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GOVERNOR OF
HAWAII



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OCT 23 2019

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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

REF: OCCL: TF

CDUA: HA-3851

MEMORANDUM

SEP 30 2019

TO: Scott J. Glenn, Director
Office of Environmental Quality Control

FROM: Suzanne D. Case, Chairperson *WDC*
Board of Land and Natural Resources

SUBJECT: Publication of the Final Environmental Assessment (EA) for Conservation District Use Application (CDUA) HA-3851 for the Grossbard/Bourzat Single Family Residence (SFR) and Associated Improvements, located at Keonepoko Iki, Puna, Hawai'i
Tax Map Key (TMK): (3) 1-5-009:053

The Department of Land and Natural Resources has reviewed the subject Final EA for Conservation District Use Application (CDUA) HA-3851 and has determined a Finding of No Significant Impact (FONSI). However, please be advised that this finding does not constitute approval of the proposal.

The Draft EA was published in the Office of Environmental Quality Control's (OEQC) August 8, 2019 edition of *The Environmental Notice*. Comments on the DEA were sought from relevant agencies as well as the public and were included in the FEA. The FEA has been prepared pursuant to Chapter 343, Hawai'i Revised Statutes and Chapter 11-200, Hawai'i Administrative Rulesⁱ. Please publish notice of this FEA-FONSI in the October 23, 2019 edition of *The Environmental Notice*.

Please contact Trevor Fitzpatrick of our Office of Conservation and Coastal Lands staff at 587-0373 should you have any questions.

Enclosures

20-090

ⁱ The Environmental Assessment was processed before the revised rules went into effect in August 2019.

APPLICANT PUBLICATION FORM

Project Name:	Grossbard/Bourzat Single-Family Residence in the Conservation District at Keonepoko
Project Short Name:	Grossbard/Bourzat Residence
HRS §343-5 Trigger(s):	Use of Land in Conservation District
Island(s):	Hawai'i
Judicial District(s):	Puna
TMK(s):	3-1-5-009:053
Permit(s)/Approval(s):	County of Hawai'i: Special Management Area Permit or Exemption Plan Approval and Grubbing, Grading, and Building Permits State of Hawai'i: Conservation District Use Permit Wastewater System Approval Water Well Permit
Approving Agency:	Hawai'i State Department of Land and Natural Resources
<i>Contact Name, Email, Telephone, Address</i>	Trevor Fitzpatrick, Planner, OCCL, trevor.j.fitzpatrick@hawaii.gov, 587-0373 DLNR- Office of Conservation and Coastal Lands 1151 Punchbowl Street, Room 131 Honolulu HI 96813
Applicant:	Françoise Bourzat and Aharon Grossbard
<i>Contact Name, Email, Telephone, Address</i>	C/O James Leonard 808-896-3459; jmleonard.mac.com 56 Laukona Street Hilo HI 96720
Consultant:	Geometrician Associates LLC
<i>Contact Name, Email, Telephone, Address</i>	Ron Terry, 808-969-7090 rterry@hawaii.rr.com P.O. Box 396 Hilo, HI 96721

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

Submit 1) the approving 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 approving 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 approving 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 approving 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 approving agency, 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 approving agency, 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 approving agency simultaneously transmits to both the OEQC and the applicant 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 The approving agency simultaneously transmits to both the OEQC and the applicant a notice that it did not make a timely determination on the acceptance or nonacceptance of the applicant's FEIS under Section 343-5(c), HRS, and therefore the applicant's FEIS is deemed accepted as a matter of law.
- Supplemental EIS Determination The approving agency simultaneously transmits its notice to both the applicant 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

Provide a description of the proposed action and purpose and need in 200 words or less.

The applicants plan a 1-story, 2,560-square foot (sf), 3-bedroom, 2-bath residence on their 6.91-acre property near Hawaiian Beaches. Also included are electric lines, an IWS, a water well and tank, an improved driveway, and an 858-sf utility shed. They will landscape with primarily native or Polynesian species and a small fruit tree orchard. All improvements would be on previously disturbed land. Landclearing over less than an acre would generate short-term impacts to noise, air and water quality, and scenery, mitigated by BMPs. A botanical survey found no threatened or endangered plant species in use areas. A coastal strip of native vegetation includes the endangered grass *Ischaemum byrone*. The owners will remove non-native trees here for both native vegetation protection and sight lines, but all native plants will be preserved. Impacts to islandwide-ranging endangered Hawaiian hoary bats and Hawaiian hawks will be avoided through vegetation removal timing. An archaeological survey found no sites and a cultural impact assessment determined that no cultural sites or practices would be affected. The residence would be not be visible from Government Beach Road. The wide shoreline setback and placement amid native vegetation would keep the home only subtly visible from the sea. The shoreline supports fishing and gathering and the applicants understand the public's right to traverse and utilize this area.

Final Environmental Assessment

**Grossbard/Bourzat Single-Family Residence
in the Conservation District at Keonepoko**

October 2019

TMK (3rd): 1-5-009:053
Keonepoko, Puna, County of Hawai'i, State of Hawai'i

APPLICANT: Françoise Bourzat and Aharon Grossbard
2150 Bear Gulch Road
Woodside, California 94062

DETERMINING
AGENCY: State of Hawai'i
Department of Land and Natural Resources
Office of Conservation and Coastal Lands
1151 Punchbowl Street, Room 131
Honolulu, Hawai'i 96813

CONSULTANT: Geometrician Associates LLC
P.O. Box 396
Hilo, Hawai'i 96721

Final Environmental Assessment
Grossbard/Bourzat Single-Family Residence
in the Conservation District at Keonepoko

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Honolulu, Hawai'i 96813

CONSULTANT:

Geometrician Associates LLC
P.O. Box 396
Hilo, Hawai'i 96721

CLASS OF ACTION:

Use of Land in Conservation District

This document is prepared pursuant to:
The Hawai'i Environmental Protection Act,
Chapter 343, Hawai'i Revised Statutes (HRS), and
Title 11, Chapter 200, Hawai'i Department of Health Administrative Rules (HAR)

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Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

TABLE OF CONTENTS

SUMMARY	ii
PART 1: PROJECT DESCRIPTION AND E.A. PROCESS	1
1.1 Project Description and Location	1
1.2 Environmental Assessment Process	13
1.3 Public Involvement and Agency Coordination	13
PART 2: ALTERNATIVES	14
2.1 Proposed Project, Alternative Sites and Alternative Uses	14
2.2 No Action	14
PART 3: ENVIRONMENTAL SETTING, IMPACTS AND MITIGATION	14
3.1 Physical Environment.....	14
3.1.1 Climate, Geology, Soils and Geologic Hazards.....	14
3.1.2 Flood Zones and Shoreline Setting.....	17
3.1.3 Water Quality.....	25
3.1.4 Flora and Fauna	26
3.1.5 Air Quality, Noise and Scenic Resources	31
3.1.6 Hazardous Substances, Toxic Waste and Hazardous Conditions	31
3.2 Socioeconomic and Cultural.....	32
3.2.1 Land Use, Socioeconomic Characteristics and Recreation.....	32
3.2.2 Cultural and Historic Resources	33
3.3 Public Roads, Services and Utilities	48
3.3.1 Roads and Access	48
3.3.2 Public Utilities and Services	48
3.4 Secondary and Cumulative Impacts	49
3.5 Required Permits and Approvals.....	49
3.6 Consistency with Government Plans and Policies	50
3.6.1 Hawai‘i County General Plan.....	50
3.6.2 Hawai‘i County Zoning and Special Management Area.....	54
3.6.3 Conservation District.....	55
PART 4: DETERMINATION, FINDINGS AND REASONS.....	57
4.1 Determination	57
4.2 Findings and Supporting Reasons	57
REFERENCES	60
LIST OF TABLES	
TABLE 1 Natural Hazards Impacting the Coastline Fronting Property.....	24
TABLE 2 Plant Species Observed on Property.....	28
LIST OF FIGURES	
FIGURE 1 Project Location Map	2
FIGURE 2 Project Site Photos.....	3
FIGURE 3 Site Plans	7
FIGURE 4 Flood Zone Map	18
FIGURE 5 Coastal Geology Map of Property	21
FIGURE 5 Coastal Geology Photos at Property	22
APPENDIX 1a Comments in Response to Early Consultation	
APPENDIX 1b Comments to Draft EA and Responses	
APPENDIX 2 Archaeological Assessment Survey	
APPENDIX 3 Cultural Impact Assessment	
APPENDIX 4 Coastal Erosion Study	

**SUMMARY OF PROJECT, ENVIRONMENTAL IMPACTS
AND MITIGATION MEASURES**

Aharon Grossbard and Françoise Bourzat (the applicants) seek a Conservation District Use Permit (CDUP) to build a single-family residence on their 6.91-acre property located *makai* of the Government Beach Road in the Conservation District between the Hawaiian Paradise Park and Hawaiian Shores subdivisions, in the Keonepoko Iki Ahupua‘a in the Lower Puna area of the Island of Hawai‘i.

The plan for the home consists of an approximately 2,560-square foot (sf), 3-bedroom, 2-bath, one-story structure with a maximum roof height above grade of 20’ 10”, plus an 858-sf utility shed and carport. In addition to residential uses, the applicants plan to landscape with primarily native or Polynesian species and also have a small orchard with fruit trees. The home will get electric power from Hawai‘i Electric Light lines, utilize a water well for potable water, and have an individual wastewater system meeting or exceeding all regulatory requirements.

The vegetation of portions of the property was disturbed many decades ago as part of the previous ranching that took place in the area, and it is primarily non-native, with the major exception of hala, which remains as part of the original vegetation in limited areas and also has regrown in disturbed areas. A coastal strip about 125 feet in width perched above a tall seacliff has native shoreline vegetation, including the endangered grass *Ischaemum byrone*, and will be entirely preserved. The location of structures and improvements to the existing driveway are being planned at a setback of 153 feet from the sea cliff to minimize disturbance of native vegetation and avoid the area of salt spray and coastal hazard. An archaeological survey determined that no archaeological sites are present, and a cultural impact assessment determined that no cultural sites or practices would be affected. The proposed home site is about 600 feet from the Government Beach Road and would not be visible from the road. The applicants plan to remove the diseased and dying coconut palms and trim or remove ironwood, autograph trees, and other non-native trees to help protect the native vegetation and provide a sight line to the sea, but they will preserve all native vegetation in the shoreline area. With the wide setback from the shoreline area, and subtly placed amid native vegetation, the home would be only intermittently visible from the sea. As with most areas in Puna, the shoreline is used occasionally by local residents to fish and gather. The applicants understand and support the public right to traverse and utilize the shoreline area.

Landclearing and construction activities would occur over less than an acre, with very minor short-term impacts to noise, air and water quality and scenery. These would be mitigated by Best Management Practices associated with the CDUP and grading permit. The applicants will ensure that all earthwork and grading conform to applicable laws, regulations and standards. The area of the proposed improvements, which is inland of the proposed shoreline setback, has been surveyed for threatened and endangered plants, and none are present. Impacts to the island wide-ranging endangered Hawaiian hoary bat and Hawaiian hawk will be avoided through timing of vegetation removal and/or hawk nest survey. In the unlikely event that additional undocumented human remains or archaeological resources, including shell, bones, midden deposits, lava tubes, or similar finds, are encountered during construction within the project site, work in the immediate area of the discovery will be halted and the State Historic Preservation Division will be contacted to determine the appropriate actions.

PART 1: PROJECT DESCRIPTION AND E.A. PROCESS

1.1 Project Description and Location

Aharon Grossbard and Françoise Bourzat (the applicants) seek a Conservation District Use Permit (CDUP) to build a single-family residence on their 6.91-acre property located *makai* of the Government Beach Road in the Conservation District between the Hawaiian Paradise Park and Hawaiian Shores subdivisions in the Lower Puna area of the Island of Hawai‘i (Figures 1-2).

The plan for the home consists of a 2,560-square foot (sf), 3-bedroom, 2-bath, one-story structure with a maximum roof height of 20’ 10” (Figure 3), plus an 858-sf utility shed and carport. For potable water they will install a water well and pump house with a small holding tank, with an additional 10,000-gallon tank for water storage and fire flow. The total developed area per Conservation District rules would be 3,718 sf. An individual wastewater system meeting or exceeding all regulatory requirements will be built. An existing driveway will be slightly widened but left unpaved for access to within about 200 feet of the shoreline, where a spur driveway will be constructed to access the carport and turnaround area. Electricity will come from Hawai‘i Electric Light lines available fronting the property on Government Beach Road, using three poles that will be installed in the widened driveway. In addition to residential uses, the applicants plan to landscape in the area immediately surrounding the home with primarily native and Polynesian species and to plant a small fruit tree orchard.

The vegetation of portions of the property was disturbed many decades ago as part of farming activities, and it is now primarily non-native, with the major exception of hala (*Pandanus tectorius*). Hala trees that are part of the original vegetation remain near the shoreline and have also regrown sporadically in the inland parts of the property. A coastal strip about 125 feet in width perched above a tall seacliff has native shoreline shrub vegetation, including naupaka (*Scaevola taccada*), the occasional hala, and the endangered grass *Ischaemum byrone*. All native vegetation in this area will be entirely preserved. The location of proposed structures and improvements to the existing driveway are being planned with a shoreline setback of 153 feet in order to minimize disturbance of native vegetation and avoid coastal hazard and salt spray. The applicants plan to trim or remove non-native trees including ironwood (*Casuarina equisetifolia*), octopus tree (*Schefflera actinophylla*), and autograph trees (*Clusia rosea*) to provide a sight line the sea and enhance the native flora elements (see Figure 3, Landscape Plan). The home site and orchard areas were chosen to limit the number of hala removed, but 42 mature hala trees, as well as many juveniles, will require removal or trimming to accommodate the home and associated features. An equal number will be planted/transplanted on the property to replace these. In the area *mauka* of the house site the applicant plans to remove many larger invasive trees including albizia (*Falcataria moluccana*), autograph trees, octopus trees and melochia (*Melochia umbellata*), wherever they pose a threat to the home, the driveway, or adjoining properties. Once removed, these will be replaced with other native or Polynesian species common to the area, especially hala but also including kou (*Cordia subcordata*), milo (*Thespesia populnea*) and kamani (*Calophyllum inophyllum*). The applicant also plans to conduct some thinning of the thickets of macaranga (*Macaranga mappia*), autograph trees, octopus tree and strawberry guava (*Psidium cattleianum*) as a means of accessing the various portions of the property.

Figure 1 Project Location Map

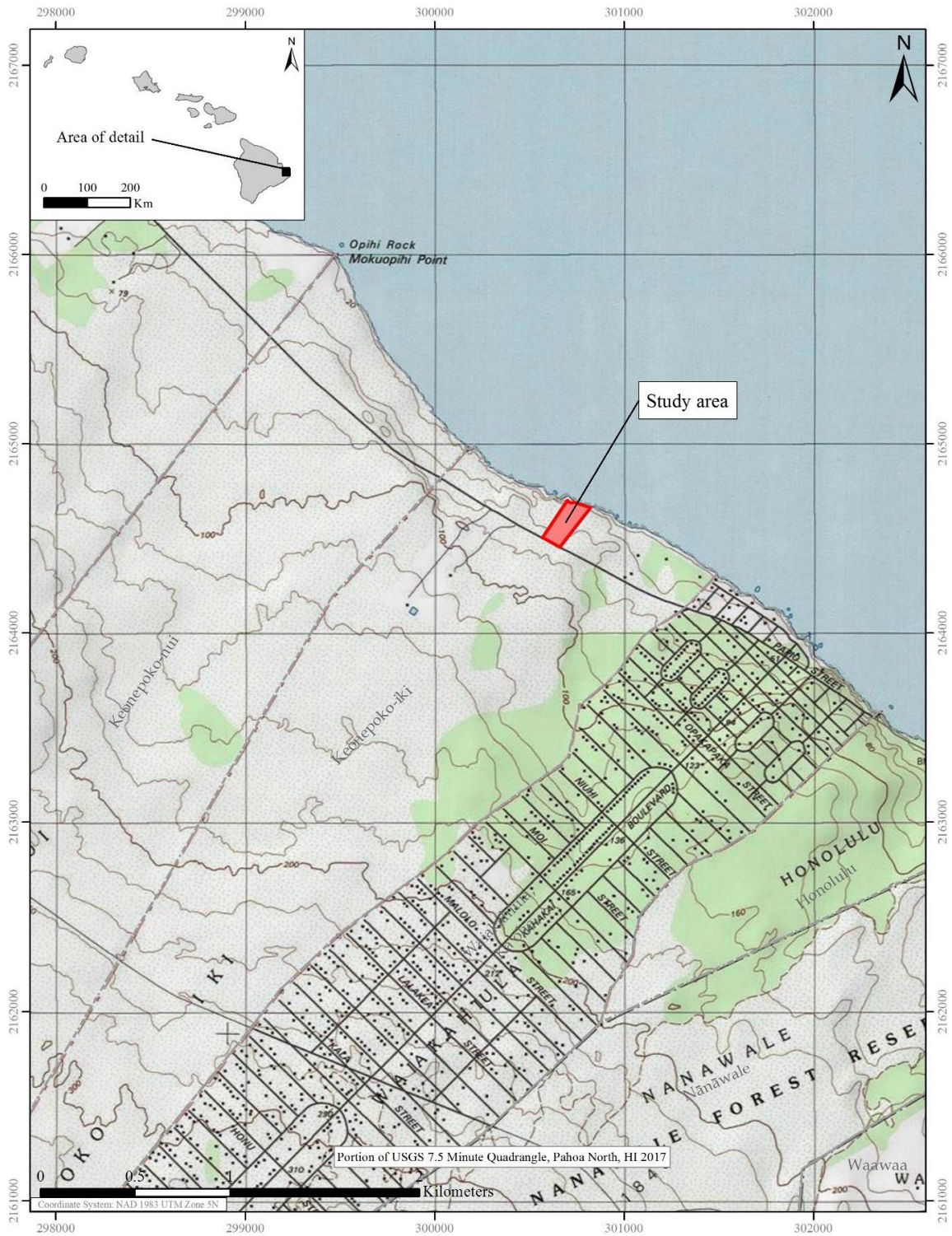


Figure 2 Site Photos



2a, Above: Aerial image with property boundary from Google Earth ©
2b, Below: *mauka* part of driveway.



Figure 2. Site Photos



2c, Above: *Makai* end of driveway. 2d, Below: Shoreline area



Figure 2. Site Photos



2e, Above: Typical closed canopy non-native forest. 2f, Below: Hala in interior



Figure 2. Site Photos



2g, Above: Transition from shoreline to interior vegetation

GROSSBARD-BOURZAT RESIDENCE
 SITE ADDRESS: TMK(3) 1-5-009, PARCEL B-2
 KEONEPOKO-IKI, HAWAIIAN BEACHES, HI

AREA TABULATIONS:

LOT AREA: 6.9100 ACRES
 300,100sf

MAXIMUM ALLOWED DEVELOPED AREA (MDA): 5,000sf

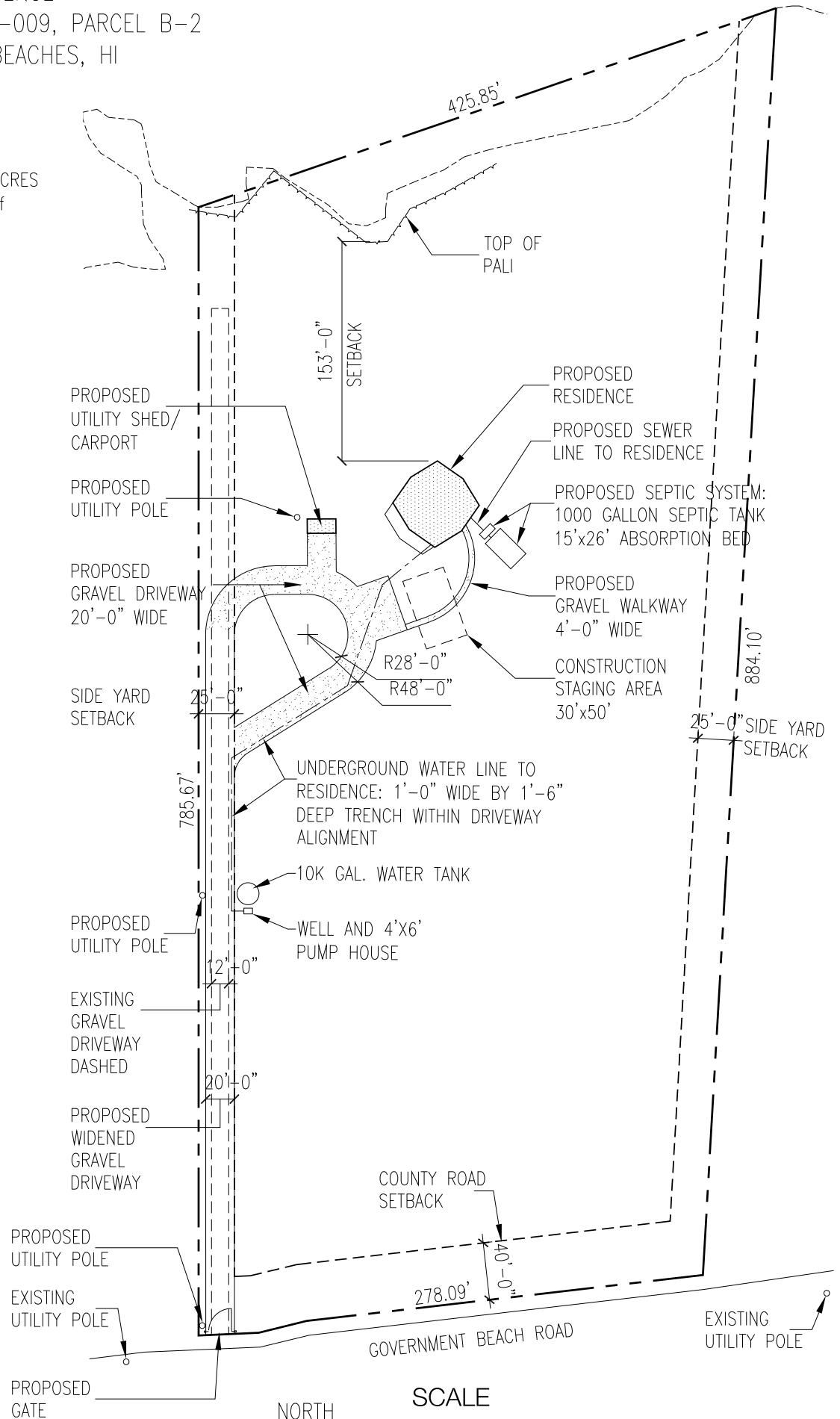
PROPOSED DEVELOPED AREA:

RESIDENCE:
 INTERIOR SPACE 1,400sf
 COVERED LANAI 790sf
 DECK 370sf
 RESIDENCE (TOTAL) 2,560sf

PROPOSED UTILITY SHED/CARPORT: 858sf

WATER TANK AND PUMP HOUSE: 300sf

TOTAL PROPOSED DEVELOPED AREA: 3,718sf



1 SITE PLAN
 1" = 100'-0"

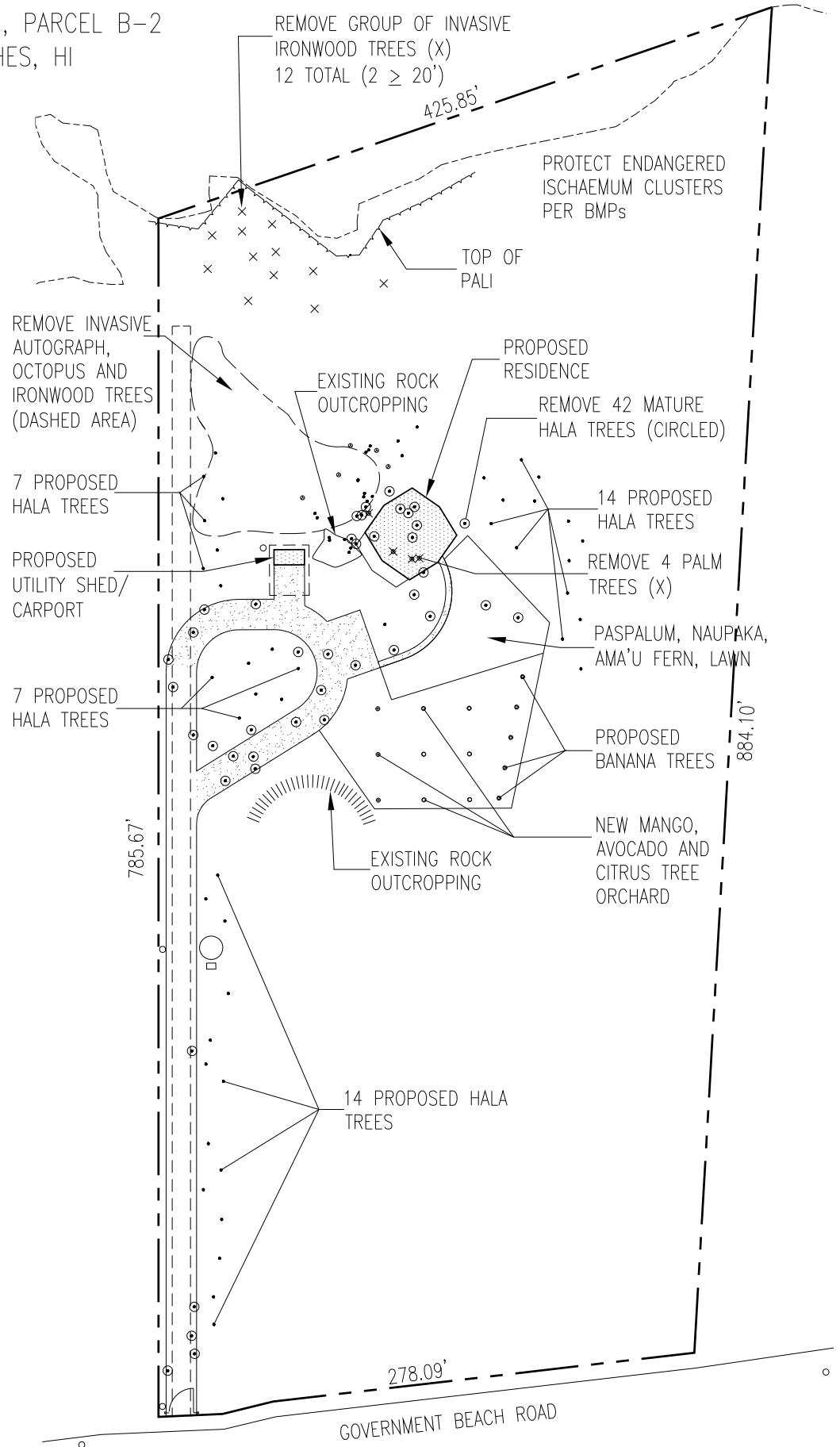


6-24-19

GROSSBARD-BOURZAT RESIDENCE
 SITE ADDRESS: TMK(3) 1-5-009, PARCEL B-2
 KEONEPOKO-IKI, HAWAIIAN BEACHES, HI

PLANT LIST:

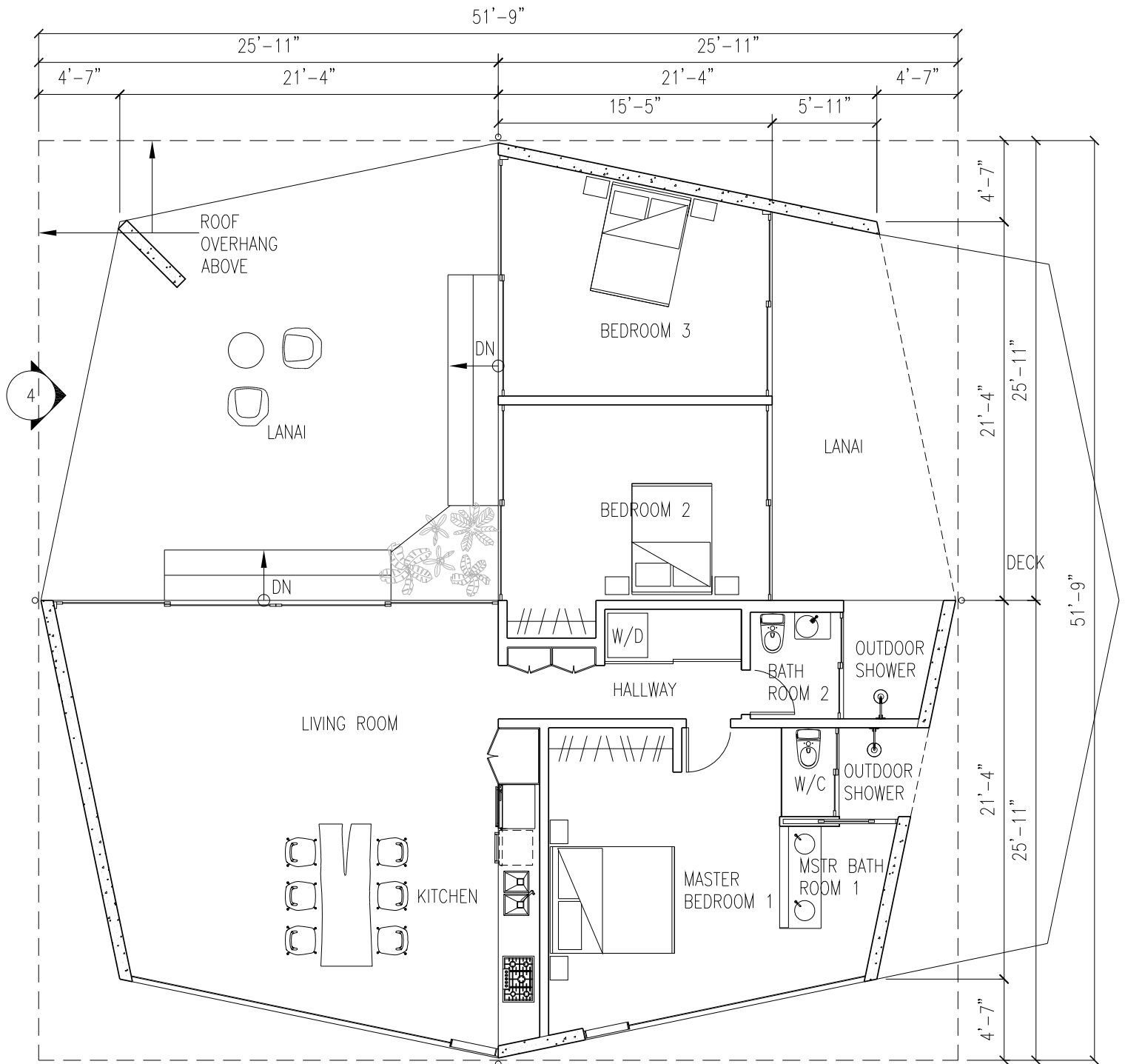
- TREES:
- PALM - TO BE REMOVED 4
 - HALA (*Pandanus tectorius*)
 TO BE REMOVED 42
 PROPOSED 42
 - PROPOSED BANANA
 (*Musa sp.*) 5
 - PROPOSED MANGO
 (*Mangifera indica*) 2
 - PROPOSED CITRUS
 (*Citrus Spp.*) 4
 - PROPOSED AVOCADO
 (*Persea americana*) 3
- SHRUBS:
- NAUPAKA (*Scaevola taccada*)
 - AMA'U FERN (*Sadleria cyatheoides*)
- GRASSES:
- PASPALUM (*Paspalum Sp*)



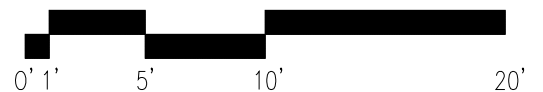
GROSSBARD-BOURZAT RESIDENCE
 SITE ADDRESS: TMK(3) 1-5-009, PARCEL B-2
 KEONEPOKO-IKI, HAWAIIAN BEACHES, HI

RESIDENCE AREA TABULATION:

INTERIOR SPACE	1,400sf
LANAI	790sf
DECK	370sf
RESIDENCE (TOTAL)	2,560sf



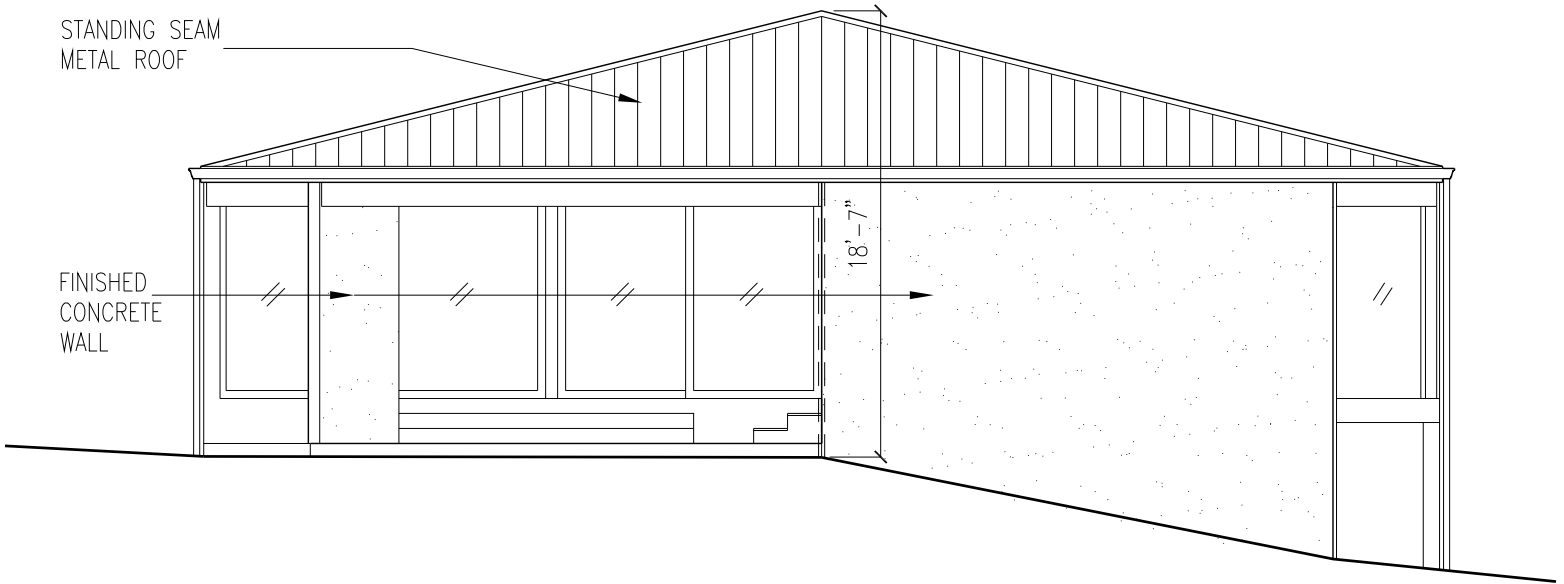
SCALE



3 FLOOR PLAN
 $\frac{1}{8}'' = 1'-0''$



GROSSBARD-BOURZAT RESIDENCE
SITE ADDRESS: TMK(3) 1-5-009, PARCEL B-2
KEONEPOKO-IKI, HAWAIIAN BEACHES, HI



4 PROPOSED RESIDENCE ELEVATION - EAST
 $\frac{1}{8}'' = 1'-0''$



5 PROPOSED RESIDENCE ELEVATION - NORTH
 $\frac{1}{8}'' = 1'-0''$

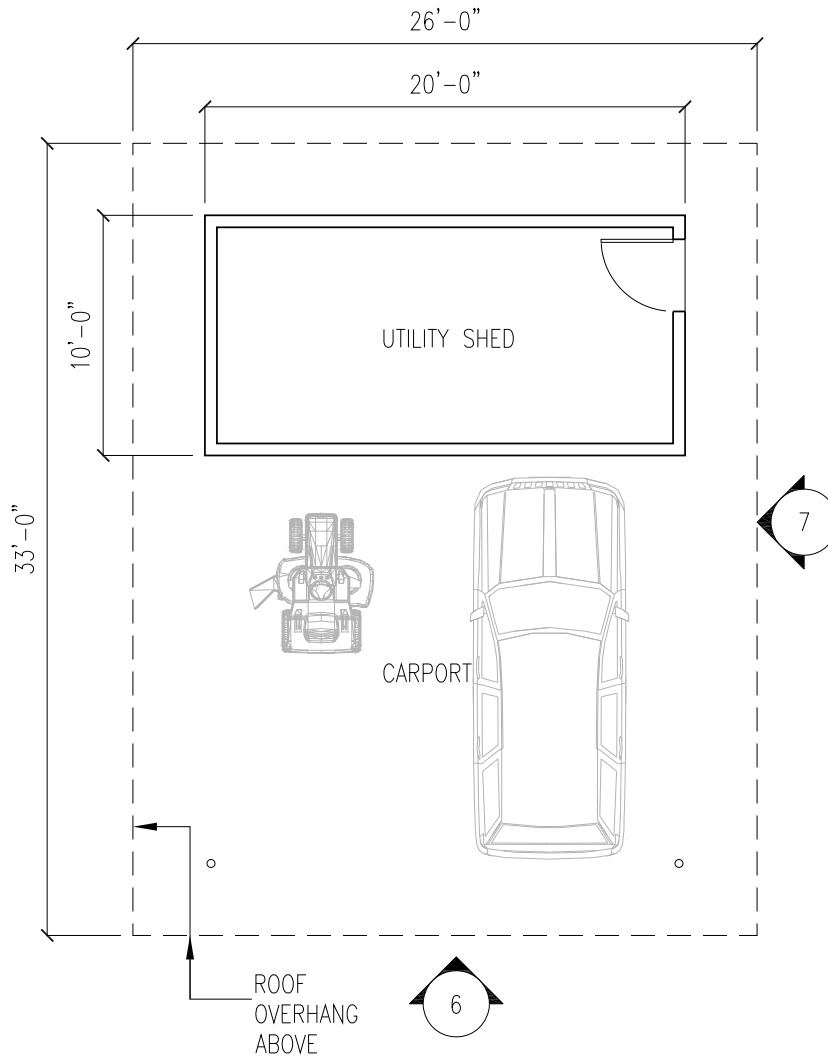


SCALE

GROSSBARD-BOURZAT RESIDENCE
SITE ADDRESS: TMK(3) 1-5-009, PARCEL B-2
KEONEPOKO-IKI, HAWAIIAN BEACHES, HI

UTILITY SHED/CARPORT
AREA TABULATION:

AREA BELOW ROOF: 858sf



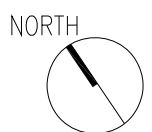
SCALE



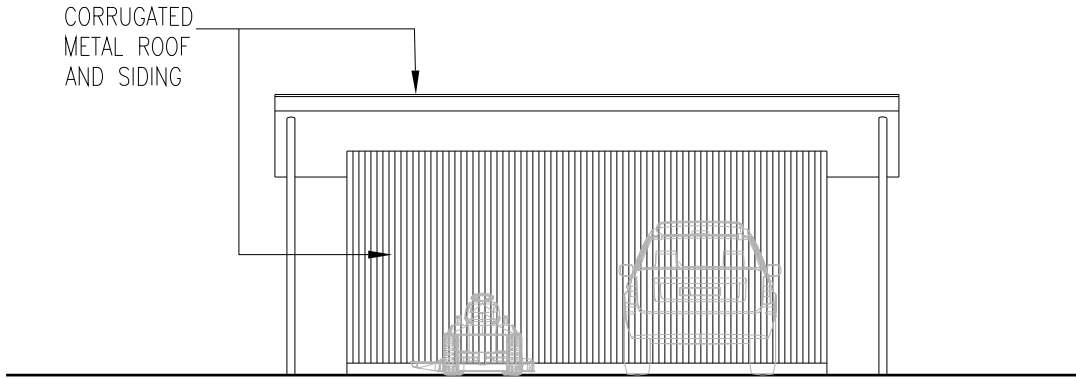
6

FLOOR PLAN - UTILITY SHED/CARPORT

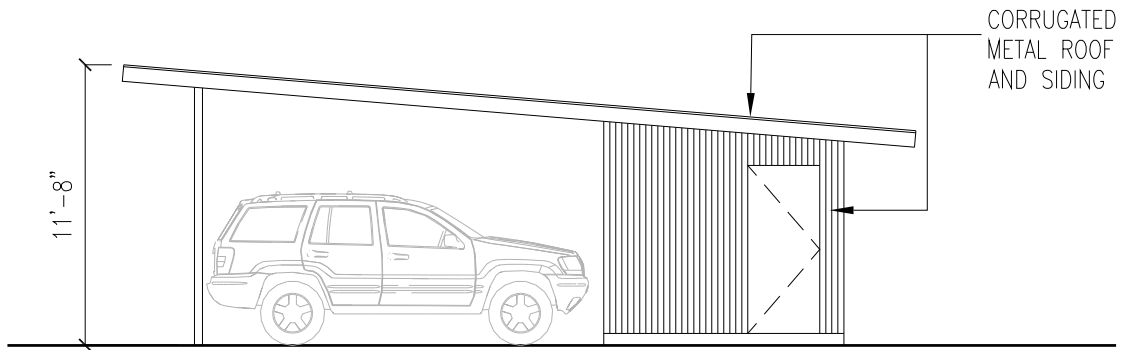
$\frac{1}{8}'' = 1'-0''$



GROSSBARD-BOURZAT RESIDENCE
SITE ADDRESS: TMK(3) 1-5-009, PARCEL B-2
KEONEPOKO-IKI, HAWAIIAN BEACHES, HI



7 UTILITY SHED/CARPORT ELEVATION - SOUTH
 $\frac{1}{8}'' = 1' - 0''$



8 UTILITY SHED/CARPORT ELEVATION - EAST
 $\frac{1}{8}'' = 1' - 0''$



SCALE

At more than 500 feet from the Government Beach Road, the home would not be visible from the road. The home's wide setback from the seacliff and its subtle placement amid vegetation would keep it barely visible from the sea. As with most areas in Puna, the shoreline is used occasionally by local residents to fish and gather. The applicants understand and support the right to traverse and utilize the shoreline area.

1.2 Environmental Assessment Process

This Environmental Assessment (EA) process is being conducted in accordance with Chapter 343 of the Hawai'i Revised Statutes (HRS). This law, along with its implementing regulations, Title 11, Chapter 200, of the Hawai'i Administrative Rules (HAR), is the basis for the environmental impact assessment process in the State of Hawai'i. According to Chapter 343, an EA is prepared to determine impacts associated with an action, to develop mitigation measures for adverse impacts, and to determine whether any of the impacts are significant according to thirteen specific criteria. Part 4 of this document states the anticipated finding that no significant impacts are expected to occur, based on the preliminary findings for each criterion made by the consultant in consultation with the Hawai'i State Department of Land and Natural Resources, the determining agency. If, after considering comments to the Draft EA, DLNR concludes that, as anticipated, no significant impacts would be expected to occur, then the agency will issue a Finding of No Significant Impact (FONSI), and the action will be permitted to proceed to other necessary permits. If the agency concludes that significant impacts are expected to occur as a result of the proposed action, then an Environmental Impact Statement (EIS) will be prepared.

1.3 Public Involvement and Agency Coordination

The following agencies, organizations and individuals have been consulted during the Environmental Assessment Process:

County:

Planning Department	County Council	Civil Defense Agency
Fire Department	Department of Public Works	Police Department
Environmental Management		

State:

Department of Health, Environmental Planning Office
Department of Land and Natural Resource (DLNR), Land Division and OCCL
Office of Hawaiian Affairs

Private:

Sierra Club
Malama O Puna
Three Adjacent Property Owners: Kamai, Dearing and Lum

Copies of communications received during early consultation are contained in Appendix 1a. Notice of the availability of the Draft EA was published in the August 8, 2019 OEQC Environmental Notice. Appendix 1b contains written comments on the Draft EA and the responses to these comments. Various places in the EA have been modified to reflect input received in the comment letters; additional or modified non-procedural text is denoted by double underlines, as in this paragraph.

PART 2: ALTERNATIVES

2.1 Proposed Project, Alternative House Sites and Alternative Uses

The proposed project and its location are described in Section 1.1 above and illustrated in Figures 1-3. The location of the home site, at a minimum of 153 feet from the sea cliff, was chosen in order to enjoy coastal breezes and views on the property and avoid mosquitos. In its inland section, the property is heavily vegetated with primarily non-native trees.

Any number of other locations on the property could also serve as the site for a residence, but none have the advantages of the proposed site in terms of breezes and views, while both avoiding mosquitos and impacts to native shoreline vegetation (which is restricted to a zone mauka of the sea cliff that varies in width from 50 to 125 feet). There is no known environmental or other reason for seriously considering other sites on the property.

No other alternative uses for the property that are identified in the Conservation District Rules as allowable uses in the Conservation District, such as a commercial tourist nature park, are desired by the applicants, and thus none are addressed in this EA.

2.2 No Action

Under the No Action Alternative, the residence would not be built. The lot would remain unused, except for temporary camping and picnicking by the owner. This EA considers the No Action Alternative as the baseline by which to compare environmental effects from the project.

PART 3: ENVIRONMENTAL SETTING, IMPACTS AND MITIGATION

The 6.91-acre property (see Fig. 1 for location) is situated between the Government Beach Road on the south side and the shoreline of the Pacific Ocean on the north side. It is flanked by similarly sized private parcels, one of which contains a newly constructed home and farm. The shoreline in this area is neatly defined by the edge of a 15-foot plus high sea cliff, in front of which is a bare pahoehoe shelf on the west end and by dense naupaka shrub vegetation on ‘a‘ā on most of the eastern side, with scattered boulders throughout. The shoreline is presumed to be just *mauka* of the edge of the sea cliff, where high waves from seasonal storms scour the rocks and prevent vegetation from establishing. *Mauka* of the shoreline the elevation gradually rises and the partly native shoreline vegetation abruptly gives way to mostly weedy vegetation (with the exception of scattered hala) typical of disturbed areas of Puna, (see photos in Figure 2 for each of these zones). U.S. Geological Survey maps and Google Earth images indicate that elevations on the property vary from about 20 to 70 feet above sea level, with the chosen residential site lying at about 40 feet above sea level.

3.1 Physical Environment

3.1.1 Climate, Geology, Soils and Geologic Hazards

Environmental Setting

The property is located on the flank of Kilauea, an active volcano, in the *ahupua‘a* of Keonepoko Iki within the Puna District. This area receives an average of about 120 inches of rain annually, with a mean annual temperature of approximately 75 degrees Fahrenheit (Giambelluca et al 2014; UH Hilo-Geography 1998:57). Guidance to federal agencies for addressing climate change issues in environmental reviews was released in August 2016 by the Council on Environmental Quality (US CEQ 2016). The guidance urged that when addressing climate change, agencies should consider: 1) the potential effects of a proposed action on climate change as indicated by assessing greenhouse gas emissions in a qualitative, or if reasonable, quantitative way; and, 2) the effects of climate change on a proposed action and its environmental impacts. It recommends that agencies consider the short- and long-term effects and benefits in the alternatives and mitigation analysis in terms of climate change effects and resiliency to the effects of a changing climate. Although this guidance has since been withdrawn for political reasons, the State of Hawai‘i in Hawai‘i Revised Statutes §226-109 encourages a similar analysis. It is possible, and even likely, that larger and more frequent tropical storms and even hurricanes will affect the Hawaiian Islands in the future. In addition, as discussed in Section 3.1.2, accelerating sea level rise is expected.

The two lava flows that underlie the project site both erupted sometime between 200 and 750 years ago, according to the general geology map of Kilauea by Moore and Trusdell (1991). Field and photo inspection by geologist Dr. Jack Lockwood (see Appendix 3) have determined that a complex of ‘a‘ā flow lobes that erupted sometime in the interval between 400 and 750 years ago is present on the sea cliff exposure. A single massive flow core and its related breccia dominates the bluff along most of the property frontage. Capping the ‘a‘ā is a “veneer” of younger pāhoehoe. The three small promontories that are present *makai* of the property owe their existence to these younger and more resistant “toes” of the lava flow.

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

Soil in the area is classified as Opihikao highly decomposed plant material. This is a well-drained, thin organic soil developed over pahoehoe bedrock. It is found from sea level to 1,000 feet in elevation and is rapidly permeable, with slow run-off and slight erosion hazard. This soil is within subclass VII_s, which means it has limitations that make it unsuitable for cultivation and restrict its use to pasture, range, woodland or wildlife (U.S. Soil Conservation Service 1973).

The entire Island of Hawai'i is subject to geologic hazards, especially lava flows and earthquakes. Volcanic hazard as assessed by the U.S. Geological Survey in this area of Puna is Zone 3 on a scale of ascending risk 9 to 1 (Heliker 1990:23). The relatively high hazard risk is because Kilauea is an active volcano. Zone 3 includes areas less hazardous than zone 2, which is adjacent to the summit and East Rift Zone (ERZ), because of greater distance from recently active vents and (or) because of topography. One to five percent of zone 3 has been covered since 1800, and 15 to 75 percent has been covered within the past 750 years. The property is within the higher-risk margin of zone 3, only about two miles from the loosely-defined boundary of zone 2. As noted above, the younger lava flow on the property was estimated by geologists to have been emplaced in the early 18th Century. The next lava flow to reach the coastline in this area (2.5 miles to the southeast) was in June 1840. For 150 years no lava flows have threatened this area, until 2014, when lava flows from Kilauea's ERZ entered Pahoehoe and almost crossed the Kea'au-Pahoehoe Highway. These flows stopped six miles upslope from the property, but the coastal area between Hawaiian Paradise Park and Hawaiian Acres could have been impacted had the eruption continued. The lava flows of 2018 devastated homes and farms in the lower elevations of Kilauea's ERZ. Moore and Trusdell's map depicts eleven lava flows that have traveled northeast from the ERZ over the past 1,500 years; seven of these have reached the ocean. Radiometric dating and detailed mapping is inadequate to define quantitative recurrence intervals for eruptive activity on the ERZ, but that limited data does suggest that "on average", lava flows travel northeast from that rift zone once every 140 years or so; flows have reached the coastline about every 200 years. Lava flows that have reached the coast are, however, relatively narrow, so the odds that the Grossbard/Bourzat property will be overrun by lava are relatively low over the expected functional lifetime of the structure.

The Island of Hawai'i experiences high seismic activity and is at risk from major earthquake damage (USGS 2000), especially to structures that are poorly designed or built, as the 6.7-magnitude quake of October 2006 and 6.9 magnitude quake of May 2018 demonstrated. The portion of the property site proposed for improvement is flat to low-sloping. There are appropriate setbacks to surrounding steeper slopes, with a minimum of 153 feet to the 15-foot-plus high sea cliff. There does not appear to be a substantial risk at the site from subsidence, landslides or other forms of mass wasting.

Impacts and Mitigation Measures

In order to deal with the potential for larger and more frequent tropical storms that could be part of a changing climate, the home has been designed to withstand hurricane force winds, and trees with the potential to be fall on the home are planned for removal (particularly nearby ironwood and autograph trees). The implications of climate change for the shoreline setting are dealt with in the next section. In general, geologic conditions do not impose undue constraints on the proposed action, as much of the Puna

District faces similar volcanic and seismic hazard and yet continues to be the fastest growing region of the State. The applicants understand that there are hazards associated with homes in this geologic setting and have made the decision that a residence here is not imprudent to construct or inhabit.

3.1.2 Flood Zones and Shoreline Setting

Floodplain Environmental Setting

Floodplain status for many areas of the island of Hawai‘i has been determined by the Federal Emergency Management Agency (FEMA), which produces the National Flood Insurance Program’s Flood Insurance Rate Maps (FIRM). The flood zones for this region were recently mapped, and digital maps are available from the Department of Land and Natural Resources at <http://gis.hawaiiinfip.org/fhat/> (Figure 4).

Unfortunately, a systematic error in this area of approximately 50-100 feet in the registration of the TMK layer and the Google Earth © layer affects precise interpretation of the map, particularly at flood zone boundaries. In any case, the proposed home building site is classified in Flood Zone X, areas outside the mapped 500-year floodplain, with minimal tsunami inundation.

Floodplain Impacts and Mitigation Measures

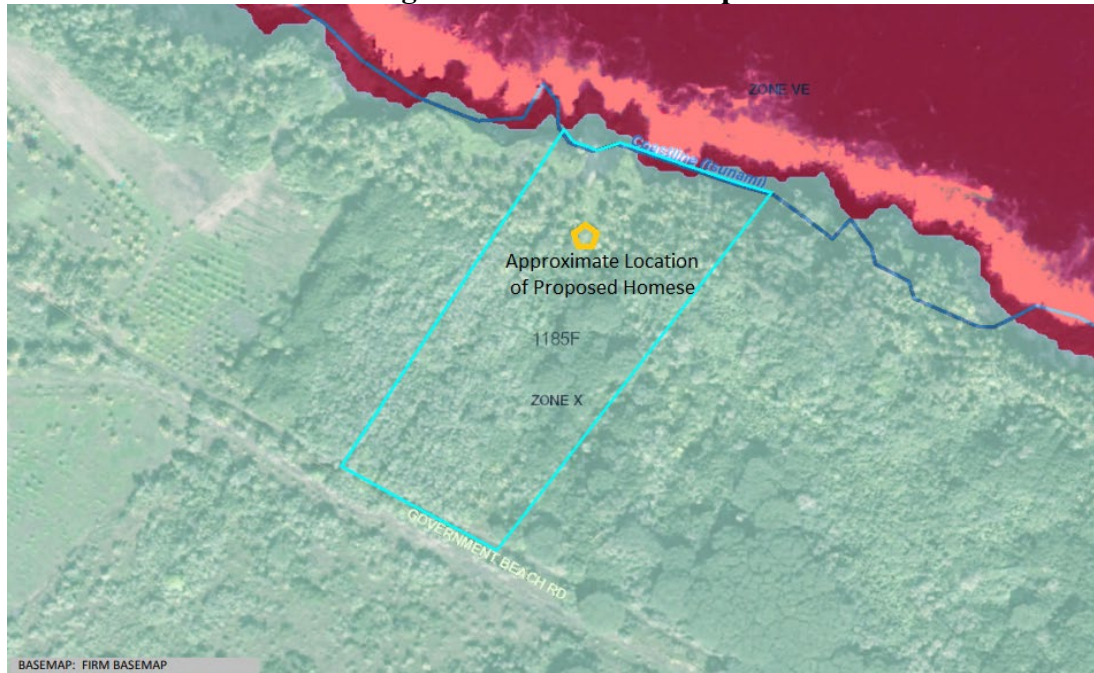
The home site would be located about 40 feet above sea level, 153 feet back from the top of the 15-foot plus high sea cliff, in an area that is clearly out of the flood zone. The proposed site for the residence is also *mauka* of the area affected by high waves. There is no evidence of tsunami inundation in this location, although storm waves of the magnitude generated by Tropical Storm Iselle, which hit the Puna coastline on August 8, 2014, have clearly affected the pahoehoe areas *makai* of the shoreline. Other than mega-tsunami of the type that would inundate all of Hilo and Honolulu, the home site is not at risk of tsunami. The applicants have chosen to locate the home a minimum of 153 feet from the cliff in order to completely avoid wave damage and minimize spray from waves. Furthermore, the very conservative siting of the home in this position at 40 feet above sea level ensures that even if and when sea level rises five or more feet above its current level, the home will likely remain out of the effective flood zone. Extremely large rises in sea level of the type that would essentially require the relocation of much of downtown Hilo and Honolulu may similarly necessitate moving the home back further on the property, which could be done with relative ease because of the 800-foot lot depth.

Coastal Erosion Issues: Background

Property near the shoreline is subject to natural coastal processes including erosion and accretion, which can be affected by human actions such as removal of sand or shoreline hardening. Erosion may adversely affect not only a lot owner’s improvements but also State land and waters, along with the recreational and ecosystem values they support.

Single-Family Residence permitting in Conservation Districts in the State of Hawai‘i is regulated by State of Hawai‘i Administrative Rules governing Conservation Districts (Title 13, Subtitle 1 Chapter 5, adopted August 12, 2011). Applications to permit shoreline residential construction in the Conservation

Figure 4. Flood Zone Map



Flood Hazard Assessment Report

www.hawaiiifip.org

Property Information

COUNTY: HAWAII
 TMK NO: (3) 1-5-009:053
 WATERSHED: KAAHAKINI
 PARCEL ADDRESS: UNKNOWN ADDRESS
 PAHOA, HI 96778

Notes:

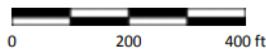


Flood Hazard Information

FIRM INDEX DATE: SEPTEMBER 29, 2017
 LETTER OF MAP CHANGE(S): NONE
 FEMA FIRM PANEL: 1551661185F
 PANEL EFFECTIVE DATE: SEPTEMBER 29, 2017

THIS PROPERTY IS WITHIN A TSUNAMI EVACUATION ZONE: YES
 FOR MORE INFO, VISIT: <http://www.scd.hawaii.gov/>

THIS PROPERTY IS WITHIN A DAM EVACUATION ZONE: NO
 FOR MORE INFO, VISIT: <http://dlnreng.hawaii.gov/dam/>



Disclaimer: The Hawaii Department of Land and Natural Resources (DLNR) assumes no responsibility arising from the use, accuracy, completeness, and timeliness of any information contained in this report. Viewers/Users are responsible for verifying the accuracy of the information and agree to indemnify the DLNR, its officers, and employees from any liability which may arise from its use of its data or information.

If this map has been identified as 'PRELIMINARY', please note that it is being provided for informational purposes and is not to be used for flood insurance rating. Contact your county floodplain manager for flood zone determinations to be used for compliance with local floodplain management regulations.

FLOOD HAZARD ASSESSMENT TOOL LAYER LEGEND (Note: legend does not correspond with NFHL)

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD - The 1% annual chance flood (100-year), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. SFHAs include Zone A, AE, AH, AO, V, and VE. The Base Flood Elevation (BFE) is the water surface elevation of the 1% annual chance flood. Mandatory flood insurance purchase applies in these zones:

	Zone A: No BFE determined.
	Zone AE: BFE determined.
	Zone AH: Flood depths of 1 to 3 feet (usually areas of ponding); BFE determined.
	Zone AO: Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined.
	Zone V: Coastal flood zone with velocity hazard (wave action); no BFE determined.
	Zone VE: Coastal flood zone with velocity hazard (wave action); BFE determined.
	Zone AEF: Floodway areas in Zone AE. The floodway is the channel of stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without increasing the BFE.

NON-SPECIAL FLOOD HAZARD AREA - An area in a low-to-moderate risk flood zone. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

	Zone XS (X shaded): Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
	Zone X: Areas determined to be outside the 0.2% annual chance floodplain.

OTHER FLOOD AREAS

	Zone D: Unstudied areas where flood hazards are undetermined, but flooding is possible. No mandatory flood insurance purchase apply, but coverage is available in participating communities.
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Source: Hawai'i DLNR: <http://gis.hawaiiifip.org/fhat/>

Districts must consider rates of coastal erosion. The State DLNR requires a “Coastal Erosion Study” to provide an estimate of annual erosion rate with any application for which construction is proposed. Such a study integrates on-site quantitative measurements by a credentialed specialist or specialists, inspection of available aerial and satellite imagery taken over a period of time, and a review of relevant geological literature.

A Coastal Erosion Study that also considered other coastal hazards was prepared for the property by Geohazards Consultants International, Inc. The full report is attached as Appendix 4 and summarized below. The reader is referred to the report for additional detailed description, maps and photos.

Sea Level Rise

Because the proposed use of a single-family residence on this coastal property has an expected useful lifetime of 40 to 70 years, it is important to first examine the potential for future sea level rise. In addition to simple inundation, sea level rise also factors into future rates of coastal retreat and erosion.

There is a scientific consensus that the earth is warming due to manmade increases in greenhouse gases in the atmosphere, according to the United Nations’ Intergovernmental Panel on Climate Change (UH Manoa Sea Grant 2014). Global mean air temperatures are projected to increase by at least 2.7°F by the end of the century. This will be accompanied by the warming of ocean waters, expected to be highest in tropical and subtropical seas of the Northern Hemisphere. Wet and dry season contrasts will increase, and wet tropical areas in particular are likely to experience more frequent and extreme precipitation. For Hawai‘i, where warming air temperatures are already quite apparent, not only is the equable climate at risk but also agriculture, ecosystems, the visitor industry and public health.

An overall global rise in sea level of 3.3 feet by the end of the 21st century was proposed by Fletcher (2010) and others. More recent scientific assessments (e.g., Rahmstorf et al 2012) posit 4 feet as a reasonable upper bound. Some recent research that concentrates on the potential for Antarctic melting to contribute more to sea level than generally modeled envisions as much as an additional meter (3.3 feet) of sea level rise (DeConto and Pollard 2016). Not only the magnitude of sea level rise but also the timing is the subject of debate. According to the Hawai‘i Climate Change Mitigation and Adaptation Commission (HCCMAC) (2017:v):

While the IPCC’s “business as usual” scenario, where GHG emissions continue at the current rate of increase, predicts up to 3.2 feet of global sea level rise by year 2100 (IPCC 2014), recent observations and projections suggest that this magnitude of sea level rise could occur as early as year 2060 under more recently published highest-end scenarios...

The HCCMAC report goes on to state that the Island of Hawai‘i is in many senses the least vulnerable of the main Hawaiian Islands to the impacts of sea level rise, but that certain areas – particularly Kona, Puakō, Kapoho and Hilo Bay.....face serious threats. It is estimated that at least 130 existing structures would experience chronic flooding if there were 3.2 feet of sea level rise.”

Relative sea-level rise, of course, is a result of the combined eustatic water rise and land subsidence. In some locations, the effects of eustatic sea level rise can be magnified substantially. The 1975 Kalapana earthquake on Kilauea's rift caused land in Kapoho to drop 0.8 feet (Hwang et al 2007:6). This episodic, seismic-induced subsidence is difficult to anticipate or measure over long periods of time. On the basis of InSAR (Synthetic Aperture Radar Interferometry) remote sensing data, Hwang et al (ibid.) estimated that the coastline at Kapoho may be subsiding at a continuous rate of between 0.31-0.67 in/yr. Rates of subsidence at the Grossbard/Bourzat property are certainly much lower as a result of its distance from Kilauea's tectonically active rift zone, as well as its position on the west side of the rift zone, where land is supported by the bulk of Mauna Loa. A rate in the middle of this estimate, or a little less than 0.5 in/yr., is probably conservative. A highly conservative estimate of overall sea level change by the year 2100, accounting for a eustatic rise of 5 feet and local tectonic sinking of about 3 feet, is 8 feet. The greatest rate of SLR will take place during the second half of this century according to recent modelling (e.g., Cazenave and Le Cozannet 2014).

Coastal Erosion: Physical Setting

As discussed in Section 3.1.1, two lava flows dated between 200 and 750 years bp underlie the property (Moore and Trusdell 1991). A complex of 'a'ā flow lobes that erupted sometime in the interval between 400 and 750 years ago is present on the sea cliff exposure (Figures 5 and 6). A single massive 'a'ā flow core and its related breccia dominate the bluff along most of the property frontage. Capping the 'a'ā is a "veneer" of younger pāhoehoe related. The composition and texture of the substrate can make large differences in susceptibility to erosion. The three small promontories that are present *makai* of the property owe their existence to these younger and more resistant "toes" of the lava flow. The older lava flow consists of friable and unconsolidated 'a'ā, while a more durable pāhoehoe covers that 'a'ā and forms the western promontories. Erosion and weathering of the less resistant 'a'ā has resulted in the prominent cove central on the property. Most of the western shoreline is bordered by large angular blocks of pāhoehoe that have recently (geologically speaking) fallen from the cliff edge. This is particularly noticeable in the farthest western corner, where the younger pāhoehoe flow is up to seven feet thick. In the areas of the small inlets on this side of the property, where wave energy is focused, these blocks have been scoured by the waves, yet they remain at some headlands providing an energy dispersive barrier to direct wave impacts on the cliff face.

The coast of this part of the Puna District faces the open ocean with no barrier of offshore reefs or bars. The submarine slope is approximately 1,300 feet/mile for a distance of roughly 6 miles, descending into the deepwater Puna Canyon. Large waves reaching the coast are predominantly related to trade wind conditions, though the shoreline is also somewhat exposed to North Pacific swells. Field observations of the coastline were taken at various tide levels on the two inspection days in November 2018. The field observations on the November 11 were made during a high tide of 2.5 feet and falling, while the water line on November 1 was rising to the same 2.5 feet above the tidal datum (tidal datum for Hilo, Hilo Bay, and Kuhio Bay, HI -<http://tidesandcurrents.noaa.gov>). The ocean was characterized by moderate swells (3-4 feet), which generated light surf.

