figure 28). Eight test units and ten shovel tests were excavated during their study. Radiocarbon dating of a sample taken from a test excavation in a temporary habitation site within Moikeha Cave (Site 24264) yielded a calibrated age range of A.D. 1000 to 1180, which makes this site “one of the earliest habitation sites along the Kona coast” (Haun and Henry 2005b:ii). The three permanent habitation sites (Sites 5674, 24261, and 24266) recorded during the study likely date to the late Historic to early Historic Period. Four of the fifteen sites assessed as significant were recommended for data recovery (Sites 5674, 24259, 24261, and 24266). Three sites were recommended for preservation (Sites 4348, 24263, and 24264).

3. CONSULTATION

As stated in the OEQC Guidelines for Assessing Cultural Impacts, the goal of the oral interview process is to identify potential cultural resources, practices, and beliefs associated with the affected project area. It is the present author's further contention that the oral interviews should also be used to augment the process of assessing the significance of any traditional cultural properties that may be identified. It is the researcher's responsibility, therefore, to use the gathered information to identify and describe potential cultural impacts and propose appropriate mitigation as necessary.

Consultation letters describing the current DOBOR mooring improvements project and seeking input regarding potential cultural impacts were sent to the Office of Hawaiian Affairs (OHA) and to Kamehameha Schools (KS). At the time of writing of the current report, no responses from either OHA or KS have been received.

There has been a series of community meeting beginning in May of 2013, with an associated written record (meeting agenda's, attendance sheets, and community response letters), that has been reviewed as a part of the current study. The present author attended the most recent of these meetings in July of 2015. What is apparent from a review of the written record associated with these meetings is that there is very little vocal support from the community for the current proposed mooring improvements project. While community consultation does not necessarily constitute "cultural" consultation, there were individuals and organization present at these meeting who did express cultural impact concerns. These concerns involved potential impacts to both traditional cultural places and traditional and customary practices. As gleaned from the written record associated with the community meetings, the following individuals and organizations were contacted: Department of Land and Natural Resources-State Historic Preservation Division (DLNR-SHPD), Barbara Nobriga (Daughters of Hawai'i), Ahu Moku Advisory Committee and Council (Pi'ilani Ka'awaloa and Kawehi Nguyen), the Keauhou Canoe Club, and Lily Kong. Additionally, Lionel Machado, an individual with a connection to Keauhou Bay was contacted.

In a National Historic Preservation Act Section 106 consultation letter (DOC No: 1402MV12), DLNR-SHPD (acting in their capacity on behalf of the State Historic Preservation Officer) related to the US Army Corps of Engineers that:

A review of our records indicated that there are numerous historic properties located in the vicinity of Keauhou bay. These properties include the Kaopa Spring (SIHP 29266), the Moikeha Cave (24254), as well as multiple other historic properties (SIHP 24255 through 24267 and 28109-28136) in the immediate surroundings of Keauhou Bay. Our records indicate that Keauhou Bay was a royal center during the pre-contact period, and served as a commercial hub during the early historic and ranching periods. Therefore, we believe that Keauhou Bay is potentially a historic district that is eligible for listing on the national and state registers of historic places.

While DLNR-SHPD did not make a formal determination with respect to Keauhou Bay being a significant historic district, their belief that Keauhou Bay is potentially a historic district eligible for listing in both the State and National Registers of Historic Places is overwhelming supported by the culture-historical background information presented in the current study. Also, in a 2013 correspondence directed to the US Army Corps of Engineers, the Daughters of Hawai'i identified Keauhou Bay as a significant culture place in its entirety. The Daughters of Hawai'i is a non-profit organization that was founded in 1903 by seven women who had been citizens of the Hawaiian Kingdom prior to annexation. A founding principle of the organization is "to perpetuate the memory and spirit of old Hawai'i and of historic facts," and to be a member a women must be a direct descendant of a person who lived in Hawai'i prior to 1880 and must contribute to the preservation of Hawaiian culture and language. As stated earlier, the Daughters of Hawai'i own and maintain the site of Kamehameha III's birthplace and accept as their larger *kuleana* the shore and waters of Keauhou Bay.

Barbara Nobriga was interviewed by the author of the current report. Barbara is an active member of the Daughters of Hawai'i, and a women of native Hawaiian ancestry that had a family home on the back edge of the bay where the Charles Machado house was later built. Her family house was destroyed by the 1946 *tsunami*. The family built another house further out near the northern point of the bay in 1967, which was sold in 1989. In a recent phone conversation Barbara shared childhood recollections of Keauhou Bay and expressed a great sadness about how she has witnessed the bay go from a clean and natural resource to an artificial and overly commercial mess. When she was young, one could still successfully fish in the bay and collect *wana* and *opihi*. She attributed the beginning of the demise to when the coral blocking deeper draft passage into the bay was blown-up in the late 1950s. Before then, only rarely did large vessels navigate the passage, rather is was canoes and sampans seen in the bay. When asked what she thought of the current DOBOR mooring improvements proposal, she expressed that state money would be better spent on restoring

the bay back to a more natural condition. She would like to see the artificial sand beach at the back of the bay removed and the former Ka‘ili‘ilinehe Beach restored. Barbara also suggested that while it might be okay for the large commercial tour boats to pick up and drop off passengers at the pier, the only boats allowed to moor in the bay should be canoes and sampans. Essentially, she feels that the addition of seven more moorings and the boats that use them would contribute to the on-going impacts on traditional family recreational use of the bay.

During the earlier (2012) community outreach the Ahu Moku Advisory Committee and Council provided comments expressing their concern that the proposed mooring improvements project has the potential to impact fishing practices within the bay. As part of the current study we reached out to Pi‘ilani Ka‘awaloa (Ahu Moku Advisory Committee) and Kawehi Nguyen (Kona Representative Ahu Moku Advisory Council). No further information was obtained.

One of the major users of Keauhou Bay is the Keauhou Canoe Club (KCC), founded by Louis and Mary Jane Kahanamoku in 1980 as the Kauikeaouli Canoe Club. KCC occupies the north-central portion of beach and back bay (Figure 38) on land owned by KSBE and leased to KCC on a yearly basis. KCC, while not a native Hawaiian organization per se, includes in their bylaws that they “shall strive to revive, develop, and perpetuate Hawaiian culture and traditions through instruction and training in outrigger canoe paddling and related Hawaiian cultural activities.” The KCC mission statement reads:

The mission of the Keauhou Canoe Club is to educate our youth, our membership, and the community at large about Hawaiian culture, values, and traditions and to promote competitive and recreational outrigger canoe paddling and other water sports in historic Keauhou Bay.

KCC has expressed strong opposition to DOBOR’s proposed mooring improvements project, and in December of 2013 they filed a lawsuit seeking to stop the project and compel DOBOR to conduct an environmental review of the proposed project in compliance with HRS Chapter 343. In their legal filing, KCC alleges (among others) the following:

KCC’s membership includes over 500 youth (*keiki*), adult, and senior masters (*Kupuna*) participating in various programs. Its membership consists, among others, of members who live in the Keauhou land division (*ahupua‘a*).

KCC’s membership also includes native Hawaiians, i.e. inhabitants of the Hawaiian Islands prior to Western contact in 1778, some of whom can trace their genealogy to Keauhou and/or surrounding areas.

It is important to the “mana” of the KCC paddling that its coaches and paddlers be connected to the bay.

Beyond KCC’s stated mission, KCC’s activities are constitutionally protected under Hawai‘i Law. Article XII, Section 7 of the Hawai‘i Constitution and Hawai‘i Revised Statutes 1-1 protects traditional outrigger canoe paddling and other cultural activities.

KCC asserts that the addition of seven new vessel moorings in the bay will negatively affect their ability to train and offer instruction related to outrigger canoe paddling, and will also have an impact other cultural activities that are practiced by the club’s membership as well as by native Hawaiian residents of Keauhou Ahupua‘a. Activities that they believe are guaranteed and protected by the Constitution of the State of Hawai‘i, as described in Article XII, Section 7, which expresses that “The State reaffirms and shall protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by ahupua‘a tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778, subject to the right of the State to regulate such rights.”

On November 13, 2015, the present author was invited to a KCC monthly board meeting that was attended by the following board and club members: Bill Armer, Terry Trinidad, Cindy Armer, Jane Bockus, Rupert Adarme, Jackie Frames, Tandy Kualii, Dennis Mihalka, Fred Giannini, Stephanie Amick, Kalani Delovio, and Moke Hauani‘o; also present was non-member, but community stakeholder, Bill Murtagh. The board meeting was held at Teshima’s Restaurant in Honalo at 6:30 am over breakfast. ASM Senior Archaeologist Teresa Gotay was also present in a note-taking capacity. A summary of the general sentiments provided by club members (both Hawaiian and non-Hawaiian) is presented first.

Jane Bockus (Williams family) is a founding board member of KCC. She moved to the Kona side from Hilo in 1971, and her husband’s family has a house on the bay. She helped start the club’s recreational paddling group, which originally consisted of *kūpuna* females who no longer raced and wanted to paddle year round. She said that the recreational group also does a lot of fundraising and in that way provides support to the community. Jane was concerned about water safety with the possibility of additional motorized boats in the water. Dennis Mihalka has been

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a member of KCC for 7 years, and joined 2 years prior to relocating to the area. He uses the club as his access to Hawaiian culture through participation, and said he would not have been exposed to Hawaiian culture without it. He said “adding moorings will not enhance the quality of cultural conditions of the Bay”. Terry Trinidad said that he spends so much time at the bay they call him “the homeless guy.” He said the bay has been super crowded for the last 5 years. By 8 a.m. people are pouring in on the weekdays there are thousands of people and on the weekends even more. He remarked on how there are very few places to access the ocean in Kailua-Kona that are not either reached by crossing over rocks, or located on private property. He said the most important thing is to control the amount of people going into the bay and decreasing the risk of people “getting big time hurt” out there. He said just one charter boat can bring up to 500 people into the bay and that the potential for 7 more boats is just too much. Rupert Adarme asked “why are we here?,” to which I replied to collect information and provide an unbiased report of my finding. He expressed skepticism with respect to how DOBOR will use the information. Jackie Frames (KCC lady paddler) said that it is impossible to separate the land and the sea ever since the lava flows came down and embraced the water, creating the bay. She spoke of observing three generations of subsistence fisherman fishing together on the pier, and suggested that more traffic and pollution will impact the active family area that the bay has become. Bill Murtagh’s were recorded and shared with the preparers of the EA as they had more to do with community issues as opposed to cultural issues.

Three native Hawaiian member of KCC, two of whom are paddling instructors, shared their *mana’o* during the group consultation. Moke Hauini’o has been a member of KCC for 15 years. He said the club is the “majority user of the bay seven days a week from sunup to sundown”. He said the improvements to the bay would impact them the most and that preserving the bay is culturally important, not only for the paddlers, but for everyone’s enjoyment. He also mentioned that the bay is a sanctuary for different types of fishes at different times of the year, shared his personal observation of thousands of pounds of mackerel (*akule*) coming into the bay. He was concerned that additional moorings would mean additional commercial tours and the many hundreds of people that book those tours.

Kalani Delovio, coach of youngest age group (under 12 years old), was born in Honolulu in 1944 and joined KCC in 1982. Kalani talked about how the Kahanamokus founded the club in 1979 to perpetuate Hawaiian culture through water sports. He said that as Hawaiians it is our privilege and responsibility to carry out their legacy, whether born and raised in Keauhou or having come in from elsewhere. Kalani objected to the proposal of additional moorings; he feels that the bay will become overcrowded and cause unsafe conditions that will interfere with the primary purpose of the club. He expressed safety concerns for the instructors and paddlers, as well as for other people in non-motorized watercraft (canoes, paddle boards, kayaks) that regularly use the bay.

Tandy Kualii, who also assists with the instruction of the young paddlers, was born in Hilo and began visiting the Kona side and Keauhou Bay in 1972, which was around the time that he learned to paddle. He indicated that he has seen lots of changes in the bay since 1980 when KCC first started. His main concern with creating additional moorings is with safety for the children. The open space that existed in the 1980s and 1990s is now congested. Tandy suggested that the coral on the north side of the bay did not extend as far into the bay as it does today, as it is now encroaching on the outside moorings. He explained that this condition forces the paddlers into shallow waters and when the surf is big the safe passage channel is further restricted. Tandy talked about how he learned *koa* canoe building from the Kahanamokus and he recalled that an *‘ili’ili* beach not rocks walls were present during his early visits to the bay (ca. 1970s). Tandy paddled with KCC from 1980-2006, but took a 6 year sabbatical. Upon his return to the club in 2012, he saw more recreational use, an increase of non-Hawaiian (“Caucasian”) paddlers, and a decrease in native Hawaiian members. He said that the club started with just two canoes and now they have eleven total.

Bill Armer (KCC president) was last to speak at the group consultation and in summary he emphasized that given their stated mission and their presence at the bay, the club accepts and exercises their stewardship responsibilities for not only the shoreline, but also water and the sea floor. They have annual clean-up days where rubbish is collected from the shoreline and by divers within the bay. The club partakes in youth educational programs, to teach about canoes and Hawaiian culture, as well as *kūpuna* health and fitness programs. Bill reiterated the concern that additional moorings in the bay would create a dangerous environment especially for the kids during the competitive season. When he concluded, I thanked the assembled group for sharing with me and explained that I had to run off and meet with Auntie Lily Kong to get her views on the proposed project. Bill smiled affectionately, suggested that I not be late for my meeting and referred to Auntie Lily as “the matriarch of Keauhou.”

Lily Nāmakaokai’a Ha’ani’o-Kong (Auntie Lily) was born in 1927 in her family home along the shore of Keauhou Bay. In her own words recorded in a 1996 interview:

... I was born in 1927, in the little village of Keauhou. My father, Harry Ha’ani’o was a fisherman, and we also had *kuleana* land at Keauhou *mauka* where we grew *kalo*, *‘uala*, and all kinds of crops

... My mother was Mary ‘Āinako‘ako‘a Ha‘ani‘o and she was a housewife. When I was growing up, there was only about 13 or 14 families around us on Keauhou Bay—my Aunt Ida Akana-Chai; Robert Kahalio‘umi (the brother of Thomas and Ben Kahulamū); Kalani Kinimaka; the Woods, Hinas, Whites, Roy Wall, and James Ko‘omoa; Alike; Henry Akā Kawewehi; Kahala Kaimihana; mother Ka‘aha‘āina (who lived to be 115 years old); Alice Hoapili, and the Walkers. It was a very close community. Most all of the Hawaiians were either fisherman or farmers. (Maly and Maly 2003:12)

On November 13, 2015, the present author met with Auntie Lily at her home in *mauka* Keauhou, ASM Senior Archaeologist Teresa Gotay, M.A. was also present to take notes. In her youth Auntie Lily lived in a 2-story house in the general vicinity of the current KCC location. In 1941, her mother knocked down the house and built a smaller one on the same lot. Auntie Lily described how there were many more ponds around Keauhou Bay where mullet, crabs, ‘ōpae‘ula could be caught. She explained how Kahalalua Pond extended from the current shoreline all the way back to the cliffs, but it is all covered over today; and how she would dive for clams in the area by the concrete wharf where the sand was more clayey, and catch slipper lobster at night where the restrooms are now. Auntie Lily said that she recently cleaned some sea urchin collected from the bay and found it to be “crunchy and flavorless instead of tasty with that melt in your mouth consistency.” Looking at old pictures (ca. 1914 to 1965), she said “I feel so sad to see what has happened to Keauhou Bay.” It is her believe that all big boats should live at Kailua and she insisted that should any more community meetings take place about this project, the meeting should be held on-site “so that *kūpuna* can show you why they need to take the big boats out.”

Auntie Lily explained that her 115 year old *tūtū* swam in the bay each evening and suggested that it was the healing waters of the bay that allowed her to leave so long. When Lily was partially paralyzed from a stroke in 1961-62, she retired from her job with the Sheraton Resort on O‘ahu and moved back to Keauhou Bay and began swimming each evening and rubbing sand on her bad arm. She believes that it was the water of the bay that healed her.

In 1963, her mother exchanged the *makai* properties at the bay for 34 acres located in Keauhou *mauka* along what was the old *mauka-makai* trail that formerly extended from just below the forest to the bay, along with and another 24 acres (inherited by her brothers) near Teshima’s Restaurant in Honalo. It was upon Auntie Lily’s recommendation to her mother that she get “value for value” as opposed to cash in exchange for the land. Lily continues to live at the *mauka* property.

Auntie Lily will soon be 89 and she still spends half of her time in the *mauka* coffee fields or in her garden, she told her daughter (also named Lily) who is in her sixties: “don’t stop – the moment you stop, that’s it.” Lily “junior” was also contracted by telephone, and she expressed concerns that fishing will be impacted by increased boat activity in the bay. She also felt strongly that the proposed mooring improvements project needs to consider impacts to the overall health and well-being of the traditional users of the bay and the generations to come.

Lionel Machado was contacted via telephone by the present author. Lionel was born in South Kona in 1941 and is the son of Charlie Machado and Hester Akana. Lionel currently lives on the windward side of O‘ahu, and is a man of native Hawaiian ancestry. As a youth, Lionel worked with his father in Keauhou Bay in the dry dock facility at Ka‘ili‘ilinehe and on the fleet of fishing vessels, which included sampans and retired US Navy tenders. Lionel described having to hook boats up to the railroad track trolley system that pulled boats out of the water and into dry dock. He also described how in the 1950s, moorings were haphazardly created (using all sorts of discarded material as anchors) in the bay for both fishing vessels and recreational boats. His father had twelve boats, nine of which were moored in the bay. One of his chores was to make sure the moored boats were secure to their moorings and free of water (which meant the hand bailing of water and pumping of bilges). This activity involved swimming in the bay from boat to boat, and he recalled occasions where there were sharks in the water. He also explained that the shallow rocky waters along the north side of the bay was a favored location for the collection of *wana*. Lionel explained that his father built their first house (that later became the yacht club) at the bay in 1956 and a second house (that is currently the Fairwinds retail and booking headquarters) in 1960 or 1961. When asked what he thought about the proposed mooring improvements project, he said that that there was probably room in the bay for more than the nine existing moorings, but he did not feel strongly one way or the other about the project.

4. IDENTIFICATION AND MITIGATION OF POTENTIAL CULTURAL IMPACTS

The OEQC guidelines identify several possible types of cultural practices and beliefs that are subject to assessment. These include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs. The guidelines also identify the types of potential cultural resources, associated with cultural practices and beliefs that are subject to assessment. Essentially these are natural features of the landscape and historic sites, including traditional cultural properties. A working definition of traditional cultural property is:

“Traditional cultural property” means any historic property associated with the traditional practices and beliefs of an ethnic community or members of that community for more than fifty years. These traditions shall be founded in an ethnic community’s history and contribute to maintaining the ethnic community’s cultural identity. Traditional associations are those demonstrating a continuity of practice or belief until present or those documented in historical source materials, or both.

The origin of the concept of traditional cultural property is found in National Register Bulletin 38 published by the U.S. Department of Interior-National Park Service. “Traditional” as it is used, implies a time depth of at least 50 years, and a generalized mode of transmission of information from one generation to the next, either orally or by act. “Cultural” refers to the beliefs, practices, lifeways, and social institutions of a given community. The use of the term “Property” defines this category of resource as an identifiable place. Traditional cultural properties are not intangible, they must have some kind of boundary; and are subject to the same kind of evaluation as any other historic resource, with one very important exception. By definition, the significance of traditional cultural properties should be determined by the community that values them.

It is however with the definition of “Property” wherein there lies an inherent contradiction, and corresponding difficulty in the process of identification and evaluation of potential Hawaiian traditional cultural properties, because it is precisely the concept of boundaries that runs counter to the traditional Hawaiian belief system. The sacredness of a particular landscape feature is often cosmologically tied to the rest of the landscape as well as to other features on it. To limit a property to a specifically defined area may actually partition it from what makes it significant in the first place. However offensive the concept of boundaries may be, it is nonetheless the regulatory benchmark for defining and assessing traditional cultural properties.

As the OEQC guidelines do not contain criteria for assessing the significance for traditional cultural properties, this study will adopt the state criteria for evaluating the significance of historic properties, of which traditional cultural properties are a subset. To be significant the potential historic property or traditional cultural property must possess integrity of location, design, setting, materials, workmanship, feeling, and association and meet one or more of the following criteria:

- a Be associated with events that have made an important contribution to the broad patterns of our history;
- b Be associated with the lives of persons important in our past;
- c Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value;
- d Have yielded, or is likely to yield, information important for research on prehistory or history;
- e Have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity.

While it is the practice of DLNR-SHPD to consider most historic properties significant under Criterion d at a minimum, it is clear that traditional cultural properties by definition would also be significant under Criterion e. A further analytical framework for addressing the preservation and protection of customary and traditional native practices specific to Hawaiian communities resulted from the *Ka Pa‘akai O Ka‘āina* v Land Use Commission court case. The court decision established a three-part process relative to evaluating such potential impacts: first, to identify whether any valued cultural, historical, or natural resources are present; and identify the extent to which any traditional and customary native Hawaiian rights are exercised; second, to identify the extent to which those resources and rights will be affected or impaired; and third, specify any mitigative actions to be taken to reasonably protect native Hawaiian rights if they are found to exist.

Based on a review of the culture-historical background material, and as indicated by most of the consulted parties as well as DLNR-SHPD, it is clear that Keauhou Bay (along with all its potential contributing elements: National Register Kamehameha III birthplace, *heiau*, ponds, burials, etc.) could be considered a historic district significant under state Criteria a, b, d, and e and eligible for listing in the Hawai‘i Register of Historic Places. As such, if any of the proposed mooring improvement activities result in a direct impact to any of the contributing elements of this potential historic district and/or if any of the proposed mooring improvement activities negatively affect the character of Keauhou Bay, then the result would be a cultural impact.

