

**CONSERVATION DISTRICT USE PERMIT APPLICATION
GARRETT SINGLE FAMILY RESIDENCE AND FARM
TMK: (3) 1-5-010:009**

Lands of Maku‘u, District of Puna, Island of Hawai‘i



(View of the Puna coastline from the area of the shoreline fronting the Garrett property)

Applicant: Kamahele Farms, LLC

**Prepared By: James M. Leonard
J M Leonard Planning, LLC**

April 2020

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CONSERVATION DISTRICT USE APPLICATION (CDUA)

All permit applications shall be prepared pursuant to HAR 13-5-31

File No.:

Acceptance Date:

180-Day Expiration Date:

Assigned Planner:

for DLNR Use

PROJECT NAME Garret Single Family Residence

Conservation District Subzone: Resource

Identified Land Use: Single-Family Residence and Nonconforming Agricultural Use
(Identified Land Uses are found in Hawai'i Administrative Rules (HAR) §13-5-22 through §13-5-25)

Project Address: 15-2145 Government Beach Road, Kea'au, Hawai'i

Tax Map Key(s): (3) 1-5-010: 009

Ahupua'a: Maku'u

County: Hawai'i

Proposed Commencement Date: 9/1/21

Estimated Project Cost: \$ 445,000.00

District: Puna

Island: Hawai'i

Proposed Completion Date: 8/31/22

TYPE OF PERMIT SOUGHT

☒ Board Permit

☐ Departmental Permit

ATTACHMENTS

\$ 2,500 Application Fee. 2.5% of project cost for Board Permits, but no less than \$250, up to a maximum of \$2500; \$250 for Departmental Permits (ref §13-5-32 through 34).

\$ NA Public Hearing Fee (\$250 plus publication costs; ref §13-5-40)

☒ 20 copies of CDUA (5 hard + 15 hard or digital copies)

☒ Draft / Final Environmental Assessment (EA) or Draft / Final Environmental Impact Statement (EIS) or Statement of Exemption

☒ State Historic Preservation Division HRS 6E Submittal Form
(dlnr.hawaii.gov/shpd/review-compliance/forms)

☐ Management Plan or Comprehensive Management Plan (ref §13-5-39) if required

☐ Special Management Area Determination (ref Hawai'i Revised Statutes 205A)

☐ Shoreline Certification (ref §13-5-31(a)(8)) if land use is subject to coastal hazards.

☐ Kuleana documentation (ref §13-5-31(f)) if applying for a non-conforming kuleana use.

☐ Boundary Determination (ref §13-5-17) if land use lies within 50 feet of a subzone boundary.

REQUIRED SIGNATURES

Applicant

Name: Kamahele Farm, LLC

Title; Agency: Fee Owner

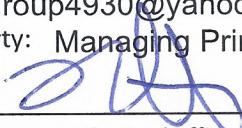
Mailing Address: 3333 E. Camelback Rd., Suite 275
Phoenix, Arizona 85018-2386

Contact Person & Title: Robert L. Garrett

Phone: (480) 909-8148

Email: bellgroup4930@yahoo.com

Interest in Property: Managing Principal, Kamahele Farms, LLC

Signature:  Date: 3/16/2020
Signed by an authorized officer if for a Corporation, Partnership, Agency or Organization

Landowner (if different than the applicant)

Name: [Same as Applicant]

Title; Agency:

Mailing Address:

Phone:

Email:

Signature: _____ Date: _____

For State and public lands, the State of Hawai'i or government entity with management control over the parcel shall sign as landowner.

Agent or Consultant

Agency: J M Leonard Planning, LLC

Contact Person & Title: James M. Leonard, Principal

Mailing Address: 56 Laukona Street
Hilo Hawai'i 96720

Phone: (808) 896-3459

Email: jmleonard@mac.com

Signature:  Date: 4/1/20

For DLNR Managed Lands

State of Hawai'i

Chairperson, Board of Land and Natural Resources

State of Hawai'i

Department of Land and Natural Resources

P.O. Box 621

Honolulu, Hawai'i 96809-0621

Signature: _____ Date: _____

CERTIFICATION

I hereby certify that I have read this completed application and that, to the best of my knowledge, the information in this application and all attachments and exhibits is complete and correct. I understand that the failure to provide any requested information or misstatements submitted in support of the application shall be grounds for either refusing to accept this application, for denying the permit, or for suspending or revoking a permit issued on the basis of such misrepresentations, or for seeking of such further relief as may seem proper to the Land Board.

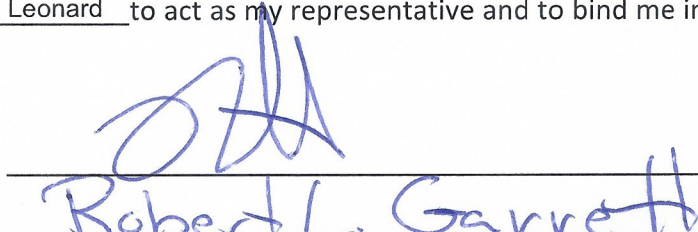
I hereby authorize representatives of the Department of Land and Natural Resources to conduct site inspections on my property. Unless arranged otherwise, these site inspections shall take place between the hours of 8:00 a.m. and 4:30 p.m.



Signature of authorized agent(s) or if no agent, signature of applicant James M. Leonard

AUTHORIZATION OF AGENT

I hereby authorize James M. Leonard to act as my representative and to bind me in all matters concerning this application.



Signature of applicant(s)

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PROPOSED USES AND PROJECT DESCRIPTION

The applicant, Robert Garrett representing Kamahele Farms LLC, proposes to construct a single-family residence and its related improvements on an approximately 13.43-acre coastal property in the State Conservation District, Resource Subzone, in the Lands of Maku‘u, Puna District of the Island of Hawai‘i. The applicant also plans to continue the ongoing “nonconforming” agricultural uses on the property, for which he plans to build a small farm shed to house the farm equipment and tools. The property is described as TMK parcel: (3) 1-5-010:009 and is located *makai* of the Government Beach Road, approximately 1/8 mile southeast of the Hawaiian Paradise Park Subdivision. The adjacent properties to the northwest and southeast are both developed with single family homes and related improvements on each, and the properties to the southwest and *mauka* of Government Beach Road are either overgrown or partially cleared and used for pasture use. The **Island and Regional Location** and **TMK Maps** showing the general location of the property are shown in **Figures 1 and 2**. For reference, the property is commonly referred to as the Kamahele Homestead Property or the Kamahele Farm, having been originally owned and homesteaded by “Sonny” Kamahele who maintained a wide range of livestock and crops and was well known for the melons that he grew at the farm.

The character of the site can be described as having two nearly equal and separate sections, consisting of the *mauka* farm portion and slightly larger *makai* coastal portion, each of which are topographically and vegetatively distinct areas. The fenced, farm portion on the *mauka* side generally consists primarily of open grassed fields that continue to be used to pasture horses and sheep. There is also a prominent stand of variegated *hala* (*Pandanus tectorius*) and cluster of prominent Cook pines (*Araucaria columnaris*) near the end of the existing driveway, as well as several fruit trees found near the prior home site and occasionally along the pasture edges. Topographically, the property’s terrain rises from its *mauka* boundary along Government Beach Road to a broad and distinctive hill side, the crest of which forms a distinct promontory located roughly midway into the property. The Kamahele house, which had been destroyed in a fire several years ago, was located towards the top of the hill, about 270 feet from the *mauka* property boundary where now only its concrete foundation remains. A family burial plot is located nearby the prior house site, at the top of the hill. The crest of the hill demarks the separation between the largely open farm portion and the heavily vegetated coastal portion, the lower portions of which are situated about 45 feet below the top of the hill. The dense vegetation within the *makai* portion consists primarily of *hala* and coconut (*Cocos nucifera*) that are interspersed with common invasive trees and an understory that includes a mix of ferns, sedges, and grasses. Along the shoreline there is a strand of native shoreline vegetation that consists of primarily *naupaka* (*Scaevola taccada*), coconut and *mau‘u ‘aki‘aki* (*Fimbristylis cymosa*).

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Figure 1 Island/Regional Location Maps Garrett Single-Family Residence

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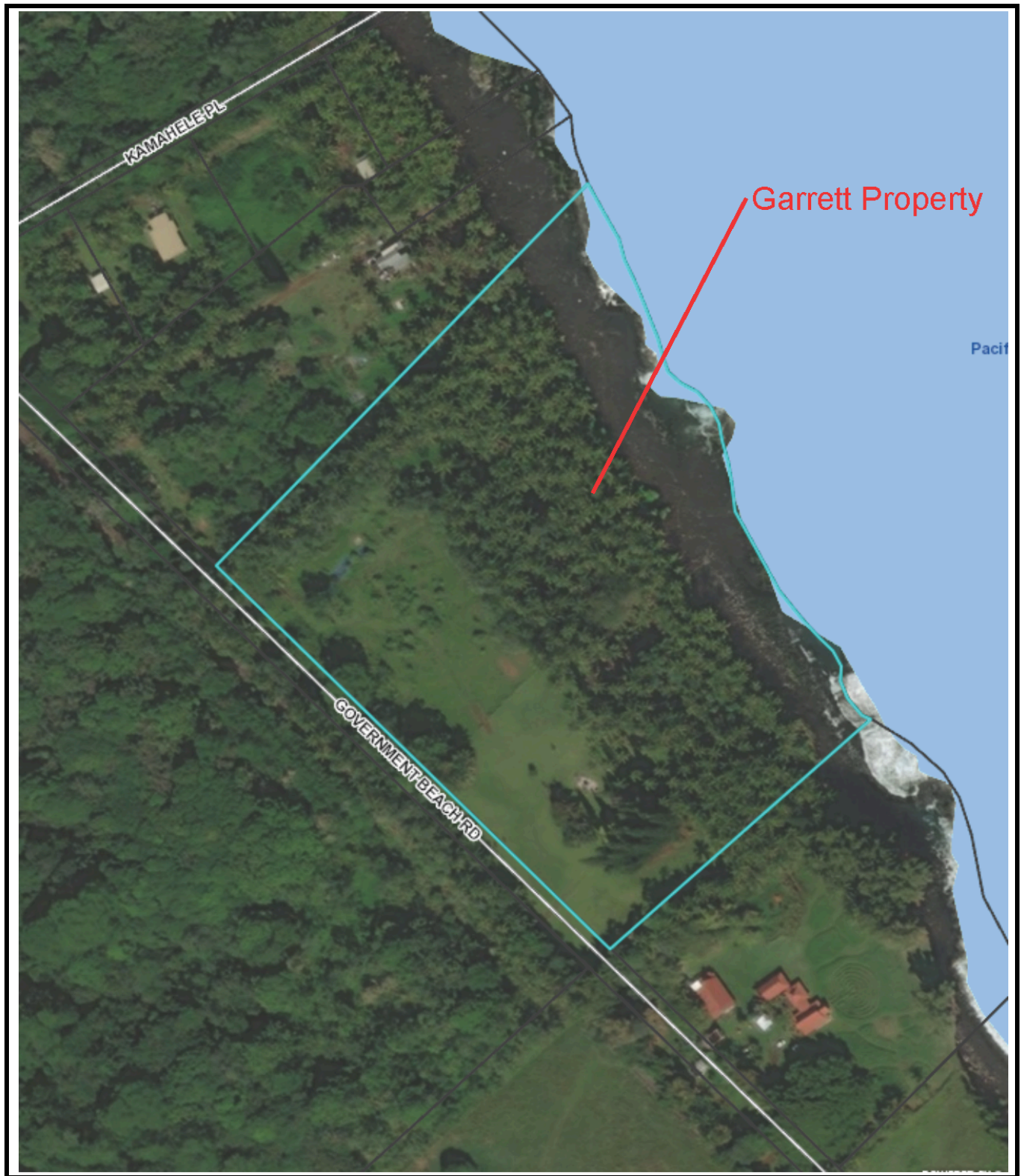


Figure 3 Aerial Vicinity Map
Garrett Single-Family Residence

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Use Permit Application

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The proposed improvements for the property would include the construction of a single-family residence and its related utilities; replacement of the existing entry gate and fencing at the property frontage with Government Beach Road; and an onsite well, pump house and potable water storage tank. A small farm utility shed is also planned nearby at the site of and using the concrete foundation of the prior single-family home that was on this property. The farm shed would be an enclosed shed structure covering an area of approximately 680 square feet, which would include an area for tractor and tool storage and a small room at the side for a pump, pressure tank and equipment storage. The existing gravel driveway leading to the house site will be realigned to approach the house site from the south, in order to minimize the amount of grading required for driveway approach and garage foundation. The driveway will remain as a 15-ft. wide gravel driveway throughout and will be grassed over, similar to the existing driveway, so as to blend seamlessly with the surrounding pasture lands.

The proposed 3-bedroom, 3 1/2 bath, two--story residence will include a kitchen, dining and living area, bathrooms, bedrooms, lanai and garage, with a total living space of approximately 2,560 square feet and a garage, basement and covered lanai area totaling 2,135 square feet. Electrical power and tele-communications will be provided to the residence by way of underground lines that would be extended from the existing HELCO and Hawaiian Telephone Company utility lines that run along the Government Beach Road and the residence would include an individual wastewater system meeting or exceeding all regulatory requirements. The **Total Development Area (TDA)** for the residence, per the Conservation District Rules (Title 13-5, HAR, Exhibit 4), is **4,824 sq. ft.**, which includes the total areas for the residence (4,695 sq. ft.) and the water storage tank and pump house (129 sq. ft.). The **Site Plan, Floor Plan, and Elevation Drawings** for the proposed residence and farm/utility shed are shown in **Figures 4 through 8** on the following pages.

The proposed house site is located near the top of the hillside, at the end of the existing driveway and set back about 212 feet from the shoreline so as to be protective of the native shoreline area and avoid the area of potential salt spray and coastal hazards. The house site is also located at least 46 feet from the historical burial site so as to provide appropriate buffer from the site. The native *hala* that are found primarily in the coastal portion will remain largely unaffected, although, two juvenile *hala* that had been planted by a previous owner in the area of the large Cook pines, will need to be relocated to accommodate the realigned driveway to the house. These would be relocated to a position nearby along the newly aligned gravel driveway. The planned landscaping for the residence would be limited to re-grassing of disturbed areas around the house site, relocation of the two *hala* trees along the realigned driveway and planting of *ti* trees at the boundary of the historic burial site, as requested by the Kamahele family, to serve as a vegetative buffer around the site.