Figure 5. Coastal Geology at Property

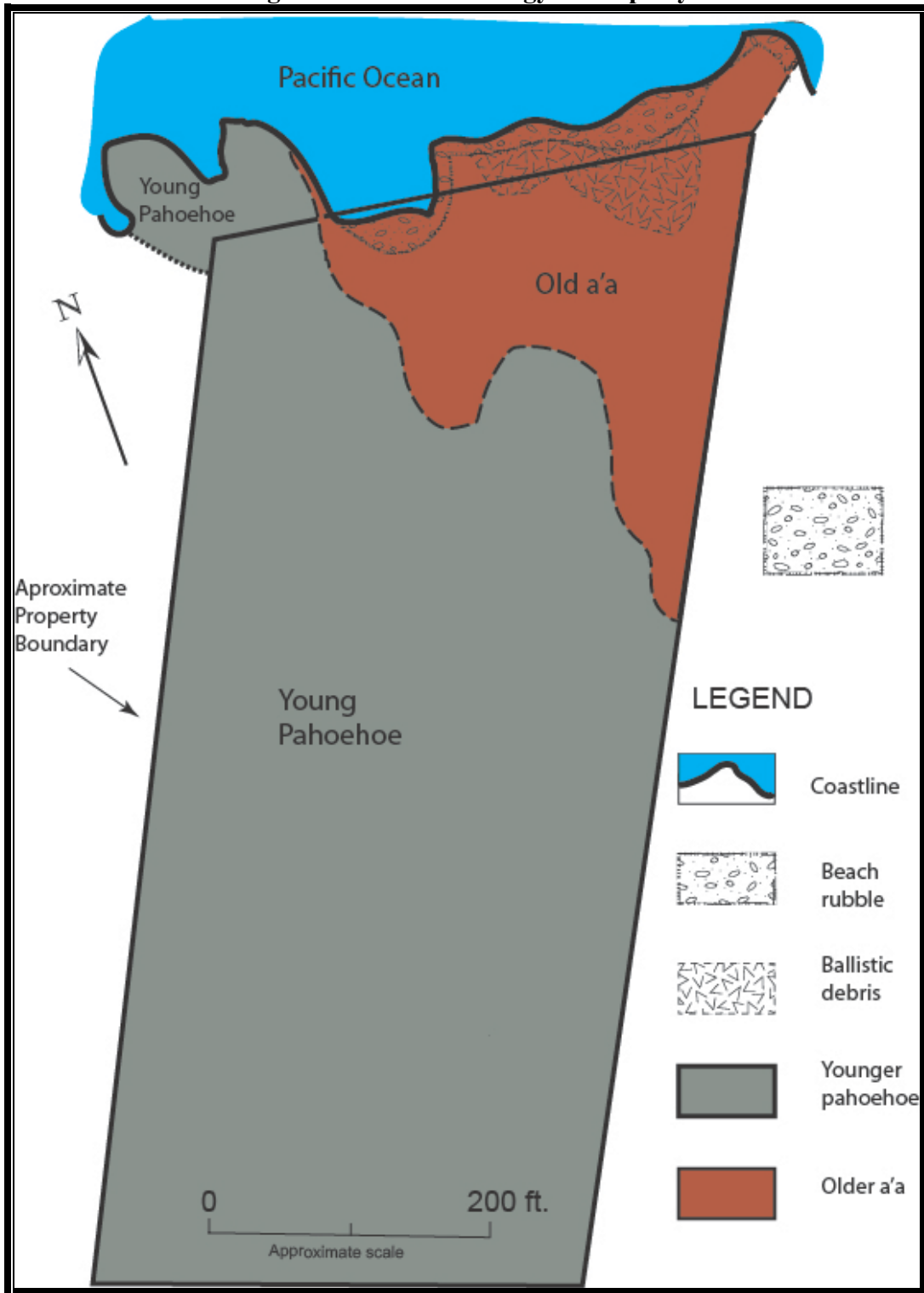


Figure 6. Shoreline Photos



6a, Above: Younger pāhoehoe at western corner of property. 6b, Below: ‘A‘ā at eastern corner.



Coastal Erosion Rate

The shoreline is legally defined in Hawai‘i as “the upper reaches of the wash of the waves, other than storm and seismic waves, at high tide during the season of the year in which the highest wash of the waves occurs, usually evidenced by the edge of vegetation growth, or the upper limit of debris left by the wash of the waves, ...” (HAR §13-5-2). At the time of when the coastal erosion study was conducted, an official shoreline position had not been surveyed or certified, as it was presumed that the applicants’ voluntary setback of 153 feet from the cliff’s edge, which coincides with the edge of vegetation growth, might preclude the need for certification.

Most shoreline studies in Hawai‘i and elsewhere focus on erosion of “soft” coasts, for the obvious reasons that erosion rates are faster (sometimes over 3 feet per year) and thus more observable and consequential for human occupation. Andriati and Walsh (2007) studied the erosion of carbonate (limestone and low-grade marble) hard coast near Bari, Italy, and documented that the finer the crystallinity of the rock, the slower the rate of retreat. They established shoreline shift rates of 0.03-0.3 feet/year – as much as 4 inches/year. Of course, the conditions of the Grossbard/Bourzat property are considerably different – not simply in terms of the relative crystallinity of the rock, but also in its degree of fracturing, marine dynamics, climate, and a host of other factors. Nevertheless, their work reinforces the observation that hard coasts are significantly more resistant to erosion.

The property shoreline is massively rocky and “hard” as opposed to unconsolidated and “soft”, and by nature it resists erosion far more effectively than Hawai‘i’s beaches and bars. Several key processes are at work contributing to erosion of this and all typical hard coasts. Wave energy impacting the cliff loosens masses of rock by compressing air within fractures, while the drag of moving water abrasively grinds smaller fragments at the shore. There is no way to definitively quantify the relative contributions of these processes, though it is reasonable to say that the energy released by wave action is probably the main cause of shoreline retreat at this locality.

Aerial imagery was examined for evidence of major changes in shoreline profile during historic times. The oldest image found was captured in 1954 (#1756 23/35, on 12 November) of the Nanawale coastline. A 1965 photo (6270 EKL12cc-31 on 6 February) was also examined. Both historic airphotos were compared to a 2018 Google Earth image. Careful inspection of available aerial photographs and measurements of shoreline positions relative to internal fixed distances (between roads, e.g.) did not indicate any erosion of the coastline had occurred. However, the scale of the photos and the precision of even digital measurements from them was not conducive to the task. This owes in large part to the large distances between any two fixed points that occur on all the maps used as reference. Any changes were too small or have occurred over too long a period of time to be measured in this way. For instance, when enlarged for analysis each pixel on the 1965 photo was in excess of ten feet. For various reasons, it is doubtful that horizontal changes of less than 10 feet could be documented, although greater changes should be apparent, especially when the morphology of prominent coastal features changes with time.

As an alternative to airphoto analysis, the coastal erosion study also considered the distance with the uppermost pāhoehoe flow has been eroded back since emplacement 200 to 400 years ago. Although the

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

distance eroded is not precisely quantifiable, an imprecise estimate of minimum shoreline retreat rate for protecting future improvements on the property can be obtained by measuring at a right angle to the general coast the length from the furthestmost point (seen at low tide) to the location of shoreline erosion lying farthest inland, then dividing this distance (approximately 130 feet) by the age of the youngest lava making up the bluff (200 to 400 years). While this estimate – 0.325 to 0.65 feet per year – discounts the possibility of erosion having removed land that once extended even farther out to sea than is presently observed (it is nearly certain that it did), it is positively biased because the age of the youngest lava was used and represents a minimum value.

Comparison of estimated erosion rates using the two methods shows the following differences.

METHOD	ESTIMATED EROSION RATE (feet per year)
Topographic interpolation	0.325 – 0.65
Photogrammetric comparison	0.34

Sea level rise can dramatically influence erosion rates in certain environments, particularly “soft” coasts with low elevations. In the case of the subject property, with hard sea cliffs between 15 and 25 feet in height, the coastal erosion study concluded that this factor would be minimal for the expected rate of sea level increase over the next 70 years. For the purposes of determining a reasonable setback in the context of the DLNR formula of 70 times the annual erosion rate (which is a maximum of 0.65 feet) plus 40 feet, the appropriate setback distance from the shoreline would be at least 85.5 feet. The applicants propose that the future home would be set back a minimum of 153 feet from the sea cliff, at an elevation of at least 40 feet above sea level, clearly more conservative than 85.5 feet.

Fletcher et al 2002 Coastal Hazard Assessment of Property

Hwang (2005) recommended that all hazards facing coastal areas should be considered when planning for land-use zoning in Hawai‘i, and not just erosion. In a USGS-sponsored study, Fletcher et al (2002) portrayed generalized hazards assessments for long sections of Hawai‘i’s coastlines; the ratings of the specific hazards for the section of Puna coastline including the property in Table 1. They considered overall hazards along this stretch of coastline as “high”.

Table 1. Natural Hazards Impacting the Coastline Fronting Property

Hazard Type	Relative Threat	Fletcher et al Rating (1-4)
Tsunami	Medium-high	4
Stream Flooding	Medium-high	3
High Waves	Medium-high	4
Storms	Medium-high	3
Erosion	Low	2
Sea Level Change	Medium-high	3
Volcanic/Seismic	High	4
Overall Hazard Assessment	High	5 (on scale of 1-7)

After Fletcher et al 2002, p.150.

Overall Assessment of Coastal Hazard: Impacts and Mitigation Measures

The high, relatively erosion resistant cliff fronting the property protects areas inland of the shoreline from any significant inland migration of the shoreline over the next many decades, and a minimum shoreline setback of at least 85.5 feet would be considered appropriately conservative. An area that has been blanketed by storm-propelled ballistic fragments on the eastern shoreline frontage, to locations as far inland as 125 feet from the shoreline, indicated that a greater setback than dictated by mere coastal erosion might be appropriate on that end of the property. The western coastal margin is not affected by this hazard and is unlikely to be experience flooding or damage from high storm surf or conventional tsunamis, and normal setbacks should apply.

For these reasons, the applicants have chosen to locate their home on the western half of the property, at about 40 feet above sea level, approximately 153 feet *mauka* of the shoreline cliffs. This will situate the residence in a zone that should be safe from damage from coastal hazards for many decades, if not a century, under most future scenarios.

Although a scenario of modest sea level rise and increased tropical storm activity would not likely cause substantial impacts to the integrity or use of the proposed residence, a worst-case scenario involving a sudden onset could have some impact. In this case, the Grossbard/Bourzat property would be among thousands, or perhaps tens of thousands, of impacted properties in what would be the largest disaster to affect the Hawaiian Islands since human settlement. As sea level rise is gradual, there would probably be an opportunity for the owner to consider relocating or scrapping all structures for re-use of its valuable materials should sea level rise sufficiently to endanger the structure.

In order to ensure that public interest in avoiding shoreline modification is guaranteed, the applicants would agree to a CDUP and/or deed condition that would prevent any future request for shoreline hardening to protect the residence, regardless of hardship, and a condition requiring moving or dismantling the home if sea level rise eventually threatens the integrity of the structure.

3.1.3 Water Quality

The house would be set back a minimum of 153 feet from the sea cliff, and no grading activities would occur *makai* of this area. No natural water features such as streams, springs, or anchialine ponds are found on or near the property.

Land clearing and construction activities would occur on an area of less than an acre. The grading work would be limited to the home site and its related spaces for driveway/parking, septic system, water well and construction staging area. Grading will be planned and conducted to balance cut and fill material for the graded area in order to avoid the need to import or export of soils from the site and the owners will require that best management practices be implemented by the contractor to ensure that there is no movement of soil from the site during construction. Related to the trenching required for the septic system and underground water lines, extracted materials (spoils) will be used to refill the trenched areas and to

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

blend the areas with the surrounding topography. No grubbing or grading is planned in the primarily non-native forest that would be utilized for the orchard. Trees and other crops will be planted in individual holes to minimize the need for ground disturbance.

A County grading permit will be required. After actual grading plans are developed, the applicants and engineer will determine whether the area of disturbance is sufficiently large to require a National Pollutant Discharge Elimination System permit. Grading for the driveway and house lot will include practices to minimize the potential for sedimentation, erosion and pollution of coastal waters. The applicants will ensure that their contractor shall perform all earthwork and grading in conformance with:

- (a) “Storm Drainage Standards,” County of Hawai‘i, October, 1970, and as revised.
- (b) Applicable standards and regulations of Chapter 27, “Flood Control,” of the Hawai‘i County Code.
- (c) Applicable standards and regulations of the Federal Emergency Management Agency (FEMA).
- (d) Applicable standards and regulations of Chapter 10, “Erosion and Sedimentation Control,” of the Hawai‘i County Code.
- (e) Conditions of an NPDES permit, if required, and any additional best management practices required by the Board of Land and Natural Resources.

The general shoreline area from Hawaiian Paradise Park to Kapoho already supports hundreds of homes several homes and is also utilized by residents and property owners to park vehicles and fish, and there are no reported water quality problems from these uses. Upon completion and occupation, the home would be similar to the homes on shoreline lots in the area, and it would be not expected to contribute to sedimentation, erosion, and pollution of coastal waters.

3.1.4 Flora and Fauna

Environmental Setting: Flora

Prior to the advent of commercial agriculture, ranching, and lot subdivision, the natural vegetation of this part of the Puna shoreline, with its substrate of geologically recent lava, was mostly coastal forest and strand vegetation. It was dominated by naupaka (*Scaevola taccada*), hala (*Pandanus tectorius*), ‘ōhi‘a (*Metrosideros polymorpha*), nanea (*Vigna marina*) and various ferns, sedges and grasses (Gagne and Cuddihy 1990).

The entire Grossbard/Bourzat property was systematically inspected for plants by Dr. Ron Terry in November 2018. Although there is some disturbance from heavy equipment that roughed in a driveway and other small areas, including a coastal ranch road that crossed the property in the area just *mauka* of the proposed house site, presumably many decades ago, the ground surface of the property appears mostly undisturbed. Shoreline vegetation up to 125 feet in width dominated by naupaka, hala, mau‘u ‘aki‘aki (*Fimbristylis cymosa*), and ‘ae‘ae (*Bacopa monnieri*) is still present and relatively intact at the herb and shrub level. Most significant are the many clusters of *Ischaemum byrone*, a State and federally listed

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

endangered grass known to grow on pahoehoe close the edge of sea cliffs, where salt spray may limit other plants. The grass is known only from the Hilo and Puna Districts of the Big Island. On the property the grass is restricted to a narrow zone within about 75 feet of the cliff, but enough individuals are present to represent a substantial population that is important to conserve. The grass patches are contained in an area of dense naupaka vegetation that protects the grass to a degree, as it is fairly hardy and somewhat resistant to occasional trampling, although fishermen's trails and camping dumps have probably had an impact. Non-native, invasive trees such as ironwood and autograph trees are present, along with the coconut trees, a Polynesian introduction. It should be noted that the coconut palms, especially in the southeastern portion near the coast, are affected by what is thought to be a form of *Fruit and Heart Rot Disease* that is evident in several other portions of Puna. The applicants plan to remove those dead and dying coconut trees and dispose of the tree remnants onsite following the protocols recommended by the State Department of Agriculture as a means of controlling the spread of the palm disease in the area.

In the zone behind the shoreline vegetation the vegetation contains one 'ōhi'a and scattered hala, but otherwise no trace of the original forest. The individual hala trees and small clusters of hala scattered throughout the property could all easily have grown in the last twenty years and do not necessarily represent a remnant of the original forest. This part of the site is dominated by a dozen or so non-native trees (most of them invasive), including ironwood, autograph tree, strawberry guava (*Psidium cattleianum*), common guava (*Psidium guajava*), octopus tree (*Schefflera actinophylla*), cecropia (*Cecropia obtusifolia*), albizia (*Falcataria moluccana*), gunpowder tree (*Trema orientalis*), and mango (*Mangifera indica*) (see Figure 2). Macaranga (*Macaranga mappia*) is especially prominent. Non-native pilau maile (*Paederia foetida*), five-leaf yam (*Dioscorea pentaphylla*) and lilikoi (*Passiflora edulis*) vines heavily festoon the trees. A full list of species detected on the property itself is found in Table 2. All natives found on the property are very common in the region, on the island, and throughout the Hawaiian Islands.

Environmental Setting: Fauna

During several visits in 2018 and 2019, we observed a number of non-native birds, including Japanese white-eyes (*Zosterops japonicus*) – by far the most abundant bird on the property – as well as common mynas (*Acridotheres tristis*), northern cardinals (*Cardinalis cardinalis*), Kalij pheasants (*Lophura leucomelanos*) and spotted doves (*Streptopelia chinensis*). It is unlikely that many native forest birds would be expected to use the project site due to its low elevation, alien vegetation and lack of adequate forest resources. However, it is not inconceivable that Hawai'i 'amakihi (*Hemignathus virens*) are sometimes present, as some populations of this native honeycreeper appear to have adapted to the mosquito borne diseases of the Hawaiian lowlands. Common shorebirds such as Pacific golden-plover (*Pluvialis fulva*), ruddy turnstone (*Arenaria interpres*), and wandering tattler (*Heteroscelus incanus*) are often seen on the Puna coastline feeding on shoreline resources. Of these, only the Pacific golden-plover was observed during the site visits. The seabird black noddy (*Anous minutus melanogenys*) was observed flying near the cliffs and over the nearshore waters, as it frequently does in cliffed coasts of the main Hawaiian Islands. It nests in crevices and caves in lava (especially pahoehoe) sea cliffs; no black noddy nests were observed on the cliffs in front of the property.

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

Table 2. Plant Species Observed on Property

Scientific Name	Family	Common Name	Life Form	Status*
<i>Andropogon virginicus</i>	Poaceae	Broomsedge	Herb	A
<i>Araucaria columnaris</i>	Araucariaceae	Cook Pine	Tree	A
<i>Asplenium nidus</i>	Aspleniaceae	'Ekaha	Fern	I
<i>Axonopus compressus</i>	Poaceae	Wide-leafed Carpet Grass	Grass	A
<i>Bacopa monnieri</i>	Plantaginaceae	'Ae'ae	Herb	I
<i>Begonia sp.</i>	Begoniaceae	Begonia	Herb	A
<i>Casuarina equisetifolia</i>	Casuarinaceae	Ironwood	Tree	A
<i>Cecropia obtusifolia</i>	Cecropiaceae	Cecropia	Tree	A
<i>Cenchrus purpureus</i>	Poaceae	Napier Grass	Herb	A
<i>Centella asiatica</i>	Apiaceae	Asiatic Pennywort	Herb	A
<i>Chamaecrista nictitans</i>	Fabaceae	Partridge Pea	Herb	A
<i>Chamaesyce hirta</i>	Euphorbiaceae	Garden Spurge	Herb	A
<i>Christella dentata</i>	Thelypteridaceae	Cyclosorus	Fern	A
<i>Clidemia hirta</i>	Melastomataceae	Koster's Curse	Herb	A
<i>Clusia rosea</i>	Clusiaceae	Autograph Tree	Tree	A
<i>Cocos nucifera</i>	Arecaceae	Niu	Tree	PI
<i>Cordyline fruticosa</i>	Agavaceae	Ti	Shrub	A
<i>Crotalaria sp.</i>	Fabaceae	Rattlepod	Herb	A
<i>Cynodon dactylon</i>	Poaceae	Bermuda Grass	Grass	A
<i>Cyperus halpan</i>	Cyperaceae	Cyperus	Sedge	A
<i>Cyperus polystachyos</i>	Cyperaceae	Pycreus	Herb	I
<i>Cyrtomium falcatum</i>	Dryopteridaceae	Holly Fern	Fern	A
<i>Desmodium tortuosum</i>	Fabaceae	Florida Beggarweed	Herb	A
<i>Desmodium triflorum</i>	Fabaceae	Tick Clover	Herb	A
<i>Digitaria ciliaris</i>	Poaceae	Digitaria	Herb	A
<i>Dioscorea sp.</i>	Dioscoreaceae	Bitter Yam	Vine	PI
<i>Dissotis rotundifolia</i>	Melastomataceae	Dissotis	Herb	A
<i>Drymaria cordata</i>	Caryophyllaceae	Drymaria	Herb	A
<i>Eleusine indica</i>	Poaceae	Goose Grass	Grass	A
<i>Epipremnum pinnatum</i>	Araceae	Pothos	Vine	A
<i>Falcataria moluccana</i>	Fabaceae	Albizia	Tree	A
<i>Ficus microcarpa</i>	Moraceae	Banyan	Tree	A
<i>Fimbristylis cymosa</i>	Cyperaceae	Mau'u 'Aki'aki	Herb	I
<i>Fimbristylis dichotoma</i>	Cyperaceae	Fimbristylis	Herb	I
<i>Ischaemum byrone</i>	Poaceae	Hilo Ischaemum	Herb	END
<i>Kadua corymbosa</i>	Rubiaceae	Hedyotis	Herb	A
<i>Kyllinga brevifolia</i>	Cyperaceae	Kyllinga	Herb	A
<i>Lepisorus thunbergianus</i>	Polypodiaceae	Pakahakaha	Fern	I
<i>Macaranga mapp</i>	Euphorbiaceae	Macaranga	Shrub	A
<i>Mangifera indica</i>	Anacardiaceae	Mango	Tree	A
<i>Megathyrsus maximus</i>	Poaceae	Guinea Grass	Grass	A

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

Table 2, continued				
Scientific Name	Family	Common Name	Life Form	Status*
<i>Melaleuca quinquenervia</i>	Myrtaceae	Paperbark Tree	Tree	A
<i>Melochia umbellata</i>	Sterculiaceae	Melochia	Tree	A
<i>Metrosideros polymorpha</i>	Myrtaceae	‘Ōhi‘a	Tree	E
<i>Mimosa pudica</i>	Fabaceae	Sleeping Grass	Herb	A
<i>Nephrolepis cordifolia</i>	Nephrolepidaceae	Sword Fern	Fern	I
<i>Nephrolepis multiflora</i>	Nephrolepidaceae	Sword Fern	Fern	A
<i>Oplismenus hirtellus</i>	Poaceae	Basketgrass	Herb	A
<i>Oxalis corniculata</i>	Oxalidaceae	Yellow Wood Sorrel	Herb	I
<i>Paederia scandens</i>	Rubiaceae	Maile Pilau	Vine	A
<i>Pandanus tectorius</i>	Pandanaceae	Hala	Tree	I
<i>Paspalum conjugatum</i>	Poaceae	Hilo Grass	Herb	A
<i>Paspalum urvillei</i>	Poaceae	Paspalum	Herb	A
<i>Passiflora edulis</i>	Passifloraceae	Passion Fruit	Vine	A
<i>Persea americana</i>	Lauraceae	Avocado	Tree	A
<i>Phymatosorus grossus</i>	Polypodiaceae	Lau‘e	Fern	A
<i>Polygala paniculata</i>	Polygalaceae	Milkwort	Herb	A
<i>Psidium cattleianum</i>	Myrtaceae	Strawberry Guava	Tree	A
<i>Psidium guajava</i>	Myrtaceae	Guava	Tree	A
<i>Sacciolepis indica</i>	Poaceae	Glenwood Grass	Herb	A
<i>Sadleria cyatheoides</i>	Blechnaceae	Ama‘u	Fern	E
<i>Scaevola taccada</i>	Goodeniaceae	Beach Naupaka	Shrub	I
<i>Schefflera actinophylla</i>	Araliaceae	Octopus Tree	Tree	A
<i>Scleria testacea</i>	Cyperaceae	Scleria	Herb	I
<i>Sida rhombifolia</i>	Malvaceae	Broom Weed	Herb	A
<i>Spathoglottis plicata</i>	Orchidaceae	Philippine Ground Orchid	Herb	A
<i>Spermacoce sp.</i>	Rubiaceae	Spermacoce	Herb	A
<i>Sphagneticola trilobata</i>	Asteraceae	Wedelia	Shrub	A
<i>Sporobolus africanus</i>	Poaceae	Smutgrass	Herb	A
<i>Stachytarpheta jamaicensis</i>	Verbenaceae	Jamaican Vervain	Herb	A
<i>Terminalia catappa</i>	Combretaceae	False Kamani	Tree	A
<i>Thunbergia fragrans</i>	Acanthaceae	White Thunbergia	Vine	A
<i>Tournefortia argentea</i>	Boraginaceae	Tree heliotrope	Tree	A
<i>Trema orientalis</i>	Ulmaceae	Gunpowder Tree	Tree	A
<i>Zingiber zerumbet</i>	Zingiberaceae	‘Awapuhi	Herb	PI

A=Alien E=Endemic I=Indigenous END=Federal and State Listed Endangered

As with all of East Hawai‘i, several endangered native terrestrial vertebrates may be present in the general area and may overfly, roost, nest, or utilize resources of the property. These include the endangered Hawaiian hawk (*Buteo solitarius*), the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), the endangered Hawaiian petrel (*Pterodroma sandwichensis*), the endangered band-rumped storm petrel (*Oceanodroma castro*), and the threatened Newell’s shearwater (*Puffinus auricularis newelli*).

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

Mammals other than the bat in the project area are all introduced species, including feral cats (*Felis catus*), feral pigs (*Sus scrofa*), small Indian mongooses (*Herpestes a. auro punctatus*) and various species of rats (*Rattus* spp.). Several species of non-native reptiles and amphibians may also be present. None are of conservation concern and all are deleterious to native flora and fauna.

The coastal and marine fauna and flora are typical of the high-energy coasts of Puna, which are young ecosystems with limited coral growth but a variety of algae, fish and invertebrates. Marine mammals and reptiles, some of them endangered, also visit the Puna coastal waters.

Impacts and Mitigation Measures

The property is dominated by alien vegetation, with the only sensitive ecosystem being the shoreline vegetation, where common native plants are present as well as numerous clumps of the endangered grass *Ischaemum byrone*. Development completely avoids the shoreline area. A number of ironwoods and autograph trees will be removed or trimmed, which while improving sight lines will also remove a threat to the native vegetation. Because of the location of the project relative to sensitive vegetation and species, construction and use of the home is not likely to have adverse biological impacts. It is likely that under the care of the applicants the shoreline area will be more protected than it is now. The applicants have been made aware of the need to avoid disturbing the endangered grass during construction and thereafter, and the following Best Management Practices will be instituted in the shoreline area during construction:

1. The *mauka* boundary of shoreline vegetation will be demarcated with orange construction fencing to prevent inadvertent intrusion of equipment, materials, and personnel.
2. A biologist will install green flagging tape that indicates “safe” paths to the ironwood trees planned for removal. No access will be allowed outside these paths during construction or tree removal.
3. The biologist will encircle clusters of *Ischaemum byrone* near the ironwood trees to be removed with yellow caution tape to ensure they are not trampled or affected by tree removal.
4. All fencing and flagging will be removed at the end of construction and tree removal.

As for hala, the largest concentration is within the *makai* half of the property. Although the trees were not systematically counted, more than 500 mature hala trees are likely present throughout the property, even though it rarely dominates any given area. The home site and orchard areas were chosen to limit the number of hala removed, but 42 mature hala trees, as well as many juveniles, will require removal or trimming to accommodate the home and associated features. In the context of the large number of existing hala on the property and in the region, the protection for hala in all areas other than those directly disturbed, the plan to foster additional hala in the orchard area and elsewhere, adjacent to the driveway, and other areas (see Figure 3, Landscape Plan), and the tendency for hala to readily regrow, no adverse impact to hala populations will take place. The removal of some of the existing ironwoods and autograph trees in the shoreline area may allow some native species to re-establish, including hala. In sum, because of the location and nature of the project relative to sensitive vegetation and species, construction and use of the single-family residence is not likely to cause adverse impacts to native flora or vegetation.

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

The precautions for preventing effects to water quality during construction listed above in Sections 3.1.1 and 3.1.6 will reduce adverse impact on aquatic biological resources in coastal waters to negligible levels.

In order to avoid impacts to the endangered but regionally widespread terrestrial vertebrates listed above, the applicants will commit to certain precautionary conditions that are proposed for the CDUP.

Construction will refrain from activities that disturb or remove shrubs or trees taller than 15 feet between June 1 and September 15, when Hawaiian hoary bats may be sensitive to disturbance. Furthermore, if landclearing occurs between the months of March and September, inclusive, a pre-construction hawk nest search by a qualified ornithologist using standard methods will be conducted. If Hawaiian hawk nests are present, no land clearing will be allowed until October, when hawk nestlings will have fledged. Finally, the applicants agree to shield any exterior lighting from shining upward, in conformance with Hawai'i County Code § 14 – 50 et seq., to minimize the potential for disorientation of seabirds.

3.1.5 Air Quality, Noise, and Scenic Resources

Environmental Setting

Air quality in the area is generally excellent, due to its rural nature and minimal degree of human activity, although vog from Kilauea volcano is occasionally blown into this part of Puna when this volcano is erupting. What noise occurs on the site is derived from natural sources (such as surf, birds and wind) and is generally very low due to the rural nature of the area.

The area shares the quality of scenic beauty along with most of the Puna coastline. The County of Hawai'i General Plan contains Goals, Policies and Standards intended to preserve areas of natural beauty and scenic vistas from encroachment. The General Plan discusses the black sand beaches and tidal ponds as noted features of natural beauty in Puna, but among specific examples of natural beauty does not identify any features or views in the *ahupua'a* of Keonepoko Iki, in Plat 1-5-009, or any other location near the project site. Shoreline views from the Government Beach Road are completely blocked by over 700 feet thick of existing heavy vegetation.

Impacts and Mitigation Measures

The project would not affect air quality or noise levels in any substantial ways. Brief and minor adverse effects would occur during construction. However, there are virtually no sensitive noise receptors in the vicinity – with no houses or other structures within 200 feet of the property boundary, and 500 feet of the proposed home site. Given the small scale and short duration of any noise impacts, coupled with the lack of sensitive receptors, noise mitigation would not be necessary.

Because all grading and construction would occur, at the closest, 153 feet from the sea cliff, and over 300 feet from the *mauka* edge of the property, with dense intervening vegetation on all sides, construction and occupation of the single-family residence would have virtually no visual impacts.

3.1.6 Hazardous Substances, Toxic Waste and Hazardous Conditions

Based on onsite inspection and the lack of any known former and current uses on the property, it appears that the site contains no hazardous or toxic substances and exhibits no other hazardous conditions. In addition to the measures related to water quality detailed in Section 3.1.3, in order to ensure to minimize the possibility for spills of hazardous materials, the applicants propose the following:

- Unused materials and excess fill will be disposed of at an authorized waste disposal site.
- During construction, emergency spill treatment, storage, and disposal of all hazardous materials, will be explicitly required to meet all State and County requirements, and the contractor will adhere to “Good Housekeeping” for all appropriate substances, with the following instructions:
 - Onsite storage of the minimum practical quantity of hazardous materials necessary to complete the job;
 - Fuel storage and use will be conducted to prevent leaks, spills or fires;
 - Products will be kept in their original containers unless unresealable, and original labels and safety data will be retained;
 - Disposal of surplus will follow manufacturer’s recommendation and all regulations;
 - Manufacturers’ instructions for proper use and disposal will be strictly followed;
 - Regular inspection by contractor to ensure proper use and disposal;
 - Onsite vehicles and machinery will be monitored for leaks and receive regular maintenance to minimize leakage;
 - Construction materials, petroleum products, wastes, debris, and landscaping substances (herbicides, pesticides, and fertilizers) will be prevented from blowing, falling, flowing, washing or leaching into the ocean
 - All spills will be cleaned up immediately after discovery, using proper materials that will be properly disposed of;
 - Should spills occur, the spill prevention plan will be adjusted to include measures to prevent spills from re-occurring and for modified clean-up procedures.

3.2 Socioeconomic and Cultural

3.2.1 Land Use, Socioeconomic Characteristics and Recreation

Existing Environment

Because of the gradual occupation of lots developed during widespread land subdivision about sixty years ago, the Puna District has been the Big Island’s fastest-growing district over the last forty years. The basis of the economy of Puna has evolved from cattle ranching and sugar to diversified agriculture, various services for the growing populations, commuting to Hilo, and tourism, which has been stimulated by being home to Kilauea, one of the world’s most active volcanoes. Population as measured in the 2010 U.S. Census was 45,326, a 66 percent increase over the 2000 count of 27,232. Despite a lack of basic infrastructure such as paved roads and water in most subdivisions, the relatively inexpensive lots, which typically range in size from one to three acres, have attracted residents from the U.S. mainland and other

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

parts of the State of Hawai‘i who seek affordable property. Some Puna subdivisions between Pahoa and Hilo (including Hawaiian Beaches and Hawaiian Shores, both near the project site), are now partially bedroom communities for Hilo’s workforce, as evidenced by the heavy flow of Hilo-bound traffic during the AM rush hour. Even with disastrous lava flows of 2018, which destroyed more than 700 homes and saw many residents permanently leave the district, new residents continue to flock in and houses are constantly in construction, especially in the less hazardous areas outside and on the Hilo-side of Kilauea’s East Rift Zone.

The Grossbard/Bourzat property is bordered by the shoreline to the north, by the Government Beach Road to the south by a vacant lot to the west, and by a single-family residence and farm on a similarly sized lot to the east. Across Government Beach Road is a farm property, and along the road in both directions are lightly used farms and cattle pastures on the *mauka* side and scattered single-family residences on the *makai* side.

Puna experiences a high demand for coastal recreation, especially in calmer shorelines areas near populations centers. Despite the long coastline, there are few beaches in Puna, and none in the vicinity of the project site. In most locations in Puna, ocean recreation consists primarily of fishing from the cliffs. There is relatively little use of the rough and irregular shoreline in this area. Maps of public accesses produced by the County of Hawai‘i do not indicate any nearby official *mauka-makai* shoreline public accesses from the Government Beach Road (<http://www.hawaiicounty.gov/pl-shoreline-access-big-island>). However, from informal access trails that connect the Government Beach Road to the shoreline, fisherman and *opihi* pickers access fishing and gathering spots all along the coast. The property does not have an official or unofficial shoreline trail either above or below the sea cliff. The area below the cliff is topographically difficult and no continuous access is possible. The pahoehoe and ‘a‘ā *mauka* of the sea cliff is somewhat walkable and is occasionally used by fishermen who are traversing the coast looking for ulua fishing spots or *opihi* gathering areas, including the lava promontories *makai* of the western end of the property (see photos in Figure 6).

Impacts and Mitigation Measures

No adverse socioeconomic impacts are expected to result from the project. The project will have a very small positive economic impact for the County of Hawai‘i. The residence and associated improvements will not adversely impact recreation, as access along the shoreline will not be affected. The proposed home will not interfere with this continuing use. The applicants have been informed of the rights of the public to utilize these areas and the cultural and subsistence importance of these practices, and they expect that conditions ensuring continued public access along the front of the property will be codified within the Conservation District Use Permit to make the access requirement explicit.

3.2.2 Cultural and Historic Resources

An archaeological assessment survey and a cultural impact assessment were prepared for the property and are attached as Appendices 2 and 3, respectively. Research for this report included primary fieldwork, consultation of archaeological and ethnographical studies and primary documents including maps and Mahele testimony, and consultation of informants. In the interest of readability, the summary below does

not include all scholarly references; readers interested in extended discussion and sources may consult these appendices. Separately, the Office of Hawaiian Affairs, the Puna County Council representative, the Sierra Club, Malama O Puna and three neighbors were also consulted as part of the EA to determine whether they had any information on natural or cultural resources that might be present or affected, and additional research on cultural resources and impacts was conducted.

Historical and Cultural Background

The first inhabitants of Hawai‘i were believed to be settlers who had undertaken difficult voyages across the open ocean. For many years, researchers have proposed that early Polynesian settlement voyages between Kahiki (the ancestral homelands of the Hawaiian gods and people) and Hawai‘i were underway by A. D. 300, although recent work suggests that Polynesians may not have arrived in Hawai‘i until at least A. D. 1000 (Kirch 2012).

The initial inhabitants of Hawai‘i are believed to have come from the southern Marquesas Islands and settled initially on the windward side, eventually expanding to leeward areas. Early Hawaiian farmers developed new strategies and tools for their new environment (Kirch 2012; Pogue 1978). Societal order was maintained by their traditional philosophies and by the conical clan principle of genealogical seniority (Kirch 2012). Universal Polynesian customs brought from their homeland included the observance of major gods *Kane*, *Ku*, and *Lono*; the *kapu* system of law and order; cities of refuge, various beliefs, and the concepts of *mana* and the *‘aumakua* (Fornander 1969).

The Development Period, believed under Kirch’s new concept to have occurred from A. D. 1100 to 1350, brought an evolution of traditional tools, including a variation of the adze (*ko‘i*), and some new Hawaiian inventions such as the two-piece fishhook and the octopus-lure breadloaf sinker. That was followed by the Expansion Period (A. D. 1350 to 1650) which saw greater social stratification, intensive land modification, and population growth. This period was also the setting for the second major migration to Hawai‘i, this time from Tahiti. Also established during this period was the *ahupua‘a*, a land-use concept that incorporated all of the eco-zones from the mountains to the shore and beyond. The usually wedge-shaped *ahupua‘a* provided a diverse subsistence resource base (Hommon 1986) and added another component to what was already becoming a well-stratified society (Kirch 2012).

As population grew during the following centuries so did the reach of inland cultivation in the upland environmental zones and consequent political and social stresses. During the Proto-Historic Period (A. D. 1650-1795), wars reflective of a complex and competitive social environment are evidenced by *heiau* building. During this period, sometime during the reign of Kalaniopu‘u (A. D. 1736-1758), Kamehameha I was born in North Kohala.

Ahupua‘a were ruled by *ali‘i ‘ai ahupua‘a* or lesser chiefs and managed by a *konohiki*. *Ali‘i* and *maka‘ainana*, or commoners, were not confined to the boundaries of *ahupua‘a* as resources were shared when a need was identified. *Ahupua‘a* were further divided into smaller sections such as *‘ili*, *mo‘o‘aina*, *pauku‘aina*, *kihapai*, *koele*, *hakuone* and *kuakua*. The chiefs of these land units have their allegiance to a territorial chief or *mo‘i* (literally translated as king) (Hommon 1986). The Grossbard/Bourzat property is

located within the *ahupua'a* of Keonepoko Iki, which translates literally as “the short sand [little]” (Pūku‘i et al. 1974), in the traditional *moku-o-loko* or district of Puna, which comprises some fifty *ahupua'a* on the eastern/windward shores of Hawai‘i Island. As Keonepoko Iki encompasses *mauka* agricultural and forest resources and *makai* fisheries, residents were once able to procure nearly all that they needed to sustain their families and contribute to the larger community from within the land division.

The Pre-Western contact population of the Puna District lived in small settlements along the coast where they subsisted on marine resources and agricultural products. As McGregor stated in reference to the lava flows that periodically alter the district, “Puna is where new land is created and new growth and new life sprout. The new land is sacred, fresh, clean, and untouched. After vegetation begins to grow upon it, it is ready for human use.” (2007:145). The villages of Puna, McEldowney notes, were similar to those of the Hilo District, and they:

...comprised the same complex of huts, gardens, windbreaking shrubs, and utilized groves, although the form and overall size of each appear to differ. The major differences between this portion of the coast and Hilo occurred in the type of agriculture practiced and structural forms reflecting the uneven nature of the young terrain. Platforms and walls were built to include and abut outcrops, crevices were filled and paved for burials, and the large numbers of loose surface stones were arranged into terraces. To supplement the limited and often spotty deposits of soil, mounds were built of gathered soil, mulch, sorted sizes of stones, and in many circumstances, from burnt brush and surrounding the gardens. Although all major cultigens appear to have been present in these gardens, sweet potatoes, ti (*Cordyline terminalis*), noni (*Morinda citrifolia*), and gourds (*Lagenaria siceraria*) seem to have been more conspicuous. Breadfruit, pandanus, and mountain apple (*Eugenia malaccensis*) were the more significant components of the groves that grew in more disjunct patterns than those in Hilo Bay (McEldowney 1979:17).

Located along the coast, the property falls within the Coastal Settlement Zone (Zone I) as modeled by McEldowney (1979:15-18), where families often lived clustered around sheltered bays (McEldowney 1979). In their refinement of the model as it applies to Puna, Burtchard and Moblo (1994) elaborate on McEldowney’s concept of the Coastal Settlement Zone:

As with her model, [the Coastal Settlement Zone] includes coastal terrain to about one-half mile inland. This is the zone expected to have the greatest density and variety of prehistoric surface features in the general study area. Primary settlements are expected in places where agriculturally productive sediments (principally well-weathered ‘*a’ā* flows) co-occur with sheltered embayments and productive fisheries. Settlements within this zone are expected to be logistically linked to inland agricultural and forest exploitation zones accessed through a network of upslope-downslope (*Mauka-makai*) trails. Larger settlements and resource acquisition areas may have been connected by cross-terrain trail networks (1994:26).

In addition to the agricultural resources listed above, the barrenness of surrounding lava flows was not a limiting factor for the cultivation of sweet-potato or ‘*uala*, which requires practically no soil to flourish. Its propagation is discussed in detail by many nineteenth and early twentieth century visitors to the

district, who describe seeing the *'uala* growing from mounds of lava stones. In the following passage, published under the title "Hawaii-Nei" in *Harper's Magazine*, Charles Nordhoff (1873a:382-402) described the vegetation of Puna and mention early commercial coffee production in the district. Nordhoff also provided observations of the narrow coastal trail "across unceasing beds of lava" that "was actually hammered down to make it smooth enough for travel" in some places (1873a:401). According to Nordhoff, "most of the lava is probably very ancient, though some is quite recent, and ferns and guava bushes and other scanty herbage grow through it" (ibid.). Nordhoff's narrative continued:

...after a descent to the sea-shore, you are rewarded with the pleasant sight of groves of cocoa-nuts and umbrageous arbors of pandanus, and occasionally with a patch of green. Almost the whole of the Puna coast is waterless...

It will surprise you to find people living among the lava, making potato patches in it, planting coffee and some fruit trees in it, fencing in their small holdings, even, with lava blocks. Very little soil is needed to give vegetation a chance in a rainy season, and the decomposed lava makes a rich earth. But, except the cocoa-nut, which grows on the beach, and seems to draw its sustenance from the waves, and the sweet-potato, which does very well among the lava, nothing seems really to thrive. (ibid.).

In another installment titled "Hawaii-Nei-II", Nordhoff (1873b:544-559) wrote of the lack of fresh water in Puna and how Dr. Coan had told him about how Native Hawaiians collected freshwater for his use during his missionary tour "from the drippings of dew in caves" (1873b:550). For, "wells are here out of the question, for there is no soil except a little decomposed lava, and the lava lets through all the water which comes from rains" compounded by the lack of mountain streams (ibid.). Nordhoff also presented the following observations of the communities in Puna as well as traditional sweet potato planting methods:

There are no fields, according to our meaning of the word. Yet formerly the people in this district were numbered by thousands: even yet there is a considerable population, not unprosperous by any means. Churches and schools are as frequent as in the best part of New England. Yet when I asked a native to show me his sweet-potato patch he took me to the most curious and barren-looking collection of lava you can imagine, surrounded too, by a very formidable wall made of lava, and explained to me that by digging holes in the lava where it was a little decayed, carrying a handful of earth to each of these holes, and planting there in a wet season, he got a very satisfactory crop. Not only that, but being desirous of something more than a bare living, this man had planted a little coffee in the same way, and had just sold 1600 pounds, his last crop. (ibid.)

Although *'uala* was cultivated widely, Handy et al said that it did not appear to have been a staple food of Puna, a district "most famous for its breadfruit" (1991:190). Handy opined:

. . . Despite the fact that sweet potatoes were planted almost universally and many patches are still maintained, the Puna natives seem to regard this vegetable with little interest, probably because

Puna people prided themselves upon and relished their breadfruit, and also because potato was nowhere and at no time the staple for this rainswept district. (1940:165)

Breadfruit (*'ulu*) was a *kinolau* (physical manifestation) of the goddess Haumea, the “patron of childbirth,” and the principal staple food of Puna, where it was most famous (Beckwith 1970:283; Handy et al. 1991). Careful and gentle propagation was required, which entailed the removal and replanting of the root sucker cutting while ensuring it remained within its original, undisturbed soil casing. With respect to *'ulu* as a sustainable food source, Handy et al. explained that, “except in Puna, Hawaii, breadfruit was wholly secondary to taro and sweet potato as a staple. I am told that in Puna in a good year, breadfruit may be eaten for 8 months of the year, beginning with May “(1991:152).

Although *'ulu* appears to have been the preferred source of sustenance for residents of Puna, taro (*kalo*) rivaled it as a staple food source. Puna’s lack of flowing streams made growing wetland *kalo* impossible. Despite this freshwater stream deficit, Puna received plentiful rainfall throughout the year, which made the cultivation of dryland *kalo* possible, even along the coast as far north as Hilo (Handy 1940). Handy et al. related that, “the wet and sometimes marshy pandanus forests from Kapoho through Poho-iki to ‘Opihikao used to be planted with taro in places” (1991:541). The method of planting dryland taro in the lowland forests of Puna is described by Handy et al. as the “*pa-hala* (pandanus clearing) method” (1991:104) and was advantageous for it did not require the constant weeding necessitated in better soils. The *Pa-hala* planting process is as follows:

Make holes in the *'a'a* (broken lava) by taking out some of the stones. Be sure that the place chosen is in a *pu hala* grove, to save the labor of hauling *hala* branches into the patch later on. Fill the hole with whatever weeds can be found and leave them there for six weeks or more. The weeds will rot and make soil. When the weeds have rotted away, the taro *huli* are wrapped in *lau hala* (*hala* leaves) to keep them moist and are planted. When three or four leaves have appeared on each *huli*, then that is the time to cut down the *pu hala* to let in the sun. The branches of the *hala* are cut off and the patch covered with them until this is not a trace of the taro to be seen. This is left until sufficiently dry to set on fire. The fire does not hurt the taro much as the *huli* are already well rooted. The *hala* reduced to ashes, give the taro the needed nourishment and they grow so tall that a man can be hidden under their leaves (Handy et al. 1991:104–105).

Hala was valued for its fragrance and harvested for more utilitarian purposes. The inhabitants of Puna were recognized for their skilled *lauhala* (*hala* leaf) weaving. The dried leaves were used to plait *lauhala* mats for thatching onto house rafters and walls in a method typically employed in Puna and the neighboring district of Hilo in the absence of *pili* grass. Plaited *lauhala* was also used for pillows, fans, floor coverings, canoe sails, baskets, and occasionally as clothing (Handy et al. 1991). According to Fornander (1918-1919), two styles of *lauhala* mats were associated with Puna; the *makali'i*, a braided, small-stranded mat, and the *puahala* or *hīnano*, made from the male pandanus blossom. The latter was highly valued, and “...is only made in Puna where the *hala* tree is very abundant. It is a regular article of trade among the natives who greatly prize it as a choice mat to sleep on” (Summers 1999:17). *Hala* had many other significant uses and came to be identified with the people of Puna.

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

In addition to *hala*, *kalo*, *‘ulu*, and *ti* mentioned above, other crops such as coconut (*niu*) and *‘awa* were cultivated in Puna. *Niu* thrived in coastal Puna and is frequently mentioned in historical accounts. With respect to varieties, Handy et al. (1991) list only two: the *niu hiwa* (particularly used for ceremony, medicine, and cooking), and the *niu lelo* (used primarily for nonreligious purposes). Water from the *niu* was palatable and flavorful. It could also be utilized on a spiritual level by priests practicing divination. The raw meat was edible and could be scraped out of the shell with a large *‘opihi* to be eaten as is or incorporated into the preparation of various sweets including *haupia* (*haukō*), *kūlolo*, and *pi‘epi‘e ‘ulu*. Besides being utilized for human consumption, coconut meat could also be used to feed animals.

Puna was a region famed in legendary history for its associations with the goddess Pele and god Kāne. Because of the relatively young geological history and persistent volcanic activity, the region has a strong association with Pele. However, the connection to Kāne is perhaps more ancient. Kāne, ancestor to both chiefs and commoners, is the god of sunlight, fresh water, verdant growth, and forests. It is said that before Pele migrated to Hawai‘i from Kahiki, Puna was esteemed the most beautiful place in the islands by many. Contributing to that beauty were the groves of fragrant *hala* and forests of *‘ōhi‘a lehua* for which Puna was famous. The inhabitants of Puna were likewise famous for their expertise and skill in *lauhala* weaving.

Many *‘ōlelo no ‘eau* (traditional sayings) speak of Puna, and most mention the land – which could at any time be covered in steaming lava left in Pele’s furious wake – and the air, which was sweetly scented with the heavenly fragrances of *hala*, *maile*, and *lehua* blossoms. The following *‘ōlelo no ‘eau* are from Mary Kawena Pūku‘i (1983):

Ka makani hali ‘ala o Puna.

The fragrance-bearing wind of Puna

Puna, Hawai‘i, was famed for the fragrance of *maile*, *lehua*, and *hala*. It was said that when the wind blew from the land, fishermen at sea could smell the fragrance of these leaves and flowers. (p. 158)

Ke one lau‘ena a Kāne.

The rich, fertile land of Kāne.

Puna, Hawai‘i, was said to have been a beautiful, fertile land loved by the god Kāne. Pele came from Kahiki and changed it into a land of lava beds, cinder, and rock. (p.191)

The fragrant breezes of Puna were also celebrated in Hawaiian *mele* (songs). One such *mele*, *Ke Ha‘a Lā Puna i ka Makani*, accompanied the very first recorded *hula* of the Pele and Hi‘iaka saga (Kanahale and Wise 1989). A tale of jealousy and spite is recounted in the legend *Hopoe the Dancing Stone*, published by Westervelt (1916). Pele called upon each of her sisters to fetch her dream lover Lohi‘au from Kaua‘i. Knowing Pele’s tempestuous temper, each feared possible repercussions and refused to go. After being denied by all but one sister, Pele rumbled her home, the volcano, sending out burning smoke and vapors, impatiently beckoning her very last option. Hi‘iaka did so, leaving behind her dear friend Hōpoe, a skilled and graceful hula dancer, and had spent much time teaching Hi‘iaka old Hawaiian hula until she became exceptional herself. Before Hi‘iaka could return, Pele’s impatient fury caused her to shake the earth with

great ferocity and heaved her lava in a torrent of devastation, annihilating Hi‘iaka’s ‘ōhi‘a lehua forest, obliterating all of Puna, and finally cornering Hōpoe as she lingered by the sea:

Hōpoe was the last object of Pele’s anger at her younger sister, but there was no escape. The slow torrent of lava surrounded the beach where Hōpoe waited death. She placed the garlands Hiiaka had loved over her head and shoulders. She wore the finest skirt she had woven from lauhala leaves. She looked out over the death-dealing seas into which she could not flee, and then began the dance of death. (Westervelt 1916:94)

In her death, Hōpoe was transformed. She was rebirthed as a stone, carefully balanced alongside the sea where she could continue her graceful dance throughout the centuries when touched by the soft breeze or the rumbling of the earth. And Hi‘iaka, her heart bitter with her sister’s betrayal, brought Lohi‘au back to Pele, faithfully as she swore she would.

Many other stories, chants and songs deal with legendary events in Puna that still bring meaning to the landscape today. Some of them dealt with ‘aumakua, which are certain animals, trees, flowers, insects, and natural phenomena who were half god and half human and communicated through mediums, possessed by their spirits. Of special significance are ‘aumakua manō (shark deities) who are frequently venerated in Hawai‘i.

A traditional *mo‘olelo* (story), “The Heart Stirring Story of Ka-Miki” (*Kaao Hooniua Puuwai no Ka-Miki*), originally appeared in *Ka Hoku o Hawai‘i* (a Hawaiian language newspaper) between 1914 and 1917. The story tells of two supernatural brothers, Ka-Miki and Maka-‘iole, who were skilled ‘ōlohe (competitors/fighters) and their travels around Hawai‘i Island by way of the ancient trails and paths (*ala loa* and *ala hele*), seeking competition with other ‘ōlohe. Among several tales involving Puna, during an expedition through the uplands, Ka-Miki and Maka-‘iole encountered a man named Pōhakuloa who was intensely working on a large *koa* log. They were headed to Kea‘au but had lost their way. They stopped and asked Pōhakuloa for directions, but he was startled by the unexpected appearance of the brothers and replied impolitely. Taunts were exchanged between the two parties, which led to a physical altercation. It was at this point, that Pōhakuloa realized that these two men were extraordinarily skilled as well as spiritually protected, and he admitted his defeat. Pōhakuloa wished to prepare a meal and drink of ‘awa with his newfound friends, and solicited the help of his brother in law, an ‘ōlohe chief named Kapu‘euhi. However, Kapu‘euhi had plans of his own. He intended to compete with and conquer the brothers but was defeated by them instead. Kapu‘euhi was infuriated by his defeat, and by Pōhakuloa’s refusal to aid in retaliation against Ka-Miki and Maka-‘iole.

Kapu‘euhi invited the brothers back to his house to partake in a meal and a particularly potent type of ‘awa, scheming to get them drunk. Unbeknownst to Ka-Miki and Maka-‘iole, this was common practice for Kapu‘euhi, who often housed weary travelers, intoxicated them with ‘awa, then killed them and stole their belongings. Kapu‘euhi waged a bet with the brothers; if they couldn’t drink five cups of the ‘awa, then he would throw them out and they would be at the mercy of the Puna forest. Ka-Miki and Maka-‘iole agreed and counteracted his bet with one of their own; if they were able to drink five cups, they would throw Kapu‘euhi out of his own house. The brothers prayed and chanted to their ancestral goddess and

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

were able to consume the entire quantity of *‘awa* without getting drunk. As agreed upon, Kapu‘euhi was thrown out. Stunned, and angered that he was thwarted once again, Kapu‘euhi requested assistance from Kaniahiku (a much feared Puna *‘olohe* and forest guardian) and her grandson Keahialaka. “At that time, Keahialaka was under the guardianship of Pānau and Kaimū, and he enjoyed the ocean waters from Nānāwale to Kaunaloa, Puna” (*Ka Hoku o Hawai‘i* October 28, 1915; translated by Maly 1998:20), which Maly suggests is symbolic of controlling those regions.

Together, Kapu‘euhi and Kaniahiku conspired to lead the brothers deep into the Puna forest, where Kaniahiku would be able to murder them, all the while maintaining the façade that they were taking them to the *‘awa* grove of Mauānuikananuha. Once Ka-Miki and Ka-‘iole were well within the domain of Kaniahiku, she created a dark and murky environment, spreading gloomy mists and an overgrowth of twisted vegetation intended to ensnare the brothers. Ka-Miki and Maka‘iole were overcome, and left for dead by Kapu‘euhi, who made his way back to safety, led by Kaniahiku’s sister. They prayed to their ancestor, Ka-uluhe-nui-hihi-kolo-i-uka for help. All at once, her presence became apparent, and the brothers were able to continue on to the *‘awa* grove. Another attempt by Kaniahiku to kill the brothers was made, however, Ka-uluhe’s protection over them was too strong, and she failed (Maly 1998).

In the legend of Ka-Miki, the land of Keonepokoiki was named for an *‘olohe* master of Puna, who was the *mokomoko* (rough hand fighting) instructor of the chief Pu‘ula (Maly 1992). According to the story Keonepokoiki was a traditional training grounds for *‘olohe* of Puna, were masters skilled in hand to hand combat and other martial arts techniques. In the story Ka-Miki quickly defeats the Puna master, Keonepokoiki in an *‘olohe* contest. Ka-Miki then threatened to kill Keonepokoiki, who seeing that there was no one who could defeat Ka-Miki, gave his complete surrender and returned to his home. According to the story, Keonepokoiki lived on the upland side of the *alaloa* (the around the island coastal trail). At his compound was an altar dedicated to his gods (Maly 1992).

Traditional life in Hawai‘i took a sharp turn on January 18, 1778 with the arrival of British Capt. James Cook in the islands. On a return trip to Hawai‘i ten months later, Kamehameha visited Cook aboard his ship the *Resolution* off the east coast of Maui and helped Cook navigate his way to Hawai‘i Island. Cook exchanged gifts with Kalaniopu‘u at Kealakekua Bay the following January and left Hawai‘i in February. However, Cook’s ship then sustained damage to a mast in a severe storm off Kohala and returned to Kealakekua, setting the stage for his death on the shores of the bay.

During the Proto-Historic Period there was a continuation of the trend toward intensification of agriculture, *ali‘i*-controlled aquaculture, settling of upland areas and development of traditional oral history. The *Ku* cult, *luakini heiau* and the *kapu* system were at their peaks, but the influence of western civilization was being felt in the introduction of trade for profit and a market-system economy. By 1810, the sandalwood trade established by Europeans and Americans twenty years earlier was flourishing. That contributed to the breakdown of the traditional subsistence system, as farmers and fishermen were required to toil at logging, which resulted in food shortages and a decline in population.

The rampant sandalwood trade resulted in the first Hawaiian national debt, as promissory notes and levies granted by American traders were enforced by American warships. The assimilation of western ways

continued with the short-lived whaling industry to the production of sugarcane, which was more lucrative but carried a heavy environmental price.

Following the death of Kamehameha I in 1819, the customary relaxing of *kapu* took place. But with the introduction of Christianity shortly thereafter, his successor, Kamehameha II, renounced the traditional religion and ordered that *heiau* structures either be destroyed or left to deteriorate. The family worship of *'aumakua* images was allowed to continue.

In 1823, British missionary William Ellis and members of the American Board of Commissioners for Foreign Missions (ABCFM) toured the island of Hawai'i scouting communities in which to establish church centers for the growing Calvinist mission. Ellis recorded observations made during this tour in a journal (Ellis 2004). His writings contain descriptions of residences and practices elsewhere in Puna that are applicable to the general study area:

The population in this part of Puna, though somewhat numerous, did not appear to possess the means of subsistence in any great variety or abundance; and we have often been surprised to find desolate coasts more thickly inhabited than some of the fertile tracts in the interior; a circumstance we can only account for, by supposing that the facilities which the former afford for fishing, induce the natives to prefer them as places of abode; for they find that where the coast is low, the adjacent water is usually shallow.

We saw several fowls and a few hogs here, but a tolerable number of dogs, and quantities of dried salt fish, principally albacores and bonitos. This latter article, with their *poē* [*poi*] and sweet potatoes, constitutes nearly the entire support of the inhabitants, not only in this vicinity, but on the sea coasts of the north and south parts of the island.

Besides what is reserved for their own subsistence, they cure large quantities as an article of commerce, which they exchange for the vegetable productions of Hilo and Mamakua [*Hāmākua*], or the mamake and other tapas of Ora [*'Ōla'a*] and the more fertile districts of Hawaii.

Ellis and the ABCFM missionaries travelled along the coast of Kauwai, Wa'awa'a, and Nānāwale Ahupua'a and then turned *mauka* toward a village in Honolulu Ahupua'a (Ellis 2004:294). On August 8, 1823, the Ellis and the missionaries left Honolulu and visited the village of Waiakahiula to the southeast of the project site. Ellis' journal provides a brief first-hand description of the village's location relative to the coast:

We arose early on the 8th, and Mr. Thurston held morning worship with the friendly people of the place [Honolulu]. Although I had been much indisposed through the night, we left Honoruru soon after six a.m. and, travelling slowly towards the sea-shore, reached Waiakeheula about eight, where I was obliged to stop, and lie down under the shade of a canoe-house near the shore. Messrs. Thurston and Bishop walked up to the settlement about half a mile inland, where the former preached to the people... (Ellis 2004:295).

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

After preaching, Bishop continued on alone toward Waiakea, while Thurston returned to fetch Ellis from the canoe shed. Upon reaching the village, Ellis found its residences to be interspersed among the agricultural fields rather than in a single, nucleated settlement:

The country was populous, but the houses stood singly, or in small clusters, generally on the plantations, which were scattered over the whole country. Grass and herbage were abundant, vegetation in many places luxuriant, and the soil, though shallow, was light and fertile. (Ellis 2004:296)

A year after Ellis' visit, in 1824, the ABCFM established a base church in Hilo. From that church (Haili), the missionaries traveled to the more remote areas of the Hilo and Puna Districts. David Lyman, who came to Hawai'i in 1832, and Titus Coan, who arrived in 1835, were two of the most influential Congregational missionaries in Puna and Hilo. As part of their duties they conducted a census of the areas within their missions. In 1835, 4,800 individuals were recorded as residing in the district of Puna; the smallest total district population on the island of Hawai'i. In 1841, Titus Coan stated that most of the 4,371 recorded residents of Puna lived near the shore, though hundreds also lived inland.

In 1835, the United States Exploring Expedition under the direction of Commander Charles Wilkes, toured Hawai'i Island and travelled through the Puna District. Wilkes produced a map of Puna, which illustrates the coastal trail but shows only a large "Pandanus Forest" covering the lands *mauka* of the Grossbard/Bourzat property (see Figure 20 of Appendix 3). Wilkes described the trail between Hilo and Nānāwale (Nanavalie) as follows:

In some places they have taken great pains to secure a good road or walking path; thus, there is a part of the road from Nanavalie to Hilo which is built of pieces of lava, about four feet high and three feet wide on the top; but not withstanding this, the road is exceedingly fatiguing to the stranger, as the lumps are so arranged that he is obliged to take a long and short step alternately; but this the natives do not seem to mind, and they pass over the road with great facility, even when heavy laden...(Wilkes 1845, Vol. IV:188-193).

The *Mahele 'Aina* took place in 1848, placing all land in Hawai'i into three categories: Crown Lands, Government Lands and Konohiki Lands. Ownership rights were "subject to the rights of the native tenants," or those individuals who lived on the land and worked it for their subsistence and for their chiefs. Native tenants of the lands that were divided up among the Crown, Konohiki, and Government could claim, and acquire title to, *kuleana* parcels that they actively lived on or farmed. In the *Māhele*, Keonepoko Ahupua'a (assumed to be Keonepoko Nui, but not specified) was returned by Lunalilo and retained as Government Land (Soehren 2005). Keonepoko Iki Ahupua'a is not listed in the *Māhele* Book, but it too became Government Land, as did Ka'ohē Ahupua'a (returned by Ulumaheihē) adjacent to the southeastern coastal boundary of Keonepoko Iki. Ka'ohē was claimed by Ulumaheihē as portion of LCAw. 5207H, a claim that was not awarded. The boundary between Ka'ohē and Keonepoko Iki is not precisely known anymore. The Grossbard/Bourzat property is located in Keonepoko Iki Ahupua'a near its

indefinite boundary with Ka'ohē Ahupua'a. No claims were made for *kuleana* within either Keonepoko Iki or Ka'ohē ahupua'a during the *Māhele* (Waihona 'Āina database).

In conjunction with the *Māhele* 'Āina of 1848, the King authorized the issuance of Royal Patent Grants to applicants for tracts of land, larger than those generally available through the Land Commission. The process for applications was clarified by the "Enabling Act," which was ratified on August 6, 1850. The Act resolved that portions of the Government Lands established during the *Māhele* should be set aside and sold as grants. The stated goal of this program was to enable native tenants, many of whom were not awarded *kuleana* parcels during the *Māhele*, to purchase lands of their own. Despite this goal, many of the Government Lands were eventually sold or leased to foreigners. The Grossbard/Bourzat property is a portion of a 277.8-acre grant parcel purchased by Kekoa in 1855 as Grant No. 1533. The record is silent regarding Kekoa's use of the grant lands. Around the time that Grant 1533 was sold, Puna's population had suffered a sharp decline. Within a quarter of a century, Puna's population declined by more than half, from 4,800 in 1835 to 2,158 in 1860 (Anderson 1865). In 1868 volcanic activity emanating from Mauna Loa volcano devastated Hawai'i Island with lava flows, earthquakes and a tsunami. This transformed the landscape of the southern part of island forever, and further contributed to the depopulation of the District of Puna. Even with this disaster, however, transportation infrastructure in the project area continued to improve in order to serve the growing commercial sugar, timber and coffee operations in Puna. The Puna District population fell further to a mere 1,043 in 1878, and it reached an unsurpassed low of 944 persons by 1884 (Thrum 1885 and 1886).

Post-*Māhele* historical accounts of Puna were mostly authored by visitors to the Hawaiian Islands and generally take the form of travelogues. These writings demonstrate a considerable transformation from the almost exclusive traditional native subsistence strategies discussed in earlier chronicles to a new way of life. As discussed in Appendix 3, such accounts include those of famous travelers Mark Twain and Isabella Bird, as well as lesser known authors such as Henry Whitney, George Chaney and John Roy Musick. Many mention the Government Beach Road, which evolved from earlier trail routes and was under construction as a true road by the 1840s. The road remained the preferred route of travel between Hilo and the outlying areas of Puna until 1895, when the Kea'au-Pāhoa Road (now Highway 130) was established to access the growing inland population centers and agricultural areas (Maly 1999:6). A small settlement at Maku'u reached after traveling through miles of hala groves is frequently mentioned.

By 1900 Puna was on the verge of major economic growth, spurred by the sugar and lumber industries. The rise and fall of these industries can be traced along the rusted railroad tracks that litter the landscape *mauka* of the study area. In 1899, the 'Ōla'a Sugar Company began operating in the Kea'au area. The directors of the company realized early that the lack of cargo transportation facilities would hinder their success. As a result, they organized the Hilo Railroad Company and, on April 8, 1899, were granted a 50-year charter (Best 1978). The railroad's infrastructure developed quickly. Rail service to 'Ōla'a (Kea'au) from Hilo began on June 18, 1900. Puna Sugar Company, located near the village of Kapoho, had been organized within the Puna District on March 2 of that same year. Puna Sugar had cane fields scattered all over lower Puna from Kapoho to Pāhoa Town itself.

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

Coastal Keonepoko Iki's thin, sticky, acidic soils, however, did not allow sugar cane cultivation. The scattered geography of suitable agricultural lands in Puna hindered the growth of the sugar industry. As with 'Ōla'a Sugar's early Kea'au operations, the lack of a reliable transportation system made it expensive to collect and transport the cane from the scattered fields to the mill. So, when Hilo Railroad proposed to lay four miles of track from Kapoho to Pāhoa, the Puna Sugar Company paid for half the cost. By March 1, 1902, the Hilo Railroad was making regular stops at the 'Ōla'a Sugar Mill, the town of Pāhoa, and in lower Puna. By 1905 the harvests of the Puna Sugar Co. were being ground at the 'Ōla'a Mill, and the Puna Sugar Co. was operating as a division of the 'Ōla'a Sugar Co. (Dorrance and Morgan 2000). The railroad in this area lasted until 1948.

The route of the railroad across Keonepoko Iki ca. 1903, *mauka* of the Grossbard/Bourzat property, appears on Hawai'i Registered Map No. 2258 (see Figure 17 of Appendix 3). On that map a "Section House" and a "Switch" at Pāhoa Junction are shown in Keonepoko Iki Ahupua'a, *mauka* of the study area. Two "Old Trails" are shown extending *makai* from near the section house to the coast (and a short distance *mauka* as well). One of the trails terminates at the coast of Keonepoko Iki to the northwest of the property.