As identified during the interview process, and supported by a review of the culture-historical background material, there are several cultural practices associated with Keauhou Bay. These practices are rooted in tradition and continue today as living testimony to the resilience of native Hawaiian practitioners in the face of potentially unintentional, but nonetheless significant impediments. As embodied by the core of native Hawaiian instructors with the Keauhou Canoe Club, and perpetuating the vision of its founders (Louis and Mary Jane Kahanamoku), the ongoing cultural practice of outrigger canoe paddling is alive and well. Both Kalani Delovio and Tandy Kualī‘i expressed concern that additional boats in the bay would create potentially dangerous conditions and have an impact not only on the physical area that they use for training their paddlers, but also could affect their ability to instruct by creating visual interference, as they need to maintain lines of sight from the shoreline to canoes in the water. If the proposed mooring improvements project leads to a permanent disruption of outrigger canoe paddling activities, then the result would be a cultural impact on such traditional activities.

Another traditional cultural practice that was identified in the historical record and one that continues to be practiced in the bay today is subsistence fishing. While not as frequent as in the past, schools of *akule* (mackerel) are known to seasonally inhabit the bay and are caught with the use of nets, and other fishes have been and are also seasonally caught with line and hook from the shore. Additionally, there were several other marine fauna species identified during the consultation process that traditionally were and continue to be collected in the bay’s shallow waters; these include: *wana* (sea urchin), *‘opihi* (limpet), slipper lobster, and clams. If the proposed mooring improvements project is determined to have an impact on the marine environment of Keauhou Bay that in turn negatively affects the bay’s faunal (fish and shellfish) populations, then the result would be a cultural impact on traditional subsistence fishing and collecting activities.

If the analyses in the EA determine that the conditions of effect are met with respect to the potential cultural impacts outlined above, then the following recommendations for mitigation are offered:

- 1) Keauhou Bay as a potential historic district – Prepare a Hawai‘i Register of Historic Places nomination for a Keauhou Bay Historic District and develop and implement an appropriate preservation strategy for the district.
- 2) Outrigger canoe use – Work directly with the native Hawaiian instructors of the Keauhou Canoe Club to design a mooring layout that meets both the needs of the public and the needs of practitioners.
- 3) Fishing and collecting activities – Develop and implement monitoring and potential breeding/repopulating programs for all of the affected species within the Keauhou Bay ecosystem.

One final recommendation based on a distillation of all of the consultations, is to reassess the needs of the community with respect to its recreation use of Keauhou Bay; relocate all moorings to the south side of the bay and rather than increasing the density of moorings, possibly reduce the number and change the character of the moorings and “restore” the bay to a more non-mechanized user friendly environment.

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APPENDIX C
UNDERWATER ARCHAEOLOGICAL
SURVEYS

An Underwater Archaeological Survey of a Portion of Keauhou Bay Small Boat Harbor for the Proposed DOBOR Mooring Improvement Project

Keauhou Ahupua'a
North Kona District
Island of Hawai'i

DRAFT VERSION



Prepared By:
Robert B. Rechtman, Ph.D.,
Teresa Gotay, M.A.,
Brian Williams, M.M.A., RPA,
and
Richard Rogers
(Piliialoha Consultants)

Prepared For:

Anchor QEA, LLC
PO Box 699
Haleiwa, HI 96712

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An Underwater Archaeological Survey of a Portion of Keauhou Bay for the Proposed DOBOR Mooring Improvement Project

Keauhou Ahupua‘a
North Kona District
Island of Hawai‘i



EXECUTIVE SUMMARY

At the request of Anchor QEA, LLC, on behalf of the Department of Land and Natural Resources-Division of Boating and Ocean Recreation (DOBOR), ASM Affiliates (ASM) completed an underwater archaeological survey for the portion of the Keauhou Bay Small Boat Harbor that has the potential to be affected by DOBOR's proposed mooring improvements project. The objective of this intensive underwater examination was to provide a thorough archaeological resources inventory for the study area and to assess whether the removal of the existing unpermitted offshore mooring anchors and the installation of new permitted mooring anchors would impact any historic properties, be they previously identified or unidentified resources. The current study was undertaken in accordance with Hawai'i Administrative Rules 13§13-275, and was performed in compliance with the Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports as contained in Hawai'i Administrative Rules 13§13-276. Compliance with the above standards is sufficient for meeting the initial historic preservation review process requirements of the State of Hawai'i with respect to any necessary permitting that may be required. Fieldwork for the current underwater survey was conducted from July 27th to 31st, 2015, under the direction of ASM-Hawai'i's Principal Investigator, Robert B. Rechtman Ph.D. The dive team was led by of ASM Senior Archaeologist Brian Williams, who holds a Master's Degree in maritime archaeology, and the scuba and snorkeling crew consisted of Captain Richard Rogers (Dive Master) and Ned Rogers, both with Piliialoha Consultants. To ensure 100% visual coverage of the study area, the survey methods included both scuba and snorkeling. As a result of the current underwater investigation there were no significant archaeological resources identified. Thus, it is our conclusion that the proposed mooring improvements project within the Keauhou Bay Small Boat Harbor will not affect any submerged historic properties. Consequently, with respect to the historic preservation review process, our recommendation is that no further work needs to be conducted prior to or during project implementation. In the unlikely event that significant archaeological resources are discovered during project implementation work should cease in the area of the discovery and DLNR-SHPD contacted pursuant to HAR 13§13-280-3.

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1. INTRODUCTION

At the request of Anchor QEA, LLC, on behalf of the Department of Land and Natural Resources-Division of Boating and Ocean Recreation (DOBOR), ASM Affiliates (ASM) completed an underwater archaeological survey for the portion of the Keauhou Bay Small Boat Harbor that has the potential to be affected by DOBOR's proposed mooring improvements project (Figures 1 and 2). The proposed improvements include the removal of the existing nine moorings and associated anchors (which are unpermitted and of substandard design) and the installation of sixteen new vessel moorings that would be supported by thirty-two mooring anchors (Figure 3). The revised configuration of offshore moorings is intended to maintain clearance from the United States Coast Guard (USCG) navigation channel, more effectively accommodate vessels, and improve vessel and user safety, while at the same time ensuring continued use of the bay by non-motorized recreational activities such as swimming, kayaking, canoeing, snorkeling, fishing, and other traditional uses of the site.

The objective of this intensive underwater examination was to provide a thorough archaeological resources inventory for the study area and to assess whether the removal of the existing unpermitted offshore mooring anchors and the installation of new permitted mooring anchors would impact any historic properties, be they previously identified or unidentified resources. While several significant archaeological and cultural sites have been identified in areas surrounding Keauhou Bay, none have been identified within the Keauhou Bay Small Boat Harbor itself.

The current study was undertaken in accordance with Hawai'i Administrative Rules 13§13-275, and was performed in compliance with the Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports as contained in Hawai'i Administrative Rules 13§13-276. Compliance with the above standards is sufficient for meeting the initial historic preservation review process requirements of the State of Hawai'i with respect to any necessary permitting that may be required. This report contains background information outlining the project area's physical and cultural contexts, a presentation of previous archaeological work in the immediate vicinity of the study area, and current survey expectations based on previous work and archival research. We also present an explanation of the project's methods, a description of the findings, and provide recommendations concerning future historic preservation work.

1. Introduction



Figure 1. Study area location.



Figure 2. Google Earth™ satellite image of the current study area.

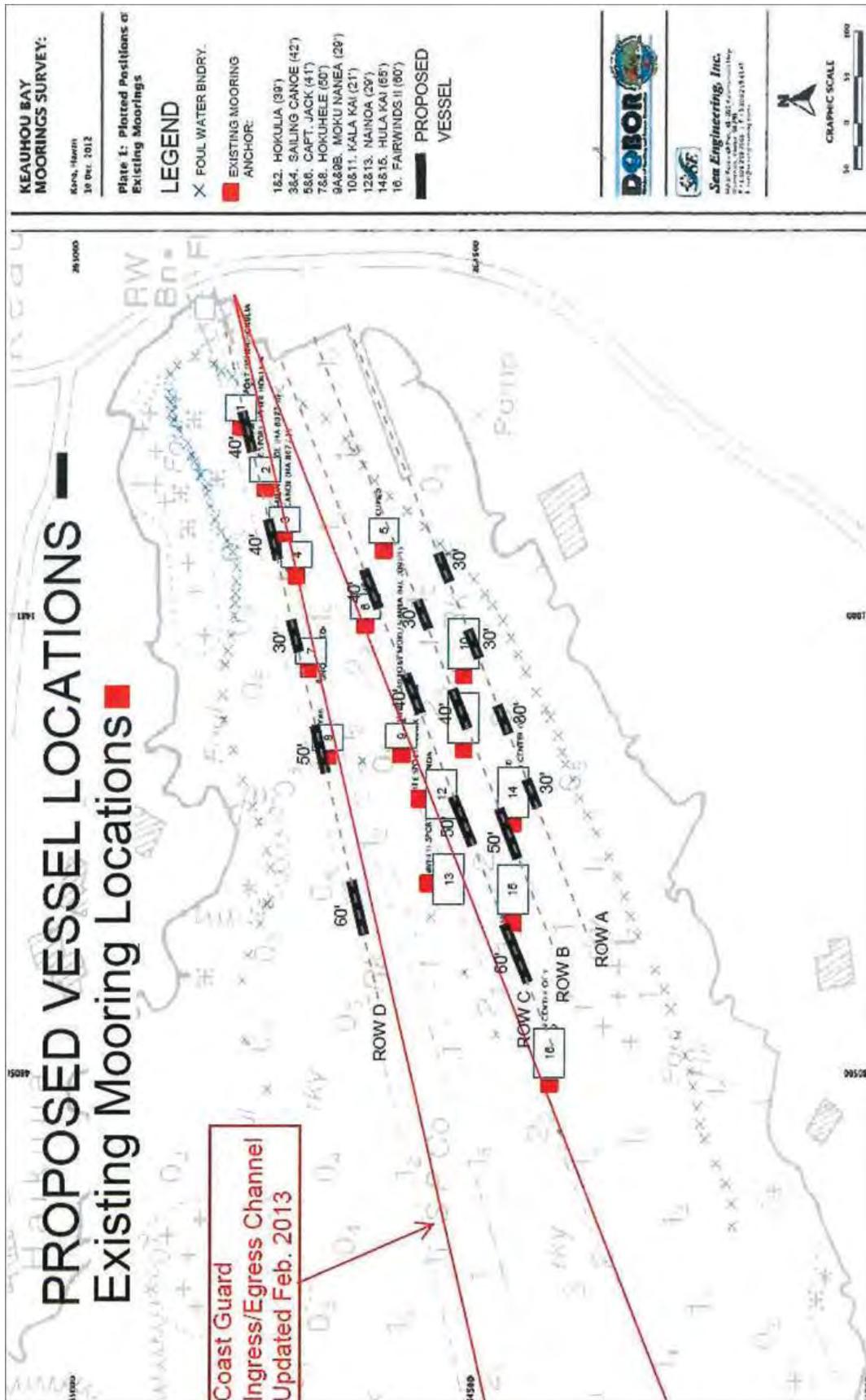


Figure 3. Mooring Development Plan.

2. BACKGROUND

This section of the report includes a discussion of the cultural-historical background for the region in addition to a synthesis of prior archaeological and historical research relevant to the current study area. Due to the focused underwater effort of the current study, this information is provided in order to generate a set of expectations regarding the nature of cultural resources that might be encountered within the study area, in a submerged context within Keauhou Bay, and to establish a basis for the assessment of the significance of any such resources.

CULTURE-HISTORICAL CONTEXT

Environment and Settlement Patterns in the Vicinity of the Current Study Area

Conventional wisdom has been that the first inhabitants of Hawai'i Island arrived by about A.D. 300, and focused habitation and subsistence activity on the windward side of the island (Burtchard 1995; Kirch 1985; Hommon 1986). However, there is no undisputed archaeological evidence for habitation of Hawai'i Island (or perhaps anywhere in Hawai'i) during this so called Settlement Period (A.D. 300 to 600), or Colonization Stage (Kirch 1985) of island occupation. More recently, Kirch (2011) has convincingly argued that Polynesians may not have arrived to the Hawaiian Islands until at least A.D. 1000, and expanded rapidly thereafter. The implications of this on the currently accepted chronology (Kirch 1985) would alter the timing of the Settlement, Developmental, and Expansion Periods, possibly shifting the Settlement Period to A.D. 1000 to 1100, the Developmental Period to A.D. 1100 to 1350, and the Expansion Period to A.D. 1350 to 1650.

Early settlement in Hawai'i is believed to have occurred from the southern Marquesas Islands and Society Islands (Emory in Tatar 1982). In these early times, Hawai'i's inhabitants were primarily engaged in subsistence level agriculture and fishing (Handy et al. 1991). This was a period of great exploitation and environmental modification, when early Hawaiian farmers developed new subsistence strategies by adapting their familiar patterns and traditional tools to their new environment (Kirch 1985; Pogue 1978). Their ancient and ingrained philosophy of life tied them to their environment and kept order; which was further assured by the conical clan principle of genealogical seniority (Kirch 1984). According to Fornander (1969), the Hawaiians brought from their homeland certain universal Polynesian customs: the major gods Kāne, Kū, and Lono; the *kapu* system of law and order; cities of refuge; the *'aumakua* concept; various epiphenomenal beliefs; and the concept of *mana*.

The initial permanent settlements in the islands were established at sheltered bays with access to fresh water and marine resources. These communities shared extended familial relations and there was an occupational focus on the collection of marine resources. Over a period of few centuries the areas with the richest natural resources became populated and perhaps even crowded, and there was an increasing separation of the chiefly class from the common people. As the environment reached its maximum carrying capacity, the result was social stress, hostility, and war between neighboring groups (Kirch 1985). Soon, large areas of Hawai'i were controlled by a few powerful chiefs.

The Developmental Period brought about a uniquely Hawaiian culture. The portable artifacts found in archaeological sites of this period reflect not only an evolution of the traditional tools, but some distinctly Hawaiian inventions. The adze (*ko'i*) evolved from the typical Polynesian variations of plano-convex, trapezoidal, and reverse-triangular cross-section to a very standard Hawaiian rectangular quadrangular tanged adze. A few areas in Hawai'i produced quality basalt for adze production. Mauna Kea, on the island of Hawai'i, possessed a well-known adze quarry. The two-piece fishhook and the octopus-lure breadloaf sinker are Hawaiian inventions of this period, as are *'ulu maika* stones and *lei niho palaoa*. The latter was a status item worn by those of high rank, indicating a trend toward greater status differentiation (Kirch 1985).

The Expansion Period is characterized by the greatest social stratification, major socioeconomic changes, and intensive land modification. Most of the ecologically favorable zones of the windward and coastal regions of all major islands were settled and the more marginal leeward areas were being developed. Within the greater Kona region, primary "chiefly" centers were established at several locations including Kailua, Kahalu'u-Keauhou, Ka'awaloa-Kealakekua, and Hōnaunau. The greatest population growth occurred during the Expansion Period as did efforts to increase upland agriculture. Rosendahl (1972) has proposed that settlement at this time was related to seasonal, recurrent occupation in which coastal sites were occupied in the summer to exploit marine resources, and upland sites were occupied during the winter months, with a focus on agriculture. An increasing reliance on agricultural products may have caused a shift in social networks as well; as Hommon (1976) argues, kinship links between coastal settlements disintegrated as those links within the *mauka-makai* settlements expanded to accommodate exchange of agricultural products for marine resources. This shift is believed to have resulted in the establishment of the *ahupua'a* system. The implications of this model include a shift in residential patterns from seasonal, temporary occupation, to permanent dispersed occupation of both coastal and upland areas.

2. Background

By this time the Island of Hawai‘i appears to have been divided into six traditional districts or *moku* (Cordy 2000). The current APE falls within the central region of the traditional *moku* of Kona, in what is today known as North Kona or Kona ‘*akau*, on the dry leeward side of the island. Kona extends from the shore across the entire volcanic mountain of Hualālai, and continues to the summit of Mauna Loa. Like other large districts on Hawai‘i, in ancient times, North Kona was further subdivided into regions of land known as ‘*okana* or *kalana*, which were themselves comprised of still smaller land units. Sometime during the A.D. 1400s, the *moku* were further divided into distinct land units known as *ahupua‘a* (Kirch 1985). *Ahupua‘a* were ideally long wedge-shaped slices of land that incorporated all of the eco-zones from the mountains to the sea and several hundred yards beyond, which afforded their inhabitants unlimited access to a diverse subsistence resource base (Cordy 2000). Entire *ahupua‘a*, or portions of the land were managed by appointed *konohiki*, or lesser chiefs, who acted as overseers under the rule of an *ali‘i ‘ai ahupua‘a*. The *ali‘i ‘ai ahupua‘a* in turn answered to an *ali‘i ‘ai moku*, a higher chief who ruled over the *moku* and claimed the abundance of the entire district. Thus, *ahupua‘a* resources supported not only the *maka‘āinana* (commoners) and ‘*ohana* (extended families) who lived on the land, but also provided support to the ruling class of higher chiefs and ultimately the crown. The *moku* of Kona has over 100 *ahupua‘a*, and approximately forty-four of these fall within the fertile central region of Kona, including Keauhou 1st and 2nd (Figure 4), where the current study area is located. The literal translation of Ke-au-hou is “the new era or the new current.” (Pukui et al. 1976:04). The majority of the *ahupua‘a* in central Kona are fairly narrow and include a combination of forest lands, upland farms, coastal *kula*, and offshore resources.

The current study area is situated in the shallow waters of Keauhou Bay, near the coastal edge of the Kona Field System (Cordy 1995, Newman 1970, Schilt 1984). The Kona Field System extends north at least to Kaū Ahupua‘a and south to Hōnaunau, west from the coastline and east to the forested slopes of Hualālai (Cordy 1995). A large portion of this area is designated in the Hawai‘i Register of Historic Places as Site 50-10-37-6601 and has been determined eligible for inclusion in the National Register of Historic Places. The basic characteristics and elevationally delimited zones (Table 1) within this agricultural/residential system as presented in Newman (1970) have been confirmed and elaborated on by archaeological (Kelly 1983; Cordy 1995; Johnson and Wolforth 2006) and ethnohistorical investigations (Kelly 1983).

Table 1. Traditional Hawaiian agricultural zones.

<i>Zone</i>	<i>Annual Rainfall (cm.)</i>	<i>Elevation (m.)</i>	<i>Primary Crops</i>
<i>Kula</i>	75-125	Sea level-150	<i>Uala, wauke, and ipu</i>
<i>Kalu‘ulu</i>	100-140	150-300	<i>Ulu, uala, and wauke</i>
‘ <i>Āpa‘a</i>	140-200	300-750	Dry land <i>kalo, uala, kī</i> and <i>kō</i>
‘ <i>Ama‘u</i>	> 200	750-1,200	<i>Maia</i> (both plantain and banana)

Cordy (1995) presents a summary of archaeological settlement patterns for Kona that is based on previous archaeological work as well as on observations made by explorers and missionaries during the late eighteenth and early nineteenth centuries. Cordy bases his reconstruction on the Hawaiian terms for the major vegetation zones used to define and segregate space within an *ahupua‘a*. It was these native terms (*kula, kalu‘ulu, āpa‘a* and ‘*āma‘u*) that were used during the *Māhele Āina* of 1848 in the description of land claims. Cordy also describes a narrow shoreline zone within the *kula* that included the lands at the immediate coastline, which typically fell outside the four traditional agricultural zones, “where most houses were located and which is rarely identified in the records as crop land” (1995:4). Cordy further defined the zone as follows:

Shoreline: This land is considered here to be that above the high-tide line extending inland 200 meters or so (600+ feet). Typically in Kailua this is from the shore back to Ali‘i Drive and perhaps 100 meters farther inland. (Cordy 1995:4)

The current study area occupies the shallow waters offshore, near the primarily residential shoreline portion of the Kona Field System, which may be interpreted as a *makai* division of the larger *kula* zone. The *kula* zone is the area from sea level to 150 meters in elevation. This lower elevation zone is traditionally associated with habitation and the cultivation of *wauke, ipu,* and ‘*uala*. The settlers in the Kona district developed agricultural techniques suited for the dry environment and produced staple and supplemental crops by exploiting all the *ko kula kai* (coastal *kula*) and *ko kula uka* (upland *kula*) had to offer (Maly 1998). These dryland techniques included planting taro in built up mounds known as *pu‘epu‘e* and planting in small holes or larger pits known as ‘*umoki* and *mākālua*, respectively (Maly 1998).