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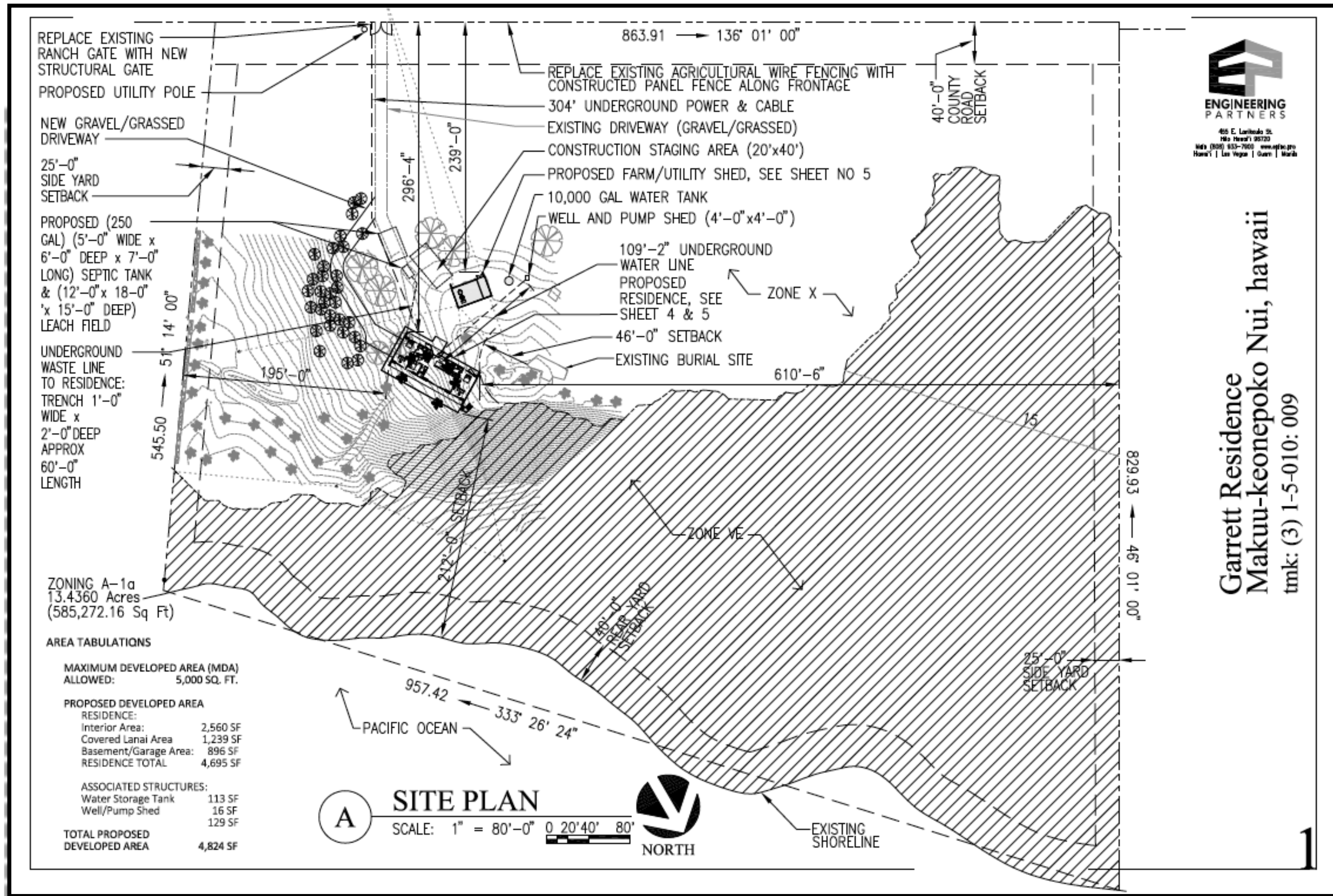
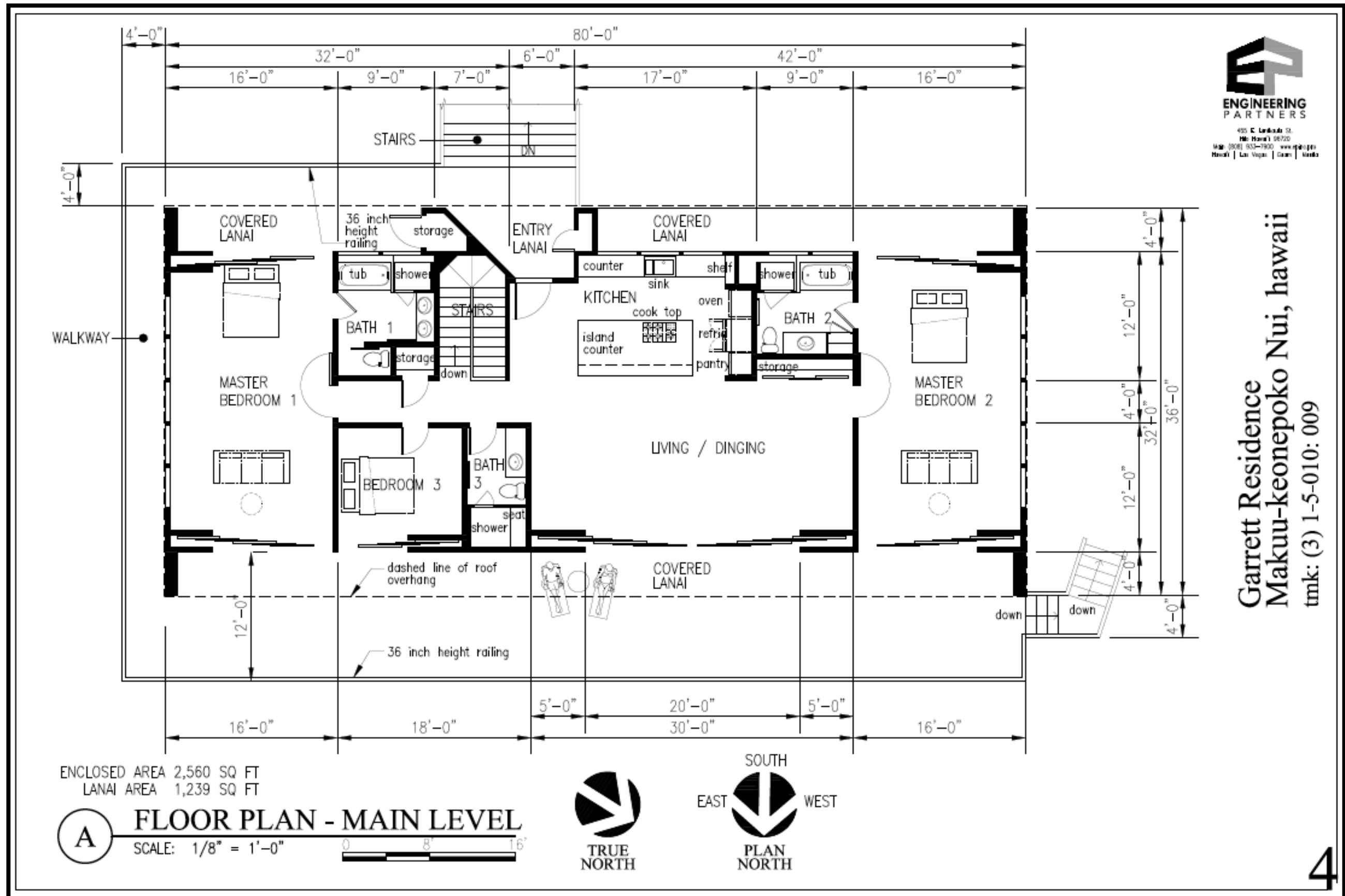


FIGURE 4 Site Plan
 Garrett Single-Family Residence and Farm

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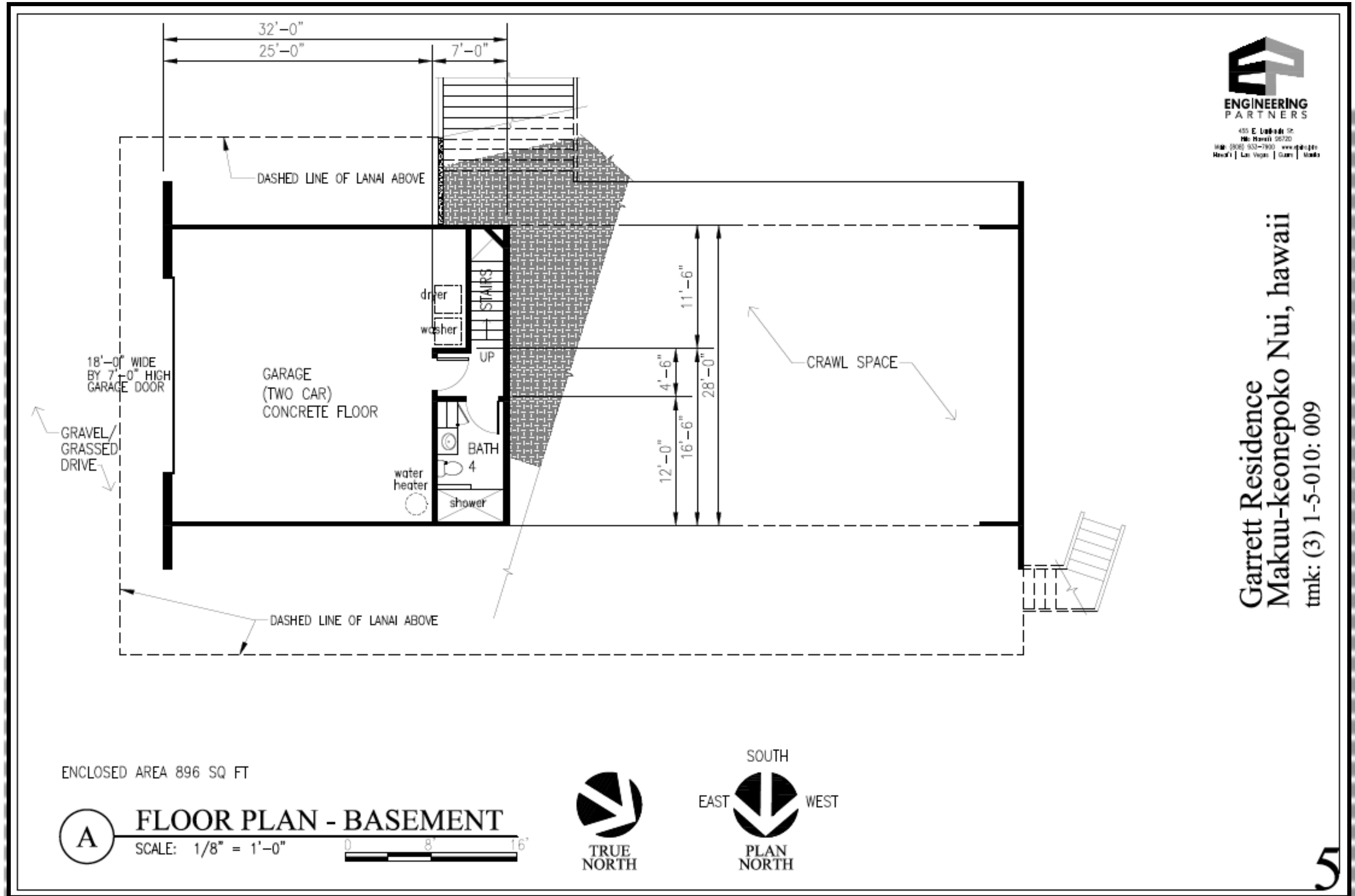


FIGURE 6 Residence Floor Plan – Garage/Basement
 Garrett Single-Family Residence

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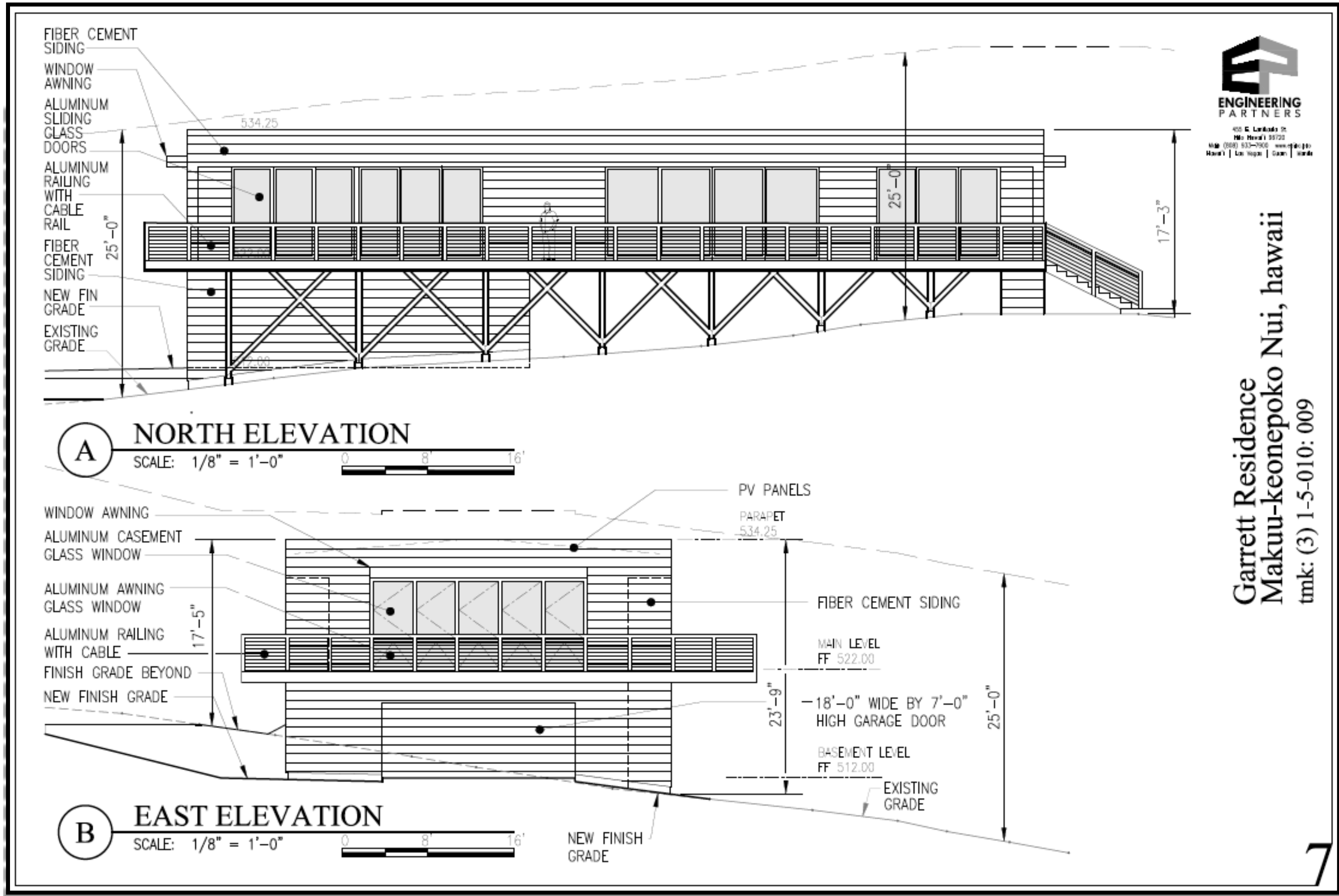


Figure 7 Residence Elevations
 Garrett Single-Family Residence

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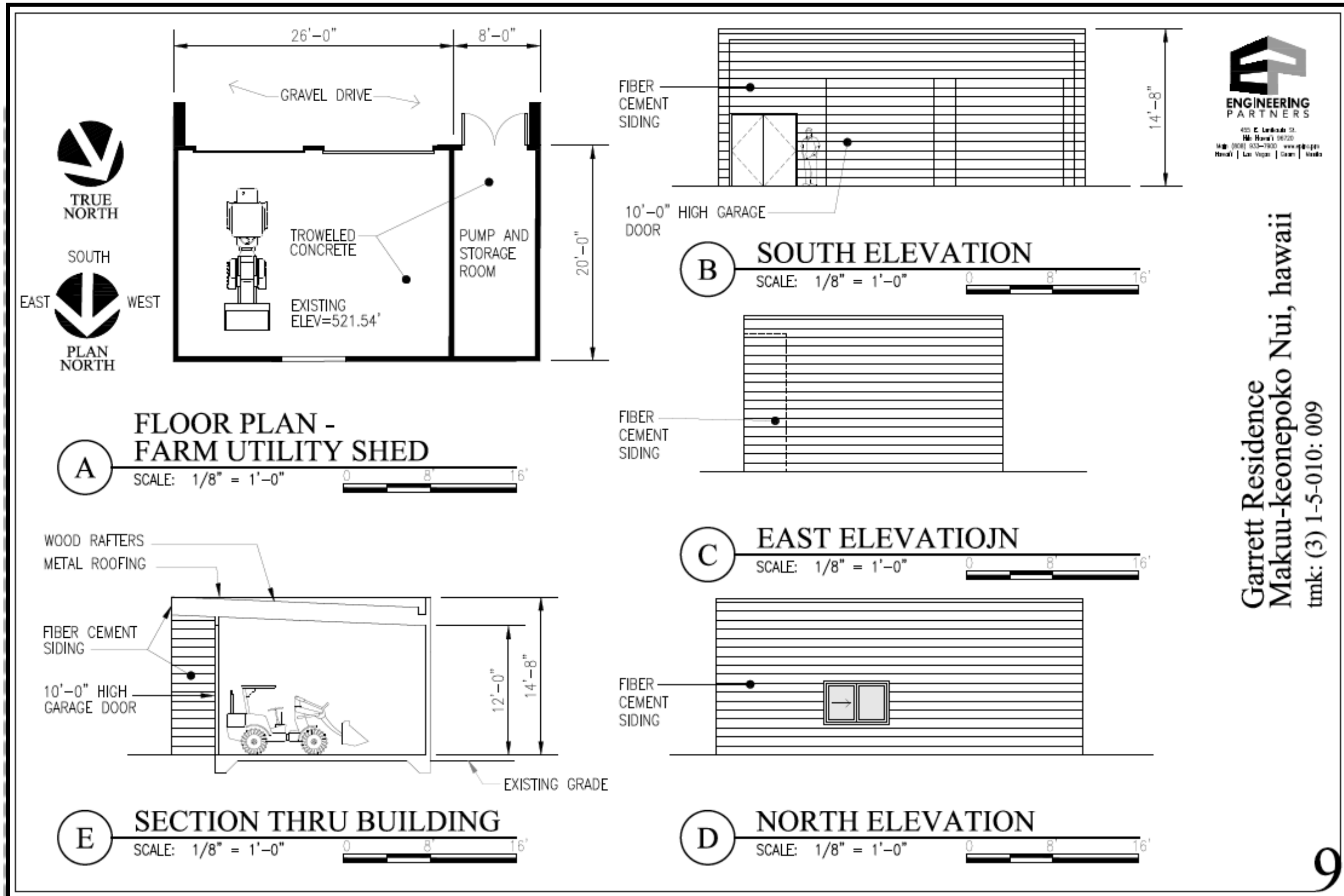


Figure 8 Farm/Utility Shed – Floor Plan and Elevations
 Garrett Single-Family Residence

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A total area of approximately 8,150 square feet or about 0.20 acres will be used for the construction of the home and its related improvements, including the areas of the realigned driveway, septic system, potable water system and construction staging areas. Additionally, special precautions are planned as part of the construction process to minimize the potential for erosion or movement of soil from the construction site. These additional precautions would include the following:

- The area of the shoreline setback (makai of the house site) will be marked and fenced at the construction areas to avoid any possible disturbance to the ground or vegetation within setback area during construction activities;
- The total amount of land disturbance will be minimized, as the construction contractor will be limited to the specific delineated construction work areas within the property;
- The contractor will take special precautions, including use of a dual-layer sedimentation control system in erosion prone areas, so as to not allow any sediment to leave the work areas, particularly towards the sea;
- Construction activities with the potential to produce ground disturbance will not be allowed during unusually heavy rains or storm conditions that might generate storm water runoff; and
- Cleared areas will be replanted or otherwise stabilized as soon as possible.