Lumber also became a big business in Pāhoa for a little over a decade. Although the lumber industry did not last, the roots of the town of Pāhoa were established during this period.

The *makai* lands of Keonepoko Iki (and neighboring Government Lands) became part of the Shipman Ranch during the early twentieth century. W.H. Shipman, Ltd. held a lease for roughly 7,400 acres of Keonepoko Nui and Keonepoko Iki (General Lease No. 1025) at an annual rental of \$300.00. The lease actually excluded the 277.8-acre Grant No. 1533 to Kekoa of which the Grossbard/Bourzat property is a part.

By 1946 rail travel was becoming less popular, and less profitable, due to improved roads and increased trucking. In March of that year, stockholders of Hawai'i Consolidated Railway voted to abandon all railroad operations. This decision was further reinforced on April 1, 1946 when a devastating *tsunami* ravaged Hilo Bay, including all the rail lines, a drawbridge in the bay, and part of the Waiākea freight yards. On November 20, 1946 the company shut down its remaining lines, including all Puna railroad operations, and began auctioning off all its assets. The 'Ōla'a railroad line remained in operating condition and continued to be used for hauling sugar until December of 1948. In that year the sugar industry began phasing out its operations in Puna and closed the tracks permanently.

Throughout this period of industrial growth and decline in Puna, the coastal portion of Keonepoko Iki Ahupua'a remained largely undeveloped. A 1924 U.S.G.S. Maku'u quadrangle shows a single structure located in the coastal portion of Keonepoko Iki, situated inland and west of the Grossbard/Bourzat property. Farrell and Dega (2013:8) indicate the lands in the general vicinity of the property were planted in coconuts in 1942 (these were later harvested and sold as mature trees). The property itself was created in 1961 when Grant No. 1533 was subdivided (Farrell and Dega 2013).

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

During the mid-1960s, the lands to the southeast and northwest of the project site were subdivided into the Hawaiian Beaches, Hawaiian Parks, and Hawaiian Shores subdivisions. In recent years several residences have been constructed along the coast in the Keonepoko area within the subdivided parcels of the former grant properties.

A number of cultural impact assessments conducted primarily for other single-family residences in the area found that a constant through all these eras of history is that the well-developed Hawaiian traditions of fishing and collecting food from the ocean continue to be practiced. This orientation to the shoreline and the traditional practices developed in Hawai'i are still passed down from generation to generation. Many fishermen catch *pūhi* to fish for *'ulua* along the cliffs of Puna. Whether they use a hand-line or rod and reel, they use knowledge and techniques of past fishermen to select fishing locations, proper bait, and technique. Fishermen throw net, fish by rod and reel, or spear fish at different locations along the shoreline including the Keonepoko area to catch specific fish such as *āholehole*, *'āweoweo*, *kala*, *kole*, *kūmū*, *manini*, *mamo*, *moana* and many other types of fish. In addition, the traditional collection of *'ōpihi*, *'a'ama*, and *limu* along the rocky shoreline is still practiced. Others fish by boat out of Hilo or Pohoiki for *akule*, *kawele 'ā*, *mahimahi*, *ono*, *'ōpakapaka*, and other species. Traditional Hawaiian fishing practices, shoreline gathering practices, and ocean access are protected by State law.

Archaeological Investigations and Resources

Previous archaeological studies conducted in the general project area provide a working model for the types and density of features that the archaeologists could expect on the project site. These studies are reviewed in Appendix 2; they identified mounds, feature complexes, platforms, walls, trails, *ahu*, C-shaped rock structures, stone alignments, faced depressions, pits and ravines. These features were interpreted as having been used for habitation, burial, ceremonial, and agricultural purposes. An informal survey in 2012 by State Historic Preservation Division (SHDP) staff on an adjacent parcel found a site that was reportedly on the Grossbard/Bourzat property.

Fieldwork at the Grossbard/Bourzat property was conducted in September 2018 by three archaeologists under the direction of Benjamin Barna, Ph.D. The entire property was walked along northeast/southwest transects with fieldworkers spaced at 10-meter intervals. Despite the thick vegetation and a layer of leaf litter, the contours of the ground surface were clearly discernible during fieldwork. Depressions (and outcrops suspected of being modified were cleared of leaf litter and vegetation as necessary and closely inspected for evidence of modification (e.g., rock stacking around edges). Several depressions observed on the parcel formed when the surface of the lava flow collapsed, and broken pieces of rock on the collapsed perimeter can resemble tightly-fitting stacked cobbles and boulders. A close examination of these depressions found only naturally-broken rock on the inside and outside of the depressions. The only soil observed at the bottom of these depressions was a very thin coating of muck derived from decaying leaf litter. In the hala forested portion of the property, the ground surface showed extensive disturbance from root growth. The ground surface in the portion of the property *mauka* of the hala concentrations exhibited relatively lower relief compared to the *makai* portion, possibly as a result of prior landclearing. Apart from a very thin (less than two centimeters) layer of organic muck beneath the leaf litter, there was almost no accumulation of sediment or soils on the property, and thus no subsurface testing was

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

attempted. No archaeological features of any kind were observed within the property. None of the natural depressions exhibited modifications, and no feature matching the description of a site previously thought to have been informally observed by SHPD staff on the property was present.

Determination of Effect to Archaeological Resources

Given the absence of archaeological resources, the archaeologists concluded that the development of the proposed single-family residence would not impact any historic properties. Therefore, the proposed determination of effect for the proposed project is “no historic properties affected.” Furthermore, their recommendation was that no further work needs to be conducted within the Grossbard/Bourzat property prior to or during project implementation. However, in the unlikely event that archaeological resources are discovered during ground disturbing activity associated with the proposed development, the applicants or contractors must cease work in the area of the discovery and DLNR-SHPD contacted pursuant to HAR 13§13-280-3. The survey was provided to SHPD for their review and comment on February 21, 2019 and assigned the SHPD log number 2019.00384. As of September 16, 2019, there has been no response.

Cultural Resources and Practices

When assessing potential cultural impacts to resources, practices, and beliefs, input gathered from community members with genealogical ties and/or long-standing residency relationships to the study area is vital. It is precisely these individuals who ascribe meaning and value to traditional resources and practices. Community members may also retain traditional knowledge and beliefs unavailable elsewhere in the historical or cultural record of a place.

As stated in the OEQC Guidelines for Assessing Cultural Impacts, the goal of the oral interview process is to identify and help determine the significance of potential cultural resources, practices, and beliefs associated with the affected study area, along with potential cultural impacts and appropriate mitigation as necessary. A notice describing the proposed Grossbard/Bourzat residence and its location and inviting consultation was published in the Office of Hawaiian Affairs (OHA) newspaper *Ka Wai Ola* (September 2018). In addition, five individuals were contacted via email and/or phone.

To date, there have been no response to the *Ka Wai Ola* notice, but two individuals contacted kindly responded to requests for interviews. Details of their interviews are contained in Appendix 3. In summary, Hidi Boteilho, a *kama ʻāina* and Vice Principal of Keonepoko Elementary School, spoke of a *mo ʻolelo* (tale) that dealt with battle with an *ali ʻi* of Puna named Pahoia that occurred *mauka* of the property near the current location of Keonepoko Elementary School. Hidi stated that she was unaware of any traditional customs or practices associated with the property itself, but she noted the prominent precipices of the Keonepoko coastline. Piʻilani Kaʻawaloa is a Hawaiian cultural practitioner from Kupahuʻa, Puna. Piʻilani is an active community member in the Puna District who holds positions in several important cultural organizations and is a recognized cultural expert for the Keonepoko area. Her knowledge of Puna comes from her long residence here and stories passed down in her ʻohana (family) and she explained that this knowledge was a *kuleana* (responsibility) given to her at a young age from her kūpuna (ancestors). She spoke of several significant events that occurred in the area, the genealogy of the people here, and

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

also various *mo'olelo*. When asked about traditional practices associated with the property, Pi'ilani shared that her *'ohana* and friends continue to fish in that area. Although the fishing grounds along this coast are normally accessed by boat, there is a four-wheel drive road to the coast, which is utilized by local fisherman. She added that the Keonepoko area is a popular fishing grounds for *moi* (threadfish) and *āholehole* (Hawaiian flagtail). Pi'ilani recalled that *kū'ula*, or fishing shrines existed at various places along the Puna coast and spoke of one in the Keonepoko area but she was unsure of its whereabouts. When asked about her thoughts on the proposed project, Pi'ilani stated that any development has the potential to disturb the cultural landscape. Although she noted that the landscape has already been affected by a number of factors, including natural disasters, Pi'ilani shared that development or construction projects within Keonepoko should consider the possibility of encountering *iwi kupuna*. She also described a series of caves and lava tubes that extend throughout this portion of the Puna District and noted that these caves had been used to obtain fresh water and for burial purposes. Pi'ilani mentioned another traditional Puna burial practice in which *lua*, or pits were lined with *kukui* before placing the *iwi* within. In light of the information shared, she suggested that a cultural monitor should be present to observe ground disturbing activities.

In summary, no specific traditional cultural sites or practices were identified to exist or have taken place within the property. However, consultees noted that an unlocated *kū'ula* is present in Keonepoko Iki and that local fishermen continue to access this coastline, along with their wish that as the coastal portion of Keonepoko Iki continues to grow, coastal access needs to be maintained in the general vicinity. It was also expressed that the general area is known to contain *iwi kupuna* and thus landowners should take a proactive approach for the care and preservation of human remains.

Impacts and Mitigation Measures for Cultural Resources

The applicants are committed to not hindering in any active or passive manner lateral shoreline access for fishing, gathering or any other cultural purpose. Archaeologists carefully inspected the area for archaeological sites and burials and found none, but lava tube entries are sometimes difficult to find and it is always possible that surface disturbance could reveal hidden burials. The applicants will be required to exercise extreme care during ground preparation, as discussed above in the context of archaeological mitigation. If subsurface human remains are uncovered during any earth moving activities, the landowner or contractors must cease work in the area of the discovery and DLNR-SHPD must be contacted pursuant to HAR 13§13-280-3.

With these precautions in place, formalized by any Conservation District Use Permit conditions imposed by the Board of Land and Natural Resources, it is reasonable to conclude, based upon the limited range of resources and the proposed mitigation to all affected resources, that the exercise of native Hawaiian rights related to gathering, access or other customary activities will not be affected, and there will be no adverse effect upon cultural practices or beliefs. The Draft EA was distributed to agencies and groups who might have knowledge in order to confirm this finding. No party reviewing the Draft EA supplied any cultural information.

3.3 Public Roads, Services and Utilities

3.3.1 Roads and Access

Existing Environment, Impacts and Mitigation Measures

The sole road access to the project site is via an existing rough driveway from the Government Beach Road (see Figure 1 and 2b). The existing driveway that currently extends to proposed house site would be widened to at least 15 feet and improved with gravel but left unpaved. About 350 feet from the shoreline, the driveway would be diverted from its current path, in the area of a previous but now overgrown ranch road, towards the residence and parking/turnaround area, terminating about 200 feet from the shoreline (see Figure 3 Site Plan). The driveway from that diversion point to the shoreline would be abandoned, but a foot trail would be left in its place.

The single-family residence would have no effect on transportation facilities, traffic or road access in the Puna District.

3.3.2 Public Utilities and Services

Environmental Setting, Impacts and Mitigation Measures

Electrical power to the home would be provided by overhead electrical power lines extended from the power lines on Government Beach Road.

Domestic water would be supplied from an onsite water well (see Figure 3 for location). It would have a 1.5-HP pump capable of delivering up to 50 gallons per minute at maximum use. A 10,000-gallon storage tank will be located adjacent to the well. The proposed storage is expected to be more than adequate to meet the expected demand, based on the applicants' expected average use of less than 500 gallons per day.

Wastewater would be treated with a septic system in conformance with requirements of the State Department of Health (see Figure 3 for location).

No parks, schools or other public facilities are present nearby, and none would be affected.

Police, fire and emergency medical service are available about seven road miles away at new facilities on Highway 130 in Pahoā. For fire protection, the applicants propose use of the water tank. Also included will be a fire hose connection at the tank or a stand near the house, per the requirements of the Hawai'i Fire Department. The applicant's architect has reviewed the Fire Code requirements applicable to the proposed single-family residence and has planned and designed the house and supporting infrastructure accordingly.

There will be no adverse impact to any public or private utilities. The addition of one single-family

residence will have no measurable adverse impact to or additional demand on public facilities such as schools, police or fire services, or recreational areas. The applicants acknowledge and understand that this lot, along with almost all other residences in the Puna District, is not located within a mile of emergency services.

3.4 Secondary and Cumulative Impacts

Due to its small scale, the proposed project would not produce any major secondary impacts, such as population changes or effects on public facilities.

Cumulative impacts result when implementation of several projects that individually have limited impacts combine to produce more severe impacts or conflicts in mitigation measures. The County of Hawai'i occasionally performs road maintenance on the Government Beach Road. No substantial government or private projects such as roadways, schools, businesses, or subdivisions, are known to be occurring or in planning for this portion of Puna. Reopening of various roadways covered by the 2018 lava flows, including Highway 132, will be occurring approximately 10 miles away but would not produce impacts in the Keonepoko area. There are several dozen private lots on the three-mile stretch of the narrow and largely unpaved Government Beach Road between the Hawaiian Paradise Park and Hawaiian Shores subdivisions. At any given time, a home may be under construction, and occasionally there are two or more homes under construction simultaneously. The adverse effects of building a single-family residence in this context are very minor and involve temporary disturbances to air quality, noise, traffic and visual quality during construction. It should again be noted that the proposed home and farm are in a somewhat isolated, sparsely populated area, and no accumulation of adverse construction effects would be expected. Other than the precautions for preventing adverse impacts during construction listed above in Sections 3.1.3 and 3.1.6, no special mitigation measures should be required to counteract the small adverse cumulative effect.

3.5 Required Permits and Approvals

County of Hawai'i:

Special Management Area Permit or Exemption
Plan Approval and Grubbing, Grading, and Building Permits

State of Hawai'i:

Conservation District Use Permit
Wastewater System Approval
Water Well Permit

3.6 Consistency with Government Plans and Policies

3.6.1 Hawai‘i County General Plan

The *General Plan* for the County of Hawai‘i is the document expressing the broad goals and policies for the long-range development of the Island of Hawai‘i. The plan was adopted by ordinance in 1989 and revised in 2005. The General Plan’s Land Use Allocation Guide Map designates the property as Open. The *General Plan* is organized into thirteen elements, with policies, objectives, standards, and principles for each. There are also discussions of the specific applicability of each element to the nine judicial districts comprising the County of Hawai‘i. Below are pertinent sections followed by a discussion of conformance.

ECONOMIC GOALS

- (a) Provide residents with opportunities to improve their quality of life through economic development that enhances the County’s natural and social environments.
- (b) Economic development and improvement shall be in balance with the physical, social, and cultural environments of the island of Hawaii.
- (d) Provide an economic environment that allows new, expanded, or improved economic opportunities that are compatible with the County’s cultural, natural, and social environment.

Discussion: The proposed construction and occupation of a single-family residence would be in balance with the natural, cultural and social environment of the County, would create temporary construction jobs for local residents, and would indirectly boost the economy through construction industry purchases from local suppliers. A multiplier effect takes place when these employees spend their income for food, housing, and other living expenses in the retail sector of the economy. Such activities are in keeping with the overall economic development of the island.

ENVIRONMENTAL QUALITY GOALS

- (a) Define the most desirable use of land within the County that achieves an ecological balance providing residents and visitors the quality of life and an environment in which the natural resources of the island are viable and sustainable.
- (b) Maintain and, if feasible, improve the existing environmental quality of the island.
- (c) Control pollution.

ENVIRONMENTAL QUALITY POLICIES

- (a) Take positive action to further maintain the quality of the environment.

ENVIRONMENTAL QUALITY STANDARDS

- (a) Pollution shall be prevented, abated, and controlled at levels that will protect and preserve the public

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

health and well being, through the enforcement of appropriate Federal, State and County standards.

(b) Incorporate environmental quality controls either as standards in appropriate ordinances or as conditions of approval.

(c) Federal and State environmental regulations shall be adhered to.

Discussion: The proposed construction and occupation of a single-family residence would not have a substantial adverse effect on the environment and would not diminish the valuable natural resources of the region. The home and associated improvements would be compatible with existing rural single-family residences and recreational uses in the area. Pertinent environmental regulations would be followed, including those for mitigation of water quality impacts.

HISTORIC SITES GOALS

(a) Protect, restore, and enhance the sites, buildings, and objects of significant historical and cultural importance to Hawaii.

(b) Appropriate access to significant historic sites, buildings, and objects of public interest should be made available.

HISTORIC SITES POLICIES

(a) Agencies and organizations, either public or private, pursuing knowledge about historic sites should keep the public apprised of projects.

(b) Amend appropriate ordinances to incorporate the stewardship and protection of historic sites, buildings and objects.

(c) Require both public and private developers of land to provide historical and archaeological surveys and cultural assessments, where appropriate, prior to the clearing or development of land when there are indications that the land under consideration has historical significance.

(d) Public access to significant historic sites and objects shall be acquired, where appropriate.

Discussion: An archaeological assessment survey has determined that no historic sites are present on the property. There are no known cultural resources or known or expected cultural uses on the lot; traditional fishing and shellfish gathering occur *makai* of the lot, which will not be affected.

FLOOD CONTROL AND DRAINAGE GOALS

(a) Protect human life.

(b) Prevent damage to man-made improvements.

(c) Control pollution.

(d) Prevent damage from inundation.

(e) Reduce surface water and sediment runoff.

(f) Maximize soil and water conservation.

FLOOD CONTROL AND DRAINAGE POLICIES

(a) Enact restrictive land use and building structure regulations in areas vulnerable to severe damage due to the impact of wave action. Only uses that cannot be located elsewhere due to public necessity and character, such as maritime activities and the necessary public facilities and utilities, shall be allowed in these areas.

(g) Development-generated runoff shall be disposed of in a manner acceptable to the Department of Public Works and in compliance with all State and Federal laws.

FLOOD CONTROL AND DRAINAGE STANDARDS

(a) “Storm Drainage Standards,” County of Hawaii, October, 1970, and as revised.

(b) Applicable standards and regulations of Chapter 27, “Flood Control,” of the Hawaii County Code.

(c) Applicable standards and regulations of the Federal Emergency Management Agency (FEMA).

(d) Applicable standards and regulations of Chapter 10, “Erosion and Sedimentation Control,” of the Hawaii County Code.

(e) Applicable standards and regulations of the Natural Resources Conservation Service and the Soil and Water Conservation Districts.

Discussion: The proposed home site and all areas planned for modification are within Zone X, or areas outside of the 500-year floodplain as determined by detailed methods in the Flood Insurance Rate Maps (FIRM). The project will conform to applicable drainage regulations and policies of the County of Hawai‘i.

NATURAL BEAUTY GOALS

(a) Protect, preserve and enhance the quality of areas endowed with natural beauty, including the quality of coastal scenic resources.

(b) Protect scenic vistas and view planes from becoming obstructed.

(c) Maximize opportunities for present and future generations to appreciate and enjoy natural and scenic beauty.

NATURAL BEAUTY POLICIES

(a) Increase public pedestrian access opportunities to scenic places and vistas.

(b) Develop and establish view plane regulations to preserve and enhance views of scenic or prominent landscapes from specific locations, and coastal aesthetic values.

Discussion: The improvements are minor and consistent with traditional uses of the land and will not cause scenic impacts or impede access.

NATURAL RESOURCES AND SHORELINES GOALS

- (a) Protect and conserve the natural resources from undue exploitation, encroachment and damage.
- (b) Provide opportunities for recreational, economic, and educational needs without despoiling or endangering natural resources.
- (c) Protect and promote the prudent use of Hawaii's unique, fragile, and significant environmental and natural resources.
- (d) Protect rare or endangered species and habitats native to Hawaii.
- (e) Protect and effectively manage Hawaii's open space, watersheds, shoreline, and natural areas.
- (f) Ensure that alterations to existing land forms, vegetation, and construction of structures cause minimum adverse effect to water resources, and scenic and recreational amenities and minimum danger of floods, landslides, erosion, siltation, or failure in the event of an earthquake.

NATURAL RESOURCES AND SHORELINES POLICIES

- (a) Require users of natural resources to conduct their activities in a manner that avoids or minimizes adverse effects on the environment.
- (c) Maintain the shoreline for recreational, cultural, educational, and/or scientific uses in a manner that is protective of resources and is of the maximum benefit to the general public.
- (d) Protect the shoreline from the encroachment of man-made improvements and structures.
- (h) Encourage public and private agencies to manage the natural resources in a manner that avoids or minimizes adverse effects on the environment and depletion of energy and natural resources to the fullest extent.
- (p) Encourage the use of native plants for screening and landscaping.
- (r) Ensure public access is provided to the shoreline, public trails and hunting areas, including free public parking where appropriate.
- (u) Ensure that activities authorized or funded by the County do not damage important natural resources.

Discussion: The home would be set back a minimum of 153 feet from the sea cliff at an elevation of about 40 feet above sea level. It would not affect shoreline resources or be damaged by waves or tides.

PUNA COMMUNITY DEVELOPMENT PLAN

The Puna Community Development Plan (CDP) encompasses the judicial district of Puna and was developed under the framework of the February 2005 County of Hawai'i General Plan. Community Development Plans are intended to translate broad General Plan Goals, Policies, and Standards into implementation actions as they apply to specific geographical regions around the County. CDPs are also intended to serve as a forum for community input into land-use, delivery of government services and any other matters relating to the planning area.

The Puna CDP does not specify land use in the project area but contains the following Goals for Managing Growth that are relevant to the action.

3.1.1 Goals (for Managing Growth)

- a. Puna retains a rural character while it protects its native natural and cultural resources.
- b. The quality of life improves and economic opportunity expands for Puna's residents.
- d. Exposure to high risk from natural hazards situations is reduced.
- f. Native vegetation, coastal and historic resources are provided new forms of protection.

Discussion: The proposed single-family residence helps the area retain a rural character. Through provision of housing it improves the quality of life and economy. The lot shares the same volcanic and seismic hazard as most of Puna and Hilo. By virtue of the home's proposed location on the lot, coastal hazards are largely avoided. Although an endangered grass is present in the shoreline vegetation, which will be entirely protected, no native vegetation, rare species, coastal resources or historic sites will be adversely affected. The construction of a of a single-family residence is not inconsistent with the Puna CDP.

3.6.2 Hawai'i County Zoning and Special Management Area

The State Land Use District for property is Conservation. The entire property is zoned by the County of Hawai'i as within the Agricultural District, minimum lot size of one acre (A-1a), although County zoning per se does not apply in the Conservation District. No aspect of the project appears to be inconsistent with County zoning.

The entire property is within the Special Management Area. Single-family residences may be determined to be an exempt action under the County's Special Management Area (SMA) guidelines. The County of Hawai'i Planning Department requires preparation of an SMA Assessment Application, in which SMA issues are expressly dealt with. A summary of consistency is provided below.

The proposed land use complies with provisions and guidelines contained in Chapter 205A, Hawai'i Revised Statutes (HRS), entitled *Coastal Zone Management*. Single-family residences may be determined to be an exempt action under the County's Special Management Area (SMA) guidelines. The proposed use would be consistent with Chapter 205A because it would not affect public access to recreational areas, historic resources, scenic and open space resources, coastal ecosystems, economic uses, or coastal hazards.

The proposed improvements are not likely to result in any substantial adverse impact on the surrounding environment. The house site is set back from the shoreline and will not restrict any shoreline uses such as hiking, fishing or water sports. Lateral pedestrian use of the shoreline area will not be impacted and there will be no effect on the public's access to or enjoyment of this shoreline area. Furthermore, viewplanes towards the project site will not be adversely impacted in any substantial way, as views from the Government Beach Road are totally blocked by trees. It is expected that the project will not result in any impact on the biological or economic aspects of the coastal ecosystem. The project site is not situated over any natural drainage system or water feature that would flow into the nearby coastal system. The property contains mostly non-native and a few common native plants, as well as the endangered grass *Ischaemum byrone* in the shoreline zone. No floodplains are present in the area. In terms of beach protection,

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

construction is set back from the shoreline and would not affect any beaches nor adversely affect public use and recreation of the shoreline in this area. With implementation of Best Management Practices associated with grading permits, there should be no impacts on marine resources. No historic sites will be adversely affected. Aside from shoreline area uses, which will not be affected, there are no known cultural resources or practices.

The Planning Director will be asked to make the determination that the proposed development of a single-family residence is not considered a “development” under Special Management Area Rules and Regulations of the County of Hawai‘i, Section 9-4 (10) (B) and is otherwise not subject to an SMA Major Permit.

3.6.3 Conservation District

The State Land Use District for the Grossbard/Bourzat property is Conservation. Its subzone is Resource, for which, according to Hawai‘i Administrative Rules (HAR) §13-5-15, a single-family residence is an identified use. Any proposed use must undergo an examination for its consistency with the goals and rules of this district and subzone. The applicants have concurrently prepared a Conservation District Use Application (CDUA), to which this EA is an appendix. The CDUA includes a detailed evaluation of the consistency of the project with the criteria of the Conservation District permit process. Briefly, the following individual consistency criteria should be noted:

1. The proposed land use is consistent with the purpose of the Conservation District;

The development of the single-family residence is in conformance with the purpose of the Conservation District. It is an identified use within the Conservation District, requiring a Board Permit for such use. A commitment by the applicants to management of the site through various mitigation measures will conserve, protect and preserve the natural features on the subject property. The proposed use will not impact lateral coastal access or the public’s ability to utilize the coastal resources that front this property. Additionally, due to the careful and limited nature of the proposed development, there would be no significant impacts to the natural or cultural resources of the area.

2. The proposed land use is consistent with the objectives of the subzone of the land on which the use will occur;

The objective of the Resource subzone “...is to develop, with proper management, areas to ensure sustained use of the natural resources of those areas.” These identified uses, which conform to the design standards in 13-5-41, will ensure the sustained use of the natural resources in the project area by mitigating potential impacts as outlined in this document. Single-family residences are an identified use in the Resource subzone under HAR 13-5-24, R-8.

3. The proposed land use complies with provisions and guidelines contained in Chapter 205A, Hawaii Revised Statutes (HRS), entitled "Coastal Zone Management," where applicable;

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

The proposed land uses comply with provisions and guidelines contained in Chapter 205A, Hawai'i Revised Statutes (HRS), entitled *Coastal Zone Management*, as outlined above in Section 3.6.2, which discusses the setting with the Special Management Area of the Coastal Zone. The proposed improvements are not likely to result in any substantial adverse impact on the surrounding environment. The residence and all related improvements will be set back a minimum of 153 feet from the sea cliff, at about 40 feet above sea level, outside the flood zone. No effect on any coastal ecosystem will occur, because of the 153-foot setback that would include all of the native shoreline vegetation zone. The use will not restrict any shoreline uses such as hiking, fishing or water sports. Lateral pedestrian use of the shoreline area will not be impacted and there will be no effect on the public's access to or enjoyment of this shoreline area. Furthermore, viewplanes towards the project site will not be adversely impacted in any substantial way, as views from the Government Beach Road are totally blocked by trees. It is expected that the project will not result in any impact on the biological or economic aspects of the coastal ecosystem. The project site is not situated over any natural drainage system or water feature that would flow into the nearby coastal system. With implementation of Best Management Practices associated with grading permits, there should be no impacts on marine resources. No historic sites are present or will be adversely affected. Aside from shoreline area uses, which will not be affected, there are no known cultural resources or practices.

4. The proposed land use will not cause substantial adverse impact to existing natural resources within the surrounding area, community or region;

Because of the relatively minor nature of the project and the lack of native terrestrial ecosystems and threatened or endangered plant species outside the shoreline zone, which will not be disturbed, the proposed single-family residence is not likely to cause adverse biological impacts. Impacts to the island wide-ranging endangered Hawaiian hoary bat and Hawaiian hawk will be avoided through timing of vegetation removal and/or hawk nest survey. No effect on any coastal ecosystem will occur, because of the no-development coastal setback that would include all of the native shoreline vegetation zone of the property along with planned precautions for preventing soil runoff during construction. The proposed action will also have no impact on the public's current access to or use of the shoreline area.

5. The proposed land use, including buildings, structures and facilities, shall be compatible with the locality and surrounding areas, appropriate to the physical conditions and capabilities of the specific parcel or parcels;

The proposed use is consistent with single-family residential use in the area. The proposed one-story home will be 20' 10" above grade at maximum and 2,560-sf in size, including decks and lanai, with a few hundred additional square feet for various utility facilities. It will be set back a minimum of 153 feet from the sea cliff, at about 40 feet above sea level, outside the flood zone. It will be in area not visible to the public on the Government Beach Road and only moderately visible from the shoreline or offshore boats. This identified use, which conforms to the design standards in HAR 13-5-41, will ensure the sustained use of the natural resources in the project area by mitigating impacts. The use will not adversely affect the surrounding properties or how these properties are utilized. This land use will be attractive and compatible with the area, which contains other homes as well as farms and ranches.

6. *The existing physical and environmental aspects of the land, such as natural beauty and open space characteristics, will be preserved or improved upon, whichever is applicable;*

The proposed use of the subject property for a single-family residence will help conserve, protect and preserve the natural features of the area.

7. *Subdivision of land will not be utilized to increase the intensity of land uses in the Conservation District;*

The proposed action does not involve or depend upon subdivision and will not lead to any increase in intensity of use beyond the requested single-family residence.

8. *The proposed land use will not be materially detrimental to the public health, safety and welfare.*

The proposed single-family residence will not be detrimental to the public health, safety, and welfare.

PART 4: DETERMINATION, FINDINGS AND REASONS

4.1 Determination

Based on the findings below, and upon consideration of comments to the Draft EA, the applicant expects that the State of Hawai'i, Department of Land and Natural Resources, will determine that the proposed action will not significantly alter the environment, as impacts will be minimal, and that this agency will accordingly issue a Finding of No Significant Impact (FONSI).

4.2 Findings and Supporting Reasons

1. *The proposed project will not involve an irrevocable commitment or loss or destruction of any natural or cultural resources.* No valuable natural or cultural resource would be committed or lost. Some native plants are present but native ecosystems would not be adversely affected. The project site is dominated by alien vegetation, with the only sensitive ecosystem on the property being the shoreline vegetation, where common native plants mixed with weeds are present, as well as one endangered grass. Development avoids the shoreline area. No adverse impact upon vegetation or endangered species should occur. Because of the location and nature of the project relative to sensitive vegetation and species, construction and use of the single-family residence is not likely to cause adverse biological impacts. An archaeological assessment survey determined that no archaeological sites are present or would be adversely affected. No valuable cultural resources and practices such as coastal access, fishing, gathering, hunting, or access to ceremonial sites would be affected in any way.

2. *The proposed project will not curtail the range of beneficial uses of the environment.* No restriction of beneficial uses would occur by residential use on this lot.

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

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 Chapter 344, HRS. The broad goals of this policy are to conserve natural resources and enhance the quality of life. The project is minor and basically environmentally benign, and it is thus consistent with all elements of the State's long-term environmental policies.
4. *The proposed project will not substantially affect the economic or social welfare of the community or State.* The project would not have any substantial effect on the economic or social welfare of the Big Island community or the State of Hawai'i.
5. *The proposed project does not substantially affect public health in any detrimental way.* The project would not affect public health and safety in any way. Wastewater will be disposed of in conformance with State Department of Health regulations.
6. *The proposed project will not involve substantial secondary impacts, such as population changes or effects on public facilities.* The small scale of the proposed project would not produce any major secondary impacts, such as population changes or effects on public facilities.
7. *The proposed project will not involve a substantial degradation of environmental quality.* The project is minor and environmentally benign, and thus it would not contribute to environmental degradation.
8. *The proposed project will not substantially affect any rare, threatened or endangered species of flora or fauna or habitat.* Thorough survey has determined that only one endangered plant species is present, *Ischaemum byrone*. It is restricted to a shoreline area within about 75 feet of the sea cliffs and will be unaffected by project activities and will likely be better protected by having an aware homeowner nearby. Other than Hawaiian hoary bats and Hawaiian hawks, island wide-ranging species that will experience no adverse impacts due to mitigation in the form of timing of vegetation removal and/or hawk nest survey, no rare, threatened or endangered species of fauna are known to exist on or near the project site, and none would be affected by any project activities.
9. *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 adverse effects of building a single-family residence are limited to very minor and temporary disturbance to traffic, air quality, noise, and visual quality during construction. This area is fairly isolated from sensitive receptors other than similar single-family residences. The County of Hawai'i occasionally performs road maintenance on the Government Beach Road. There are no substantial government or private projects in construction or planning, and no accumulation of adverse construction effects would be expected. Other than the precautions for preventing adverse effects during construction listed above, no special mitigation measures should be required to counteract the small adverse cumulative effect.

Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

10. *The proposed project will not detrimentally affect air or water quality or ambient noise levels.* No substantial effects to air, water, or ambient noise would occur. Brief, temporary effects would occur during construction and would be mitigated. The context of the property's location, with no residences, parks, or other sensitive uses nearby, will help avoid noise impacts. Water quality impacts would not occur.
11. *The project does not affect nor would it likely to be damaged as a result of being located in environmentally sensitive area such as a flood plain, tsunami zone, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal area.* The proposed home site is not located in a flood zone. The home would be about 153 feet from the sea cliff, well behind the shoreline and outside the area historically affected by tsunami or high waves. In general, geologic conditions do not impose undue constraints on the proposed action, as much of the Puna District faces similar volcanic and seismic hazard and yet continues to be the fastest growing region of the State. The applicants understand that there are hazards associated with homes in this geologic setting and have made the decision that a residence is not imprudent to construct or inhabit.
12. *The project will not substantially affect scenic vistas and viewplanes identified in county or state plans or studies.* No scenic views are located nearby or would be affected in any way. Coastal views from the Government Beach Road are totally obstructed by over 500 feet of dense vegetation. The attractive design of the home, given the existing context in which the home would not be visible from public vantage points, would not materially degrade the scenery of the project area.
13. *The project will not require substantial energy consumption.* Negligible amounts of energy input would be required for construction and occupation of the residence.

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Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

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Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

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Grossbard/Bourzat Single-Family Residence at Keonepoko Environmental Assessment

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Environmental Assessment

Grossbard/Bourzat Single-Family Residence in the Conservation District at Keonepoko

APPENDIX 1a Comments in Response to Early Consultation

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DAVID Y. IGE
GOVERNOR OF HAWAII



SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

October 17, 2018

Geometrician Associates, LLC
Attention: Mr. Ron Terry
P.O. Box 396
Hilo, Hawaii 96721

via email: rterry@hawaii.rr.com

Dear Mr. Terry:

SUBJECT: Early Consultation for Environmental Assessment for Proposed Single-Family Residence in the Conservation District located at Puna District, Island of Hawaii; TMK: (3) 1-5-009:053 on behalf of **Francoise Bourzat**

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

At this time, enclosed are comments from the (a) Engineering Division, (b) Office of Conservation & Coastal Lands, and (c) Land Division – Hawaii District on the subject matter. Should you have any questions, please feel free to call Darlene Nakamura at (808) 587-0417. Thank you.

Sincerely,

A handwritten signature in black ink, appearing to read "Russell Y. Tsuji".

Russell Y. Tsuji
Land Administrator

Enclosures
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII



SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 19, 2018

MEMORANDUM

TO:
FROM

DLNR Agencies:

- Div. of Aquatic Resources
- Div. of Boating & Ocean Recreation
- Engineering Division
- Div. of Forestry & Wildlife
- Div. of State Parks
- Commission on Water Resource Management
- Office of Conservation & Coastal Lands
- Land Division – Hawaii District
- Historic Preservation

2018 SEP 21 AM 11:00
RECEIVED
LAND DIVISION

TO
FROM:

SUBJECT: Russell Y. Tsuji, Land Administrator *TS*
LOCATION: Early Consultation for Environmental Assessment for Proposed Single-Family Residence in the Conservation District
APPLICANT: Puna District, Island of Hawaii; TMK: (3) 1-5-009:053
 Geometrician Associates, LLC on behalf of **Francoise Bourzat**

Transmitted for your review and comment is information on the above-referenced subject matter. We would appreciate your comments by **October 15, 2018**.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura at 587-0417. Thank you.

- We have no objections.
- We have no comments.
- Comments are attached.

Signed: *Cary S. Chang*
 Print Name: Cary S. Chang, Chief Engineer
 Date: 9/20/18

Attachments
cc: Central Files

**DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION**

LD/Russell Y. Tsuji

Ref: Early Consultation for Environmental Assessment for Proposed Single-Family Residence in the Conservation District, Puna District, Island of Hawaii; TMK: (3) 1-5-009:053

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high risk areas). State projects are required to comply with 44CFR regulations as stipulated in Section 60.12. Be advised that 44CFR reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood Hazard Zones are designated on FEMA's Flood Insurance Rate Maps (FIRM), which can be viewed on our Flood Hazard Assessment Tool (FHAT) (<http://gis.hawaiiinfip.org/FHAT>).

If there are questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7253.
- Kauai: County of Kauai, Department of Public Works (808) 241-4846.

Signed: 
CARTY S. CHANG, CHIEF ENGINEER

Date: 9/20/12

DAVID Y. IGE
GOVERNOR OF HAWAII



HA-19-51

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 19, 2018

MEMORANDUM

TO:

DLNR Agencies:

- Div. of Aquatic Resources
- Div. of Boating & Ocean Recreation
- Engineering Division
- Div. of Forestry & Wildlife
- Div. of State Parks
- Commission on Water Resource Management
- Office of Conservation & Coastal Lands
- Land Division – Hawaii District
- Historic Preservation

FROM:

Russell Y. Tsuji, Land Administrator

SUBJECT:

Early Consultation for Environmental Assessment for Proposed Single-Family Residence in the Conservation District

LOCATION:

Puna District, Island of Hawaii; TMK: (3) 1-5-009:053

APPLICANT:

Geometrician Associates, LLC on behalf of **Francoise Bourzat**

Transmitted for your review and comment is information on the above-referenced subject matter. We would appreciate your comments by **October 15, 2018**.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura at 587-0417. Thank you.

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

Signed:

Print Name:

Lauren Y. Asaka

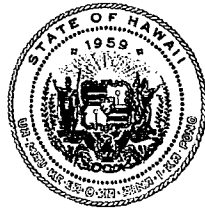
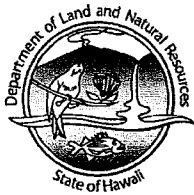
Date:

10/9/18

Attachments

cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

JEFFREY T. PEARSON, P.E.
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

Ref: OCCL:LY

CORR: HA 19-51

MEMORANDUM

OCT - 9 2018

TO: Russell Tsuji, Administrator
Division of Forestry and Wildlife

FROM: Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

SUBJECT: Request for Comments: Pre-Consultation for Environmental Assessment for Proposed Single Family Residence in the Conservation District

TMK: (3) 1-5-009:053

LOCATION: Puna, Hawai'i Island

According to the information provided, Ms. Francoise Bourzat, property owner, is proposing to construct a single family home on her 6.91 acre property located makai of Government Beach Road between Hawaiian Paradise Park and Hawaiian Shores subdivisions in lower Puna.

The conceptual plan for the home currently consists of a 2,500 square foot, 3 bedroom, 2 bath, 2 story structure. She also plans to landscape the property primarily with native or Polynesian species and create a small garden of vegetables and fruit trees. The home will get electric power from HELCO lines, utilize catchment for the water system, and have an individual wastewater system. She is also proposing to trim and/or remove ironwood, autograph, and other non-native trees to provide a sight of line to the sea, but preserve the native vegetation in the shoreline area.

The OCCL notes that the project summary does state that the Environmental Assessment (EA) will accompany a Conservation District Use Application (CDUA). We further note that the property is located within the Resource Subzone of the State Land Use Conservation District.

Regarding our comments for the EA, we specifically ask that the EA address the property's exposure to sea level rise as it pertains to the Sea Level Rise Exposure Area (SLR-XA) and any potential impacts sea level rise and associated hazards may have on the project. For more information regarding this subject, we suggest that you utilize the *Hawai'i Sea Level Rise Vulnerability and Adaptation Report* and the Hawai'i Sea Level Rise Viewer which can be found at <http://climateadaptation.hawaii.gov>. We look forward to reviewing the Draft EA along with the CDUA upon submission.

Should you have any questions regarding our comments, please contact Lauren Yasaka of our Office at 587-0386.

DAVID Y. IGE
GOVERNOR OF HAWAII



SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

2018 SEP 21 A 11:57

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

RECEIVED
LAND DIVISION
HILO, HAWAII

September 19, 2018

MEMORANDUM

FROM:
TO:

DLNR Agencies:

- Div. of Aquatic Resources
- Div. of Boating & Ocean Recreation
- Engineering Division
- Div. of Forestry & Wildlife
- Div. of State Parks
- Commission on Water Resource Management
- Office of Conservation & Coastal Lands
- Land Division – Hawaii District
- Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator ✓

SUBJECT: Early Consultation for Environmental Assessment for Proposed Single-Family Residence in the Conservation District

LOCATION: Puna District, Island of Hawaii; TMK: (3) 1-5-009:053

APPLICANT: Geometrician Associates, LLC on behalf of **Francoise Bourzat**

Transmitted for your review and comment is information on the above-referenced subject matter. We would appreciate your comments by **October 15, 2018**.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura at 587-0417. Thank you.

- We have no objections.
- We have no comments.
- Comments are attached.

Signed: _____

Print Name: GORDON C. HEIT

Date: 10/9/18

Attachments
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII



SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

October 24, 2018

Geometrician Associates, LLC
Attention: Mr. Ron Terry
P.O. Box 396
Hilo, Hawaii 96721

via email: rterry@hawaii.rr.com

Dear Mr. Terry:

SUBJECT: Early Consultation for Environmental Assessment for Proposed Single-Family Residence in the Conservation District located at Puna District, Island of Hawaii; TMK: (3) 1-5-009:053 on behalf of **Francoise Bourzat**

Thank you for the opportunity to review and comment on the subject matter. In addition to our previous comments dated October 17, 2018, enclosed are comments from the Division of Aquatic Resources on the subject matter. Should you have any questions, please feel free to call Darlene Nakamura at (808) 587-0417. Thank you.

Sincerely,

A handwritten signature in black ink, appearing to read "Russell Y. Tsuji".

Russell Y. Tsuji
Land Administrator

Enclosure
cc: Central Files

DAVID I. IGE
GOVERNOR OF
HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF AQUATIC RESOURCES
1151 PUNCHBOWL STREET ROOM 350
HONOLULU HAWAII 96813

SEZANNE D. CASE
DIRECTOR
DEPARTMENT OF LAND AND NATURAL RESOURCES
1151 PUNCHBOWL STREET ROOM 350
HONOLULU HAWAII 96813
ROBERT K. MAMUDA
DEPUTY DIRECTOR
JEFFREY T. PEARSON, P.E.
DEPUTY DIRECTOR
AQUATIC RESOURCES
DEPARTMENT OF LAND AND NATURAL RESOURCES
1151 PUNCHBOWL STREET ROOM 350
HONOLULU HAWAII 96813
COMMUNITY DEVELOPMENT AND ECONOMIC DEVELOPMENT
CONSERVATION AND CULTURAL LANDS
CONSERVATION AND RECREATION DEVELOPMENT
ENGINEERING
HISTORIC PRESERVATION
LAND AND NATURAL RESOURCES
LAND
STATE PARKS

Date: 10/17/18
DAR # 5793

MEMORANDUM

TO: Brian J. Neilson
Acting DAR Administrator
FROM: Troy Sakihara *[Signature]*, Aquatic Biologist

SUBJECT: Early consultation for an environmental assessment for a proposed single family residence in conservation district in Puna, Hawaii Island.

Request Submitted by: Russell Tsuji, Administrator, Land Division DLNR

Location of Project: TMK (3) 1-5-009:053, Puna District, County of Hawaii

Brief Description of Project:

This is an early consultation for an Environmental Assessment to build a proposed single family home in the State Land Use Conservation District in Puna, on Hawaii Island. TMK (3) 1-5-009:053. The proposed house is 2500 sq ft, set back 600 ft from Government Road, leaving an approximate 150 ft setback from the ocean. The vegetation on the property consists primarily of non-native vegetation and hala trees. The owner plans to cut down and trim ironwood trees on the property to open a sight line to the ocean. Existing native vegetation on the property, particularly along the coastal boundary above the sea cliff are to be preserved. The DAR finds that no measurable impacts or threats to the surrounding coastal and marine habitats seem apparent or are anticipated by the proposed project.

Comments:

No Comments Comments Attached

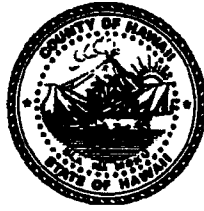
Thank you for providing DAR the opportunity to review and comment on the proposed project. Should there be any changes to the project plan, DAR requests the opportunity to review and comment on those changes.

Comments Approved: *[Signature]* Date: 10/18/18
Brian J. Neilson
Acting DAR Administrator

RECEIVED
OCT 18 2018
AQUATIC RESOURCES
DIVISION OF AQUATIC RESOURCES
DEPARTMENT OF LAND AND NATURAL RESOURCES
1151 PUNCHBOWL STREET ROOM 350
HONOLULU HAWAII 96813

Harry Kim
Mayor

Wil Okabe
Managing Director



Allan G. Simeon, P.E.
Director

Merrick H. Nishimoto
Deputy Director

County of Hawai'i
DEPARTMENT OF PUBLIC WORKS
Aupuni Center
101 Pauahi Street, Suite 7 · Hilo, Hawai'i 96720-4224
(808) 961-8321 · Fax (808) 961-8630
public_works@hawaiicounty.gov

OCTOBER 16, 2018

ATTN: RON TERRY
GEOMETRICIAN ASSOCIATES, LLC.
P.O. BOX 396
HILO, HAWAII 96721
(via email to rterry@hawaii.rr.com)

SUBJECT: EARLY CONSULTATION FOR ENVIRONMENTAL ASSESSMENT FOR
PROPOSED SINGLE FAMILY RESIDENCE IN THE CONSERVATION
DISTRICT
PUNA DISTRICT, ISLAND OF HAWAII
TMK: (3) 1-5-009:053

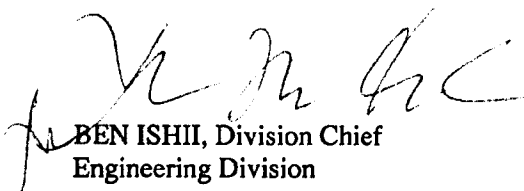
We received the subject dated September 17, 2018 and have the following comments:

The subject parcel is in an area designated as Zone X on the Flood Insurance Rate Map (FIRM) by the Federal Emergency Management Agency (FEMA). Zone X is an area determined to be outside the 500-year floodplain.

All activities shall comply with the requirements of Hawaii County Code, Chapter 10, Erosion and Sedimentary Control.

Access to the subject property is via Government Beach Road which is classified as a "road-in-limbo." Although the public has a right of access through this right-of-way, it has not been maintained by any government entity in recent years. Furthermore, there is no assurance that it will ever be subject to such maintenance.

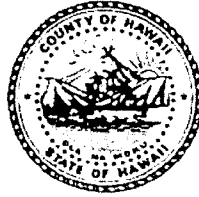
Should there be any questions concerning this matter, please contact Ms. Robyn Matsumoto in our Engineering Division at (808) 961-8924.


BEN ISHII, Division Chief
Engineering Division

RM

cc: James Leonard (jleonard@mac.com)

Harry Kim
Mayor



Paul K. Ferreira
Police Chief

Kenneth Bugado Jr.
Deputy Police Chief

County of Hawai`i

POLICE DEPARTMENT

349 Kapiolani Street • Hilo, Hawai`i 96720-3998
(808) 935-3311 • Fax (808) 961-8865

September 21, 2018

Mr. Ron Terry, Principal
Geometrician Associates
P. O. Box 396
Hilo, HI 96720
rterry@hawaii.rr.com

Dear Mr. Terry:

SUBJECT: EARLY CONSULTATION FOR ENVIRONMENTAL ASSESSMENT FOR
PROPOSED SINGLE-FAMILY RESIDENCE IN THE CONSERVATION
DISTRICT, PUNA DISTRICT, ISLAND OF HI, TMK; (3RD)1-5-009:053

Staff, upon reviewing the provided documents, does not anticipate any significant impact to traffic and/or other public safety concerns.

Thank you for allowing us the opportunity to comment.

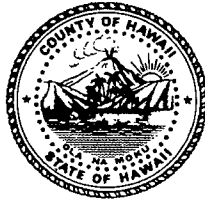
If you have any questions, please contact Captain Kenneth Quiocho, Puna District Commander, at 965-2716.

Sincerely,

MITCHELL K. KANEHAILUA, JR.
ASSISTANT POLICE CHIEF
AREA I OPERATIONS

KO III/180885

Harry Kim
Mayor



Michael Yee
Director

Daryn Arai
Deputy Director

West Hawai'i Office
74-5044 Ane Keohokalole Hwy
Kailua-Kona, Hawai'i 96740
Phone (808) 323-4770
Fax (808) 327-3563

County of Hawai'i
PLANNING DEPARTMENT

East Hawai'i Office
101 Pauahi Street, Suite 3
Hilo, Hawai'i 96720
Phone (808) 961-8288
Fax (808) 961-8742

October 5, 2018

Mr. James Leonard
Geometrician Associates, LLC
P.O. Box 396
Hilo, Hawai'i 96721

Dear Mr. Leonard,

SUBJECT: Early Consultation for Draft Environmental Assessment
Project: Single-Family Residence in the Conservation District
TMK: (3) 1-5-009:053, Puna District, Island of Hawai'i

Thank you for your letter dated September 14, 2018, requesting comments from this office regarding the preparation of a Draft Environmental Assessment (DEA) for the above referenced project and property.

According to your submittal, the applicant proposes to build a two story, 3-bedroom, 2-bath single-family dwelling consisting of 2,500 square feet. Also proposed is the establishment of a family garden and the planting of fruit trees. While your submittal proposes that the house site will be set back approximately 600 feet from Government Road, the setback from the shoreline coastal pali (cliff) is not clear.

We note the following for this parcel:

1. The subject 6.91 acre parcel is zoned Agricultural (A-1a) by the County. However, because it is located entirely within the State Land Use Conservation District, the State of Hawai'i Department of Land and Natural Resources (DLNR) has jurisdiction on any use or activity within the Conservation District.
2. The property is designated Open by the General Plan's Land Use Pattern Allocation Guide (LUPAG) Map. The DEA should describe how the proposed project is consistent with the policies, standards, and courses of action of the County of Hawai'i General Plan 2005, as amended in February 2005.

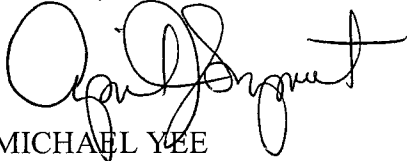
Mr. James Leonard
Geometrician Associates, LLC
October 5, 2018
Page 2

3. The project site is located in the Puna Community Development Plan (CDP) planning area, and the DEA should outline the project's consistency with the goals, objectives, policies and actions of the Puna CDP.
4. The property is also located within the County's Special Management Area and has frontage along the coastline. Therefore, a Special Management Area Use Permit Assessment Application will be required to be submitted for the proposed development.

Attached is a letter dated August 30, 2012, from the Department of Land and Natural Resources, Historic Preservation Division. The letter outlines a possible archaeology site that was identified on the subject parcel. It would be advisable that these findings be confirmed with DLNR and appropriate preservation agreement/plan be established.

We have no further comments to offer at this time. Please keep us informed and provide our department with a copy of the DEA for our review and comment. If you have any questions, please feel free to contact Keiko Mercado of this office at Keiko.Mercado@hawaiicounty.gov or (808) 961-8134.

Sincerely,



MICHAEL YEE
Planning Director

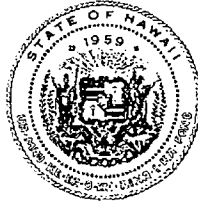
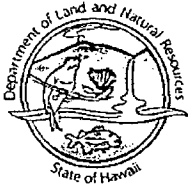
KM:ja

\\COH33\planning\public\wpwin60\Keiko\EA-EIS Review\PreconsultationEA-SingleFamilyDwellingConservation.doc

Enclosure: DLNR-SHPD letter dated August 30, 2012

Cc: Mr. Ron Terry

NEIL ABERCROMBIE
GOVERNOR OF HAWAII



SEP - 4 2012
RECEIVED
COUNTY OF HAWAII
PLANNING
DEPT.

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

PAUL J. CONRY
INTERIM FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAIHOGLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

**HISTORIC PRESERVATION DIVISION
DEPARTMENT OF LAND AND NATURAL RESOURCES**

601 Kamokila Boulevard, Suite 555
Kapolei, HI 96806

August 30, 2012

Bobby Jean Leithead-Todd, Planning Director
Attn: Bethany Morrison
County of Hawaii Planning Department
101 Pauahi Street, Suite 3
Hilo, Hawaii 96720-4224

LOG NO: 2012.2536
DOC NO: 1208TD06
Archaeology

Dear Ms. Leithead-Todd:

**SUBJECT: Chapter 6E-42 Historic Preservation Review –
Special Management Area Use Permit Assessment for a Coconut Farm
Keonepoko Iki Ahupua'a, Puna District, Island of Hawai'i
TMK: (3) 1-5-009:055**

This letter is in response to your transmittal dated July 17, 2012 regarding the above application to develop a coconut farm within 4.0 acres of the 6.7-acre parcel. The project area is located along the shoreline and is currently vacant. According to the application, there will be no construction or mechanical land alteration in connection with this permit.

Our records indicate that no archaeological inventory survey has been conducted of this project area; however the *mauka* portion of the parcel along the Old Government Road corridor was examined in connection with a proposed Kapoho-Keaukaha Highway in 1974 (Ewart & Luscomb, B.P. Bishop Museum 1974). This reconnaissance survey identified one archaeological site that is shown in our GIS to be within the subject parcel (BPBM Site Ha-A4-21). This site is described as a stone-faced natural depression in fair condition that warrants additional fieldwork (Ewart & Luscomb 1974:34). As part of this review, a site inspection of the property was requested by our office in order to verify the presence of this site and determine the likelihood of additional sites within the project area.

A site inspection was conducted of the subject parcel August 10, 2012; it was determined that the area of the proposed coconut farm has been previously grubbed and compacted in connection with the former coconut farm. An archaeological feature similar to that described as Site Ha-A4-21 was observed on the adjacent parcel (1-5-009:053); it is therefore likely that the mapped location of this site is in error. During the inspection, one potentially significant historic site was observed in the coastal portion of the parcel, outside of the proposed project area. The site consists of a rather substantial wall segment and associated terrace along the *mauka* side; it has been assigned SIHP Site 50-10-45-29486. The applicant indicates that this feature will be preserved, and that our office will have access to the site for purposes of documentation and evaluation, so that a preservation agreement can be developed.

We believe that **no historic properties will be adversely affected** by the proposed project, with the understanding that Site 29486 will be preserved, and an appropriate buffer zone is established to ensure protection of the site from disturbance. If you have any questions regarding these comments, please contact me at 933-7653 or at Theresa.K.Donham@hawaii.gov.

Aloha,

Theresa K. Donham
Archaeology Branch Chief

080863

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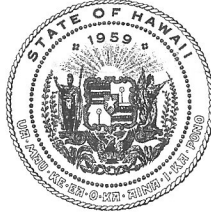
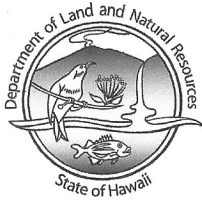
Environmental Assessment

Grossbard/Bourzat Single-Family Residence in the Conservation District at Keonepoko

APPENDIX 1b Comments to Draft EA and Responses

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DAVID Y. IGE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHO'OLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

REF: OCCL:LY

CDUA: HA-3851
Acceptance Date: July 29, 2019
180 Day Expiration Date: January 25, 2020

Mr. James Leonard
J M Leonard Planning, LLC
56 Laukona Street
Hilo, HI 96720

SEP 12 2019

Dear Mr. Leonard:

SUBJECT: End of Comment Period
Conservation District Use Application (CDUA) HA-3851 for the Grossbard/.Bourzat single Family Residence and Associated Improvements Located at Keoneopoko Iki, Puna, Hawai'i Tax Map Key (TMK): (3) 1-5-009:053

This letter is regarding the processing of CDUA HA-3851. The public and agency comment period on your application has closed (September 9, 2019). Attached to this letter are copies of the comments received by the Office of Conservation and Coastal Lands (OCCL) regarding your CDUA.

Please send copies of your responses to the questions and comments raised in these letters directly to the authoring agency as well as to the OCCL. Responses to comments received directly should also be forwarded to the OCCL.

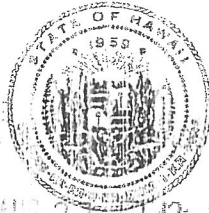
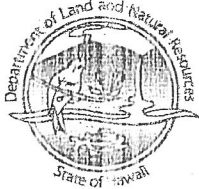
Should you have any questions, please contact Lauren Yasaka of our Office at 587-0386.

Sincerely,

A handwritten signature in black ink, appearing to read "Samuel J. Lemmo".

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

DAVID IGE
GOVERNOR OF HAWAII



OFFICE
A

2019 AUG -6 A STATE OF HAWAII
2019 AUG 21 12:17

DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
LAND DIVISION
POST OFFICE BOX 621
HILO, HAWAII HONOLULU, HAWAII 96809

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
ROBERT H. MASUDA
FIRST DEPUTY
M. KALEO MANUEL
DEPUTY DIRECTOR - WATER
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONSERVATION
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENFORCEMENT
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

ref:OCCLLY

MEMORANDUM:

CDUA HA-3851
Acceptance Date: July 29, 2019
180 Day Expiration Date: January 25, 2020
SUSPENSE DATE: 21 Days from stamped date

AUG - 2 2019

TO: DLNR, Division of Conservation and Resource Enforcement
DLNR, Division of Forestry and Wildlife
DLNR, Hawaii District Land Office

Office of Hawaiian Affairs
Department of Health, OEQC
CoH, Department of Planning
CoH, Fire Department

FROM: Samuel J. Lenono, Administrator
Office of Conservation and Coastal Lands

SUBJECT: REQUEST FOR COMMENTS
Draft Environmental Assessment and Conservation District Use Application (CDUA) HA-3851 for the Crossbard/Bourzat Single Family Residence (SFR) and Associated Improvements

APPLICANT: Francoise Bourzart and Aharon Grossbard

LOCATION: Keonepoko Iki, Puna, Hawai'i
Tax Map Key: (3) 1-5-009:053

Please find enclosed, a CD with an electronic copy of the subject DEA, CDUA HA-3851, and our notice to the applicant. We would appreciate your agency's review and comment on this application. If no response is received by the suspense date, we will assume there are no comments. The suspense date starts from the date stamp. Please contact Lauren Yasaka at (808) 587-0386, should you have any questions on this matter.

BY AUGUST 23
() Comments Attached

No Comments

Attachment
Enclosure

8/21/19
Fax: OCCL

8/21/19
Signature
GORDON C. HEIT DLA
Print Name/Title

The DLNR Land Division (HI District Branch)
has no comments regarding this request.

geometrician

ASSOCIATES, LLC
integrating geographic science and planning

phone: (808) 969-7090 PO Box 396 Hilo Hawaii 96721 rterry@hawaii.rr.com

September 18, 2019

Sam Lemmo, Administrator
Office of Conservation and Coastal Lands
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Lemmo:

Subject: Comments on Draft Environmental Assessment (DEA)/Conservation District Use Application (CDUA) for Grossbard/Bourzat Single-Family Residence in the Conservation District at Pōpōkī, Puna District, Island of Hawai'i, TMK 3-1-5-009:053

I am in receipt of your September 12, 2019 letter to project planner James Leonard that provided comment letters on the Draft EA and discussed Final EA processing.

In the interest of a complete record on comment letters to the EA/CDUA, I would first like to acknowledge receipt of comments from DLNR agencies contained within form memos circulated by your office. We acknowledge here the *no-comment* remarks of the Land Division, Hawaii District Branch conveyed by memo of August 21, 2019. Concerning the August 20, 2019 letter from the County of Hawai'i Planning Department, please see the attached letter.

Thank you for circulating the EA and CDUA for review by DLNR and other agencies. If you have any questions about the EA, please contact me at (808) 969-7090; for questions about the project or CDUA, please contact James Leonard, Project Planner, at (808) 896-3459.

Sincerely,



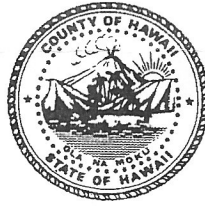
Ron Terry, Principal
Geometrician Associates

Cc: James Leonard, Françoise Bourzat

Harry Kim
Mayor

Wil Okabe
Managing Director

West Hawai'i Office
74-5044 Ane Keohokalole Hwy
Kailua-Kona, Hawai'i 96740
Phone (808) 323-4770
Fax (808) 327-3563



2019 AUG 23 A 9:25
RECEIVED
OFFICE OF CONSERVATION
AND COASTAL LANDS
COUNTY OF HAWAII
PLANNING DEPARTMENT

Michael Yee
Director

Duane Kanuha
Deputy Director

East Hawai'i Office
101 Pauahi Street, Suite 3
Hilo, Hawai'i 96720
Phone (808) 961-8288
Fax (808) 961-8742

August 20, 2019

Samuel J. Lemmo, Administrator
Department of Land and Natural Resources
Office of Conservation and Coastal Lands
P. O. Box 621
Honolulu, HI 96809

Dear Mr. Lemmo,

SUBJECT: Request for Comments on Draft Environmental Assessment (DEA) for Conservation District Use Application (CDUA) HA-3851
Project: Groassbard/Bourzart Single Family Residence
Location: TMK: (3) 1-5-009:053, Pu'ua-Keonepoko Iki, Puna, Hawai'i

Thank you for your letter dated August 2, 2019, requesting comments from this office regarding a Draft Environmental Assessment (DEA) for the above referenced project and property.

According to the submittal, the applicant is proposing to construct a 2,560-square foot Single-Family Residence (SFR) and related improvements, including landscaping, the establishment of a garden-area, and the planting of fruit trees for personal use. Additionally, the proposed SFR and associated development will be located approximately 153-feet from the shoreline and therefore is not within the County of Hawaii shoreline *setback* area.

The property is located within the County of Hawai'i Special Management Area (SMA). According to Chapter 205A-22, HRS, and Planning Commission Rule No. 9-4(e)(I)(B) and (A) relating to the Special Management Area, the "*Grading, removing, dredging, mining, or extraction of any materials*" and "*Placement or erection of any solid material or any gaseous, liquid, solid, or thermal waste*", respectively, is defined as "development." Therefore, the applicant is required to submit to this office a *Special Management Area Assessment Application* prior to beginning construction.

We would like to inform you that there are established historic trails located along this coastline, however, we recognize that maps may not exist. We ask that the applicant contact the Na Ala Hele trail program (Hawai'i Island) to ensure there are no access trails or easements traversing the shoreline area (or top of pali) fronting the subject parcel.

Samuel J. Lemmo, Administrator
Department of Land and Natural Resources
Office of Conservation and Coastal Lands
August 20, 2019
Page 2

The Planning Department appreciates that the applicant integrated a discussion on how the project aligns within the County of Hawai'i General Plan (2005) and LUPAG designation. Additionally, we appreciate the applicant including a discussion on the projects integration with the *Puna Community Development Plan* (PCDP).

If you have any questions regarding this letter or the SMA application we requested, please contact Alex J. Roy of this office at (808) 961-8140 or via email at alex.roy@hawaiicounty.gov

Sincerely,



AJR MICHAEL YEE
Planning Director

AJR:mad

\\wpwin60\alex_roy\ea_eis_review\grossbard_sfr_puna\pd_response_ltr_dea_ha3851.docx

cc: James Leonard, JM Leonard Planning LLC

geometrician

A S S O C I A T E S , L L C
integrating geographic science and planning

phone: (808) 969-7090 PO Box 396 Hilo Hawaii 96721 rterry@hawaii.rr.com

September 18, 2019

Michael Yee, Director
Hawai'i County Planning Dept.
101 Pauahi Street, Suite 3
Hilo HI 96720

Dear Mr. Yee:

Subject: Comments on Draft Environmental Assessment (DEA)/Conservation District Use Application (CDUA) for Grossbard/Bourzat Single-Family Residence in the Conservation District at Pōpōkī, Puna District, Island of Hawai'i, TMK 3-1-5-009:053

Thank you for your comment letter dated August 20, 2019. In answer to your specific comments:

1. The applicant is required to submit to this office a Special Management Area Assessment Application prior to beginning construction.

Project planner James Leonard has prepared an SMA Assessment and expects to provide it with the FONSI when it is issued by DLNR, per our understanding of the SMA requirements for the County of Hawai'i.

2. There are established historic trails located along this coastline, even if maps may not exist. Contact the Na Ala Hele trail program (Hawai'i Island) to ensure there are no access trails or easements traversing the shoreline area (or top of pali) fronting the subject parcel.