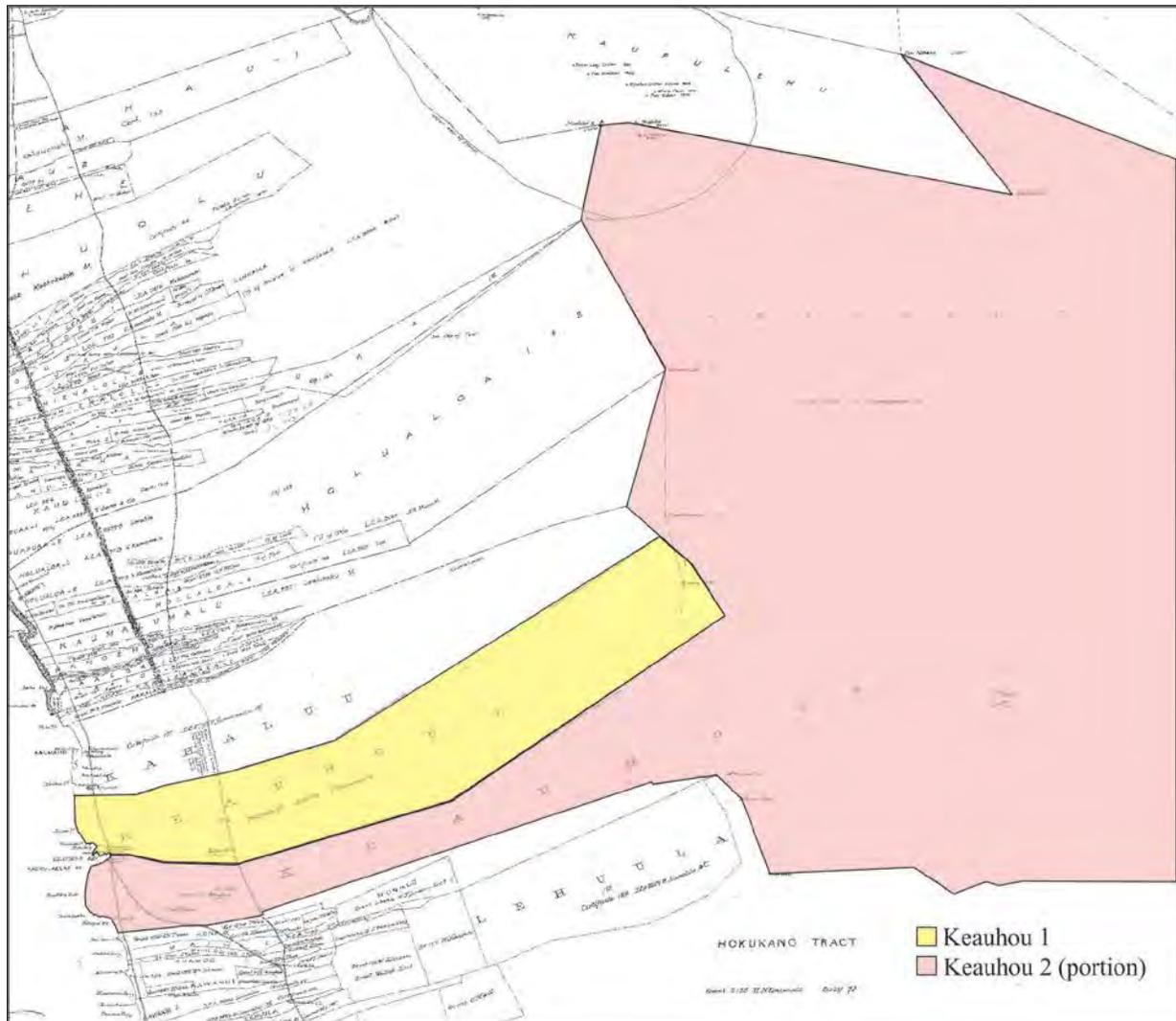


Figure 4. Composite of Hawaii Reg. Maps No. 1280 and 1281 (ca. 1877 and 1891, respectively) showing Keauhou 1st Ahupua'a and a portion of Keauhou 2nd Ahupua'a.

According to the archaeological record, historic documentation, and legendary accounts, the shoreline zone of the Kona Field System was home to many *ali'i* and *konohiki*. Their associated habitation sites typically consisted of complexes of various, separate structures associated with specific functions often based on gender divisions. The *maka'ainana* (commoners) also lived in residential complexes during prehistoric times, albeit with fewer structures of reduced size compared to those of the *ali'i* and *konohiki*.

In addition to permanent habitation, the shoreline zone was also used for non-agricultural activities, such as recreation, ceremonial practices, canoe storage, fishing and related rituals, and burial (Johnson and Wolforth 2006). Smaller temporary habitations associated with fishing activities were also common along the shore (Cordy 1995). Numerous ceremonial structures such as fishing shrines and traditional places of worship or *heiau* are found along the Kona coastline (Stokes and Dye 1991). Precontact burial practices in central Kona were most commonly performed along the shore and the lower *kula* zone, with few scattered burial sites further inland and still less with an increase in elevation (Cordy 1995). Furthermore, according to Cordy:

In the case of coastal housing in Central Kona often burials are found behind and among the houses in small square platforms – nicely made and too small for houses. Occasionally, burials are in low mounds, or below pavings flush with the ground. Usually in Central Kona burials are in small clusters – one to perhaps 10 or 15 structures. Occasionally, larger sets of burials are present together in one place . . . Typically, however, large cemeteries do not seem to be the norm in Central Kona. (Cordy 1995:14)

The district of Kona figures prominently as a royal center in the Proto-Historic Period. Beginning around A.D. 1600-1620, Hawaiian royalty resided within the shoreline zone of central Kona at Kailua, Hōlualoa, Kahalu‘u, and Keauhou. Such royal and high chiefly centers included dwellings for chiefs, their court, and local *maka‘āinana* in addition to public structures, such as *heiau*, sporting grounds and places of refuge (Cordy 1995). As a result of the presence of these royal and high chiefly centers, population size increased for a time, as did the density of habitations and public structures within the *makai* area of the *kula* zone. However, during the early nineteenth century, following the death of Kamehameha I and the adoption of Western introduced religious practices, *heiau* no longer held their significance as elements of a state-sponsored religion. In fact, at many of these sites in central Kona, the wooden god images were burned and the structures themselves were dismantled (Kelly 1983). The stones of the destroyed *heiau* were often used for other building projects such as the Kuakini Wall.

The settlement patterns described above persisted into the early Historic Period, but with the introduction of new crops and rapid population loss in the early 1800s, major changes were well underway. During the nineteenth century, the traditional Hawaiian residential complexes evolved into multi-room structures built on stone platforms with clearly defined internal divisions (O’Hare and Wolforth 1998). Historic Period burials often incorporated historic-era artifacts and architecture, such as mortar and corrugated tin as part of isolated structures or interments within stone platforms (O’Hare and Wolforth 1998). Another change to the landscape came with the introduction of ranching to the *kula* zone in the mid-1800s, which persisted well into the twentieth century in much of the district of North Kona, including within Keauhou 1st and 2nd *ahupua‘a*.

Keauhou 1st and 2nd Ahupua‘a

Legendary and Traditional Accounts

Prior to first contact with Europeans in the late eighteenth century and the development of a written Hawaiian language, the history of ancient Hawai‘i was transmitted orally from generation to generation. The following section presents a selection of such traditional accounts associated with Keauhou 1st and 2nd, many of which mention specific historical figures, place names, and historically significant locales.

As previously mentioned, the current study area is located within the district of Kona, which extends from the western shores of Hawai‘i Island across the entire volcanic mountain of Hualālai to the summit of Mauna Loa, where Kona is joined by the districts of Ka‘ū, Hilo, and Hāmākua. One traditional reference to the northern and southern-most coastal boundaries of Kona tells us of the district’s extent:

Mai Ke-ahu-a-Lono i ke ‘ā o Kani-kū, a hō‘ea i ka ‘ūlei kolo o Manukā i Kaulanamauna e pili aku i Ka‘ū!—From Keahualono [the Kona-Kohala boundary] on the rocky flats of Kanikū, to Kaulanamauna next to the crawling (tangled growth of) ‘ūlei bushes at Manukā, where Kona clings to Ka‘ū! (*Ka‘ao Ho‘oniua Pu‘uwai no Ka-Miki in Ka Hōkū o Hawai‘i*, September 13, 1917; Translated by K. Maly)

In Kona, where there were no regularly flowing streams to the coast, access to potable water (*wai*), was of great importance and played a role in determining areas of settlement. The waters of Kona were found in springs and caves (from shoreline to the mountain lands), or procured from rain catchments and dewfall. Traditional narratives abound with descriptions and names of water sources, and also record that the forests were more extensive and extended much further seaward than they do today. These forests not only attracted rains from the clouds and provided shelter for cultivated crops, but also in dry times drew the *kēhau* and *kēwai* (mists and dew) from the upper mountain slopes to the low lands (Rechtman et al. 2001). Also of interest to the current study, is how Native Hawaiians would dive down to freshwater seeps and springs that surface in saltwater in order to collect drinking water in calabashes. Charles Henry Hitchcock (1909) mentions finding such freshwater springs off Keauhou.

In the 1920s-1930s, Handy et al. (1991) conducted extensive research and field interviews with elder native Hawaiians. In the lands of North and South Kona, they recorded native traditions describing agricultural practices and rituals associated with rain and water collection. Primary in these rituals and practices was the lore of Lono—a god of agriculture, fertility, and the rituals for inducing rainfall. Handy et al., observed:

The sweet potato and gourd were suitable for cultivation in the drier areas of the islands. The cult of Lono was important in those areas, particularly in Kona on Hawaii . . . there were temples dedicated to Lono. The sweet potato was particularly the food of the common people. The festival in honor of Lono, preceding and during the rainy season, was essentially a festival for the whole people, in contrast to the war rite in honor of Ku which was a ritual identified with Ku as god of battle. (Handy et al. 1991:14)

Handy et al. (1991) noted that the worship of Lono was centered in Kona. Indeed, it was while Lono was dwelling at Keauhou, that he is said to have introduced taro, sweet potatoes, yams, sugarcane, bananas, and *‘awa* to Hawaiian farmers (Handy et al. 1991). The rituals of Lono—“The father of waters”—and the annual *makahiki* festival (honoring Lono) preceding and during the rainy season, were of great importance to the native residents of this region (Handy et al. 1991:14). The significance of rituals and ceremonial observances in cultivation and indeed in all aspects of life was of great importance to the well-being of the ancient Hawaiians, and cannot be overemphasized, or overlooked when viewing traditional sites of the cultural landscape.

One of the earliest accounts that directly mentions the Keauhou area pertains to ‘Umi-a-Līloa, who briefly united the warring chiefs of Hawai‘i Island under his rule during the early 1600s (Cordy 2000). Like many rulers before and after him, ‘Umi built and re-built many *heiau* throughout his rule (ibid.). Ahu-a-‘Umi Heiau, located in upland Keauhou, is the most famous *heiau* built by ‘Umi (ibid.). ‘Umi apparently relocated his court to the site of Ahu-o-Umi, the remains of which can still be found today, far from the coast at an elevation of about 5,200 feet, in the saddle between Hualalai and Mauna Loa (Cordy 2000). ‘Umi’s grandson Lonoikamakahiki, also resided at Kahalu‘u and Keauhou (Elmore and Kennedy 2001).

As previously mentioned, the Kona coast was host to several chiefly centers, the Keauhou Bay area was no exception. Several high ranking chiefs were said to have been born and/or resided in Keauhou and nearby Kahalu‘u, including Kuakini, Miriam Kekāuluohi, and Keopuolani the “sacred” wife of Kamehameha who gave birth to Kauikeaouli (Kamehameha III) along the shores of Keauhou Bay, in the vicinity of the current study area. In an *‘ōlelo no ‘eau* (Hawaiian proverb), Pukui refers to Keauhou citing its significance as a chiefly center and the many associated *kapu*:

Keauhou i ka ‘ihi kapu

Keauhou, where the strict kapu were observed.

Keauhou, Kona. This was the place where many of the highest chiefs resided and where Kamehameha III was born. (Pukui 1994:181-182)

In his book *Ruling Chiefs of Hawaii*, Kamakau (1992) provides several accounts of chiefly activities that occurred in Keauhou and nearby Kahalu‘u. One of Kamakau’s earliest accounts of Keauhou mentions Kalani‘ōpu‘u, the *ali‘i-nui* of Hawai‘i Island from 1754-1782:

After the death of Captain Cook and the departure of his ship, Ka-lani-‘opu‘u moved to Kainaliu near Honua‘ino and, after some months, to Keauhou where he could surf in the waves of Kahalu‘u and Holualoa, and then to Kailua. (ibid.:105)

Another chiefly account presented by Kamakau (1992) is the ca. 1789 birth of Kuakini who would grow up to be governor of Hawai‘i from 1820-1844, and who was raised by Kamehe‘aiku (female cousin of Ke‘e‘aumoku) at Keauhou:

At the birth of the child [Kua-kini] there was a great hula at Kahalu‘u, and the name hula (*hula inoa*) was being danced for the birth of the new son to Na-mahana and Ke‘e-au-moku. Visitors came to bring gifts (*ho‘okupu*), and among them was Ka-mehe-‘ai-ku who had gone away and hidden in the country and slept with a man and given birth to a child. She was a cousin of Ke‘e-au-moku, and when she was discovered among the spectators at the hula Ke‘e-ai-moku gave the child to her to suckle and gave with him the land of Keauhou; and Ka-mehe-‘ai-ku took the little chief to Keauhou and there nourished him until he was grown. (ibid.:388)

Kamakau (1992) also writes about Kekāuluohi, premier of Hawai‘i from 1839-1845, who was born in Keauhou in 1794. According to Kamakau, Kekāuluohi was a revered chiefess and a favorite above all the others of her generation thanks to her link to numerous chiefly ancestral lines of Kaua‘i, O‘ahu and Hawai‘i. The following excerpt demonstrates just how special Kekāuluohi was considered to be:

Ke-ka-ulu-ohi was brought up at Kahalu‘u and Keauhou by Na-mahana and Ke‘e-au-moku, her grandparents, who fondled her as if she were a feather lei made from the precious *mamo* bird. (ibid.:394)

Kekāuluohi went on to marry Kamehameha I in 1809 in Waikiki. Upon his death, she became one of Liholiho’s five wives until she was given to Kana‘ina, with whom she bore her first male child (W.C. Lunalilio) in 1834.

2. Background

Keauhou also figures in the life story of another prominent chiefess, Queen Keōpūolani known as the sacred wife of Kamehameha I and mother of Liholiho. She was born on Maui in 1780 and lived there until the age of nine or ten, at which time the 'Iao Valley battle forced her and some relatives to flee to Moloka'i (Kamakau 1992). Shortly thereafter in 1813, Kamehameha I brought Keopuolani from Moloka'i to Hawai'i:

At Keauhou in North Kona, Ke-opu-o-lani was brought up under the name of Wahine-pio until she was a grown girl. With her mother she accompanied Kamehameha on his expedition to make war upon Ka-lani-ku-pule on Oahu, where in 1795 was fought the battle Nu'uano. Here one of the Oahu chiefs gave her the name of Ke-opu-o-lani in place of that of Ka-lani-kau-i-ka-'alaneo by which she had been previously called. (ibid.:260)

One of the most well-known stories that features Keauhou is the birth ca. 1813 of Keopuolani's third child Kauikeaouli (Kamehameha III). The legend holds that the baby was stillborn and brought back to life by a *kahuna* named Kapihe. Gutmanis describes the birth and ceremony, including the chant (*Ho 'iho 'i ana i ka 'uhane*- a chant used to return the spirit to the body) used by Kapihe to bring Kauikeaouli back to life:

Some births are not easy and the child is still-born. On those sad occasions every effort is made to bring life to the small body. When Ke'opu-o-lani was expecting the child that would later rule as Kamehameha III, she was at Ke-au-hou, Kona, Hawaii. One day, after swimming in the bay, she was seized with violent cramps as she walked back to her house on the grounds of Ka-lei-o-papa heiau and she gave birth in the open. The child appeared dead with afterbirth that was very flabby.

Ka-pihe, the high priest, was called. He instructed Ke'opu-o-lani's attendants to stand in a circle with their forefingers locked with each other, a fire was built in the center of the ring and after the embers were brushed aside the afterbirth was turned over and over above the hot rocks.

At one point, Ka-pihe looked up and saw the image of a child in the dark clouds and he knew that the baby would live. He gave the boy the name Kau-ike-ke-ao-uli, which means, "Stationed-in-the-firmament." Some say Ka-pihe used a kite in this ceremony.

The following is said to be one of the prayers used by Ka-pihe as he worked over the body.

Hulia ka lani i ke akua	Flashes the heavens to the god,
Lapalapa ka honua i ke keiki	The earth blazes by the child
E ke keiki e ho'oua i ka punohu lani,	O child, cause the small black clouds of the heavens to give rain

Aia I ka lani hoku e	The star is in the heavens
O ku'u 'uhane e kahe mau,	O my spirit continually flows,
I la'a i kou kanawai.	That your ti leaves be sacred.

(Gutmanis 1983:38-40)

Burtchard (1995) suggests that as a result of the presence of Kamehameha's court in greater Kona area beginning in 1813, high status features of monumental construction were developed in the region. A prime example of such high status features is the massive Kāneaka Hōlua, or Pu'u-o-Kaomi-la'o slide (Figure 5), which was constructed in Keauhou around this time. This "Royal Slide at Keauhou" (SIHP Site 1669) was one of the longest and best preserved of its kind, and Burtchard offered the following details:

Soehren (1966), in his article on the Royal Slide at Keauhou, notes that "... According to the Rev. A.S. Baker (1921) [sic 1916] it [the slide] was built by Kamehameha for his son Kauikeaoli, [later Kamehameha III], born to Keopuolani at nearby Keauhou Bay in 1814 (Kamakau 1961:260). Soehren cites Kamakau (1961:242) and Kekahuna (n.d.) to apply the alternative names Ka holua o Kaneaka and Pu'u-o-Kaomi-la'o to this dramatic National Register archaeological feature. (Burtchard 1995:40)

A 1953 sketch map (Figure 6) by Kekahuna shows a detailed plan view of the *hōlua* at Keauhou with associated historical notes. The original length of the slide was almost 6,000 feet, extending *makai* from Pu'u o Kaomilā'ō to He'eia Bay, located to northwest of the current study area (Hammatt et al. 1981).



Figure 5. The *hōlua* slide at Keauhou ca. 1905 (from the A.S. Baker collection).

was not found during Stokes fieldwork (Stokes and Dye 1991:85). Ho'okuku Heiau (SIHP Site 3811) is sometimes referred to as Kaopa Heiau or Ka-lei-o-papa Heiau (see Kekahuna map Figure 7). Stokes (1991) reported that the *heiau* of Ho'okuku was the site of the aforementioned miracle that provided life to the stillborn Kamehameha III. Figure 7 shows the detailed plan view portion of a 1955 sketch map by Kekahuna. In his map, Kekahuna refers to Ho'okuku Heiau as Ka-lei-o-papa Heiau, because Kaleiopāpā was another name of Kamehameha III. Kekahuna's maps were part of a newspaper serial (printed in thirty-seven installments in the Hilo Tribune Herald) about the history and historic sites of Kailua-Kona entitled *Kamehameha in Kailua*, which was authored by Theodore Kelsey and Henry Kekahuna with cultural assistance from Kekahuna's uncle Naluahine Ka'opua. Various high status features discussed above are found on this 1954 sketch map of Keauhou Bay with associated historical notes gathered by Kekahuna (Figure 8). This map also illustrates the locations and names of various coastal points and coves, the Ho'okuku Spring, house and wall locations as they appeared in the early 1950s, in addition to the location of the then present dry-dock and boat pier within Keauhou Bay.

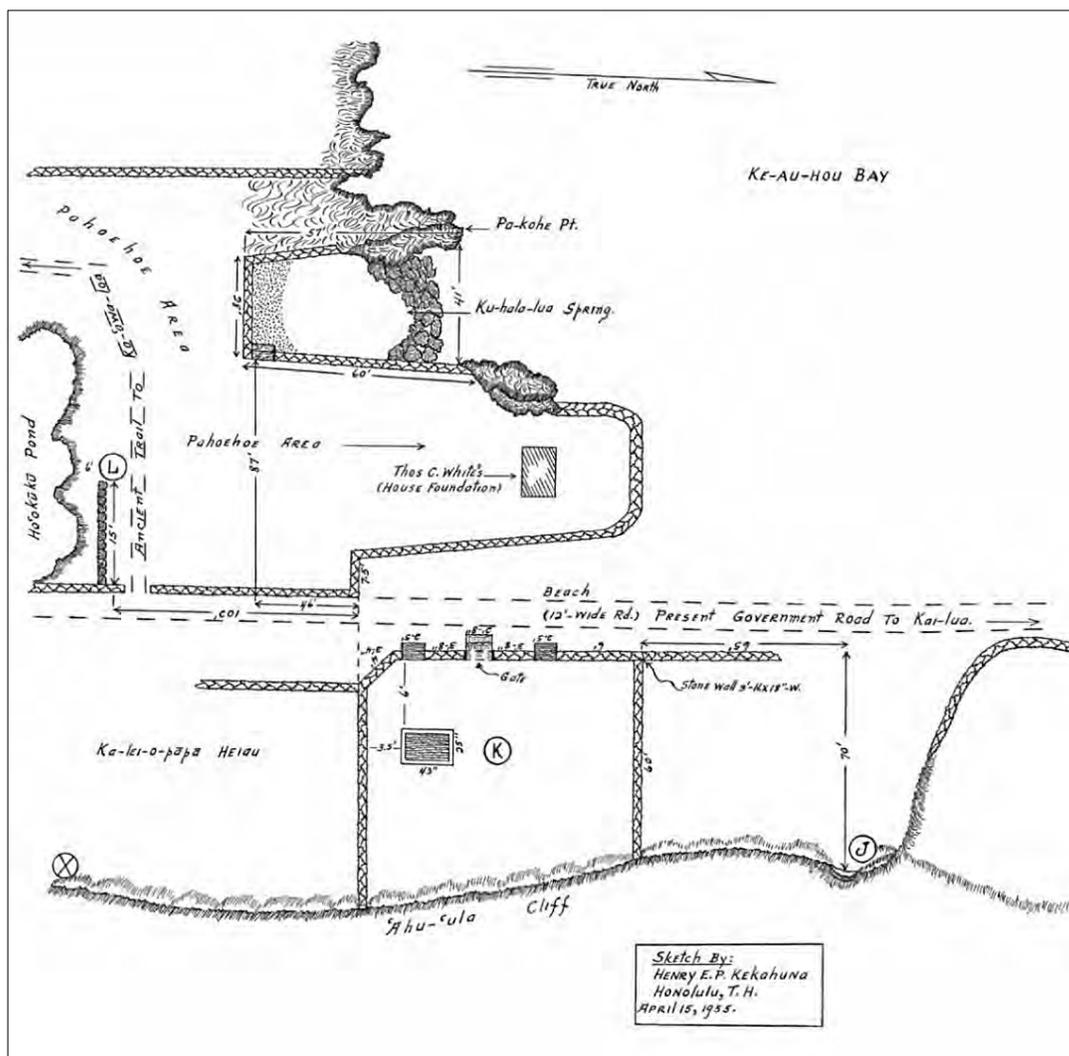


Figure 7. Portion of 1955 sketch map by Kekahuna, showing Kaleiopāpā Heiau, also known as Ho'okuku and Kaopa Heiau.