Overall, the proposed improvements will require relatively little grading due to the careful design of the structures to fit the site, the use of the prior house foundation for the farm and utility shed and a realignment of the driveway approach to the house site which is planned to minimize the amount of grading required for the both carport foundation and driveway approach. Other related site improvements would include the placement of the underground utilities lines connecting to the potable water and septic systems, the extension power and telecommunication lines to the house and the replacement of the existing gate and fencing along the front of the property. The plans and requirements for the on-site utilities, including their associated trenching requirements, and for the site preparation, construction staging, and landscaping are described in detail below.

UTILITIES: In terms of the supporting utilities, electrical power, telecommunications and CATV connections will be provided from the existing utility lines that run along the *mauka* side of the Government Beach Road and would be extended underground to the house site by means of a single power pole utility pole located near the existing entry along the southwestern boundary of the property and then underground along the alignment of the existing drive, as shown on the **Site Plan in Figure 3**, so as to provide the most direct and shortest route to the house site and minimize the amount of new disturbance to the land. The single utility pole would be placed into a hole that is 2 feet in diameter and 5 feet deep and would be

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located in a previously disturbed area near the property boundary, thereby minimizing amount of clearing required and potential impact on the land. Additionally, roof mounted photovoltaic and water heating panels are also planned with the home to help reduce the overall energy requirements of the home.

The domestic water supply would be provided from an onsite water well located along the southwest side of the farm shed, about 240 feet *makai* of the Government Beach Road. It will have a 1.5 HP pump capable of delivering up to 50 gallons per minute. The water well and pump will be housed in a well/pump shed that would be 16 square feet in size and 6 feet in height, sufficient to house the pump and water filtration system. A 10,000-gallon storage tank, which would be located adjacent to the well site, would encompass an area of approximately 113 square feet and would be set on a pad of crushed rock to provide a stable and level base. The proposed storage is expected to be more than adequate to meet the expected demand based on the family's projected average daily use of less than 200 gallons per day, while having sufficient reserve capacity to meet the fire-flow requirements for the planned residence.

Wastewater would be treated by an individual septic system located adjacent to the residence, which would be designed and installed in conformance with requirements of the State Department of Health. The septic system would have a tank capacity of 250 gallon and an absorption field that extends over an area of approximately 370 square feet. The trenching requirements for the septic system are summarized in a table within the full trenching requirements for the project in the following section.

SITE PREPARATION (Clearing, Grading or Grubbing, Trenching, and Construction Staging): Grubbing and grading will occur in the areas of the realigned driveway and parking area; the areas of the potable water tank and pump house; house foundation; construction staging area and the areas of the trenching required for the septic system and water transmission lines, comprising a total area of approximately 8,150 square feet or just under 0.20 acres. As noted above, the propose residence, including the realigned driveway approach, has been designed and planned to fit the site and to minimize the amount of land alteration and grading required.

The well and potable water storage tank are located adjacent to the prior house site and planned farm shed, and near the location of the prior tank and well location, so as to minimize the amount of ground disturbance required and benefit from their proximity to the farm shed which will include a pump and storage room where and additional pump and pressure tank will be located. Additionally, the underground lines for conveying power, telecommunication and CATV to the home will be aligned with the existing drive and parking area to provide the shortest and most direct route to the home and minimize the potential area of new disturbance. Further, extracted

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material from the trenching will be used to refill trenched areas and to blend the areas with the surrounding topography so as to avoid the need for any off-site disposal of materials. A summary of the projected **trenching requirements** for the project utilities, including the linear dimensions for utility lines and affected area for utility trenching, are provided below within **Table 1**.

TABLE 1					
Garrett Residence- Utility Related Trenching Requirements					
	Length (Ft.)	Width (Ft.)	Depth (Ft.)	Affected Area (Sq. Ft.)	Total Area (Sq. Ft.)
Septic System - Residence					
Tank	8	5	6	40	
Absorption Field	18	15	2	270	
Sewer Line	60	1	2	60	
					370
Underground Water Lines					
Potable	110	1	1.5	110	110
Underground Utility Lines					
Power/CATV/Tel.	304	2	1.5		608
TOTAL AREA					1,088 Sq. Ft.

The staging of the construction equipment and storage of materials, as indicated on the **Site Plan in Figure 3**, would take place in an approximately 20' x 40' area at the parking and turnaround area of the existing driveway, just mauka of the prior house site. This includes a relatively level and previously graded area that had been previously used as a parking and turn around area so as to limit the area of additional disturbance.

LANDSCAPING AND NATIVE SPECIES PROTECTION: The additional landscaping planned as part of the site improvements, as indicated in the **Landscape Plan within Figure 9**, would be limited to relocating the two (2) smaller *hala* trees that are located within a grouping of Cook Pines near the planned approach to the house site; removal of a portion of the cluster of existing Cook pines and as many as six (6) coconut palms in the area of the house site and driveway approach; re-grassing over disturbed areas surrounding the residence and the realigned driveway approach to the house; and planting of ti (*Cordyline fruticose*) trees in the area of surrounding the burial site to serve as a vegetative buffer to define and protect this sensitive area. The two *hala* that would be impacted in the area of the driveway approach to the house are both young juveniles that were planted by the prior owner among the Cook pines and are, thus, easily moved.

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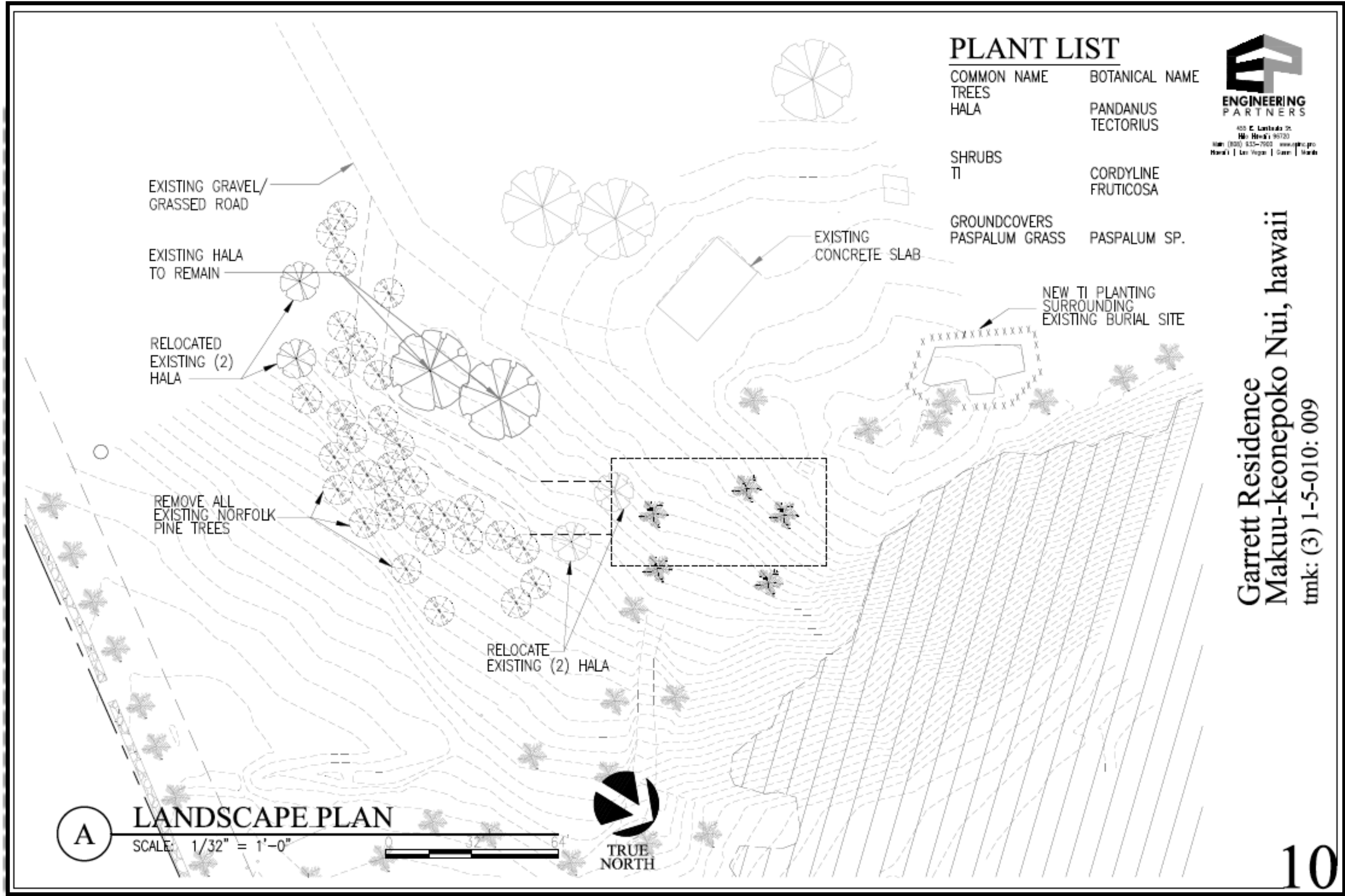


FIGURE 9 LANDSCAPE PLAN
Garrett Single-Family Residence

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While the owner plans to remove and dispose a portion of the Cook pines as a precautionary measure to protect the home from potential damage of these shallow rooted trees falling during heavy storms, the young *hala* trees will be relocated nearby to the area of the existing *hala* grove along the new driveway alignment. Those Cook pines to be removed will be disposed of on-site by means of chipping and use as a mulch in the areas throughout the property and/or use as firewood by the applicant and neighbors .

The coastal area, which includes the native coastal vegetation, being topographically separate from the farm area, would remain unaffected by the planned improvements. As noted, the vegetation within the coastal portion consists primarily of a dense coconut and *hala* forest, interspersed with common invasive trees, with an understory of ferns, sedges and grasses and with a strand of truly shoreline native vegetation consisting of *naupaka* and *mau'u aki'aki* found along the shoreline. Also, in a single roughly 50-foot long, 10-foot wide area along the eastern portion of the shoreline, are a number of clumps of *Ischaemum byrone*, a State and federally listed endangered grass known to grow on pahoehoe close the edge of sea cliffs, where salt spray may limit other plants. Interestingly, the grass is found in an area that is frequently trodden by fishermen traveling up and down the coast and, despite the trampling it receives, the tough, clumpy grass has survived and even thrived in this area. Nevertheless, Applicant plans to take special steps to further protect the grass by encircling the grass patches with rock curbs using one or two courses of dry-stacked rocks. This simple and unobtrusive measure, as recommended by the Ron Terry, Ph.D., who conducted the botanical survey and prepared the Draft Environmental Assessment (Draft EA) that accompanies this application, has been found to be particularly successful in protecting the grass when applied at other sites along the coast where the grass is present. Aside from *Ischaemum byrone*, all the other native plants found on the property are very common to the region, the Island and throughout the main Hawaiian Islands. It is worth noting that, given the protective measures noted above, as well as the landscaping planned with the planned residence, there would be no loss of or negative impacts to the native species found throughout the property as a result of the proposed improvements and uses of the property. Examples of the **Native Species** found in the coastal portion of the property are shown in **Figure 10**.

PROJECT TIMETABLE: The site preparation and home construction is planned to begin as soon as construction related permits and plan approvals are obtained, which are expected within a year from receipt of the Conservation District Use Permit being sought with this application, and all work on the site is expected to be completed within a year from the start of construction.

FIGURE 10. Native Species in the Coastal Area



View of the native hala found within the hala and coconut forest in the coastal portion. The topographic change from the farm portion is also most evident in this section on the makai side of the pu'u.



View of the typical native vegetation found along the shoreline fronting the coastal portion, including primarily coconut and the native naupaka and mau'u 'aki'aki.

FIGURE 10 (Continued) Native Species in the Coastal Area



View of the shoreline grass that includes clusters of the endangered Hilo Ischaemum (Ischaemum byrone) grass found near the pahoehoe cliff-edge in the eastern portion, along the coast.



Clusters of the endangered Hilo Ischaemum grass found near the cliff-edge among other shoreline, which will be further protected from trampling with curbs of dry stacked rocks.

EXISTING CONDITIONS

Climate, Geology, Soils and Geologic Hazards

The approximately 13.43-acre coastal property is located between the Government Beach Road along its southwest boundary and the shoreline at its northeastern boundary. Elevations over site range from the mean sea level (AMS) along the coast at its *makai* boundary, to about 50 feet at the hill-top near the midpoint in the southeastern portion of the property, to approximately 30-feet AMS at the *mauka* boundary with the Government Beach Road. This area receives an average of about 120 inches of rain annually and experiences a mean annual temperature of approximately 75 degrees Fahrenheit.

As is typical of this portion of the Puna coast, the coastline fronting the property is characterized by boulder laden coastline with a shallow coastal shelf bounded by steep submarine slopes and with no beaches along the shore. The nearly 1,000-foot long shoreline frontage of the property can be characterized as having five bands: tidepools; a line of large, rounded boulders fronting a low, stepped cliff; behind which is a fairly level pahoehoe shelf and then another ridge of boulders. *Mauka* of this shoreline is the hill or *pu'u* that was formed by a *littoral* cone and cinder deposits, with the highest point found on the southeast end, and which gradually disappearing towards the northwest where conditions are low and swampy. This *pu'u* is distinctive feature of the property and is of some geologic interest as evidence of the littoral cone that was formed from the violent steam explosions that occurred when the lava flow met the sea.

In terms of the underlying geology, according to the geologists who prepared the Coastal Erosion and Shoreline Hazard Study that accompanies this application, the coastal shelf that extends *makai* of the shoreline is the oldest exposed lava on the property with an estimated age of between 750 and 1500 years ago. This lava flow is also exposed *mauka* of the Property and visible as an isolated "*kipuka*", being surrounded by other younger flows. When this flow reached the sea, it formed the littoral cone and the widespread cinder deposits that are found over much of the property as a result of the explosive interaction of molten lava meeting the seawater. Then between 450 and 750 years ago, another lava flow covered the area and surrounded but did not inundate the *pu'u*. Most recently, the entire area was again surrounded by a widespread '*Aila'au* lava flow, a tube-fed *pahoehoe* lava flow, with an estimated age of 200-350 years ago (Moore and Trusdell's 1991).

Soil in the area is classified as Opihikao highly decomposed plant material. This well-drained, thin organic soil develops over pahoehoe bedrock. It is found from sea level to 1,000 feet in elevation and is rapidly permeable, with slow run-off and

a slight erosion hazard. This soil is within subclass VIIs, which means it has limitations that generally make it unsuitable for cultivation and restrict its use to pasture, range, woodland or wildlife (U.S. Soil Conservation Service 1973).

Geologic Hazards

Regarding geological hazards that may be present, 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, is Zone 3 on a scale of ascending risk from 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) 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, however, could be described as being within the higher-risk margin of Zone 3, being only about 1.5 miles from the loosely-defined boundary of Zone 2.

For many centuries the area between the Hawaiian Paradise Park and Hawaiian Beaches Subdivisions has not been threatened by lava, with the nearest lava flow, occurring in June 1840, being about 2.5 miles to the southeast. For another 150 years no lava flows threatened this area, until 2014, when a lava flow from Kilauea’s Eastern Rift Zone entered Pahoa and approached the Kea‘au-Pahoa Highway. The flow 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. Also, the lava flows of 2018 that erupted between the areas of Leilani Estates and Noni Farms Road in the Puna District, devastated hundreds of homes and numerous farms in the lower elevations of Kilauea’s ERZ. Although the 2018 lava flow did not approach closer than 5 miles of the Garrett property and originated at lower elevation so as not to be a threat to the subject area, it demonstrated the transformative and potentially destructed power of a large eruption.

Moore and Trusdell’s map indicates that there were eleven lava flows that traveled northeast from the ERZ over the past 1,500 years; eight of which 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 and flows have reached the coastline about every 200 years. Though, lava flows that have reached the coast are relatively narrow, so that the odds that the Garrett property will be overrun by lava within the next few centuries are relatively low over the expected functional lifetime of the structure.