The EA included both an archaeological inventory survey and a cultural impact assessment that carefully researched both the on-ground features and all known documentary sources concerning trails. The only trail recorded in the area was what ultimately became the Government Beach Road. Early consultation was conducted with the Land Division of DLNR, which provided a copy of the letter to Na Ala Hele. The Draft EA was also provided by OCCL to Na Ala Hele. Neither of these communications resulted in a comment from the agency. Out of deference to your concerns, Principal Investigator Matt Clark, M.A., of ASM Affiliates contacted Jackson Bauer of Na Ala Hele on September 12, 2019 and initiated a discussion on the potential presence of trails that involved sharing the extensive set of maps, deeds and testimony that ASM utilized in preparing its studies. No evidence of trails has emerged to date from this discussion; the dialogue is continuing and Project Planner James Leonard will inform the Planning Department if any new information arises.

3. The Planning Department appreciates that the applicant integrated a discussion on how the project aligns within the County of Hawai'i General Plan, LUPAG designation, and Puna Community Development Plan.

Thank you for acknowledging this discussion.

We very much appreciate your review of the document. If you have any questions about the EA, please contact me at (808) 969-7090.

Sincerely,

A handwritten signature in black ink that reads "Ron Terry". The signature is written in a cursive style with a large, sweeping flourish at the end of the name.

Ron Terry, Principal
Geometrician Associates

Cc: Sam Lemmo, James Leonard, Françoise Bourzat

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Environmental Assessment

Grossbard/Bourzat Single-Family Residence in the Conservation District at Keonepoko

APPENDIX 2 Archaeological Assessment Survey

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An Archaeological Assessment of a 6.9-Acre Coastal Parcel

TMK: (3) 1-5-009:053

Keonepoko Iki Ahupua‘a
Puna District
Island of Hawai‘i

DRAFT VERSION



Prepared By:
Benjamin Barna, Ph.D.
and
Ted Bibby, Ph.D.

Prepared For:

Françoise Bourzat and Aharon Grossbard
2150 Bear Gulch Road
Woodside, CA 94062

September 2018



Archaeology • History • Anthropology • Architectural History

Hilo Office: (808) 969-6066 Fax: (808) 443-0065
507-A E. Lanikaula Street, Hilo, HI 96720

Honolulu Office: (808) 439-8089 Fax: (808) 439-8087
820 Mililani Street, Suite 700, Honolulu, HI 96813

An Archaeological Assessment of a 6.9-Acre Coastal Parcel

TMK: (3) 1-5-009:053

Keonepoko Iki Ahupua‘a

Puna District

Island of Hawai‘i



EXECUTIVE SUMMARY

At the request of James Leonard, ASM Affiliates conducted an Archaeological Inventory Survey of a roughly 6.9 acre parcel (TMK: (3) 1-5-009:053) in Keonepoko Iki Ahupua'a, Puna District, Island of Hawai'i. Françoise Bourzat and Aharon Grossbard (the landowners) seek a Conservation District Use Permit (CDUP) to build a single-family dwelling on their 6.9-acre property located makai of the Government Beach Road in Keonepoko Iki, northwest of the Hawaiian Beaches subdivision, in the Lower Puna area of the Island of Hawai'i. The current study was conducted in support of Conservation District Use Application (CDUA) and Environmental Assessment (EA) being prepared for the property.

On September 13, 2018, Ivana Hall, B.A., Ted Bibby, Ph. D., and Benjamin Barna, Ph.D. conducted an intensive pedestrian archaeological survey of the entire study area (100% surface survey). Dr. Barna is the principal investigator for the current study. During the pedestrian survey of the study area, the entire parcel was subject to northeast/southwest pedestrian transects with fieldworkers spaced at 10-meter intervals. Although a few depressions, outcrops, lava blisters and overhangs were observed, close inspection of each of these revealed no evidence of human use or modification. In the *hala* forested portion of the study area, the ground surface showed extensive disturbance from root growth. The ground surface in the portion of the study area *mauka* of the *hala* was relatively flat possibly as a result of prior vegetation clearing. Apart from a very thin (less than two centimeters) layer of organic muck beneath the leaf litter, there was almost no accumulation of sediment or soils in the study area, and so no subsurface testing as attempted.

As a result of the current fieldwork, no archaeological features of any kind were observed within the study area. According to 13§13-284-5(b)(5)(A) when no archaeological resources are discovered during an archaeological inventory survey the production of an Archaeological Assessment report is appropriate. The current study was undertaken in accordance with Hawai'i Administrative Rules 13§13-284, 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 historic preservation review process requirements of both the Department of Land and Natural Resources–State Historic Preservation Division (DLNR–SHPD) and the County of Hawai'i Planning Department

CHAPTERS

	Page
1. INTRODUCTION.....	1
STUDY AREA DESCRIPTION.....	1
2. BACKGROUND	11
CULTURE-HISTORICAL CONTEXT.....	11
A Generalized Model of Hawaiian Prehistory	12
Legendary References to the Puna District	14
History After Contact	16
PREVIOUS ARCHAEOLOGICAL STUDIES	32
3. STUDY AREA EXPECTATATIONS.....	35
4. FIELDWORK	36
FIELD METHODS	36
5. DETERMINATION OF EFFECT	37
REFERENCES CITED.....	38

FIGURES

	Page
1. Study area location (portion of U.S.G.S. 7.5 min. series quadrangle, Pāhoa North, HI 2017).....	2
2. Tax Map Key (TMK: (3) 1-5-009 showing location of current study parcel (TMK: (3) 1-5-009:053) shaded red.....	3
4. Google Earth aerial image of TMK: (3) 1-5-009:053 with parcel outlined in red.....	4
5. Southwest boundary of the study area along Old Government Beach Rd. Survey flag visible center-right of photo. View is to the east.....	4
6. Coastal bluff fronting the study area, view to the northwest.	5
7. Photograph of study area with access driveway in the foreground leading makai. View to the North East.....	5
8. Geology of current study area with parcel outlined in red.....	6
9. Weathered inflationary lobe overgrown by <i>Schefflera actinophylla</i> , view to the south.....	7
10. Soils in the current study area with parcel outlined in red.....	7
11. February 19, 1977, aerial image (USGS 1977) of the current study area with parcel outlined in red.....	8
12. Coastal strand vegetation along the north west corner of the study area. Access driveway is visible center of picture. View to the southwest.....	8
13. Vegetation in study area transitioning from coastal strand to <i>hala</i> forest. View is to the southwest.....	9
14. Dense <i>hala</i> forest in study area. View is mauka, to the southwest.....	9
15. Inland introduced weedy trees and vines in the study area, view to the south.....	10
16. Inland introduced weedy trees and vines in the study area, view to the south.....	10

17. Portion a map of Hilo and Puna ca. 1841 (Wilkes 1844:61).	20
18 Portion of Hawai‘i Registered Map No. 2258 \ (Morange 1903a) with the current study area shaded in red.	23
19. Hawai‘i Registered Map No. 367 showing the boundaries of Keonepoko Nui Ahupua‘a (Naeole 1880), current study area outlined in red.	24
20. Hawai‘i Registered Map No. 2084 showing the Keonepoko Homestead lots (Morange 1903b).	26
21. Portion of Hawai‘i Territory Survey Plat Map No. 811 (prepared in 1915) showing the area leased to W.H. Shipman Ltd. (Wall 1915:811)	28
22. 1918 map (C.S.F. 2992) of General Lease No. 1025 to W.H. Shipman Ltd. in Keonepoko Nui and Iki <i>ahupua‘a</i> . (Arioli 1918).....	29
23. 1929 map (C.S.F. 5261) of the Ka‘ohe-Maku‘u-Keonepoko Iki Government Tract. (Coff 1929).....	30
24. Portion of the 1924 Makuu quadrangle (USGS 1924) showing the current study area shaded red.	31
26. Site locations within Increment H of the Ewart and Luscomb (1974:7) survey area showing the location of the current study parcel (shaded red).....	34
27. Natural depression with <i>hala</i> leaf litter and root disturbance, view to the southeast.....	36
28. Relatively flat ground surface in the <i>mauka</i> portion of the study area., view to the south.	37

1. INTRODUCTION

At the request of James Leonard, on behalf of Françoise Bourzat and Aharon Grossbard (landowners), ASM Affiliates conducted an Archaeological Inventory Survey of a roughly 6.9 acre area parcel (TMK: (3) 1-5-009:053) located in Keonepoko Iki Ahupua‘a, Puna District, Island of Hawai‘i (Figures 1 and 2). The current study was conducted in support of Conservation District Use Application (CDUA) and Environmental Assessment (EA) being prepared for the property. The landowners intend to develop a single-family dwelling, family garden, and fruit tree plantings within the *makai* portion of the parcel.

According to 13§13-284-5(b)(5)(A) when no archaeological resources are discovered during an archaeological inventory survey the production of an Archaeological Assessment report is appropriate. The current study was undertaken in accordance with Hawai‘i Administrative Rules 13§13–284, 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 historic preservation review process requirements of both the Department of Land and Natural Resources–State Historic Preservation Division (DLNR–SHPD) and the County of Hawai‘i Planning Department. This report provides a study area description, a detailed culture-historical background, a discussion of prior archaeological studies within the vicinity of the current study area, and the results of the current field investigation of the study area.

STUDY AREA DESCRIPTION

The study area consists of a roughly 6.9-acre parcel (TMK: (3) 1-5-009:053) located between the Old Government Beach Road and the coast in Keonepoko Iki Ahupua‘a, Puna District, Island of Hawai‘i (Figure 3; see Figures 1 and 2). The parcel is roughly 264 meters long with approximately 103 meters of road frontage (Figure 4) and 126 meters of coastline, where it is fronted by a low coastal bluff (Figure 5). Elevation within the study area ranges from 6 to 20 meters (20 to 70 feet) above sea level. The entire parcel is undisturbed and shows no evidence of recent activity, except for an approximately 3-meter-wide by 220 meter long pre-existing access road (Figure 6) which extends from Government Beach Road to the coastal bluff. The entrance of the access road into the study area is blocked by boulders and short sections of pig fencing, and modern rubbish such as cans, bottles, car parts, and clothing have been dumped nearby (see Figure 6). The access road is lined on both sides with windrows of a few centimeters tall, but these are obscure and generally grown over with vegetation.

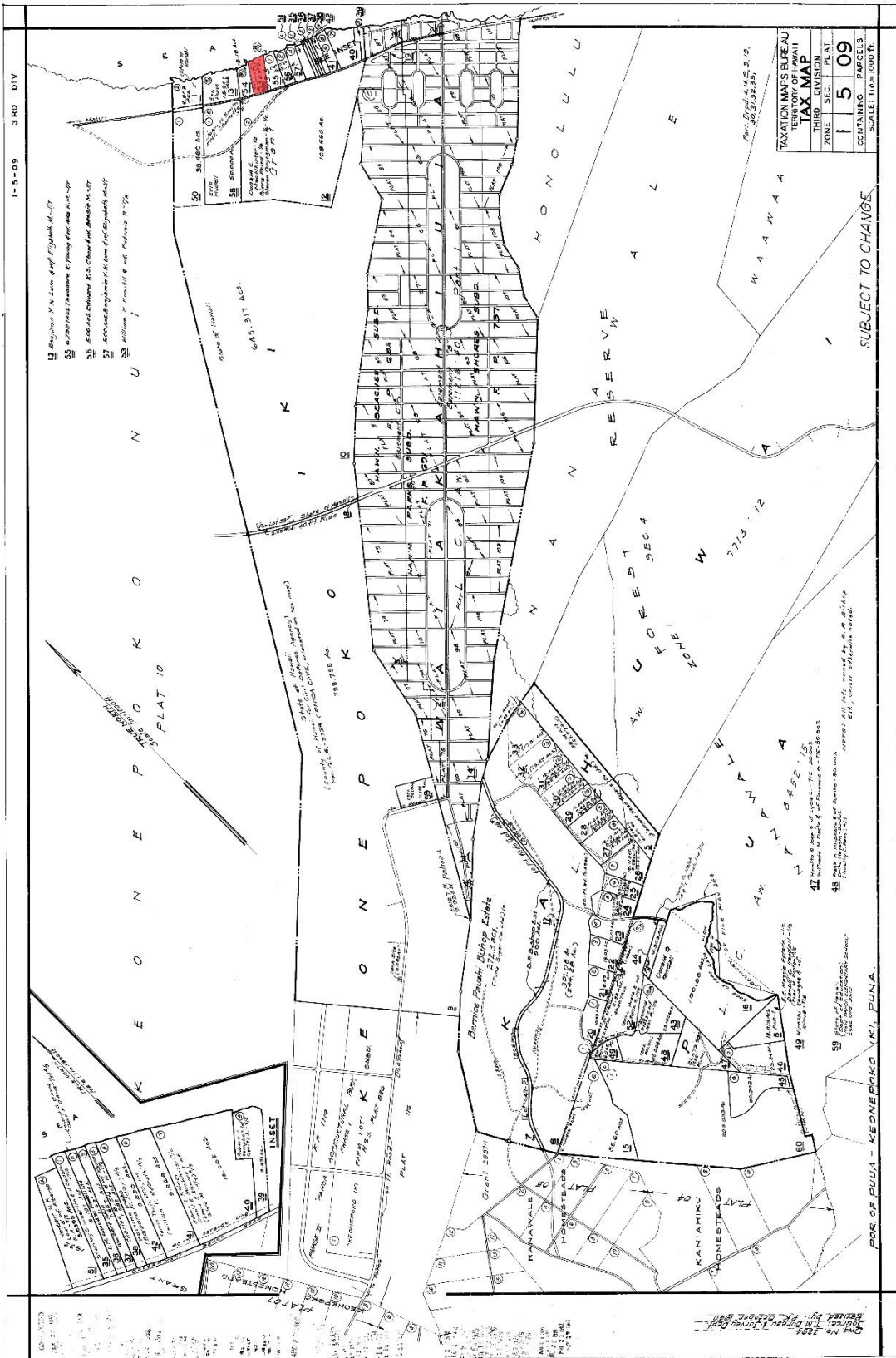


Figure 2. Tax Map Key (TMK: (3) 1-5-009 showing location of current study parcel (TMK: (3) 1-5-009:053) shaded red.



Figure 3. Google Earth aerial image of TMK: (3) 1-5-009:053 with parcel outlined in red.



Figure 4. Southwest boundary of the study area along Old Government Beach Rd. Survey flag visible center-right of photo. View is to the east.



Figure 5. Coastal bluff fronting the study area, view to the northwest.



Figure 6. Photograph of study area with access driveway in the foreground leading makai. View to the North East.

1. Introduction

This portion of the Puna coast is generally formed of mixed *pāhoehoe* and 'a'ā lava flows that originated from Kīlauea Volcano between 400 and 750 years before present (Figure 7) (Sherrod et al. 2007). The weathered lavas on the ground surface have meter-scale topography with some scattered unmodified depressions adjacent to 2-5 meter tall weathered *pāhoehoe* and 'a'ā inflationary lobes (Figure 8). The thin soils that have developed in the vicinity of the study parcel are classified as Opihikao highly decomposed plant material on *pāhoehoe* lavas (Figure 9) (Soil Survey Staff 2018).

In addition to the access road from Government Beach Road, aerial imagery from 1977 (Figure 10) indicates the presence of a second road paralleling the coast and terminating a short distance to the west of the study parcel. This second road was not apparent during the current study, possibly obscured by thick *naupaka* growing along the *mauka* edge of the coastal strand (Figure 11).

The vegetation of the coastal strand (Figure 12) includes primarily *naupaka* (*Scaevola guadichaudiana*), coconut palms (*Cocos nucifera*), *hala* (*Pandanus tectorius*) and ironwood trees (*Casuarina equisetifolia*). Inland of the coastal strand vegetation is a dense *hala* forest (Figure 13) that gradually transitions to a mix of introduced weedy tree and vine species (Figures 14 and 15) such as *maile pilau* (*Paederia foetida*), various pothos (*Epipremnum aureum*) and philodendron vines, bingabing (*Macaranga mappia*), autograph trees (*Clusia rosea*), strawberry guava (*Psidium cattleianum*), umbrella trees (*Schefflera actinophylla*), gunpowder trees (*Trema orientalis*), and melochia (*Melochia umbellata*), with a few coconut palms (*Cocos nucifera*), *laua'e* ferns (*Phymatosorus grossus*), *hala*, and tī plants (*Cordyline fruticosa*) also present.

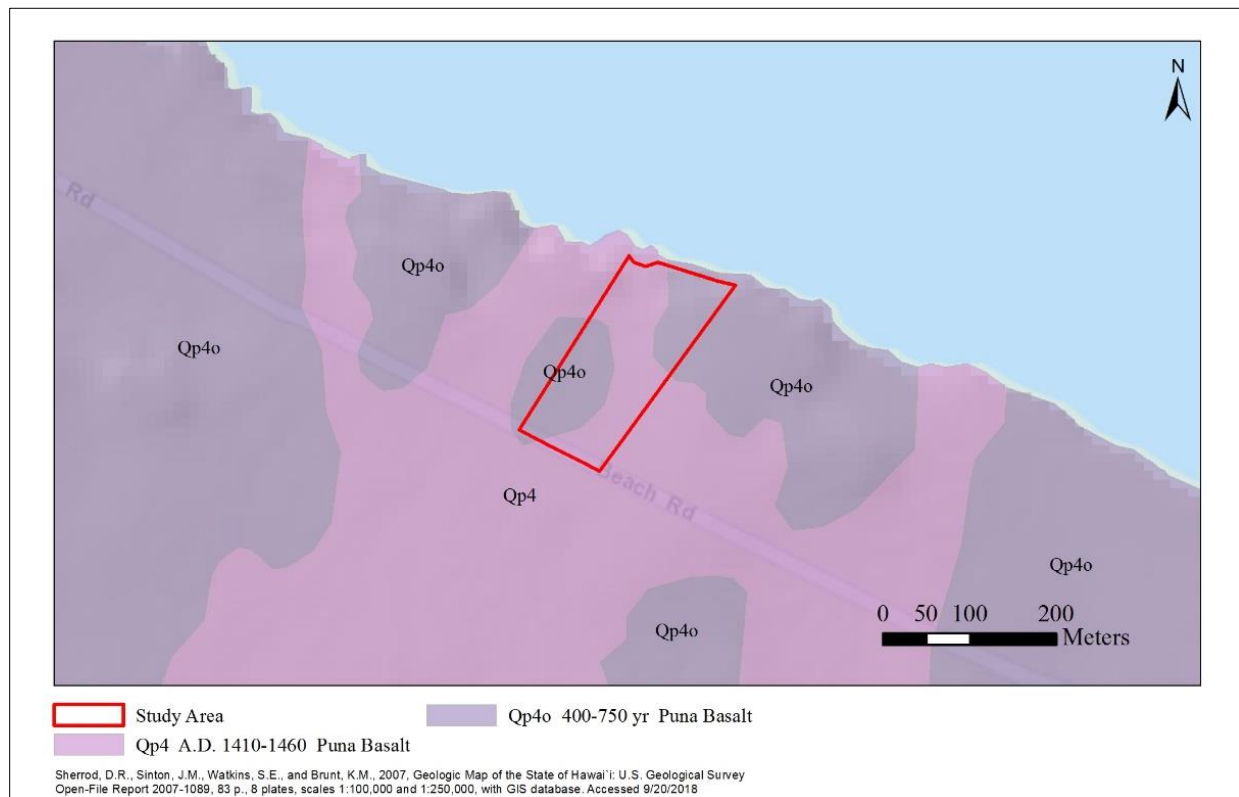


Figure 7. Geology of current study area with parcel outlined in red.



Figure 8. Weathered inflationary lobe overgrown by *Schefflera actinophylla*, view to the south.

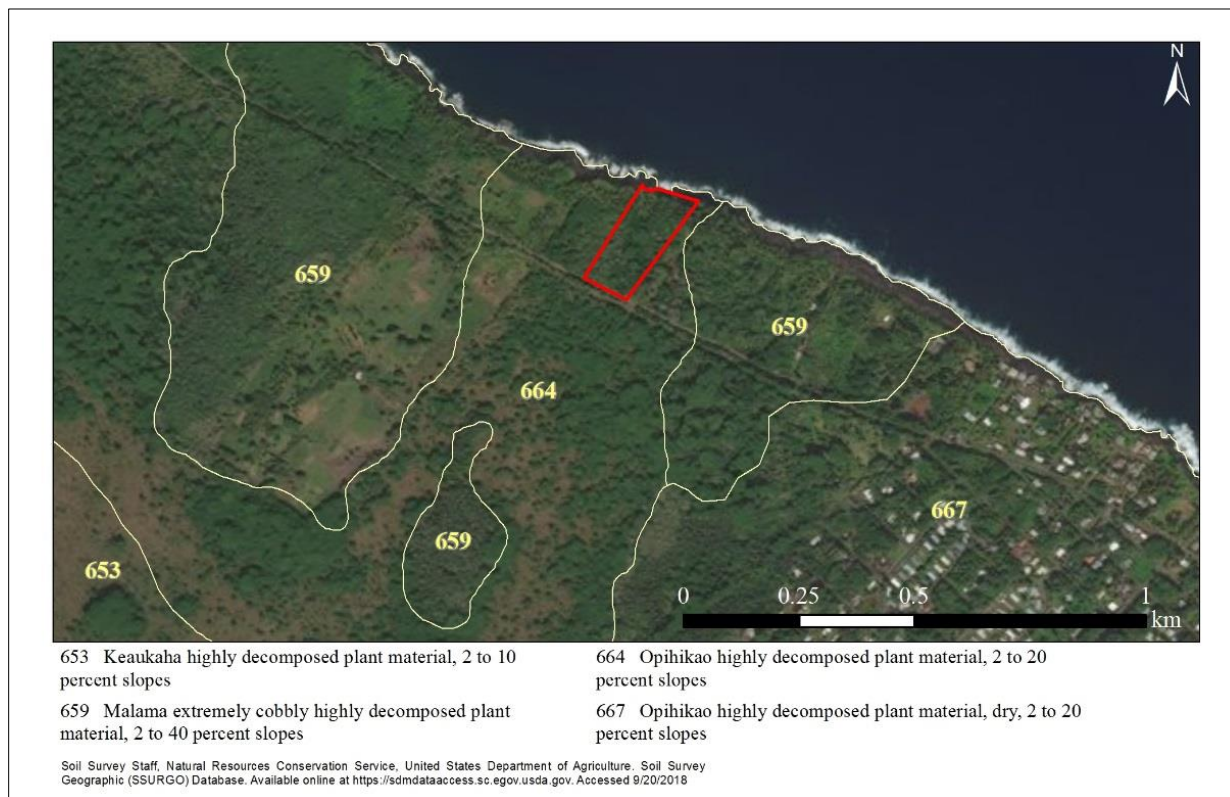


Figure 9. Soils in the current study area with parcel outlined in red.



Figure 10. February 19, 1977, aerial image (USGS 1977) of the current study area with parcel outlined in red.



Figure 11. Coastal strand vegetation along the north west corner of the study area. Access driveway is visible center of picture. View to the southwest.



Figure 12. Vegetation in study area transitioning from coastal strand to *hala* forest. View is to the southwest.



Figure 13. Dense *hala* forest in study area. View is mauka, to the southwest.



Figure 14. Inland introduced weedy trees and vines in the study area, view to the south.



Figure 15. Inland introduced weedy trees and vines in the study area, view to the south.

2. BACKGROUND

To generate a set of expectations regarding the nature of archaeological resources that might be encountered within the study parcel, and to establish an environment within which to assess the significance of any such resources, a general culture-historical context for the region and a review of previous archaeological studies in the vicinity of the current study area are presented.

CULTURE-HISTORICAL CONTEXT

The *ahupua'a* of Keonepoko Iki is one of fifty traditional land divisions found in the District of Puna on the eastern shores of the Island of Hawai'i (see Figure 1). In the book *Native Planters In Old Hawaii*, Handy and Handy (1991) describe Puna as an agriculturally fertile land that has been repeatedly devastated by lava flows. Writing during the 1930s, they relate that:

The land division named Puna—one of the six major chiefdoms of the island of Hawai'i said to have been cut ('*oki*) by the son of the successor of the island's first unifier, Umi-a-Liloa—lies between Hilo to the north and Ka'u to the south, and it projects sharply to the east as a great promontory into the Pacific. Kapoho is the most easterly point at Cape Kumukahi. The uplands of Puna extend back toward the great central heights of Mauna Loa, and in the past its lands have been built, and devastated, and built again by that mountain's fires. In the long intervals, vegetation took hold, beginning with miniscule mosses and lichens, then ferns and hardier shrubs, until the uplands became green and forested and good earth and humus covered much of the lava-strewn terrain, making interior Puna a place of great beauty...

...One of the most interesting things about Puna is that Hawaiians believe, and their traditions imply that this was once Hawaii's richest agricultural region and that it is only in relatively recent time that volcanic eruption has destroyed much of its best land. Unquestionably lava flows in historic times have covered more good gardening land here than in any other district. But the present desolation was largely brought about by the gradual abandonment of their country by Hawaiians after sugar and ranching came in... (Handy and Handy 1991:531–542).

The District of Puna is situated largely on the slopes of Kilauea Volcano. The east rift zone of the volcano, a broad, low profile ridge (2-4 kilometers wide) formed by countless eruptions originating from numerous vents along its crest. The zone extends through the district from the Kilauea Caldera to Cape Kumukahi at the eastern tip of the island, a distance of 55 kilometers. The north side of the rift zone, extending to the slopes of Mauna Loa and to the northeastern Puna coast, is covered primarily by lavas that erupted from the summit of Kilauea about 200-750 years ago. In contrast, nearly the entire crest of the rift zone is covered by lava that is less than 200 years old, and most of the young lava flows that emanate from vents along the crest have spread southward towards the southeastern coast of the district, covering the older lava flows in the process (Sherrod et al. 2007; Wolfe and Morris 1996).

The *ahupua'a* of Keonepoko Iki includes areas of both the Coastal Settlement Zone (Zone I) and the Upland Agricultural Zone (Zone II) as described by (McEldowney 1979:15–18). While this model is largely based on early historical accounts, it also considers environmental variables and human resource needs, and offers insights into the prehistoric past (Burtchard and Moblo 1994). In their refinement of the model as it applies to Puna, Burtchard and Moblo elaborate on McEldowney's concept of the Coastal Settlement Zone:

As with her model, [the Coastal Settlement Zone] includes coastal terrain to about one half mile inland. This is the zone expected to have the greatest density and variety of prehistoric surface features in the general study area. Primary settlements are expected in places where agriculturally productive sediments (principally well-weathered 'a'ā flows) co-occur with sheltered embayments and productive fisheries. Settlements within this zone are expected to be logistically linked to inland agricultural and forest exploitation zones accessed through a network of upslope-downslope (*Mauak-makai*) trails. Larger settlements and resource acquisition areas may have been connected by cross-terrain trail networks. (Burtchard and Moblo 1994:26)

Located along the coast, the current study parcel falls within Zone I of McEldowney's (1979) model. Because this part of the *ahupua'a* also extends out to the ocean fisheries fronting its coastline, with these marine resources and the *mauka* agricultural and forest resources, the former residents of Keonepoko Iki were once able to procure nearly all that they needed to sustain their families and contribute to the larger community from within the land division. The *ahupua'a* resources in turn helped support the *ali'i* that ruled the District of Puna (Maly 1998).

It is within this general context that the following discussion of the history and culture of the study area is framed. The chronological summary presented below begins with the peopling of the Hawaiian Islands and includes the presentation of a generalized model of Hawaiian Prehistory containing specific legendary references to the study *ahupua'a* and a discussion of the general settlement patterns. The discussion of Prehistory and legendary references is followed by a summary of Historic events in the district that begins with the arrival of foreigners in the islands and then continues with the history of land use in Puna after contact. The summary includes a discussion of the changing life ways and population decline of the early Historic Period, a review of land tenure in the study *ahupua'a* during the *Māhele 'Āina* of 1848, and documentation of the transition to modern industries, agriculture, and residential development during the late nineteenth and twentieth centuries. A synthesis of the Precontact settlement patterns and the Historically documented land use, combined with a review of the findings of previously conducted archeological studies, provides a means for predicting the types of archaeological features that may be encountered within the project area, and a basis for assessing the function, age, and significance of any encountered archaeological sites.

A Generalized Model of Hawaiian Prehistory

The generalized cultural sequence that follows is based on Kirch's (1985) model, but is amended to include recent revisions offered by Kirch (2011). Recent re-evaluations of archaeological data (Athens et al. 2014; Kirch 2011; Wilmshurst et al. 2011) strongly suggest that there is no archaeological evidence for occupation of Hawai'i Island (or perhaps anywhere in Hawai'i) until at least A.D. 1000, but once arrived in the archipelago, the colonizing populations spread rapidly thereafter. The implications of this on the currently accepted chronology 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, the Expansion Period to A.D. 1350 to 1650, and the Proto-Historic Period to A.D. 1650-1795.

The initial settlement in Hawai'i is believed to have occurred from the southern Marquesas Islands. The Settlement Period was a time 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. Order 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*. Over a period of several centuries areas with the richest natural resources became populated and perhaps even crowded, and the population began expanding to the *kona* (leeward side) and more remote regions of the island (Cordy 2000). In Puna, initial settlements were likely established at sheltered bays with access to fresh water and rich marine resources. These small communities would have shared extended familial relations, and there was likely an occupational focus on the collection of marine resources.

The Development 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). As the environment reached its maximum carrying capacity, the result was social stress, hostility, and war between neighboring groups (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. The greatest population growth occurred during the Expansion Period. It was during the Expansion Period that a second major migration settled in Hawai'i, this time from Tahiti in the Society Islands. According to Kamakau (1976), the *kahuna* Pā'ao settled in the islands during the 13th century. Pā'ao was the keeper of the god Kū'kā'ilimoku, who had fought bitterly with his older brother, the high priest Lonopele. After much tragedy on both sides, Pā'ao was expelled from his homeland by Lonopele. He prepared for a long voyage and set out across the ocean in search of a new land. On board Pā'ao's canoes were thirty-eight men (*kānaka*), two stewards (*kānaka 'ā'īpu'upu'u*), the chief Pilika'aiea (Pili) and his wife Hina'aukekele, Nāmau'u o Malaia, the sister of Pā'ao, and the prophet Makuaka'ūmana (Kamakau 1992). In 1866, Kamakau told the following story of their arrival in Hawai'i:

Puna on Hawai'i Island was the first land reached by Pā'ao, and here in Puna he built his first *heiau* for his god Aha'ula and named it Aha'ula [Waha'ula]. It was a *luakini*. From Puna, Pā'ao went on to land in Kohala, at Pu'uepa. He built a *heiau* there called Mo'okini, a *luakini*.

It is thought that Pā'ao came to Hawai'i in the time of the *ali'i* La'au because Pili ruled as *mo'i* after La'au. You will see Pili there in the line of succession, the *mo'o kū'auhau*, of Hanala'anui. It was said that Hawai'i Island was without a chief, and so a chief was brought from Kahiki; this is according to chiefly genealogies. Hawai'i Island had been without a chief for a long time, and the chiefs of Hawai'i were *ali'i maka'āinana* or just commoners, *maka'āinana*, during this time.

... There were seventeen generations during which Hawai'i Island was without chiefs—some eight hundred years. ... The lack of a high chief was the reason for seeking a chief in Kahiki, and that is perhaps how Pili became the chief of Hawai'i. He was a chief from Kahiki and became the ancestor of chiefs and people of Hawai'i Island. (1992:100–102)

According to Kirch's (1985) model, the concept of the *ahupua'a* was established sometime during the A.D. 1400s, adding another component to a then well-stratified society. This land unit 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*, or lesser chiefs; 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). This form of district subdividing was integral to Hawaiian life and was the product of strictly adhered to resource management planning. In this system, the land provided fruits and vegetables and some meat for the diet, and the ocean provided a wealth of protein resources (Rechtman and Maly 2003).

Entire *ahupua'a*, or portions of the land were generally under the jurisdiction of appointed *konohiki*, or lesser chief-landlords, who answered to an *ali'i 'ai ahupua'a*. The *ali'i 'ai ahupua'a* in turn answered to an *ali'i 'ai moku* (chief who claimed the abundance of the entire district). Thus, *ahupua'a* resources supported not only the *maka'āinana* and *'ohana* who lived on the land, but also contributed to the support of the royal community of regional and/or island kingdoms. This form of district subdividing was integral to Hawaiian life and was the product of strictly adhered to resources management planning. In this system, the land provided fruits and vegetables and some meat for the diet, and the ocean provided a wealth of protein resources. Also, in communities with long-term royal residents, divisions of labor (with specialists in various occupations on land and in procurement of marine resources) came to be strictly adhered to.

The Precontact population of the Puna District lived in small settlements along the coast where they subsisted on marine resources and agricultural products. The villages of Puna, McEldowney (1979) notes, were similar to those of the Hilo District, and they:

...comprised the same complex of huts, gardens, windbreaking shrubs, and utilized groves, although the form and overall size of each appear to differ. The major differences between this portion of the coast and Hilo occurred in the type of agriculture practiced and structural forms reflecting the uneven nature of the young terrain. Platforms and walls were built to include and abut outcrops, crevices were filled and paved for burials, and the large numbers of loose surface stones were arranged into terraces. To supplement the limited and often spotty deposits of soil, mounds were built of gathered soil, mulch, sorted sizes of stones, and in many circumstances, from burnt brush and surrounding the gardens. Although all major cultigens appear to have been present in these gardens, sweet potatoes, ti (*Cordyline terminalis*), noni (*Morinda citrifolia*), and gourds (*Lagenaria siceraria*) seem to have been more conspicuous. Breadfruit, pandanus, and mountain apple (*Eugenia malaccensis*) were the more significant components of the groves that grew in more disjunct patterns than those in Hilo Bay. (McEldowney 1979:17)

People probably began utilizing the agricultural resources of upland Puna during the early expansion period of Hawai'i Island (Burtchard and Moblo 1994). As coastal populations increased, the need for food caused people to seek arable land at higher elevations. This trend of increasing population along desirable coastal locations and the expansion into upland regions to support the coastal populations would have continued throughout prehistory, slowly populating more marginal areas of Puna District. As population density increased through A.D. 1600-1700s, so would political competition. This competition, undoubtedly, produced conflict, which led to political exiles and the further expansion into upland areas as these refugees sought asylum in more remote places and hidden lava tubes (Burtchard and Moblo 1994).

By the seventeenth century, large areas of Hawai‘i Island (*moku āina* – districts) were controlled by a few powerful *ali‘i ‘ai moku*. There is island-wide evidence to suggest that growing conflicts between independent chiefdoms were resolved through warfare, culminating in a unified political structure at the district level. It has been suggested that the unification of the island resulted in a partial abandonment of portions of leeward Hawai‘i, with people moving to more favorable agricultural areas (Barrera 1971; Schilt and Sinoto 1980). ‘Umi a Līloa, a renowned *ali‘i* of the Pili line, is often credited with uniting the Island of Hawai‘i under one rule (Cordy 2000). According to (Kamakau 1992:17–18), at this time, “Hua-‘a was the chief of Puna, but Puna was seized by ‘Umi and his warrior adopted sons... Hua-‘a was killed by Pi‘i-mai-wa‘a on the battle field of Kuolo in Kea‘au, and Puna became ‘Umi-a-Līloa’s.” Umi’s reign lasted until around ca. A.D. 1620, and was followed by the rule of his son, Keawenui a ‘Umi, and then his grandson, Lonoikamakahiki (Cordy 2000).

Kirch (1985) places the beginning of the Proto-Historic Period during the rule of Lonoikamakahiki. This was a time marked by both political intensification and stress and continual conquest by the reigning *ali‘i*. Wars occurred regularly between intra-island and inter-island polities. It was during this time of warfare that Kamehameha, who would eventually rise to power and unite all the Hawaiian Islands under one rule, was born in the District of North Kohala on the Island of Hawai‘i (Kamakau 1992). There is some controversy about the year of his birth, but Kamakau (1992:66–68) places the birth event sometime between A.D. 1736 and 1758, most likely nearer to the later date.

In A.D. 1754, after many bloody battles, Kalani‘ōpu‘u, the *ali‘i ‘ai moku* of Ka‘ū, defeated his main rival Keaweopala in South Kona and declared himself ruler over all of the island of Hawai‘i (Kamakau 1992:78). Kalani‘ōpu‘u was a clever and able chief, and a famous athlete in all games of strength, but according to Kamakau (1992) he possessed one great fault, he loved war and had no regard for others’ land rights. According to Barrère (1959), the chiefs of the Puna District did not figure prominently into the Precontact political strife and turmoil on Hawai‘i Island. Barrère writes:

Puna, as a political unit, played an insignificant part in shaping the course of history of Hawaii Island. Unlike the other districts of Hawaii, no great family arose upon whose support one or another of the chiefs seeking power had to depend for his success. Puna lands were desirable, and were eagerly sought, but their control did not rest upon conquering Puna itself, but rather upon control of the adjacent districts, Kau and Hilo. (Barrère 1959:15)

Legendary References to the Puna District

Despite its perceived lack of importance with respect to the emerging political history of Hawaiian leadership, Puna was a region famed in legendary history for its associations with the goddess Pele and god Kāne (Maly 1998). Because of the relatively young geological history and persistent volcanic activity, the region’s association with Pele has been a strong one. However, the association with Kāne is perhaps more ancient. Kāne, ancestor to both chiefs and commoners, is the god of sunlight, fresh water, verdant growth, and forests (Pūku‘i 1983). It is said that before Pele migrated to Hawai‘i from Kahiki, there was “no place in the islands . . . more beautiful than Puna” (Pūku‘i 1983:11). Contributing to that beauty were the groves of fragrant *hala* and forests of ‘*ōhi‘a lehua* for which Puna was famous:

Puna pāia ‘ala i ka hala (Puna, with walls fragrant with pandanus blossoms)

Puna, Hawai‘i, is a place of *hala* and *lehua* forests. In olden days the people would stick the bracts of *hala* into the thatching of their houses to bring some of the fragrance indoors. (Pūku‘i 1983:301)

As the Hawaiian people had no written language until Post-contact times, traditional *mo‘olelo* were passed down orally through the generations. Plentiful are the myths and legends associated with the beautiful *wahi pana* of Puna, which frequently refer to the majestic female fire deity, Pele, or “Pele-honua-mea (Pele of the sacred earth)” (Beckwith 1970). Most closely associated with the powerful, temperamental volcanoes of Hawai‘i, she was perhaps both feared and respected equally by the people of the islands. Nimmo (1990) relates that, “although the actual worship of Pele was most important in the districts of Hawai‘i that experienced active volcanism, the mythology of the goddess was widespread throughout the Hawaiian Islands”, but that, “there is no evidence that Pele was worshipped extensively beyond the volcano area of Hawai‘i, although her mythology was apparently widespread throughout the Hawaiian Islands and members of her family were important in ritual throughout the archipelago” (Nimmo 1990:44).

The Heart Stirring Story of Ka-Miki

A traditional *mo‘olelo*, “The Heart Stirring Story of Ka-Miki” (*Kaao Hooniua Puuwai no Ka-Miki*), originally appeared in *Ka Hoku o Hawai‘i* (a Hawaiian language newspaper) between 1914 and 1917. The story tells of two supernatural brothers, Ka-Miki and Maka-‘iole, who were skilled ‘*ōlohe* (competitors/fighters) and their travels

around Hawai‘i Island by way of the ancient trails and paths (*ala loa* and *ala hele*), seeking competition with other *‘ōlohe*. As described by Maly:

The narratives were primarily recorded for the paper by Hawaiian historians John Wise and J.W.H.I. Kihe (with contributions from Steven Desha Sr.). While Ka-Miki is not an ancient account, the authors set the account in the thirteenth century (by association with the chief Pili, who came to Hawai‘i with Pā‘ao). They used a mixture of local stories, tales, and family traditions in association with place names to tie together fragments of site specific history that had been handed down over the generations. Thus, while in many cases, the personification of individuals and their associated place names may not be “ancient,” the site documentation within the “story of Ka-Miki” is of both cultural and historical value. (Maly 1998:17)

A portion of the legend set in Puna was published between October 21 and November 18, 1915. Translated by Maly (1998:17-25), this portion describes many people and places within the district, and mentions a young chief of Puna named Keahialaka. The Maly (1998) translation of the story is summarized below.

During an expedition through the uplands of Puna, Ka-Miki and Maka-‘iolo encountered a man named Pōhakuloa who was intensely working on a large *koa* log. They were headed to Kea‘au, but had lost their way. They stopped and asked Pōhakuloa for directions, but he was startled by the unexpected appearance of the brothers, and replied impolitely. Taunts were exchanged between the two parties, which led to a physical altercation. Pōhakuloa soon realized that these two men were extraordinarily skilled as well as spiritually protected, and he admitted his defeat. Pōhakuloa wished to prepare a meal and drink of *‘awa* with his newfound friends, and solicited the help of his brother in law, an *‘ōlohe* chief named Kapu‘euhi. However, Kapu‘euhi had plans of his own. He intended to compete with and conquer the brothers, but was defeated by them instead. Kapu‘euhi was infuriated by his defeat, and also by Pōhakuloa’s refusal to aid in retaliation against Ka-Miki and Maka-‘iolo.

Kapu‘euhi invited the brothers back to his house to partake in a meal and a particularly potent type of *‘awa*, scheming to get them drunk. Unbeknownst to Ka-Miki and Maka-‘iolo, this was common practice for Kapu‘euhi, who often housed weary travelers in his guest house, intoxicated them with *‘awa*, then killed them and stole their precious belongings. Kapu‘euhi waged a bet with the brothers; if they couldn’t drink five cups of the *‘awa*, then he would throw them out and they would be at the mercy of the Puna forest. Ka-Miki and Maka-‘iolo agreed, and counteracted his bet with one of their own; if they were able to drink five cups, they would throw Kapu‘euhi out of his own house. The brothers prayed and chanted to their ancestral goddess, and were able to consume the entire quantity of *‘awa* without getting drunk. As agreed upon, Kapu‘euhi was thrown out. Stunned, and angered that he was thwarted once again, Kapu‘euhi requested assistance from Kaniahiku (a much feared Puna *‘ōlohe* and forest guardian) and her grandson Keahialaka. “At that time, Keahialaka was under the guardianship of Pānau and Kaimū, and he enjoyed the ocean waters from Nānāwale to Kaunaloa, Puna” (*Ka Hoku o Hawai‘i* October 28, 1915; translated by Maly 1998:20), which Maly (1998) suggests is symbolic of controlling those regions.

Together, Kapu‘euhi and Kaniahiku conspired to lead the brothers deep into the Puna forest, where Kaniahiku would be able to murder them, all the while maintaining the façade that they were taking them to the *‘awa* grove of Mauānuikananuha. Once Ka-Miki and Ka-‘iolo were well within the domain of Kaniahiku, she created a dark and murky environment, spreading gloomy mists and an overgrowth of twisted vegetation intended to ensnare the brothers. Ka-Miki and Ka-‘iolo were overcome, and left for dead by Kapu‘euhi, who made his way back to safety, led by Kaniahiku’s sister. They prayed to their ancestor, Ka-uluhe-nui-hihi-kolo-i-uka for help. All at once, her presence became apparent, and the brothers were able to continue on to the *‘awa* grove. Another attempt by Kaniahiku to kill the brothers was made, however, Ka-uluhe’s protection over them was too strong, and the endeavor failed.

Ka-Miki and Ka-‘iolo realized that Kapu‘euhi had deceived them and had been in affiliation with Kaniahiku. They were angered, and trapped him in the *‘awa* grove. In an effort of retaliation, Kaniahiku summoned for her grandson, Keahialaka, and readied herself for a battle. Ka-Miki and Maka-‘iolo reprimanded Kaniahiku for her deceitful actions, which only served to anger her even further. Aggressively, Kaniahiku attacked Ka-Miki with her tripping club and spear, but Ka-Miki was far too elusive for her. He swiftly evaded each attempt at injury made on his behalf. In desperate need of assistance, Kaniahiku beckoned to Keahialaka by playing her nose flute, urging him to hurry to her side. Although Keahialaka was strong and skillful in the arts of *‘ōlohe*, he was all too easily overcome by Ka-Miki. His grandmother, in an attempt to free him from Ka-Miki, was also captured.

Kaniahiku was astounded at the dexterity of the brothers. Their skill was incomparable to any other *‘ōlohe* she had ever encountered, and even her own skill paled in comparison, for she had never been defeated. All at once she surrendered to Ka-Miki and Maka-‘iolo, who in turn released her and her grandson. Back at Kaniahiku’s house, a meal was prepared, the *‘awa* of Kali‘u was enjoyed, and the gods were honored with offerings. Kaniahiku requested that

the brothers take Keahialaka with them as they continued their journey on the *ala loa*, declaring that if they did, they would be welcomed wherever their travels took them in Puna. Ka-Miki and Maka'iole approved of this request, and took Keahialaka on as their companion. Together, the three men journeyed throughout various districts of Hawai'i island, and competed in many 'ōlohe competitions.

In the legend of Ka-Miki, the land of Keonepokoiki was named for an 'ōlohe master of Puna, who was the *mokomoko* (rough hand fighting) instructor of the chief Pu'ula (Maly 1992). According to the story Keonepokoiki was a traditional training grounds for 'ōlohe of Puna, were masters skilled in hand to hand combat and other martial arts techniques. In the story Ka-Miki quickly defeats the Puna master, Keonepokoiki in an 'ōlohe contest. Ka-Miki then threatened to kill Keonepokoiki, who seeing that there was no one who could defeat Ka-Miki, gave his complete surrender and returned to his home. According to the story, Keonepokoiki lived on the upland side of the *alaloa* (the around the island coastal trail). At his compound was an altar dedicated to his gods (Maly 1992). ...

History After Contact

The arrival of Western explorers in Hawai'i signified the end of the Precontact Period, and the beginning of the Historic Period. With the arrival of foreigners, Hawai'i's culture and economy underwent drastic changes. Demographic trends during the late Proto-Historic Period/early Historic Period indicate population reduction in some areas, due to war and disease, yet increase in others, with relatively little change in material culture. At first there was a continued trend toward craft and status specialization, intensification of agriculture, *ali'i* controlled aquaculture, the establishment of upland residential sites, and the enhancement of traditional oral history (Kent 1983; Kirch 1985). The Kū cult, *luakini heiau*, and the *kapu* system were at their peaks, although western influence was already altering the cultural fabric of the Islands (Kent 1983; Kirch 1985). Foreigners very quickly introduced the concept of trade for profit, and by the time Kamehameha I had conquered O'ahu, Maui and Moloka'i, in 1795, Hawai'i saw the beginnings of a market system economy (Kent 1983). Some of the work of the commoners shifted from subsistence agriculture to the production of foods and goods that they could trade with early visitors. Introduced foods often grown for trade with Westerners included yams, coffee, melons, Irish potatoes, Indian corn, beans, figs, oranges, guavas, and grapes (Wilkes 1845). Later, as the Historic Period progressed, Kamehameha I died, the *kapu* system was abolished, Christianity established a firm foothold in the islands, and introduced diseases and global economic forces began to have a devastating impact on traditional life-ways in the Hawaiian Islands. This marked the end of the Proto-Historic Period and the end of an era of uniquely Hawaiian culture.

The Arrival of Captain James Cook and the End of Kalani'ōpu'u's Reign (1778-1782)

British explorer Captain James Cook, in command of the ships *H.M.S. Resolution* and *H.M.S. Discovery*, landed in the Hawaiian Islands on January 18, 1778. The following January 17th [1779], on a return trip to Hawaiian waters, Cook anchored near Ka'awaloa at Kealakekua Bay in the South Kona District to resupply his ships. This return trip occurred at the time of the annual *Makahiki* festival, and many of chiefs and commoners were gathered around the bay celebrating. According to John Ledyard, a British marine on board Cook's ship, upward of 15,000 inhabitants were present at the bay, and as many as 3,000 canoes came out to greet the ships (Jarves 1847:59). It has been suggested that Captain Cook was mistaken for the god Lono himself returned, as men would not normally be allowed to paddle out during the *Makahiki* without breaking the *kapu* and forfeiting all of their possessions (Kamakau 1992). On January 26th Kalani'ōpu'u, the reigning chief of Hawai'i Island, visited Cook on board the *H.M.S. Resolution*, where they exchanged gifts. Kamehameha, the future ruler of all of Hawai'i, was present at this meeting (Jarves 1847).

On February 4th, Cook set sail from Kealakekua Bay, but a storm off the Kohala coast damaged the mast of the *H.M.S. Resolution*, and both ships were forced to return to Kealakekua to make repairs. With Cook's return many of the inhabitants of Kealakekua began to doubt that he was actually the physical manifestation of Lono (Kamakau 1992). On February 13th, several natives were discovered stealing nails from the British ships. They were fired upon by the crew, and a chief close to Kalani'ōpu'u named Palea was knocked down, and his canoe taken. That night one of Cook's boats was stolen, and the following morning Cook set ashore at Ka'awaloa with six marines to ask Kalani'ōpu'u for its return. Kalani'ōpu'u, however, denied any knowledge of the theft; Cook decided to hold the chief captive until the boat was returned (Kamakau 1992). When Cook tried to seize Kalani'ōpu'u, however, a scuffle ensued and Cook was killed (along with four of his men and several natives) there on the shores of Ka'awaloa, struck down by a metal dagger. When Captain Cook fell, the British ships fired cannons into the crowd at the shore and several more natives were killed. Kalani'ōpu'u and his retinue retreated inland, bringing the body of Cook with them.

In March of 1779, after Cook's death, Captain King sailed along the Puna shoreline and described the district as a sparsely populated, but verdant and fertile (Maly 1998). Captain King, mentioned that Kalani'ōpu'u had one of his residences there, and he provided the following description of the landscape:

...the SE sides of the districts of Opoona & Kaoo [Puna and Ka'ū]. The East part of the former is flat, covered with Coco nut trees, & the land far back is of a Moderate height. As well as we could judge this is a very fine part of the Island, perhaps the best. Terreeoboo [Kalani'ōpu'u] has one of his residences here.

On the SW extremity of Opoona the hills rise abruptly from the Sea side, leaving but a narrow border, & although the sides of the hills have a fine Verdure, yet they do not seem Cultivated, & when we sailed pretty near & along this end of Opoona, we did not observe that it was equally Populous with the Eastern parts; before we reached the East point of the Island, & all along this SE side the snowy mountain calls Roa (or extensive) [Mauna Loa] is very conspicuous. It is flattish at the top or makes what we call Table land... (Beaglehole 1967:606)

After the departure of *H.M.S. Resolution* and *Discovery*, Kalani'ōpu'u moved to Kona, where he surfed and amused himself with the pleasures of dance (Kamakau 1992). While he was living in Kona, famine struck. Kalani'ōpu'u ordered that all the cultivated products of that district be seized, and he then set out on a circuit of the island. Kalani'ōpu'u first went to Hinakahua in Kapa'au, North Kohala where he amused himself with "sports and games such as hula dancing, *kilu* spinning, *maika* rolling, and sliding sticks" (Kamakau 1992:106). During his stay in Kohala, around 1780, Kalani'ōpu'u proclaimed that his son Kiwala'ō would be his successor, and he gave the guardianship of the war god Kūka'ilimoku to Kamehameha (Fornander 1996; Kamakau 1992). It was during his time in Kohala that an uprising, led by a highly esteemed chief of Puna named Imakakoloa, occurred. Upon hearing of the uprising, Kalani'ōpu'u immediately went to Hilo to quell the rebellion.

Though customary at the time, to furnish the king's court with items such as "pigs, fish, taro, fruits and other forms of wealth" (Elkin 1904), it is said that Imakakoloa rebelled because he was tired of the incessant and exorbitant demands of Kalani'ōpu'u. As a chief who loved the people of Puna, and was beloved by them in return, Imakakoloa refused Kalani'ōpu'u's demands. He felt that "his own people who cultivated the ground should be provided with the necessities of life, before the numbers of the royal court, who lived in idleness" (Elkin 1904:26). Rather than allow Kalani'ōpu'u access to the toils of the people of Puna, Imakakoloa:

...seized the valuable products of his district, which consisted of hogs, gray tapa cloth ('*eleuli*), tapas made of *mamaki* bark, fine mats made of young pandanus blossoms ('*ahu hinalo*), mats made of young pandanus leaves ('*ahua*), and feathers of the '*o'o* and *mamo* birds of Puna. (Kamakau 1992:106)

This action angered Kalani'ōpu'u, who was insulted by the insubordination. He vowed revenge against Imakakoloa, and devised a plan to kill him. A battle between the two men ensued, and although Imakakoloa was a worthy opponent, his army was no match for Kalani'ōpu'u's superior forces. After the battle, the Puna chief fled and was sheltered in the district by his people for more than a year. Kalani'ōpu'u, sworn to vengeance, ruthlessly stalked the fugitive chief for the duration of his emancipation, and in his rage he ordered that Puna be burned to the ground. Fornander (1969:202) indicates that the district was "literally laid in ashes" as a result of Kalani'ōpu'u's vengeance.

While the rebel Puna chief was sought, Kalani'ōpu'u "went to Ka'ū and stayed first at Punalu'u, then at Waiohinu, then at Kama'oa in the southern part of Ka'ū, and erected a heiau called Pakini, or Halauwailua, near Kama'oa" (Kamakau 1992:108). Imakakoloa was eventually captured and brought to the *heiau*, where Kiwala'ō was to sacrifice him. "The routine of the sacrifice required that the presiding chief should first offer up the pigs prepared for the occasion, then bananas, fruit, and lastly the captive chief" (Fornander 1996:202). However, before Kiwala'ō could finish the first offerings, Kamehameha, "grasped the body of Imakakoloa and offered it up to the god, and the freeing of the tabu for the heiau was completed" (Kamakau 1992:109). Upon observing this single act of insubordination, many of the chiefs believed that Kamehameha would eventually rule over all of Hawai'i. After usurping Kiwala'ō's authority with a sacrificial ritual in Ka'ū, Kamehameha retreated to his home district of Kohala.

The Rule of Kamehameha I (1782-1819)

After Kalani'ōpu'u's death in April of 1782, several chiefs were unhappy with Kiwala'ō's division of the island's lands, and civil war broke out. Kiwala'ō, Kalani'ōpu'u's son and appointed heir, was killed at the battle of Moku'ōhai, South Kona in July of 1782. Supporters of Kiwala'ō, including his half-brother Keōua and his uncle Keawemauhili, escaped the battle of Moku'ōhai with their lives and laid claim to the Hilo, Puna, and Ka'ū Districts. According to I'i (1963) nearly ten years of almost continuous warfare followed the death of Kiwala'ō, as Kamehameha endeavored to unite the Island of Hawai'i under one rule and conquer the islands of Maui and O'ahu. Keōua became Kamehameha's main rival on the Island of Hawai'i, and he proved difficult to defeat (Kamakau 1992). Keawemauhili would eventually give his support to Kamehameha, but Keōua never stopped resisting. Around 1790, in an effort to secure

2. Background

his rule, Kamehameha began building the *heiau* of Pu‘ukoholā in Kawaihae, which was to be dedicated to the war god Kūka‘ilimoku (Fornander 1996).

Westervelt (1916) relates a story of Keōua, Keawemauhili, and Kamehameha that begins after the battle of Moku‘ōhai, but tells of another battle in ca. 1790 when Kamehameha routed Keōua at Waimea and Hāmākua and then sent men to attack Ka‘ū. As Keōua attempted to return to his home district a portion of his army was killed by an eruption of Kīlauea Volcano. Westervelt writes:

. . . Kiwalao’s half-brother Keoua escaped to his district Ka-u, on the southwestern side of the island. His uncle Keawe-mau-hili escaped to his district Hilo on the southeastern side.

For some years the three factions practically let each other alone, although there was desultory fighting. Then the high chief of Hilo accepted Kamehameha as his king and sent his sons to aid Kamehameha in conquering the island Maui.

Keoua was angry with his uncle Keawe-mau-hili. He attacked Hilo, killed his uncle and ravaged Kamehameha’s lands along the northeastern side of the island.

Kamehameha quickly returned from Maui and made an immediate attack on his enemy, who had taken possession of a fertile highland plain called Waimea. From this method of forcing unexpected battle came the Hawaiian saying, “The spear seeks Waimea like the wind.”

Keoua was defeated and driven through forests along the eastern side of Mauna Kea (The white mountain) to Hilo. Then Kamehameha sent warriors around the western side of the island to attack Keoua’s home district. Meanwhile, after a sea fight in which he defeated the chiefs of the islands Maui and Oahu, he set his people to building a great temple chiefly for his war-god Ka-ili. This was the last noted temple built on all the islands.

Keoua heard of the attack on his home, therefore he gave the fish-ponds and fertile lands of Hilo to some of his chiefs and hastened to cross the island with his army by way of a path near the volcano Kīlauea. He divided his warriors into three parties, taking charge of the first in person. They passed the crater at a time of great volcanic activity. A native writer, probably Kamakau, in the native newspaper *Kuokoa*, 1867, describes the destruction of the central part of this army by an awful explosion from Kīlauea. (Westervelt 1916:140-141)

The untimely eruption of Kīlauea, as Keōua’s army attempted to return to Ka‘ū to stop Kamehameha’s warriors from ravaging their home district, cost him about 400 fighting men along with an untold number of women and children (Fornander 1996). Kamehameha’s prophets said that this eruption was the favor of the gods who rejoiced at his building of Pu‘ukoholā Heiau. According to Westervelt (1916:146), “The people said it was proof that Pele had taken Kamehameha under her special protection and would always watch over his interests and make him the chief ruler.”

Unable to defeat Keōua in battle, Kamehameha resorted to trickery. When Pu‘ukoholā Heiau was completed in the summer of 1791, Kamehameha sent his two counselors, Keaweheulu and Kamanawa, to Keōua to offer peace. Keōua was enticed to the dedication of the Pu‘ukoholā Heiau by this ruse, and when he arrived at Kawaihae, he and his party were sacrificed to complete the dedication (Kamakau 1992). The assassination of Keōua gave Kamehameha undisputed control of Hawai‘i Island by 1792 (Greene 1993). It is widely thought that Keōua knew the likely outcome of his visit to Pu‘ukoholā Heiau, but sacrificed himself anyway to spare the people of Ka‘ū further bloodshed.

By 1796, with the aid of foreign weapons and advisors, Kamehameha conquered all of the island kingdoms except Kaua‘i. In 1810, when Kaumuali‘i of Kauai gave his allegiance to Kamehameha, the Hawaiian Islands were unified under a single leader (Kuykendall and Day 1976) Kamehameha would go on to rule the islands for another nine years. He and his high chiefs participated in foreign trade, but continued to enforce the rigid *kapu* system.

Early Written Accounts of Puna (1820-1847)

Following the death of Kamehameha I in 1819, the Hawaiian religious and political systems began a radical transformation; Ka‘ahumanu proclaimed herself “*Kuhina nui*” (Prime Minister), and within six months the ancient *kapu* system was overthrown. Within a year, Protestant missionaries arrived from America (Fornander 1969; I‘i 1963; Kamakau 1992). In 1823, British missionary William Ellis and members of the American Board of Commissioners for Foreign Missions (ABCFM) toured the island of Hawai‘i seeking out communities in which to establish church centers for the growing Calvinist mission. Ellis recorded observations made during this tour in a journal (Ellis 2004), and offers a rare glimpse at the study area during this time. Walking from Kīluea to Waiakea along Puna’s southeastern

shore with his missionary companions Asa Thurston and Artemas Bishop, Ellis recorded descriptions of residences and practices that are applicable to the general study area:

The population in this part of Puna, though somewhat numerous, did not appear to possess the means of subsistence in any great variety or abundance; and we have often been surprised to find desolate coasts more thickly inhabited than some of the fertile tracts in the interior; a circumstance we can only account for, by supposing that the facilities which the former afford for fishing, induce the natives to prefer them as places of abode; for they find that where the coast is low, the adjacent water is usually shallow.

We saw several fowls and a few hogs here, but a tolerable number of dogs, and quantities of dried salt fish, principally albacores and bonitos. This latter article, with their *poë* [*poi*] and sweet potatoes, constitutes nearly the entire support of the inhabitants, not only in this vicinity, but on the sea coasts of the north and south parts of the island.

Besides what is reserved for their own subsistence, they cure large quantities as an article of commerce, which they exchange for the vegetable productions of Hilo and Mamakua [Hāmākua], or the *mamake* and other tapas of Ora [‘Ōla‘a] and the more fertile districts of Hawaii. (Ellis 2004:263-264)

Ellis and the ABCFM missionaries travelled along the coast of Kauwai, Wa‘awa‘a, and Nānāwale *ahupua‘a* and then turned *mauka* toward a village in Honolulu Ahupua‘a (Ellis 2004:294). On August 8, 1823, the Ellis and the ABCFM missionaries left Honolulu and visited the village of Waiakahiula to the southeast of the current study area. Ellis’ journal provides a brief first-hand description of the village’s location relative to the coast:

We arose early on the 8th, and Mr. Thurston held morning worship with the friendly people of the place [Honolulu]. Although I had been much indisposed through the night, we left Honoruru [*sic*] soon after six a.m. and, travelling slowly towards the sea-shore, reached Waiakeheula [*sic*] about eight, where I was obliged to stop, and lie down under the shade of a canoe-house near the shore. Messrs. Thurston and Bishop walked up to the settlement about half a mile inland, where the former preached to the people...(Ellis 2004:295)

After preaching, Bishop continued on alone toward Waiakea, while Thurston returned to fetch Ellis from the canoe shed. Upon reaching the village, Ellis found its residences to be interspersed among the agricultural fields rather than in a single, nucleated settlement:

The country was populous, but the houses stood singly, or in small clusters, generally on the plantations, which were scattered over the whole country. Grass and herbage were abundant, vegetation in many places luxuriant, and the soil, though shallow, was light and fertile. (Ellis 2004:296)

While other early visitors to Puna provide general descriptions of conditions in the district during subsequent decades. One year after Ellis’ tour, the ABCFM established a base church in Hilo. From that church (Hāili), the missionaries traveled to the more remote areas of the Hilo and Puna Districts. David Lyman, who came to Hawai‘i in 1832, and Titus Coan, who arrived in 1835 were two of the most influential congregational missionaries in Puna and Hilo. As part of their duties they compiled census data for the areas within their missions. In 1835, 4,800 individuals were recorded as residing in the district of Puna (Schmitt 1973) the smallest total district population on the island of Hawai‘i. In 1841, Titus Coan recorded that most of the 4,371 recorded residents of Puna lived near the shore, though there were hundreds of individuals who lived inland (Holmes 1985).

In 1841, the United States Exploring Expedition under the direction of Commander Charles Wilkes, toured the Hawaii Island and travelled through the Puna District. Wilkes produced a map of Puna, which includes the coastal trail but shows only a large “Pandanus Forest” covering the lands in the vicinity of the study area (Figure 16).

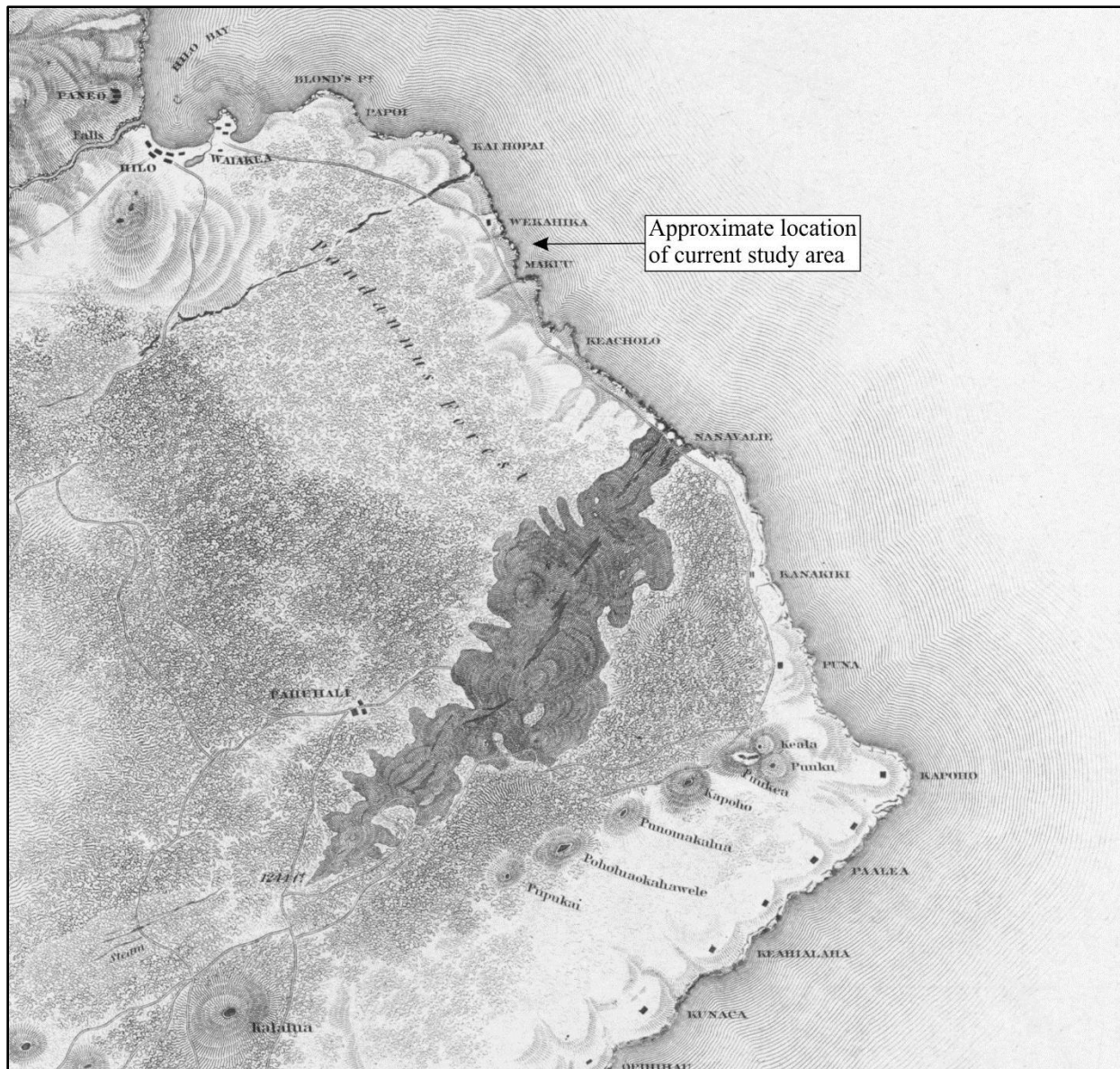


Figure 16. Portion a map of Hilo and Puna ca. 1841 (Wilkes 1844:61).