Keauhou Bay as an Early Shipping Center

The use of Keauhou Bay as a shipping locus was noted as early as 1794; as according to Menzies (1920) there was a foreigner in residence at Keauhou engaged in the manufacture of charcoal to supply visiting western ships (Menzies 1920). Concerning the anchorage of vessels at Keauhou Bay, Mackintosh reported that the bay “is resorted to by vessels for cargoes of firewood, sandalwood and other commodities of produce” (1838:2). According to Folk et al., “Keauhou may have been always particularly well suited geographically for the transportation of forest resources to the coast and the sandalwood of a vast interior could have been funneled down through Keauhou to the waiting holds of Keauhou Bay” (2003:7).

Of particular relevance to the current study area is the story of the *Fair American*, an American trading schooner whose final history is closely linked to Keauhou Bay. In 1788, Captain Simon Metcalf of the ship *Eleanora* appears to have purchased the fifty-foot vessel in Macao. Shortly thereafter, under his son Thomas’ command the *Fair American* set sail as tender for the *Eleanora* to the Pacific Northwest on a trade venture (Howay 1926). The *Fair American* arrived in North Kona in 1790 with her six man crew, and swiftly became the victims of a brutal siege disguised as trade gestures, orchestrated by Kamehameha I’s uncle Kame’eiamoku; Isaac Davis was the only crewman left alive (Rogers 1999). According to Kuykendall (1967), Kame’eiamoku’s act of vengeance was in response to an episode in which he had been shamed by Captain Metcalf aboard the *Eleanora* and vowed to take his revenge on the next foreign ship to enter his waters.

As a result of the siege, Kamehameha placed a *kapu* on trade with the Americans in order to keep the news of the *Fair American*’s fate from Metcalf, who was prone to violence (Rogers 1999). One of the *Eleanora* crewmen, John Young, was captured when he was sent ashore by Metcalf to find some willing trade partners. Metcalf made some vain attempts to drum up trade and recover his lost crewman, but set sail for China within a few days without ever seeing John Young, his son Thomas, or the *Fair American* again. After reprimanding Kame’eiamoku for his actions, Kamehameha took command of the *Fair American*, and secured her at Keauhou Bay (ibid.). Kuykendall (1967) goes on to report that the *Fair American* became the first foreign vessel to be included in Kamehameha’s war fleet and Rogers (1999) recounts the story of the 1791 sea battle known as the Battle of the Red Mouthed Gun, in which the *Fair American* was outfitted with a gun called Lopaka and crewed by Young, Davis, Kamehameha and a Hawaiian crew. Young and Davis also apparently used the vessel for trade in 1793 (Rogers 1999).

Between 1790 and 1795 Captain George Vancouver sailed the ship *Discovery* and her tender *Chatham* on an exploration voyage throughout the Pacific Ocean. He and his crew made several visits to the Hawaiian Islands and had interactions with Kamehameha I and his retinue, as well as John Young and Isaac Davis. Vancouver kept a journal throughout his voyage, which was published in three volumes. Volume II published in 1798 contains the equivalent of eyewitness accounts of the siege of the *Fair American* and its aftermath. Vancouver recorded two separate entries that deal directly with the captured vessel. In the first entry dated February 1793, Vancouver recounts the following version of events as told to him by Young:

On the 17th of March, Young had permission to be on shore until the next day, when the snow [the *Eleanora*] stood close in, and fired a gun as a signal for him to return on board; but, to his very great astonishment, he found the canoes all *tabooed*, and hauled up on the shore, and was informed by *Tamaahmaah* [Kamehameha I], that if he attempted to take a canoe himself, he would be put to death, but that he should have a canoe the next day. Having no other resource, Young was obliged to submit; and in the evening he was informed, that the schooner *Fair American* had been captured by *Tamaahmootoo* [Kame’eiamoku], to the southward of Toeaigh [Kawaihae] bay; and that Mr. Metcalf’s son, and the four men composing the crew, had been barbarously murdered. (1798:137)

Vancouver goes on to explain the courtesy and kindness with which Kamehameha treated Young and how on the 22nd of March, Young accompanied the King to investigate the circumstances of the previous events. Regarding the state of the *Fair American* at that time, Vancouver recounts:

The schooner was found in the situation already described, destitute of almost every thing that was moveable. *Tamaahmaah* demanded the vessel should instantly be delivered up to him, that he might restore her to the proprietor Mr. Metcalf, should he ever again visit Owhyhee [Hawai’i]. This was complied with by *Tamaahmootoo*, who received from the king a very sharp rebuke for the great impropriety of his late conduct in the capture of the schooner, and his unpardonable barbarity in murdering the commander and the people; in excuse for which, he alledged [sic] he had been struck and otherways ill treated by the father of the unfortunate young man. (1798:137)

According to Vancouver, it was at this time that Kamehameha first encountered Davis after the attack alive but in bad shape. Vancouver collected the following account of the siege of the *Fair American* from Davis himself:

2. Background

“The Schooner, being clofe in with the land, and nearly or intirely [sic] becalmed, fhe was vifited by *Tamaahmootoo*, a very powerful chief, who was attended by a great number of the inhabitants. Many of thefe, as well as their chief, made confiderable prefents to the young commander, and others fold their hogs and vegetables for little or nothing; and in order to ingratiate themfelves further in the good opinion of Mr. Metcalf, and to gain his permiffion for their entering his vefel, they told him that the fnow [the *Eleanora*] was but a little way to the weftward, and that he would fee his father before night . . .” (1798:138)

Davis went on to tell Vancouver about how the commander and his men were thrown overboard and that he himfelf was thrown overboard when his pistol misfired (Vancouver 1798). He also described his struggle for survival on his way to the shore, and the fubfequent care he received in addition to being paraded around the village by Kame'eiamoku. Davis also told Vancouver that Kame'eiamoku had stripped the vefel before Kamehameha and Young had gotten to her. In addition, Davis confirmed Young's account of the king having fcolded his uncle before he “took poffeffion of the fchooner for the right owner” (ibid.:139).

In his fecond entry that mentions the *Fair American*, dated March 1793, Vancouver relates the following account of the location and condition of the vefel:

On the morning of the 8th the weather being pleafant, with a gentle breeze from the land, we failed from Karakakoo [Kealakekua], and ftood along fhore to the northward; about four miles from our laft ftation we paffed a fmall creek, where we faw the captured fchooner laid up, and houfe built over it to protect her from the fun. About this time *Tamaahmaah*, with his queen and moft of his attendants, had overtaken us. I took this opportunity of refuming this unfortunate fubject, and underftood from *Tamaahmaah*, that it was his intention to return the fchooner to Mr. Metcalf her owner. This, *Tamaahmaah* promifed to do; either to Mr. Metcalf himfelf, or to the commander of any vefel authorized by Mr. Metcalf to receive her. Young bore witnefs to the king's fincerity, and laid that this had been his confant language, from the moment he became acquainted with the melancholy caufe of her detention. From Young we learned, that the fchooner was now of little value, having nearly fallen to pieces for want of the neceffary repairs (1798:164-165).

Archibald Menzies, the feurgeon and naturalift aboard Vancouver's fhip, also kept a journal during his time on board *Discovery*. A felection of his journal entries documenting his three vifits to the Hawaiian Islands between 1792 and 1794 was published in 1920. Menzies also interacted with Kamehameha I and his retinue as well as Young and Davis (whom he refers to as Davies in his accounts) while anchored off the Kona coast in March of 1793. Menzies had the following to fay about Young and Davis and the repercussions of the feige of the *Fair American*:

They had no wifh to leave the ifland as they faid they expected their commander, Mr. Medcalf [sic], to touch this way again, and were defirous of joining him in preference to any other. The king was also anxious to detain them till Mr. Medcalf [sic] fhould come, that they might inform him that he had no previous knowledge or any hand in the unfrotunate affair of taking the fchooner, which they both declared was actually the cafe. For John Young affured us that he was afhore at Kealakekua with the king at the time he received the intelligence of it, and that he appeared much agitated and truly grieved for the barbarous and cruel tranfaction for which he fo much dreaded Mr Medcalf's [sic] vengenance, that he infantly ordered all the fhore to be tabooed, and not a fingle canoe fuffered to go to his vefel, by which means John Young was detained on the ifland. Mr. Medcalf [sic] finding the intercourse with the fhore entirely cut off, sailed without being able to difcover the caufe of it, or having the leaft idea of his fchooner being at the iflands, for fhe had been captured at Nootka at the fame time Mr. Meares's vefels were and carried to St. Blas by Dr. Joseph Martinez, and came here in hopes of meeting the Eleanor. (Menzies 1920:96-97)

In a feperate entry, Menzies describes the events furrrounding the feige of the *Fair American*:

The bufein of taking the fchooner was accomplifhed at noon day by fome double canoes under the direction of a treacherous chief named Kameeiamoku, who under the difguife of a frienfhip got on board with his diabolical party, and at a fignal given feized the unfortunate crew and threw them overboard, while thofe in the canoes knocked them with clubs and paddles till they put an end to their exiftence, except Ifaac Davies, who from his being a very ftrong and ftout man, ftruggled fo hard that he had the good fortune of reaching the fhore alive after receiving many wounds and bruises, and his life was afterwards fpared at the infigation of the king.

The schooner was at this time lying in a small cove [Keauhou Bay] about two leagues to the northward of Kealakekua, and roofed over with thatch to preserve her, in order to be delivered to Mr. Medcalf [sic] when he came to the island.(ibid.:97)

The *Fair American* appears again in Menzies account of his third journey to Hawai‘i with the *Discovery*, which occurred in 1794, when he briefly visited the current study area on his way to summit Hualālai. Kamehameha had arranged for chief Haalou to be his escort and recommended their voyage begin by canoe. Menzies recounts the events thusly:

January 16th. Everything being ready, we set out from the vessels in the forenoon of the 16th in company with Keeaumoku and his wife in a large double canoe, followed by Haalou and our attendants in another. As we were passing the village of Kaawaloa, we were joined by Mr. Howell and his attendants in his own canoe. After this we proceeded to the northward close along the shore for about four or five miles from Kealakekua when we entered a small cove surrounded by a scattered village belonging to Keeaumoku. In this cove we found the American schooner [*Fair American*], which the natives had captured, belonging to Mr. Medcalf [sic]. She was secured and housed over to preserve her from the weather, but we did not examine her condition very closely for fear of giving offense. They told us that she made a great deal of water, which they were obliged to pump out daily, otherwise that she would sink. (ibid.:148-149)

Despite numerous visitors to the islands in the following decades who penned descriptions, we found no further observations of the *Fair American* within our review of the literature, nor was the vessel noted during nineteenth century land surveys of Keauhou Bay. The most likely place to nearshore moor, or careen a vessel, would have been in the southeastern-most corner of the bay where the vessel would have been subjected to less swell and surf action (the same reason a modern boat ramp and pier exist there today).

Missionary Accounts of Keauhou Bay in the early 1800s

Much of the Hawaiian Island historic data available for review comes from the early post-contact writings of missionaries and traders generated during the late eighteenth and early nineteenth centuries. The following excerpts from British missionary William Ellis’ journals originally published in 1825 offer important glimpses into the Kona region in the vicinity of the current study area at that time, including the history and legends he heard spoken during his visit.

In 1823, Ellis, accompanied by Joseph Goodrich and Reverends Asa Thurston and Artemas Bishop, toured the Island of Hawai‘i seeking out communities in which to establish church centers and schools for the Calvinist mission. On July 18, 1823 Ellis and his missionary companions started their tour of Hawai‘i heading south along the coast of the district of Kona. Of the overall environment of the district of Kona, Ellis opined that:

Kona is the most populous of the six great divisions of Hawai‘i, and being situated on the leeward side, would probably have been the most fertile and beautiful part of the island had it not been overflowed by flood of lava... (1963:174).

Ellis made the following observations of the countryside on his approach to Keauhou and the vicinity of the current study area:

We passed another large heiau, and travelled about a mile across a rugged bed of lava, which had evidently been ejected from a volcano more recently than the vast tracts of the same substance by which it was surrounded. It also appeared to have been torn to pieces, and tossed up in the most confused manner, by some violent convulsion of the earth, at the time it was in a semifluid state.

There was a kind of path formed across the most level part of it, by large smooth round stones, brought from the sea-shore, and placed about three or four feet apart. By stepping from one to another of these, we passed over the roughest piece of lava we had yet seen; and soon after five p.m. we arrived at Keauhou, a pleasant village containing one hundred and thirty-five houses, and about eight miles from Kairua [Kailua]. Messrs. Bishop and Harwood reached the same place about an hour earlier, and here we proposed to spend the night.

We had not been long in the village, when about one hundred and fifty people collected round the house in which we stopped.

After singing and prayer, Mr. Thurston preached to them. They gave good attention; and though we conversed with them a considerable time after the service was ended, they still thronged our house, and seemed unwilling to disperse. (1963:103-104)

2. Background

Ellis went on to describe the central Kona region as an area of dense population with extensive cultivation inland compared to the southern reaches of Kona, which supported smaller populations made up mostly of fishermen. According to Ellis, during their walk from Kailua to Keauhou they generated a population estimate based on the following observations:

We counted six hundred and ten houses, and allowed one hundred more for those who live among the plantations on the sides of the hills. Reckoning five persons to each house, which we think not far from a correct calculation, the population of the tract though which we have travelled today will be about 3550 souls (1963:104)

In their travels between Kailua and Keauhou, Ellis' group "passed nineteen heiaus, of different dimensions" (Ellis 1963:104). Ellis also noted various smaller temples (likely fishing shrines) along the coast where fishermen made offerings to the gods of the sea. However, no specific mention of a *heiau* or shrine was made pertaining to Keauhou. Ellis did mention Keauhou in his discussion of Hawaiian burial customs, thusly:

. . . Their artificial graves were either simple pits dug in the earth, or large enclosures. One of the latter, which we saw at Keauhou, was a space surrounded with high stone walls, appearing much like an ancient heiau or temple. We proposed to several natives of the village to accompany us on a visit to it, and give us an outline of its history; but they appeared startled at the thought, said it was a wahi ino, (place evil,) filled with dead bodies, and objected so strongly to our approaching it, that we deemed it inexpedient to make our intended visit. (ibid.:364)

Beginning in the 1820s, when the center of government moved from Kailua-Kona to Honolulu, the Keauhou area began to see a rapid decline in coastal village settlement. The uplands of Kona saw a boom in the coffee and tobacco industries as well as more diversified agriculture, including the rearing of livestock (e.g., cattle, goats, and pigs). These events were a mere precursor to significant land tenure changes that were soon to take place.

The Māhele 'Āina of 1848

Profound religious, socioeconomic, and demographic changes took place in the early 1800s that resulted in the establishment of a Euro-American style of land tenure, and the *Māhele 'Āina* of 1848 or Great *Māhele* was the vehicle used to divide the land between the crown, government, *konohiki*, and native tenants. Prior to this land reformation, all the land and natural resources of Hawai'i were held in trust by the *ali'i* who, in concert with *konohiki* land agents, meted out use rights to the native tenants. During the *Māhele* all lands were placed in one of three categories: Crown Lands (for the occupant of the throne), Government Lands, and *Konohiki* Lands; all three types of land were subject to the rights of the native tenants therein.

The *ali'i* and *konohiki* were required to present their claims to the Land Commission to receive a Land Commission Award (LCAw.) for lands provided to them by Kamehameha III. They were also required to provide commutations to the government in order to receive royal patents on their awards. The lands were identified by name only, with the understanding that the ancient boundaries would prevail until the land could be surveyed. This process expedited the work of the Land Commission and subsequent land transfers (Chinen 1961). In 1862, the Commission of Boundaries (Boundary Commission) was established to legally set the boundaries of all the *ahupua'a* that had been awarded as a part of the *Māhele*. Boundary descriptions were collected for Keauhou 1st and 2nd, as these were awarded at *Konohiki* lands, and will be discussed in further detail below.

Native commoners could also register claims for land with the Land Commission, and if substantiated, they would receive awards referred to as *kuleana*. Upon confirmation of a claim, a survey was required before the Land Commission could issue a *kuleana* award. According to Kelly (1983), several prominent *konohiki* related in some way to the Kamehameha dynasty received land awards in North Kona District.

In 1848-1849, the *ahupua'a* of Keauhou was divided into two sections: Keauhou 1st to the north, and Keauhou 2nd to the south. During the *Māhele*, both *ahupua'a* were awarded as *Konohiki* Land. Victoria Kamāmalu (LCAw. 7713) received the *ahupua'a* of Keauhou 1st, while her brother, Lot Kapuāiwa (Kamehameha IV) (LCAw. 7715, Apana 12) received Keauhou 2nd. Hammatt et al. (1981) believe that since the land of Keauhou was retained by the Kamehameha dynasty, it reflects their perceived value of the land and resources.

In addition to these divisions, according to Elmore and Kennedy (2001) numerous land claims were made and fifty LCAws. were awarded in Keauhou 1st Ahupua'a; according to Maly and Maly (2001). Twenty-one claims were made, which resulted in the award of sixteen LCAws. in Keauhou 2nd Ahupua'a. Tomonari-Tuggle summarized land use and residential life in Keauhou 1st Ahupua'a thusly:

Residences were primarily along the coast, generally occurring as stone wall-enclosed house lots containing up to five houses. Within house-lots were a variety of garden plants, including kou, hala, hau, papaya, loulou palm, pineapples, noni, coconut trees, and “some flowers for beautification”. . . At Keauhou Bay, houselots are located primarily on the promontory between Keauhou and He‘eia Bays, with seven situated on the south side of the bay. One lot is isolated on the southern coast of Keauhou 2. There were at least four trails in Kahalu‘u and Keauhou 1 which led to the upland cultivation areas. There do not appear to be any similar trails in Keauhou 2. Upland agriculture occurred primarily between 1000 to 1700 ft above sea level . . . Only in Keauhou 1 do agricultural parcels extend all the way to the coast. This occurs in a strip of shallow gullies with well-drained, thin organic soils overlying an aa base. . . (Tomonari-Tuggle 1985:27)

The awarded *kuleana* claims within Keauhou 2nd Ahupua‘a ranged in size from 1.5 to 6.28 acres with an average of 3.34 acres. Twelve of the awards consisted of two or three lots (usually at different elevations), while the remaining awards consisted of single lots (Haun and Henry 2004). According to Haun and Henry (2005a), the awarded lots are concentrated in two areas; eight claims were along the coast on the south side of the bay, and the remaining claims were situated upland between 880 feet and 1750 foot elevation. As the current study area is the underwater portion of Keauhou Bay, the following discussion will focus on those LCAws. that surround the bay (Figure 9). Of the over sixty *kuleana* lots awarded during the *Māhele*, twenty *kuleana* (Table 2) are found in close proximity to Keauhou Bay (see Figure 9). Of these, eight are located north of the bay (LCAw. 5781:1, 7428:1, 7738:2, 8046:2, 8526:2, 9700:1, 9759, 9946:1); five are located on or near the southern shore of the bay (LCAw. 5785:2, 7319:2, 7365:2, 7366:2); and nine are situated to the east of Keauhou Bay, *mauka* of Kamehameha III Road (LCAw. 5781:2, 7361:2, 7362:2, 7372:2, 9753:2, 10734:2; 11046:2, 11047:2, 11048:2; see Figure 9).

Table 2. LCAws. in the vicinity of the current study area.

LCAw. No.	Awardee	Ahupua‘a	Land Use
5781:1 and 2	Kanehoa	Keauhou 1 st	Garden and house lot
5785:2	Keehualauumoku	Keauhou 2 nd	House lot
7319:2	Naholowaa	Keauhou 2 nd	House lot
7361:2	Kapuipui	Keauhou 1 st	House lot
7362:2	Kaanoano	Keauhou 1 st	House lot
7365:2	Keohoeae	Keauhou 2 nd	House lot
7366:2	Kukahi	Keauhou 2 nd	House lot
7372:2	Kaikuaana	Keauhou 1 st	House lot
7428:1	Kaihe	Keauhou 1 st	House lot
7738:2	Aoao	Keauhou 1 st	House lot
8046B:2	Hawaawa	Keauhou 1 st	House lot
8526:2	Keone	Keauhou 1 st	House lot
9698:2	Kapela	Keauhou 2 nd	House lot
9700:1	Kaaukelemoku	Keauhou 1 st	House lot
9753:2	Kaluahinenui	Keauhou 1 st	House lot
9759	Kailiakaale	Keauhou 1 st	House lot
9946:1	Keiki Lono	Keauhou 1 st	House lot
10734:2	Paiki	Keauhou 1 st	10 partially cultivated plots
11046:2	Molale	Keauhou 1 st	House lot
11047:2	Poopuu	Keauhou 1 st	House lot
11048:2	Haluapo	Keauhou 1 st	House lot

2. Background

The majority of the *kuleana* claims on or near the shore of Keauhou Bay are referred to as *hale* (house) or *pahale* (house lots) in the native testimonies, as Table 2 shows. Many of the *kuleana* claimants also had corresponding *mauka* agricultural *apana* awarded. The majority of the house lots are often described as enclosed with or surrounded by a wall. The native testimony also provides residence information pertaining to the house lots. Such information included the number of houses located within the land being claimed, typically between one and three houses and the names of their residents. Some of the claimants themselves resided in houses on their land as in the case of LCAw. 9700: “Kaaukelemoku had enclosed the house lot. He has one house there within he is living” (N.T. 648 v. 4). Another claimant planned to do so, as in the testimony for LCAw 7319:2, which states that the house lot, “is enclosed by a wall which they made, there is no house, they are preparing to build it. It was a vacant place, enclosed by them” (N.T. 4:660-661).