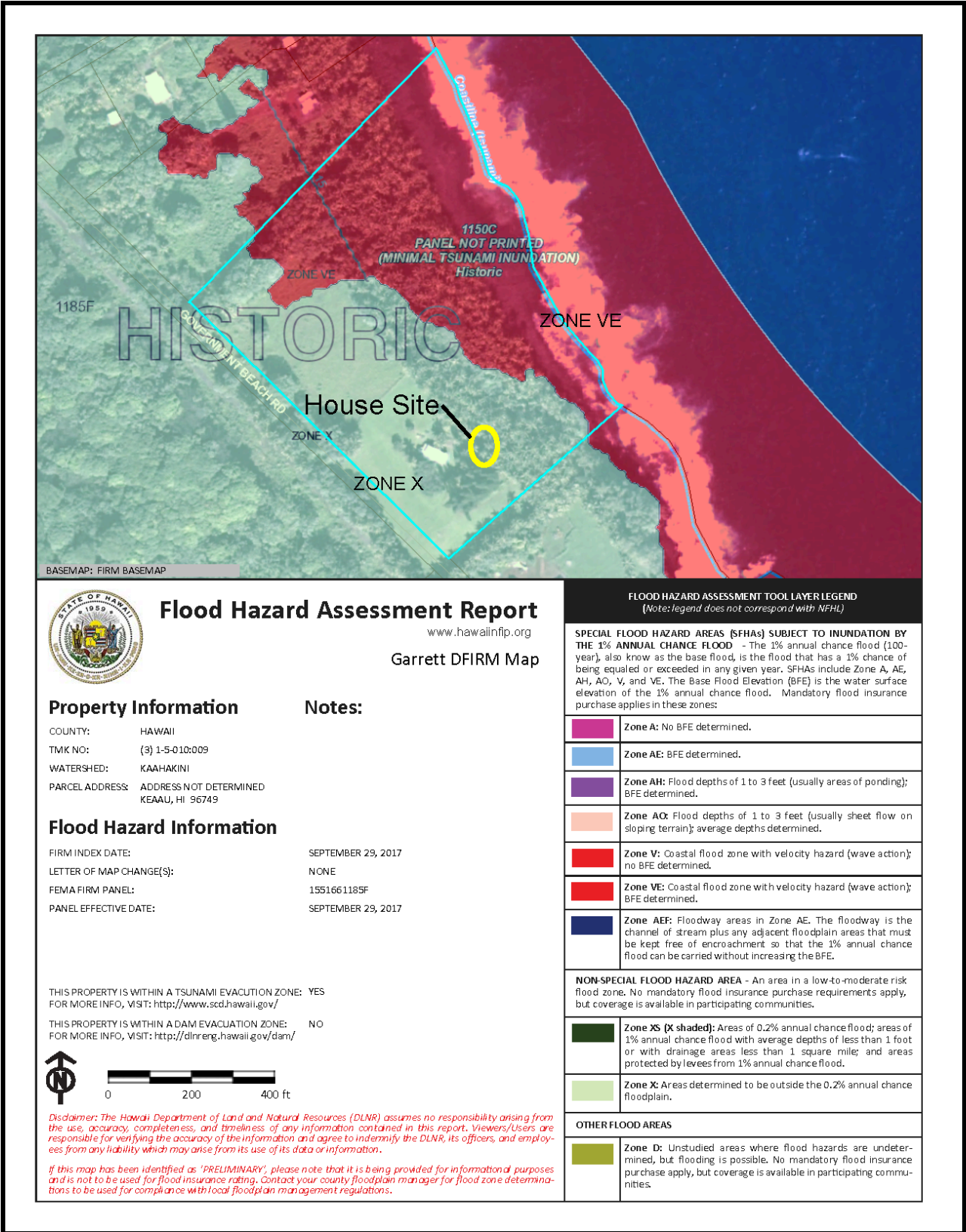
The Island of Hawai‘i experiences high seismic activity and is at risk from earthquake damage (USGS 2000), especially to structures that are poorly designed or built, as the 6.7-magnitude quake of October 2006 and the 6.9-magnitude quake of May 2018 demonstrated. The portion of the property site proposed for improvement is moderately sloped, near the summit of the roughly 50-foot high littoral cone. In that there are appropriate setbacks to areas of steeper slopes, with a minimum setback of about 212 feet to the shoreline, there does not appear to be a substantial risk at the site from subsidence, landslides or other forms of mass wasting.

Flood Zones and Coastal Conditions and Erosion

The 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 (DLNR) at <http://gis.hawaiiinfip.org/fhat/>. As shown on the **Flood Zone Map**, the area of the proposed house site is classified in Flood Zone X, as shown in **Figure 11**, which are defined as areas outside the mapped 500-year floodplain, with minimal risk of tsunami inundation.

The proposed home site is located about 40 feet above sea level, about 230 feet back from the shoreline shelf, in an area that is clearly out of the flood zone. The proposed home site is located near the top of littoral cone and completely outside the area affected by high waves and tsunami inundation. Although storm waves generated by Tropical Storm Iselle, which hit the Puna coastline on August 8, 2014, clearly affected the shoreline here, there were no effects to the proposed home site. 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 Applicant has also decided to site the home a sufficient distance from the shoreline near the *mauka* edge of the hill in order to completely avoid wave damage and minimize spray from waves. Furthermore, the very conservative siting of the home in this position at about 40 feet above sea level ensures that even with a sea level rise of five or more feet above its current level, the home will continue to remain well out of the effective flood zone. Even extremely large rises in sea level of the type that would essentially require the relocation of much of downtown Hilo and Honolulu would not affect the home in its proposed location.

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**Figure 11 Flood Zone Map
Garrett Single Family Residence and Farm**

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With regard to the coastal erosion process that may be present along the coastal portion of the property, a Coastal Erosion Study was performed for the property by tesARCH (Timothy E. Scheffler, Ph.D and John P. Lockwood, Ph.D). The tesARCH study found that the *pāhoehoe* flow that the type of hard rock coastline as found fronting the property can susceptible to High Magnitude-Low Frequency type events, there is little indication of erosion along this edge. An estimate of erosion rates was calculated based on the physical characteristics along this coastal portion and the age of the lava flows, yielding minimum erosion rate of between 1.68 and 3.48 inches/year, based on the range for the age of the leading edge of lava flow at the coastal interface, with a mean rate of 2.58 inches/year. Historical aerial photos dating back to 1954 were also compared with recent satellite imagery and no discernable change to the coastline could be detected through a comparison of the images. However, accounting for the possibility of error, given the scale and resolution of the photos used, a maximum possible rate of erosion was projected to be between 2.2 to 3.8 inches/year, which would be comparable to the mean rate derived based on the geo-historic data. Combining the two methods employed and accounting for the accelerating effects of anticipated sea level rise and global warming, the tesARCH Study concluded that there is an estimated average annual erosion rate along the coastal edge of the property in the order of 2.58 inches or 0.215 feet per year.

For the purposes of meeting the application submittal requirements and in accordance with the standards within Exhibit 4 of Chapter 13-5, HAR, for determining the minimum shoreline setback for a single-family home in the Conservation District, a minimum shoreline setback is determined as 40-feet plus 70 times the average annual coastal erosion rate, as determined by a coastal erosion study. **Based on a coastal erosion rate provided from the tesARCH Study of 0.215 ft./yr., the minimum shoreline setback for the property would need to be at least 55.05-feet (40 ft. plus 70×0.215 ft./yr.).** In that the applicant is proposing a shoreline setback of greater than 212 feet, which far exceeds the minimum setback calculated per the DLNR standards, there would appear to be an ample margin of safety in protecting from the potential long-term impacts from coastal erosion at the property. A copy of the **Coastal Erosion Study** for site, which includes a full description and analysis of the geological conditions of the property and methodology for calculating the average annual rate of coastal erosion, can be found in **Appendix A** of this application.

Flora and Fauna

As part of a Draft Environmental Assessment that accompanies this Application, a survey of the flora and fauna found on the site was conducted in April 2019 by biologist, Ron Terry, PhD. As noted, the property is almost equally divided between

the coastal and farm portions with a clear demarcation between the two in terms of the site topography and vegetative character of the two areas.

As seen from the aerial photo in **Figure 3**, the decades of prior farming and grazing on the property has left the *mauka* half of the property as woody pasture lands, with numerous fruit trees and weedy trees, shrubs, found primarily along the edges, as well as remnant crops such as taro and squash. In terms of the remnants of original native trees that might be found, 'Ōhi'a is no longer present and, aside from *hala*, no other native trees are found on the property.

On the *makai* half of the property, the vegetation consists of a coconut and *hala* forest interspersed with the occasional invasive tree species that are common to the area, and with an understory of ferns, sedges and grasses. There is a narrow band of truly shoreline vegetation along the shoreline that consists of primarily *naupaka* and *mau'u 'aki'aki* (*Fimbristylis cymosa*). In one roughly 50-foot long, 10-foot wide area, in the eastern portion along shoreline, are found several clumps of *Ischaemum byrone*, a State and federally listed endangered grass known to grow on pahoehoe close the edge of sea cliffs. Interestingly, the grass is found in an area that is frequently trodden by fishermen traveling up and down the coast and, despite the trampling it receives, the tough, clumpy grass in this area has survived and even thrived. Nevertheless, as noted above, the Applicant will implement measures to further protect the grass by encircling the grass patches with rock curbs using one or two courses of dry-stacked rocks. A full **List of Plant Species** detected on the site in the course of the Dr. Terry's botanical survey is provided in **Table 2**. Additionally, the general vegetative character of the site is shown in a series of **Site Photos** found in **Figure 12**. Aside from *Ischaemum byrone*, all native plants found on the property are very common in the region, on the island, and throughout the Hawaiian Islands.

Regarding the fauna found on the property, the avifauna observed included primarily common alien species, including Japanese white-eyes (*Zosterops japonicus*), cattle egrets (*Bubulcus ibis*), domestic chickens (*Gallus gallus domesticus*), common mynas (*Acridotheres tristis*), northern cardinals (*Cardinalis cardinalis*), spotted doves (*Streptopelia chinensis*), striped doves (*Geopelia striata*) and house finches (*Carpodacus mexicanus*). The only native bird seen was the *kolea* or Pacific golden-plover (*Pluvialis fulva*), a migratory bird commonly found on both shorelines and pastures from late August to late April. Other migratory shorebirds, such as the ruddy turnstone (*Arenaria interpres*) and wandering tattler (*Heteroscelus incanus*) are often seen feeding along the Puna coastline are likely to be present *makai* of the Garrett property. The seabird black noddy (*Anous minutus melanogenys*) flies near cliffs over nearshore waters. It nests in crevices and caves in lava (especially pahoehoe) sea cliffs; no black noddy nests were observed on the low cliffs in front of the property.

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Table 2. Plant Species Observed on Property

Scientific Name	Family	Common Name	Life Form	Status*
<i>Ageratum conyzoides</i>	Asteraceae	Ageratum	Herb	A
<i>Ageratum houstonianum</i>	Asteraceae	Ageratum	Herb	A
<i>Alocasia macrorrhizos</i>	Araceae	'Ape	Shrub	PI
<i>Aloe vera</i>	Agavaceae	Aloe	Shrub	A
<i>Araucaria columnaris</i>	Araucariaceae	Cook Pine	Tree	A
<i>Artocarpus altilis</i>	Moraceae	Breadfruit	Tree	A
<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>Catharanthus roseus</i>	Apocynaceae	Madagascar Periwinkle	Shrub	A
<i>Cecropia obtusifolia</i>	Cecropiaceae	Cecropia	Tree	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>Citrus sp.</i>	Rutaceae	Citrus	Tree	A
<i>Clidemia hirta</i>	Melastomataceae	Koster's Curse	Herb	A
<i>Clusia rosea</i>	Clusiaceae	Autograph Tree	Tree	A
<i>Colocasia esculenta</i>	Araceae	Taro	Shrub	A
<i>Cocos nucifera</i>	Arecaceae	Niu	Tree	PI
<i>Commelina diffusa</i>	Commelinaceae	Honohono	Herb	A
<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 javanicus</i>	Cyperaceae	'Ahuawa	Sedge	I
<i>Cyperus halpan</i>	Cyperaceae	Cyperus	Sedge	A
<i>Cyperus polystachyos</i>	Cyperaceae	Pycrus	Herb	I
<i>Desmodium tortuosum</i>	Fabaceae	Florida Beggarweed	Herb	A
<i>Desmodium triflorum</i>	Fabaceae	Tick Clover	Herb	A
<i>Dieffenbachia seguine</i>	Araceae	Dumb Cane	Herb	A
<i>Digitaria ciliaris</i>	Poaceae	Digitaria	Herb	A
<i>Eleusine indica</i>	Poaceae	Goose Grass	Grass	A
<i>Emilia sonchifolia</i>	Asteraceae	Pualele	Herb	A
<i>Epipremnum pinnatum</i>	Araceae	Pothos	Vine	A
<i>Erechtites valerianifolia</i>	Asteraceae	Fireweed	Herb	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>Hippobroma longiflora</i>	Campanulaceae	Star of Bethlehem	Herb	A
<i>Ischaemum byrone</i>	Poaceae	Hilo Ischaemum	Herb	END
<i>Ipomoea triloba</i>	Convolvulaceae	Little Bell	Vine	A
<i>Kyllinga brevifolia</i>	Cyperaceae	Kyllinga	Herb	A

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Table 2, continued				
Scientific Name	Family	Common Name	Life Form	Status*
<i>Lantana camara</i>	Verbenaceae	Lantana	Shrub	A
<i>Lepisorus thunbergianus</i>	Polypodiaceae	Pakahakaha	Fern	I
<i>Macaranga mappia</i>	Euphorbiaceae	Macaranga	Shrub	A
<i>Macaranga tanarius</i>	Euphorbiaceae	Macaranga	Tree	A
<i>Mangifera indica</i>	Anacardiaceae	Mango	Tree	A
<i>Megathyrsus maximus</i>	Poaceae	Guinea Grass	Grass	A
<i>Melochia umbellata</i>	Sterculiaceae	Melochia	Tree	A
<i>Monstera deliciosa</i>	Araceae	Monstera	Vine	A
<i>Morinda citrifolia</i>	Rubiaceae	Noni	Tree	
<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>Persea americana</i>	Lauraceae	Avocado	Tree	A
<i>Pluchea carolinensis</i>	Asteraceae	Sourbush	Shrub	A
<i>Phymatosorus grossus</i>	Polypodiaceae	Laua'e	Fern	A
<i>Pseuderanthemum carruthersii</i>	Acanthaceae	Purple Pseuderanthemum	Shrub	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>Scaevola taccada</i>	Goodeniaceae	Beach Naupaka	Shrub	I
<i>Scleria testacea</i>	Cyperaceae	Scleria	Herb	I
<i>Senna occidentalis</i>	Fabaceae	Coffee senna	Herb	A
<i>Sesuvium portulacastrum</i>	Aizoaceae	'Akulikuli	Herb	I
<i>Sida rhombifolia</i>	Malvaceae	Broom Weed	Herb	A
<i>Spathoglottis plicata</i>	Orchidaceae	Philippine Ground Orchid	Herb	A
<i>Sphagneticola trilobata</i>	Asteraceae	Wedelia	Shrub	A
<i>Sporobolus africanus</i>	Poaceae	Smutgrass	Herb	A
<i>Syzygium malaccense</i>	Myrtaceae	Mountain Apple	Tree	A
<i>Terminalia catappa</i>	Combretaceae	False Kamani	Tree	A
<i>Tournefortia argentea</i>	Boraginaceae	Tree Heliotrope	Tree	A
<i>Trema orientalis</i>	Ulmaceae	Gunpowder Tree	Tree	A
<i>Vigna marina</i>	Fabaceae	Nanea, Beach Pea	Vine	I

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

Figure 12 Site Photos



View east from the entry gate showing the existing Cook pines and variegated pandanus (hala) planted along the existing gravel driveway into the property.



View west from near the crest of the hill across the pasture area in the mauka farm portion of the property.

Figure 11 Site Photos



View of the family burial plot at the top of the hill, near the prior Kamahele house site.



View east towards the proposed house site near the makai edge of the farm portion of the property.

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View east across the coconut and hala forested area within the makai coastal portion of the property.



View northwest along the coast showing the rocky coastal conditions backed by the common shoreline vegetation consisting of primarily coconut and the native naupaka.

Figure 12 SITE PHOTOS
Garrett Single Family Residence

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Native forest birds would be not expected to be found at the project site due to its low elevation, alien vegetation and lack of adequate forest resources. However, it is not inconceivable that a few Hawai'i 'amakihi (*Hemignathus virens*) would sometimes be present, as some populations of this native honeycreeper appear to have adapted to the mosquito-borne diseases of the Hawaiian lowlands.

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*).

Aside from the bat, other mammals in the project area are all introduced species, including the horses (*Equus ferus caballus*) and sheep (*Ovis aries*) that graze the property, feral cats (*Felis catus*), feral pigs (*Sus scrofa*), small Indian mongooses (*Herpestes a. auropunctatus*) and various species of rats (*Rattus* spp.) that wander in and out. Several species of non-native reptiles and amphibians may also be present. A green anole (*Anolis carolinensis*) was seen during the survey, and the highly invasive coqui frog (*Eleutherodactylus coqui*) is nearly universally found in lowland Puna. None of these feral animals 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.