Wilkes, travelling towards Kapoho at the eastern tip of the island, provides the following description of Puna:

...Almost all of the hills or craters of any note have some tradition connected with them; but I found that the natives were now generally unwilling to narrate these tales, calling them “foolishness.”

After leaving the pahoihoi [sic] plain, we passed along the line of cone-craters towards Point Kapoho, the Southeast part of the island.

Of these cone-craters we made out altogether, large and small, fifteen, trending about east-northeast. The names of the seven last are Pupukai, Pohoiaokahowele [Pu‘u-hōlua-o-Kahawali], Punomakalua, Kapoho, Puukea, Puuku, and Keala. On some of these the natives pointed out where there had formerly been slides, an amusement or game somewhat similar to the sport of boys riding down hill on sleds. These they termed kolua [sic – *holua*].

This game does not appear to be practiced now, and I suppose that the chiefs consider themselves above such boyish amusements. The manner in which an old native described the velocity with which they passed down these slides was, by suddenly blowing a puff; according to him, these amusements were periodical, and the slides were usually filled with dried grass.

As we approached the sea-shore, the soil improved very much, and was under good cultivation, in taro, sweet-potatoes, sugar cane, and a great variety of fruit and vegetables. At about four o'clock, we arrived at the house of our guide, Kekahunanui, who was the "head man." I was amused to find that none of the natives knew him by this name, and were obliged to ask him, before they could give it to Dr. Judd...

...The view from the guide's house was quite pretty, the eye passing over well-cultivated fields to the ocean, whose roar could be distinctly heard... [Wilkes 1845: Vol. IV:186]

During the night, one of the heaviest rains I had experienced in the island, fell; but the morning was bright and clear,—every thing seemed to be rejoicing around, particularly the singing-birds, for the variety and sweetness of whose notes Hawaii is distinguished. Previous to our departure, all the tenantry, if so I may call them, came to pay their respects, or rather to take a look at us. We had many kind wishes, and a long line of attendants, as we wended our way among the numerous taro patches of the low grounds, towards Puna; and thence along the sea-coast where the lava entered the sea, at Nanavalie [Nānāwale]. The whole population of this section of the country was by the wayside, which gave me an opportunity of judging of their number; this is much larger than might be expected from the condition of the country, for with the exception of the point at Kapoho, very little ground that can be cultivated is to be seen. The country, however, is considered fruitful by those who are acquainted with it, notwithstanding its barren appearance on the roadsides. The inhabitants seemed to have an abundance of bread-fruit, bananas, sugar-cane, taro, and sweet-potatoes. The latter, however, are seen to be growing literally among heaps of stones and pieces of lava, with scarcely soil enough to cover them; yet they are, I am informed, the finest on the island...

In some places they have taken great pains to secure a good road or walking path; thus, there is a part of the road from Nanavalie to Hilo which is built of pieces of lava, about four feet high and three feet wide on the top; but not withstanding this, the road is exceedingly fatiguing to the stranger, as the lumps are so arranged that he is obliged to take a long and short step alternately; but this the natives do not seem to mind, and they pass over the road with great facility, even when heavy laden...(Wilkes 1845, Vol. IV:188-193)

In 1846, Chester S. Lyman, "a sometime professor" at Yale University visited Hilo, Hawai'i, and stayed with Titus Coan (Maly 1998). Traveling the almost 100 mile long stretch of the "Diocese" of Mr. Coan, Lyman reported that the district of Puna had somewhere between 3,000-4,000 inhabitants (Maly 1998). Entering Puna from Hilo, and traveling to Kea'au along the coast, Lyman offered the following observations of the Puna District:

...The groves of Pandanus were very beautiful, and are the principal tree of the region. There is some grass and ferns, and many shrubs; but the soil is very scanty. Potatoes are almost the only vegetable that can be raised, and these seem to flourish well amid heaps of stone where scarcely a particle of soil could be discovered. The natives pick out the stones to the depth often of from 2 to 4 feet, and in the bottom plant the potato—how it can expand in such a place is a wonder.

Nearly all Puna is like this. The people are necessarily poor—a bare subsistence is all they can obtain, and scarcely that. Probably there are not \$10 in money in all Puna, and it is thought that not over one in five hundred has a single cent. The sight of some of these potatoe patches would make a discontented N.E. farmer satisfied with his lot. Yet, I have nowhere seen the people apparently more contented & happy. (Lyman ms. Book III:3 in Maly 1998:35)

Written accounts left by early visitors to the Island of Hawai'i offer insight into what life may have been like for the earliest residents of Puna. However, by the time Ellis visited Puna, less than fifty years after the arrival of the first Europeans, the population of Hawai'i was already beginning to decline. By 1850, the population of Hawai'i Island had dropped to 25,846 individuals (Schmitt 1973:8). Maly (1998) summarizes the reasons for the rapid decline of native populations thusly:

Overall, historic records document the significant effect that western settlement practices had on Hawaiians throughout the islands. Drawing people from isolated native communities into selected village parishes and Hawaiian ports-of-call, had a dramatic, and perhaps unforeseen impact on native residency patterns, health, and social and political affairs. In single epidemics hundreds, and even thousands of Hawaiians died in short periods of time. (1998:36)

Legacy of the Great Māhele (1848-1873)

By the middle of the nineteenth century the ever-growing population of Westerners in the Hawaiian Islands forced socioeconomic and demographic changes that promoted the establishment of a Euro-American style of land ownership, and the *Māhele* became the vehicle for determining ownership of native lands. During the *Māhele*, land interests of the King (Kamehameha III), the high-ranking chiefs, and the low-ranking chiefs, the *konohiki*, were defined. The chiefs and *konohiki* were required to present their claims to the Land Commission to receive awards 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 (Chinen 1961:13).

During the *Māhele ʻĀina* of 1848, all lands were placed in one of three categories: Crown Lands (for the occupant of the throne), Government Lands, and *Konohiki* Lands. During the *Māhele*, land interests of the King (Kamehameha III), the high-ranking chiefs (the *ali ʻi nui*), and the low-ranking chiefs (the *konohiki*), were defined. The chiefs and *konohiki* were required to present their claims to the Land Commission to receive awards 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. To expedite the work of the Land Commission, these lands were identified by name only, with the understanding that the ancient boundaries would prevail until the land could be surveyed (Chinen 1961:13). All lands awarded during the *Māhele* were subject to the rights of the native tenants therein. Native tenants of the lands that were divided up among the Crown, *Konohiki*, and Government could claim, and acquire title to, *kuleana* parcels that they actively lived on or farmed. The Board of Commissioners oversaw the program and administered the *kuleana* as Land Commission Awards (LCAw.). In Puna, however, very few claims for *kuleana* were submitted. Maly (1998:37) notes that, with the exception of the islands of Kahoʻolawe and Niʻihau, no other land division of comparable size, had fewer claims for *kuleana* from native tenants than the district of Puna.

As a result of the *Māhele*, Keonepoko Ahupuaʻa (assumed to be Keonepoko Nui, but not specified) was returned by Lunalilo and retained as Government Land (Soehren 2005). Keonepoko Iki Ahupuaʻa is not listed in the *Māhele* Book, but it too became Government Land, as did Kaʻohe Ahupuaʻa (returned by Ulumaheihei) adjacent to the southeastern coastal boundary of Keonepoko Iki. Kaʻohe was claimed by Ulumaheihei as portion of LCAw. 5207H, a claim that was not awarded. The partial boundaries of Kaʻohe (near the coast) are shown on only one of the Historic maps reviewed for this study (Hawaiʻi Registered Map No. 2258; Figure 17). On most maps the coastal lands of Kaʻohe have been lumped together with those of Keonepoko Iki (the Kaʻohe Homesteads, located within a detached piece of the *ahupuaʻa* above Pāhoā town, still retain the Kaʻohe name, however). As can be seen in Figure 17 the current study area is located in Keonepoko Iki Ahupuaʻa near its indefinite boundary with Kaʻohe Ahupuaʻa, between two coastal points labeled “Kawaiki” and “Keahu” on the map. No LCAw. claims were made for *kuleana* within either Keonepoko Iki or Kaʻohe *ahupuaʻa* during the *Māhele* (Waihona ʻĀina database).

In conjunction with the *Māhele ʻĀina* of 1848, the King authorized the issuance of Royal Patent Grants to applicants for tracts of land, larger than those generally available through the Land Commission. The process for applications was clarified by the “Enabling Act,” which was ratified on August 6, 1850. The Act resolved that portions of the Government Lands established during the *Māhele* should be set aside and sold as grants. The stated goal of this program was to enable native tenants, many of whom were not awarded *kuleana* parcels during the *Māhele*, to purchase lands of their own. Despite the stated goal of the grant program, in reality, many of the Government Lands were eventually sold or leased to foreigners. The current study area is a portion of a 277.8-acre grant parcel purchased by Kekoa in 1855 as Grant No. 1533 (see Figure 17). The record is silent regarding Kekoa’s use of the grant lands.

In 1862, the Commission of Boundaries (Boundary Commission) was established in the Kingdom of Hawaiʻi to legally set the boundaries of all the *ahupuaʻa* that had been awarded as a part of the *Māhele*. Subsequently, in 1874, the Commissioners of Boundaries were authorized to certify the boundaries for lands brought before them. The primary informants for the boundary descriptions were old 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. As Keonepoko Iki was retained as government land, its boundaries were not set by the land commission. However, the boundaries of neighboring Keonepoko Nui, which was returned by Lunalilo to the Government, were surveyed in 1880 for the estate of C. Kanaina, and place names along the common boundary with Keonepoko Iki are shown on a survey map (Figure 18).

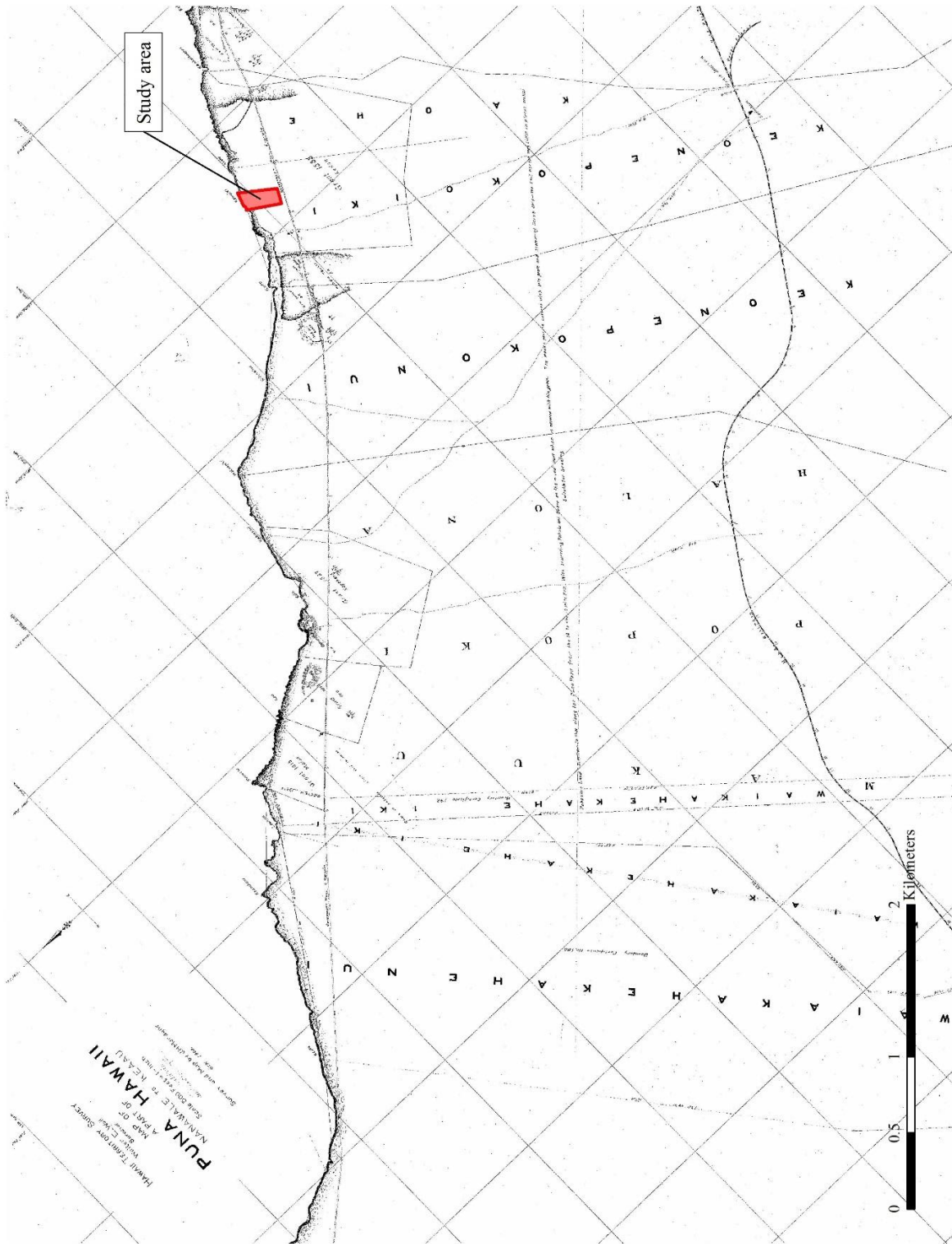


Figure 17 Portion of Hawai'i Registered Map No. 2258 (Morange 1903a) with the current study area shaded in red.

In 1868 a volcanic eruption emanating from Mauna Loa volcano shook Hawai‘i Island, bringing with it lava flows, earthquakes and a *tsunami* that transformed the landscape of the southern part of island forever, and further contributed to the depopulation of the District of Puna. Coan (1882) recorded that on April 2:

...a terrific shock rent the ground, sending consternation through all Hilo, Puna, and Kau. In some places fissures of great length, breadth, and depth were opened... Stone houses were rent and ruined, and stone walls sent flying in every direction...the sea rose twenty feet along the southern shore of the island, and in Kau 108 houses were destroyed and forty-six people drowned...Many houses were also destroyed in Puna, but no lives were lost. During this awful hour the coast of Puna and Kau, for the distance of seventy-five miles subsided seven feet on average, submerging a line of small villages all along the shore. One of my rough stone meeting houses in Puna [Kapoho-Koa‘e], where we once had a congregation of 500 to 1,000 was swept away with the influx of the sea, and its walls are now under water... (Coan 1882:314-316)

The population of Puna continued to decline throughout the first half of the nineteenth century and Hawaiians maintained marginalized communities outside of the central population centers. These communities were located in “out-of-the-way” places. In the aftermath of the *Māhele*, economic interests in the region swiftly changed from the traditional Hawaiian land tenure system of subsistence farming and regional trading networks to the more European based cash crops including coffee, tobacco, sugar, timber, and pineapple, and emphasized dairy and cattle ranching. While large tracts of land in lower Puna were used for cattle grazing and sugarcane cultivation, the current project area does not appear to have been used for either purpose.

The Old Government Beach Road (Site 50-10-36-21273), which is located outside the *mauka* edge of the current study parcel, is considered a historic property. The Old Government Beach Road (also referred to as the Puna Trail) was previously studied by Lass (1997) and Maly (1999) within the *ahupua‘a* of Kea‘au. Currently, this road is dirt covered and maintained for vehicular access. Maly (1999) relates that the current alignment of the Old Government Road, which evolved from earlier trail routes, was under construction by the 1840s. The road remained the preferred route of travel between Hilo and the out-lying areas of Puna until 1895, when the Kea‘au-Pāhoa Road (Highway 130) was established to access the growing inland population centers and agricultural areas (Maly 1999:6).

Keonepoko Iki Ahupua‘a and Coastal Puna during the Twentieth Century

By 1900 Puna was on the verge of major economic growth, spurred by the sugar and lumber industries. The rise and fall of these industries can be traced along the rusted railroad tracks that litter the landscape *mauka* of the study area. In 1899, the ‘Ōla‘a Sugar Company began operating in the Kea‘au area. The directors of the company realized early that the lack of mass transportation in would hinder the success of their business. As a result, they organized the Hilo Railroad Company and, on April 8, 1899, were granted a 50 year charter (Best 1978). The railroad’s infrastructure developed quickly. Rail service to ‘Ōla‘a (Kea‘au) from Hilo began on June 18, 1900. Another sugar company, the Puna Sugar Company, located near the village of Kapoho, had been organized within the Puna District on March 2 of that same year. Puna Sugar had cane fields scattered all over lower Puna from Kapoho to Pāhoa Town itself. Coastal Keonepoko Iki’s thin, sticky, acidic soils, however, spared the study area from the new sugar fields, and in fact wide dispersal of suitable agricultural lands also hindered the growth of the sugar industry in Puna. As with ‘Ōla‘a Sugar’s early Kea‘au operations, the lack of a reliable transportation system made it expensive to collect and transport the cane from the scattered fields to the mill. So, when Hilo Railroad proposed to lay 4 miles of track from Kapoho to Pāhoa, the Puna Sugar Company paid for half the cost. By March 1, 1902, the Hilo Railroad was making regular stops at the ‘Ōla‘a Sugar Mill, the town of Pāhoa, and in lower Puna.

The route of the railroad across Keonepoko Iki can be seen on Hawai‘i Registered Map No. 2258 prepared by J.H. Morange in September of 1903 (see Figure 17). On that map a “Section House” and a “Switch” at Pāhoa Junction are shown in Keonepoko Iki Ahupua‘a, *mauka* of the study area. Two “Old Trails” are shown extending *makai* from near the section house to the coast (and a short distance *mauka* as well). One of the trails terminates at the coast of Keonepoko Iki to the northwest of the current study area. Beginning in 1903 *mauka* portions of Keonepoko Nui and Keonepoko Iki *ahupua‘a* (in the vicinity of the town of Pāhoa) were subdivided into twenty-three homestead lots collectively called the Keonepoko Homesteads (Figure 19). Soon after that the sixteen lot Ka‘ohe Homesteads were created in the area above the town of Pāhoa (*mauka* and east of Keonepoko Iki Ahupua‘a). All of these parcels were sold as grants. By 1905 the harvests of the Puna Sugar Co. were being ground at the ‘Ōla‘a Mill, and the Puna Sugar Co. was operating as a division of the ‘Ōla‘a Sugar Co. (Dorrance and Morgan 2000).

2. Background

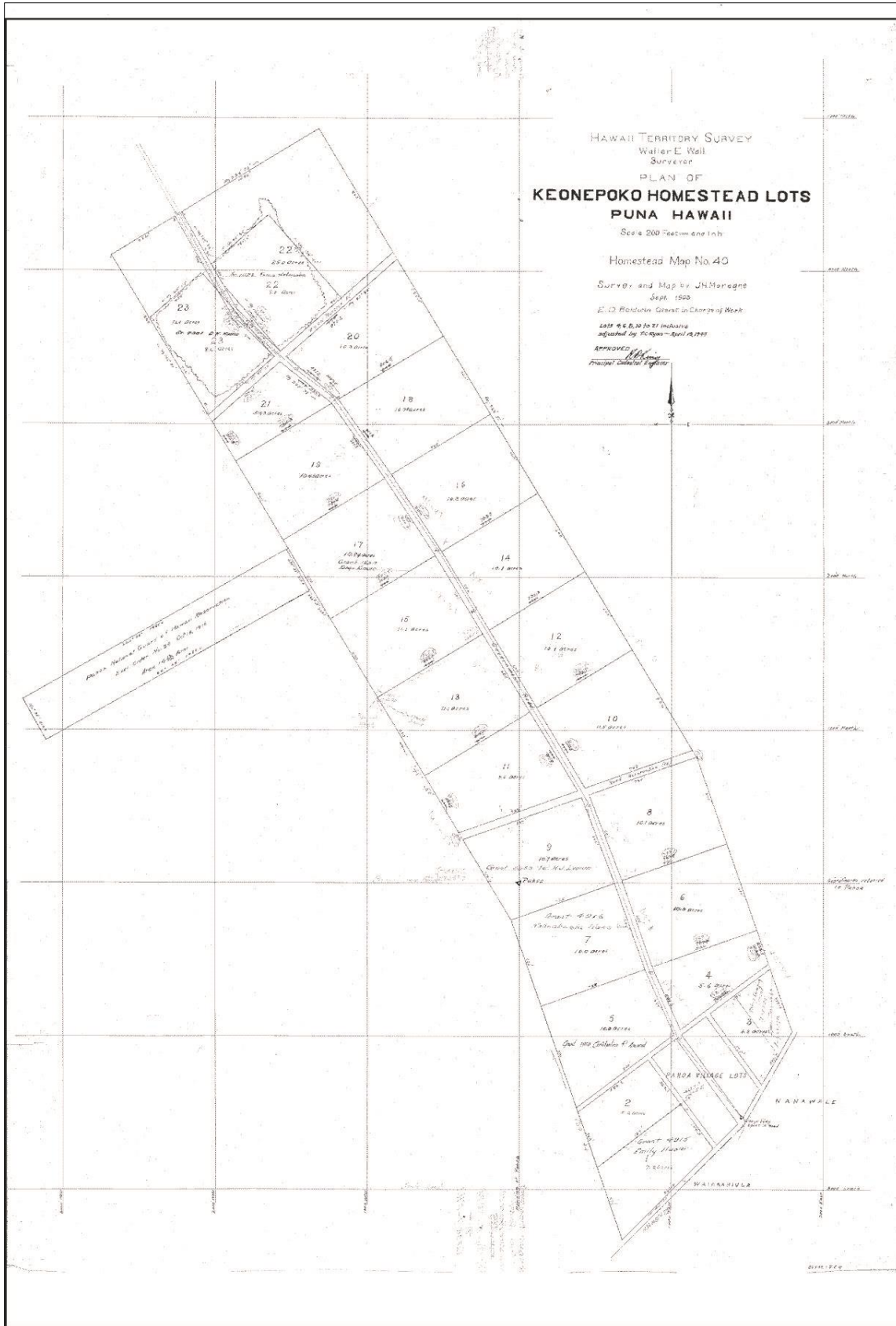


Figure 19. Hawai'i Registered Map No. 2084 showing the Keonepoko Homestead lots (Moragne 1903b).

In 1907, the Hawaiian Mahogany Lumber Company incorporated and signed a five-year contract with the Atchison, Topeka, and Santa Fe Railroads for the delivery of 90,000,000 board feet of 'ōhi'a railroad ties from the vast forest reserves of Puna (Clark et al. 2001). Subsequently, in 1908 the company erected a lumber mill at Pāhoā. A network of narrow gauge railroad tracks, 3 feet wide, went from the lumber mill to the forests above Pāhoā. On March 24, 1909 the Hawaiian Mahogany Company became the Pāhoā Lumber Mill, and James B. Castle, the former managing director of the mill, became the new owner. The company then negotiated a contract with the Santa Fe Railway Company for the delivery 2,500,000 cross ties and 2,500 sets of switch ties. In addition to railway ties, the Pāhoā Lumber Mill began producing products such as roofing shingles, flooring, paving blocks and lumber for cars, wagons, and carriages.

On the night of January 28, 1913, however, a raging fire broke out in the mill and it burned to the ground along with most of the stock of milled lumber. Fortunately for Pāhoā residents, the wind blew the flames and smoke to the north away from the village. In spite of this disaster, J. B. Castle rebuilt the mill and by October the mill was operating again under the name of the Hawai'i Hardwood Company, part of the Hawaiian Development Company. The Santa Fe Railroad found, ultimately, that 'ōhi'a wood did not last as long as expected in the dry climate of the American Southwest. They did not renew their contract, and, in 1916, the Hawaiian Hardwood Company, Inc. closed their doors permanently (Burtchard and Moblo 1994).

When the lumber business moved out of Pāhoā in ca. 1916, the mill was leased to 'Ōla'a Sugar. Standard gauge railroad track replaced the old timber railroad grade tracks, and the timber producing forests were converted to sugarcane fields. The company used four mogul type Baldwin locomotives to haul cane from the Puna fields through Pāhoā to their processing plant in Kea'au. Passenger rail service in the Puna District also started to increase around this time. In 1916 the Hilo Railroad was reorganized as the Hawai'i Consolidated Railway. The railroad used Baldwin locomotives and Hall-Scott motorcars with passenger trailers to haul freight and passengers. Then, in 1925 the Hawai'i Consolidated Railway ordered and received three railbuses from the White Motor Company, which they used in Puna and Hilo districts, making daily stops in the town of Pāhoā. The railbuses became an especially popular form of transportation during World War II when mandatory gas rationing was in effect for all residents (Best 1978).

The *makai* lands of Keonepoko Iki (and neighboring Government Lands) became part of the Shipman Ranch during the early twentieth century. Hawai'i Territory Survey Plat Map No. 811 (prepared in 1915) shows that W.H. Shipman, Ltd. held a lease for roughly 7,400 acres of Keonepoko Nui and Keonepoko Iki (General Lease No. 1025) at an annual rental of \$300.00 (Figure 20). The lease (Figure 21), which began on July 12, 1918 and expired on July 31, 1928, excluded the 277.8 acre Grant No. 1533 to Kekoa where the current study area is located. W.H. Shipman, Ltd. also held a lease for roughly 14,000 acres of the adjacent *ahupua'a* of Maku'u, Holonā and Pōpōkī (General lease No. 854), which expired on November 25, 1929. On subsequent maps (Figure 22), the general area leased by Shipman is referred to as the Ka'ohē-Maku'u-Keonepoko Iki Government Tract; no additional lease information for this tract was discovered.

By 1946 rail travel was becoming less popular, and less profitable, due to improved roads and increased trucking. In March of that year, stockholders of Hawai'i Consolidated Railway voted to abandon all railroad operations. This decision was further reinforced on April 1, 1946 when a devastating *tsunami* destroyed Hilo Bay, including all the rail lines, a drawbridge in the bay, and part of the Waiākea freight yards. On November 20, 1946 the company shut down its remaining lines, including all Puna railroad operations, and began auctioning off all its assets. The 'Ōla'a railroad line remained in operating condition and continued to be used for hauling sugar until December of 1948. In that year the sugar industry began phasing out its operations in Puna and closed the tracks permanently.

Throughout this period of industrial growth and decline in Puna, the coastal portion of Keonepoko Iki Ahupua'a remained largely undeveloped. The 1924 U.S.G.S. Maku'u quadrangle (Figure 23) shows a single structure located in the coastal portion of Keonepoko Iki, situated inland and west of the current study area (interestingly this map does not show the Government Beach Road along the mauka boundary of the current study area). Farrell and Dega (2013:8) indicate the lands in the general vicinity of the current study area were planted in coconuts in 1942 (these were later harvested and sold as mature trees). The current study parcel was created in 1961 when Grant No. 1533 was subdivided (Farrell and Dega 2013). During the mid-1960s, the lands to the southeast and northwest of the study area were subdivided into the Hawaiian Beaches, Hawaiian Parks, and Hawaiian Shores subdivisions. In recent years several residences have been constructed along the coast of Keonepoko Iki within the subdivided parcels of the former grant property. Archaeological studies have been conducted at a number of those parcels; the results of these studies are discussed further below.

2. Background

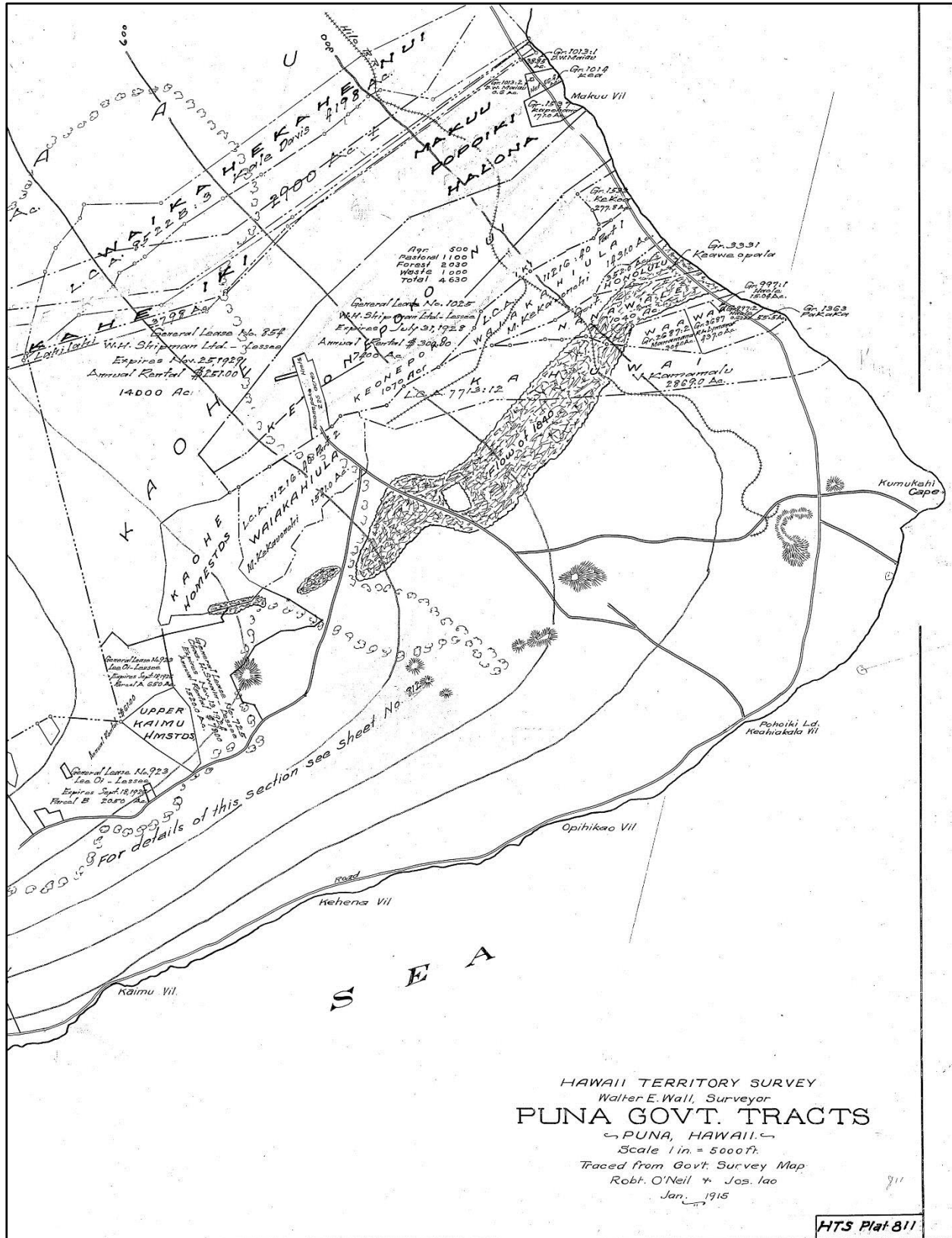


Figure 20. Portion of Hawai'i Territory Survey Plat Map No. 811 (prepared in 1915) showing the area leased to W.H. Shipman Ltd. (Wall 1915:811)

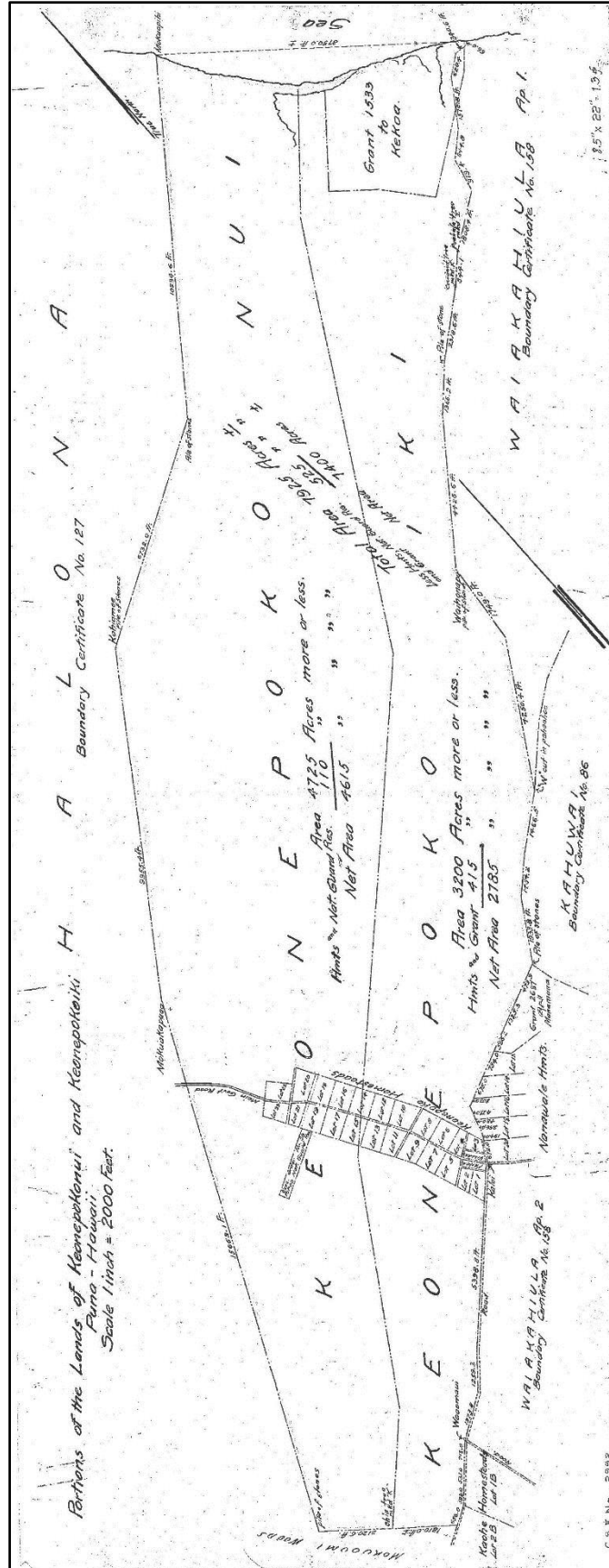


Figure 21. 1918 map (C.S.F. 2992) of General Lease No. 1025 to W.H. Shipman Ltd. in Keonepoko Nui and Iki ahupua'a. (Arioli 1918)

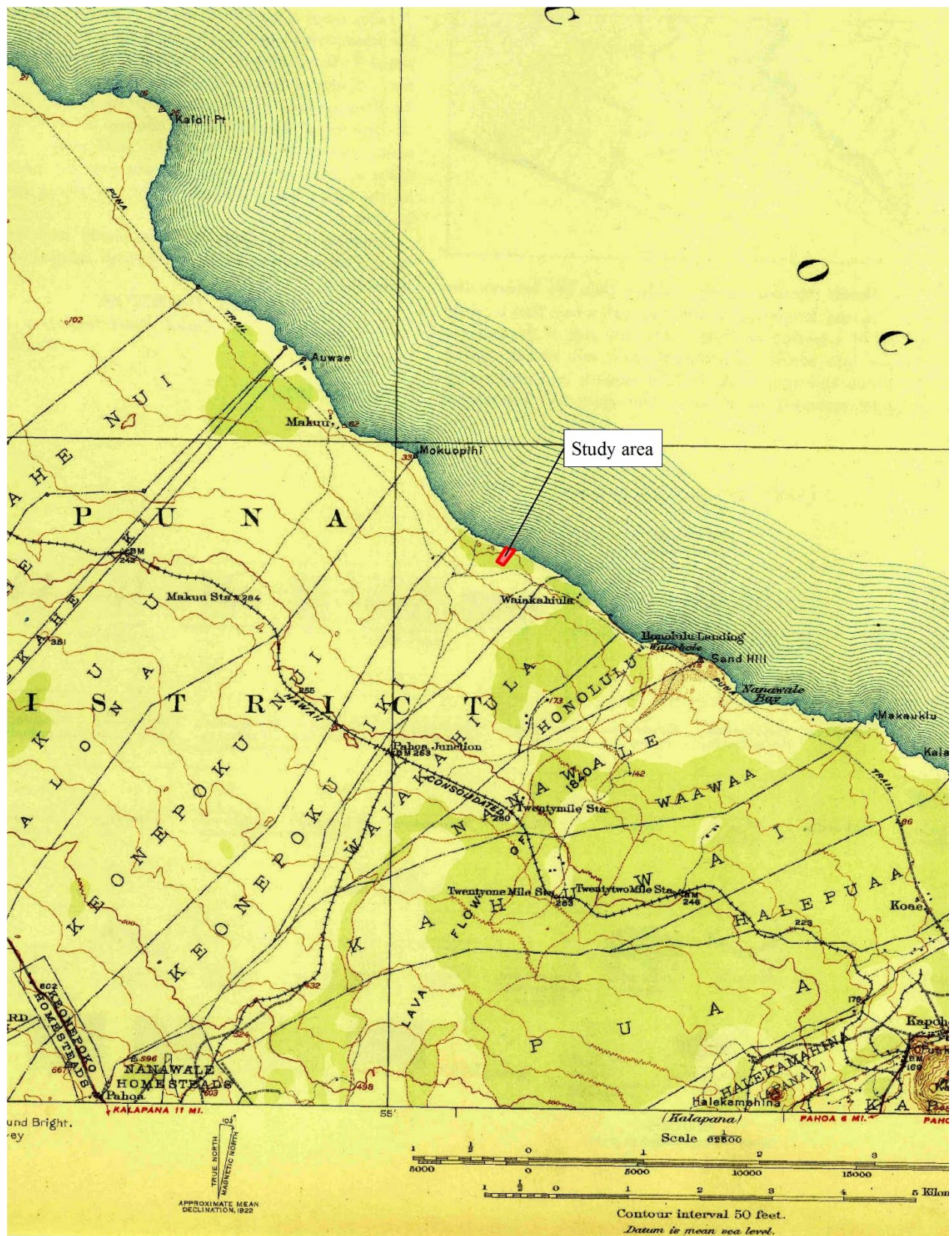


Figure 23. Portion of the 1924 Makuu quadrangle (USGS 1924) showing the current study area shaded red.

PREVIOUS ARCHAEOLOGICAL STUDIES

Since the early 1900s, several archaeological studies have examined the coastal areas of Puna where Precontact and early Historic populations tended to concentrate (Figure 24). The earliest survey of archaeological resources in the vicinity of the study area was conducted by Hudson (1932). Hudson attempted to inventory the sites of East Hawai'i Island from Waipi'o Valley to the Ka'u District for the B. P. Bishop Museum. He recorded a wide range of archaeological features including *heiau*, burials, caves, habitations, trails, and agricultural features during his survey. The route of the survey took him through the coastal portion of Keonepoko Iki Ahupua'a. Hudson (1932:304) noted that it was difficult to obtain information about sites in Puna because "most of them are located along the coast between Keaau and Kapoho where no one now lives, and it is difficult to locate descendants of the former Hawaiian population of the area who might be able to shed light on the nature and function of certain sites", and that, "back from the sea the land is under cultivation in cane, used for pasture, or covered with dense vegetation which can be penetrated only with difficulty." Hudson did not record any specific features in the immediate vicinity of the current study area, although he did note a trail (Site 83) in Keonepoko Nui Ahupua'a to the northwest of the study parcel, and a canoe shed (Site 84) in Waikahiula Ahupua'a to the southeast of the study parcel.

Forty-two years later, Ewart and Luscomb (1974) of the B. P. Bishop Museum conducted a six-mile long archaeological reconnaissance survey of a proposed Kapoho-Keaukaha Highway route from Waikahiula Ahupua'a to Kea'au Ahupua'a. The survey area consisted of a 2,000-foot wide corridor roughly following the route of the old Government Road (Site 21273) that passes *mauka* of the current study area (see Figure 24). Ewart and Luscomb (1974) recorded sixty sites within combined Keonepoko Nui and Iki *ahupua'a* (designated *Ahupua'a* 4 or A4). These sites, which included mounds, feature complexes, platforms, walls, a trail, *ahu*, c-shapes, stone alignments, faced depressions, pits and ravines, were interpreted as having been used for habitation, burial, ceremonial, and agricultural purposes. A single site, Site A4-21, was mapped on the parcel immediately south of the study area (Figure 25). This site was described as "a partially stone-faced natural depression, 13 by 7m; bottom is covered with soil" (Ewart and Luscomb 1974:34). It was assessed as being in fair condition, but possessing poor archaeological potential.

Seven coastal parcels within former Grant No. 1533 to Kekoa to the southeast of the current study parcel have been subject to more detailed archaeological surveys (Figure 24). Farrell and Wells (1994) conducted a preliminary archaeological inventory of two adjacent coastal parcels (TMKs: (3) 1-5-009:038 and 042) situated roughly 450 meters southeast of the current study area. Fourteen features/feature groupings were identified during the survey (designated CRMS-1 to 14), although two of the identified feature areas (CRMS-3 and 6) were actually situated on the adjacent parcel to the northwest (TMK: (3) 1-5-009:037), and another (CRMS-6) was situated on the adjacent parcel to the southeast (TMK: (3) 1-5-009:041). With the exception of a core-filled boundary wall located along the *makai* edge of the Old Government Beach Road, the features were all interpreted as having been used for agricultural purposes during the Historic Period. The core-filled wall was later assigned the State Inventory of Historic Places (SIHP) site designation 50-10-45-18759, while the agricultural features were grouped as a complex designated 50-10-45-18758.

Former DLNR-SHPD Hawai'i Island Assistant Archaeologist, Jeanne Knapp, conducted a field inspection of TMK: (3) 1-5-009:040 located roughly 600 meters to the southeast of the current study area in 2003 (see Figure 24). She noted "several wall remnants, possibly historic in age...in the interior of the property but not within the proposed development area" (Knapp 2003). These walls were not described in detail, nor were the locations plotted. As the landowner agreed to avoid any impacts to areas within the subject parcel containing the walls, DLNR-SHPD found that no historic properties would be affected by the development of a single-family residence on the property.

Rechtman (2005) conducted a field inspection of TMK: (3) 1-5-009:056, situated adjacent to the southeastern boundary of the adjacent study parcel (see Figure 24). The majority of that property had been significantly mechanically altered in the past, and no archaeological resources were discovered. Surface features were observed on an adjacent parcel to the southeast of the Rechtman (2005) study area, however, as that parcel (TMK: (3) 1-5-009:057) had not been previously mechanically cleared. Rechtman (2005) also noted that no walls were present along the *makai* edge of the Old Government Beach Road (Site 21273) where it bordered the parcel, as they had been bulldozed away and ended in rubble to the southeast of the study parcel. Given the negative findings, Rechtman (2005) requested that DLNR-SHPD issue a written determination of "no historic properties affected" for TMK: (3) 1-5-009:056.

In 2012, DLNR-SHPD staff conducted a field inspection of the parcel immediately to the south of the current study area (Log No. 2012.2536, Doc No. 1208TD06). SHPD staff did not identify any historic resources in the *mauka* portion of the parcel, which had been grubbed and graded. They did note a Historic wall feature near the coast, *makai* of the bulldozed coastal road. SHPD Staff also stated, "An archaeological feature similar to that described as Site Ha-A4-21 was observed on the adjacent parcel [i.e., the current study area]" and suggested that the site's location (see Figure 25) as mapped by Ewart and Luscomb (1974) was incorrect.

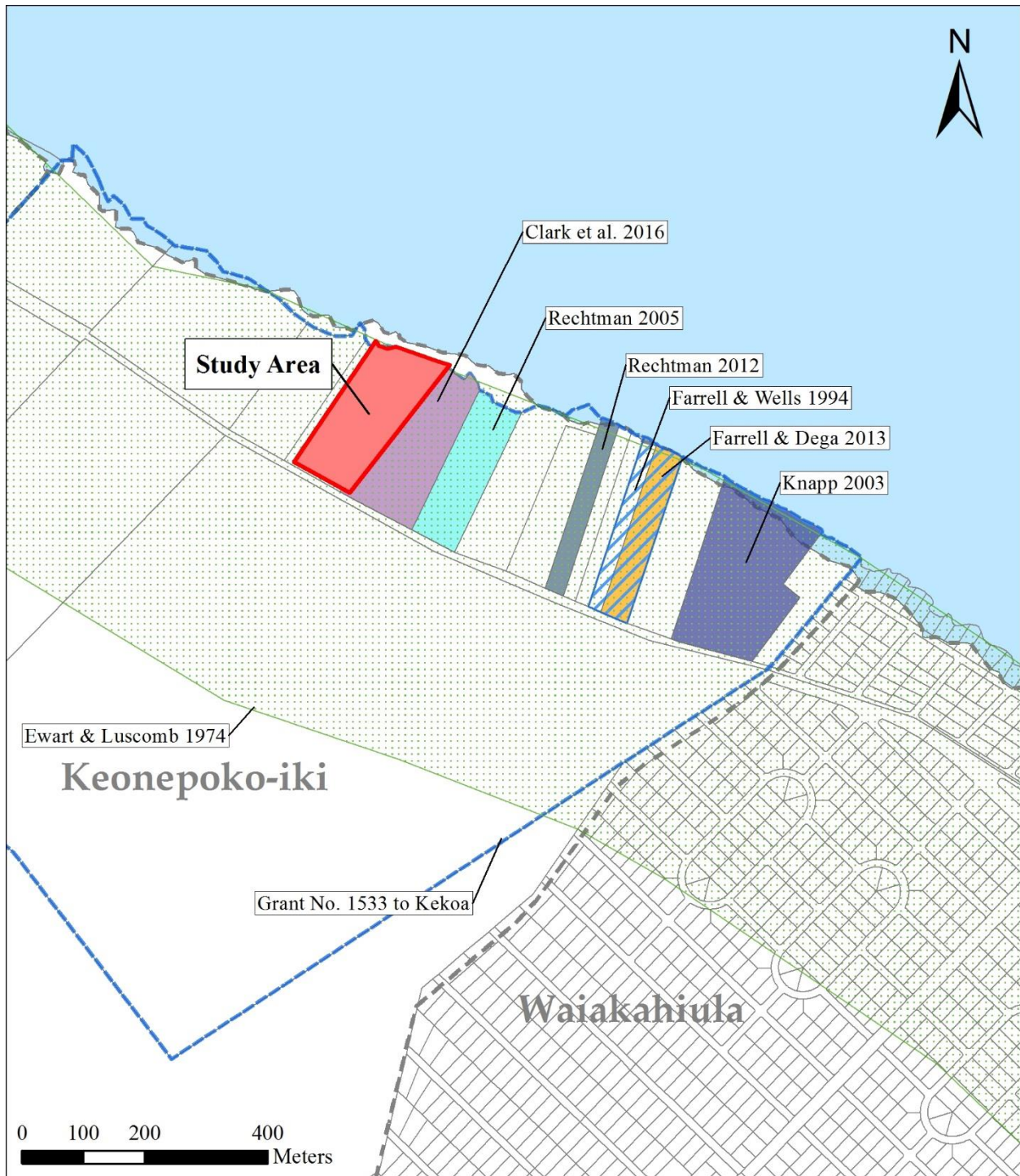


Figure 24. Locations of previous archaeological studies.

2. Background

Also in 2012, Rechtman (2012) conducted a field inspection of TMK: (3) 1-5-009:035 situated roughly 400 meters southeast of the current study area (see Figure 24). The majority of that parcel had also been previously mechanically cleared and built upon, and as a result no archaeological resources were observed. Rechtman (2012) did note, however, that surface features were observed on the adjacent parcel to the northwest, as that parcel (TMK: (3) 1-5-009:051) had not been previously mechanically cleared. It was also reported that the rock wall typically present along the *makai* edge of the Old Government Beach Road (Site 21273) was absent, and had been bulldozed away, although Rechtman (2012) did note that a rock wall along the *makai* side of Site 21273 was present fronting parcels to the southeast and northwest of the study parcel. Given the negative findings, Rechtman (2012) requested that DLNR-SHPD issue a written determination of “no historic properties affected” for TMK: (3) 1-5-009:035.

Farrell and Dega (2013) updated the Farrell and Wells (1994) study for TMK: (3) 1-5-009:042, situated roughly 460 meters southeast of the current study parcel (see Figure 24). Farrell and Dega (2013) conducted additional fieldwork, but did not identify any additional sites or features. They reported only the findings specific to Parcel 042. As described above that parcel contained two archaeological sites, a core-filled wall along the Old Government Beach Road (Site 18759), and a complex of Historic Period agricultural features (Site 18758) that may have been initially created during the Precontact Period. Features identified at Site 18758 include walls, irregular rock mounds, modified depressions, rock rings that appeared to be planting circles, and a single faced terrace. The features of the agricultural complex extend onto neighboring parcels to the northwest and southeast.

Clark et al. (2016) performed an Archaeological Inventory Survey of the adjacent parcel TMK: (3) 1-5-009:055 (see Figure 24). The location of Site Ha-A4-21 as mapped by Ewart and Luscomb (1974) was inspected and found to be within the formerly grubbed and graded *mauka* section of the adjacent parcel. The Clark et al (2016) study was undertaken due to the change of proposed land use for the parcel and the presence of the known site. The single Historic windbreak wall was recorded and a test-unit was excavated in the *makai* portion of the study area (Site 50-10-45-30571). The significance of the archaeological resource was derived from information collected during the investigation of Site 30571, Because the likelihood of encountering additional significant subsurface archaeological resources was remote, no further historic preservation work was recommended.

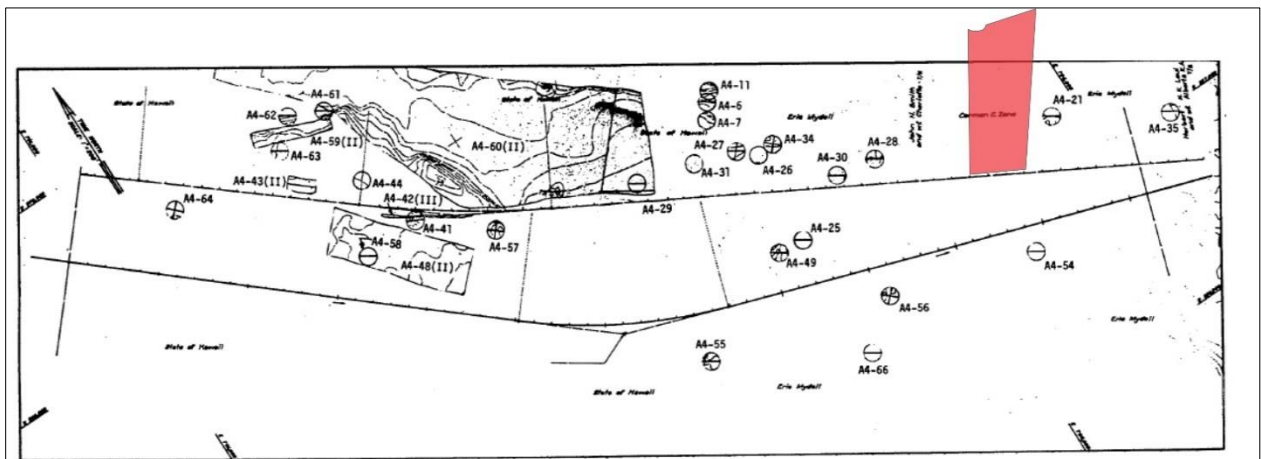


Figure 25. Site locations within Increment H of the Ewart and Luscomb (1974:7) survey area showing the location of the current study parcel (shaded red).

3. STUDY AREA EXPECTATIONS

The *ahupua'a* of Keonepoko Iki falls within the Coastal Settlement Zone (Zone I) is described by (McEldowney 1979:15–18). While this model is largely based on early historical accounts, it also considers environmental variables and human resource needs, and offers insights into the prehistoric past. In their refinement of the model as it applies to Puna, Burtchard and Moblo (1994:26) elaborate on McEldowney's concept of the Coastal Settlement Zone:

As with her model, [the Coastal Settlement Zone] includes coastal terrain to about one half mile inland. This is the zone expected to have the greatest density and variety of prehistoric surface features in the general study area. Primary settlements are expected in places where agriculturally productive sediments (principally well-weathered 'a'ā flows) co-occur with sheltered embayments and productive fisheries. Settlements within this zone are expected to be logistically linked to inland agricultural and forest exploitation zones accessed through a network of upslope-downslope (*Mauka-makai*) trails. Larger settlements and resource acquisition areas may have been connected by cross-terrain trail networks.

Previous archaeological studies have documented a Precontact settlement pattern along this portion of the Puna coast that features dispersed habitation sites and agricultural complexes along with ceremonial and burial areas, all associated with a fairly dense (but not necessarily nucleated) population. Areas inland of the study area were exploited for agricultural purposes and the collection of forest resources, but not generally for habitation. Keonepoko Iki does not appear to have been a population center during Precontact times, and by early Historic times, as drastic population reduction occurred throughout Hawai'i and traditional sites were abandoned settlement appears to have become even less dense (Maly 1998). The later Historic Period saw a minor expansion of settlement in this area of both transplanted Hawaiians and non-Hawaiians alike. This was primarily due to Government grant programs. Grantees often modified their lands obscuring if not obliterating prior residential and agricultural sites. The influx of people during this period waned by the early twentieth century as a result of commercial economic failures, and the population once again dipped. Present-day vegetation in the study area suggests that at least a portion of the parcel has been disturbed by vegetation removal prior to 1977. The Precontact/early Historic archaeological landscape is expected to be somewhat intact. Archaeological features expected to be encountered include agricultural features typical of this part of Puna (e.g., modified depressions, modified outcrops, alignments, and/or mounds associated), possibly, but not likely, intermixed with scattered habitation features (platforms, terraces, pavements, walls, and/or enclosures). Burials are also possible in the study area. The Government Beach Road (Site 50-10-36-21273) is located outside of the study area, and rock wall segments may be present lining the road.

4. FIELDWORK

On September 13, 2018, Ivana Hall, B.A., Ted Bibby, Ph. D., and Benjamin Barna, Ph.D. conducted an intensive pedestrian archaeological survey of the entire study area (100% surface survey). Dr. Barna is the principal investigator for the current study.

FIELD METHODS

During the pedestrian survey of the study area, the entire parcel was subject to northeast/southwest pedestrian transects with fieldworkers spaced at 10-meter intervals. Despite the thick vegetation and a layer of leaf litter, the contours of the ground surface were clearly discernable during fieldwork. Depressions (Figure 26) and outcrops suspected of being modified were cleared leaf litter and vegetation as necessary and closely inspected for evidence of modification (e.g., rock stacking around edges). Several depressions observed on the parcel formed when the surface of the lava flow collapsed, and broken pieces of rock on the collapsed perimeter can resemble tightly-fitting stacked cobbles and boulders. A close examination of these depressions found only naturally-broken rock on the inside and outside of the depressions. The only soil observed at the bottom of these depressions was a very thin coating of muck derived from decaying leaf litter.

In the *hala* forested portion of the study area, the ground surface showed extensive disturbance from root growth. The ground surface in the portion of the study area *mauka* of the *hala* exhibited relatively lower relief (Figure 27) compared to the *makai* portion, possibly as a result of prior vegetation clearing. A few *tī* plants were observed near the access road, and the area around them was closely inspected. Apart from a very thin (less than two centimeters) layer of organic muck beneath the leaf litter, there was almost no accumulation of sediment or soils in the study area, and thus no subsurface testing was attempted.

FIELD RESULTS

As a result of the current fieldwork, no archaeological features of any kind were observed within the study area. None of the natural depressions exhibited modifications, and no feature matching the description of Site Ha-A4-21 was observed. It is our conclusion that Site Ha-A4-21 had been mapped by Ewart and Luscomb (1974) relatively close to its actual location, but the site had been destroyed by grubbing and grading prior to SHPD's field inspection in 2012.



Figure 26. Natural depression with *hala* leaf litter and root disturbance, view to the southeast.



Figure 27. Relatively flat ground surface in the *mauka* portion of the study area., view to the south.

5. DETERMINATION OF EFFECT

Given the negative findings of the current study with respect to archaeological resources, it is concluded that the development of the proposed single-family residence will not impact any historic properties. Therefore, the determination of effect for the proposed project is “no historic properties affected.”

With respect to the historic preservation review process of the Department of Land and Natural Resources–State Historic Preservation Division (DLNR–SHPD), our recommendation is that no further work needs to be conducted within the current study area prior to or during project implementation. In the unlikely event that archaeological resources are discovered during ground disturbing activity associated with the proposed development, work should cease in the area of the discovery and DLNR-SHPD contacted pursuant to HAR 13§13-280-3.

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Environmental Assessment

Grossbard/Bourzat Single-Family Residence in the Conservation District at Keonepoko

APPENDIX 3 Cultural Impact Assessment

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A Cultural Impact Assessment for the Proposed Residential Development of TMK: (3) 1-5-009:053

Keonepoko Iki Ahupua‘a
Puna District
Island of Hawai‘i



Prepared By:

Genevieve Glennon, B.A.,
Lokelani Brandt, M.A.,
Aoloa Santos, B.A.,
and
Robert B. Rechtman, Ph.D.

Prepared For:

Françoise Bourzat and Aharon
Grossbard
2150 Bear Gulch Road
Woodside, CA 94062

December 2018



Archaeology • History • Anthropology • Architectural History

Hilo Office: (808) 969-6066 Fax: (808) 443-0065
507-A E. Lanikaula Street, Hilo, HI 96720

Honolulu Office: (808) 439-8089 Fax: (808) 439-8087
820 Millilani Street, Suite 700, Honolulu, HI 96813

**A Cultural Impact Assessment for the
Proposed Residential Development of
TMK: (3) 1-5-009:053**

Keonepoko Iki Ahupua‘a
Puna District
Island of Hawai‘i



CHAPTERS

	Page
1. INTRODUCTION	1
STUDY AREA DESCRIPTION	1
Geology, Soils, and Vegetation	6
2. BACKGROUND	11
GENERAL CULTURE-HISTORICAL CONTEXT	11
Early Hawaiian Settlement	11
Ruling Chiefs on Hawai‘i Island	12
A Brief History of Hawai‘i After Western Contact	14
Keonepoko Iki and the Greater Puna District	15
Traditional Settlement Patterns	16
Celebrated Landscape and Agricultural Practices of the Puna District.....	18
Legendary References to the Puna District	23
Early Explorers and Missionary Accounts	25
Legacy of the Māhele ‘Āina (1848-1873).....	29
Commission of Boundaries (1862-1876)	30
Puna Following the Māhele ‘Āina.....	33
Keonepoko Iki Ahupua‘a and Coastal Puna during the Twentieth Century	34
PREVIOUS ARCHAEOLOGICAL STUDIES	41
3. CONSULTATION.....	44
HIDI BOTEILHO.....	44
PI‘ILANI KA ‘AWALOA	44
SUMMARY OF PREVIOUS ORAL HISTORY	45
4. IDENTIFICATION AND MITIGATION OF POTENTIAL CULTURAL IMPACTS	46
REFERENCES CITED.....	49

FIGURES

	Page
1. Study area location.....	2
2. Tax Map Key (TMK): (3) 1-5-009 showing location of current study parcel (053) shaded red.	3
3. Google Earth aerial image of TMK: (3) 1-5-009:053 with parcel outlined in red.....	4
4. Southwest boundary of the study area along Old Government Beach Rd. Survey flag visible center-right of photo. View is to the east.....	4
5. Coastal bluff fronting the study area, view to the northwest.	5
6. Photograph of study area with access trail leading <i>makai</i> . View to the northeast.	5
7. Geology of current study area with parcel outlined in red.....	6
8. Weathered inflationary lobe overgrown by <i>Schefflera actinophylla</i> , view to the south.....	7

9. Soils in the current study area with parcel outlined in red.....	7
10. February 19, 1977, aerial image (United States Geological Survey 1977) of the current study area with parcel outlined in red.....	8
11. Coastal strand vegetation along the north west corner of the study area. Access driveway is visible center of picture. View to the southwest.....	8
12. Vegetation in study area transitioning from coastal strand to <i>hala</i> forest. View to the southwest.....	9
13. Dense <i>hala</i> forest in study area. View to the southwest.....	9
14. Inland introduced weedy trees and vines in the study area, view to the south.....	10
15. Inland introduced weedy trees and vines in the study area, view to the south.....	10
16. Portion of Hawai‘i Registered Map 2060 by J.M. Donn in 1901 showing study area within the Puna District (shaded pink).....	16
17. McEldowny’s (1978:64) land use zone map showing study area located in Zone I.....	17
18. <i>Hala</i> groves within the subject parcel.....	18
19. Man standing in a Puna <i>pū hala</i> grove in 1888 (Brigham and Stokes 1906:28).....	19
20. Portion of Hawai‘i Registered Map 424 prepared by Wilkes in 1841 showing the approximate location of current study area and nearby coastal trail.....	27
21. Portion of Hawai‘i Registered Map No. 2258 (Morange 1903a) with the current study area shaded in red.....	31
22. Hawai‘i Registered Map No. 367 showing the boundaries of Keonepoko Nui Ahupua‘a (Naeole 1880), current study area outlined in red.....	32
23. 1855 surveyor map of Grant 1533, showing study area (outlined red) and other noted features.....	33
24. Hawai‘i Registered Map No. 2084 showing the Keonepoko Homestead lots (Morange 1903b).....	35
25. Portion of Hawai‘i Territory Survey Plat Map No. 811 (prepared in 1915) showing the area leased to W.H. Shipman Ltd. (Wall 1915:811).....	37
26. 918 map (C.S.F. 2992) of General Lease No. 1025 to W.H. Shipman Ltd. in Keonepoko Nui and Iki <i>ahupua ‘a</i> , with study area outlined red. (Wright 1918).....	38
27. 1929 map (C.S.F. 5261) of the Ka‘ohe-Maku‘u-Keonepoko Iki Government Tract showing study area outlined red. (Coff 1929).....	39
28. Portion of the 1924 Makuu quadrangle (United States Geological Survey 1924) showing the current study area shaded red.....	40
29. Previous archaeological studies in the vicinity of the current study area.....	41
30. Site locations within Increment H of the Ewart and Luscomb (1974:7) survey area showing the location of the current study parcel (shaded red).....	42

TABLES

	Page
1. Previous archaeological studies.....	41

APPENDIX

	Page
A <i>Ka Wai Ola</i> Public Notice.....	57

1. INTRODUCTION

At the request of Françoise Bourzat and Aharon Grossbard (the applicants), ASM Affiliates has prepared this Cultural Impact Assessment (CIA) for the proposed construction of a single-family residence on a roughly 6.9 acre parcel (TMK: (3) 1-5-009:053) in Keonepoko Iki Ahupua‘a, Puna District, Island of Hawai‘i (Figures 1 and 2). This CIA will serve as a companion document for a Conservation District Use Permit (CDUP) and Environmental Assessment (EA) that are being prepared for the proposed development. The applicants seek to develop a single family residence, possibly with a garden area and some fruits trees. ASM Affiliates conducted an Archaeological Assessment (AA) of the subject property in September of 2018 (Barna and Bibby 2018) in which no Historic properties were identified.

The current report was prepared in support of an Environmental Assessment in compliance with 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. Below is a description of the general project area and the proposed development activities. Followed by a detailed cultural and historical background that includes a presentation of prior studies; all of which combine to provide a physical and cultural context for the project area. Finally, the consultation process is described, which includes a discussion of potential impacts to the cultural landscape and the historic and cultural properties therein as well as appropriate actions and strategies to mitigate any such impacts.

STUDY AREA DESCRIPTION

The study area consists of a roughly 6.91-acre parcel (TMK: (3) 1-5-009:053) located between the Old Government Beach Road and the coast in Keonepoko Iki Ahupua‘a, Puna District, Island of Hawai‘i (Figure 3). The parcel is roughly 264 meters long with approximately 103 meters of road frontage (Figure 4) and 126 meters of coastline, where it is fronted by a low coastal bluff (Figure 5). Elevation within the study area ranges from 6 to 20 meters (20 to 70 feet) above sea level. The entire parcel is undisturbed and shows no evidence of recent activity, except for an approximately 3-meter-wide by 220-meter-long pre-existing access road (Figure 6) which extends from Government Beach Road to the coastal bluff. The entrance of the access road into the study area is blocked by boulders, a short sections of pig fencing, and modern rubbish such as cans, bottles, car parts, and clothing (see Figure 6). The access road is lined on both sides with windrows that are a few centimeters tall, but these are obscure and generally grown over with vegetation.