Figure 9. Portion of modified TMK map illustrating location of LCAw’s in the vicinity of the current study area.

In some instances there are references to specific things planted within these house lots; such as LCAw 7365 in which 3 *loulou* trees and 1 *kou* tree were planted at the time the testimony was given. (N.T. 4:662-663). Another example is LCAw 5781:2 in which, “Kanehoa has built a fence he has planted 3 coconut trees and 15 palm trees” (N.T. 659-660 v. 4). A review of the native testimonies also reveals mention of different ‘*ili* (land sections) in the vicinity of the current study area. The *kuleana* claimants of lands located *mauka* of Kamehameha III Road, mention the ‘*ili* of Maili (LCAw 10734), Makakanalii (LCAw. 7362). While the ‘*ili* mentioned in association with *kuleana* claims on the north shore of the Bay (*makai* of Kamehameha III Road) include Puuloa 3 and Laulauhili (LCAw 7738), Opukaha 2 (LCAw. 8526). The south shore *kuleana* claimants also mention the ‘*ili* of Puuloa (LCAw 7365) in addition to the ‘*ili* of Pakohe (LCAw. 5785).

As previously mentioned, in 1862, the Boundary Commission was responsible for legally setting the boundaries of all the *ahupua‘a* that had been awarded as a part of the *Māhele*. Subsequently, in 1874, the Boundary Commission was authorized to certify the boundaries for lands brought before them. The primary informants for the boundary descriptions were older native residents of the lands, many of which had also been claimants for *kuleana* during the *Māhele*. This information was collected primarily between A.D. 1873 and 1885 and was usually given in Hawaiian and transcribed in English as they occurred. Boundary descriptions were not collected for all *ahupua‘a*. The boundary testimonies and survey records provide a good summary of traditional knowledge of places, and identify localities ranging from the shore to the upper most boundaries of the *ahupua‘a*. The narratives describe: fishing *heiau*, the royal *holua* slide, marine resources of Keauhou; the occurrence of historical features, including residences; sandalwood harvesting; and name many localities on the land in addition to traditional origin stories. The following excerpts of two Boundary Commission testimonies and one judgment pertaining to the current study area vicinity illustrate the informative value of these documents:

Volume 1, No.A, pp. 318-320

Keauhou 1, North Kona, Hawaii,

August 8th, A.D. 1873

Testimony:

Lono kane, sworn,

I was born at Keauhou at the time of Kaoku and have lived here most of my life; . . . The boundary at the shore between Keauhou 1st and Keauhou 2nd is at Kamanae, a heiau for fishermen situated above the beach, on the hill where the houses stand; . . . Keauhou is bounded by the sea and the land has ancient fishing rights extending out to sea.

Volume A, No.1, pp. 266-268

Keauhou 2, North Kona, Hawaii,

August 8th, A.D. 1873 (evening)

Testimony:

Kakio, kane, sworn,

I was born at Keauhou at the time Kamehameha I came from Hilo to Kealakekua and from there to Honolulu, at the time of Oku. I have always lived here and know the land of Keauhou 2d and its boundaries. I used to go after sandalwood on the mountain, . . . The boundary at shore between the two Keauhous is at a place called Kamanae at the beach; Thence it runs mauka to the head of Holua (an old sliding place); . . . They say in the days of Keauaumoku the Akule used to belong to Keauhou 2d and the birds to Keauhou 1st, but the Chief of Keauhou 2 married a chief of Keauhou 1st and after that all the fish were given to Keauhou 1st and the birds and land mauka to Keauhou 2nd.

June 15, 1886

Judgment

Beginning at the Southwest corner of Keauhou 1st at a rock marked by crosses and situated in the bank mauka of the shore and South of the Cavern Anamoikeha, thence the boundary runs along Keauhou 1st to the head of the Holua

Life in Keauhou 1st and 2nd Ahupua‘a in the late Nineteenth and Early Twentieth Centuries

The following section presents a discussion of life in Keauhou 1st and 2nd Ahupua‘a during the late nineteenth and early twentieth century based on observations made by visitors to the area. In 1880, George Bowser, editor of *The Hawaiian Kingdom Statistical and Commercial Directory and Tourist Guide*, wrote about the various statistics and places of interest around the Hawaiian Islands, including Keauhou:

...[S]ituated on a small inlet of the sea... It is a romantic spot, with pretty local scenery and a fine view of Mauna Hualalai as a background. All the way from Kailua I found the road was good, with cocoanut groves every mile or so, and plenty of pineapples, which are in season all the time, from June to December. (Bowser 1880 in Maly and Maly 2001:68)

A few years later, between 1882 and 1884, Kingdom Surveyor, Joseph S. Emerson conducted a survey of the Keauhou-Keel vicinity. He generated letters and field notebooks in addition to recording survey map coordinates. While in the field, Emerson, who was able to communicate in Hawaiian, used native residents of the land as guides. As a result, he was able to record traditional place names for the trails and various natural and cultural features that he encountered (Maly and Maly 2001). Emerson was also accompanied by one of his assistants, J. Perryman, a talented young artist who prepared detailed sketches of the landscape during the time of the surveys. Figure 10 below is a reproduction of one of their maps, recorded on October 31, 1883 in the Field Book 255:61, which shows three distinct views of the coast of North Kona from the vantage point of Keauhou. The uppermost portion depicts the view to the north with Kailua Bay in the distance. The middle portion depicts the view to the west, which shows the current study area. In particular, one notices the concentration of vegetation and houses along the shores of bay and the “open space” and “pāhoehoe covered with brush” *mauka* the shore. The bottom portion is the view to the southwest and depicts a solitary house in the foreground, as well as a road.

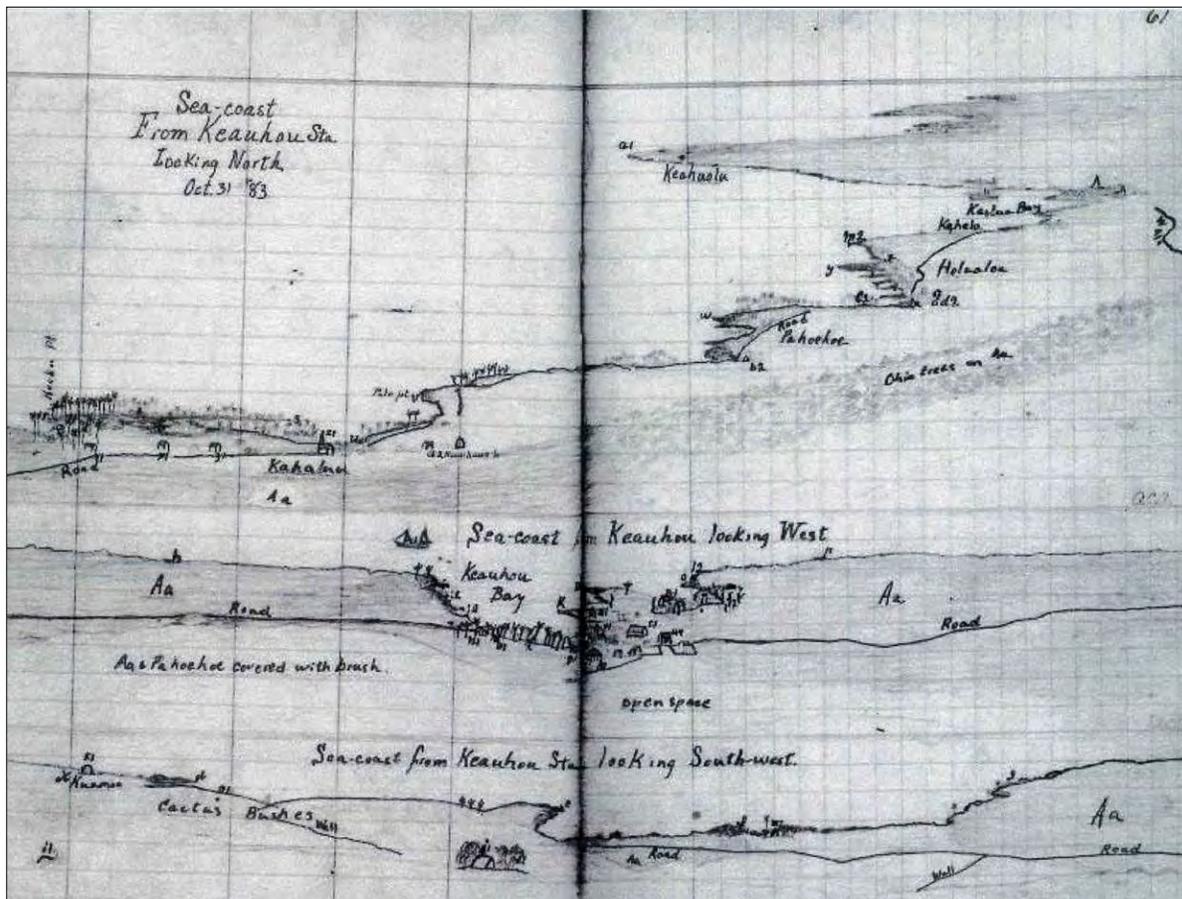


Figure 10. 1883 Perryman sketch of the sea coast from Keauhou station (from Maly and Maly 2001:265).

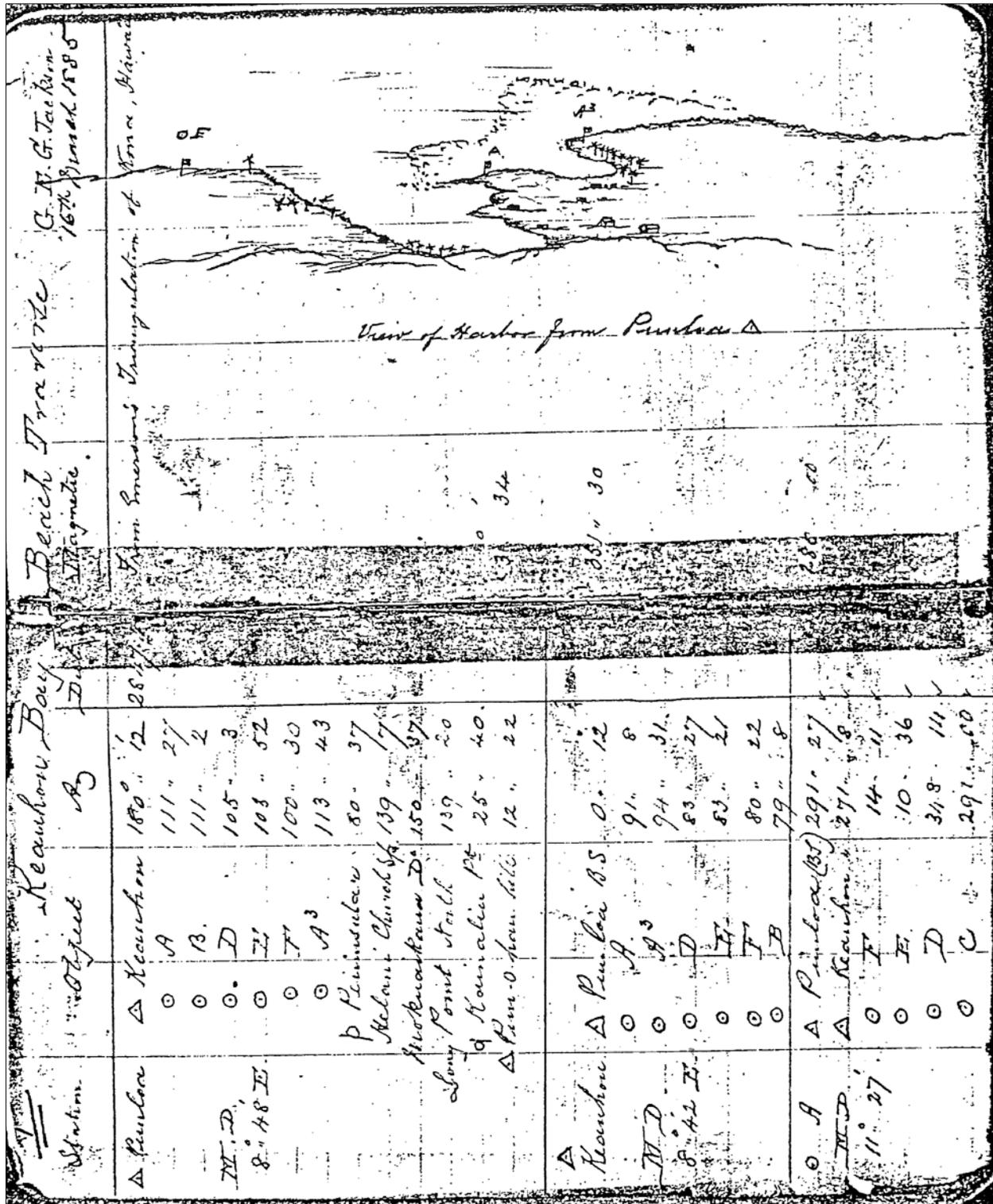


Figure 12. Copy of G.E.G. Jackson's March 16, 1885 survey of Keauhou Bay showing view of harbor from Puuloa triangulation station, note his Datum "E" at top left of sketch.

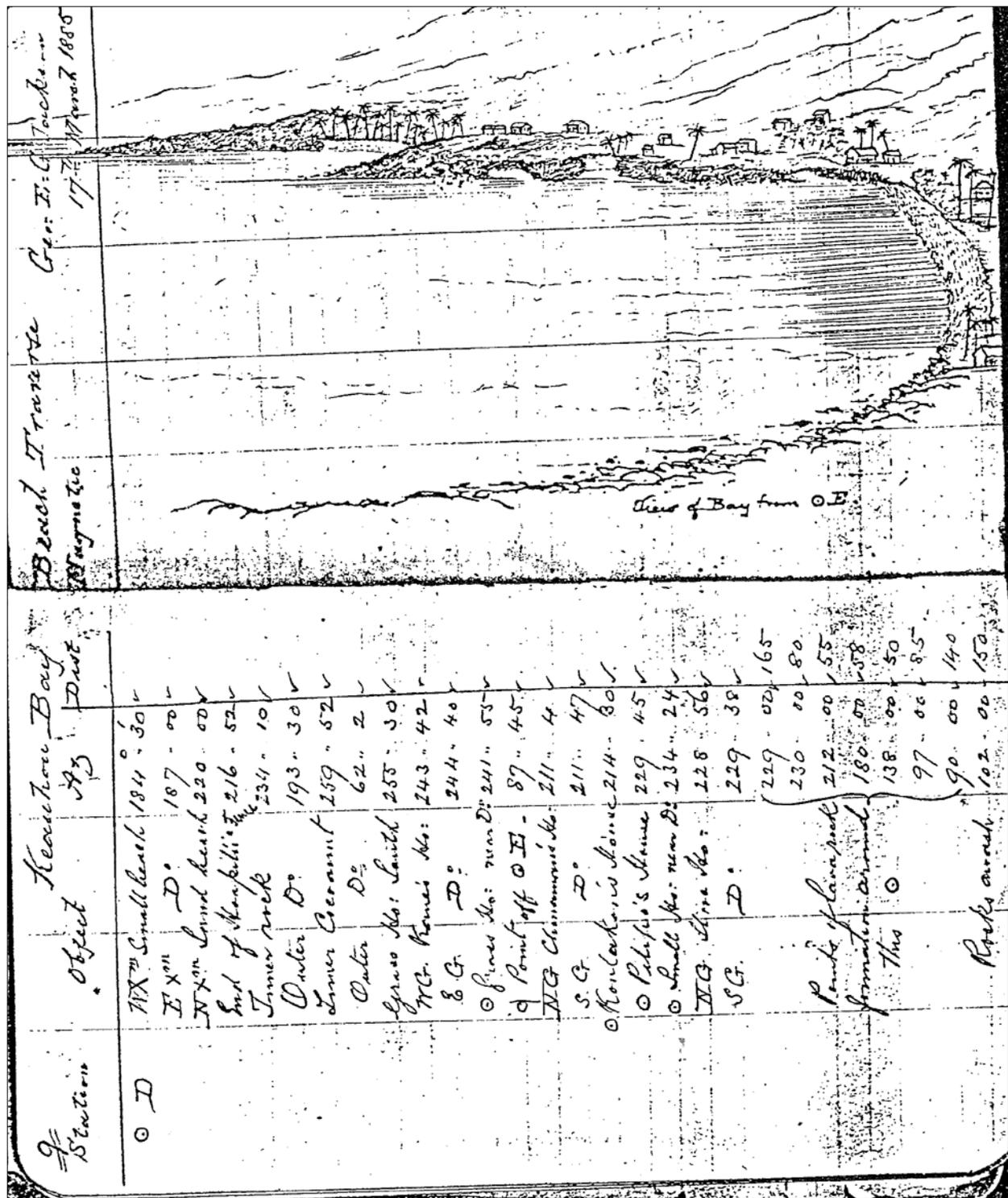


Figure 13. Copy of G.E.G. Jackson's March 17, 1885 survey of Keauhou Bay showing view from his Datum E.

2. Background

By the early twentieth century development of the Kona uplands as an agricultural and ranching center was in full swing. According to Tomonari-Tuggle (1985), Keauhou was literally the end of the road from Kailua because to the south of Keauhou the so-called road was not much more than a trail. This is evidenced by a review of early twentieth century maps of the area such as the 1928 USGS Kailua Quadrangle (Figure 14) that illustrates the numerous paths, trails, and roads connecting the coast with the uplands. Within Keauhou 1st and 2nd Ahupua'a, Cordy (1989) notes four *mauka-makai* trails, in addition to two trails that cut across the *ahupua'a* in the coastal zone as follows:

Two major trails cross the ahupua'a dating to prehistoric and early historic times. These are the coastal trail and the inland trail, the latter approximating the Kona Belt Road... Six inland-heading trails extend from the shore up to the agricultural field—labelled 1-6 on Figure 10. Two trails (Trails 1 and 2) are in the north, identified by Reinecke [1930]. Two (3 and 4) are in the central and south areas, both visible on the tax maps (e.g., 7-8-10)-- connecting to the Heeia and Keauhou Bay housing areas, Trail 4 being the "Keauhou Trail". Two more (Trails 5 and 6) are identified in the uplands. One (6) appears on TMK map 7-8-07, to the south of the "Keauhou Trail". The other (5) identified in the Awards Books, seems to lie between the "Keauhou Trail" and the southern trail. These latter two trails may not have extended all the way to the shore; they may have been branches off the "Keauhou Trail". In the Awards Books, when noted, these trails are labeled "ala nui"... Reinecke's maps suggest that ca. 1929, the "Keauhou Trail" may have been the only inland-heading trail still in use, because he labeled it "path used now". But this is not verified. (Cordy 1989:14 in Sweeny and Burtchard 1995:15-16)

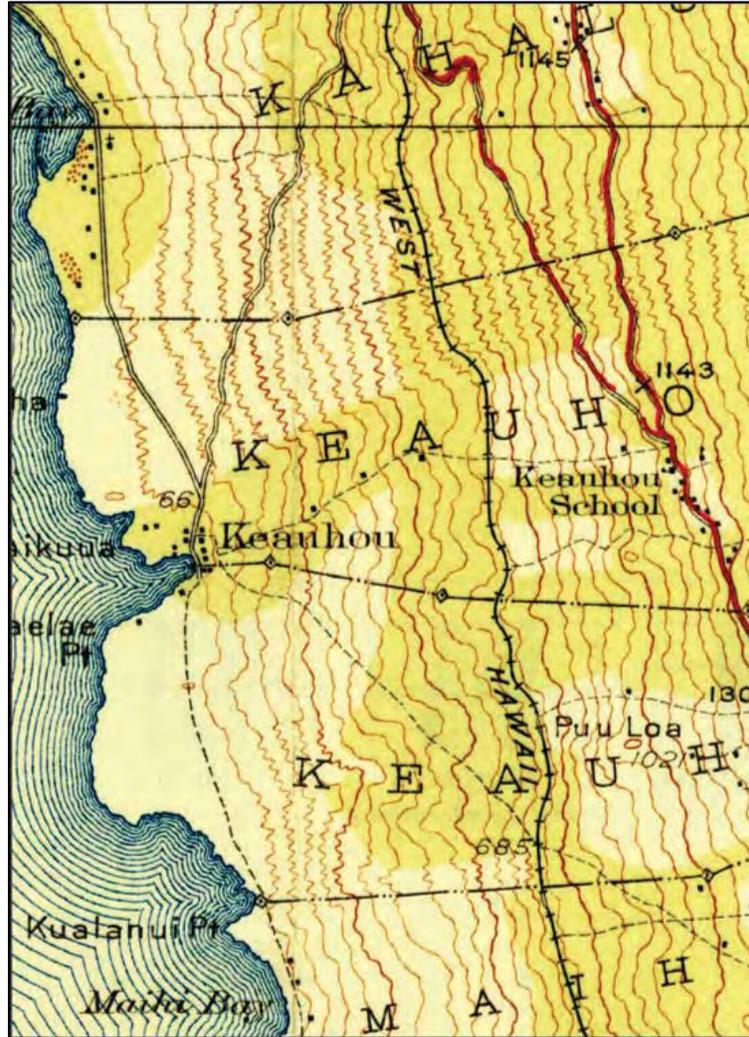


Figure 14. Portion of 1928 USGS Kealakekua Quadrangle map showing the trails and roads around Keauhou.