In order to avoid impacts to the endangered but regionally widespread terrestrial vertebrates listed above, the applicant will commit to conditions that are proposed for the requested CDUP. Specifically, construction would 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. If any tree cutting 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 found to be present, no land clearing would be allowed until October, when hawk nestlings would have fledged. Finally, the applicant agrees 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.

Archaeological, Historic and Cultural Resources

With regards to the historical and cultural resources on the subject property, an Archaeological Inventory Survey (AIS) Report, based on a survey of the full property, was prepared in August 2019 by archaeological firm, Scientific Consultant Services, Inc. (SCS). As part of the AIS Report, previous archaeological studies conducted in the general project area were reviewed to provide a working model for the types and density of features that the archaeologists could expect on the project site. Based on previous archaeological studies, historical research and family interviews it was expected that pre-Western Contact to early Historic era agricultural and habitation features would be located on the property. These features would include the Kamahele House Site 7476, rock walls, rock clearing mounds and possible enclosures. It was also hypothesized from the prior studies that a State Inventory of Historic Sites (SIHP) Site 50-10-45-20598, a remnant segment of trail located along the coastal cliff on the property to the southeast, might continue onto the Garrett property.

As a result of a pedestrian survey conducted in March and April 2019 by SCS Senior Archaeologists Glenn Escott M.A. and Suzan Escott, B.A., five archaeological sites were identified in the project area. Three of the sites (Sites 50-10-45-7476, 18980 and 18987) were previously recorded in a prior report and two were previously undocumented sites. The three previously identified sites include the cement foundation at the Kamahele House Site (Site 7476), an agricultural complex (Site 18980) located in the eastern coastal portion of the property, and the family burial plot (Site 18987), located near the prior Kamahele House Site. Two of the newly recorded sites include the rock wall along the southeast, southwest and northwest boundaries of Parcel 009 (Site TS1) and a short rock wall segment (Site TS2) in the southeast corner of the property. No portion of SIHP Site 50-10-45-20598, a remnant segment of trail located at the top of a high coastal cliff on the adjacent property to the southeast, was found on the Garrett property. It appears that the trail led to the shoreline pahoe hoe bench here, as there is no high cliff on the Garrett property.

The research performed with the AIS determined that the sites are primarily from the Historic Era, although Site 18980, an agricultural complex, could possibly have a pre-Western Contact Era component. The Site 18980 features are constructed in the manner of and having characteristics common to Historic Era features. The AIS report notes that all the sites identified on the Project Site were constructed by the Kamahele and Kamoe families as part of a working farm and were utilized up through the modern era.

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The five archaeological sites identified during the AIS study were assessed for significance as outlined in Hawai'i Administrative Rules §13-284-6, which is discussed in detail in **Appendix B**. The significance determination and recommended treatments for the sites are summarized in **Table 3**, below. Preservation at Site 18980 and Site 18987 will consist of avoidance and protection (conservation) per HAR §13-277-3(1). Site 18980 will be preserved in accordance with an Archaeological Preservation Plan and Site 18987 will be preserved in accordance with a Burial Site Component of the Preservation Plan that is to be prepared following SHPD approval of the AIS and its findings. It is worth noting that neither of the two sites designated for preservation and protection would be impacted from the planned development and uses on the property. Site 18980, which is an agricultural complex located in the south eastern corner and coastal portion of the property is far removed from the area of the proposed improvements, and setbacks and boundary treatments are planned with Site 18987, an historic grave site, to be protective of the grave site and provide a respectful separation from the planned residence and associated improvements. A copy of the **Archaeological Inventory Survey Report** for the property is enclosed for reference as **Appendix B** of this Application.

Table 3. Archaeological Site Significance and Recommended Treatments

SIHP #50-10-45:	TYPE	FUNCTION	SITE AGE	SIGNIFICANCE CRITERIA*	RECOMMENDED TREATMENT
7476	Kamahele House	Habitation	Historic Era	d	No Further Work
18980	Complex (Agriculture)	Rock walls and rock mounds	Pre-Contact to early post-Contact Era	d	Preservation
18987	Burials	Historic graves	Historic Era	d, e	Preservation
TS-1	Rock Wall	Property Boundary	Historic Era	d	No Further Work
TS-2	Rock Wall	Road edge	Historic Era	d	No Further Work

*(a) Associated with events that have made a significant contribution to the broad patterns of our history, or be considered a traditional cultural property).

(b) Associated with the lives of persons significant in the past property.

(c) Embodies distinctive characteristics of a type, period, or method of construction, or represents a significant and distinguishable entity whose components may lack individual distinction.

(d) Has yielded or may be likely to yield, information important in prehistory or history property

(e) Has an important value to 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, oral accounts-- these associations being important to the group's history and cultural identity property.

Similarly, a Cultural Impact Assessment (CIA) Report of the property and its history was prepared by SCS in November 2019, was prepared to identify the potential impacts from the project to any traditionally valued cultural or historical resources, as well as to any cultural practices or beliefs.

When assessing potential cultural impacts to resources, practices, and beliefs, input is gathered from community members with genealogical ties and/or long-standing residency relationships to the study area, as it is 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. As part of the CIA Study, consultation was sought from Kamaile Puluole-Mitchell of the Office of Hawaiian Affairs (OHA); SHPD Burial Sites Specialist, Jordan Kea Calpito; SHPD Hawai'i Island Archaeologist, Sean Naleimaile; and Hawai'i Island Burial Council (HIBC) Member, Kalena Blakemore. Consultation was also conducted at the property with members of the Kamahale and Lui families, which have direct ties to the property. The Kamahale family members are related to "Sonny" Kamahale who first purchased the parcel as a homestead property; the Lui family members are descendants of the Kea family, which was awarded the original Land Grant (Grant 1014) that included the current property, and both families are said to have descendants buried at the family burial plot on the property. Additionally, a notice describing the proposed residence and its location and inviting consultation was published in the June 2019 edition of the Office of Hawaiian Affairs (OHA) newspaper, Ka Wai Ola. Public notices were also published in the Honolulu Star-Advertiser and the Hawai'i Tribune Herald. The public notices, however, did not generate any additional responses from the public.

In the analysis of the Project's potential impact on cultural resources, practices and beliefs, the CIA Study found that the only cultural practice associated with the Project Area is fishing. Mr. Garrett, the applicant and property owner, has stated that the Kamahale and Lui families are welcome on the property on a managed basis, that is with access arranged with the owner upon request by the individual family members, and that he will not prevent or impede access along the property shoreline for fishing. Based on the results of the Archaeological Inventory Survey and the Cultural Impact Assessment, the CIA Study concludes that no traditional cultural practices will be affected by the proposed project and there will be no direct adverse effect upon cultural practices in the broader project area and region.

Additionally, pursuant specifically to Act 50 related to addressing the effects on Hawai'i's culture, and traditional and customary rights, the CIA Study finds that the proposed Project will not affect the exercise of native Hawaiian rights or any ethnic group, related to gathering, access or other customary activities. A copy of the **Cultural Impact Assessment Study** is found for reference in **Appendix C** of this application.

EVALUATION CRITERIA

The Department or Board will evaluate the merits of a proposed land use based upon the following eight criteria (Ref. Section 13-5-30 ©):

- 1. The Purpose of the Conservation District is to conserve, protect and preserve the important natural and cultural resources of the State through appropriate management and use to promote their long-term sustainability and the public health, safety, and welfare (Ref. Section 13-5-1). How is the proposed land use consistent with the purpose of the Conservation District.**

The proposed use of the subject property for a single-family residence and its related facilities and the ongoing "nonconforming agricultural uses are identified uses within the Conservation District. The owner is committed to management of the site in a manner that will help to conserve, protect and preserve the natural resources and areas of remaining native vegetation on the property.

The primary natural and cultural resources associated with the area of the property are the coastal related resources and native vegetation found primarily in the coastal portion. The shoreline along the property's *makai* boundary is defined by a low, stepped cliff backed by a rocky and bolder laden coastline, and while there are no beaches present or safe areas to enter the ocean, the coastal area is known to be used by those walking along the shoreline to fish. The proposed uses will be sufficiently set back from the shoreline so as to have no impact to the coastal related resources or on the public's ability to access or utilize the coastal resources that front this property.

Those trees and plants that are common to the area and of potential cultural significance include primarily *hala* and coconut, which are concentrated primarily in the coastal portion of the property. While two younger *hala* trees, which were planted by a prior owner in the area of the proposed house site, will need removed in the course preparing the house site and its realigned driveway approach, these trees will be relocated nearby in the area along the realigned gravel driveway. Part of the Landscape Plan for the property includes the removal of up to six coconut

trees located at the proposed house site, which should not have any measurable impact to this resource as coconuts are abundant throughout the property, especially in the coastal area and near the shoreline. In terms of additional landscaping, very few new plantings are planned in association with the proposed residence. Additional landscaping would be limited to plantings of *ti* in the area of the existing burial site, as recommended by the lineal descendants of the property, to serve as a vegetative buffer, and re-grassing of the areas of the realigned gravel driveway and disturbed areas around the residence. Overall, the improvements and uses planned for the property have been planned in areas of prior disturbance and in a manner so as to minimize the potential impact natural character, as well as to the natural and cultural resources of the site.

2. How is the proposed use consistent with the objectives of the subzone of the land on which the land use will occur? (Ref. Sections 13-5-11 through 13-5-15)

The objective of the **Resource** subzone "...is to develop, with proper management, areas to ensure sustained use of the natural resources of those areas."

Single Family Residences and Nonconforming Agricultural land uses, including the structures that are accessory to those facilities or uses, are identified uses in the Resource subzone under HAR 13-5-24, R-7, HAR 13-5-7 and HAR 13-5-22, P-9 which lists the following as identified land uses and the required permits (with the letter D indicating a Board permit approval is required, and the letter B indicating a Site Plan approval is required for such uses:

(D-1) A single family residence that conforms to design standards as outlined in this chapter.

(B-1) Construction or placement of structures accessory to existing facilities or uses.

The continuation of the existing agriculture on the property is considered a "nonconforming use," as defined under HAR 13-5-7 to mean: "...the lawful use of any building premises, or land for any trade, industry, residence, or other purposes which is the same as and no greater than that established prior to October 1, 1964 or prior to the inclusion of the building, premises, or land within the conservation district. The ongoing agricultural uses on the property in the form of planting, cultivating, and harvesting crops and subsistence livestock, having being continued on the property since the prior owner's initial purchase of the property as a "homestead property" in the early 1900's up to the present, would clearly meet the definition of a "nonconforming use".

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The design and construction of the proposed single-family residence, which conforms 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 delineated in this application and the enclosed Environmental Assessment. Additionally, construction of the owners' residence on the property will allow for the continued use of the property for subsistence farming purposes and for the continual monitoring and management of the property in a manner that is protective of those natural resources that are present.

The proposed dwelling will be built to comply with all Federal, State and County regulations and is designed to ensure that the structure will be safe and in a manner that minimizes the potential risks from natural hazards to the inhabitants. In accordance with the design standards within HAR 13-5-41, Exhibit 4, the total floor area for the proposed residence will be less than 5,000 square feet, and the maximum height of the structure will be less than 25-feet. Additionally, the minimum side, front, and back yard setbacks of 25 feet will be met. Further, in that the planned residence would be located a minimum of 212 feet from the shoreline, this would far exceed the minimum the shoreline setback established by standards within HAR 13-5-41, Exhibit 4, which is calculated to be 55.05 feet for this coastal property. Also, in conformance with the Design Standards, the proposed residence has been designed to be compatible with the surrounding environment by incorporating such measures as:

- * Use of appropriate landscaping with the use of primarily native species;
- * Use of "earth-tones" in the selection of roof and building colors;
- * Use of a (DOH approved) wastewater collection system;
- * Limiting the disturbed area to only those areas required for the construction of the residence and related infrastructure and siting and designing the structure in consideration of the existing topography so as to minimize the amount of grading required;
- * Consolidating the uses in the residence within a single, connected structure with a single kitchen; and
- * Conforming with all applicable building and grading code, and setback requirements.

In this way, the proposed residence would be in full conformance with the Department's design standards for a single-family residence in the State Conservation District, as delineated in HAR 13-5-41, Exhibit 4. The Farm and Utility Shed structure would utilize the foundation of the previous house that had been destroyed by a fire. This structure, the water storage tank, and well and pump house are all located on previously constructed or disturbed areas, adjacent

to the prior house site and in the area of the prior water tank, so as to reduce the amount of land alteration required for these structures.

3. Describe how the proposed land use complies with the provisions and guidelines contained in Chapter 205A HRS, entitled “Coastal Zone Management”.

The proposed land use complies with provisions and guidelines contained in Chapter 205A, Hawaii Revised Statutes (HRS), entitled Coastal Zone Management. Single-family residences and agricultural uses may be determined to be exempt actions 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, nor be exposed to coastal hazards. Public access to and along the shoreline area will not be impacted and there will be no effect on the public's use of this shoreline area. An SMA Assessment Application has been prepared and will be submitted to the Hawaii County Planning Department in order to specifically address the SMA related issues. With the SMAA Application, the Planning Director will be asked to make the determination that the proposed development of the single-family and related uses are not considered a “development” under Special Management Area Rules and Regulations of the County of Hawai‘i, Section 9-4 (10) (B) and, therefore, would not require approval of a SMA Use Permit to allow for the proposed uses. A request will also be made to the County Planning Director to exempt the project from the requirement of submitting a certified map of the shoreline, given the hardened and defined nature of the shoreline in the area and the considerable distance that the proposed structures and uses will be setback from the shoreline. In order to meet the County's application processing requirements, the submittal of the SMA Assessment Application generally follows after the State DLNR's acceptance of the Draft Environmental Assessment. A copy of the County's SMA determination will be provided to the Department and its Office of Conservation and Coastal Lands immediately upon receipt from the County Planning Department.

4. Describe how the proposed land use will not cause substantial adverse impacts to the existing natural resource within the surrounding area, community or region.

Because the careful planning of the project and the protection given to areas of

existing native species and potentially threatened or endangered plant species, the planned use of the property for the single-family residence and related uses will not result in any significant adverse impacts to the existing natural resources, surrounding area or community. In fact, through the careful planning that includes ample setbacks from the coastal resources and from potentially sensitive historical site, as well as the protection of the existing native plantings, and through the ongoing monitoring and management of the property afforded by the creation of the family's residence, the proposed use of the property will have a generally positive and supportive impact to the native ecosystems.

Also, given the disturbed nature of the areas of the proposed improvements, and by the careful planning of improvements in relation to the existing topography, the amount of grading required for the residence and farm related improvements will be minimized. No effect on any coastal ecosystem will occur because of the physical and topographic separation from the ocean, the broad vegetated area fronting the proposed home site that will be left undisturbed, and the special precautions planned for preventing soil runoff during construction of the home and its related facilities. As such, the proposed construction of the single-family home and its related improvements, together with the owner's commitment to management of the site will serve to conserve, protect and preserve the natural resources on the subject property.

5. Describe how the proposed land use, including buildings, structures, and facilities, is compatible with the locality and surrounding areas, appropriate to the physical conditions and capabilities of the specific parcel or parcels.

The subject parcel is a portion of a grouping of coastal lots of various sizes located along the Government Beach Road in the area directly southeast of the Hawaiian Paradise Park Subdivision, in the area of the historic Maku'u Village. The property, often referred to as the Kamahale Homestead or Kamahale Farm, was originally part of the homestead lots that were created in the early 1900s. While there is a long history of subsistence farming in the area, today, one only finds the occasional use of properties for grazing animals, such as sheep, goats, and horses, such as the subject property. Most of the properties along this portion on the makai side of the Government Beach Road show signs of prior use and have single family homes, including the adjacent properties to the northwest and those further to the north along Kamahale Place. The adjacent property along the southeast boundary, which is also in the State Conservation District, has been developed with single family residence and farm and the properties to the southwest, which are *mauka* of the Government Beach Road and outside the Conservation District,

are typically larger parcels that are generally unused and overgrown or are partially cleared and used for ranching.

The construction activities associated with this single-family residence, farm shed and related improvements will be confined solely to the owner's lot and will not pose any adverse impact to the natural resources of the area, community or region. The required setbacks and buffers have been integrated as part of the site planning. The planned use of the property as a homesite with the continuation of the existing agricultural uses, would be consistent with the existing and planned uses of adjacent properties and will not negatively affect how these properties are utilized. The proposed residence and farm shed are planned towards the interior of the property and are located so as to be far removed from the adjoining properties and are of a scale that is appropriate to the physical conditions and capabilities of the site.

6. Describe how the existing physical and environmental aspects of the land, such as natural beauty and open space characteristics, will be preserved or improved upon.

The proposed use of the subject property for a single-family residence and commitment to management of the site will conserve, protect and preserve the natural features on the subject property. In fact, a distinguishing characteristic of the property are the open pasture lands along the hillside and the *mauka* portions of the property that support several horses and sheep and are backed by a palm and *hala* forest in the coastal portion. The proposed residence would replace the prior house structure that had been on the property for decades and had been destroyed by a fire and the farm and utility shed would be built on the site of the prior home to help minimize the amount of site modification needed for this structure. As such, by locating both structures and their associate improvements (well and pump house and water storage tank) in the previously disturbed area at the end of the existing drive and the site of the prior home, by continuing the existing agricultural use over much of the property, and by leaving the coastal portion of the property undisturbed, the applicant will be preserving the very open space characteristic and natural beauty of the site that distinguishes this property.