1. Introduction

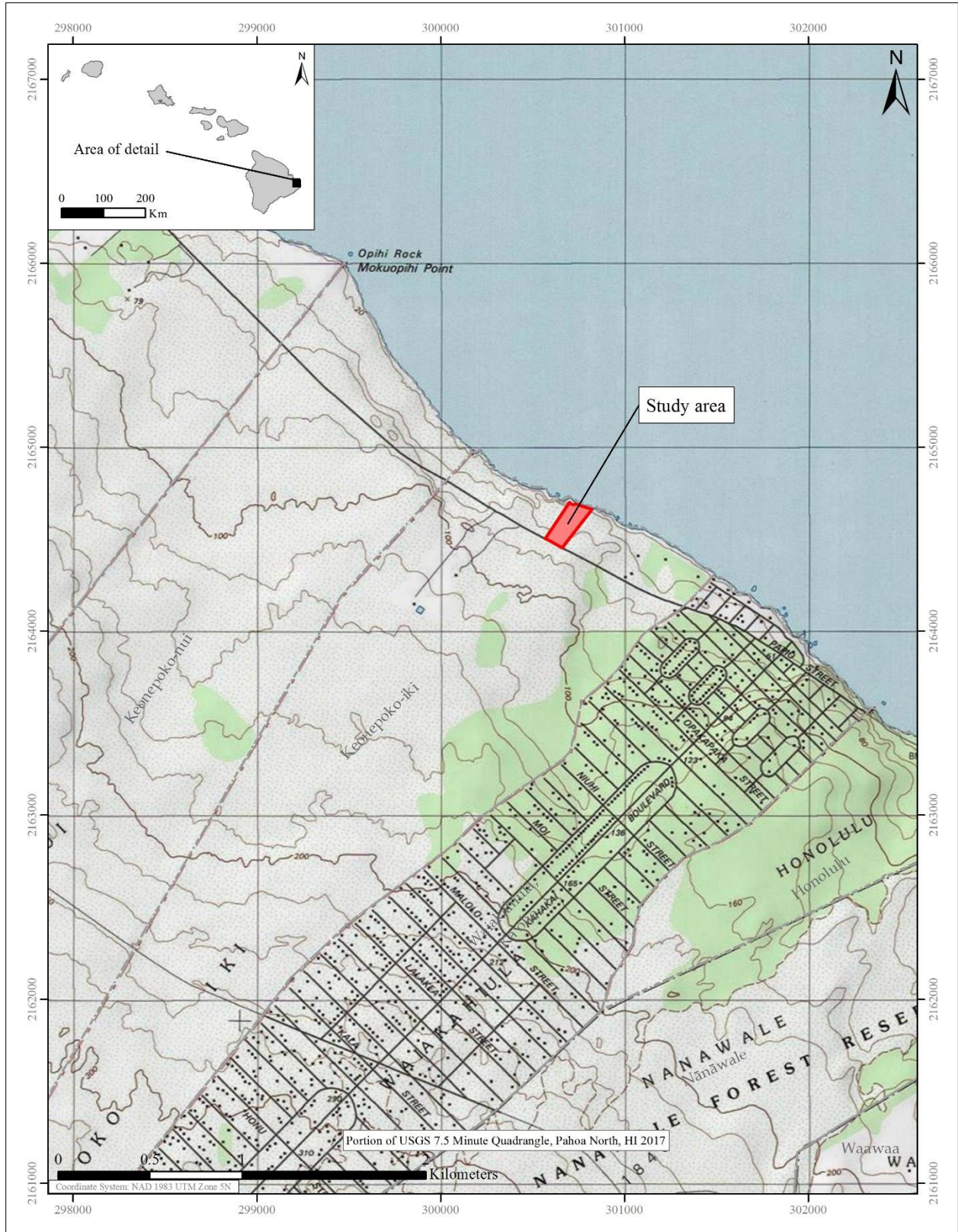


Figure 1. Study area location.

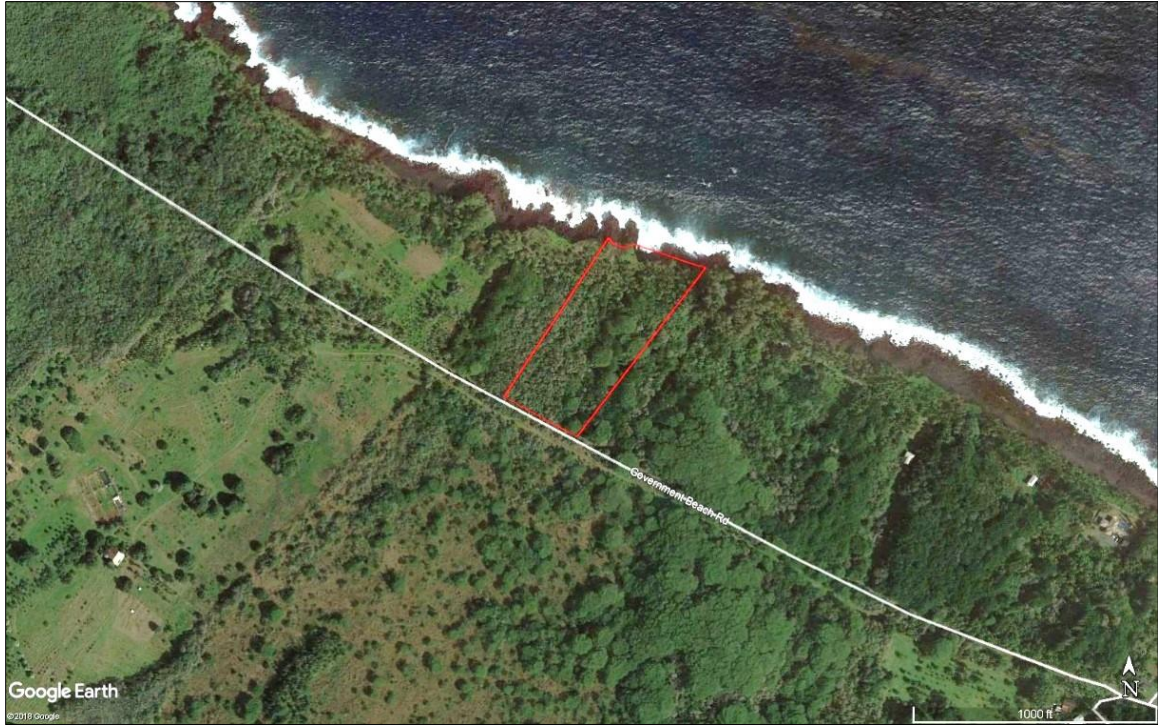


Figure 3. Google Earth aerial image of TMK: (3) 1-5-009:053 with parcel outlined in red.



Figure 4. Southwest boundary of the study area along Old Government Beach Rd. Survey flag visible center-right of photo. View is to the east.



Figure 5. Coastal bluff fronting the study area, view to the northwest.



Figure 6. Photograph of study area with access trail leading *makai*. View to the northeast.

Geology, Soils, and Vegetation

This portion of the Puna coast is generally formed of mixed *pāhoehoe* and ‘*a‘ā*’ lava flows that originated from Kīlauea Volcano between 400 and 750 years before present (Figure 7) (Sherrod et al. 2007). The weathered lavas on the ground surface have meter-scale topography with some scattered unmodified depressions adjacent to 2-5 meter tall weathered *pāhoehoe* and ‘*a‘ā*’ inflationary lobes (Figure 8). The thin soils that have developed in the vicinity of the study parcel are classified as Opihikao highly decomposed plant material on *pāhoehoe* lava, labeled as “664” in Figure 9 (United States Department of Agriculture, Natural Resources Conservation Service, Soil Survey Staff 2018).

In addition to the access road from Government Beach Road, aerial imagery from 1977 (Figure 10) indicates the presence of a second road paralleling the coast and terminating a short distance to the west of the study parcel. This second road was not apparent during the current study, possibly obscured by thick *naupaka* growing along the *mauka* edge of the coastal strand (Figure 11).

The vegetation of the coastal strand (Figure 12) includes *naupaka* (*Scaevola guadichaudiana*), *niu* (*Cocos nucifera*), *hala* (*Pandanus tectorius*) and ironwood trees (*Casuarina equisetifolia*). Inland of the coastal strand vegetation is a dense *hala* forest (Figure 13) that gradually transitions to a mix of introduced weedy tree and vine species (Figures 14 and 15) such as *maile pilau* (*Paederia foetida*), pothos (*Epipremnum aureum*) and philodendron vines, bingabing (*Macaranga mappia*), autograph trees (*Clusia rosea*), strawberry guava (*Psidium cattleianum*), umbrella trees (*Schefflera actinophylla*), gunpowder trees (*Trema orientalis*), and melochia (*Melochia umbellata*), with a few coconut palms (*Cocos nucifera*), *laua‘e* ferns (*Phymatosorus grossus*), *hala*, and *kī* plants (*Cordyline fruticosa*).

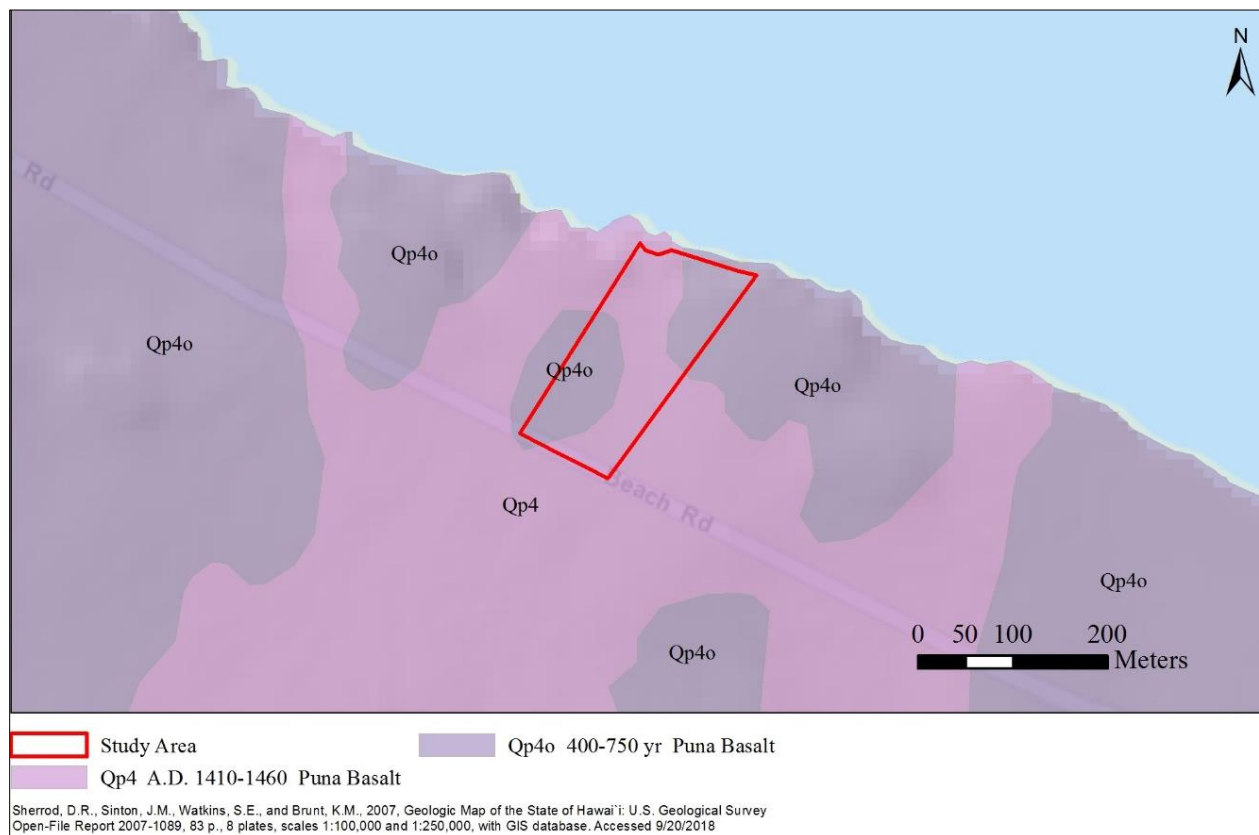


Figure 7. Geology of current study area with parcel outlined in red.



Figure 8. Weathered inflationary lobe overgrown by *Schefflera actinophylla*, view to the south.

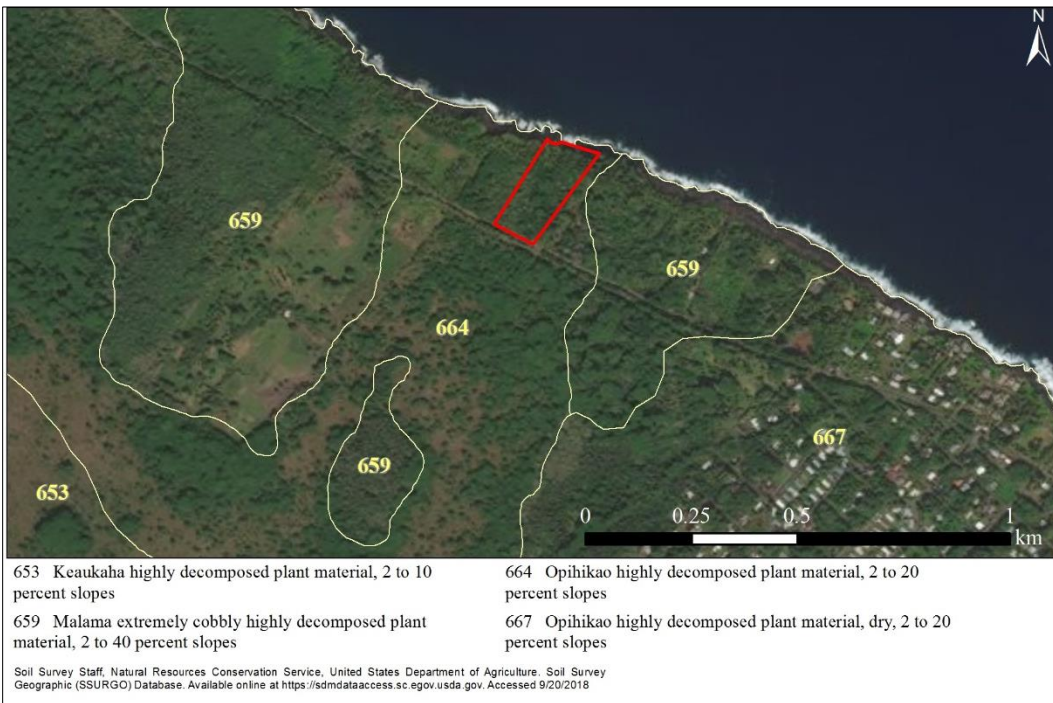


Figure 9. Soils in the current study area with parcel outlined in red.

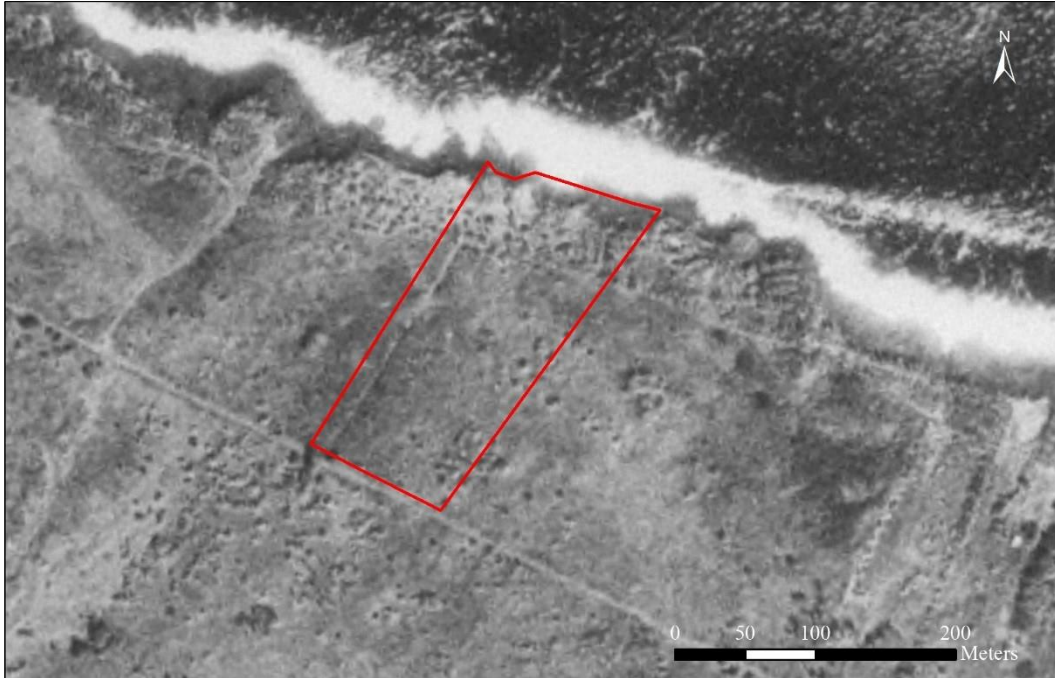


Figure 10. February 19, 1977, aerial image (United States Geological Survey 1977) of the current study area with parcel outlined in red.



Figure 11. Coastal strand vegetation along the north west corner of the study area. Access driveway is visible center of picture. View to the southwest.



Figure 12. Vegetation in study area transitioning from coastal strand to *hala* forest. View to the southwest.



Figure 13. Dense *hala* forest in study area. View to the southwest.



Figure 14. Inland introduced weedy trees and vines in the study area, view to the south.



Figure 15. Inland introduced weedy trees and vines in the study area, view to the south.

2. BACKGROUND

The chronological summary presented below begins with the peopling of the Hawaiian Islands and a generalized model of Hawaiian Prehistory followed by a summary of Historic events in the Hawaiian Islands after the arrival of foreigners. The discussion continues with a presentation of legendary and historical references to Keonepoko Iki Ahupua‘a and at times the greater Puna District. This summary includes oral traditions and first-hand Historic accounts recorded by visitors and missionaries. A review of land tenure in the study *ahupua‘a* during the *Māhele ‘Āina* of 1848 and documentation of the transition to modern industries, agriculture, and residential development during the late 19th and 20th centuries. The discussion concludes with a review of findings from prior investigations conducted in the study area vicinity. It is within this general context that the following discussion of the history and culture of the study area is framed. The culture-historical context presented below for Keonepoko Iki Ahupua‘a is based on original research conducted by ASM at various online repositories as well as physical repositories including the University of Hawai‘i at Hilo Mo‘okini Library, State Historic Preservation Division library, and the Hawai‘i State Archives.

GENERAL CULTURE-HISTORICAL CONTEXT

Early Hawaiian Settlement

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 (Kirch 2011). 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 originated from the southern Marquesas Islands (Emory in Tatar 1982). During these early times, Hawai‘i’s inhabitants were primarily engaged in subsistence level agriculture and fishing (Handy and Handy 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 (1880), 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; *pu‘uhouua* or 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 a 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 did societal conflict, which resulted in 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 next period reflect an evolution of the traditional tools and 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. 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 the 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. During this expansion period, 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 the 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), which added 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* or chiefs who controlled the *ahupua'a* resources; who, for the most part, had complete autonomy over this generally economically self-supporting piece of land. *Ahupua'a* lands were in turn, managed by an appointed *konohiki* or lesser chief-landlord. The *ali'i-'ai-ahupua'a*, in turn, answered to an *ali'i 'ai moku* (chief who claimed the abundance of the entire district). Thus, *ahupua'a* resources supported not only the *maka'āinana* (commoners) and *'ohana* (families) who lived on the land but also contributed to the support of the royal community of regional and/or island kingdoms. *Ahupua'a* are land divisions that typically incorporated 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). Although the *ahupua'a* land division typically incorporated all of the eco-zones, their size and shape varied greatly. This form of district subdividing was integral to Hawaiian life and was the product of resource management planning that was strictly adhered to. In this system, the land provided fruits and vegetables and some meat for the diet, and the ocean provided a wealth of protein resources (Rechtman and Maly 2003). In communities with long-term royal residents, divisions of labor (with specialists in various occupations on land and in the procurement of marine resources) were also strictly enforced.

Ruling Chiefs on Hawai'i Island

By the seventeenth century, large areas of Hawai'i Island were controlled by a few powerful *ali'i 'ai moku*. There is island-wide evidence to suggest that growing conflicts between independent chiefdoms were resolved through warfare, culminating in a unified political structure at the district level. It has been suggested that the unification of the island resulted in a partial abandonment of portions of leeward Hawai'i, with people moving to more favorable agricultural areas (Barrera 1971); (Schilt and Sinoto 1980). 'Umi a Līloa, a renowned *ali'i* of the Pili line, is often credited with uniting the Island of Hawai'i under one rule during the Precontact Period (Cordy 1994). 'Umi-a-Līloa is also credited with formalizing the land division system on Hawai'i Island and separating the various classes of chiefs, priests, and laborers (Beamer 2014); (Cordy 2000); (Kamakau 1992)). Upon the death of 'Umi-a-Līloa, Hawai'i Island came under the control of his eldest son Keli'iokāloa-A-'Umi (Cordy 2000), whose reign is marked by his mistreatment of the lesser chiefs and commoners. His reign was short lived and by the early eighteenth century Hawai'i Island fell under the control of Alapa'inui, who assembled a robust army and assigned his closest potential usurpers (his nephews Keawema'uhili, Kalani'ōpu'u, and Keōua) as generals in his militia. The prodigious 'Ī clan, spread across the districts of Ka'ū, Puna, Hilo, and portion of Hāmākua was also a powerful force and threat to Alapa'i campaign (Cordy 2000). As Alapa'i gathered his forces to strike back at Kekaulike, the *ali'i nui* of Maui, the high ranking *ali'i wahine* (chiefess) Keku'iapoiwa made her way to Kokoiki, Kohala to give birth to Pai'ea, the birth name given to Kamehameha I (ibid.). Kamehameha was reared in the traditions and customs of the ancient chiefs and trained under some of the most skilled warriors of that time including Kekūhaupi'o. Upon Alapa'i's death, his eldest son Keawe'ōpala was named heir to the kingdom. Sometime around A.D. 1754, after many bloody battles, Kalani'ōpu'u, the *ali'i 'ai moku* of Ka'ū, defeated his main rival, Keawe'ōpala, in South Kona and declared himself ruler over all of the island of Hawai'i (Kamakau 1992:78). Kalani'ōpu'u was a clever and able chief, and a famous athlete in all games of strength, but according to Kamakau (1992) he possessed one great fault, he loved war and had no regard for others' land rights. According to Barrère (1959), the chiefs of the Puna District did not figure prominently into the Precontact political strife and turmoil on Hawai'i Island. Barrère writes:

Puna, as a political unit, played an insignificant part in shaping the course of history of Hawaii Island. Unlike the other districts of Hawaii, no great family arose upon whose support one or another of the chiefs seeking power had to depend for his success. Puna lands were desirable, and were eagerly sought, but their control did not rest upon conquering Puna itself, but rather upon control of the adjacent districts, Kau and Hilo. (Barrère 1959:15)

By the mid eighteenth century, the young and determined Kamehameha directed his efforts toward consolidating Hawai'i Island under his rule. To accomplish this monumental task, Kamehameha continued his training under his more experienced kin namely Kalani'ōpu'u, who was the *ali'i nui* of Hawai'i Island (Kamakau 1992); ('Ī'i 1959). During Kalani'ōpu'u's reign, the first foreign vessels arrived in Hawaiian waters captained by British explorer, James Cook. Cook, in command of the ships *H.M.S. Resolution* and *H.M.S. Discovery* first landed at Waimea, Kaua'i in January 18, 1778 and the following year on January 17, 1779, on a return trip to Hawaiian waters he anchored just off the shores of Kealahou Bay, South Kona. Aboard these ships were innovative technologies and diseases unknown to the inhabitants of these islands. On January 26th Kalani'ōpu'u, the reigning chief of Hawai'i Island, visited Cook on board the *H.M.S. Resolution*, where they exchanged gifts. Kamehameha, the future ruler of all of Hawai'i, was present at this meeting (Jarves 1847). On February 13th, several natives were discovered stealing nails from the British ships. They were fired upon by the crew, and a chief close to Kalani'ōpu'u named Palea was knocked down, and his

canoe taken. That night one of Cook's boats was stolen, and the following morning Cook set ashore at Ka'awaloa with six marines to ask Kalani'ōpu'u for its return. Kalani'ōpu'u, however, denied any knowledge of the theft; Cook decided to hold the chief captive until the boat was returned (Kamakau 1992). When Cook tried to seize Kalani'ōpu'u, however, a scuffle ensued and Cook was killed (along with four of his men and several natives) there on the shores of Ka'awaloa, struck down by a metal dagger. When Captain Cook fell, the British ships fired cannons into the crowd at the shore and several more natives were killed. Kalani'ōpu'u and his retinue retreated inland, bringing the body of Cook with them. Items such as metal, nails, guns, canons, and the large foreign vessels themselves stirred the interest of the *ali'i* and *maka'āinana* alike. Acquisition of these technological advancements came through barter and at times through confiscation (Kuykendall 1938). This resulted in the *ali'i* gaining possession of items that ultimately set traditional Hawaiian warfare in new trajectory; one that would be forged by none other than Kamehameha.

The Rebel Puna Chief, 'Imakakōloa

Wars occurred regularly between intra-island and inter-island polities during this period. During his stay in Kohala, around 1780, Kalani'ōpu'u proclaimed that his son Kīwala'ō would be his successor of his island kingdom, and he gave the guardianship of the war god Kūkā'ilimoku to his nephew Kamehameha (Fornander 1996; Kamakau 1992). It was during his time in Kohala that an uprising, led by a highly esteemed chief of Puna named 'Imakakōloa, occurred. Upon hearing of the uprising, Kalani'ōpu'u immediately went to Hilo to quell the rebellion. Though customary at the time, to furnish the king's court with items such as pigs, fish, taro, fruits and other forms of wealth (Elkin 1904), it is said that 'Imakakōloa rebelled because he was tired of the incessant and exorbitant demands of Kalani'ōpu'u. As a chief who loved the people of Puna, and was beloved by them in return, 'Imakakōloa refused Kalani'ōpu'u's demands. He felt that "his own people who cultivated the ground should be provided with the necessities of life, before the numbers of the royal court, who lived in idleness" (Elkin 1904:26). Rather than allow Kalani'ōpu'u access to the toils of the people of Puna, 'Imakakōloa:

...seized the valuable products of his district, which consisted of hogs, gray tapa cloth ('*eleuli*), tapas made of *mamaki* bark, fine mats made of young pandanus blossoms ('*ahu hinalo*), mats made of young pandanus leaves ('*ahua*), and feathers of the '*o'o* and *mamo* birds of Puna. (Kamakau 1992:106)

This action angered Kalani'ōpu'u, who was insulted by the insubordination. He vowed revenge against 'Imakakōloa and devised a plan to kill him. A battle between the two men ensued, and although 'Imakakōloa was a worthy opponent, his army was no match for Kalani'ōpu'u's superior forces. After the battle, the Puna chief fled and was sheltered in the district by his people for more than a year. Kalani'ōpu'u, sworn to vengeance, ruthlessly stalked the fugitive chief for the duration of his emancipation, and in his rage he ordered that Puna be burned to the ground. Fornander (1969:202) indicates that the district was "literally laid in ashes" as a result of Kalani'ōpu'u's vengeance.

While the rebel Puna chief was sought, Kalani'ōpu'u "went to Ka-'u and stayed first at Punalu'u, then at Waiohinu, then at Kama'oa in the southern part of Ka-'u, and erected a heiau called Pakini, or Halauwailua, near Kama'oa" (Kamakau 1992:108). 'Imakakōloa was eventually captured and brought to the *heiau*, where Kīwala'ō was to sacrifice him. "The routine of the sacrifice required that the presiding chief should first offer up the pigs prepared for the occasion, then bananas, fruit, and lastly the captive chief" (Fornander 1996:202). However, before Kīwala'ō could finish the first offerings, Kamehameha, "grasped the body of Imakakoloa and offered it up to the god, and the freeing of the tabu for the heiau was completed" (Kamakau 1992:109). Upon observing this single act of insubordination, many of the chiefs believed that Kamehameha would eventually rule over all of Hawai'i. After usurping Kīwala'ō's authority with a sacrificial ritual in Ka'ū, Kamehameha retreated to his home district of Kohala.

The Rise and Conquest of Kamehameha I

After Kalani'ōpu'u's death in April of 1782, several chiefs were unhappy with Kīwala'ō's division of the island's lands, and civil war broke out. Kīwala'ō, Kalani'ōpu'u's son and appointed heir, was killed at the battle of Moku'ōhai, South Kona in July of 1782. Supporters of Kīwala'ō, including his half-brother Keōua and his uncle Keawemauhili, escaped the battle of Moku'ōhai with their lives and laid claim to the Hilo, Puna, and Ka'ū Districts. According to 'Ī'i (1959) nearly ten years of almost continuous warfare followed the death of Kīwala'ō, as Kamehameha endeavored to unite the Island of Hawai'i under one rule and conquer the islands of Maui and O'ahu. Keōua became Kamehameha's main rival on the Island of Hawai'i, and he proved difficult to defeat (Kamakau 1992). Keawemauhili would eventually give his support to Kamehameha, but Keōua never stopped resisting. Around 1790, in an effort to secure his rule, Kamehameha began building the *heiau* of Pu'ukoholā in Kawaihae, which was to be dedicated to the war god Kūkā'ilimoku (Fornander 1996). Fornander (1996) relates a story of Keōua, Keawemauhili, and Kamehameha that begins after the battle of Moku'ōhai, but tells of another battle in ca. 1790 when Kamehameha routed Keōua at Waimea

and Hāmākua and then sent men to attack Ka‘ū. As Keōua attempted to return to his home district a portion of his army was killed by an eruption of Kīlauea Volcano. Westervelt writes:

... Kiwalao’s half-brother Keoua escaped to his district Ka-u, on the southwestern side of the island. His uncle Keawe-mau-hili escaped to his district Hilo on the southeastern side.

For some years the three factions practically let each other alone, although there was desultory fighting. Then the high chief of Hilo accepted Kamehameha as his king and sent his sons to aid Kamehameha in conquering the island Maui.

Keoua was angry with his uncle Keawe-mau-hili. He attacked Hilo, killed his uncle and ravaged Kamehameha’s lands along the northeastern side of the island.

Kamehameha quickly returned from Maui and made an immediate attack on his enemy, who had taken possession of a fertile highland plain called Waimea. From this method of forcing unexpected battle came the Hawaiian saying, “The spear seeks Waimea like the wind.”

Keoua was defeated and driven through forests along the eastern side of Mauna Kea (The white mountain) to Hilo. Then Kamehameha sent warriors around the western side of the island to attack Keoua’s home district. Meanwhile, after a sea fight in which he defeated the chiefs of the islands Maui and Oahu, he set his people to building a great temple chiefly for his war-god Ka-ili. This was the last noted temple built on all the islands.

Keoua heard of the attack on his home, therefore he gave the fish-ponds and fertile lands of Hilo to some of his chiefs and hastened to cross the island with his army by way of a path near the volcano Kilauea. He divided his warriors into three parties, taking charge of the first in person. They passed the crater at a time of great volcanic activity. A native writer, probably Kamakau, in the native newspaper *Kuokoa*, 1867, describes the destruction of the central part of this army by an awful explosion from Kilauea. (Westervelt 1916:140–141)

The untimely eruption of Kīlauea, as Keōua’s army attempted to return to Ka‘ū to stop Kamehameha’s warriors from ravaging their home district, cost him about 400 fighting men along with an untold number of women and children (Fornander 1996). Kamehameha’s prophets said that this eruption was the favor of the gods who rejoiced at his building of Pu‘ukohola Heiau. According to Westervelt (1916:146), “The people said it was proof that Pele had taken Kamehameha under her special protection and would always watch over his interests and make him the chief ruler.”

Unable to defeat Keōua in battle, Kamehameha resorted to trickery. When Pu‘ukoholā Heiau was completed in the summer of 1791, Kamehameha sent his two counselors, Keaweheulu and Kamanawa, to Keōua to offer peace. Keōua was enticed to the dedication of the Pu‘ukoholā Heiau by this ruse, and when he arrived at Kawaihae, he and his party were sacrificed to complete the dedication (Kamakau 1992). The assassination of Keōua gave Kamehameha undisputed control of Hawai‘i Island by 1792 (Greene 1993). It is widely thought that Keōua knew the likely outcome of his visit to Pu‘ukoholā Heiau, but sacrificed himself anyway to spare the people of Ka‘ū further bloodshed. By 1796, with the aid of foreign weapons and advisors, Kamehameha conquered all of the island kingdoms except Kaua‘i. In 1810, when Kaumuali‘i of Kauai gave his allegiance to Kamehameha, the Hawaiian Islands were unified under a single leader (Kuykendall and Day 1976) Kamehameha would go on to rule the islands for another nine years (Kuykendall and Day 1976). He and his high chiefs participated in foreign trade but continued to enforce the *kapu* system.

A Brief History of Hawai‘i After Western Contact

The arrival of Western explorers in Hawai‘i signified the end of the Precontact Period, and the beginning of the Historic Period. With the arrival of foreigners, Hawai‘i’s culture and economy underwent drastic changes. Demographic trends during the early Historic Period indicate population reduction in some areas, due to war and disease, yet increase in others, with relatively little change in material culture. At first there was a continued trend toward craft and status specialization, intensification of agriculture, *ali‘i* controlled aquaculture, the establishment of upland residential sites, and the enhancement of traditional oral history. The Kū cult, *luakini heiau*, and the *kapu* system were at their peaks, although western influence was already altering the cultural fabric of the Islands (Kirch 1985); (Kent 1983). Foreigners very quickly introduced the concept of trade for profit, and by the time Kamehameha had conquered O‘ahu, Maui and Moloka‘i, in 1795, Hawai‘i saw the beginnings of a market system economy (Kent 1983). Some of the work of the *maka‘āinana* shifted from subsistence agriculture to the production of foods and goods that they could trade with early visitors. Introduced foods often grown for trade with Westerners included yams, coffee, melons, Irish potatoes, Indian corn, beans, figs, oranges, guavas, and grapes (Wilkes 1845).

In 1819, Kamehameha died and the *kapu* system that governed all aspects of traditional Hawaiian society was symbolically abolished when Liholiho, the son of Kamehameha and heir apparent ate in the presence of his biological mother Keōpūolani and *hānai* (adoptive mother) Ka‘ahumanu. These two women were of high rank and of the two, Ka‘ahumanu was designated as the *Kuhina Nui* or regent of the islands. In 1820, the first Protestant missionaries landed on Hawai‘i Island and within several years they had converted many *ali‘i* and established a firm foothold in the islands. by establishing mission stations around the islands where they were able to influence the greater population of *maka‘āinana* (Ellis 1917; Fornander 1969; Kamakau 1992). Naturally, to accomplish their goal of religious conversion, these early missionaries began establishing schools, thereby introducing reading and writing into Hawaiian culture and formalizing Hawaiian orthography. By this time, introduced diseases and global economic forces began to severely alter traditional life-ways.

Keonepoko Iki and the Greater Puna District

The *ahupua‘a* of Keonepoko Iki (also historically referenced as Keonepoko 2) is one of fifty traditional land divisions situated in the easternmost District of Puna the Island of Hawai‘i (Figure 16). Keonepoko Iki Ahupua‘a is bounded on the north by Keonepoko Nui, which is sometimes designated as Keonepoko 1 and on the south by Ka‘ohe Ahupua‘a (see Figure 16). The Hawaiian proverb “Puna, mai ‘Oki‘okiaho a Māwae” describes the extent of the district spanning from ‘Oki‘okiaho (lit. to sever the cord) the southern boundary, to Māwae (lit. fissure), the northern boundary. In describing a Hawaiian understanding of the name Puna, McGregor writes:

The name Puna means wellspring and derives from observations by Native Hawaiian ancestors of how the forest of Puna attract the clouds to drench he [*sic*] district with its many rains, such as “ka ua moaniani lehua o Puna” (the rain the brings fragrance of the lehua of Puna). The rains refresh and enrich the Puna water table and sustain the life cycle of all living things in Puna and the entire island of Hawai‘i. (McGregor 2007:143–144)

The Puna district comprising of some 311,754 acres is further described by Handy and Handy (1991) as an agriculturally fertile land that has been repeatedly devastated by lava flows. Writing during the 1930s, they relate that:

The land division named Puna—one of the six major chiefdoms of the island of Hawai‘i said to have been cut (*‘oki*) by the son of the successor of the island’s first unifier, Umi-a-Liloa—lies between Hilo to the north and Ka‘u to the south, and it projects sharply to the east as a great promontory into the Pacific. Kapoho is the most easterly point at Cape Kumukahi. The uplands of Puna extend back toward the great central heights of Mauna Loa, and in the past its lands have been built, and devastated, and built again by that mountain’s fires. In the long intervals, vegetation took hold, beginning with miniscule mosses and lichens, then ferns and hardier shrubs, until the uplands became green and forested and good earth and humus covered much of the lava-strewn terrain, making interior Puna a place of great beauty...

...One of the most interesting things about Puna is that Hawaiians believe, and their traditions imply that this was once Hawaii’s richest agricultural region and that it is only in relatively recent time that volcanic eruption has destroyed much of its best land. Unquestionably lava flows in historic times have covered more good gardening land here than in any other district. But the present desolation was largely brought about by the gradual abandonment of their country by Hawaiians after sugar and ranching came in... (Handy and Handy 1991:531–542).

The District of Puna is situated largely on the slopes of Kīlauea Volcano. The east rift zone of the volcano, a broad, low profile ridge (2-4 kilometers wide) formed by countless eruptions originating from numerous vents along its crest. The zone extends through the district from the Kīlauea Caldera to Cape Kumukahi at the eastern tip of the island, a distance of 55 kilometers. The north side of the rift zone, extending to the slopes of Mauna Loa and to the northeastern Puna coast, is covered primarily by lavas that erupted from the summit of Kīlauea about 200-750 years ago. In contrast, nearly the entire crest of the rift zone is covered by lava that is less than 200 years old, and most of the young lava flows that emanate from vents along the crest have spread southward towards the southeastern coast of the district, covering the older lava flows in the process (Sherrod et al. 2007; Wolfe and Morris 1996).

Kīlauea is also recognized as the home of Pelehonuaamea and according to Kalākaua (1972:139), Pele’s “favorite residence was the vast and ever-seething crater of Kīlauea, beneath whose molten flood, in halls of burning adamant and grottoes of fire, she consumed the offerings of her worshippers and devised destruction to those who long neglected her or failed to respect her prerogatives.” Ho‘oulumāhie (2006) indicates that on her way to Kīlauea Pele initially carved out a crater called Malama just inland of her landing place at Keahialaka. Pele was dissatisfied with

2. Background

this crater, and proceeded to feverishly excavate two more craters called Pu'ulena and Poho-iki, both of which she was also displeased with and abandoned as she continued her pursuit for a suitable home.

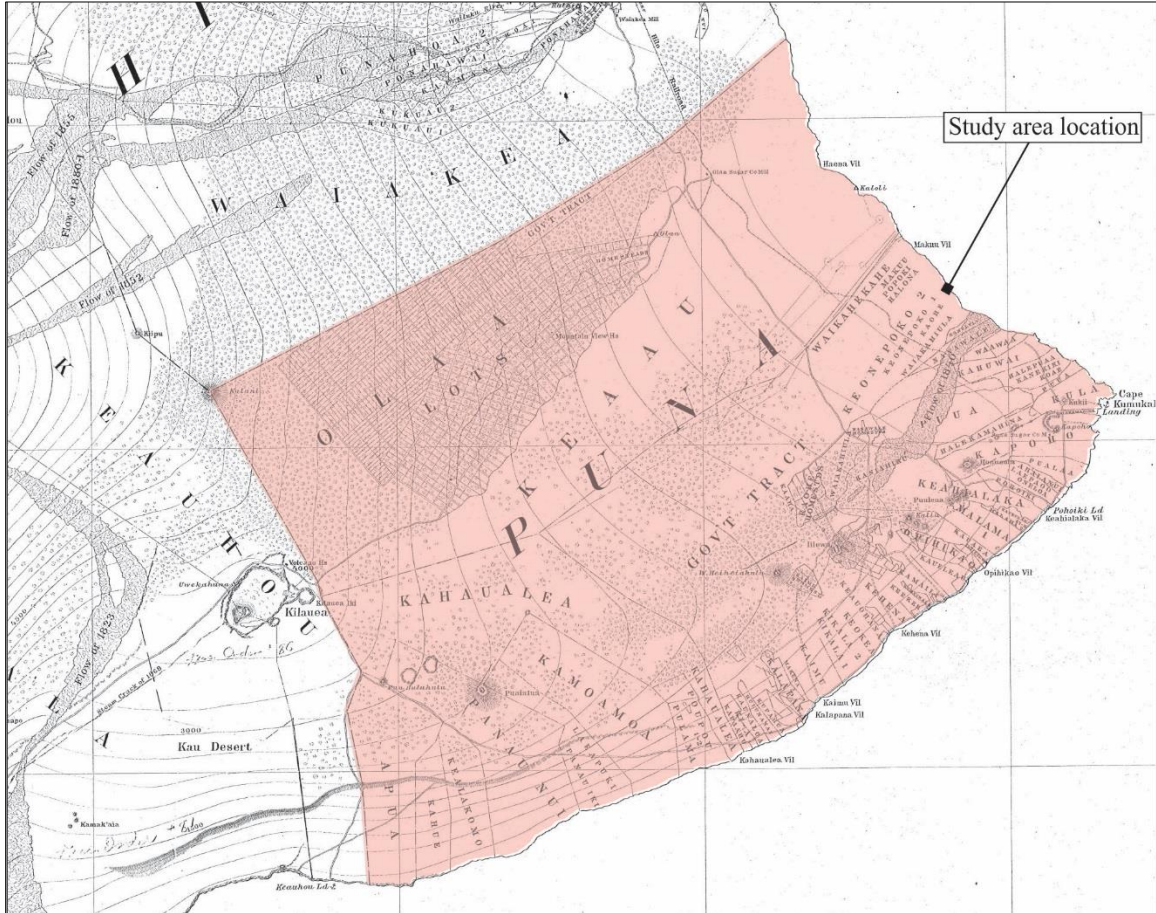


Figure 16. Portion of Hawai'i Registered Map 2060 by J.M. Donn in 1901 showing study area within the Puna District (shaded pink)

Traditional Settlement Patterns

The *ahupua'a* of Keonepoko Iki includes areas of both the Coastal Settlement Zone (Figure 17) and the Upland Agricultural Zone (Zone II) as described by (McEldowney 1979:15–18). While this model is largely based on early historical accounts, it also considers environmental variables and human resource needs, and offers insights into the prehistoric past (Burtchard and Moblo 1994). In their refinement of the model as it applies to Puna, Burtchard and Moblo elaborate on McEldowney's concept of the Coastal Settlement Zone:

As with her model, [the Coastal Settlement Zone] includes coastal terrain to about one half mile inland. This is the zone expected to have the greatest density and variety of prehistoric surface features in the general study area. Primary settlements are expected in places where agriculturally productive sediments (principally well-weathered 'a'ā flows) co-occur with sheltered embayments and productive fisheries. Settlements within this zone are expected to be logistically linked to inland agricultural and forest exploitation zones accessed through a network of upslope-downslope (*Mauka-makai*) trails. Larger settlements and resource acquisition areas may have been connected by cross-terrain trail networks. (Burtchard and Moblo 1994:26)

Located along the coast, the current study parcel falls within Zone I of McEldowney's (1979) model (see Figure 17). Because this part of the *ahupua'a* also extends out to the ocean fisheries fronting its coastline, with these marine resources and the *mauka* agricultural and forest resources, the former residents of Keonepoko Iki were once able to procure nearly all that they needed to sustain their families and contribute to the larger community from within the land division. The *ahupua'a* resources in turn helped support the *ali'i* that ruled the District of Puna (Maly 1998).

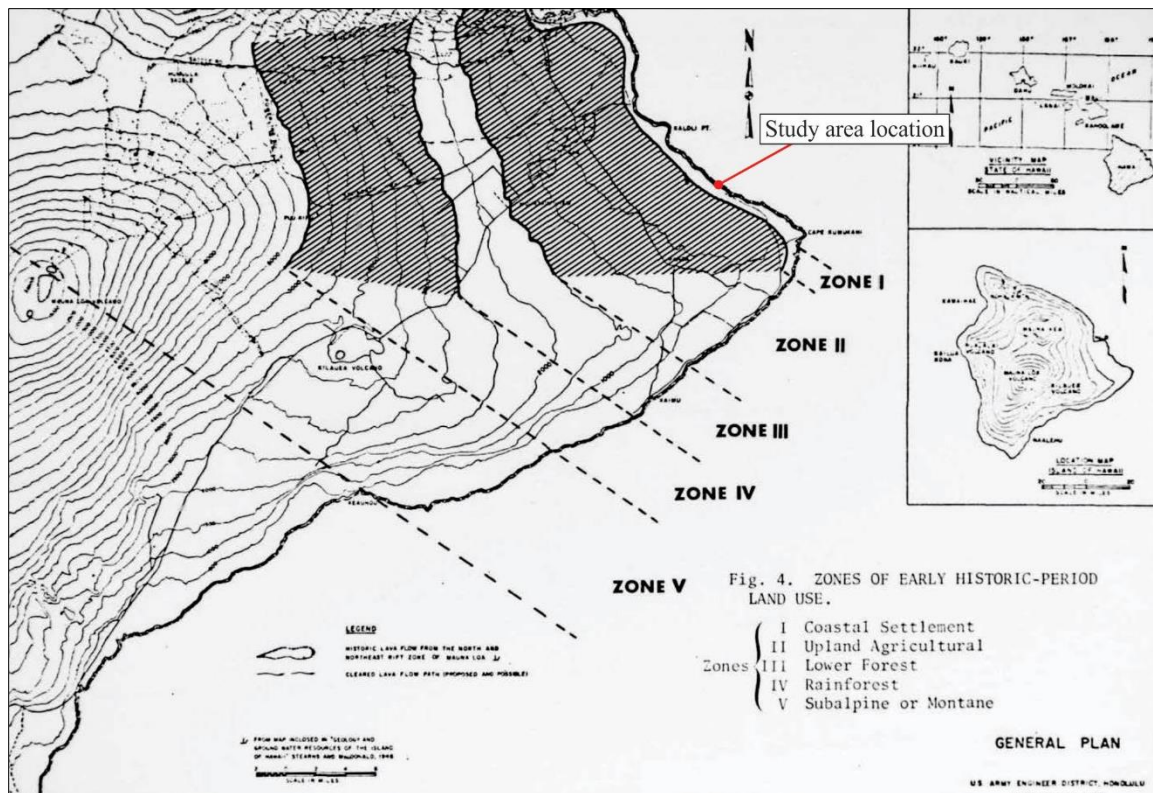


Figure 17. McEldowney's (1978:64) land use zone map showing study area located in Zone I.

The Precontact population of the Puna District lived in small settlements along the coast where they subsisted on marine resources and agricultural products. The villages of Puna, McEldowney (1979) notes, were similar to those of the Hilo District, and they:

...comprised the same complex of huts, gardens, windbreaking shrubs, and utilized groves, although the form and overall size of each appear to differ. The major differences between this portion of the coast and Hilo occurred in the type of agriculture practiced and structural forms reflecting the uneven nature of the young terrain. Platforms and walls were built to include and abut outcrops, crevices were filled and paved for burials, and the large numbers of loose surface stones were arranged into terraces. To supplement the limited and often spotty deposits of soil, mounds were built of gathered soil, mulch, sorted sizes of stones, and in many circumstances, from burnt brush and surrounding the gardens. Although all major cultigens appear to have been present in these gardens, sweet potatoes, ti (*Cordyline terminalis*), noni (*Morinda citrifolia*), and gourds (*Lagenaria siceraria*) seem to have been more conspicuous. Breadfruit, pandanus, and mountain apple (*Eugenia malaccensis*) were the more significant components of the groves that grew in more disjunct patterns than those in Hilo Bay. (McEldowney 1979:17)

The 'ohana or extended family played a major role in the settlement of the Puna District. The Hawaiian proverb "Hilina'i Puna, kālele iā Ka'ū" describes how the districts of Puna and Ka'ū were settled by an extended family (Pukui 1983:107). Pukui further elaborates:

The ancestors of these two districts were originally of one extended family. The time came when those of each district decided to have a name of their own, without breaking the link entirely. Those in Ka'ū referred to themselves as the Mākaha [fierce] and those in Puna as the Kumākaha [in a state of fierceness]. (ibid.)

Pukui attributes the ancestor named 'Ī as one of the progenitors of this extended family. The proverb, "Ka hālau a 'Ī" literally translated as "the house of 'Ī" describes the spreading of this family throughout Hāmākua, Hilo, Puna, and Ka'ū (ibid.:141). These traditional sayings emphasize a shared familial bond between those of Puna and the adjacent districts of Ka'ū and Hilo—a development that is also reflected in the districts' political history.

During the early expansion period, people probably began utilizing the agricultural resources of upland Puna (Burtchard and Moblo 1994). As coastal populations increased, the need for food caused people to seek arable land at higher elevations. This trend of increasing population along desirable coastal locations and the expansion into upland regions to support the coastal populations would have continued throughout prehistory, slowly populating more marginal areas of Puna District. As population density increased through A.D.1600-1700s, so would political competition. This competition, undoubtedly, produced conflict, which led to political exiles and the further expansion into upland areas as these refugees sought asylum in more remote places and hidden lava tubes (Burtchard and Moblo 1994).

Celebrated Landscape and Agricultural Practices of the Puna District

Puna appears to be a seemingly desolate, harsh, lava-coated terrain under the incessant threat of the molten fires of the fierce female goddess Pelehonuamea (Pele). However, Puna’s volcanic nature stands as the eternal source of freshly created raw landscapes that symbolically and physically represents the beginning of life for the Hawaiian Islands. Because of the relatively young geological history and persistent volcanic activity, the region’s association with Pele has been a strong one. Ever-changing and growing, Puna is a land of rebirth and regeneration, which are embodied in its proximity to the volcano, the growth of new vegetation on new land, and the section of the island chain that welcomes the sun (Kanahele 2011). While this district is renowned as the home of Pele, traditional text also describes this district as “*‘āina i ka houpo a Kāne,*” (land on the bosom of Kāne) (Pukui 1983:11). Pukui (ibid.) explains that before Pele’s migration from her homeland, Kahiki, there was no place more beautiful than Puna. Pukui (1983:191) lists another proverb, *ke one lau ‘ena a Kāne* (the rich, fertile land of Kāne), which Puna “was said to have been a beautiful, fertile land loved by the god Kane” but was transformed into lava beds, cinder, and rock with Pele’s arrival. According to Kanahele (2011), the god Kāne manifests as the sun, new life, and fresh water—elements which are found in abundance throughout this district.

The island landscape rejuvenates, as it has done repeatedly, sprouting new land and life. Puna has and continues to support a hospitable environment favorable for producing abundant vegetation. As Keonepoko Iki encompasses both *mauka* agricultural and forest resources and ocean fisheries fronting the coastline, former residents were once able to procure nearly all that they needed to sustain their families and contribute to the larger community from within the land division. The *ahupua‘a* resources in turn helped support the *ali‘i* that ruled the District of Puna (Maly 1998).

One such plant found in the study area includes *hala* (Figure 18). As indicated by Handy (1940:194), Puna is referred to as “*Puna paia ala i ka hala*” (Puna hedged with fragrant *hala*). Additional details are given by Pukui (1983:301) about this proverb, she adds, “[i]n the olden days the people would stick the bracts of *hala* into the thatching of their houses to bring some of the fragrance indoors.” Indeed, the presence of Puna’s sweet-smelling famed *hala* (*Pandanus tectorius*) groves are prevalent throughout written historic literature and celebrated in countless Hawaiian *‘ōlelo no ‘eau* (proverbs), *oli* (chants), and *mele* (songs). The *‘ōlelo no ‘eau* “Ka makani hali‘ala o Puna” boast of the fragrance bearing winds of Puna scented with *maile* (*Alyxia stellata*), *lehua* (*Metrosideros polymorpha*), and *hala* (ibid.:158). Pukui explains that “[i]t was said that when the wind blew from the land, fishermen at sea could smell the fragrance of these leaves and flowers.”



Figure 18. *Hala* groves within the subject parcel.

While frequently exalted for its glorious fragrance, the pandanus tree (*pū hala*, or *hala*) (Figure 19) was also exploited for more utilitarian purposes. The dried leaves were frequently used to plait *lauhala* mats, which could be used for thatching onto house rafters (a method typically employed in Puna and the neighboring district of Hilo in the absence of *pili* grass) and house walls, pillows, fans, floor coverings, canoe sails, baskets, and occasionally as clothing (Handy 1940; Handy and Handy 1991; Summers 1999). William T. Brigham, former Director of the Bernice Pauahi Bishop Museum, described seeing the natives of Puna weaving the mats for which the district was famous:

Puna was a famous region for hala mats, and in 1864, the author, when journeying through the district with that noble missionary the Reverend Titus Coan, saw many a party in the curious open caves (caused by a breakdown of the lava crust in some of the many streams of lava, ancient and recent, that form much of the surface of Puna) busily engaged in weaving mats, a work for which the comparative coolness and dampness of the caves was most suited. A quarter of a century later in traveling the same road with a younger companion the scene was greatly changed: the caves were there, the hala trees were there, but the inhabitants had gone, and for sixty miles there was nothing but a few deserted churches and some aged breadfruit trees to tell that once people had lived there. Fifteen years later the scene had again changed owing to the opening of roads and the cultivation of sugarcane, but the present inhabitants were not the old natives, and the mat making is only here and there continued when there is a chance to sell to the foreigner. (Brigham and Stokes 1906:29)

The inhabitants of Puna were undoubtedly recognized for their expertise and skill in *lauhala* weaving. Maly (1998:6) relates, “to this day, Puna is known for its growth of *hala*, and the floors and furniture of some of the old households are still covered with fine woven mats and cushions. Weaving remains an important occupation of many native families of Puna.” According to Fornander (1918–1919) two particular styles of *lauhala* mats were associated with Puna; the *makali‘i*, a braided, small-stranded mat, and the *puahala* or *hīnano* made from the male pandanus blossom. The latter was especially highly valued, and according to Summers (1999:17) “...is only made in Puna where the hala tree is very abundant. It is a regular article of trade among the natives who greatly prize it as a choice mat to sleep on.”

The *hala* tree also carries spiritual significance, some of which is derived from the literal meaning, “to pass; elapse, as time; to pass away” (Pukui and Elbert 1986:50). *Lei* (garland of flowers or foliage commonly worn around the neck) strewn together from the ‘*āhui hala* (pandanus fruit keys) is often gifted to an individual to commemorate the passing of a major life event or given to a deceased individual to help usher their spirit into the afterlife. Additionally, Handy and Pukui (1998) conveys the significance of the *hala*, which played a role in the protection of a newborn baby’s placenta (‘*iewe*). *Hala* groves were abundant in Puna and concealing the ‘*iewe* high up in the leaves prevented it from being pilfered. The people of Puna were sometimes referred to as *maka kōkala* (thorny eyes) by the inhabitants of the neighboring district of Ka‘ū, correlating the spined leaves of the *hala* with the long eyelashes of the baby whose ‘*iewe* it was sheltering, providing a “bright keen look” (Pukui and Elbert 1986:160).



Figure 19. Man standing in a Puna *pū hala* grove in 1888 (Brigham and Stokes 1906:28).

2. Background

Historical literature reveals that the *hala* groves were also utilized for the cultivation of staple food crops, particularly *kalo*. While the *'ulu* (breadfruit) appears to be the dominant source of sustenance for residents of Puna, the *kalo* (taro) undoubtedly rivaled it as a staple food source. Unlike the neighboring district of Hilo, Puna lacked continuously flowing streams, which therefore made growing *kalo* using the popular *lo'i* (irrigated fields) method nearly impossible. Despite this, Puna received ample rainfall throughout the year, which made the cultivation of dryland *kalo* possible, even “along the coast as far as Hilo” (Handy 1940:126). Handy and Handy (1991:541) relate that “the wet and sometimes marshy pandanus forests from Kapoho through Poho-iki to ‘Opihikao used to be planted with taro in places.” The method of planting dryland taro in the lowland forests of Puna is described by Handy and Handy (1991:104) as the “*pa-hala* (pandanus clearing) method.” When used to grow *kalo*, the method involved the following:

. . . Make holes in the *'a'a* (broken lava) by taking out some of the stones. Be sure that the place chosen is in a *pu hala* grove, to save the labor of hauling *hala* branches into the patch later on. Fill the hole with whatever weeds can be found and leave them there for six weeks or more. The weeds will rot and make soil. When the weeds have rotted away, the taro *huli* are wrapped in *lau hala* (*hala* leaves) to keep them moist and are planted. When there or four leaves have appeared on each *huli*, then that is the time to cut down the *pu hala* to let in the sun. The branches of the *hala* are cut off and the patch covered with them until this is not a trace of the taro to be seen. This is left until sufficiently dry to set on fire. The fire does not hurt the taro much as the *huli* are already well rooted. The *hala* reduced to ashes, give the taro the needed nourishment and they grow so tall that a man can be hidden under their leaves. (Handy and Handy 1991:104–105)

This method of cultivating dryland *kalo* in Puna could also be practiced on grass-covered slopes rather than directly atop lava. Unlike the previous method, the surface organic matter would undergo an initial burn-off before being planted. Handy elaborates:

On slopes covered with grass, like those of Hamakua on Maui and Hawaii and Kohala on Hawaii, the grass was formerly burned off and the ground cleared (*waele*) of brush and stubble. This was also done in Puna and elsewhere on land covered with staghorn fern. The field then had to be dug over (*ohiki*) and the stubble thrown out. The open soil was left for a few weeks, or until the small rubbish had decayed. On the windy slopes of Kohala the whole field was covered with cut grass to keep the moisture in. In planting, small holes were made in the soft earth several feet apart and a cutting dropped into each. The old procedure, termed *okupe*, was to thrust the digging stick into the soft earth with the right hand, lift the soil to one side, and drop the cutting into the hole with the left. The cuttings were left uncovered until the rootlets showed vigorous growth; then each cutting was straightened and soil pressed down around it. Kamakau (40) advised burning over the whole field again when the plants showed four or five leaves, weeds, taro leaves and all, after which he says the taro springs forth so luxuriantly “that a man could be hidden among the leaves.” (Handy 1940:52)

In slightly more elevated regions of Puna such as lands *mauka* of the current study area, *kalo* could be planted in the depression left by a toppled over *hāpu'u* fern trunk:

In *pa pulupulu*, where there were fern-tree (*pulupulu*) forests at relatively low altitudes, as in Hilo and Puna districts on the island of Hawaii, the fern trunks were toppled over. The holes made by the removal of the bulbous bases were suited to planting taros without further excavation. Presumably the discarded trunks, with the starchy core removed for use as food for men or feed for hogs, were heaped around the clearing, making an enclosure (*pa*). (Handy and Handy 1991:51)

In addition to *kalo*, *'uala*, or sweet potato, was grown in great quantities throughout Puna, and Handy (1940:190) suggests that although it was indeed cultivated widely, it does not appear to have been a staple food of the district which was “most famous for its breadfruit”:

. . . The sandy soil southeast of Honolulu must have been utilized for sweet potatoes. As to the interior of northern Puna in ancient times, I have no information. There are a few patches now in Koae and the vicinity of Kapoho; the slopes and higher ground inside Kapoho crater are ideal for sweet potatoes. A variety of wild potato with deeply cut leaf, which had obviously gone wild from cultivation, was found near the rich taro land of Malama homesteads. It is safe to assume that sweet potatoes were cultivated throughout southeast Puna both inland and along the coast wherever there were plantations. They are still grown in small patches at Kaimu, Kalapana, and Kapaahu. It is said that on the barren coast beyond Kapaahu, fishermen scraped together piles of broken lava and rubbish when rains came and successfully grew sweet potatoes in them. Despite the fact that sweet

potatoes were planted almost universally and many patches are still maintained, the Puna natives seem to regard this vegetable with little interest, probably because Puna people prided themselves upon and relished their breadfruit, and also because potato was nowhere and at no time the staple for this rainswept district. (Handy 1940:165)

The barrenness of surrounding lava flows was not a limiting factor in propagating *'uala*, which requires practically no soil to flourish. Its propagation is discussed in fair detail by nineteenth and early twentieth century visitors to the district, who describes seeing the *'uala* growing from mounds of lava stones. For example, an account from 1853 relates:

There is an increasing attention paid to the culture of the sweet potato, to which our soil and climate are admirably adapted. It grows well in almost every part of the Islands, and no where better than among the dry hot stones of Puna, Kau and Kona on Hawaii,—No one who has ever traveled over those districts can fail to have been struck with astonishment at the sight of beautiful sweet potatoes growing in hills of broken lava with not a particle of earth to be seen in their vicinity. The natives sometimes manure these hills of lava by placing a few boughs upon the lava, then piling stones on them, and when they are partially decayed pulling up the stems or woody part which leaves the leaves and bark to moisten and enrich the hill. The sweet potato is the great article of food in the dry burnt districts of Hawaii, and the cost of raising it is next to nothing. The yield, I am told, is from 50 to 75 bbls. per acre. (Royal Hawaiian Agricultural Society 1853:7)

'Ulu (breadfruit), another important staple crop was a *kinolau* (physical manifestation) of the goddess Haumea, the “patron of childbirth,” and the principle staple food of Puna where it was most famous (Beckwith 1970:283; Handy and Handy 1991). Careful and gentle propagation was required, which entailed the removal and replanting of the root sucker cutting while ensuring it remained within its original, undisturbed soil casing. Concerning *'ulu* as a sustainable food source, (Handy and Handy 1991:152) explain that “except in Puna, Hawaii, breadfruit was wholly secondary to taro and sweet potato as a staple. I am told that in Puna in a good year, breadfruit may be eaten for 8 months of the year, beginning with May.”

In addition to these staples, other crops such as *niu* (coconut) and *'awa* were readily produced in Puna. The uses for *niu* recounted by Handy and Handy (ibid.) were many and varied. It thrived in coastal Puna and is frequently mentioned in historical accounts. With respect to varieties, Handy lists only two: the *niu hiwa* (particularly used for ceremony, medicine, and cooking), and the *niu lelo* (used primarily for nonreligious purposes). The method of propagating *niu* involved burying a sprouted nut on top of an octopus (*he'e*) at a hole deep enough to bury it completely. The buried *he'e* was purported to “give the root a spread and grip like its own and to produce nuts that were bulbous like its head or body (*pu*)” (ibid.:172). Water from the *niu* was palatable, flavorful, and rich in nutrients. It could also be utilized on a spiritual level by priests practicing divination. The raw meat is edible and could be scraped out of the shell with a large *'opihi* shells and eaten as is or incorporated into the preparation of various sweets including *haupia* (*haukō*), *kūlolo*, and *pi'epi'e 'ulu*. Besides being utilized for human consumption, coconut meat could also be used to feed animals. Handy and Handy (ibid.:174) explained:

In some localities in Puna, pigs were taught to open their own coconuts. When the owners of the pigs expected to be absent for some time, they husked a quantity of the nuts, leaving a strip of husk on each one about two inches in width. When a pig wanted to open a nut, he grasped it by this strip of husk and dashed it against a rock. Thus the pigs were assured of fresh food until the owners returned.

The meat of the coconut could also be crafted into fresh coconut oil. Handy and Handy (ibid.:192) describes the process as it was done in Puna thusly:

In Puna, *mano'i* or coconut oil was made as follows: The fresh gratings, with *maile* or other *kupukupu* (any odoriferous plant) to give fragrance, were placed in a container in the hot sun. When the oil separated away from it, the mass was squeezed through *ahuawa* and the refuse (*oka*) thrown away. The oil was used for anointing the body and hair and washing the hair.

Coconuts husk also provided fibers that were plaited to make sennit *'aha* (cordage) that was used for lashing house timbers, adzes, canoe parts. The coconut shell was cleaned and sometimes split in half where it would be fashioned into medicine, food, and drink receptacles, including *'apu* that was used for serving and mixing *'awa*. The trunk of the coconut was carved to form the main body of the *pahu hula* drum. Coconut leaf stems and midribs were used to clean pig intestines, make brooms, shrimp snares, and for stringing *kukui* nuts to be burned as candles. The leaves were plaited to make fans and playing balls for children, and the end of the leaf was used as *kapu* markers along the coastline or to frighten fish out from under ocean ledges (Handy and Handy 1991).

2. Background

'Awa, a plant described as the “cherished narcotic” of the Hawaiian people by Handy and Handy (1991:192) was utilized by all socioeconomic classes in Hawaiian Prehistory and is mentioned in several *mo'olelo* (traditional accounts) for the Puna District. Pukui (1983) lists the following Hawaiian proverbs describing the district's famed 'awa:

'Awa kau lā'au o Puna.

Tree-growing 'awa of Puna.

Tree-grown 'awa of Puna was famous for its potency. It was believed that birds carried pieces of 'awa up into the trees where it would grow (ibid.:29)

Puna, 'āina 'awa lau o ka manu.

Puna, land of the leafed 'awa planted by the birds. (ibid.:300)

Ka 'awa lena o Kali'u.

The yellowed 'awa of Kali'u.