In 1913, H.W. Kinney published a visitor's guide to the island of Hawai'i. In his guide he includes the descriptions of the land at the time, historical accounts of events, and descriptions of sites and practices that might be observed by the visitor (Maly and Maly 2001). Kinney provides the following description of Keauhou in 1913:

KEAUHOU is the next village south of Kahaluu. It is a steamer landing and is of particular interest. It was the birthplace of Kamehameha the Third, the place of his birth being shown as a big rock immediately *mauka* of the big monkeypod stump about 200 feet south of the wharf. The king lived, in childhood, where the White house now stands *makai* of the stone mentioned. It was *tabu* for the people to walk on the cliff above the house in the morning, when their shadows would fall on the house. Those who wanted to cross, had to swim. *Mauka* of the village is seen the most famous papa holua in the Islands, a wide road-like stretch, which was laid with grass steeped in kukuinut oil so as to allow the prince and his friends to coast down in their sleighs constructed for the purpose. At the end of the slide was a *lanai*, where the prince and his friends would don malos and go with their surfboards far out to the sea, where the surf would carry them right to the prince's house. Here are also the remnants of the heiau Puu-o-Kaloa. The Hawaiians still look for a dumbbell-shaped cloud to connect it with the heiau if Keeku (See Kahaluu), which is a certain sign of rain. When it appears it is a good time to plant (Kinney 1913:63 in Maly and Maly 2001:70-71).

As illustrated in the above excerpt, Keauhou appears to have become a tourist destination by the early 1900s that offered visitors a glimpse of Hawaiian history and culture.

Photographs from the A.S. Baker collection (Figures 15-18) taken at Keauhou Bay on August 15, 1914, document the dedication ceremony of the Kauikeaouli Tablet. These historic images provide a glimpse of how the current study area vicinity appeared in the early 1900s. Queen Lili'uokalani (Figure 19) attended the dedication of the plaque, which commemorated the birth of Kamehameha III at his birthplace.



Figure 15. Procession of canoes in Keauhou Bay for the dedication ceremony of the Kauikeaouli Tablet, August 15 1914 (A.S. Baker collection).



Figure 16. Landing the Kauikeaouli Tablet at Keauhou Bay for the dedication ceremony, August 15, 1914 (A.S. Baker collection).



Figure 17. Scene of Kauikeaouli Tablet procession, August 15, 1914 (A.S. Baker collection).



Figure 18. Close-up of Kauikeaouli Tablet procession, August 15, 1914 (A.S. Baker collection).



Figure 19. Queen Lili'uokalani at Keauhou, August 15, 1914 (A.S. Baker collection).

2. Background

Based on a review of archival documents and photographs, it appears that a wooden pier was constructed at some time during the early 1900s along the eastern shore of Keauhou Bay. Figure 20 below is a photograph found in the digital archive of the Hawaii State Archives, which dates to ca. 1916. Another photograph (Figure 21) taken by the Pacific Press and accessed through the same digital Hawaii State Archive depicts the same pier nearly twenty years later, ca. 1935. Sources indicate that this pier was no longer in existence by 1950, as can be seen in Figure 22, which indicates that by that time the dry-dock shown on the 1954 Kekahuna map (see Figure 8) was already established. This dry-dock was operated by Charles Machado, who also had a small fleet of fishing boats that operated out of Keauhou Bay. The area labeled “present boat pier” (this is actually a wharf) on the 1954 Kekahuna map (see Figure 8) appears to have been sometime built between 1951-1954 as is not seen in 1950 photographs of the area (see Figure 22, Figures 23 and 24). The original wooden version of the current pier may have been built around 1957 (Lionel Machado personal communication), and was clearly operational by 1963 as can be seen in a photograph (Figure 25) taken in November of that year.

During the late 1950s and early 1960s there were numerous boats moored in the bay and housed in the Machado dry-dock; and as related by Lionel Machado (personal communication), the moorings were haphazardly created and anchored using all kinds of discarded metal debris (i.e., machinery parts, old boat engines, anchors, etc.) found in the immediate vicinity of the bay. Such potential items can be seen littering the beach in Figure 24.



Figure 20. The pier at Keauhou Bay, ca. 1916 (Hawaii State Archives).



Figure 21. Keauhou Bay pier ca. 1935 (Hawaii State Archives).



Figure 22. Keauhou Bay shore in 1950 (Hawaii State Archives), note dry-dock area and tracks to haul boats out of the water at center of photo.



Figure 23. Keauhou Bay shore in 1950 (Hawaii State Archives), looking toward current concrete wharf area.



Figure 24. Keauhou Bay shore in 1950 (Hawaii State Archives), at current wharf area.



Figure 25. November 1, 1963 photograph (Kona Historical Society) of the then new pier at Keauhou Bay, note Charles Machado house in right background.

Modern Use at Keauhou Bay

Beginning the 1960s, resort and tourist-related development in the Keauhou area has altered the landscape, particularly along the coast. Such has resulted in the construction of resort hotels and golf courses in addition to the construction and upgrading of roadways beginning in the 1970s. Ongoing residential and resort development has taken over many of the beachfront properties in the vicinity of the current study area. The former Machado drydock area was converted for boat storage associated with the Keauhou (Kauikeaouli) Canoe Club. In 1973-74, the wooden pier was shortened by the removal of two of piles and reconstructed with metal piles and a new deck surface (John Moore personal communication). In 1978 the Hawai'i Department of Transportation assumed administration of the Keauhou Bay Small Boat Harbor, and within a few years thereafter, the present day concrete boat ramp was constructed on the southern side of the bay. Administration of the Keauhou Bay Small Boat Harbor was transferred again in 1992 to the Department of Land and Natural Resources, at which time the following description was prepared:

This very well protected small boat harbor includes slips and moorings for 19 vessels, a double-lane, 30 foot wide launching ramp which was donated to replaced a former marina railway, and fishing hoist. (DOT Boating Program transfer to DLNR document, dated August 1992)

Previous archaeology

Since the early 1900s, the Keauhou Bay region has been included in various island-wide thematic or regional surveys (Stokes 1906; Reinecke n.d.; Emory 1932). These first few studies were mostly conducted under the auspices of the Bishop Museum or Bishop Estate, and the early site descriptions, oral traditions, and place name information records are currently on file at the Department of Anthropology at the Bishop Museum in Honolulu. Major resort development in the 1970s spawned a surge of archaeological studies in the vicinity of Keauhou Bay carried out by the Bishop Museum as well as private archaeological consultants. These studies began to focus on individual parcels slated for development, most of which were situated along the coast. The number of studies undertaken in the Keauhou Bay area has continued to increase over the last forty years, and have revealed evidence of habitation and resource acquisition as well as ceremonial and recreational use of the land. The following discussion centers on previous archaeological studies in close proximity to the current study area.

As previously mentioned, in 1906 Stokes (Stokes and Dye 1991) conducted fieldwork traversing around Hawai‘i Island with the sole purpose of recording *heiau* for the Bishop Museum. Stokes observed and recorded no less than 25 *heiau* in the Kona district, five of which (Ka‘io‘ena Heiau, Ōpūkaha Heiau, Kamau‘ai Heiau, Ho‘okuku Heiau, Ahu a ‘Umi Heiau) were believed to have been located in the vicinity of the current study area within Keauhou 1st and 2nd *ahupua‘a*. However, they were only able to locate and observe the ruins of one of these five *heiau* during their 1906 field survey. The ruins of Ka‘io‘ena (BPBM Site D4-100) consisted of a few pavements or low platforms along the edge of an *a‘ā* flow, about 3000 feet from the sea at an elevation of 400 feet above sea level, on the boundary between Kahalu‘u and Keauhou. Regarding Ōpūkaha Heiau (Site 3813), Stokes provided only locational data and report that the *heiau* was not seen during the fieldwork. Of Kamau‘ai Heiau (Site 3812) it was suggested (Stokes and Dye 1991) that the *heiau* may actually have stood at the base of the high cliff at the site known as Ho‘okuku or Kaopa Heiau, rather than on top of the cliff overlooking Keauhou Bay as previously believed. This conclusion is likely due in part to the fact that the purported site of Kamau‘ai *heiau* had become a house lot and, “the owner said that he and his people had lived there for a long time and had never heard of a *heiau* being there” (1991:85). Stokes offered the following description of Ho‘okuku (Kaopa) Heiau:

Heiau of Ho‘okuku or Kaopa, land of Keauhou 2, North Kona, near the boundary of Keauhou I. Keauhou wharf bears 168°, 250 feet. This place owes its interest in modern times to the tradition that the royal child (later Kamehameha III) who was stillborn here then was miraculously brought to life. There is nothing suggestive of a *heiau* in the appearance of the place. A low, rambling wall encloses a space of about 1.5 acres at the foot of a high cliff. The contour of the ground inside is similar to that outside, and within are breadfruits, *loulou*, and other trees. Also inside, however, is a large rock to which marvelous revivifying powers were attributed, and it was stated that the dead baby was placed on the stone for some days and came to life by virtue of the stone, with the aid of the priest’s parayers. It is not improbable, if all were known, that this would prove to be the site of the *heiau* of Kamau‘ai Heiau mentioned above. (Stokes and Dye 1991:85)

Of Ahu-a-‘Umi Heiau, Stokes and Dye (1991) only mention its location within Keauhou 2nd *Ahupua‘a* and that it was not visited. However, the *heiau* was first recorded in 1830 by Bingham and has been included in many studies in the decades since. For further information, the reader is referred to Cordy (2000) for a detailed discussion of this inland *heiau*.

In 1929 and 1930, Reinecke conducted fieldwork in the coastal portions of Keauhou 1st and 2nd and identified twenty-four sites (Sites 51-74) surrounding the current study area (Table 3). Reinecke recorded these twenty-four nearby sites in sequence, moving from south to north along the edge of Keauhou Bay. Portions of the maps associated with this survey are reproduced in Figures 26 and 27, below. A detailed view of Sites 51 through 57 (see Figure 27), which are located toward the southwestern end of Keauhou Bay, was presented as an inset of a map of another area. In his preamble to the site descriptions of Sites 51-74, Reinecke states the following:

There is a gap of about 1400’ [from Site 50] to the next ruins, those of the old *heiau* [Site 51]. The Hawaiians evidently disliked building on the smooth *pāhoehoe* of this section. (n.d.:80)

Table 3. Sites recorded by Reinecke in 1929 around Keauhou Bay.

Site #	Notes (reproduced from Reinecke n.d.:80-82)
51	Kaukulaelae Heiau
52	Platform in good condition, 26x18x2, with foundations and wall behind and makai. Probably a modern house platform.
53	A similar platform in rougher condition. Has three layers of retaining wall makai. Roughly 20 plus 4 plus 4x20-24x6. Behind it a small pen, about 12x12x3.
54	Well-built platform, for house of public building, about 78x30x2, with a makai section (part of main platform) 18x18x2.
55	Pen about 38x20x3 before it was broken down.
56	Platform on knoll, about 43x30x4. Pointed out by a fisherman as fishing heiau known as Pohakukanikaula or Mokukanikaula.
57	Two smooth-floored pens, side by side with ruined rubble walls. Inside dimensions 36x28 and 32x22.
58	Probably puoa [burials] or just plain heaps on the pāhoehoe [8 rock mounds of various size]
59	Modern house platform site, about [33?]x25
60	Modern house platform site, about 32x33
61	Modern house platform site, about 34x23.5
62	Heaps of rubble 8x9 and 5x5
63	Low heap of rubble about 20x20. Round holes have been ground in the pāhoehoe slabs.
64	Alaihi, a fishing heiau. Now merely part of a house yard.
65	A medium-sized, modern house platform, not measured.
66	Kamohalii Heiau
67	Moikeha Cave
68	Low ground behind the wharf. In ancient times the site of Kamauai Heiau. (the legend connected with it is found in Thrum's Annual for 1908)
69	Kualalua, the brackish seepage W. of Mr. Tommy White's beach house, used for bathing.
70	Mouth of burial cave Ke-eku-a-ka-puaa. Used for a burial as recently as 1913, when a very poor Hawaiian man was strapped between two sheets of galvanized iron roofing and thrust into the cave. 2 rather rough double platforms near its mouth. Their use is puzzling.
71	Puu o Kaloa, an upheaved mass of pāhoehoe blocks with no evidence of construction, claimed to be a heiau sacred to the god Loa
72	Hale o Lono, likely the house of Lonoikamakahiki, only a few large stones and no foundation to indicate a heiau
73	House site on level ground, 20x16
74	Space about 40x40, strewn with ilili, part of it probably one a [house?] site

Reinecke recorded 12 distinct features (features a through l) as part of Kaukulaelae Heiau (Site 51), and provided the following description:

- a. A section paved with large stones, surrounded by walls 3' thick and 4' high. Divided into two parts, 18x5 and 18x16.
- b. Remains of a platform 22x11' wide N. and S., width E. and W. unknown, but the ruins extend about 21'. Remains of retaining wall on S.
- c. Platform 11x16x14x3.
- d. Shelf roughly 16x16x2
- e. Main platform of various levels. From the wall about a to the east end is about 90'; width at the wall is 43', at other end about 34'. A trough 6' wide between e and d. It contains three or four little pits.
- f. Platform about 12x50.
- g. Platform about 30x40, merging into the debris from e.
- h. Modern appearing pen 21x35, with walls 4' high and 4' thick.
- i. Walls 50 and 36 feet long, which once joined and inclosed [sic.] an area about 60x10 (may not be part of the heiau).
- j. Retaining wall; platform between it and heiau proper.
- k. Knoll made into rough platform about 18x12 (may not be part of the heiau)
- l. Debris 25 or 30 feet each direction, about a small platform, about 7-6x1/2.

Reinecke reported the condition of Site 51 as follows:

The whole platform of the heiau is so rough and dilapidated that it is hard to trace its original form and limits carefully. Apparently it was oriented E. and W., with dimensions over all of about 110x40. There apparently have been later additions (n.d.:80)

Reinecke also documented another *heiau* called Kamohoalii (Site 66; see Figure 26) at the base of a cliff, which was "utterly in ruins, nothing remaining except the foundation of the outer wall" (n.d.:81). Reinecke goes on to recount that Kamehameha III was born in the vicinity of this ruin:

Kauikeouli was born on the stone which now supports the tablet to his memory, just N. of the heiau. According to the story. . . Kauikeouli's mother was bathing in the bay when she felt her pangs, and staggering out of the water, she supported herself against the boulder. Kauikeouli was stillborn. A runner was at once dispatched to fetch a noted kahuna, Kapihi-nui (Great Lamentation). . . He [the kahuna] ordered the runner to return and notify the queen that he would soon arrive, but when the runner came back to Keauhou he was astounded to find that the kahuna, with his supernatural powers, had arrived before him. Kapihi-nui resuscitated Kauikeouli by warming his body (according to Kanalioumi) or by breathing into his nostrils and reciting spells (Kawewehi). . .

Mr. Kahalioumi says that the front of the heiau stood ten feet in height. Mr. Kawewehi adds that the stones from it have been used four times in attempts to build up a sea wall to protect the road, but that the stones, put to such a profane use, have every time been washed down, although there have been no storms. (Reinecke n.d.:81)

Another site that deserves further mention is Site 67, which is listed as Moikeha Cave (see Figure 26) and described thusly:

This is a famous cave. The story is that a king, flying [fleeing] from his enemies, hid himself in the cave, standing erect and motionless with all his body above his legs hidden in a high pocket of the cave. His enemies, looking inside, did not observe his legs, and passed him by. (Reinecke n.d.: 81-82)

As previously mentioned, Kekahuna and Kelsey documented the history of Kailua-Kona. The sketch maps they generated based on informant accounts, contain references to various archaeological features located along the coast of Keauhou Bay. These maps provide a glimpse of where archaeological sites were known to be located as well as how Keauhou Bay area appeared in the early 1950s. In his brief description and historical notes that accompanied the maps, Kekahuna provided a sample of the s associated with the different features as well as updated observations on the condition of the sites ca. 1949-1954. Many of these descriptions harken back to Reinecke's original documentation

2. Background

of sites along the shores of Keauhou Bay. The following are excerpts of the notes most relevant to the current study, please refer to Figure 28 for location:

- E. Concrete tomb of Chief Kane-hoa, a son of the noted chief Hoa-pili, close companion of Ka-mehameha I. Chief Kane-hoa, grandfather of the present Hoa-pili families, was a brother of Chief Maka-‘ina‘i, who lived with his family on the land where the tomb now lies.
- F. The remnant of the foundation platform of a royal residence of ancient King Lono-i-ka-makahiki. When Kamehameha I became king, he and his royal family occupied this site, and the area west of it to Ha‘i-ka-ua Cove. His royal canoe landing was Pueo Cove.
- G. The remnant of a stone house foundation . . . here marks the birthplace of the noted Hawaiian antiquarian David Malo . . . [born 1795].
- H. Site of Ka-moho-alii Heiau, of which only a few large stones remain.
- I. Site where Chief Kane-hoa’s residence stood.
- J. Cave of Mo‘i-keha. . .
- K. A monument to the memory of King Ka-mehameha III. . . here lies an enclosure near the base of ‘Ahu-‘ula Cliff. . .
- L. At this point, now covered, which lies out about 102 ft. southward from the southwest corner of the monument enclosure to the seaward edge of the present road, then 15 ft. below it, near the former north side of the now filled Ho‘okūkū Pond, on pāhoehoe originally about 2 ft. higher than the road, the seemingly lifeless newborn Prince Kau-i-ke-ao-uli, through powerful prayers of the celebrated kahuna Ka-pihe-hui, and by passing the undetached afterbirth (ka ‘iewe), over a fire to warm it (ua ‘olala ‘io I ke ahgi), was providentially snatched back to the land of the living, an occasion of great rejoicing.
- M. A pit about 9 fathoms deep and 20 ft. in diameter, known as Ka-imu-ki, lies here in Ke-au-hou Bay, a little out from ‘ala-‘ihi Point. Back of the point on the land of Ka-imu-ki, where a house now stands, was born the celebrated medical kahuna Kamali‘i-kane . . .
- N. Feather cloaks and capes (‘ahu-‘ula) were here aired in the sun at the south end of ‘Ahu-‘ula Cliff. . . Wahine-maikai Cove. Here women of old bathed for ceremonial cleansing following menstruation. . . The rocky shore, formerly fronted by a small pebbled beach, has largely broken away.

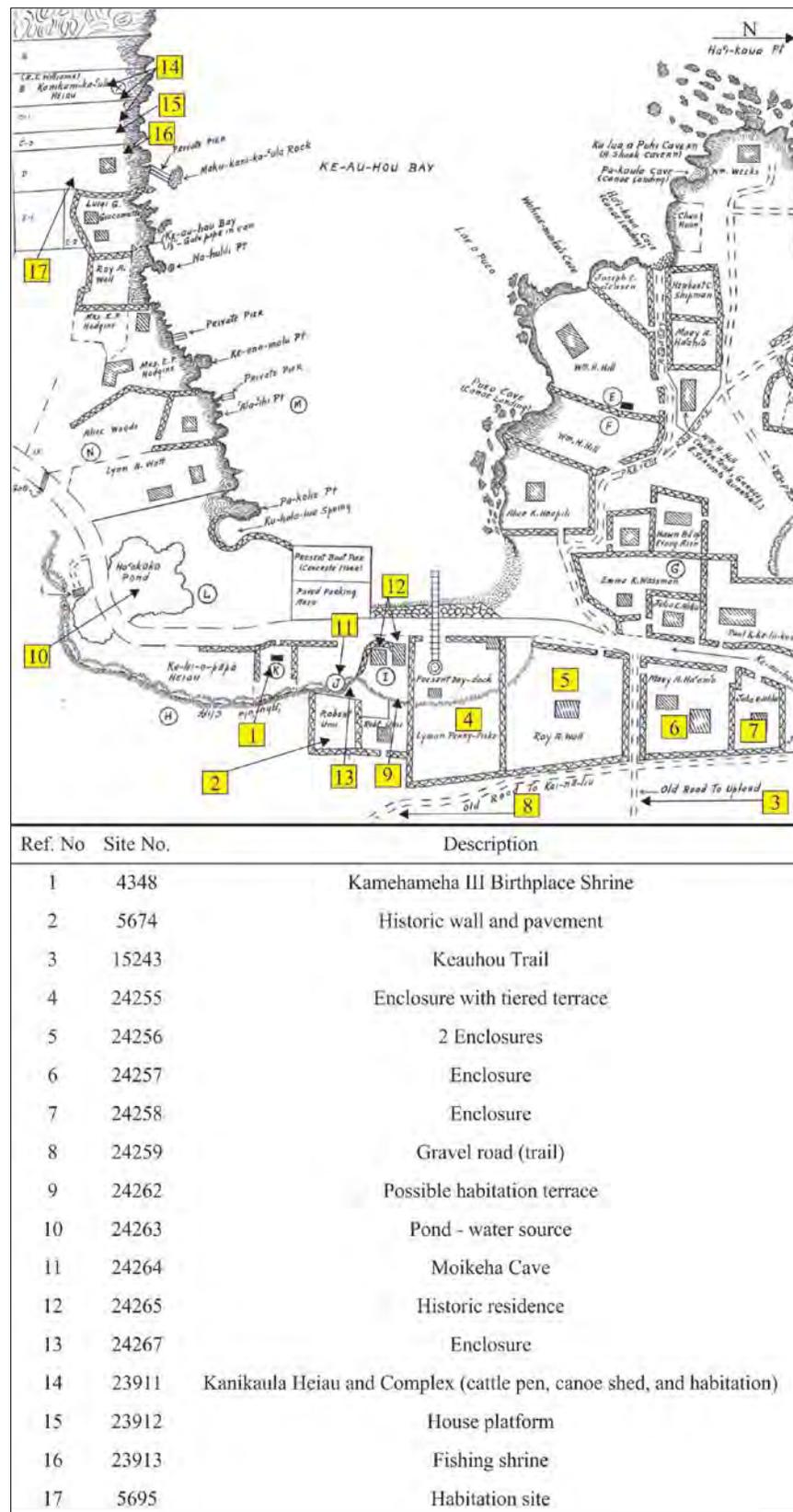


Figure 28. Portion of Kekahuna's 1954 sketch map of Keauhou Bay showing corresponding site numbers of features recorded near the current study area.