7. If applicable, describe how subdivision of land will not be utilized to increase the intensity of land uses in the Conservation District.

The proposed action involves the construction of a single-family residence on a single lot and does not require further subdivision and, therefore, would not increase the intensity of land use in the Conservation District.

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

The public use of the area is limited to those who occasionally walk along the Government Beach Road or traverse the coastline to fish. The planned development of a single-family residence and associated improvements, being setback a significant distance from the shoreline, will have no impact to the public or public use of the shoreline area. By allowing the applicant to build a home and to use the property as his primary residence, will prevent the property from being subject to vagrant use that had previously been an ongoing problem on this property and led to the despoiling the natural beauty of the site and destroying the native vegetation in the coastal portion of the property. Further, the family's presence on the property will help discourage the illegal dumping that had historically occurred along the Government Beach Road and would thereby help maintain a cleaner and safer environment for the public who walk along this road. Importantly, the use of the property as the site for the owner's primary home and creation of a farm and utility shed, will allow the owner to manage and maintain the property, control the spread of invasive species, be protective of the coastal resources and native species and support the continued agricultural uses and the open space characteristics of the property that are intrinsic to its natural beauty. In this way, the proposed use can be seen as being largely beneficial to the health, safety and welfare of the area.

CULTURAL IMPACTS

Articles IX and XII of the State Constitution, other state laws, and the courts of the State require government agencies to promote and preserve cultural beliefs, practices, and resources of Native Hawaiians and other ethnic groups.

Please provide the identity and scope of cultural, historical and natural resources in which traditional and customary native Hawaiian rights are exercised in the area.

The property does not contain any springs, land features, or caves that might be cultural importance, and no gathering of plant material is noted from the property.

A Cultural Impact Assessment (CIA) Study was conducted specifically to determine the Project's potential impacts on the cultural resource, practices and beliefs of the project area. In its analysis, the CIA Study found that the only cultural practice associated with the Project Area is fishing. The applicant and property owner has stated that the Kamahale and Lui families are welcome on the property on a managed basis and that he will not prevent or impede access along the property shoreline for fishing. Based on the results of the Archaeological Inventory Survey and the Cultural Impact Assessment, the CIA Study concludes that no traditional cultural practices will be affected by the proposed project and there will be no direct adverse effect upon cultural practices in the broader project area and region. Additionally, in specifically addressing the Project's potential effects on Hawai'i's culture, and traditional and customary rights, the CIA Study finds that the proposed Project will not affect the exercise of native Hawaiian rights or any ethnic group, related to gathering, access or other customary activities.

Identify the extent to which those resource, including traditional and customary Native Hawaiian rights, will be affected or impaired by the proposed action.

As noted above, based on the findings of the Cultural Impact Assessment, no known traditional or customary Native Hawaiian rights will be affected or, otherwise, impaired by the proposed action.

What feasible action, if any, could be taken by the BLNR in regard to your application to reasonably protect native Hawaiian rights?

The BLNR, through its permitting process for uses in the Conservation District and the applicant's agreement to comply with the requirements of the Conservation District Use Permit, can insure that the approved work in no way affects or impairs the exercise of traditional or customary Native Hawaiian rights in the property area, to the extent that such practices are provided by Hawaii statutory or case law.

The Applicant is aware that the exercise of traditional, customary or religious practices of native Hawaiians in the immediate area of the property is provided for by the State Constitution and State law and expects that a condition ensuring the protection of such practices will be codified within the requested Conservation District Use Permit approval.

OTHER IMPACTS

Does the proposed land use have an effect (positive or negative) on public access to and along the shoreline and along any public trail.

According to the County of Hawai'i (<http://www.hawaiicounty.gov/pl-shoreline-access-big-island>), there are no official *mauka-makai* shoreline public access routes in the area extending to the shoreline from the Government Beach Road, however, there are some driveways on currently vacant properties that are informally used. Lateral access along the rocky shoreline in this portion, south of Hawaiian Paradise Park, is also possible, though difficult, and is practiced by a few fishers and gatherers that are occasionally seen fishing in the area.

The proposed construction of the owner's residence on the property, being setback a considerable distance from the shoreline, together with proposed measures to protect against any ground disturbance in the area *makai* of this setback, will ensure that the development would have no adverse impact on existing public access to and along the shoreline area, nor would the planned use of the property as the owner's principal residence or the continued agricultural uses impede the continual use of coastal area fronting the property.

Does the proposed use have any effect (positive/negative) on beach processes?

Typical of much of the southeastern Puna coastline, the coastal stretch fronting the property is characterized by a low rocky cliff fronting a rocky and boulder laden coastline bounded by steep submarine slopes, with no beaches or shallow offshore areas present. Given the rocky coastal conditions and the clear absence of any beaches in the area, there would be no potential impacts on beach processes in the area as a result of the proposed construction and related activities.

Will the proposed use cause increased sedimentation?

All runoff from impermeable surfaces will be retained on site and quickly absorbed into the porous ground. It should be noted that the driveway to the property will remain as a gravel drive, thereby encouraging water retention on the site and minimizing the potential for water runoff and erosion. The Applicant will ensure that the construction contractor performs all earthwork and grading in conformance with State and County regulations and grading for the realigned driveway and house site will include practices to minimize the potential for sedimentation, erosion and pollution of coastal waters, including the following additional measures:

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- The area of the shoreline setback (makai of the house site) will be marked and fenced at the construction area to avoid any possible disturbance to the ground or vegetation within setback area during construction activities;
- The construction contractor will be limited to the specific delineated construction work areas within the property in order to minimize the total amount of land disturbance;
- The contractor will take special precautions, including use of a dual-layer sedimentation control system in erosion prone areas, so as to not allow any sediment to leave the work areas, particularly towards the direction of the sea;
- Construction activities with the potential to produce ground disturbance will not be allowed during unusually heavy rains or storm conditions that might generate storm water runoff; and
- Cleared areas will be replanted or otherwise stabilized as soon as possible.

As such, given the extensive efforts to limit the amount of land disturbance and combination of protective measures that would be in place and followed in the course of construction, any threat of increased runoff or sedimentation from the property would be negligible.

Will the proposed use cause any visual impact on any individual or community?

The proposed residence would be located near the center of the property, far removed from neighboring residents, and would be at a scale and location that would not be visible from the nearest residents. Furthermore, by consolidating the planned structures in the area of the prior home site and continuing the existing agricultural uses on the property, the existing open character of the property will be retained. Importantly, no existing views of the shoreline or ocean from surrounding properties or adjacent public road will be impacted or obscured by the proposed improvements. As such, the visual impact of the proposed use to the surrounding residents or the community would appear to be largely positive as the combination of careful planning and sound stewardship will help to preserve the natural beauty of the site and not impact any important coastal views.

Please describe any sustainable design elements that will be incorporated in the propose land use (such as the use of efficient ventilation and cooling systems; renewable energy generation; sustainable building materials; permeable paving materials; efficient energy and water systems; efficient waste management systems; et al.).

The proposed residence will be built as a single structure, rather than detached components, which will support the efficient use of energy and materials, and will be designed in a manner that will facilitate the use of natural ventilation and lighting. Additionally, energy efficient appliances will be used throughout the house. The use of generous lanais along the east and west faces and an insulated roof structure to reduce the potential solar gain to the home, together with opportunities for natural ventilation, will reduce the need for air conditioning of interior spaces. The home will also be complemented with roof mounted photovoltaic and solar water heating panels which will greatly reduce the external energy requirements and the overall energy demand within the home.

Water for domestic use and fire protection will be obtained from an on-site well. The water storage, pumping, and filtration system will be monitored for any signs of leaks, to ensure an efficient use of available resources.

Wastewater from the residence will be treated by an individual wastewater system that is designed to meet or exceed the DOH requirements and to ensure an efficient processing of wastewater given the particular soil conditions of the site.

If the project involves landscaping, please describe how the landscaping is appropriate to the Conservation District (e.g. use of indigenous and endemic species; xeriscaping in dry areas; minimizing ground disturbance; maintenance or restoration of the canopy; removal of invasive species; habitat preservation and restoration; et al.).

In relation to the overall landscaping activities planned for the property, it is worth noting that few additional plantings are planned or required for this “homestead” property that has been occupied and used as an active farm for several decades. The additional landscaping planned as part of the site improvements would be limited to relocating two (2) of the smaller *hala* trees that located within a grouping of Cook Pines near the planned approach to the house site; removal of a portion of the cluster of existing Cook pines and as many as six (6) coconut palms in the area of the house site and driveway approach; re-grassing over disturbed areas surrounding the residence and the realigned driveway approach the house; and planting of ti (*Cordyline fruticose*) in the area of surrounding the family burial plot to serve as a vegetative buffer to define and protect this sensitive area. While the owner plans to remove and dispose of the Cook pines, the young *hala* trees will be relocated nearby to the area of the existing *hala* grove along the new driveway alignment. Those Cook pines to be removed will be disposed of on-site by means of chipping and use as a mulch in the areas throughout the property, and/or use as firewood by the applicant or neighbors .

The coastal area, which includes a concentration native coastal vegetation and a listed endangered grass along the shoreline, being topographically separate from the house site and farm area, would remain unaffected by the planned improvements. The vegetation within the coastal portion consists primarily of a dense coconut and *hala* forest, interspersed with common invasive trees, with an understory of ferns, sedges and grasses and with a strand of truly shoreline native vegetation consisting of *naupaka* and *mau'u aki'aki* found along the shoreline. Also, in a narrow strip along the eastern portion of the shoreline are found a number of clumps of a State and federally listed endangered grass, *Ischaemum byrone*, known to grow on pahoe hoe close the edge of sea cliffs. This grass is found in an area that is frequently trodden by fishermen who use or travel through this area and, despite the trampling, this tough and clumpy grass has survived and even thrived in this area. Nevertheless, the Applicant plans to take steps to further protect the grass by encircling the grass patches with rock curbs using one or two courses of dry-stacked rocks. This simple and unobtrusive measure, as recommended by the Ron Terry, Ph. D who conducted the botanical survey and prepared the Draft Environmental Assessment (Draft EA) that accompanies this application, has been found to be particularly successful in protecting the grass when applied at other sites along the coast where the grass is present.

With regards to minimizing ground disturbance, specific measures have been taken in the planning and design of the proposed structures to minimize the amount of grading and land alteration required. These measures include a realignment of the driveway approach to minimize the amount of grading required, designing the home in relation to the existing topography, siting all proposed improvements in previously disturbed areas and use of the prior house site as a foundation for the farm/utility shed. Additionally, special precautions, as delineated in the following section regarding Best Management Practices, are proposed as part of the house construction to minimize the potential for soil erosion or movement from the construction site, especially in the direction of the coastal area and sea.

In this way, the landscaping for the property would be especially appropriate for the Conservation District by promoting the use of species that are appropriate and common to the area; protecting the native species and native habitats; establishing ample setbacks; minimizing the requirements for ground disturbance; and by minimizing the potential for soil erosion and its potential impact to native coastal vegetation and resources. The use of xeriscape (drought tolerant) plantings would not be needed nor appropriate for this area which is subject to consistently heavy rainfall throughout the year.

Please describe the Best Management Practices that will be used during construction and implementation of the proposed land use.

Grading for the home construction will include practices to minimize the potential for sedimentation, erosion and pollution of any nearby stream waters. Land clearing and construction activities would occur on less than 0.2 acres of the project site and is expected to take less than three days. The applicant will ensure that the contractor performs 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, and
- (e) Any additional control measures imposed by the Board of Land and Natural Resources and the Department of Public Works.

Additionally, as part of construction, the applicants will require that the construction contractor implement the following Best Management Practices.

- The area of the shoreline setback (makai of the house site) will be marked and fenced at the construction area to avoid any possible disturbance to the ground or vegetation within setback area during construction activities;
- The construction contractor will be limited to the specific delineated construction work areas within the property in order to minimize the total amount of land disturbance;
- The contractor will take special precautions, including use of a dual-layer sedimentation control system in erosion prone areas, so as to not allow any sediment to leave the work areas, particularly towards the direction of the sea;
- Construction activities with the potential to produce ground disturbance will not be allowed during unusually heavy rains or storm conditions that might generate storm water runoff; and
- Cleared areas will be replanted or otherwise stabilized as soon as possible.

Please describe the measures that will be taken to mitigate the proposed land use's environmental and cultural impacts.

In the analysis of the Project's potential impact on cultural resources, practices and beliefs, the Cultural Impact Assessment (CIA) Study found that the only cultural practice associated with the Project Area is fishing. The applicant and property owner has stated that the Kamahele and Lui families are welcome on the property on a managed basis and that he will not prevent or impede access along the property shoreline for fishing. Based on the results of the Archaeological Inventory Survey and the Cultural Impact Assessment, the CIA Study concludes that no traditional cultural practices will be affected by the proposed project and there will be no direct adverse effect upon cultural practices in the broader project area and region. Additionally, pursuant specifically to Act 50 related to addressing the effects on Hawai'i's culture, and traditional and customary rights, the CIA Study finds that the proposed Project will not affect the exercise of native Hawaiian rights or any ethnic group, related to gathering, access or other customary activities.

As to the potential impacts to archaeological sites on the property and proposed mitigation, an Archaeological Inventory Survey of the property identified five (5) archaeological sites, three previously identified sites and two new sites. The five archaeological sites were assessed for significance and provided recommended treatments, which included preservation recommendations for two of the sites, the family burial plot (Site 18987) and an agricultural complex (Site 18980). Preservation measures at both sites will include both avoidance and protection. Site 18980 will be preserved in accordance with an Archaeological Preservation Plan and Site 18987 will be preserved in accordance with a Burial Site Component of the Preservation Plan that is to be prepared. It is worth noting that neither of the two sites designated for preservation and protection would be impacted from the planned development and uses on the property. Site 18980, an agricultural complex, is located in the southeastern corner and coastal portion of the property and is far enough removed from the area of the proposed improvements, both physically and topographically, so as not to be potentially impacted by the planned construction and uses on the property. Additionally, ample setbacks and boundary treatments are planned in association with Site 18987, an historic grave site, to be protective of the site and provide a respectful separation from the planned residence and its associated improvements.

With regards to potential impacts to the native flora, most of the native species found on site are concentrated in the coastal portion, including the native *hala* within the *hala* and coconut forest and the native *naupaka* and *mau'u 'aki'aki*, found along the shoreline. A large cluster of the variegated variety of *hala*, which

was planted by a prior owner is found along the end of the existing driveway. There are also clusters of the federally and state listed endangered Hilo *Ischaemum* grass found near the rock cliff edge at the shoreline in the eastern portion of the property. In that the proposed improvements are planned solely in *mauka* portion of the property, which is topographically separate from the coastal portion where the concentration of native species is found, the native species on the property would remain unaffected by the proposed development. Two young *hala* plants that were planted by a prior owner among the Cook pines in the area of the planned driveway approach to the residence will need to be relocated to an area along the new driveway alignment and the other existing *hala* in this area. The owner also plans to implement measures to protect the Hilo *Ischaemum* grass near the coast by encircling the grass patches with rock curbs using one or two courses of dry-stacked rocks to protect the grass from those traveling up and down the coast or visiting the property.

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. Specifically, construction will commit to refrain from activities that disturb or remove the vegetation between June 1 and September 15, when Hawaiian hoary bats may be sensitive to disturbance. If land clearing 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 Hawks 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.

The planned residence and related structures would be located in previously disturbed areas and would be setback an ample distance from the shoreline so as to minimize the potential impacts to the coastal area and related native shoreline vegetation. Grading of the site will be limited to those areas required for the proposed house site and the realigned portion of the existing driveway. The coastal area will be left undisturbed to serve as a natural vegetative buffer between the areas to be developed and the shore and, in addition to adhering to all federal, state, and county regulations regarding erosion and sedimentation control, a set of Best Management Practices (BMPs) would be implemented to minimize the potential threat of soil erosion, especially towards the area of the native shoreline vegetation and the sea.

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SINGLE FAMILY RESIDENTIAL STANDARDS

Single Family Residences must comply with the standards outlined in HAR Chapter 13-5, Exhibit 4. Please provide preliminary architectural renderings (e.g. building footprint, exterior plan view, elevation drawings; floor plan, etc.) drawn to scale.

See Figures 4, 5, and 6 showing building footprint, floor plan, and elevations drawings of the proposed residence.

SIZE OF LOT: 585,272.16 Sq. Ft. (13.436 Acres)

	Existing	Proposed	Total
Proposed Building Footprint (Residence)	-0-	2,880 Sq. Ft.	2,880 Sq. Ft
Paved /Impermeable Areas (Other Structures)	680 Sq. Ft. (Area of prior house foundation)	129 Sq. Ft. (Includes areas of the water storage tank and pump house)	809 Sq. Ft
Landscaped Areas	219,477 Sq. Ft (Approx. Area of the Existing Farm Portion)	-0- Sq. Ft. (All new plantings and re-grassing to be w/i Existing Farm Portion)	219,477 Sq. Ft.
Unimproved Areas	365,795 Sq. Ft. (Area of Undisturbed Coastal Portion)	-0- Sq. Ft. (Total Unimproved Area to Remain Unchanged)	365,795 Sq. Ft.