Refers to Kali'u, Kilohana, Kaua'i. People noticed drunken rats in the forest and discovered some very potent 'awa there. There is a Kali'u in Puna, Hawai'i, where good 'awa is also grown. (ibid.:140)

The 'awa roots were carefully chewed (pounded in later years) into balls (*mana* or *mana 'awa*), strained with the stem fibers of the *ahu 'awa*, and presented as offerings or drunken out of polished *niu* shell 'apu 'awa cups for pleasure, ceremonial, and relaxation purposes. It was also a principal element in the treatment of both physical and spiritual ailments in living subjects by the *kahuna* (priests) and a crucial ingredient in ritualistic use in which its procurement and preparation were handled with the utmost care. Of all the districts of Hawai'i Island, Puna was the most renowned for its 'awa, producing the finest 'awa kau la'au:

Kau la'au is the famous *awa* of Puna, Hawaii, which grows in the crotches of trees where, according to the Hawaiians, it becomes planted by birds building pieces of the stem into their nests (M). A line from a *mele* reads: “Ka manu ahai kanu awa e” (The bird clipping the twig of awa and planting it elsewhere; see 21, p. 30). Kaaikamanu (Ka) identifies it as the same as *Mokihana*, but Mrs. Pukui, who is very well acquainted with Puna (Kaaikamanu came from eastern Maui) tells me that any variety might be found growing in this way. This Puna *awa* was famous for its strength, which was due, in Mrs. Pukui's opinion, to the fact that its roots grew in sunlight. (Handy and Handy 1991:202–203)

Because of this unique cultivation method, the natives of Puna were renowned across the archipelago for producing the most superior and potent 'awa. This notion is expressed in several traditional accounts including, *Ka Mo'olelo o Hi'iakaikapoliopole* (Ho'oulumāhiehie 2006) when the infamous Pele introduced herself to the striking Lohi'auipo from Kaua'i. After Pele indicated that she was from Puna, Lohi'au responded, “no Puna 'i'o o kā 'oe, no ka 'āina 'awa lau a ka manu, ka 'āina i ka polo hīnāno” (is that so, you are from Puna, from the land of the young 'awa plant of the birds, the land of the pandanus trees). This *mo'olelo* as well as that concerning the highly skilled rat shooter named Pīkoi-a-ka-'alalā (Kauai 1865–1866), and the legend of Ke-au-nini (Westervelt 1915) suggest that the 'awa found growing in the trees of Puna was spread throughout the forest by birds. The legendary account of Ke-au-nini (ibid.:198) explains that this type of 'awa was also found growing in the Pana'ewa forest. Westervelt (1915:198) writes: “he picked up the stones and ran to Pana-ewa and got the awa hanging on the tree...” The intoxicating effects of 'awa, especially the potent Puna variety, induce a supreme state of physical relaxation and ataraxia and are described in a *mele* sung by Hi'iaka:

Ka wai mukiki ale lehua a ka manu,

Ka awa ili lena i ka uka o Ka-li'u,

Ka manu aha'i lau awa o Puna:

Aia i ka laau ka awa o Puna.

Mapu mai kona aloha ia'u—

Hoolaau mai ana ia'u e moe,

E moe no au, e-e!

O honey-dew sipped by the bird,

Distilled from the fragrant lehua;

O yellow-barked awa that twines

In the upper lands of Ka-li'u;

O bird that brews from this leafage

Puna's bitter-sweet awa draught;—

Puna's potentest awa grows

Aloft in the crotch of the trees.

It wafts the seduction to sleep,

That I lock my senses in sleep!

(Emerson 1915:31)

Legendary References to the Puna District

As the Hawaiian people had no written language until Post-contact times, traditional *mo'olelo* were passed down orally through the generations. Plentiful are the chants, myths, and legends associated with the many beautiful *wahi pana* (storied place) of Puna, which frequently refer to the majestic female fire deity, Pele, or “Pele-honua-mea (Pele of the sacred earth)” (Beckwith 1970) as well as other deities and chiefs. However, the only legend to specifically feature the subject *ahupua'a*, Keonepoko Iki appears in the legend titled *Ke Ka'ao Ho'oniua Pu'uwai no Ka-miki*. As the subject parcel is situated along the coast, descriptions concerning *'aumākua manō* or ancestral shark deities of Puna have also been included.

Ke Ka'ao Ho'oniua Pu'uwai no Ka-miki (The Heart Stirring Story of Ka-Miki)

A traditional *mo'olelo* titled, *Kaao Hooniua Puuwai no Ka-Miki*, originally appeared in the Hawaiian language newspaper, *Ka Hoku o Hawai'i* between 1914 and 1917 and later translated by Hawaiian historian and cultural specialist Kepā Maly. The story tells of two supernatural brothers, Ka-Miki and Maka-'iole, who were skilled *'ōlohe* (competitors/fighters) and their travels around Hawai'i Island by way of the ancient trails and paths (*ala loa* and *ala hele*), seeking competition with other *'ōlohe*. As described by Maly:

The narratives were primarily recorded for the paper by Hawaiian historians John Wise and J.W.H.I. Kihe (with contributions from Steven Desha Sr.). While Ka-Miki is not an ancient account, the authors set the account in the thirteenth century (by association with the chief Pili, who came to Hawai'i with Pā'ao). They used a mixture of local stories, tales, and family traditions in association with place names to tie together fragments of site specific history that had been handed down over the generations. Thus, while in many cases, the personification of individuals and their associated place names may not be “ancient,” the site documentation within the “story of Ka-Miki” is of both cultural and historical value. (Maly 1998:17)

That portion of the legend set in Puna was published between October 21 and November 18, 1915. Translated by Maly (1998:17–25), this portion describes many people and places within the district, and mentions a young chief of Puna named Keahialaka. The Maly (ibid.) translation of the story is summarized below.

During an expedition through the uplands of Puna, Ka-Miki and Maka-'iole encountered a man named Pōhakuloa who was intensely working on a large *koa* log. They were headed to Kea'au, but had lost their way. They stopped and asked Pōhakuloa for directions, but he was startled by the unexpected appearance of the brothers, and replied impolitely. Taunts were exchanged between the two parties, which led to a physical altercation. Pōhakuloa soon realized that these two men were extraordinarily skilled as well as spiritually protected, and he admitted his defeat. Pōhakuloa wished to prepare a meal and drink of *'awa* with his newfound friends, and solicited the help of his brother in law, an *'ōlohe* chief named Kapu'euhi. However, Kapu'euhi had plans of his own. He intended to compete with and conquer the brothers, but was defeated by them instead. Kapu'euhi was infuriated by his defeat, and also by Pōhakuloa's refusal to aid in retaliation against Ka-Miki and Maka-'iole.

Kapu'euhi invited the brothers back to his house to partake in a meal and a particularly potent type of *'awa*, scheming to get them drunk. Unbeknownst to Ka-Miki and Maka-'iole, this was common practice for Kapu'euhi, who often housed weary travelers in his guest house, intoxicated them with *'awa*, then killed them and stole their precious belongings. Kapu'euhi waged a bet with the brothers; if they couldn't drink five cups of the *'awa*, then he would throw them out and they would be at the mercy of the Puna forest. Ka-Miki and Maka-'iole agreed, and counteracted his bet with one of their own; if they were able to drink five cups, they would throw Kapu'euhi out of his own house. The brothers prayed and chanted to their ancestral goddess, and were able to consume the entire quantity of *'awa* without getting drunk. As agreed upon, Kapu'euhi was thrown out. Stunned, and angered that he was thwarted once again, Kapu'euhi requested assistance from Kaniahiku (a much feared Puna *'ōlohe* and forest guardian) and her grandson Keahialaka. “At that time, Keahialaka was under the guardianship of Pānau and Kaimū, and he enjoyed the ocean waters from Nānāwale to Kaunaloa, Puna” (*Ka Hoku o Hawai'i* October 28, 1915; translated by Maly (1998:20), which Maly (ibid.) suggests is symbolic of controlling those regions.

Together, Kapu'euhi and Kaniahiku conspired to lead the brothers deep into the Puna forest, where Kaniahiku would be able to murder them, all the while maintaining the façade that they were taking them to the *'awa* grove of Mauānuikananuha. Once Ka-Miki and Maka-'iole were well within the domain of Kaniahiku, she created a dark and murky environment, spreading gloomy mists and an overgrowth of twisted vegetation intended to ensnare the brothers. Ka-Miki and Maka-'iole were overcome, and left for dead by Kapu'euhi, who made his way back to safety, led by Kaniahiku's sister. The brothers prayed to their grandmother, Ka-uluhe-nui-hihi-kolo-i-uka (Ka-uluhe) for help. All at once, her presence became apparent, and the brothers were able to continue on to the *'awa* grove. Another attempt

by Kaniahiku to kill the brothers was made, however, Ka-uluhe's protection over them was too strong, and the endeavor failed.

Ka-Miki and Maka'iole realized that Kapu'ehi had deceived them and had been in affiliation with Kaniahiku. They were angered, and trapped him in the 'awa grove. In an effort of retaliation, Kaniahiku summoned for her grandson, Keahialaka, and readied herself for battle. Ka-Miki and Maka'iole reprimanded Kaniahiku for her deceitful actions, which only served to anger her even further. Aggressively, Kaniahiku attacked Ka-Miki with her tripping club and spear, but Ka-Miki was far too elusive for her. He swiftly evaded each attempt at injury made on his behalf. In desperate need of assistance, Kaniahiku beckoned to Keahialaka by playing her nose flute, urging him to hurry to her side. Although Keahialaka was strong and skillful in the arts of 'ōlohe, he was all too easily overcome by Ka-Miki. His grandmother, in an attempt to free him from Ka-Miki, was also captured.

Kaniahiku was astounded at the dexterity of the brothers. Their skill was incomparable to any other 'ōlohe she had ever encountered, and even her own skill paled in comparison, for she had never been defeated. All at once she surrendered to Ka-Miki and Maka'iole, who in turn released her and her grandson. Back at Kaniahiku's house, a meal was prepared, the 'awa of Kali'u was enjoyed, and the gods were honored with offerings. Kaniahiku requested that the brothers take Keahialaka with them as they continued their journey on the *ala loa*, declaring that if they did, they would be welcomed wherever their travels took them in Puna. Ka-Miki and Maka'iole approved of this request, and took Keahialaka on as their companion. Together, the three men journeyed throughout various districts of Hawai'i island, and competed in many 'ōlohe competitions.

In the legend of Ka-Miki, the land of Keoneopokoiki was named for an 'ōlohe master of Puna, who was the *mokomoko* (rough hand fighting) instructor of the chief Pu'ula (Maly 1992). According to the story Keoneopokoiki was a traditional training grounds for 'ōlohe of Puna, were masters skilled in hand to hand combat and other martial arts techniques. In the story Ka-Miki quickly defeats the Puna master, Keoneopokoiki in an 'ōlohe contest. Ka-Miki then threatened to kill Keoneopokoiki, who seeing that there was no one who could defeat Ka-Miki, gave his complete surrender and returned to his home. According to the story, Keoneopokoiki lived on the upland side of the *alaloa* (the around the island coastal trail). At his compound was an altar dedicated to his gods (Maly 1992). ...

'Aumakua Manō of Puna

While *pōhaku* were sometimes represented as 'aumākua, they were not the only focus of personification and reverence. Martha Beckwith (1917:503) relates that 'aumākua worship was also directed towards certain animals, trees, flowers, insects, and natural phenomena who are "half god, half, human, who utter their counsels through the lips of some medium, who becomes for the moment possessed with their spirit":

The idea is a simple one. The presence of a spirit is indicated by a divine possession in which the person possessed speaks not as he is accustomed but in the character and with the words of spirit whose medium he is. His utterances are not his own but are the means by which, together with dream and vision, the spirit of the *aumakua* counsels his protégé. In order that the *aumakua* may be strong enough to act as his part as helper, he must receive offerings of prayer, and of sacrifice in the shape of food and drink called "feeding the spirit." (ibid.:506)

As previously mentioned, 'aumākua served as intermediaries and played an important role in guiding the soul in the underworld and was capable of leading it either into the desirable and peaceful Wākea region or the miserable depths of Milu. Therefore, it was vital to maintain good relations with the 'aumākua. Emerson (1892) elaborates on 'aumākua forms, practices of veneration, and consequences of accidental disrespect by its *kahu* (keeper):

Every family had its *aumakua*, to whom each individual owed allegiance and worship, and from whom he expected aid and guidance in all the affairs of life. So long as a person devoutly observed the *kapus*, fulfilled his vows, and rendered due worship, the *aumakua* was his best friend and protector. But let him fail in any of these particulars, thereby becoming *hewa* [wrong, or guilty], he incurred its wrath and displeasure, which was visited upon him by pain and sickness. The *kahuna* must then be called in to determine which of the *aumakua*s was offended and for what cause, and to atone for the fault by the proper prayer and offerings. One of the grave faults that a person might commit was "*pepehi aumakua*," that is, injuring or destroying any animal of the class held sacred by his family. This fault [*hewa*] was never done intentionally, and, when committed by an unlucky accident, the offender was bound to make a feast of such articles as *awa*, a pig, fowls, squid, the fishes called *aholehole*, *anae*, *kala*, *kumu*, and *palani*, together with *kalo*, potatoes, bananas and sugar cane as an offering to the offended god. . . (Emerson 1892:22)

As the children inherited the *aumakuas* of both father and mother, the tendency was for every family to have a large number of *aumakuas*. It is claimed, that the primary idea of the word *aumakua* is the spirit of an ancestor, deified and rendered potent for good or evil, by the long continued *hoomanamana* of its posterity. The spirits of those who had become famous for skill or power would very naturally after death receive the worship of those their craft or profession. Many of these *aumakuas* still retain the shadowy form of a human spirit. Others have been transformed into various animal forms, or, as some people prefer to consider it, manifest themselves through those animals. Other have taken up their abode in trees, stones, and other objects. (ibid.:23)

Of particular note are shark *'aumākua* who are frequently worshipped in coastal areas of Hawai‘i such as Puna, and considered as both a friend and protector of its *kahu* (Beckwith 1917; Emerson 1892). Ancestral deity worship is considered a quintessential spiritual practice of the Native Hawaiians of old, and it stands today as a heritable custom, belief, and connection to the past preserved by rich oral traditions many of which are associated with mythological tales. One such story concerns the famous shark war that occurred at ‘Ewa on the island of O‘ahu in which a struggle for power ensued among a group of legendary and primal sharks that resulted in the banishment of the cannibalistic sharks. Two of the shark *'aumākua* involved in the battle are said to be from Puna and are identified below in addition to several others said to be of Puna (Emerson in (Beckwith 1917:510–512):

Hika-welo-ula (k) of *Puna*, Hawaii, son of the *Kau* shark, *Ke-alii-kaua* and of *Ahia*, a woman of *Kalapana*. AT birth he was covered with red tapa, the kind called *pukohukohu*, and became a red shark. He had two forms, that of a shark at sea, that of a man on land.

Kane-i-kaupaku (k) of *Puna*, Hawaii.

Kane-mahuna (k) of *Puna*, Hawaii.

Ke-au (k) *Puhi*’s shark off *Kumukahi*, Hawaii.

Ke-alii-holo-i-ka-moana (the chief sailing over the ocean) (k) lives in *Kekaha*, *Puna*, from *Ka-lai-o-kawili* in *Apua* district to *Ka-lai-o-wili-ia* in *Panau-nui*. “He began life a human child living on land, was a *kaukau-alii* (low chief) under *Iwakakaoloa*, the blind chief of *Puna*. He was an expert fisherman, frequenting the sea in a canoe. At death, wrapped in *Kapa-ahu-na-ii*, he was cast into the sea at *Kealakomo* and became a shark-god of the class called *akua-noho* who were supposed to ‘dwell with or be over men as guardians. He showed his friendship to men by warning them of the approach of hostile sharks by exhibiting himself above the level of the sea. He went with the other sharks to the great shark war at Oahu.”

Ka-pani-la (the shutting out of the sun) (k) is so named “because his enormous bulk would obscure the sun should he come to land. He is the largest of the sharks. His usual haunts extended from the point *Ka-lae-o-lamaulu* in *Kapoho*, *Puna*, to *Kumukahi* point in *Kapele*.” He was friendly to the natives and “great things were expected of him when he led the Hawaiian sharks to war, but off Diamond Head he got stranded in shallow water and could proceed no further.”

Ka-ai-poo (the head eater). He lives at *Kapaahu*, *Puna*, and carries the mark of the shark’s mouth on his back.

Early Explorers and Missionary Accounts

The first written accounts from early explorers and missionaries, such as those presented in the following pages, describe Puna as a populated country containing residences, primarily along the coast where marine resources were easily accessible. These narratives also describe a surprisingly fertile agricultural landscape thriving among what would appear to be unsuitable fields of lava and thin soils, rife with crops such as *kalo*, sweet potatoes, sugar cane, breadfruit, and bananas. It is evident through these accounts that although Puna natives were still largely rooted in traditional subsistence practices, procurement, and trade, western influence was slowly infiltrating into native lifeways.

In March of 1779, after Cook’s death, Captain King sailed along the Puna shoreline and described the district as a sparsely populated, but verdant and fertile (Maly 1998). Captain King, mentioned that Kalani‘ōpu‘u had one of his residences there, and he provided the following description of the landscape:

...the SE sides of the districts of Opoona & Kaoo [Puna and Ka‘ū]. The East part of the former is flat, covered with Coco nut trees, & the land far back is of a Moderate height. As well as we could judge this is a very fine part of the Island, perhaps the best. Terreeoboo [Kalani‘ōpu‘u] has one of his residences here.

On the SW extremity of Opoona the hills rise abruptly from the Sea side, leaving but a narrow border, & although the sides of the hills have a fine Verdure, yet they do not seem Cultivated, & when we saild [*sic*] pretty near & along this end of Opoona, we did not observe that it was equally Populous with the Eastern parts; before we reachd [*sic*] the East point of the Island, & all along this SE side the snowy mountain calls Roa (or extensive) [Mauna Loa] is very conspicuous. It is flattish at the top or makes what we call Table land... (Beaglehole 1967:606)

Following the death of Kamehameha I in 1819, the Hawaiian religious and political systems began a radical transformation; Ka‘ahumanu proclaimed herself “Kuhina nui” (Prime Minister), and within six months the ancient *kapu* system was overthrown. Within a year, Protestant missionaries arrived from America (Fornander 1969; Ī‘ī 1959; Kamakau 1992). In 1823, British missionary William Ellis and members of the American Board of Commissioners for Foreign Missions (ABCFM) toured the island of Hawai‘i seeking out communities in which to establish church centers for the growing Calvinist mission. Ellis recorded observations made during this tour in a journal (Ellis 1917), and offers a rare glimpse at the study area during this time. Walking from Kīlauea to Waiākea along Puna’s southeastern shore with his missionary companions Asa Thurston and Artemas Bishop, Ellis recorded descriptions of residences and practices that are applicable to the general study area:

The population in this part of Puna, though somewhat numerous, did not appear to possess the means of subsistence in any great variety or abundance; and we have often been surprised to find desolate coasts more thickly inhabited than some of the fertile tracts in the interior; a circumstance we can only account for, by supposing that the facilities which the former afford for fishing, induce the natives to prefer them as places of abode; for they find that where the coast is low, the adjacent water is usually shallow.

We saw several fowls and a few hogs here, but a tolerable number of dogs, and quantities of dried salt fish, principally albacores and bonitos. This latter article, with their *po‘ē* [*poi*] and sweet potatoes, constitutes nearly the entire support of the inhabitants, not only in this vicinity, but on the sea coasts of the north and south parts of the island.

Besides what is reserved for their own subsistence, they cure large quantities as an article of commerce, which they exchange for the vegetable productions of Hilo and Mamakua [Hāmākua], or the *mamake* and other tapas of Ora [‘Ōla‘a] and the more fertile districts of Hawaii. (Ellis 1917:203)

Ellis and the ABCFM missionaries travelled along the coast through the study area passing through the *ahupua‘a* of Kahuwai, Wa‘awa‘a, and Nānāwale and then turned *mauka* toward a village in Honolulu Ahupua‘a, located to the (Ellis 1917:223). After departing Kahuwai, Ellis and the band missionaries arrived at a small village in Honolulu Ahupua‘a, located to the south of the study area. In detailing their route and the nature of the village, Ellis commented:

... we traveled in an inland direction to Honoruru [Honolulu], a small village situated in the midst of a wood, where we arrived just at the setting of the sun.

Whilst the kind people at the house where we put up were preparing our supper, we sent and invited the inhabitants of the next village to come and hear the word we had to speak to them. They soon arrived; the large house in which we had taken up our lodgings was filled, and a discourse was delivered from John xii. 46... (Ellis 1917:223–224)

On August 8, 1823, Ellis and the ABCFM missionaries left Honolulu and visited a village in the *ahupua‘a* of Waiakahiula, located to the south of the current study area. Ellis’ journal provides a brief first-hand description of the village’s location relative to the coast:

We afterwards spent an hour in conversation and prayer with the people of these sequestered villages, who had perhaps never before been visited by foreigners, and then lay down on our mats to rest.

We arose early on the 8th, and Mr. Thurston held morning worship with the friendly people of the place [Honolulu]. Although I had been much indisposed through the night, we left Honoruru [Honolulu] soon after six a.m. and, travelling slowly towards the sea-shore, reached Waiakeheula [Waiakahiula] about eight, where I was obliged to stop, and lie down under the shade of a canoe-house near the shore. Messrs. Thurston and Bishop walked up to the settlement about half a mile inland, where the former preached to the people... (Ellis 1917:224)

After preaching, Bishop continued on alone toward Waiākea, while Thurston returned to fetch Ellis from the canoe shed. Upon reaching the village, Ellis found its residences to be interspersed among the agricultural fields rather than in a single, nucleated settlement:

The country was populous, but the houses stood singly, or in small clusters, generally on the plantations, which were scattered over the whole country. Grass and herbage were abundant, vegetation in many places luxuriant, and the soil, though shallow, was light and fertile. (ibid.)

While other early visitors to Puna provide general descriptions of conditions in the district during subsequent decades. One year after Ellis' tour, the ABCFM established a base church in Hilo. From that church, the predecessor of historic Hāili Church, the missionaries traveled to the more remote areas of the Hilo and Puna Districts. David Lyman, who came to Hawai'i in 1832, and Titus Coan, who arrived in 1835 were two of the most influential congregational missionaries in Puna and Hilo. As part of their duties they compiled census data for the areas within their missions. In 1835, 4,800 individuals were recorded as residing in the district of Puna the smallest total district population on the island of Hawai'i (Schmitt 1973). In 1841, Titus Coan recorded that most of the 4,371 recorded residents of Puna lived near the shore, though there were hundreds of individuals who lived inland (Holmes 1985).

In 1841, the United States Exploring Expedition under the direction of Commander Charles Wilkes, toured Hawaii Island and travelled through the Puna District. Wilkes produced a map of Puna, which includes the coastal trail but shows only a large "Pandanus Forest" covering the lands in the vicinity of the study area (Figure 20).

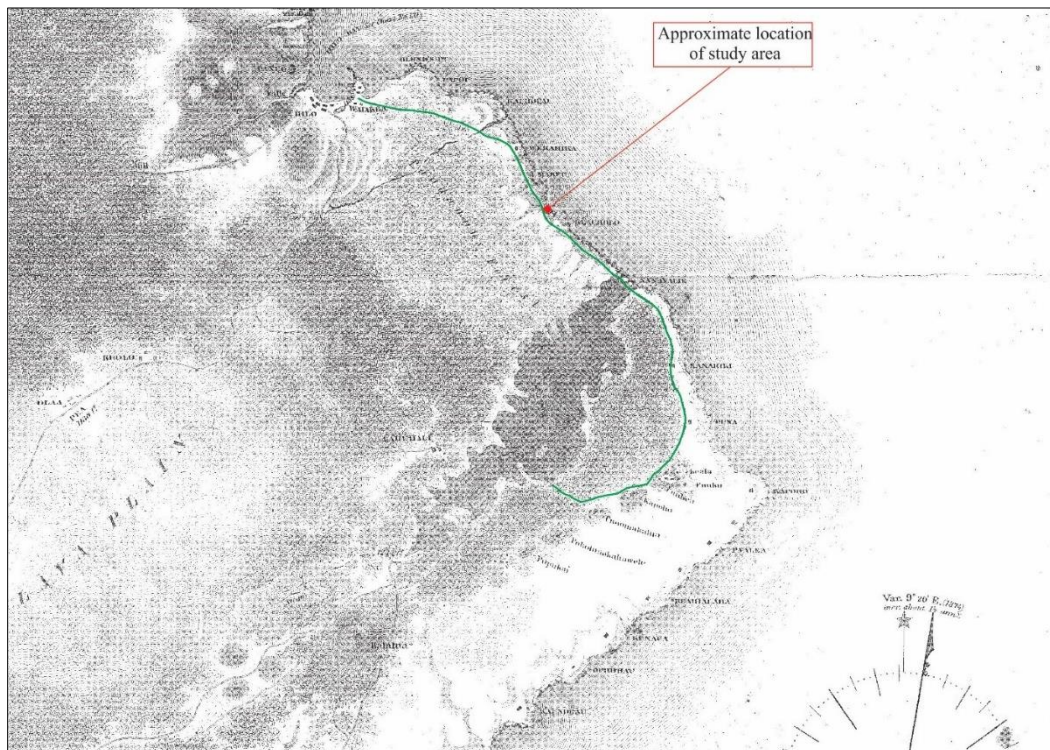


Figure 20. Portion of Hawai'i Registered Map 424 prepared by Wilkes in 1841 showing the approximate location of current study area and nearby coastal trail.

Wilkes, travelling towards Kapoho at the eastern tip of the island, provides the following description of Puna:

...Almost all of the hills or craters of any note have some tradition connected with them; but I found that the natives were now generally unwilling to narrate these tales, calling them "foolishness."

After leaving the pahoihoi [pāhoehoe] plain, we passed along the line of cone-craters towards Point Kapoho, the Southeast part of the island.

Of these cone-craters we made out altogether, large and small, fifteen, trending about east-northeast. The names of the seven last are Pupukai, Poholuakahowele [Pu'u-hōlua-o-Kahawali], Punomakalua, Kapoho, Puukea, Puuku, and Keala. On some of these the natives pointed out where there had formerly been slides, an amusement or game somewhat similar to the sport of boys riding down hill on sleds. These they termed kolua [*holua*].

This game does not appear to be practiced now, and I suppose that the chiefs consider themselves above such boyish amusements. The manner in which an old native described the velocity with

which they passed down these slides was, by suddenly blowing a puff; according to him, these amusements were periodical, and the slides were usually filled with dried grass.

As we approached the sea-shore, the soil improved very much, and was under good cultivation, in taro, sweet-potatoes, sugar cane, and a great variety of fruit and vegetables. At about four o'clock, we arrived at the house of our guide, Kekahunanui, who was the "head man." I was amused to find that none of the natives knew him by this name, and were obliged to ask him, before they could give it to Dr. Judd...

...The view from the guide's house was quite pretty, the eye passing over well-cultivated fields to the ocean, whose roar could be distinctly heard... (Wilkes 1845:186)

During the night, one of the heaviest rains I had experienced in the island, fell; but the morning was bright and clear,—every thing seemed to be rejoicing around, particularly the singing-birds, for the variety and sweetness of whose notes Hawaii is distinguished. Previous to our departure, all the tenantry, if so I may call them, came to pay their respects, or rather to take a look at us. We had many kind wishes, and a long line of attendants, as we wended our way among the numerous taro patches of the low grounds, towards Puna; and thence along the sea-coast where the lava entered the sea, at Nanavalie [Nānāwale]. The whole population of this section of the country was by the wayside, which gave me an opportunity of judging of their number; this is much larger than might be expected from the condition of the country, for with the exception of the point at Kapoho, very little ground that can be cultivated is to be seen. The country, however, is considered fruitful by those who are acquainted with it, notwithstanding its barren appearance on the roadsides. The inhabitants seemed to have an abundance of bread-fruit, bananas, sugar-cane, taro, and sweet-potatoes. The latter, however, are seen to be growing literally among heaps of stones and pieces of lava, with scarcely soil enough to cover them; yet they are, I am informed, the finest on the island...

In some places they have taken great pains to secure a good road or walking path; thus, there is a part of the road from Nanavalie [Nānāwale] to Hilo which is built of pieces of lava, about four feet high and three feet wide on the top; but not withstanding this, the road is exceedingly fatiguing to the stranger, as the lumps are so arranged that he is obliged to take a long and short step alternately; but this the natives do not seem to mind, and they pass over the road with great facility, even when heavy laden... (ibid.: 188-193)

In 1846, Chester S. Lyman, "a sometime professor" at Yale University visited Hilo, Hawai'i, and stayed with Titus Coan (Maly 1998). Traveling the almost 100-mile-long stretch, Lyman reported that the district of Puna had somewhere between 3,000-4,000 inhabitants (ibid.). Entering Puna from Hilo, and traveling to Kea'au along the coast, Lyman offered the following observations of the Puna District:

...The groves of Pandanus were very beautiful, and are the principal tree of the region. There is some grass and ferns, and many shrubs; but the soil is very scanty. Potatoes are almost the only vegetable that can be raised, and these seem to flourish well amid heaps of stone where scarcely a particle of soil could be discovered. The natives pick out the stones to the depth often of from 2 to 4 feet, and in the bottom plant the potato—how it can expand in such a place is a wonder.

Nearly all Puna is like this. The people are necessarily poor—a bare subsistence is all they can obtain, and scarcely that. Probably there are not \$10 in money in all Puna, and it is thought that not over one in five hundred has a single cent. The sight of some of these potatoe patches would make a discontented N.E. farmer satisfied with his lot. Yet, I have nowhere seen the people apparently more contented & happy. (Lyman ms. Book III:3 in (Maly 1998:35)

Written accounts left by early visitors to the Island of Hawai'i offer insight into what life may have been like for the earliest residents of Puna. However, by the time Ellis visited Puna, less than fifty years after the arrival of the first Europeans, the population of Hawai'i was already beginning to decline. By 1850, the population of Hawai'i Island had dropped to 25,846 individuals (Schmitt 1973:8). Maly (1998) summarizes the reasons for the rapid decline of native populations thusly:

Overall, historic records document the significant effect that western settlement practices had on Hawaiians throughout the islands. Drawing people from isolated native communities into selected village parishes and Hawaiian ports-of-call, had a dramatic, and perhaps unforeseen impact on native residency patterns, health, and social and political affairs. In single epidemics hundreds, and even thousands of Hawaiians died in short periods of time. (1998:36)

Legacy of the Māhele ‘Āina (1848-1873)

By the mid-nineteenth century, the ever-growing population of Westerners in the Hawaiian Islands resulted in socioeconomic and demographic changes that promoted the establishment of a Euro-American style of land ownership. By 1840 the first Hawaiian constitution had been drafted and the Hawaiian Kingdom shifted from an absolute monarchy into a constitutional government. Convinced that the feudal system of land tenure previously practiced was not compatible with a constitutional government, the *Mō‘ī* Kamehameha III and his high-ranking chiefs decided to separate and define the ownership of all lands in the Kingdom (King n.d.). The change in land tenure was further endorsed by missionaries and Western businessmen in the islands who were generally hesitant to enter business deals on leasehold lands that could be revoked from them at any time. After much consideration, it was decided that three classes of people each had one-third vested rights to the lands of Hawai‘i: the *Mō‘ī* (monarch), the *ali‘i* (chiefs) and *konohiki* (land agents), and the *maka‘āinana* (common people or native tenants).

In 1845 the legislature created the Board of Commissioners to Quiet Land Titles (more commonly known as the Land Commission), first to adopt guiding principles and procedures for dividing the lands and granting land titles, and then to act as a court of record to investigate and ultimately award or reject all claims brought before them. All land claims, whether by chiefs for entire *ahupua‘a* or by tenants for their house lots and gardens, had to be filed with the Land Commission within two years of the effective date of the Act (February 14, 1848) to be considered. This deadline was extended several times for the *ali‘i* and *konohiki*, but not for commoners (Alexander 1920; Soehren 2005).

The *Mō‘ī* and some 245 *ali‘i* (Kame‘eleihiwa 1992; Kuykendall 1938) spent nearly two years trying unsuccessfully to divide all the lands of Hawai‘i amongst themselves before the whole matter was referred to the Privy Council on December 18, 1847 (King n.d.). Once the *Mō‘ī* and his *ali‘i* accepted the principles of the Privy Council, the *Māhele ‘Āina* (Land Division) was completed in just forty days (on March 7, 1848), and the names of all of the *ahupua‘a* and *‘ili kūpono* (nearly independent *‘ili* land division within an *ahupua‘a*) of the Hawaiian Islands and the chiefs who claimed them, were recorded in the *Buke Mahele* (also known as the *Māhele Book*) (Soehren 2005). As this process unfolded the *Mō‘ī*, who received roughly one-third of the lands of Hawai‘i, realized the importance of setting aside public lands that could be sold to raise money for the government and also purchased by his subjects to live on. Accordingly, the day after the division when the last chief was recorded in the *Buke Māhele* (*Māhele Book*), the *Mō‘ī* commuted about two-thirds of the lands awarded to him to the government (King n.d.). Unlike the *Mō‘ī*, the *ali‘i* and *konohiki* were required to present their claims to the Land Commission to receive their Land Commission Award (LCAw.). The chiefs who participated in the *Māhele* were also required to provide commutations for a portion of their lands to the government to receive a Royal Patent that gave them title to their remaining lands. The lands surrendered to the government by the *Mō‘ī* and *ali‘i* became known as “Government Land,” while the lands that were personally retained by the *Mō‘ī* as his personal lands became known as “Crown Land,” and the lands received by the *ali‘i* became known as “*Konohiki* Land” (Chinen 1958:vii, 1961:13). Most importantly, all lands (Crown, Government, and *Konohiki* lands) identified and claimed during the *Māhele* were “subject to the rights of the native tenants” therein (Garavoy 2005:524). Finally, all lands awarded during the *Māhele* were identified by name only, with the understanding that the ancient boundaries would prevail until the land could be formally surveyed. This process expedited the work of the Land Commission.

As a result of the *Māhele*, Keonepoko Ahupua‘a (assumed to be Keonepoko Iki, but not specified) was returned by William Charles Lunalilo and retained as Government Land (Soehren 2005). Keonepoko Iki Ahupua‘a is not listed in the *Māhele Book*, but it too became Government Land, as did Ka‘ohe Ahupua‘a (returned by Ulumaheihei) adjacent to the southeastern coastal boundary of Keonepoko Iki. Ka‘ohe was claimed by Ulumaheihei as portion of LCAw. 5207H, a claim that for reasons unspecified, was not awarded. The partial boundaries of Ka‘ohe (near the coast) are shown on only one of the Historic maps reviewed for this study (Hawai‘i Registered Map No. 2258; Figure 21). On most maps the coastal lands of Ka‘ohe have been lumped together with those of Keonepoko Iki (the Ka‘ohe Homesteads, located within a detached piece of the *ahupua‘a* above Pāhoa town, still retain the Ka‘ohe name, however). As can be seen in Figure 22 the current study area is located in Keonepoko Iki Ahupua‘a near its indefinite boundary with Ka‘ohe Ahupua‘a, between two coastal points labeled “Kawaiki” and “Keahu” on the map. A search through the Waihona ‘Āina online database revealed that no LCAw. claims were made for *kuleana* within either Keonepoko Iki or Ka‘ohe *ahupua‘a* during the *Māhele*.

In conjunction with the *Māhele ‘Āina* of 1848, the King authorized the issuance of Royal Patent Grants to applicants for tracts of land, larger than those generally available through the Land Commission. The process for applications was clarified by the “Enabling Act,” which was ratified on August 6, 1850. The Act resolved that portions of the Government Lands established during the *Māhele ‘Āina* should be set aside and sold as grants also dubbed government grants. The stated goal of this program was to enable native tenants, many of whom were not awarded

2. Background

kuleana parcels during the *Māhele*, to purchase lands of their own. Despite the stated goal of the grant program, in reality, many of the Government Lands were eventually sold or leased to foreigners. The current study area is a portion of a 277.8-acre grant parcel purchased for \$69.50 by Kekoa in 1855 as Grant No. 1533 (Figure 23). Although the record is silent regarding Kekoa's use of his lands, notes taken by Keoni Ana, the surveyor, described several built features on the boundaries of the property including an "alanui" or road marking the southeast corner, an "ahupohaku" or stone on the southwest corner, an 'ōhi 'a tree on the northwest corner, and the "alanui aupuni" or government road at the northeast corner (see Figure 23).

Commission of Boundaries (1862-1876)

In 1862, the Commission of Boundaries (Boundary Commission) was established in the Kingdom of Hawai'i to legally set 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 old native residents who learned of the boundaries from their parents, neighbors, or other relatives. The boundary information was collected primarily between 1873 and 1885 and was usually given in Hawaiian and simultaneously transcribed into English. Although hearings for most *ahupua'a* boundaries were brought before the Boundary Commission and later surveyed by Government employed surveyors, in some instances, the boundaries were established through a combination of other methods. In some cases, *ahupua'a* boundaries were established by conducting surveys on adjacent *ahupua'a*. Or in cases where the entire *ahupua'a* was divided and awarded as LCAw. and or Government issued Land Grants (both which required formal surveys), the Boundary Commission relied on those surveys to establish the boundaries for that *ahupua'a*. Although these small-scale surveys aided in establishing the boundaries, they lack the detailed knowledge of the land that is found in the Boundary Commission hearings. As Keonepoko Iki was retained as government land, its boundaries were not set by the land commission. However, the boundaries of neighboring Keonepoko Nui, which was returned by Lunalilo to the Government, were surveyed in 1880 for the estate of C. Kanaina, and place names along the common boundary with Keonepoko Iki are shown on a survey maps (see Figures 21 and 22).

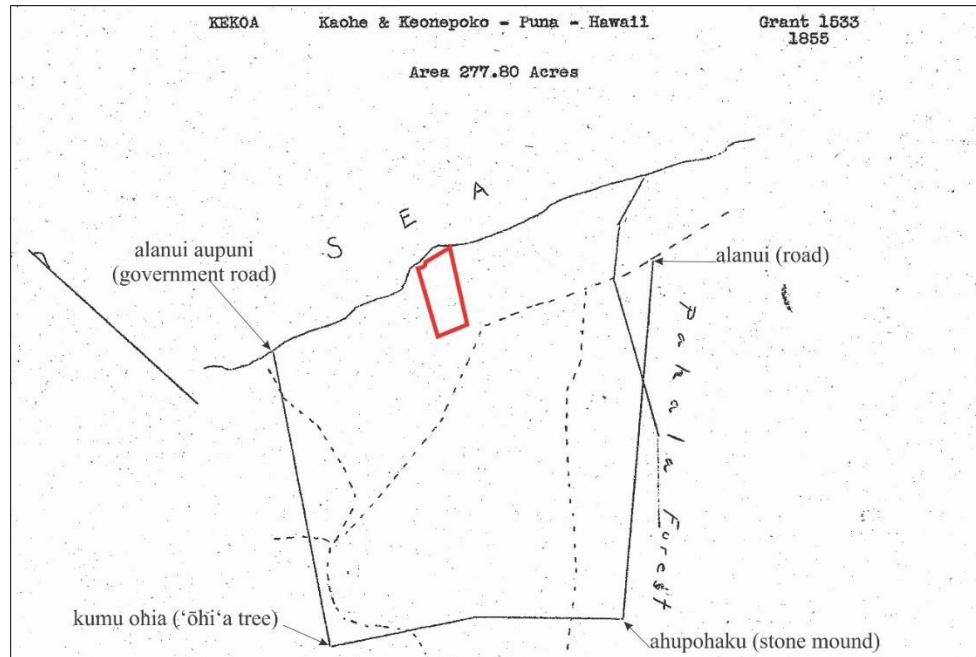


Figure 23. 1855 surveyor map of Grant 1533, showing study area (outlined red) and other noted features.

Puna Following the Māhele ‘Āina

Of the 311,754 acres that make up the Puna District, only nineteen *kuleana* awards were granted, thereby giving this district the distinction of having the smallest amount of private lands awarded under the 1850 *Kuleana* Act (McGregor 2007). McGregor (2007:159) summarizes the distribution of lands following the *Māhele ‘Āina*:

Of these awards, sixteen grants of 50,876 acres, four ahupua‘a, and two portions of a third ‘ili were given to ten chiefs who lived outside of Puna. Three small parcels totaling 32.33 acres were granted to commoners, Baranaba, Hewahewa, and Haka. The bulk of the Puna lands were designated as public lands either to the monarchy, as Crown lands, or to the government of the Hawaiian Kingdom. This means that the interest of the majority of the Native Hawaiians in Puna were never separated out from the lands of Puna and remained vested in the lands held by the Crown and the government.

While the reasons so few *kuleana* awards were granted in Puna by the Land Commission remains unknown, McGregor (2007:160) surmises that this “...illustrates the plight of Native Hawaiian kua‘āina [persons from the country] who lived outside of the mainstream of Hawai‘i’s economic and social development.” She further explains that:

First, Puna was isolated from the mainstream of communication and transportation networks. It is very probable that the kua‘āina of Puna were not aware of the process or did not realize the significance of the law proclaimed in February 1846... Second, it is possible that the Puna Hawaiians did not have a way to raise the cash needed for the land surveys, which cost between \$6 to \$12. Wages at the time were normally between 12 ½ cents and 33 cents a day. There were few wage-earning jobs in Puna. Cash would have to be raised from selling extra fish or other products, which was difficult given the people’s subsistence level of living. Third, continuing volcanic activity in Puna may have discouraged claimants from filing for a particular lot. It is also possible that some Native Hawaiian families believed that the lands of Puna were the domain of Pelehonuamea and her family of deities and could not be claimed for ownership by individuals. Fourth, at least some of the Puna Hawaiians filed their land claims after the deadline. In an 1851 petition to the legislature, several Puna residents asked to be issued land grants without penalty because they had filed their claims after the February 14, 1848. (McGregor 2007:160)

The dire results of the *Māhele ‘Āina* in conjunction with the changing economy continued to alter the traditional life ways of the Native Hawaiian population in Puna by pushing them into the market economy. Participation in the burgeoning market economy allowed the native population to earn cash to purchase and lease land as well as pay the

required taxes. McGregor (2007:161) notes that "...the primary resources for commercial sale were the coastal fisheries, salt, pulu (the hairy fibers from the hapu'u fern), 'ōhi'a timber, and open land for cattle and goat grazing."

In 1868 a volcanic eruption emanating from Mauna Loa volcano shook Hawai'i Island, bringing with it lava flows, earthquakes and a *tsunami* that transformed the landscape of the southern part of island forever, and further contributed to the depopulation of the District of Puna. Coan (1882) recorded that on April 2:

...a terrific shock rent the ground, sending consternation through all Hilo, Puna, and Kau. In some places fissures of great length, breadth, and depth were opened... Stone houses were rent and ruined, and stone walls sent flying in every direction...the sea rose twenty feet along the southern shore of the island, and in Kau 108 houses were destroyed and forty-six people drowned...Many houses were also destroyed in Puna, but no lives were lost. During this awful hour the coast of Puna and Kau, for the distance of seventy-five miles subsided seven feet on average, submerging a line of small villages all along the shore. One of my rough stone meeting houses in Puna [Kapoho-Koa'e], where we once had a congregation of 500 to 1,000 was swept away with the influx of the sea, and its walls are now under water... (Coan 1882:314–316)

The population of Puna continued to decline throughout the first half of the nineteenth century and Hawaiians maintained marginalized communities outside of the central population centers. These communities were located in "out-of-the-way" places. In the aftermath of the *Māhele*, economic interests in the region swiftly changed from the traditional Hawaiian land tenure system of subsistence farming and regional trading networks to the more European based cash crops including coffee, tobacco, sugar, timber, and pineapple, and emphasized dairy and cattle ranching. While large tracts of land in lower Puna were used for cattle grazing and sugarcane cultivation, the current project area does not appear to have been used for either purpose.

The Old Government Beach Road (Site 50-10-36-21273), which is located outside the *mauka* edge of the current study parcel, is considered a historic property. The Old Government Beach Road (also referred to as the Puna Trail) was previously studied by Lass (1997) and Maly (1999) within the *ahupua'a* of Kea'au. Currently, this road is dirt covered and maintained for vehicular access. Maly (1999) relates that the current alignment of the Old Government Road, which evolved from earlier trail routes, was under construction by the 1840s. The road remained the preferred route of travel between Hilo and the out-lying areas of Puna until 1895, when the Kea'au-Pāhoa Road (Highway 130) was established to access the growing inland population centers and agricultural areas (Maly 1999:6).

Keonepoko Iki Ahupua'a and Coastal Puna during the Twentieth Century

By 1900 Puna was on the verge of major economic growth, spurred by the sugar and lumber industries. The rise and fall of these industries can be traced along the rusted railroad tracks that litter the landscape *mauka* of the study area. In 1899, the 'Ōla'a Sugar Company began operations in Kea'au Ahupua'a. The directors of the company realized early that the lack of mass transportation in would hinder the success of their business. As a result, they organized the Hilo Railroad Company and on April 8, 1899, they were granted a 50 year charter (Best 1978). The railroad's infrastructure developed quickly. Rail service to 'Ōla'a (Kea'au) from Hilo began on June 18, 1900. Another sugar company, the Puna Sugar Company, located near the village of Kapoho, had been organized within the Puna District on March 2 of that same year. Puna Sugar had cane fields scattered all over lower Puna from Kapoho to Pāhoa Town. Coastal Keonepoko Iki's thin, sticky, acidic soils, however, spared the study area from the new sugar fields, and in fact wide dispersal of suitable agricultural lands also hindered the growth of the sugar industry in Puna. As with 'Ōla'a Sugar's early Kea'au operations, the lack of a reliable transportation system made it expensive to collect and transport the cane from the scattered fields to the mill. So, when Hilo Railroad proposed to lay 4 miles of track from Kapoho to Pāhoa, the Puna Sugar Company paid for half the cost. By March 1, 1902, the Hilo Railroad was making regular stops at the 'Ōla'a Sugar Mill, the town of Pāhoa, and in lower Puna.

The route of the railroad across Keonepoko Iki can be seen on Hawai'i Registered Map No. 2258 prepared by J.H. Morange in September of 1903 (see Figure 21). On that map a "Section House" and a "Switch" at the Pāhoa Junction are shown in Keonepoko Iki Ahupua'a, *mauka* of the study area. Two "Old Trails" are shown extending *makai* from near the section house to the coast (and a short distance *mauka* as well). One of the trails terminates at the coast of Keonepoko Iki to the northwest of the current study area. Beginning in 1903 *mauka* portions of Keonepoko Nui and Keonepoko Iki *ahupua'a* (in the vicinity of the town of Pāhoa) were subdivided into twenty-three homestead lots collectively called the Keonepoko Homesteads (Figure 24). Soon after that the sixteen lot Ka'ohe Homesteads were created in the area above the town of Pāhoa (*mauka* and east of Keonepoko Iki Ahupua'a). All of these parcels were sold as grants. By 1905 the harvests of the Puna Sugar Co. were being ground at the 'Ōla'a Mill, and the Puna Sugar Co. was operating as a division of the 'Ōla'a Sugar Co. (Dorrance and Morgan 2000).

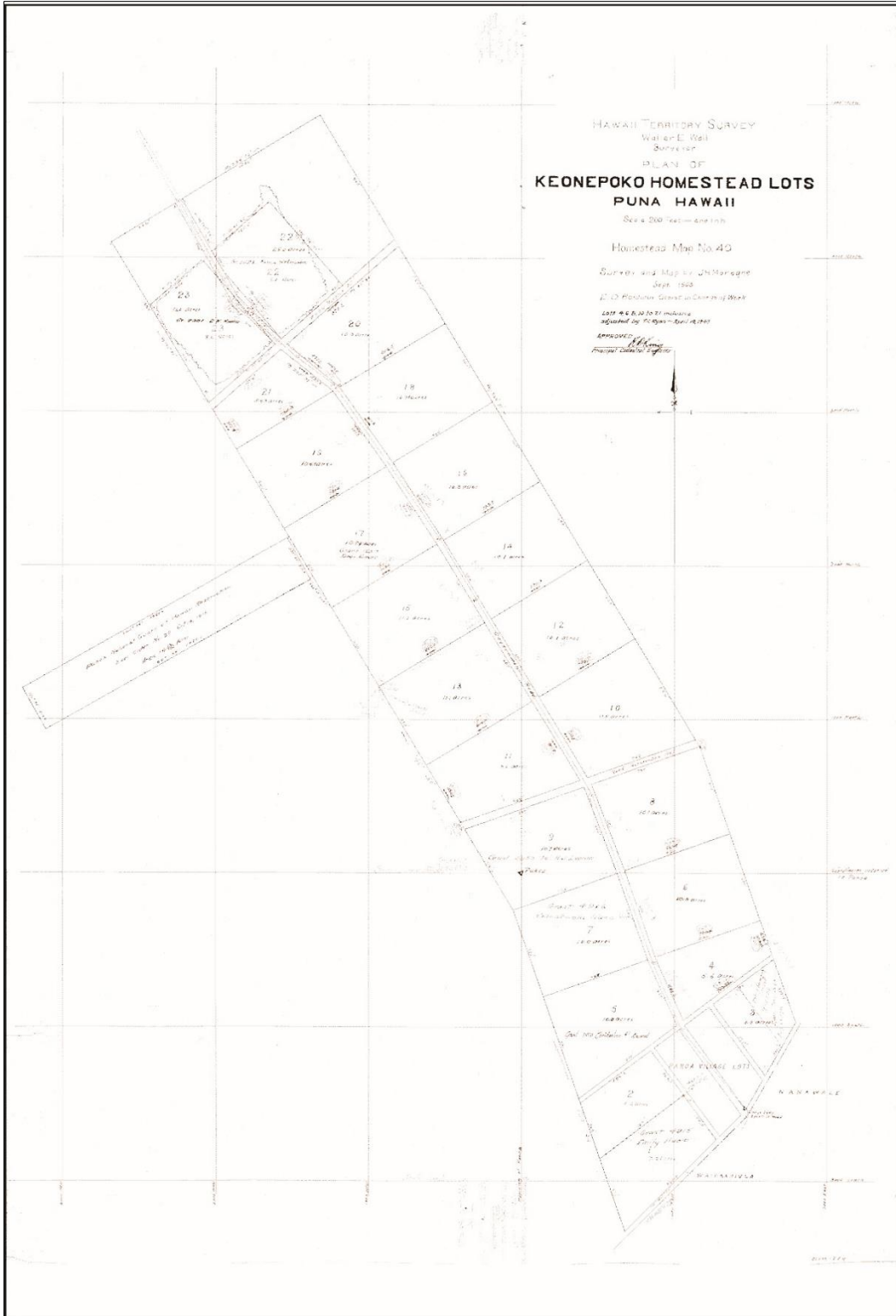


Figure 24. Hawai'i Registered Map No. 2084 showing the Keonepoko Homestead lots (Morange 1903b).

2. Background

In 1907, the Hawaiian Mahogany Lumber Company incorporated and signed a five-year contract with the Atchison, Topeka, and Santa Fe Railroads for the delivery of 90,000,000 board feet of *‘ōhi‘a* railroad ties from the vast forest reserves of Puna (Clark et al. 2001). Subsequently, in 1908 the company erected a lumber mill at Pāhoā. A network of narrow gauge railroad tracks, 3 feet wide, went from the lumber mill to the forests above Pāhoā. On March 24, 1909 the Hawaiian Mahogany Company became the Pāhoā Lumber Mill, and James B. Castle, the former managing director of the mill, became the new owner. The company then negotiated a contract with the Santa Fe Railway Company for the delivery 2,500,000 cross ties and 2,500 sets of switch ties. In addition to railway ties, the Pāhoā Lumber Mill began producing products such as roofing shingles, flooring, paving blocks and lumber for cars, wagons, and carriages.

On the night of January 28, 1913, however, a raging fire broke out in the mill and it burned to the ground along with most of the stock of milled lumber. Fortunately for Pāhoā residents, the wind blew the flames and smoke to the north away from the village. In spite of this disaster, J. B. Castle rebuilt the mill and by October the mill was operating again under the name of the Hawai‘i Hardwood Company, part of the Hawaiian Development Company. The Santa Fe Railroad found, ultimately, that *‘ōhi‘a* wood did not last as long as expected in the dry climate of the American Southwest. They did not renew their contract, and, in 1916, the Hawaiian Hardwood Company, Inc. closed their doors permanently (Burtchard and Moblo 1994).

When the lumber business moved out of Pāhoā in ca. 1916, the mill was leased to ‘Ōla‘a Sugar. Standard gauge railroad track replaced the old timber railroad grade tracks, and the timber producing forests were converted to sugarcane fields. The company used four mogul type Baldwin locomotives to haul cane from the Puna fields through Pāhoā to their processing plant in Kea‘au. Passenger rail service in the Puna District also started to increase around this time. In 1916 the Hilo Railroad was reorganized as the Hawai‘i Consolidated Railway. The railroad used Baldwin locomotives and Hall-Scott motorcars with passenger trailers to haul freight and passengers. Then, in 1925 the Hawai‘i Consolidated Railway ordered and received three railbuses from the White Motor Company, which they used in Puna and Hilo districts, making daily stops in the town of Pāhoā. The railbuses became an especially popular form of transportation during World War II when mandatory gas rationing was in effect for all residents (Best 1978).

The *makai* lands of Keonepoko Iki (and neighboring Government Lands) became part of the Shipman Ranch during the early twentieth century. Hawai‘i Territory Survey Plat Map No. 811 (prepared in 1915) shows that W.H. Shipman, Ltd. held a lease for roughly 7,400 acres of Keonepoko Nui and Keonepoko Iki (General Lease No. 1025) at an annual rental of \$300.00 (Figure 25). The lease (Figure 26), which began on July 12, 1918 and expired on July 31, 1928, excluded the 277.8 acre Grant No. 1533 to Kekoa where the current study area is located. W.H. Shipman, Ltd. also held a lease for roughly 14,000 acres of the adjacent *ahupua‘a* of Maku‘u, Halonā and Pōpōkī (General lease No. 854), which expired on November 25, 1929. On subsequent maps (Figure 27), the general area leased by Shipman is referred to as the Ka‘ohe-Maku‘u-Keonepoko Iki Government Tract; no additional lease information for this tract was discovered.

By 1946 rail travel was becoming less popular, and less profitable, due to improved roads and increased trucking. In March of that year, stockholders of Hawai‘i Consolidated Railway voted to abandon all railroad operations. This decision was further reinforced on April 1, 1946 when a devastating *tsunami* destroyed Hilo Bay, including all the rail lines, a drawbridge in the bay, and part of the Waiākea freight yards. On November 20, 1946 the company shut down its remaining lines, including all Puna railroad operations, and began auctioning off all its assets. The ‘Ōla‘a railroad line remained in operating condition and continued to be used for hauling sugar until December of 1948. In that year the sugar industry began phasing out its operations in Puna and closed the tracks permanently.

Throughout this period of industrial growth and decline in Puna, the coastal portion of Keonepoko Iki Ahupua‘a remained largely undeveloped. The 1924 U.S.G.S. Maku‘u quadrangle (Figure 28) shows a single structure located in the coastal portion of Keonepoko Iki, situated inland and west of the current study area (interestingly this map does not show the Government Beach Road along the *mauka* boundary of the current study area). Farrell and Dega (2013:8) indicate the lands in the general vicinity of the current study area were planted in coconuts in 1942 (these were later harvested and sold as mature trees). The current study parcel was created in 1961 when Grant No. 1533 was subdivided (Farrell and Dega 2013). During the mid-1960s, the lands to the southeast and northwest of the study area were subdivided into the Hawaiian Beaches, Hawaiian Parks, and Hawaiian Shores subdivisions. In recent years several residences have been constructed along the coast of Keonepoko Iki within the subdivided parcels of the former grant property. Archaeological studies have been conducted at a number of those parcels; the results of these studies are discussed further in the ensuing section of this report.

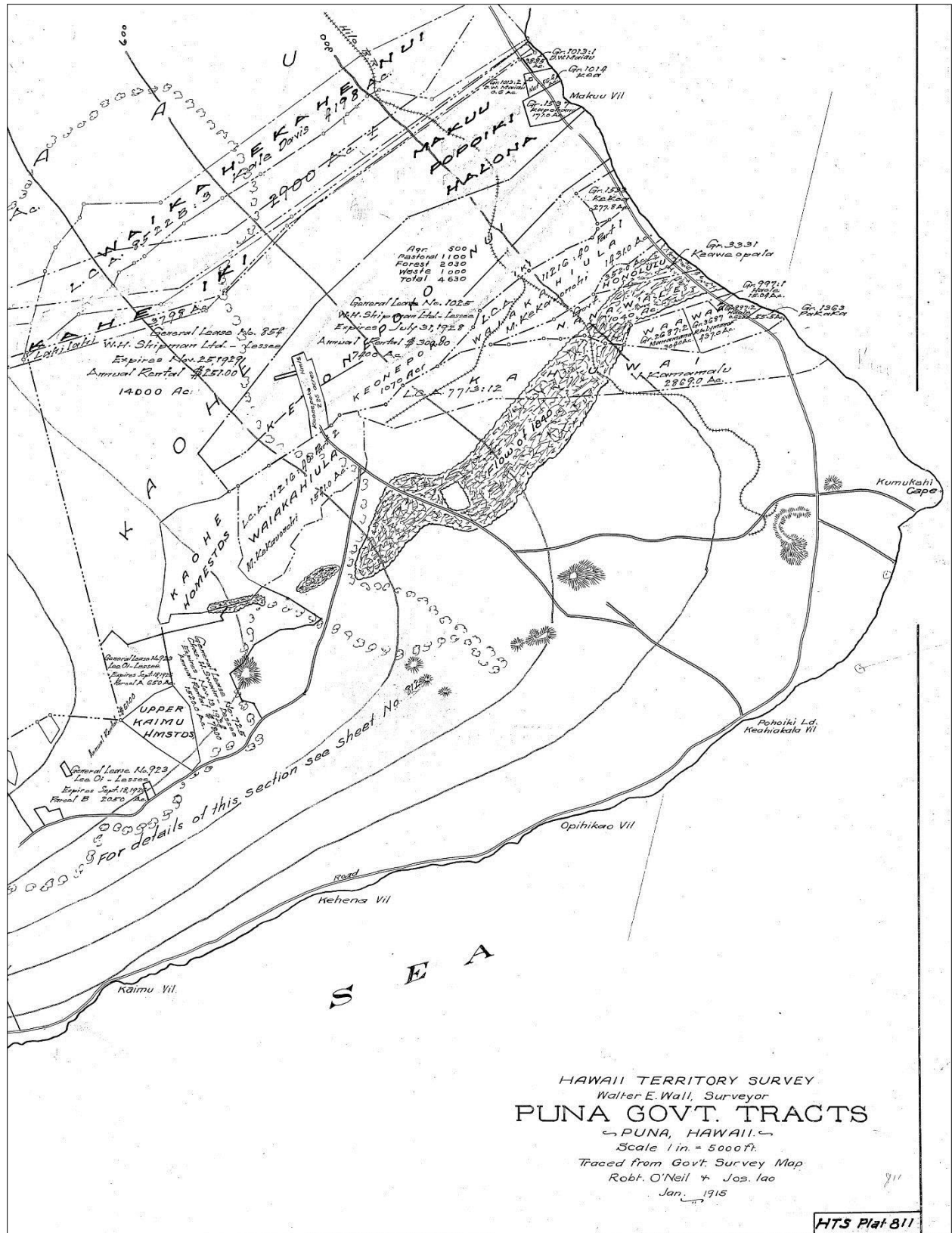


Figure 25. Portion of Hawai'i Territory Survey Plat Map No. 811 (prepared in 1915) showing the area leased to W.H. Shipman Ltd. (Wall 1915:811)

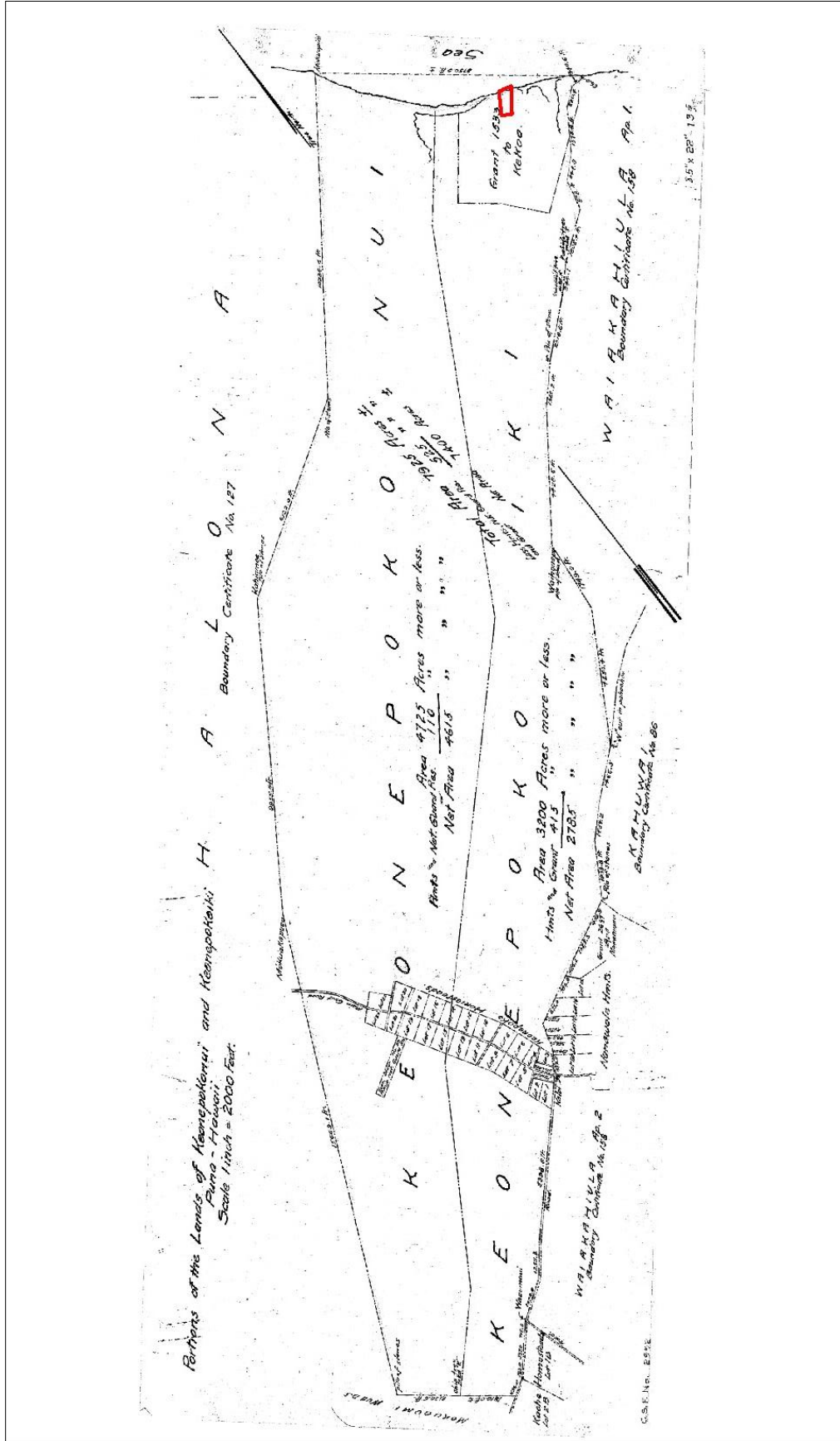


Figure 26. 918 map (C.S.F. 2992) of General Lease No. 1025 to W.H. Shipman Ltd. in Keonepoko Nui and Iki ahupua'a, with study area outlined red. (Wright 1918)

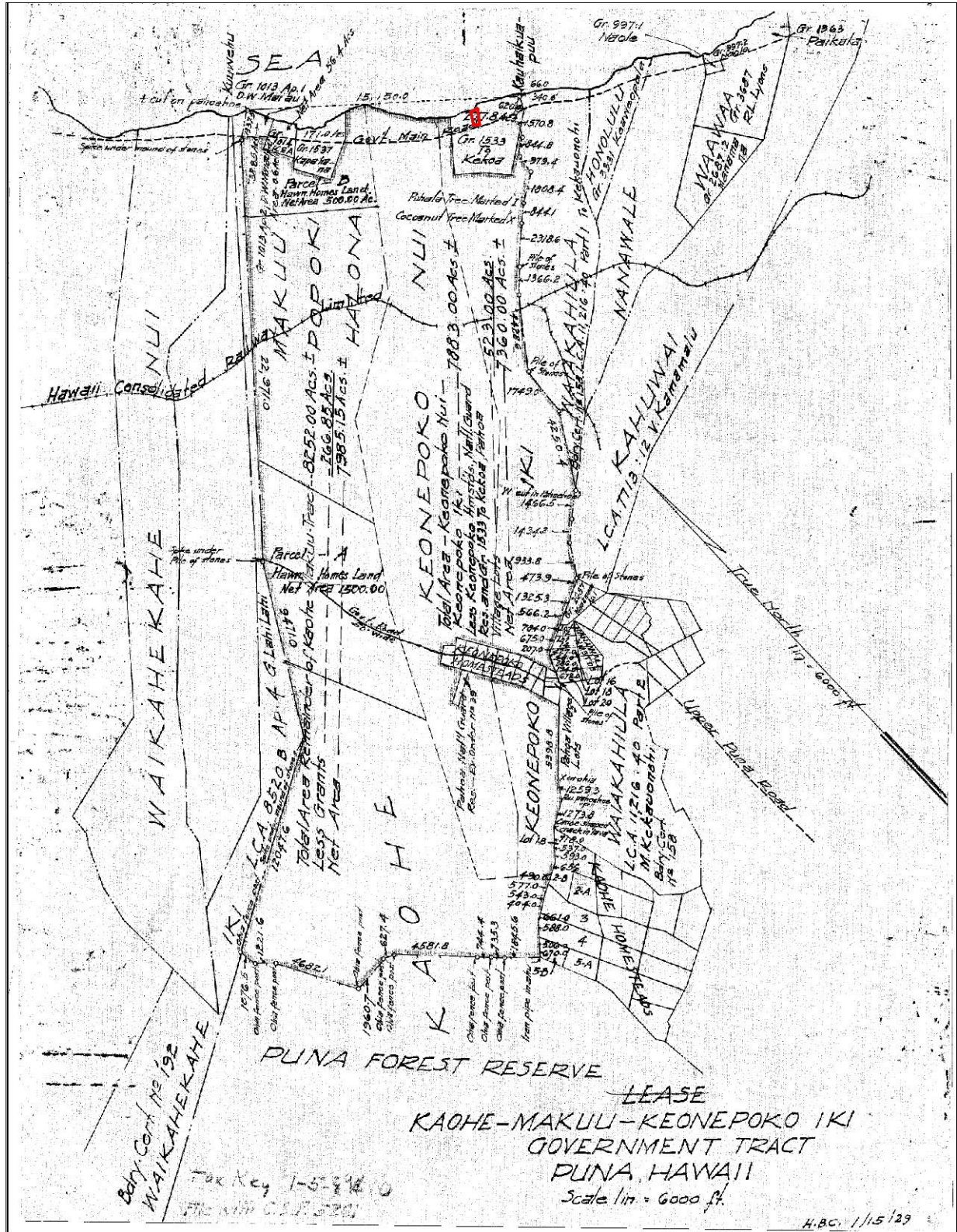


Figure 27. 1929 map (C.S.F. 5261) of the Ka'ohē-Makū'u-Keonepoko Iki Government Tract showing study area outlined red. (Coff 1929)

2. Background

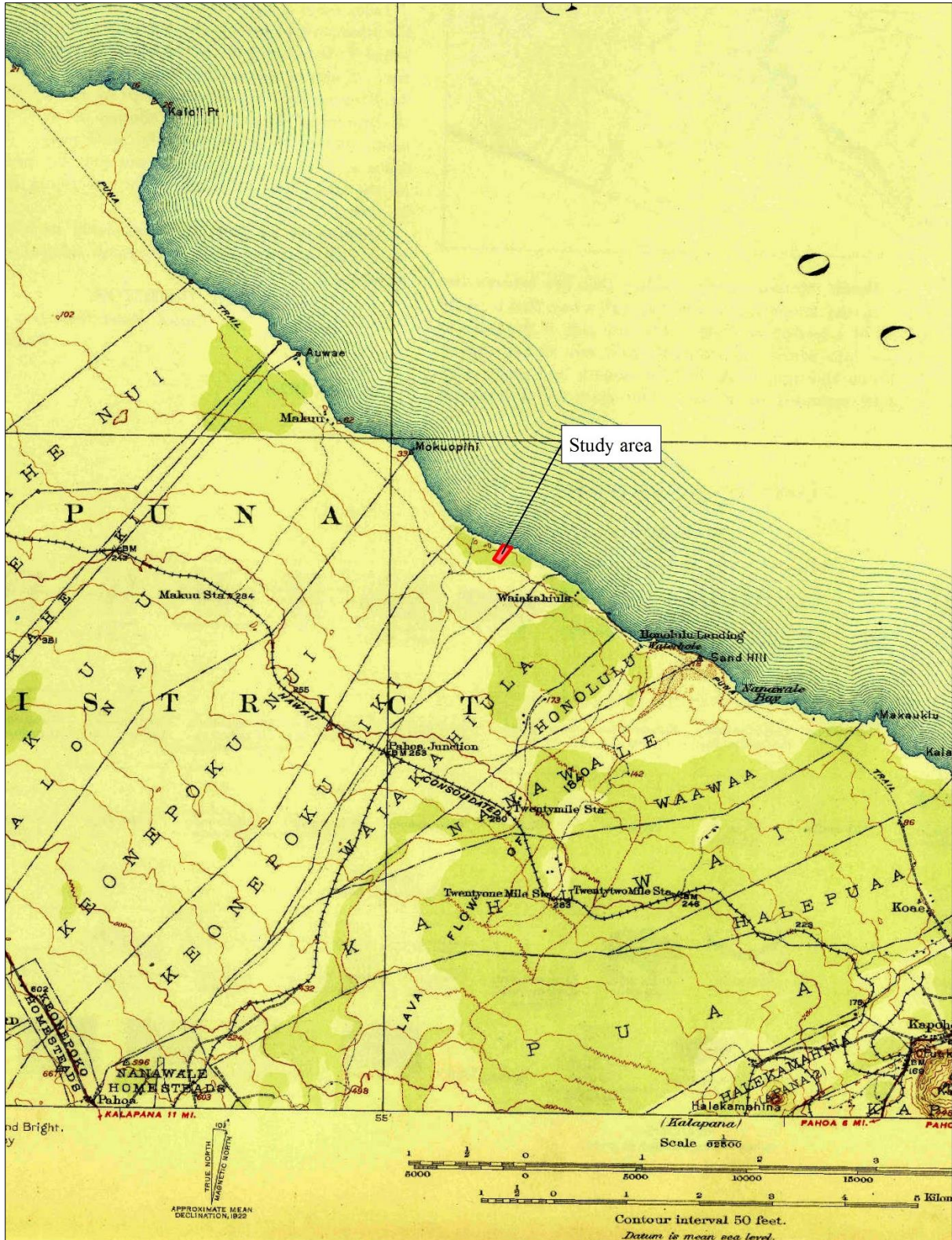


Figure 28. Portion of the 1924 Makuu quadrangle (United States Geological Survey 1924) showing the current study area shaded red.