2. Background

In 1971, the Bishop Museum conducted a reconnaissance survey (Emory et al. 1971) of four partially developed areas (Areas 1, 7, 9, and 13B) of Bishop Estate land in the Keauhou-Kahaluu Bay region. Area 1 extended *mauka* of Kamehameha III Road from the shores of Keauhou Bay adjacent to the current study area (Figure 29). Emory et al. reported:

Area 1, largely because of extensive bulldozing, has been rendered the least important, archaeologically, of the four survey areas. The prime sites around Keauhou Bay have already been built on or cleared by bulldozers. Our search through the brush revealed few sites, all of them near the edge of the bluff immediately back of the bay. The recommendations for this area are therefore not as encompassing or as strong as for previous areas. (1971:43)

As a result of their study, ten sites were recorded and assigned Bishop Museum site numbers D3-35 through D3-44 within the *makai* portion of Area 1. Site types included a possible habitation enclosure (D3-35), two platforms of undetermined function (D3-36 and 39), a rock wall (D3-37), a mound that may possibly contain a burial (D3-38), two possible house terraces (D3-40 and 41), and an open midden site that likely corresponds with a campground for fishermen (D3-44). In addition, they recorded Moikeha Cave (D3-42) as provided the following description:

Kekahuna (1954) described this natural cave as the place where Moikeha (a traditional chief who lived some 28 generations ago) hid to escape pursers from Ka-‘u. The cave is at the base of the cliff directly back of Keauhou Bay. It is presently being used for the storage of wood and other article. (1971:45)

Site D3-43 was assigned to the location of the Birthplace of Kamehameha III (Kauikeaouli), which has been commemorated by the Daughters of Hawai‘i with an inscribed plaque set in a concrete block within a small rock enclosure (Emory et al. 1971). This site was included in Kekahuna’s 1954 and 1955 maps; and was placed on the National Register of Historic Places in 1978 (Tomonari-Tuggle 1985). Emory et al. summarized their findings for Area 1 thusly:

The ten sites recorded for Area 1 are only a vestige of what must have existed formerly (before bulldozing), including the lowest surviving section of the great holua runway of which the upper part, above the Alii Highway, is still to be seen.

The most prominent archaeological site remaining in Area 1 is the level land [D3-44] along the base of the vertical bluff a short distance back of the head of Keauhou Bay. (1971:46)

In 1979, Soehren conducted a reconnaissance survey (Soehren 1979) of a 0.66 acre parcel (TMK: (3) 7-8-012:032), located on the *makai* side of Kamehameha III road to the north of Keauhou Bay (see Figure 29). As a result of his study, Soehren reported that the area was mostly bulldozed but remnants of structures and midden were still observable, and he reported observing an octopus lure and a coral disc (Tomonari-Tuggle 1985).

Also in 1979, Archaeological Research Center Hawaii, Inc. (ARCH) conducted a reconnaissance survey (Hammatt 1979) of an area along the south shore of Keauhou Bay for the Kona Surf Hotel. As a result of this study, Hammatt identified five features, two of which he interpreted as modern foundations. All five features had been originally recorded by Reinecke (n.d.) as part of Sites 51, 52, and 53. Hammatt recommended additional documentation and subsurface testing of Features H and I of Site 51, and Site 53. As Walker and Haun (1989:4) pointed out, “Hammatt evidently was not aware the modern foundations had been constructed above older platforms identified by Reinecke (Site 52-Feature K and Site 52).”

In 1980, ARCH revisited Area 1 of the Bishop Estate Lands and conducted another reconnaissance survey (Hammatt 1980; see Figure 29). As a result of that survey, seven of the ten sites recorded by Emory et al. (1971) were identified, while sites D3-35, D3-40, and D3-44 were recorded as destroyed by road grading operations in the decade since the Bishop Museum study. Hammatt (1980) recommended that only site D3-43, the birthplace of Kamehameha warranted further study or preservation efforts.

In 1983, PHRI conducted a reconnaissance survey (Rosendahl et al. 1983) in the vicinity of the Kamehameha III Birth Site Memorial within Area 1 of Bishop Estate Lands, *mauka* of Kamehameha III Road to the east of the current study area (see Figure 29). Their survey was undertaken in conjunction with preparation of a cultural resources management plan for the Keauhou Resort. As part of their study, they tried and were unable to locate the remains of Kaleiopapa Heiau atop Ahu‘ula Cliff. Additionally, the excavation of nine test units in three separate areas at the base of Ahu‘ulu Cliff revealed that Site D3-44 (originally recorded by Emory et al. 1971) had been markedly disturbed prior to their study.

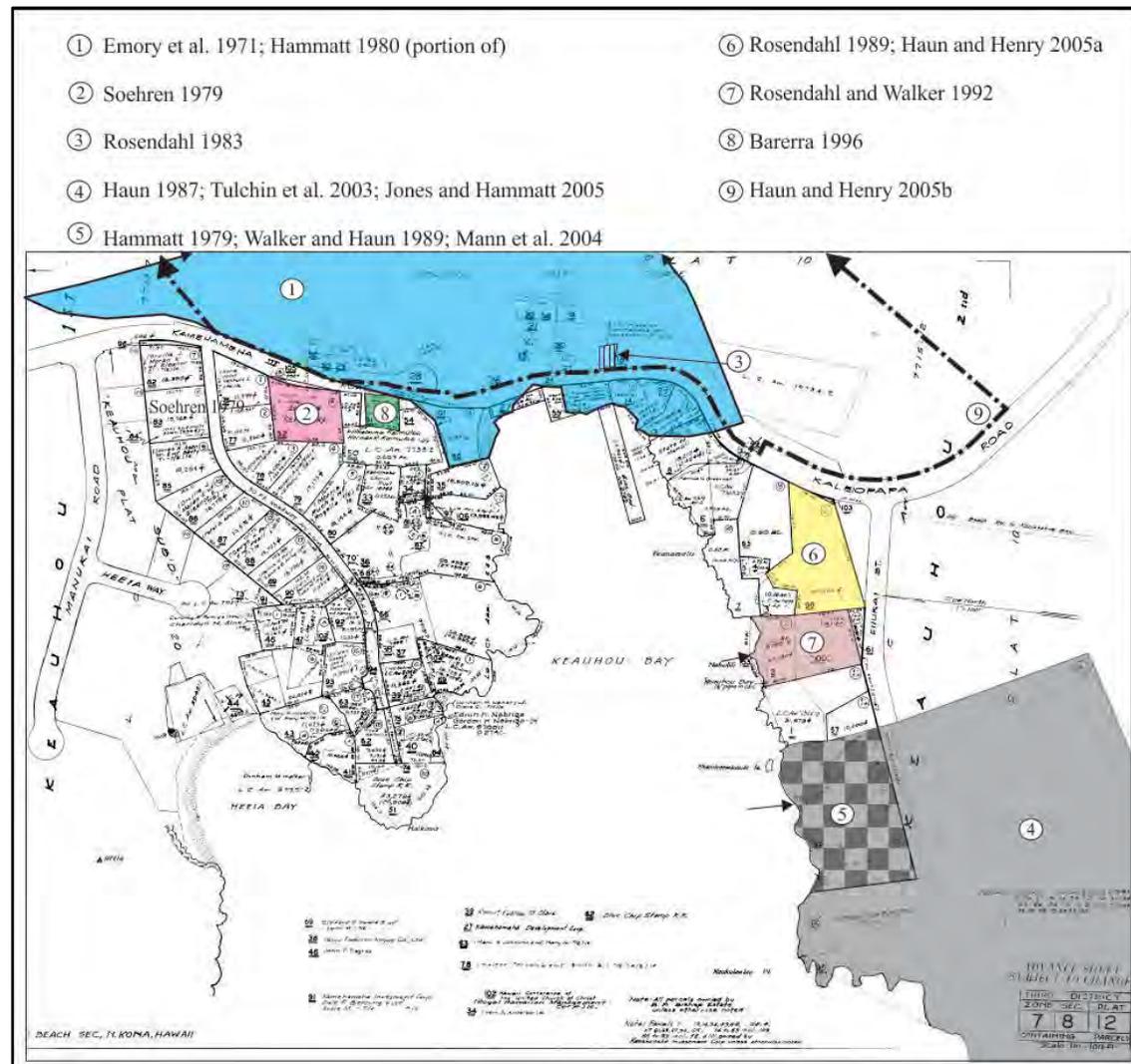


Figure 29. Portion of TMK map showing locations of previous archaeological studies in the vicinity of the current study area.

Although the focus of the following study falls well *mauka* of the current study area, the cultural resource management plan for Keauhou Resort developed by PHRI (Tomonari-Tuggle 1985), is a valuable source of information for the general Keauhou area. Tomonari-Tuggle provides an annotated bibliography of archaeological and historical research conducted in the Keauhou area that spans over eighty years of investigations. She also provides detailed inventories of sites recorded in the various development parcels that comprised Keauhou Resort. However, the two parcels closest to the current study area (Parcels 1 and 6) are not featured in the plan.

In 1987, PHRI conducted a reconnaissance survey and limited subsurface testing (Haun 1987) of the entire Kona Surf Resort property (TMKs: (3) 7-8-010: 38 por. and (3) 7-8-012: 058-060) for a proposed wedding chapel site. The Kona Surf Hotel property is located along the southern coast of Keauhou Bay and includes Kaukulaelae Point (see Figure 29). As previously mentioned, this area had been surveyed by ARCH in 1979 (Hammatt 1979). As a result of the 1987 survey, PHRI were able to relocate three of the seven sites (Sites 51-57) that Reinecke recorded on the Kona Surf Hotel property in 1929 or 1930, including Features H, I, and K of Site 51 as well as Sites 52 and 53. In addition, PHRI identified two previously unrecorded sites, consisting of a *papamū* and a subsurface cultural deposit with waterworn pebbles, midden, historic glass and ceramic fragments, and a coral abrader. Haun (1987) recommended that further intensive survey and testing be conducted in the proposed wedding chapel site.

Subsequently, in 1989, PHRI (Walker and Haun 1989) conducted intensive archaeological survey and testing at the proposed wedding chapel site located on a 2.3 acre portion of the Kona Surf Hotel grounds (TMK: (3) 7-8-012:058-60 Por.). As a result of their study, five archaeological sites with seven component features were identified. Formal

2. Background

feature types recorded include: a previously unrecorded *papamū* and a newly identified subsurface cultural deposit (SIHP Site 5695); in addition to five previously recorded features: a platform (Site 53), two terraces (Sites 51-K and 52), a U-shaped wall (Site 51-I), and an enclosure (Site 51-H). Subsurface testing consisted of the excavation of ten test units within Reinecke sites 51, 52, 53, and SIHP Site 5695 that were added to the three test units, which had been excavated during the earlier PHRI study of the same area (Haun 1987). As a result of their study, more than 450 portable artifacts were recovered, including 348 that were classified as indigenous types and 110 historic. The indigenous portable artifacts were comprised primarily of volcanic glass fragments, with some coral, urchin, and scoria abraders, a few basalt flakes, modified bone and marine shell ornaments. A partial stone *poi* pounder and the mammal bone point of a two-piece bonito lure were also recovered. Historic artifacts included fragments of metal, glass, and plastic. A large amount of faunal remains (5,648 grams) comprised primarily of marine shell, followed by bone, *kukui* nut, and charcoal was also recovered. Radiocarbon testing yielded a date range of A.D. 1440-1748. Based on their findings, PHRI suggest prehistoric use of the area around Sites 53 and 5695. In particular, they suggest Site 5695 was the site of lithic manufacture, based on the volume of volcanic glass debitage present and that marine exploitation was the focus for Sites 51 and 53.

In 1989, PHRI conducted an archaeological field inspection (Rosendahl 1989) of a parcel along the south shore of Keauhou Bay (TMK: (3) 7-8-012:098). As a result of that study, one site (PHRI Temporary Site 736-1) was identified, consisting of several walls that probably served as property boundaries during the Historic Period. These walls likely correspond with a series of walls oriented parallel and perpendicular to the shoreline that Hammatt (1979) mentioned as a result of his aforementioned survey of the south shore of Keauhou Bay. However, Hammatt had interpreted the walls as modern in origin (Haun and Henry 2005a).

In 1992, PHRI conducted an archaeological field inspection (Rosendahl and Walker 1992) of three parcels (TMKs: (3) 7-8-012:002, 053, and 100), located along the southern shore of Keauhou Bay (see Figure 29). No sites were identified within their study area, as a result of their investigation.

In 1996, William Barrera Jr. conducted an archaeological investigation (Barrera 1996) of a parcel (TMK: (3) 7-8-012:031), located on the *mauka* side of Kamehameha III Road to the north of Keauhou Bay (see Figure 29). As a result of his study, Barrera noted that the entire parcel had been graded.

In 2003, Cultural Services Hawaii (CSH) conducted an archaeological inventory survey (Tulchin et al. 2003) of the entire Kona Surf Resort parcel (TMKs: (3) 7-8-012: 58 and (3) 7-8-010: 038 and 039; see Figure 29). Four previously recorded archaeological sites were relocated on the northeast side of the Kona Surf Resort property during their study. As a result three SIHP Site designation numbers were assigned to the site numbers given by Reinecke (n.d.). Reinecke's field site numbers 51-53 correspond to the currently numbered SIHP Sites 23911-23913. Features recorded during their study included the following: an enclosure (Site 23911 Feature A), a canoe shed (Site 23911 Feature B), two terraces (Site 23911 Features C and D), a Historic House Platform (Site 23912), a fishing shrine (Site 23913), and sub-surface cultural deposits related to a habitation (Site 5695).

Subsequently, in 2004, CSH prepared a preservation plan (Mann et al. 2004) for a 0.5 acre parcel (TMK: (3) 7-8-012:058) within the Kona Surf Resort property (see Figure 29). A cultural preserve was proposed for the northeast side of the Kona Surf property, where the four aforementioned archaeological sites (SIHP Sites 23911-23913, and 5695), are located. According to a local *kupuna*, Reinecke was mistaken when he called Site 51 the remains of *Kaukulaelae Heiau*, and that the correct name is actually *Kanika'ula Heiau* (Mann et al. 2004). Interestingly, on the 1954 sketch map of Keauhou Bay (see Figure 28), Kekahuna has a site labeled "*Kanikani-ka'ula Heiau*" in the vicinity of Reinecke's Site 51, which closely resembles the name used in the preservation plan fifty years later. Preservation measures include the creation of a 50-foot buffer zone around the four sites, stabilization of sites, with the goal of providing visitors with an informative experience. The plan also proposed that all out-of-context artifacts on and off the property be reclaimed and relocated within the cultural preserve area. In addition, a burial reinterment site consisting of an above-ground burial crypt was suggested, to be constructed only if burials are encountered during construction renovations of the hotel. No future archaeological research was to be allowed within the cultural preserve without the prior written approval of a research plan by SHPD.

In 2004, Haun & Associates conducted an archaeological inventory survey (Haun and Henry 2005a) of a 1.08-acre parcel (TMK (3) 7-8-012:098), located on the southern side of Keauhou Bay (see Figure 29). Portions of their study area had already been surveyed by Hammatt (1979) and Rosendahl (1989). Haun and Henry augmented their pedestrian survey with seven shovel tests and one trowel probe. As a result of their study, two sites were identified (SIHP Sites 24215 and 24216). Site 24215 consists of a small overhang with a wall adjacent to it. Two shovel tests excavated within Site 24215 revealed the following habitation debris: marine shell fragments, *kukui* nut shells, and sea urchin fragments, which suggested to them the use of the site during Precontact through early Historic times. Site

24216 is a historic complex comprised of five features, which likely corresponds with PHRI temporary Site 736-1, originally recorded by Rosendahl (1989). The features of Site 24216 include: two stacked rock walls (Features A and B), a modified outcrop (Feature C), a retaining wall (Feature D), and a prepared niche (Feature E). One of the rock walls (Feature A) was interpreted as a historic livestock control feature, the crude modified outcrop (Feature C) was interpreted as a possible historic agricultural clearing mound, while the historic retaining wall (Feature D) appears to have supported a gravel and concrete roadway and concrete path. The walled-in overhang (Feature E) was interpreted as a storage feature that was used in Prehistoric and Historic times based on the cultural material recovered from five shovel tests, which included marine shell remains and waterworn basalt pebbles within and outside of the overhang, based on their review of historic maps, Haun and Henry suggest that the features of Site 24216 were likely built between 1928 and 1954 and associated with a concrete house foundation and gazebo located on an adjacent parcel, which was owned by Mrs. E.P. Hodgins ca. 1954. Both sites were assessed as significant under Criterion “d” based on their informational content and Haun and Henry’s treatment recommendation was no further work or preservation needed.

In 2004, Haun & Associates conducted an archaeological inventory survey (Haun and Henry 2005b) of a 25-acre parcel (TMK (3) 7-8-010:044), located *mauka* of Kamehameha III Road along Keauhou Bay (see Figure 29). This same study parcel corresponds with a portion of Area 1 of the Bishop Estate Lands, which has been the subject of various archaeological investigations, discussed above. A total of twenty-two sites with thirty-nine features had previously been documented within their project area. Seven of these previously recorded sites appear to have been destroyed prior to their survey. During their study, fifteen sites were recorded including six previously recorded sites (D3-37, and D3-39 through D3-43) and nine newly identified sites, comprised of twenty-two features. As a result, four of the sites given temporary Bishop Museum field numbers by Emory et al. (1971) were assigned the following new SIHP Site designation numbers: Site 24256 (D3-41), Site 24262 (D3-40), Site 24264 (D3-42), and Site 24267 (D3-39); in addition to the two SIHP Site designations that had been assigned sometime in the 1980s: Site 4348 (Kamehameha III birthplace shrine, D3-43) and Site 5674 (D3-36 and D3-37). Site 24262 (D3-40), a disturbed terrace, had previously been recorded as destroyed by Hammatt (1980). Also, Site 24267 (D3-39), which was originally recorded as a platform, was reclassified by Haun and Henry as a low enclosure. The twenty-two recorded features include paved house foundations, various enclosures, walls, terraces, platforms, midden scatters, mounds, a fresh water pool, a cave, a staircase, and a road. The range of feature function includes ranching, habitation (temporary and permanent), ceremonial, transportation, water acquisition, recreation, and possible burial, all of which conform to documented use of the *kula* zone. Evidence of Precontact use of the study area is evidenced by the temporary habitation cave (Moikeha Cave, Site 24264) and the pool designated Site 24263 that may be a remnant of Ho‘okuku Pond, which appears in legends of Keauhou as well as on Kekahuna’s 1954 Map (see Figure 28). Eight test units and ten shovel tests were excavated during their study. Radiocarbon dating of a sample taken from a test excavation in a temporary habitation site within Moikeha Cave (Site 24264) yielded a calibrated age range of A.D. 1000 to 1180, which makes this site “one of the earliest habitation sites along the Kona coast” (Haun and Henry 2005b:ii). The three permanent habitation sites (Sites 5674, 24261, and 24266) recorded during the study likely date to the late Historic to early Historic Period. Four of the fifteen sites assessed as significant were recommended for data recovery (Sites 5674, 24259, 24261, and 24266). Three sites were recommended for preservation (Sites 4348, 24263, and 24264).

3. STUDY AREA EXPECTATIONS

Given the restricted nature of the current study area (the underwater shoreward portion of Keauhou Bay; Figure 30), and in light of the culture-historical background information coupled with the results of prior archaeological work, a concise set of archaeological expectations can be generated. The 1954 Kekahuna map of Keauhou Bay with historical notes (Figure 8) indicates that a pit identified by the name Ka-imu-ki, with a depth extending possible 50 feet, may be found in the otherwise shallow southeastern portion of the bay. The significance of this potential natural feature is not elaborated upon, but it may have been a source of upwelling fresh water and thus a locus for Precontact and Historic Period water and marine resource procurement. No other potential Precontact submerged resources are expected within the study area.

Based on the information provided by Menzies (1920) and Vancouver (1798), it is possible that submerged evidence of the schooner *Fair American* could be present within the bay. As previously discussed, she was last observed in 1794 in a state of disrepair, and under the control of Kamehameha I. Direct evidence of the presence of a sunken *Fair American* could be wooden timbers and possibly metal fittings appropriate to an eighteenth century sailing vessel. Indirect evidence of the sunken schooner could be in the form of ballast stones of a mineral composition not native to the Hawaiian Islands.

Beginning in the early 1900s a series of wharfs and piers (both public and private) were constructed toward the southeastern portion of the bay and along the southern shoreline, remnant elements of these constructions may be present. It is also possible that isolated artifacts may be discovered on the ocean floor within the bay, however known repeated storm events may have carried such material out to sea; and as part of their stewardship of the bay the Keauhou Canoe Club conducts an annual cleanup with scuba divers who remove debris for the bay's ocean floor. It is likely that some of the existing mooring anchors are objects greater in age than fifty years, but their current context is no doubt tertiary (at best) in nature (e.g., a machinery part {context 1} that was discarded as refuse {context 2} and later submerged and repurposed as a mooring anchor {context 3}), which precludes their consideration as significant historic objects. For example, the discarded engine parts seen in a 1950 photograph (see Figure 24) of the Keauhou Bay shoreline, were likely subsequently used as makeshift mooring anchors

Lastly, Keauhou Bay as a geographic feature combined with its terrestrial surroundings has the potential to be considered as significant historic district or cultural landscape; the evaluation of this potentiality is however beyond the scope of the current study.



Figure 30. Water surface above current study area, view to the southeast.