SETBACKS : Front: 40' County Roadway Setback Sides: 25' Back (Shoreline): 55.05' Minimum Shoreline Setback (Based on Exhibit 4, shown below)

SHORLINE PROPERTIES

Average Lot Depth (ALD): **698 ft.** Average Annual Coastal Erosion Rate: **0.45 ft./yr.**

Minimum Shoreline Setback based on Exhibit 4: **55.05 ft. [(0.215 x 70 ft.) + 40 ft.]**

Actual Shoreline Setback for proposed structures: **212 ft.**

MAXIMUM DEVELOPABLE AREA

The Maximum Developable Area includes all floor areas under roof, including first, second, and third stories, decks pools, saunas, garage or carport, and other above ground structures.

Maximum Developable Area, based on Exhibit 4: **5,000 Sq. Ft.**

Actual Developable Area of proposed residence: **4,824 Sq. Ft**

Actual Height of the proposed building envelope as defined in Exhibit 4: **23 Ft.-9 In.**

COMPATIBILITY

Provide justification for any proposed deviation from the established residential standards.

The proposed design for the Garrett Single-Family Residence, as planned, would be fully compliant with the Single-Family Residential Standards listed in HAR Sec. 13-5, Exhibit 4; with no deviation required.

How is the design of the residence compatible with the surrounding area?

As noted above, the design of the residence will be in conformance with the compatibility criteria within HAR Sec. 13-5, Exhibit 4 through implementation of the following measures:

- * Use of appropriate landscaping, consisting of predominately native species that are common to the area and applied only where necessary, to help blend the structures with the surrounding environment;
- * Use of “earth-tones” in the selection of roof and building colors;
- * Use of a (DOH approved) wastewater collection system;
- * Limiting the disturbed area to only those areas required for the construction of the residence and related improvements; and siting the structure in consideration of the existing topography so as to minimize the grading required;
- * Consolidating all uses of the home within a single, connected structure with a single kitchen;
- * Preservation and protection of those existing areas containing native vegetation;
- * Conformance with all applicable building, grading, height and setback requirements.

If grading is proposed, include a grading plan which provides the amount of cut and fill. Has grading or contouring been kept to a minimum?

While a grading plan for the home construction has yet to be prepared, due to previously disturbed character of the house site and efforts by the designer to site and design of the home to fit the existing grade, the grading required to construct the home and related improvements will be minimal. Also, the overall design seeks to minimize the need to either import or export materials by balancing the cut and fill requirements for the house site and related

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driveway realignment. While no fill material will need to be brought to the site, an estimated 10 cubic yards of imported material (crushed rock) would be needed as part of the foundation for the planned water storage tank, pump house and for the garage and basement of the residence. Additionally, an estimated 20 cubic yards of crushed lava material, will be brought to the site to dress the area of the realigned driveway, parking and turnaround area.

No grubbing or grading would take place in the area of the farm and utility shed as this structure will make use of the existing concrete foundation left over from the prior residence. With regards to the amount of trenching required for utilities, the wastewater collection system is located relatively close to the home to reduce the amount of grading or trenching required for underground transmission line. The well and potable water storage tank are also located relatively close to the home, adjacent to the planned farm and utility shed, so that the underground water lines can be aligned through the existing driveway parking so as to minimize total amount of ground disturbance required. Likewise, the trenching required for the underground power, telecommunications, and CATV lines will be aligned along the existing driveway in an effort to minimize the total amount of further ground disturbance. Further, the extracted material (spoils) from the trenching will be used to refill trenched areas and to blend the areas with the surrounding topography so as to avoid the need for any off-site disposal of materials.

APPENDICES

A. COASTAL EROSION STUDY

B. ARCHAEOLOGICAL INVENTORY SURVEY

C. CULTURAL IMPACT ASSESSMENT REPORT

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APPLICATION**

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APPENDIX A

COASTAL EROSION STUDY

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COASTAL EROSION AND SHORELINE HAZARDS STUDY FOR THE “KAMAHELE FARM” - GARRETT PROPERTY

Makuu Ahupua`a, Puna District, Island of Hawai`i
TMK: (3) 1-5-10:009

Prepared by:
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July 18, 2019

Executive Summary

A geological survey of the Kamahele Farms property was conducted in order to calculate a site-specific Average Annual Erosion Rate (AAER), identify any erosion prone areas, and evaluate the risk posed by other potential coastal hazards. This survey has been prepared in support of Conservation District Use Permit Application (CDUA) and Environmental Assessment (EA) being prepared for the owner, Bob Garrett, who intends to develop a single-family dwelling and barn and continue the farm uses on the property. The geological development of the littoral cone and seaward bench are explained. Historical photos of the coastline are evaluated for measureable change. We conclude with an overall AAER = 2.58 inches per year, emphasizing its variable nature over geological time and the influence of sea level rise on its intensity. This establishes a minimum setback line 55.05 ft. (40 ft. plus 70 times 2.58 inches) from the certified shoreline.

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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 the Average Annual Coastal Erosion Rate must be determined, based on formal “Coastal Erosion Studies” which are to be carried out following the guidelines in the Hawaii Coastal Hazard Mitigation Guidebook (Hwang 2005). This report satisfies these requirements.

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Changes in the coastline over time are the product of a complex and long-term interplay between powerful geological forces, particularly so in Hawai`i. The combined effects of volcanism, erosion, sedimentation, sea-level change, island subsidence, and even bio-genic production over millennia will influence the nature and durability of the coast as we now see it. These processes of both construction and destruction must be accounted for in any evaluation of coastal dynamics (Ramalho, et al., 2013). Volcanic action, mostly new lava flows, build out the island, and then coastlines retreat as mass wasting, marine and fluvial erosion reshape the landscape.

This is a very difficult process to quantify and summarize, especially on the younger of the Hawaiian Islands which, in their youth, may not yet have reached a long-term, stable equilibrium. Thorne Abbott (2013) reviews several problematic aspects in determining the AAER for planning purposes. These difficulties in measuring erosion rates on lengths of coastline on Maui, apply directly to the Big Island. The difficulties include issues with irregular shaped properties and erosion in multiple directions (which we are not concerned with, in this case) but also the problematic nature of erosion-resistant hard coasts as opposed to soft linear beaches, where shorelines can suddenly change because of the movement of sand (Abbott 2013:17).

Despite these drawbacks, an empirically based and quantitative estimate of the erosion rates is possible. This report also seeks to delineate any erosion-prone or otherwise hazardous areas along this small section of coastline as well. As used throughout this report, the “shoreline” denotes the highest wash of waves and is usually defined by the line of permanent vegetation, whereas, the “coastline” is a more general term used in this report for the most seaward edge of land at high tide.

Property Location and Physical Setting

The Kamahele Farm Property is a parcel of oceanfront land between the “Old Government Beach Road” and the sea. It is near the ancient village of Makuu in lower Puna District. The property is about halfway between the subdivision of Hawaiian Paradise Park and Mokuopihi Point (see Figure 2). A notable feature of the property is the high hill or “pu`u” that fills the greater part of the southeast portion. This feature (a “littoral cone”) can be seen on the USGS topographic map (Figure 2),



Figure 2 “Pahoa North” (USGS 1994), approx. property boundaries in red.

The property has approximately 915 ft. of ocean frontage (see Figure 3). The coastline is characteristic of the low-lying rocky geology of this part of Puna. There are no perched sand beaches above the high tide line. The water’s edge can be perilous especially during episodes of large surf. The pahoehoe lava extends out a large distance from the vegetation-defined shoreline (a minimum of 195 ft. and a maximum of 242 ft. as measured from aerial photographs), and ends abruptly in deep water. This bench lies less than 3 ft. above the waterline at high tide and contains numerous tide pools (visible in Figure 3). The southern third of the property’s coastline contrasts with the former. A boulder beach has formed on top of this bench at this end. In Figure 3, the bench can be seen extending out from the “boulder beach” to a similar width, though it is now partially submerged.



Figure 3 Google image (March 16, 2017) with approximate subject property boundaries in red.

Photo 1, below is an overview of the Kamahale shoreline taken from a sea cliff at the extreme southeast corner of the property. This cliff is formed by a more recent lava flow that just covered this portion of the property (see Geology, below). As such, it stands 12 ft. above the ocean surface (at high tide, see below Marine Conditions). Photo 1 also shows the boulder beach and its stable angle of repose of 35 degrees). In the distance, on the right of the photo the pahoe-hoe bench mentioned above is notable.

Another feature of note is the high hill behind the shore, also visible in Photo 1. It rises abruptly from about 80 ft. behind the shoreline (the vegetation line) to an elevation almost 40 ft. above sea level. The tall palm trees and lush vegetation attest to the relative stability of the strip behind the beach and create a “littoral terrace” between the shoreline and the pu`u. The cliff, boulder beach and coastal bench all provide ample buffer to the littoral terrace from all but the most extreme events. These are discussed in more detail below.



Photo 1 The Kamahele property coastline, view to northwest from southeast corner

Geological Background

The geological units that make up the Kamahele Farm property are illustrated below in Figure 4. Understanding the sequence of geological events on site provides a fundamental framework from which inferences concerning erosion rates are based.

The coastal shelf extending makai (ie. seaward) of the shoreline is the oldest exposed lava on the property, with an estimated age of between 750 and 1,500 years ago (Moore and Trusdell 1991 unit “p3”) derived from the summit area of Kilauea volcano. These lavas are not shown on the large scale geological map (Trusdell et al. 1994; Moore and Trusdell 1991, or on Figure 4). The lava flow “p3” is also exposed mauka (ie landward) of the Property as an isolated kipuka. Where this flow reached the sea violent steam explosions formed a littoral cone and widespread cinder deposits (Moore and Trusdell’s 1991 unit “p4d”) resulting from the interaction of molten lava with seawater (Figure 4). Then between 450 and 750 years ago another lava flow surrounded, but did not inundate, the pu’u (“p4o”). Most recently the entire area was again surrounded by a widespread ‘Aila’au lava flow with an estimated age of 200-350 years ago (Unit “p4”).

The Kamahele Farm consists largely of portions of “p4d”, which are littoral cone cinder deposits. It is one of few littoral cone formations on Kilauea’s coastline. Due to Kilauea’s frequent activity in historic times, these formations are well described geologically (Moore and Ault 1965). The process has also been described for the larger scale but similar littoral features of Mauna Loa volcano (Jurado-Chichay, Rowland and Walker 1996).



Figure 4 Portion of Geologic Map (Trusdell et al. 2006) with property boundary in red.

Marine Conditions and 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 rising to significant heights slam into the island's flank. Large waves reaching the coast are predominantly related to trade wind conditions, though the coastline is also exposed directly to the largest North Pacific swells (Figure 5).

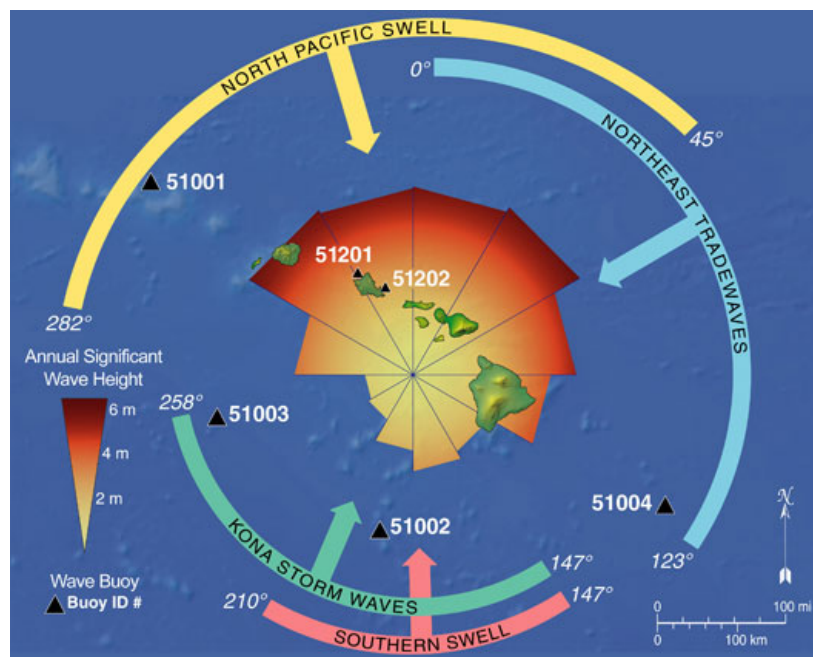


Figure 5 Frequency and magnitude of waves affecting Hawaii (www.soest.hawaii.edu).

The coastline at the Kamahele Farm property faces approximately 50 deg., slightly east of north-east. This is significant relative to typical incoming waves. Note on Figure 5 that the largest waves of all come from the north-north-east, north or north-north-west direction. These North Pacific swells can reach significant heights of 20+ ft. and are the major contributor to coastal erosion as well as storm damage. The Kamahele Farm property is oriented obliquely to this incoming wave energy.

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 considered in our overall 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 the discussion of erosion along any coast. Merrifield and Maltrud (2011) noted that trade winds have intensified across the

Pacific gradually since the early 1990s, e.g. This trend in sea level rise is more pronounced 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 Kamahele Farm 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 for this part of the island are summarized in Figure 6. These are based upon data collected in nearby Hilo Bay, the closest continuously monitored tidal station to the property. The magnitudes of these relative elevations are an important reference for assessing the importance of any measured changes or, in particular their impacts outside the normal range.

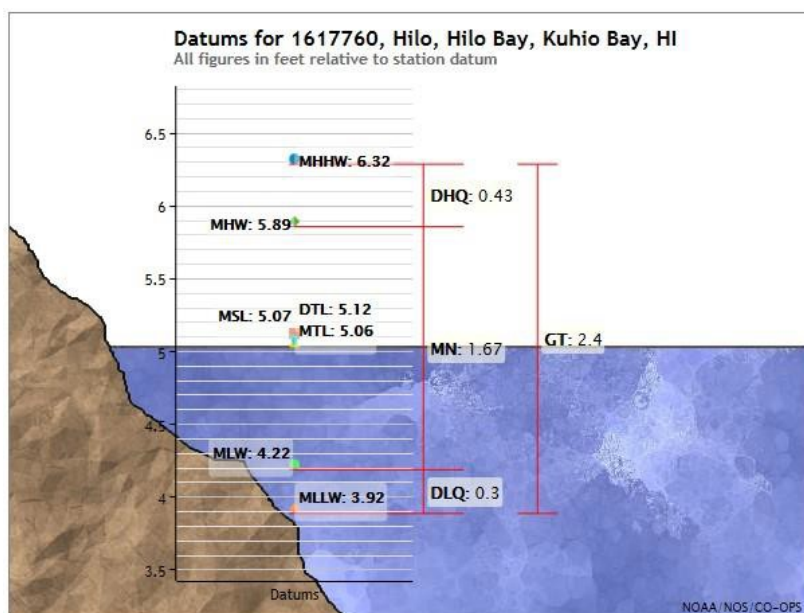


Figure 6 Tidal data for Hilo Bay (in ft.).

The mean range of tidal change (MN) is 1.67 ft. with a Great Diurnal Range (GT) of 2.4 ft. Tidal heights are given as positive and negative values relative to the Mean Lowest Low Water (3.92 ft.). 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. The field inspection coincided with a 1.97 ft. high tide. Therefore, observations during that time represented a level near the Mean Highest High Water.

Field Inspection and 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).

Given the complexity of interacting volcanic and coastal formation processes, in order to assess the historical and prehistorical movement of the shoreline and identify areas prone to erosion, a simple sedimentary “facies” model was constructed. This is a recommended means of assessing complex geomorphic situations in Hawaii. For example, Felton (2002) uses this method to distinguish storm derived and tsunami emplaced debris, describe the potential mobility of any beach deposits and their nature, account for isostatic changes and quantify other depositional processes. At the Kamahele Farm Property efforts were made to evaluate the grain size and roundness/sphericity of eroded materials, evaluate the matrix and macro-mineralogical composition of lava flows present, and evaluate geomorphology and the associated sedimentary structures (boulder beach, shoreline berm, reworked storm deposits, etc.) within the project area.

Lithology and Structure

Lava flows making up the coastal shelf can often be distinguished by their mineralogy. The flows that make up the pahoehoe bench (“p3”) and those that compose the younger higher sea cliff (“p4o”) at the southeast were examined with low magnification hand-lens. The younger stacked layers of lava are typical fine, vesicular tholeiitic basalts, in this case almost devoid of olivine and containing abundant but very fine plagioclase crystals. Pipe vesicles, suggestive of interaction with seawater, were noted in several exposures.