PREVIOUS ARCHAEOLOGICAL STUDIES

Since the early 1900s, several archaeological studies have examined the coastal areas of Puna where Precontact and early Historic populations were concentrated. To assist in understanding the nature of historic properties recorded within the study area vicinity, the following paragraphs summarizes the findings of relevant studies. Figure 29 shows the location of these studies, relative to the study area parcel and Table 1 below is a listing of all relevant studies organized chronologically.

Table 1. Previous archaeological studies

<i>Year</i>	<i>Authors</i>	<i>Type of Study</i>	<i>Ahupua'a</i>
1932	Hudson	Inventory survey	East Hawai'i
1974	Ewart and Luscomb	Reconnaissance survey	Waiakahi'ula to Kea'au
1994	Farrell and Wells	Inventory survey	Keonepoko Iki
2003	Knapp	Field inspection	Keonepoko Iki
2005	Rechtman	Field inspection	Keonepoko Iki
2012	Rechtman	Field inspection	Keonepoko Iki
2013	Farrell and Dega	Updated inventory survey	Keonepoko Iki
2016	Clark et al.	Inventory survey	Keonepoko Iki
2018	Barna and Bibby	Archaeological assessment	Keonepoko Iki

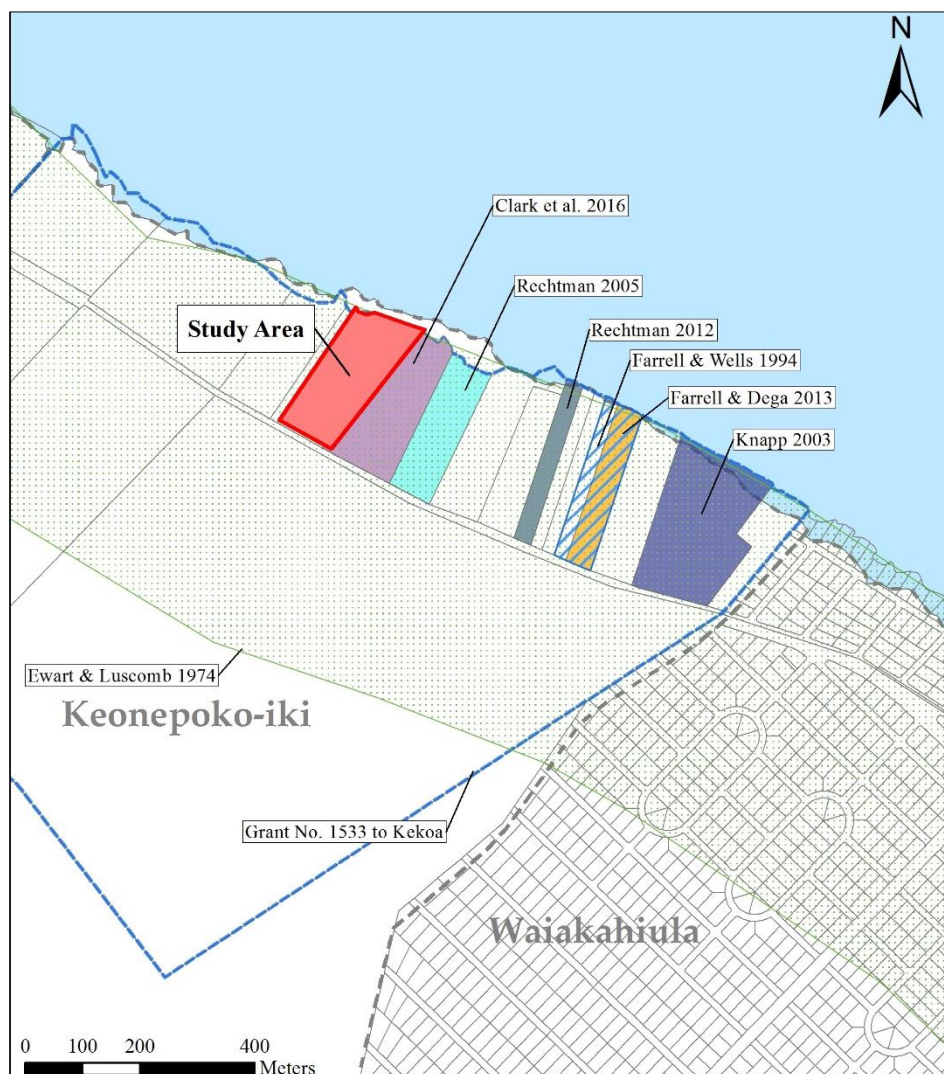


Figure 29. Previous archaeological studies in the vicinity of the current study area.

within the proposed development area” (Knapp 2003). These walls were not described in detail, nor were the locations plotted. As the landowner agreed to avoid any impacts to areas within the subject parcel containing the walls, DLNR-SHPD found that no historic properties would be affected by the development of a single-family residence on the property.

Rechtman (2005) conducted a field inspection of TMK: (3) 1-5-009:056, situated adjacent to the southeastern boundary of the adjacent study parcel (see Figure 29). The majority of that property had been significantly mechanically altered in the past, and no archaeological resources were discovered. Surface features were observed on an adjacent parcel to the southeast of the Rechtman (2005) study area, however, as that parcel (TMK: (3) 1-5-009:057) had not been previously mechanically cleared. Rechtman (2005) also noted that no walls were present along the *makai* edge of the Old Government Beach Road (Site 21273) where it bordered the parcel, as they had been bulldozed away and ended in rubble to the southeast of the study parcel. Given the negative findings, Rechtman (2005) requested that DLNR-SHPD issue a written determination of “no historic properties affected” for TMK: (3) 1-5-009:056.

In 2012, Rechtman (2012) conducted a field inspection of TMK: (3) 1-5-009:035 situated roughly 400 meters southeast of the current study area (see Figure 29). The majority of that parcel had also been previously mechanically cleared and built upon, and as a result no archaeological resources were observed. Rechtman (2012) did note, however, that surface features were observed on the adjacent parcel to the northwest, as that parcel (TMK: (3) 1-5-009:051) had not been previously mechanically cleared. It was also reported that the rock wall typically present along the *makai* edge of the Old Government Beach Road (Site 21273) was absent, and had been bulldozed away, although Rechtman (2012) did note that a rock wall along the *makai* side of Site 21273 was present fronting parcels to the southeast and northwest of the study parcel. Given the negative findings, Rechtman (2012) requested that DLNR-SHPD issue a written determination of “no historic properties affected” for TMK: (3) 1-5-009:035.

Farrell and Dega (2013) updated the Farrell and Wells (1994) study for TMK: (3) 1-5-009:042, situated roughly 460 meters southeast of the current study parcel (see Figure 29). At the time that the 1994 study was prepared, the landowner did not have any formal development plans for the property, and the report was never submitted to DLNR-SHPD until 2012. Upon receipt of the 1994 report, DLNR-SHPD requested several revisions to meet the standards currently in place for Archaeological Inventory Survey reports. Farrell and Dega (2013) conducted some additional fieldwork (but did not identify any additional sites or features) and updated the earlier report to meet current standards, reporting only the findings specific to Parcel 042. As described above that parcel contained two archaeological sites, a core-filled wall along the Old Government Beach Road (Site 18759), and a complex of Historic Period agricultural features (Site 18758) that may have been initially created during the Precontact Period. Features identified at Site 18758 include walls, irregular rock mounds, modified depressions, rock rings that appeared to be planting circles, and a single faced terrace. The features of the agricultural complex extend onto neighboring parcels to the northwest and southeast.

Clark et al. (2016) performed an archaeological inventory survey of the adjacent parcel TMK: (3) 1-5-009:055 (see Figure 29). Prior to their survey, on August 10, 2012, DLNR-SHPD staff, in response to a special management use permit assessment application for a proposed coconut farm, conducted a field inspection of TMK: (3) 1-5-009:055. They did not identify any historic resources in the grubbed and graded, *mauka* portion of the parcel, but did note a Historic wall feature near the coast, *makai* of the bulldozed coastal road. In order to protect this Historic site, which was outside of the development area proposed at that time, without having to undertake any additional archaeology, Theresa Donham, former DLNR-SHPD branch chief, recommended that a construction barrier be erected along the *makai* edge of the coastal road prior to any development activities, and that no development associated activities be conducted *makai* of the construction barrier. The Clark et al (2016) study was undertaken due to the change of proposed land use for the parcel and the presence of the known site. The single Historic windbreak wall was recorded and a test-unit was excavated in the *makai* portion of the study area (Site 50-10-45-30571). The significance of the archaeological resource was derived from information collected during the investigation of Site 30571. Since the likelihood of encountering additional significant subsurface archaeological resources was remote, no further historic preservation work was recommended for the site.

In September of 2018, Barna and Bibby (2018) of ASM Affiliates conducted an archaeological assessment of the subject parcel. As a result of the fieldwork, no archaeological features of any kind were observed within the study area. According to 13§13-284-5(b)(5)(A) when no archaeological resources are discovered during an archaeological inventory survey the production of an Archaeological Assessment report is appropriate. The current study was undertaken in accordance with Hawai‘i Administrative Rules 13§13–284, 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.

3. CONSULTATION

Gathering input from community members with genealogical ties and long-standing residency or relationships to the study area is vital to the process of assessing potential cultural impacts to resources, practices, and beliefs. It is precisely these individuals that ascribe meaning and value to traditional resources and practices. Community members often possess traditional knowledge and in-depth understanding that are unavailable elsewhere in the historical or cultural record of a place. 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 authors' further contention that the oral interviews should also be used to augment the process of assessing the significance of any identified traditional cultural properties. Thus, it is the researcher's responsibility to use the gathered information to identify and describe potential cultural impacts and propose appropriate mitigation as necessary.

In an effort to identify individuals knowledgeable about traditional cultural practices and/or uses associated with the current subject property, a public notice was submitted to the Office of Hawaiian Affairs (OHA) on September 9, 2018 for publication in their newspaper, *Ka Wai Ola* (Vol. 35, No. 10.:19) The notice was subsequently published in the October 2018 issue (Appendix A). As of the date of the current report, no responses have been received from the public notice

Throughout the course of this study, a concerted effort was made to contact and consult with community members of Keonepoko, and individuals who might have knowledge of/and or concerns about traditional cultural practices associated with the project area. This effort was made primarily through email and phone. In all the initial email correspondences, ASM Staff described the nature of the proposed project and its location. Upon completion of the interview, an interview summary was prepared and emailed to the interviewees for review. With the approval of the interviewees, the finalized version of the summaries are presented below.

Although no responses were received as a result of the *Ka Wai Ola* publication, five individuals were contacted via email and/or phone. On November 6, 2018, a phone message was left for Hidi Boteilho for consultation, which she responded to with willingness to participate, and her interview summary is included below. Hidi referred ASM staff to a family member and a *kama'āina* of the area, Leila Kealoha and Pi'ilani Ka'awaloa. On November 9, 2018 via social media (Facebook), Ikaika Marzo was contacted and Mrs. Leila Kealoha was initially contacted by phone on November 12, 2018. On November 20, 2018, Jasmine Kupihea was also contacted via phone and she expressed interest in participating. Follow up phone calls were made to secure an interview. However, no response was received. An initial contact email was sent to Pi'ilani Ka'awaloa on November 12, 2018, which she responded to with interest to participate. ASM completed an interview with Pi'ilani, which is also summarized below.

HIDI BOTEILHO

A phone interview was conducted by Aoloa Santos on November 12, 2018 with Hidi Boteilho, *kama'āina* and Vice Principal of Keonepoko Elementary School where she has worked for the last ten years. Mrs. Boteilho is also from Puna, raised on the Hawaiian Homestead lands of Maku'u, located to the northwest of the current study area. When asked about her knowledge of the study area vicinity, Mrs. Boteilho briefly recounted a battle with an *ali'i* of Puna named Pahoa, that occurred *mauka* of the study area near the current location of Keonepoko Elementary School. Additionally, she stated that previous research shows no written account of this *mo'olelo*, but that it is acknowledged through an oral tradition retold by Pi'ilani Ka'awaloa, a cultural practitioner and *kama'āina* of the Puna District. Mrs. Boteilho stated that she was unaware of any traditional customs or practices associated with the study area, but noted the prominent precipices of the Keonepoko coastline.

PI'ILANI KA'AWALO A

An interview with Pi'ilani Ka'awaloa was conducted by Aoloa Santos in Kea'au on December 3, 2018. Ms. Ka'awaloa is a Hawaiian cultural practitioner from Kupahu'a, Puna. Pi'ilani is an active community member in the Puna District and was referred to by many as a cultural expert for the Keonepoko area. She serves on several community boards, including the Kalapana Community Organization. She is also the *Po'o* (head) and a Puna representative for the Moku O Keawe 'Aha Moku Advisory Council, and is a Reverend at Ka Mauloa O Ka Mālamalama Ho'omana Na'auao Church. Her knowledge of the study area comes primarily from stories passed down in her *'ohana* (family) and she explained that this knowledge was a *kuleana* (responsibility) given to her at a young age from her *kūpuna* (ancestors).

Pi'ilani spoke of a significant event that occurred in the adjacent *ahupua'a* of Waiakahi'ula (also spelled Waiakahe'ula), which translates to "the place where the waters runs red." She shared that fishermen from the area have reported the waters along the cliffs to turn red during *ho'oilo*, the wet season. Pi'ilani also related the name to a bloody battle that occurred in Keonepoko Iki.

She explained that this battle occurred during the time of either 'Ahia, a great warrior of Puna. Pi'ilani imparted that the *ali'i* of Puna ruled in the same manner as the *ali'i* of Ka'u, cruel and oppressive. Furthermore, she shared an *'olelo no'eau* (Hawaiian proverb) that described the genealogy of the people to explain their similar characteristics, "*E ala e Ka'u, kahiko o Mākaha; e ala e Puna, Puna Kumākaha; e ala e Hilo na'au kele!*" Additionally, she explained that this *'olelo no'eau* was a call to unite the people. She went on to explain that the people of Puna were originally from Ka'u and that those who moved to Puna referred to themselves as Kūmakaha. Pi'ilani believes the *ali'i* responsible for the battle in Waikahi'ula were of the same bloodline. She shared the following *mo'olelo*, which was passed down to her from her mother, of a cruel *ali'i* who overtaxed his people. After growing weary of his tirade, the people rebelled against him by refusing to pay their taxes, which infuriated the *ali'i*. In a fit of rage, the *ali'i* gathered his men and ordered them to kill the people. However, the people were prepared to stand against him and the *maka'āinana* (commoners) that resided along the coastline of from Waiakahi'ula to Keonepoko Nui marched upland from the coast to prevent the *ali'i* from advancing any further. The grounds where the *maka'āinana* confronted the *ali'i* and his men was the site of the current Keonepoko Elementary School. Here a battle ensued, and many people were slaughtered. Pi'ilani further detailed that during the battle the *maka'āinana*, although great in numbers, summoned the rains through ritual which included *oli* and *pule* to aid in the battle. A rainstorm followed, and a great flood washed all the bodies towards the ocean. Although the *maka'āinana* were victorious in their pursuit to prevent any more bloodshed, the area *makai* of the battle field became a graveyard of those slaughtered. Pi'ilani further added that development built within those areas, especially near the coastline, have encountered *iwi* (human remains). She believes that these *iwi* may have been associated with this battle.

When asked about traditional practices associated with the study area, Pi'ilani shared that her *'ohana* and friends continue to fish in that area. Although the fishing grounds along this coast are normally accessed by boat, there is a four-wheel drive road to the coast, which is utilized by local fisherman. She added that the Keonepoko area is a popular fishing grounds for *moi* (threadfish) and *āholehole* (Hawaiian flagtail). Pi'ilani recalled that *kū'ula*, or fishing shrines existed at various places along the Puna coast and spoke of one in the Keonepoko area but she was unsure of its whereabouts.

When asked about her thoughts on the proposed project, Pi'ilani contended that any development has the potential to disturb the cultural landscape. Although she noted that the landscape has already been affected by a number of factors, including natural disasters, Pi'ilani shared that development or construction projects within Keonepoko Nui and Keonepoko Iki should consider the possibility of encountering *iwi kupuna*. She also described a series of caves and lava tubes that extend throughout this portion of the Puna District and expressed that these cave systems were used to obtain fresh water or were used for burial purposes. Pi'ilani mentioned another traditional Puna burial practice in which *lua*, or pits were lined with *kukui* (*Aluerites moluccana*) before placing the *iwi* within. In light of the information shared, she suggested that a cultural monitor should be present to observe ground disturbing activities.

SUMMARY OF PREVIOUS ORAL HISTORY

During the 2016 Archaeological Inventory Survey of the adjacent parcel TMK: (3) 1-5-009:055, ASM Affiliates consulted with Wayland Lum, the current manager of the remaining lands that were formerly a part of the Kekoa grant. The Kekoa grant property in its entirety (of which the current study parcel is a part of) has been in Wayland Lum's family since at least the 1920s, when his maternal grandfather (Erik Mydell [Mejdell], of mixed Norwegian/Hawaiian ancestry) and grandmother (Mary Kiawe [Kaiewe] Mydell, of Hawaiian ancestry) either purchased or inherited the property. According to Wayland the property was used for cattle ranching, and as part of that activity, the observed coastal road was created by his grandfather. Wayland was born in 1954 and his personal experiences on the property continue to this day. He related that when his was growing up the property was very remote to the then Puna population. He was not aware of anybody using their land or the immediate shoreline area for cultural practices.

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. In the Hawai'i Revised Statutes—Chapter 6E a definition of traditional cultural property is provided.

“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 the 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.

Analysis of the culture-historical background reveals that Puna District is described in many traditional accounts and is synonymous with the male deity Kāne who among other natural phenomena, manifest at the sun, new growth, and freshwater—elements that are found in abundance throughout this district. While the bounty of sun and freshwater furnished the early settlers with a hospitable and favorable environment in which they established small coastal villages with access to a variety of marine resources, life was periodically disrupted by volcanic activities associated with the Pele clan. While stories of the Pele clan in Puna abound, traditional lore informs us that they are a migratory family whose origins are set in Kahiki and upon their arrival in Hawai‘i, the leading clan member, Pelehonuamea set out in search of a suitable home. After digging many craters on the various island and several more in the Puna District, Pele eventually finds refuge at Kīlauea, Hawai‘i’s most active volcano. As the deity of lava, Pele, known for her hot temper engages in many dreadful fights that drastically transform this district into one of cinders and fields of hardened lava rock. As desolate as these new lava beds appear, they provide the foundation for new vegetation including ‘ōhi‘a and the coastal *hala* plant, both of which are found in abundance throughout the district. These two plants were vastly utilized in traditional cultural practices. *Hala* groves were particularly significant for cultivation practices of staple food crops, such as *kalo* and ‘*ulu*. With limited water resources, the people adapted unique cultivation practices for these crops. These two plants were utilized in traditional cultural practices of Puna. With limited water resources, the people adapted unique cultivation practices, such as the “*pa-hala*,” a method of planting *kalo* and various other methods to grow ‘*uala* (sweet potato), *niu* (coconut) and ‘*awa* (kava). Early historical accounts reveal that while the harsh terrain of Puna may not appear to be the ideal conditions for agriculture, it was not a limiting factor for the native inhabitants.

These early Historical accounts also shed light on Puna’s political history, describing it as having an insignificant role in shaping the island’s politics. Native traditions, however, tells of Puna’s political alliance with the neighboring districts of Ka‘ū and Hilo. Following the arrival of Captain James Cook, foreign interest in the Puna District grew significantly. Many of these early visitors were drawn to this rural district to witness the fires of Pele at Kīlauea or to spread Christianity. By the mid 19th century, the native population in Puna as elsewhere in the islands continued to decline, and the ever-growing population of foreigners propelled major changes, especially the system of land ownership. The shift to a Euro-American style of land tenure resulted in the *Māhele ‘Āina*, which began in 1848 and lasted until the early 1850s. As a result of this sweeping change, Keonepokoiki was set aside as Government Land, as were many other *ahupua‘a* in Puna. In 1855, a 277.80-acre parcel was surveyed and sold to Kekoa. The survey map shows various built features in and around the current study area including a road that passed near the southwest corner of the subject parcel. With a continuously declining native population and growing foreign interest in the district, new agricultural industries spread throughout lower Puna including coffee, tobacco, sugar, timber, pineapple, and dairy and cattle ranching. An interview conducted in 2016 with Wayland Lum revealed that the current study area was used for cattle ranching. The sugar and lumber industry, which led to the construction of the first railroad system in Puna did, however, reshape the landscape of Keonepoko and gave rise to the towns of Kapoho and Pāhoa.

By the turn of the 20th century, the *mauka* portion of Keonepoko Nui and Iki was subdivided and dubbed Keonepoko Homesteads. By 1915, the *makai* section of Keonepoko Iki became part of the Shipman Ranch, however, the area remained largely undeveloped. During the mid-1960s, the lands to the southeast and northwest of the current study area were developed into the Hawaiian Beaches, Hawaiian Parks, and Hawaiian Shores subdivisions. The continued growth of these subdivisions has led to residences being developed along the coast which has resulted in a series of published archaeological studies.

Previous archaeological studies conducted in and around the study area have led to the documentation of a variety of sites including agricultural features (e.g. modified depressions, rock rings, terraces, modified outcrops, alignments, and mounds), intermixed with habitation features (platforms, terraces, pavements, walls, and enclosures), as well as trails, historic roads. The archaeological assessment conducted in September 2018, however, reported no Historic properties.

As a result of the consultation process, no specific traditional cultural practices were identified to exist or have taken place within the current study area. Although no specific cultural practices were described as occurring within the subject parcel, Pi‘ilani Ka‘awaloa noted that local fishermen continue to access this coastline and that a *kū‘ula* once existed in the Keonepoko vicinity but its exact location could not be discerned. As the coastal portion of Keonepoko Iki continues to grow, the consulted parties expressed a desire for coastal access to be maintained in the general vicinity of the study area. Additionally, in light of the account shared by both Hidi Boteilho and Pi‘ilani Ka‘awaloa regarding the battle that occurred in Keonepoko, and the potential for encountering *iwi kupuna*, the authors recommend that the landowners take a proactive approach for the care and preservation of human remains. Although

4. Identification and Mitigation of Potential Cultural Impacts

no surface burials and lava tubes were discovered during the September 2018 archaeological assessment, or during previous archaeological investigations conducted on the adjacent parcels, one of the consulted individuals feels there is still a possibility for encountering *iwi kupuna*. If subsurface human remains are uncovered during any earth moving activities, all construction in the general area will cease and the State Historic Preservation Division will be contacted as recommend in the 2018 archaeological assessment (Barna and Bibby 2018).

In summary, the recommendations provided above are intended to ensure that the proposed project considers the concerns and thoughts shared by the consulted parties. While none of the consulted parties explicitly opposed the proposed project, the concerns, and recommendations offered above are intended to support the landowner in being mindful of the cultural, social, and environmental uniqueness of Keonepoko Iki. Conducting background research, consulting with community members, and taking steps towards mitigating any potential impact will aid in maintaining the cultural and environmental vibrancy of Puna. Attention to and implementation of the above-described issues and measures relative to the above-identified study area will help to ensure no such resources, practices, or beliefs will be adversely affected by the proposed project.

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APPENDIX A
***KA WAI OLA* PUBLIC NOTICE**

PUBLIC NOTICE

ASM Affiliates is preparing a Cultural Impact Assessment (CIA) to support environmental permitting of a proposed single family residence development of TMK: (3) 1-5-009:053, located in Keonepoko Iki Ahupua'a, Puna District, Island of Hawai'i. We are seeking consultation with any community members that might have knowledge of traditional cultural uses of the proposed project area; or who are involved in any ongoing cultural practices that may be occurring on or in the general vicinity of the subject properties, which may be impacted by the proposed project. If you have and can share any such information please contact Bob Rechtman brechtman@asmaffiliates.com, or Lokelani Brandt lbrandt@asmaffiliates.com, phone (808) 969-6066, mailing address ASM Affiliates 507A E. Lanikāula Street, Hilo, HI 96720.

Environmental Assessment

Grossbard/Bourzat Single-Family Residence in the Conservation District at Keonepoko

Cultural Impact Assessment

APPENDIX 4

Coastal Erosion Study

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GEOHAZARDS CONSULTANTS INTERNATIONAL, INC.
Appraisal of hazards – reduction of risk

COASTAL HAZARDS AND EROSION STUDY
FOR THE BOURZAT – GROSSBARD PROPERTY
Keonepoki Iki Ahupua`a, Puna District, Island of Hawai`i
TMK: (3) 1-5-09:053

T.E. Scheffler, Ph.D
and
J.P. Lockwood, Ph.D.; CPG-9806

March 27, 2019



P.O. BOX 479 · VOLCANO, HAWAI`I 96785 · USA
TEL: (808) 967-8579 · FAX: (808) 967-8525 · email: geohaz@hawaii.rr.net

Contents

Introduction.....	4
Property Location and Physical Setting.....	5
Field Inspection.....	6
Marine Conditions	8
Wave Climate.....	8
Tidal Conditions.....	10
Geological Background	11
Shoreline Findings	12
Lava flow lithology and structure.....	13
Other Deposits	16
Erosion Processes.....	19
Quantification of Erosion Rate	20
Coastal Contour Comparison.....	21
Effects of Subsidence and Sea Level Rise (SLR) on Shoreline.....	23
General Coastal Zone Hazards.....	25
Summary	27
References Cited	28

List of Figures

Figure 1 Subject property, TMK (3) 1-5-09:53.....	5
Figure 2 USGS Topographic Map (Pahoa North Quad, 20' contour interval) with approximate subject property boundaries in red.....	6
Figure 3 Google image (2018) with approximate subject property boundaries in red.....	7
Figure 4 Frequency and magnitude of waves affecting Hawaii showing wave buoy locations....	8
Figure 5 Tidal data for Hilo Bay (in feet).....	10
Figure 6 Portion of Geologic Map (Trusdell <i>et al.</i> 2006) with approximate subject property boundary in red.....	11
Figure 7 Geologic sketch-map of B-G Property showing two lava flows and coastal deposits..	12
Figure 8 1965 aerial photo.....	20
Figure 9 Comparison of 1965 shoreline (in black) with 2018 shoreline (in red).....	22

List of Tables

Table 1 Summary of erosion rate calculation results.....	22
Table 2 Summary of potential sea level rise.....	24
Table 3 Summary of natural hazards at the B-G property from (Fletcher <i>et al.</i> , 2002:150).....	25

List of Photos

Photo 1 General view of the coastline to the WNW of the Bourzat-Grosbard property, Kaloli Point in distance.....	4
Photo 2 Younger pāhoehoe at northwestern corner of property (view N).....	13
Photo 3 Columnar fractures and resulting wave resistant pāhoehoe boulders well exposed just west of property boundary (view WNW).....	14
Photo 4 Mass wasting racks in the young pahowhow parallel to coastline (view to ESE).....	14
Photo 5 Older 'a'ā flow (view to ESE).....	15
Photo 6 Active erosion and wave run-up during storm event (view NW) note undercut pāhoehoe on left.....	16
Photo 7 Ballistic debris field (view N).....	17
Photo 8 Ballistic debris further inland.....	17
Photo 9 Example of wave-tossed boulder found 120 feet inland from coastline.....	18

Introduction

The Hawaii Administrative Rules concerning Conservation Districts (Title 13, Subtitle 1, Chapter 5, adopted August 12, 2011) state that applicants for Single Family Residential construction in coastal Conservation Districts must consider rates of coastal erosion affecting their properties in order to determine minimum shoreline setbacks for permitting. DLNR established a requirement that Annual Coastal Erosion Rates must be determined, based on formal “Coastal Erosion Studies”. This report documents the nature of erosion and shoreline migration at the Bourzat - Grossbard (B-G) property based on quantitative measurements and observations obtained through field inspection, aerial photography, satellite imagery, and review of the geologic literature.



Photo 1 General view of the coastline to the WNW of the Bourzat-Grosbard property, Kaloli Point in distance.



Figure 2 USGS Topographic Map (Pahoa North Quad, 20' contour interval) with approximate subject property boundaries in red.

Field Inspection

John Lockwood directed field technicians (Kamaka Nihipali, Amber Davis and Takemi Furukawa) in the field investigations and survey. The B-G property (hereafter referred to as “the Property”) was visited on two separate occasions to observe differing ocean conditions. September 11 and November 1, 2018 were spent making field observations, surveying with Brunton pocket transit and measuring tape, and obtaining site photography.

The field observations on the 11th were observed during a high tide of 2.5 feet and falling, water line on the 1st was rising to the same 2.5 feet above the tidal datum (tidal datum for Hilo, Hilo Bay, and Kuhio Bay, HI -<http://tidesandcurrents.noaa.gov>). The ocean was characterized by moderate swells (3-4 feet), which generated light surf.



Figure 3 Google image (2018) with approximate subject property boundaries in red.

Marine Conditions

Wave Climate

The coast of this part of the Puna District faces the open ocean with no submerged barriers such as offshore reefs or sand bars. The submarine slope is approximately 1300 ft/mile for a distance of roughly 6 miles, descending into the deep water Puna Canyon. The extremely long fetch of waves crossing the Pacific creates a situation where big, long period swells slam into the island's flank, rising to significant heights. Large waves reaching the coast are predominantly related to trade wind conditions, though the shoreline is also exposed directly to the largest North Pacific swells (Figure 4).

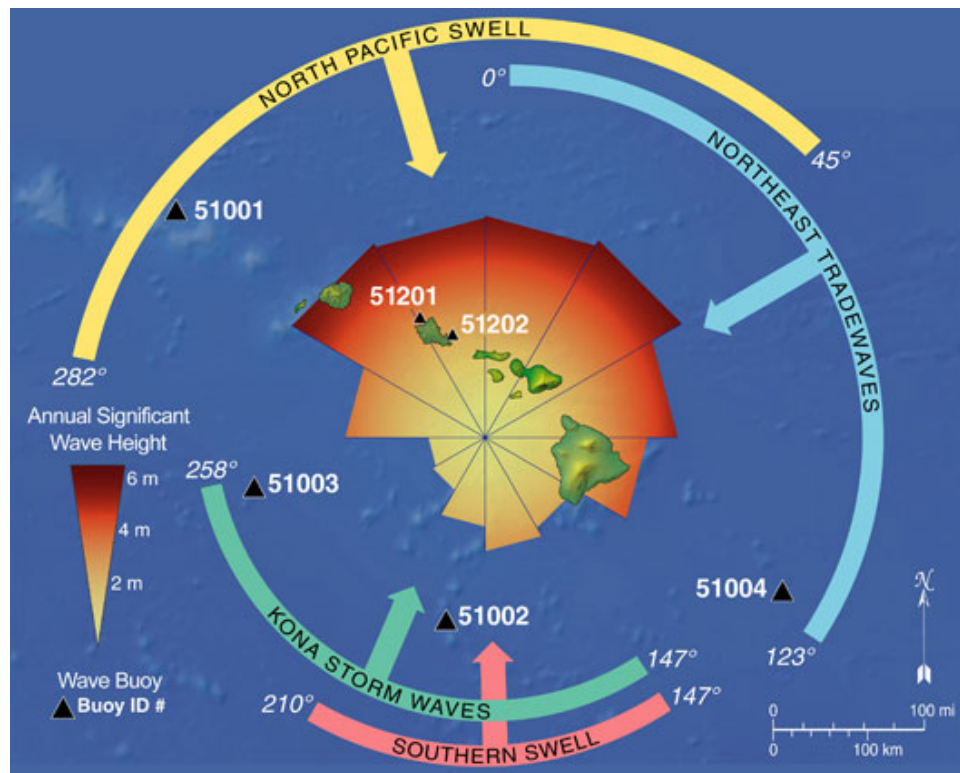


Figure 4 Frequency and magnitude of waves affecting Hawaii showing wave buoy locations.

Orientation of shoreline at the B-G property is to the north-north-west. This is significant relative to typical incoming significant wave directions. Note on Figure 5 that the largest waves of all come from precisely this direction. These North Pacific swells combined with unrelenting Northeast Trade wind waves can reach significant heights of 20+ feet. This is in contrast to the Ka`u and Kona coasts which absorb, on average, a much smaller amount of wave energy (from www.soest.hawaii.edu/coasts/nps/waveClimate.php)

It is beyond the scope of this study to quantify changes in storminess or significantly higher wave heights due to climate change. A precise forecast of these positively contributing variables is impossible, however, their potential effects on erosion are integral in our conclusions. Rising sea surface temperatures in Hawaiian waters could, for example, influence hurricane storm tracks

impacting the islands (Businger, 1998). The recurrence and intensity of wave energy focused on the coastline is obviously a critical factor in discussion erosion along hard coasts. Merrifield and Maltrud (2011) noted that trade winds have intensified across the Pacific gradually since the early 1990s, e.g. This has increased sea level trends significantly in western Pacific waters relative to other regions in the World Ocean, with some rates of rise as much as three times the global average. The probability and extent of sea level rise at the B-G property is discussed in a separate section.

For tropical waters, the incidence of “one-in-ten year” extreme waves impacting shorelines may double or triple as a consequence of the wind intensification described above (Wang and others, 2014). Substantial wave height increases—by as much as 40%-- have also been observed along some Pacific shores, though to what extent this relates to climate change or pulsating phenomena as the Pacific Decadal Oscillation is unclear (e.g.—Ruggiero and others, 2010). Hypothetically, the incidence of hurricanes in the eastern Pacific may actually *decrease* with warming climate, but the strongest storms will likely become even more intense (e.g.--Grinsted, 2012; Holland and Bruyère, 2013).

Tidal Conditions

Tidal conditions are summarized in Figure 5 based upon data collected in nearby Hilo Bay, the closest continuously monitored tidal station to the property shoreline. The mean range of tidal change (MN) is 1.67 feet with a Great Diurnal Range (GT) of 2.4 feet.

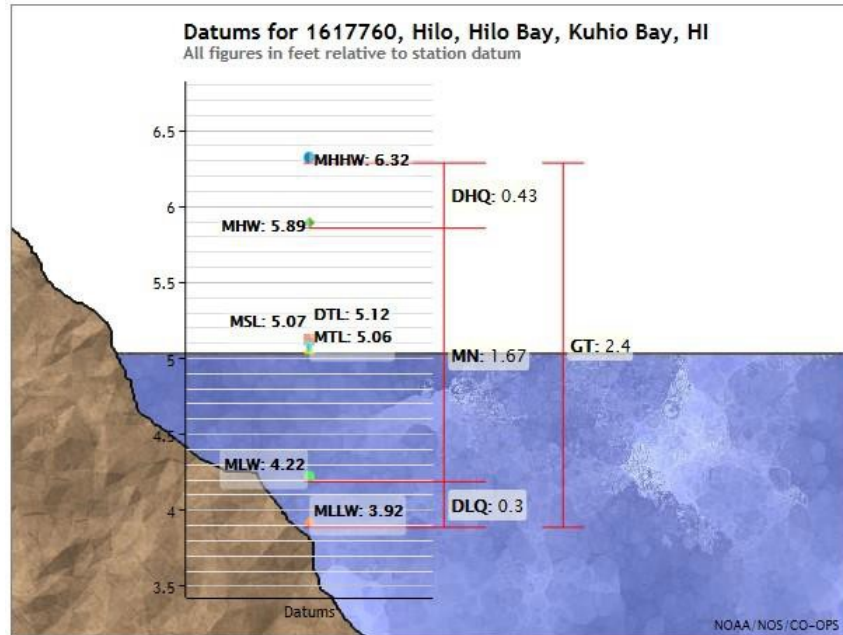


Figure 5 Tidal data for Hilo Bay (in feet).

Acronyms of significance to this study are MHHW = Mean Highest High Water level and MLLW = Mean Lowest Low Water level; where MSL = Mean Sea Level. These tidal datums are used as reference to water level elevations. Tidal heights are given as positive and negative values relative to the Mean Lowest Low Water (3.92 feet).

On the two field visits water levels were about one-half of a foot above their average heights. We can infer that the highest tides of the year affecting this coast are at least another foot higher than they were on these days of observation. Understanding the tidal variation throughout the year is important as any instantaneous “snapshot” of the coastline at a given tide can be misleading on the whole.

Geological Background

Lava flows of “Puna Basalt” cover the property. These are predominantly tholeiitic basalts from Kilauea volcano (Holcomb 1987; Clague *et al.* 1999). Their ages are grouped into younger and older components; The p4 flow (light pink in Figure 6 below) is the more general designation for the large `Aila`au pāhoehoe flow field (Swanson *et al.* 2012). This was a long lived eruption series erupted between 200 – 400 years B.P. (Moore and Trusdell 1991) The flow comprising the majority of the property’s coastal frontage (p4o, darker pink) belongs to an older `a`ā flow dating to between 400 – 750 years B.P. (Trusdell *et al.* 2006).



Figure 6 Portion of Geologic Map (Trusdell *et al.* 2006) with approximate subject property boundary in red.

Vegetation and soil cover largely obscure these flows inshore, but coastal exposures are good to excellent. Unit “p4o” (dark pink in Figure 6) consists of a complex of `a`ā flow lobes erupted sometime in the interval between 400 and 750 years ago. A single massive flow core and its related breccia dominates the bluff along this length of the eastern shoreline. This flow presents itself along the majority of the central and eastern portion of the frontage.

Capping the `a`ā is a “vener” of younger pāhoehoe related to Trusdell *et al.*’s (2006) unit “p4” (the lighter pink on Figure 6) of which the western end of the shoreline is comprised. The three small promontories at the western extent of the properties shoreline owe their existence to these younger and more resistant pāhoehoe flow toes.

Shoreline Findings

The shoreline is legally defined in Hawaii as “the upper reaches of the wash of the waves, other than storm and seismic waves, at high tide during the season of the year in which the highest wash of the waves occurs, usually evidenced by the edge of vegetation growth, or the upper limit of debris left by the wash of the waves, ...” (HAR §13-5-2).

It was critical for the purposes of this study to relate the position and condition of the shoreline relative to locally highly variable physical geology. The two lava flows identified on published geological maps were easily distinguishable in the field. Their unique characters create dynamic conditions. These lava flows are illustrated on Figure 7 and discussed in the sections below. In addition, Figure 7 shows the location of significant non-volcanic coastal deposits that also have a bearing on inferences concerning erosion of this particular shoreline.

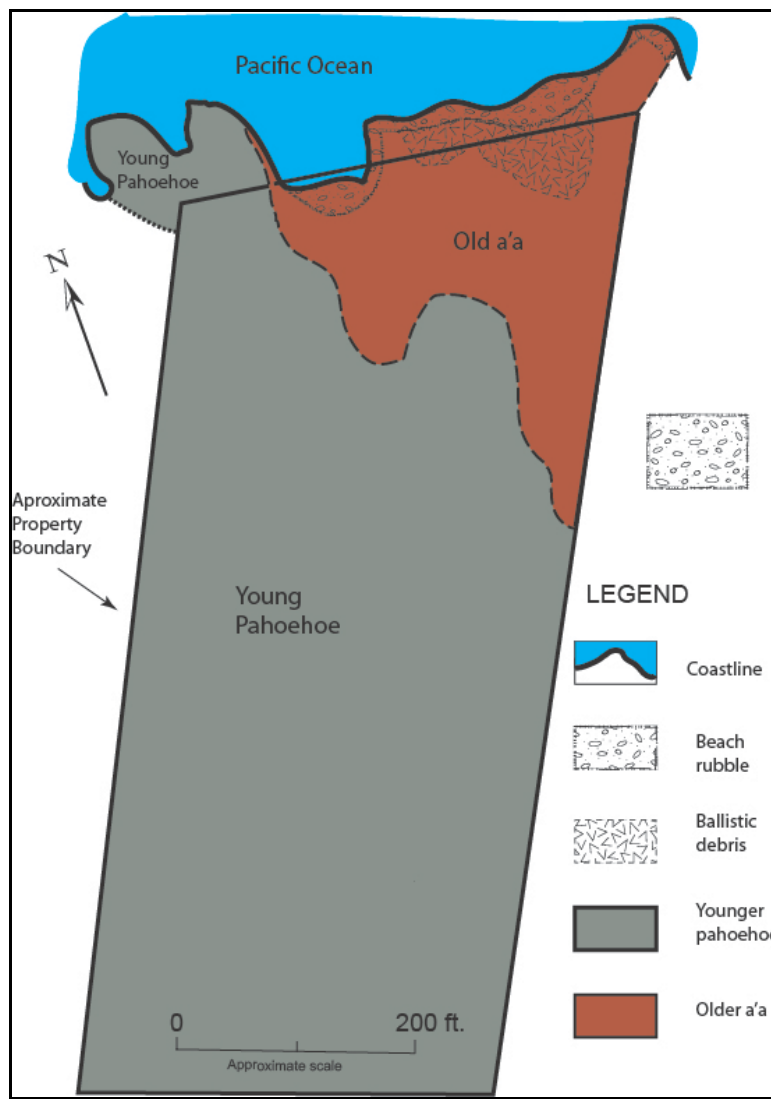


Figure 7 Geologic sketch-map of B-G Property showing two lava flows and coastal deposits.

Lava flow lithology and structure

The older lava flow consists of a in large part friable and unconsolidated 'a'ā, while a more durable *Pāhoehoe* covers that `a`ā and forms the western promontories. Erosion and weathering of the less resistant 'a'ā has resulted in the prominent cove central on the property. Lithologically, the upper pāhoehoe has a dense aphanitic texture. The fine micro-crystalline basalt is so fine-grained that its component mineral crystals are not detectable by the unaided eye. Vesicles are round to sub-rounded and lined with hematite and fine crystals. Some pāhoehoe surfaces have well preserved ropy forms attesting to the flows' young age. In eroded near-shore exposures, surface glass is sparse, though inland shiny black surfaces are common. Olivene content is <0.5%.

The physical (as opposed to chemical and mineralogical distinctions) are significant as the composition and texture of the substrate can make large differences in susceptibility to erosion. Most of the entire western coastline is bordered by large angular blocks of pāhoehoe that have recently fallen from the cliff edge. This is particularly noticeable in the west where the younger pāhoehoe flow is thickest (to 7 feet). In the areas of the small inlets on this side of the property, where wave energy is focused, these blocks have been scoured by the waves (see Photo 2), yet they remain at some headlands providing a energy dispersive barrier to direct wave impacts on the cliff face (see Photo 3).



Photo 2 Younger pāhoehoe at northwestern corner of property (view N).



Photo 3 Columnar fractures and resulting wave resistant pāhoehoe boulders well exposed just west of property boundary (view WNW).

The mass wasting of the dense pāhoehoe flows occurs stochastically, usually only under the influence of extreme wave events. Blocks gradually crack along internal fissures and weakness planes. The somewhat columnar form of the falling rock are well shown in Photo 3. Cracks commonly propagate parallel to the coastline (see Photo 4). In these cases, erosion occurs stochastically. The cliff is stable for extended periods of time, large failures are quite uncommon and usually only triggered by extreme events.



Photo 4 Mass wasting racks in the young pahowhow parallel to coastline (view to ESE).

The underlying ‘a‘ā, and the majority of the central and northeast portions of the property represent a separate, older flow and are of a different mineralogical composition. Sub-hedral green olivine crystals of up to 1.5 millimeter make up 1 -2% of the rock, sub-hedral plagioclase crystals make up approximately 2%, with sparse euhedral lath to 2 millimeters. The flow is a complex mixture of massive irregular “blue rock”, tabular bodies interspersed with loosely and easily erodible fragmented and spiny ‘a‘ā. This heterogeneity increases with depth (see Photo 5).

An accretionary lava ball of 2 meter diameter was observed in this ‘a‘ā massif. Fragmented components of this ‘a‘ā conglomerate are very susceptible to weathering and erosion due to their unconsolidated nature. There was clear evidence of mechanical erosion by storm waves including the obvious under-cutting of more the more durable pāhoehoe (see Photo 6 and 7).



Photo 5 Older ‘a‘ā flow (view to ESE).



Photo 6 Wave action and run-up during storm event (view NW) note undercut pāhoehoe on left.

Other Deposits

Younger sedimentary deposits have formed since emplacement of the flows. These sediments derive from the above described ‘a‘ā, battered constantly by the ocean. This material consists of a limited amount of beach rubble that can include rounded blocks of pāhoehoe as well as significant amounts of ballistic debris propelled onshore behind the vegetatively defined shoreline.

Elevation and slopes are less pronounced on the older ‘a‘ā. This allows for a far greater range of wave run-up on the northeast quarter of the property. This run-up during extreme wave events results in a field of scattered, loose, angular fragments of cobble and boulder-size ‘a‘ā that have been launched inland by storm waves and accumulated over a large area (see Figure 7, above and Photos 7 and 8). Survey revealed an ‘a‘ā block, 16 inches in diameter, that had been thrown 120 feet inland (see Photo 9). This ballistically emplaced debris is strong evidence for erosion of the ocean-front edge of the flow. This situation could present significant risk to life and property within this zone and should be considered a storm hazard.



Photo 7 Ballistic debris field (view N).



Photo 8 Ballistic debris further inland.



Photo 9 Example of wave-tossed boulder found 120 feet inland from coastline.

Erosion Processes

Coastlines can be classified, generally, into “soft” and “hard,” depending upon whether they consist of sands and related fine, easily transportable sediments or of solid less easily weathered substrate. Almost all shoreline change studies focus on soft coasts, including quite recently within the Hawaiian Islands (e.g.—Anderson *et al.*, 2015), and available data are otherwise scarce. The coastline at the property is of the ‘hard’ variety.

Several key processes are at work contributing to erosion of this and all typical hard coasts. Wave energy impacting the bluff loosens masses of rock by compressing air within fractures, while the drag of moving water abrasively grinds smaller fragments at the shore. Wind and gravity can loosen free pieces of breccia as well. Storm seas timed with extreme tides can be especially erosive. There is no way to definitely quantify the relative contributions of these processes, though it is reasonable to say that the energy released by wave action is probably the main cause of shoreline retreat at this locality.

The sea cliff is resistant to erosion, and no erosion occurs during normal sea conditions. During times of major storms, the impact of waves can cause mechanical erosion, although even this is usually negligible. Cracks near the edge of the sea cliff in several places (Figure 9) indicate where the cliff edge is unstable, and susceptible to failure when impacted by powerful storm waves. While rare this type of mechanical erosion is indicated by the presence of large angular, subangular, and sub-rounded blocks found at the base of the sea cliff fronting the property, in particular to the west.

The eastern side of the property is more susceptible to erosion given its physical texture. The scattered angular `a`ā, to two feet diameter noted above the coastal plain and as much as 120 feet inboard of the shoreline (Fig. 10) indicates that the material has been mobilized in the past, though again in an episodic manner.

To accurately assess the rates of changes at the property location a much longer historical series of observations must be evaluated. For this we turn to the quantitative evaluation of aerial photos in the next section.

Quantification of Erosion Rate

Aerial imagery was examined for evidence of major changes in shoreline profile during historic times. The oldest image found included one captured in 1954 (#1756 23/35, on 12 November) of the Nanawale coastline. A 1965 photo (6270 EKL12cc-31 on 6 February) taken 53 years earlier was also examined and both were compared to a 2018 Google Earth image.

Careful inspection of available aerial photographs and measurements of shoreline positions relative to internal fixed distances (between roads, e.g.) did not indicate any erosion of the coastline had occurred. However, the scale of the photos and the precision of even digital measurements from them was not conducive to the task. This owes in large part to the large distances between any two fixed points that occur on all the maps used as reference. Any changes were too small or have occurred over too long a period of time to be measured in this way. For instance, when enlarged for analysis each pixel on the 1965 photo was in excess of ten feet.

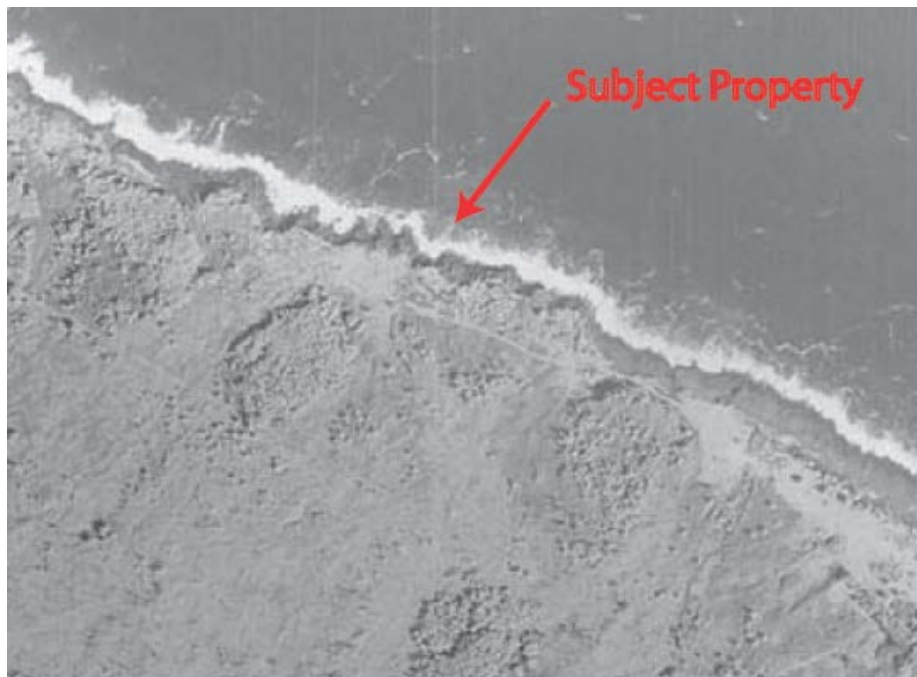


Figure 8 1965 aerial photo.

Shading and resolution differences can easily obscure important smaller-scale details such as the shifting of a boulder here or modest collapse of a ledge there. Likewise, both GoogleEarth and Aerial imagery registered in color over a period of years, show no evident changes.

Unknown differences in tidal level and surf conditions at the times individual photography was obtained also contribute to the lack of precision. Recall from the above discussion that the average diurnal range of tides is 1.67 feet; on a beach with a slope of 30% (1:3) this translates to approximately five feet horizontal change, adding another confounding variable to our photogrammetric methods. It is thus doubtful that horizontal changes of less than 10 feet could be documented, although greater changes should be apparent, especially when the morphology of

prominent coastal features changes with time.

A longer term perspective can be derived from estimates of the coastal erosion that has taken place since the emplacement of these lava flows. The uppermost pāhoehoe flow has obviously been eroded back since emplacement 200 - 400 years ago, but the distance eroded is not precisely quantifiable.

A general estimate of a *minimum* shoreline retreat rate for protecting future improvements on the property can be obtained logically by dividing the horizontal length of erosion evident across the lava flow by the known age of that flow. By measuring at a right angle to the coastline the length from *the furthest point* (seen at low tide) to the location of shoreline erosion lying *farthest inland*, then dividing this distance (approximately 130 feet) by the age of the youngest lava making up the bluff (200 – 400 years) we arrive at a plausible estimate. While this estimate - 0.325 to 0.65 feet per year - discounts the possibility of erosion having removed land that once extended even farther out to sea than is presently observed (it is nearly certain that it did), it is positively biased because the age of the *younger* lava was used.

Coastal Contour Comparison

Since a quantitative approximation of the shoreline erosion rate at this property is not statistically feasible using the methods outlined by Hwang (2005) for sandy beaches, shoreline determinations must rely upon alternative indicators – primarily observation of active erosion of the coastal sea cliff - factors such as freshly cut cliff faces or presence of angular erosional debris as discussed above. Shoreline erosion is not a continuous process that can be characterized by simple “erosion rates”. Mechanical erosion of the coastline is episodic, related to the uncommon impact of especially strong storm activity.

Only two images were appropriate for this analysis, a 1965 photo and a current Google image from 2018. These digital images were scaled to match in Adobe illustrator. Each coastline was traced and a digital shoreline created for each, these shorelines were then overlain with one another and compared. Results are shown below, with the semi-transparent 2018 image for reference. Notice the significant gap between the black (1965) and red (today), especially in the small cove. Confounding factors of image resolution and distortion as well as tidal and wave influences at the different times of the photos make the measurement of the discrepancy approximate. However, it is at least 17.85 feet in the single cove at the central west end of the property - yielding an erosion rate of 0.34 feet per year at this spot.

Interestingly, there seems to have been little to no erosion of the three prominent spits of young Pāhoehoe. The shelf to the east of the small square cove is also relatively little changed, however it does show quite a bit more variation than the west, suggesting some limited movement of the coastline. It is also interesting to note that the instantaneous rate at the cove (0.34 feet per year) corresponds quite well with the inferred minimum rate based on a simple topographic projections and the age of the youngest flow (see Table 1).



Figure 9 Comparison of 1965 shoreline (in black) with 2018 shoreline (in red)

In addition to the assumptions made and noted in the table above, these rates need to be considered in the context of the environment. The shoreline is not retreating everywhere uniformly, nor is it doing so continuously. Erosion is episodic and principally storm-related. In addition, the estimates presented above do not reflect three facts that need to be taken into long-term consideration: (1) the island is sinking isostatically; (2) eustatic sea level change is taking place in response to climate change, and (3) wave and storm conditions also appear to be changing in the central and eastern Pacific, also in response to climate change. The next section considers these influences.

METHOD	ESTIMATED EROSION RATE (feet per year)
Topographic interpolation	0.325 – 0.65
Photogrammetric comparison	0.34

Table 1 Summary of erosion rate calculation results.

Effects of Subsidence and Sea Level Rise (SLR) on Shoreline

Hwang *et al.* (2007) use a figure of 0.16 inches per year in their assessments of present-day SLR for Oahu, but an overall global rise in sea level of 40 inches by the end of the 21st century has been proposed by Fletcher (2010) and others. SLR for any particular area depends heavily on local factors (water temperatures, ocean currents, salinity, etc.) and Anderson and others (2015) predict a doubling of SLR rates for Hawaii within 30 years.

Total sea-level, of course, is a result of the combined changes in elevation of both water and land. Therefore, we must distinguish between eustatic and isostatic change. Eustatic changes are due to a greater or lesser volume of water in the oceans globally which is affected by global warming. Isostatic changes are locally affected by crustal movements and land subsidence or accretion.

The Big Island of Hawaii is sinking into the Earth's mantle because of the gravitational isostatic load of its growing volcanoes. A subsidence rate of (0.08 - 0.12 inches per year) related to isostatic sinking has been determined by submersible studies of drowned reefs off west Hawaii (Moore and Fornari 1984), but that rate must be higher for the Puna coastline, where volcanic loading activity is greater (Moore 1970).

Coastline subsidence can be accelerated by sudden events such as the 1975 Kalapana earthquake that caused land in Kapoho to suddenly drop 0.8 feet (based on Hawaii Volcano Observatory (USGS) data in Hwang *et al.* 2007). Such *episodic* seismic induced subsidence is impossible to anticipate or measure over long periods of time. On the basis of InSAR (Synthetic Aperture Radar Interferometry) remote sensing data, Hwang *et al.* (*ibid.*) state that the coastline at Kapoho may be subsiding at a *continuous* rate of between .31 – .67 in/yr. Rates of subsidence at the Property, 11 miles to the northwest of the East Rift Zone, are necessarily much lower as a result of their distance from Kilauea's active rift zone.

The area of the B-G property lies in a footwall position north of the zone of active normal faulting associated with the southern flank of Kīlauea Volcano (Owen and Bürgmann, 2006). In these situations the headwalls are generally stable and the footwalls drop.

A “worst-case” eustatic sea-level rise estimate of 78 inches by the end of this century is given by Pfeffer (2008). Another estimate puts the rise at 40 inches, a more conservative estimate (Solomon, 2007) and in-line with Fletcher's (2010) estimate above. This change should be added to an annual estimated crustal subsidence rate for easternmost Puna. The greatest rate of SLR will take place during the second half of this century according to recent modelling (e.g.--Cazenave and Le Cozannet, 2014).

	MINIMUM (inches per year)	MAXIMUM (inches per year)
Land subsidence (positive isostatic change)	0.31	0.67
Global Sea-level rise (positive eustatic change)	0.44	0.85
Sea-level rise (sum)	0.75	1.52

Table 2 Summary of potential sea level rise.

The durability and height of the coastal sea cliff fronting the Property (greater than 16 feet at even the highest tides) ensures that combined sea level change and land subsidence will not cause significant shoreline transgression in this area, although it will slowly increase the erosive action of storm waves over the next several decades and centuries.

Anderson and others (2015) studied this phenomenon in the context of soft coasts throughout the Hawaiian Islands and concluded that average rates of shoreline recession would double by the year 2050, and increase to 2.5 times present and historically measured values by 2100, with shoreline retreats of as great as 190 feet possible in some places. The relevancy of this study to the current subject property is minimal, however, given the elevated coastal cliff and “hard” nature of substrate at this location.

General Coastal Zone Hazards

Hwang (2005) recommends that all hazards facing coastal areas should be considered when planning for land-use zoning in Hawaii, and not just erosion. Fletcher *et al.* (2002) portray generalized hazards assessments for long areas of Hawaii’s coastlines; they rate the specific hazards for the area of Puna fronting the Property as shown in the following Table:

Hazard Type	Relative Threat
Tsunami (1-4)	4
Stream Flooding (1-4)	3
High Waves (1-4)	4
Storms (1-4)	3
Erosion (1-4)	2
Sea Level Change (1-4)	3
Volcanic/Seismic (1-4)	4
Overall Hazard Assessment (1-7)	5

Table 3 Summary of natural hazards at the B-G property from (Fletcher *et al.*, 2002:150).

Elevated threats in the “Volcanic/Seismic” type are due to the Nanawale coast’s susceptibility to periodic morphological changes caused by Kilauea’s active East Rift Zone (ERZ). Kilauea’s south flank has experienced many historic earthquakes and despite a current pause in eruptive activity, it will feel them in the future as well. For example, three more recent earthquakes in 1954, 1975 and 1989 registered 6.5, 7.2 and 6.1 on the Richter scale of magnitude (not to mention the most recent M=5.4 and 6.9 pair of tremblors that hit May 4, 2018 - which was felt strongly in this area.

Other volcanic hazards include the threat of inundation by lava flows. The B-G property lies just on the zone 2 side of the boundary between hazard zones 2 and 3 (Wright *et al.* 1992). It is a fair distance from the precarious volcanic rifts or summits (zone 1), but the property does lie adjacent to and downslope from the active ERZ of Kilauea volcano. In zone 2, 15 – 25% of the land area has been covered by lava in the last 200 years (within historically recorded times). In the last 750 years up to 75% of all land within this zone was impacted by lava flows (USGS).

Slightly less threatening along this coastline is the possibility of a tsunami. Exceedingly large “tidal waves” generated by local or wide ranging Pacific-Rim volcanic movements can severely impact this region. Data are available for historic tsunami heights from Hilo as well as from Cape Kumukahi (the B-G property lies approximately half-way between the two). In 1946 a tsunami reached 26 ft above normal sea level in Hilo and 19 ft. Cape Kumukahi. Similarly, in 1957 waves of 13 and 12 ft.

(respectively) were recorded. One of the largest tsunami's of modern time to hit the island came in 1960 when a 35 ft. high wall of water completely decimated the low-lying coastal areas of Hilo. On the southeast shore this wave amounted to only 13 ft. Recall from previous description of the coastal plain that it has a slope of only 2% (a gradient of 1:50). Therefore, for every one foot of vertical wave height above the elevated cliff, wave run-up could be as much as 50 feet horizontally, with no accounting for additional surge and momentum. There is, however, no indication or historic recording of 1960 tsunami overrun in the property area.

Summary

The shoreline and sea cliff in front of the Property were mapped in order to assess the erodibility of underlying rocks and the dynamic nature of geologic and marine processes that contribute to erosion.

The pāhoehoe flow that defines the edge of the sea cliff is susceptible to erosion by storm or tsunami waves, and indications of such minor erosion are documented. A rough estimate of erosion rates was calculated based on the physical characteristics and age of the lava flows on site. Minimum erosion rates between 0.325 – 0.65 feet per year were calculated (a mean of .49 feet per year).

Historical aerial photos dating back to 1954 were compared to 2018 Google imagery. Significant erosion was observed in a single locality as indicated by the deepening of the small centrally located cove. The erosion rate for that area, based on quantitative measurements from aerial photos was calculated at an absolute rate of 0.34 feet per year.

Combining the two methods employed herein $((.49 + .34) / 2)$ results in a figure of .415 feet per year. This estimate must be tempered by the accelerating effects of anticipated isostatic sea level rise and global warming. Nevertheless, it is notable that the actual measured rate falls in the low range of the estimated minimum. For this reason, and accounting for unpredictable, future geological and climate variations, **we conclude that the estimated annual erosion rate is on the order of .45 feet per year.**

A continuous and steady rate of erosion of the coastline (and thus of the inland shoreline), is not appropriate, as erosion appears to be episodic, related to the frequency of storm wave activity. Future inland migration of the shoreline will be impacted predominantly by such unpredictable and episodic storms, and could include sudden subsidence due to seismic and tectonic events.

In any event, the high, relatively erosion resistant cliff fronting the property protects areas inland of the shoreline from any significant inland migration of the shore over the next many decades. An area that has been blanketed by storm-propelled ballistic fragments on the eastern coastal region indicated greater setbacks may be indicated there. The western coastal margin is not affected by this hazard and normal setbacks should apply.

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