4. FIELDWORK

Fieldwork for the current underwater survey was conducted from July 27th to 31st, 2015, under the direction of ASM-Hawai'i's Principal Investigator, Robert B. Rechtman Ph.D. The dive team was led by of ASM Senior Archaeologist Brian Williams, who holds a Master's Degree in maritime archaeology, and the scuba and snorkeling crew consisted of Captain Richard Rogers (Dive Master) and Ned Rogers, both with Piliialoha Consultants.

METHODS

To ensure 100% visual coverage of the study area, the survey methods included both scuba and snorkeling (Figure 31). First, a circular survey was conducted around each of the existing mooring sites. This consisted of tying a reeled measuring tape around the anchor rope or chain and setting scuba divers at 5 foot intervals for circular transects. Three divers participated in this effort so that one circular transect covered an approximate 15 foot radius around the mooring. Two circular transects were swam at each mooring site so that an approximate 30 foot radius was surveyed around each mooring. Every time an object of interest was identified, the distance and bearing from the mooring were recorded, and if a series of objects or features was observed they were followed out from the 30 foot radius area.

The proposed DOBOR Keauhou Bay Small Boat Harbor project map (see Figure 3) identified sixteen existing mooring anchors for removal; however, seventeen mooring anchors were observed to be currently situated in the bay. To ensure that no mooring locations were missed, ASM surveyed all seventeen mooring anchors with the circular scuba survey techniques described above. None of the existing mooring anchors are deeper than 30 feet from the surface.

Second, in order to ensure complete coverage of the proposed mooring sites (proposed mooring blocks include a 10 foot sweep radius), 30 foot swim-line transects were conducted along each of the four proposed mooring rows (A-D; see Figures 3 and 31). Scuba divers lined up at 10 foot intervals and swam parallel transects along a measuring tape centered on the line of the proposed mooring locations; the entire length of all four proposed mooring rows was covered plus an additional 50 feet on either end to account for any subsequent project redesign. Surge was minimal, however, to ensure accuracy all three divers swam the same compass bearing and kept the tape taut. When objects of interest were observed, transect markers were placed so that divers could converge and record findings, then return to their marked locations to continue the transect survey.

Lastly, given the excellent underwater visibility during this project, the three divers snorkeled the outside edges of the bay with a roughly 10 foot transect spacing and completed a 100-percent visual inspection of the study area, from the western outermost proposed mooring to the shorelines on the north, east, and south side of the bay.

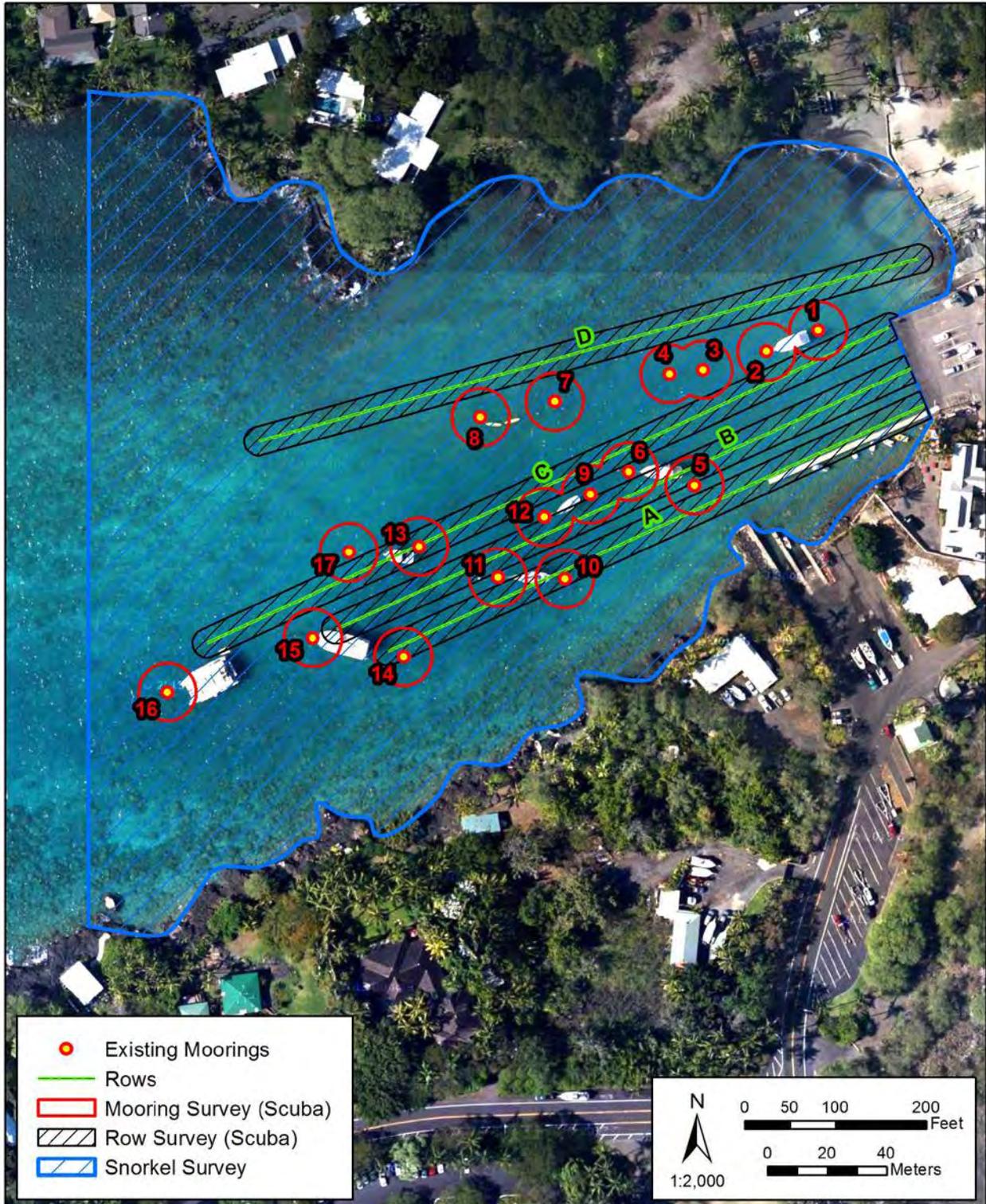


Figure 31. The study area with the survey locations depicted.

FINDINGS

During the current underwater survey there were no submerged features identified dating from the Precontact or early Historic Periods. With respect to the potential identification of the *Fair American*, likewise there was no evidence of any kind observed to indicate the presence of this eighteenth century sailing vessel within the current survey area. The roughly 50 foot deep pit identified and described on the 1954 Kekahuna map (see Figures 8 and 28) as Ka-imu-ki was not encountered during the current survey, nor was it shown on a bathymetric map of the bay prepared in 1885 (see Figure 11); however, modern bathymetry does indicate a small depressed area (roughly 8 feet deep) in the same general vicinity of Kekahuna's mapped location of Ka-imu-ki (Figure 32, cf. Figure 8). It is possible that this pit has become filled and is no longer visible.

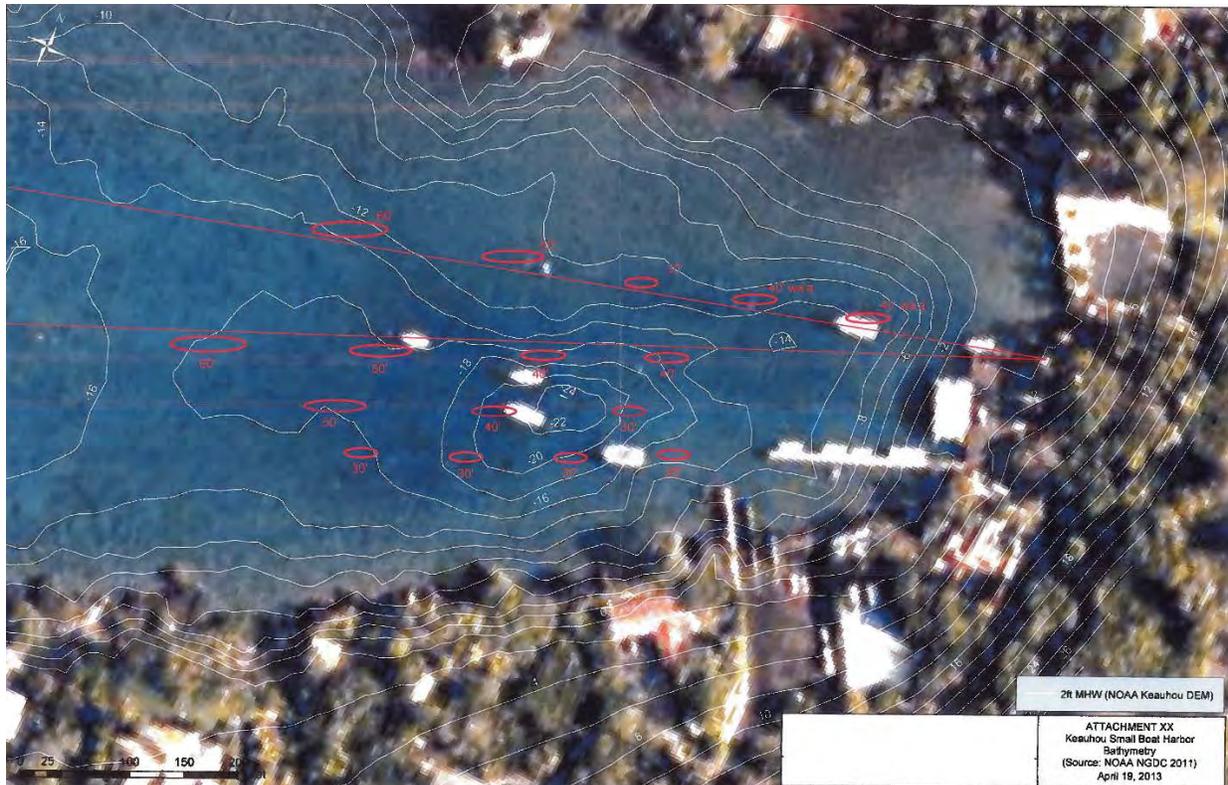


Figure 32. Bathymetry of Keauhou Bay showing depressed area near center of image.

Extending seaward from (and in line with) the current pier toward the Mooring Anchor 5 survey area and within the Row A survey corridor (see Figure 31), two sets of former support piles (Figures 33 and 34) were observed that are likely associated with the older (ca. 1957) version of the pier, before it was shortened. This matches the oral information that was provided by John Moore, which was presented above. Slightly beyond the former pier support piles, also within the Row A survey corridor, a concrete slab and metal railing (Figure 35) were observed. These appear to have been part of a former private sunning platform, perhaps not unlike the one depicted in Figure 36.



Figure 33. First set of cut support piles seaward of current pier.



Figure 34. Second set of cut support piles seaward of current pier.



Figure 35. Concrete slab and metal railing near southern shoreline of bay in Row A survey corridor.



Figure 36. Private sunning platform on southern side of Keauhou Bay ca. 1960s (Kona Historical Society).

4. Fieldwork

The existing mooring anchors currently in use were found to be a mix of concrete blocks, metal anchors, heavy chain drags, and miscellaneous metal objects that include various machinery and engine parts (Figures 37-40). Within the 30 foot radius of the active moorings several abandoned mooring anchors of concrete, metal anchors, machinery and miscellaneous iron objects, along with accumulations of rope and chain were also observed (Figures 41-44). Most of these items appeared to be of modern origin. The scuba survey of the four linear corridors of the proposed new mooring anchors (Rows A-D; see Figure 31) produced similar results, with only a handful of objects (metal anchors and machinery parts; Figures 45 and 46) encountered within the Row A corridor; nothing worthy of note was observed within the Rows B, C, or D survey corridors.



Figure 37. Mooring Anchor #2.



Figure 38. Mooring Anchor #6.



Figure 39. Mooring Anchor #5.



Figure 40. Mooring Anchor #10.



Figure 41. Abandoned mooring anchor near Mooring Anchor #3.



Figure 42. Abandoned mooring anchor near Mooring Anchor #5.



Figure 43. Abandoned mooring anchor near Mooring Anchor #6.



Figure 44. Abandoned mooring anchor near Mooring Anchor #13.



Figure 45. Machine part in Row A scuba survey corridor near Mooring Anchor #14.

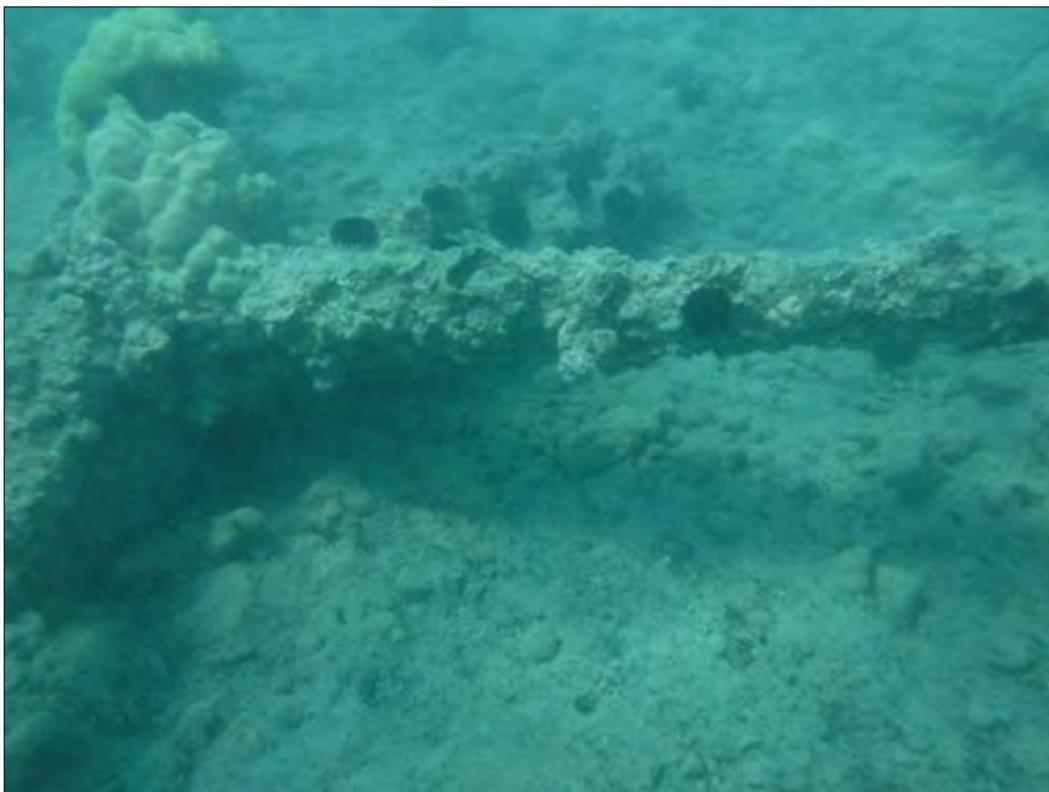


Figure 46. Anchor in Row A scuba survey corridor near Mooring Anchor #5.

4. Fieldwork

During the perimeter snorkel survey of the balance of the study area, several unidentifiable metal objects and a long metal pipe running parallel with the shoreline were noted in the southern portion of the bay. To the north of Row D a cement block with a ring (Figure 47), bits of metal piping, a truck axel with wheels (Figure 48), pieces of machinery, an automobile engine block (Figure 49), and the remnants of a diesel ship's engine (Figure 50) were observed. Nearly all of these objects had chain or rope attached suggesting they were used as makeshift mooring anchors in the past (matching the oral information that was presented above).



Figure 47. Cement block with ring seen in snorkel survey.



Figure 48. Axle with wheels seen in snorkel survey.

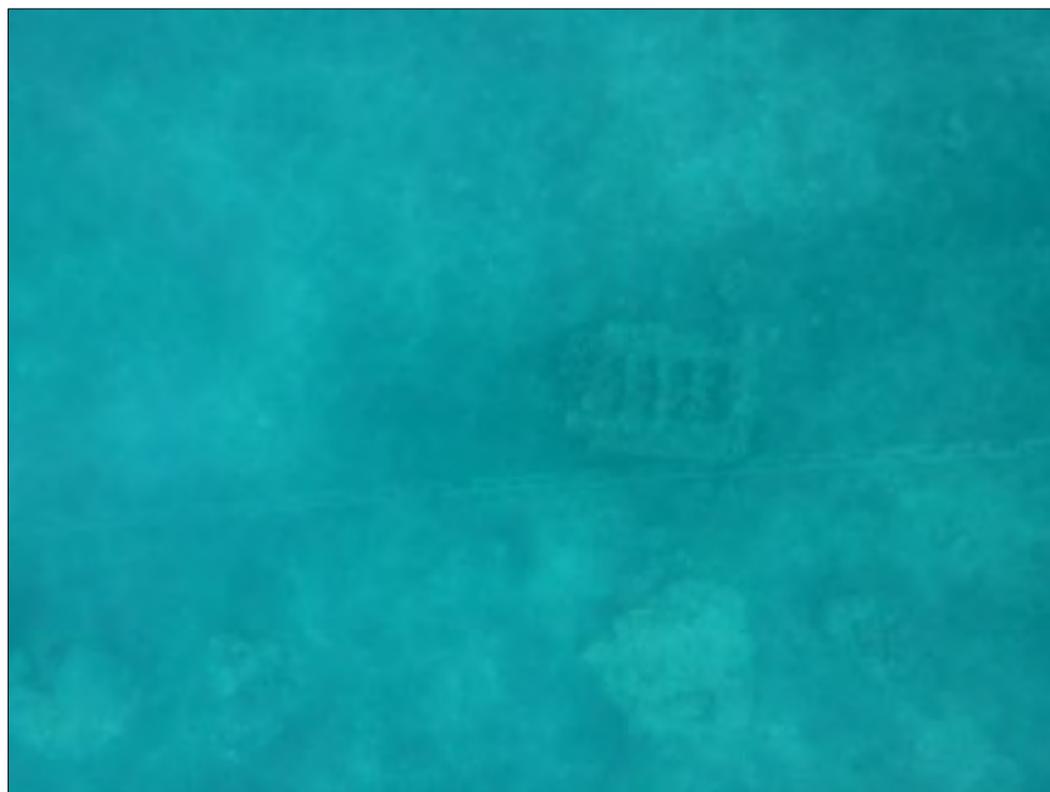


Figure 49. Engine block seen in snorkel survey.



Figure 50. Diesel ship engine seen in snorkel survey.

The few seemingly Historic Period objects (see Figures 42, 48, and 50) that were observed within the study area are obviously in tertiary states of use (see discussion in the Study Area Expectations section above) and do not retain their historical integrity of contextual association, thus are not considered to be historic properties as defined in HAR 13§13-275-2.

The sea floor in general was oddly devoid of small refuse, historic or modern; only a handful of modern bottles and snorkeling gear were observed. After discussion with a local resident, it became apparent that the 2011 *tsunami* may have washed anything out of the bay that didn't weigh more than 40 or 50 pounds; meaning that any historic refuse may have been re-located out to sea. Additionally, the local canoe club sponsors an annual cleanup of the bay that includes scuba divers collecting refuse for removal and disposal, which may also account for the "clean" nature of the ocean floor in the moorings area.

CONSIDERATION OF POTENTIAL IMPACTS TO HISTORIC PROPERTIES BEYOND THE PROJECT AREA FOOTPRINT

While the current study by design is focused on the submerged environment of the Keauhou Bay Small Boat Harbor, background research indicates there are several terrestrial historic properties and cultural sites that are known to exist in close proximity to the bay; thus some consideration is given here with respect to potential indirect impacts to these resources as a result of the proposed mooring replacement and expansion project. Primary among these resources is the location (SIHP Site 4348) of the birthplace of Kamehameha III (Kauikeaouli) on the *mauka* side of current Kaleiopapa Road (see Figure 28). Other sites closer to the project footprint include traditional canoe landing sites (as reported by Kekahuna) on the north side of the bay (see Figure 8); and as suggested earlier, Keauhou Bay as a geographic feature has the potential to be considered as significant historic district or cultural landscape. A separate Cultural Impact Assessment is also being prepared for this project that further explores such potentialities and associated potential impacts.

The types of indirect impacts that deserve consideration here include: potential impacts to onshore resources that may result from the staging of construction materials and equipment, impacts resulting from possible increased traffic to the Keauhou Bay area, and visual impacts to the Keauhou Bay area resulting from the placement of additional moorings.

With respect to the first of these potential indirect impacts, the construction plans will identify the locations of all significant land-based historic properties in the vicinity of the bay, and DOBOR will ensure that the construction contractor implements a best management practices (BMP) plan that takes into consideration the protection of all identified land-based historic properties. With respect to traffic in the immediate Keauhou Bay area, the Traffic and Transportation section of the Environmental Assessment for this project concluded that “the proposed action would not result in a change in traffic to, from, or into Keauhou Bay.” Such a conclusion precludes any assessment of impacts to resources as a result of increased traffic. The establishment of seven new non-commercial moorings will add a maximum of seven more personal-use boats in the bay. It is argued here that the presence of seven more non-commercial boats will not create any adverse visual impacts within and around the bay and the total of sixteen moorings is still less than the number of moorings that were previously in the bay up until at least 1992, when there were nineteen moorings reported when the jurisdiction of the Keauhou Small Boat Harbor transferred from the Department of Transportation to the Department of Land and Natural Resources.

5. CONCLUSION AND RECOMMENDATIONS

As a result of the current underwater investigation there were no significant archaeological resources identified. Thus, it is our conclusion that the proposed mooring improvements project within the Keauhou Bay Small Boat Harbor will not affect any submerged historic properties. Consequently, with respect to the historic preservation review process, our recommendation is that no further work needs to be conducted prior to or during project implementation. In the unlikely event that significant archaeological resources are discovered during project implementation work should cease in the area of the discovery and DLNR-SHPD contacted pursuant to HAR 13§13-280-3.

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