The formations (represented by “p1d3”) are typical of hydrovolcanic eruptions described for Kilauea volcano’s littoral cones (Mattox and Mangan 1997). The nature of these deposits and those seaward, which are not illustrated on the geologic map are key to our interpretations.

It is axiomatic that littoral cones form on the coast. There is ample physical evidence at Kamahele to substantiate this. The following photos (2, 3 and 4) illustrate a spatter bomb, ash layering, and glassy fragments that are typical of hydrovolcanic interactions. Together this evidence suggests that this littoral cone formed at the ocean entry, although it is *further* from the ocean today than when it formed (see Evolution of Kamahele Coastline, below).



Photo 2 Spatter bomb embedded in Kamahele Ash



Photo 3 Indurated and weak layering



Photo 4 Fine glassy spatter fragments in Kamahele ash

The ash and cinder from the Kamahele littoral cone have been altered and redeposited. The discovery of ash deposits in the interstices and matrix of conglomerate *on top* of the coastal bench gave another clue to the evolutionary processes active on this coastline. Placing these events in time and space is critical to the model presented below and employed in estimating the overall erosion rate on site.



Photo 5 Redeposited Kamahele ash

There is abundant evidence that the lava flows along this shoreline were also emplaced very near or at the coast. This implies that little erosion of the original deposits has occurred. For example, Photos 6 and 7 show two different results when hot lava encounters seawater. The first are several pits in the pahoehoe that have been literally blasted out with the force of steam explosions. The second is a similar less intensive disruption of viscous flow by the introduction of water. The “frothy” pahoehoe pictured in Photo 7 is a result.



Photo 6 Steam explosion pit



Photo 7 Frothy pahoehoe



Photo 8 Ponded pahoehoe and fossil gas bubbles.

Photo 8 illustrates another example of the interaction of water and hot lava. These indications were ubiquitous on the coastal shelf. The image is of the top of thick, ponded pahoehoe layer at northwest margin of Property. “Fossil gas bubbles” are shown, suggesting this flow overlay seawater. The seawater rose to the surface of the flow as steam forming bubbles where it encountered an impermeable surface layer of quenched glassy basalt. This surface layer has since been eroded away, revealing the underlying bubble.



Photo 9 Columnar jointing on coastal shelf, view southeast

Photo 9 shows weakly developed columnar jointing of the bedrock (note the hexagonal pattern of fracture on the ground in the photo). These structures indicate the relatively great thickness of this lava flow, which is also revealed in some tide pools where vertical exposures of pahoehoe layers were greater than 3 ft. thick. This is abnormal for a lava flow unless it has been obstructed and begins to pond. In this case, the evidence suggests that these lavas formed by ponding near the coastal delta when emplaced.

The Evolution of the Kamahele Coastline

Based on the above examination of the structure and geometry of lava flows and distribution of other deposits across the site, the following model of the evolution of the Kamahele coastline was constructed. This model and the geologically evidenced events it chronicles provides us with the framework upon which a quantifiable estimate of overall erosion can be made.

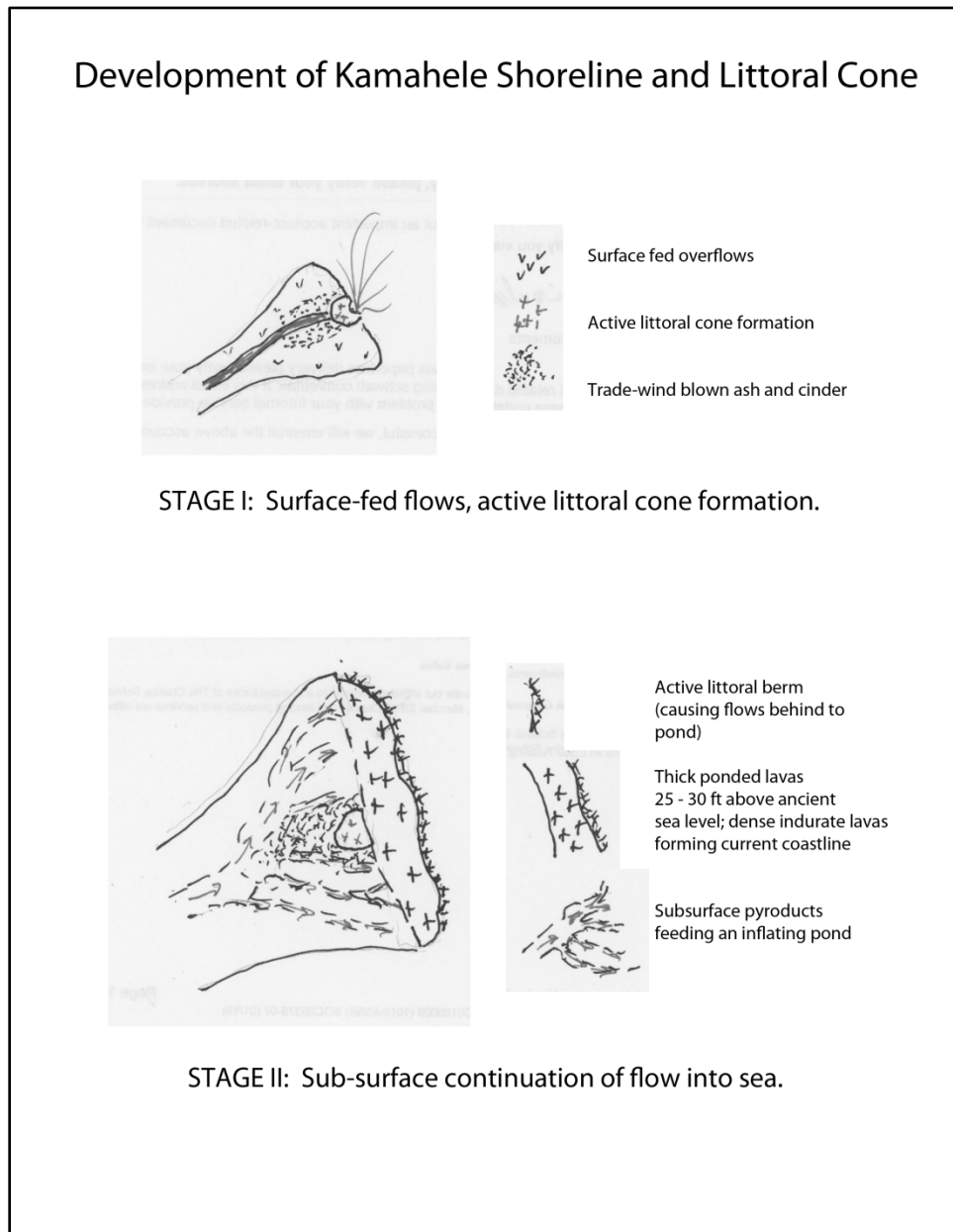


Figure 7 Illustration of the geological development of the Kamahele flow (“p3”).

Our reconstruction of geological events at the Kamahele coast is shown in Figure 7. In Stage I, the “p3’ flow is active, littoral cone formation begins where a concentrated flow enters the sea. After formation of the cone, less dramatic non-explosive Stage II subsurface emplacement of lava represents the continuing more mature eruption phase when subsurface pyroducts fed the flow and again built ponded coastal deltas, bound seaward by a coastal berm of explosive debris that has since been eroded away. At the time (more than 1,000 years before the present), sea levels were about 30 ft. lower. We suggest that this is when the current “coastline” developed, and the first shorelines formed and began to erode.

The profile of the current coastline is depicted in profile below (this hypothetical cross-section runs through the middle of the property). The cross-section is vertically exaggerated four-times to emphasize the vertical relationships between units. Our cross section shows the subsequent Aila’au flow (“p4o”) on the left, overlying the Kamahele littoral deposits. It is only at the extreme southeast of the property that these flows reached the ocean.

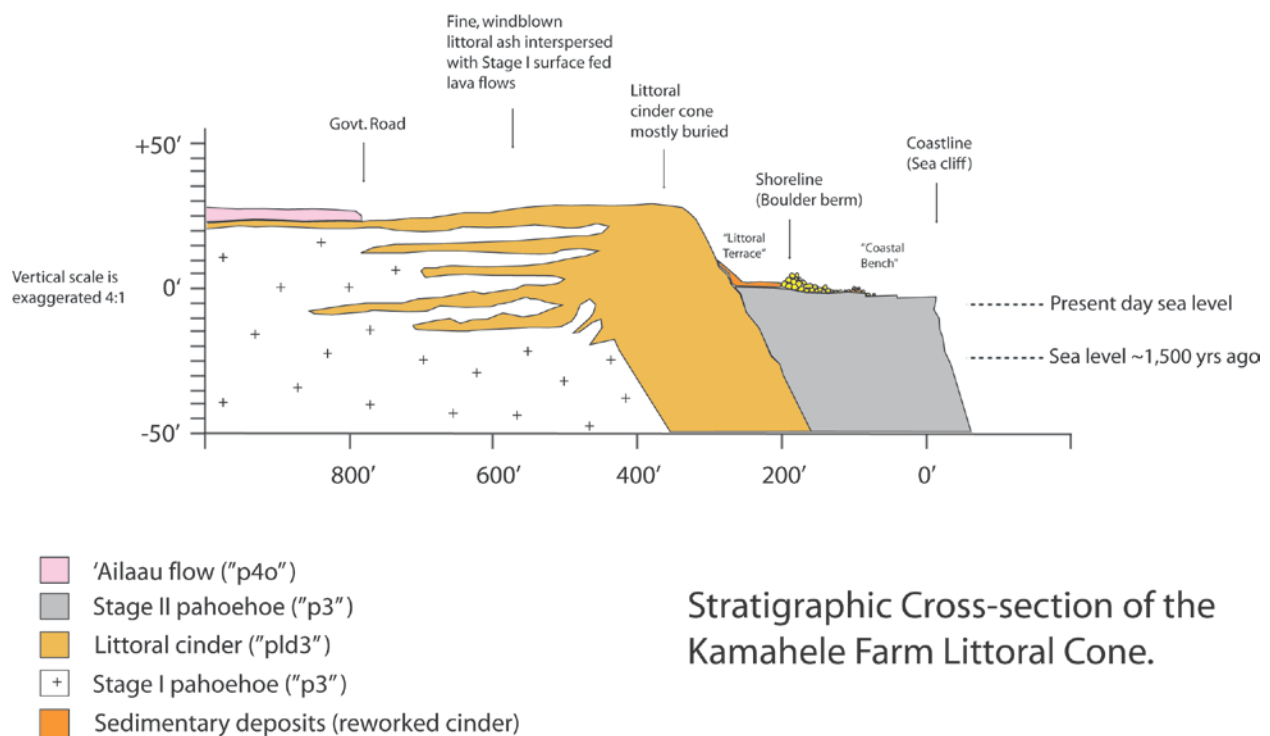


Figure 8 Schematic cross-section of Kamahele stratigraphy

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.

Different portions of the shoreline are more or less prone to erosion as a result of the volcanic forces that shaped them in combination with the marine conditions. In this case, the unique combination of physical forces and variety of substrate create five types of natural erosional formations. These include the remnant coastline, the current shoreline, a boulder beach and back-beach berm, and a littoral bench. These features are illustrated on Figure 9 and are described below.

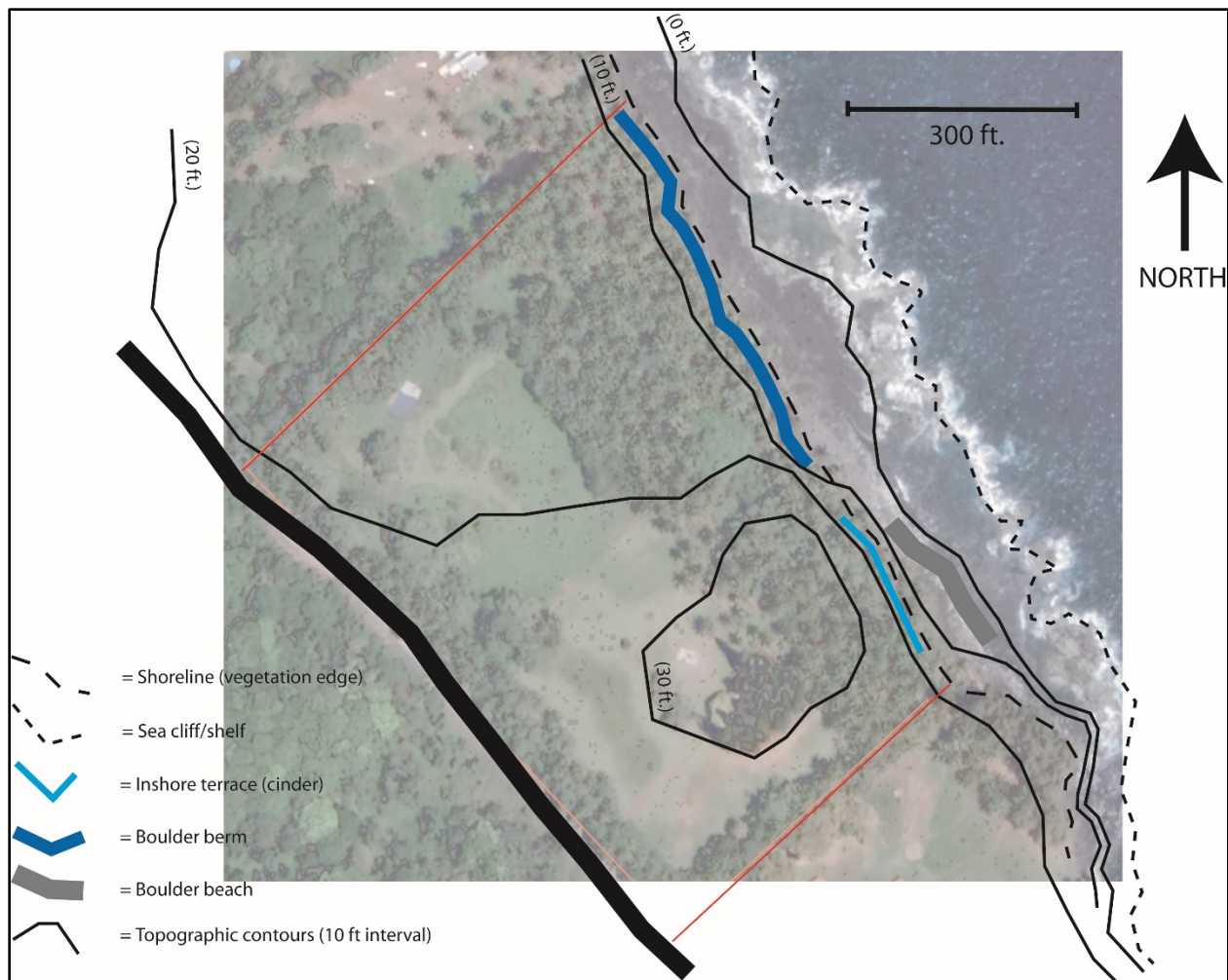


Figure 9 Summary site illustration.

The sea cliff at the southeast, formed by multiple pahoehoe overflows during one of the youngest ‘Aila’au eruptions, is subject to mechanical to erosion, although none 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 10) indicate where the cliff edge is unstable, and susceptible to failure when impacted by powerful storm waves, which inject water between flow layers, causing hydraulic fracturing. The boulders fronting this cliff largely consist of sub-angular blocks derived from cliff erosion.

These cliffs are the remains of the most recent lava flow (“p4o”) to have impacted the property and are they are limited to a small corner of the property.



Photo 10 Sea Cliffs at southeast property corner, view south

The boulder beach occupying the southern third of the property's ocean frontage (Figure 11) is about 300 ft. long. Closer inspection revealed large, well rounded boulders atop scoured pahoehe bedrock. The boulders are very well sorted and it seems these boulders absorb a great deal of energy from pounding waves. However, their organization and regular slope (angle of repose) indicate some equilibrium has been achieved. Examination of a 63 year old aerial photo bears this conclusion out (see below).



Photo 11 Boulder Beach, view west-northwest

Behind the boulder beach and extending the length of the property is a significant berm of boulders and cobbles. The berm is 500 ft., or more, long extending beyond the northern property boundary. It is less conspicuous behind the boulder beach, but remnants are indicated (see below). The berm is between 15 – 20 ft. wide and at least 6 ft. high. Its origin relates to periodic storm waves that wash materials up the beach and stack them further inland, much like a levee forms alongside a periodically overbanking river. The berm's linearity and regularity suggest that along with the boulder beach it also has formed over a significant amount of time and is not eroding. It is largely covered with vegetation, and presumably marks the "shoreline".



Photo 12 Boulder Berm, view southwest



Photo 13 Back beach storm boulders, view southwest

Behind this berm is an area of scattered boulders. These rocks are similarly well rounded and indicative of being worn by the water. Unlike the organized linear pile of stones making up the back-beach berm, these boulders are haphazardly strewn up to 60 ft. inland. This is particularly true at the northwest corner of the property. These rocks were most likely tossed beyond the berm into this low-lying area during extreme storm events.



Photo 14 Littoral bench, view west-northwest

One would expect to find similar storm tossed boulders behind the beach at the south end. However, the littoral bench – a strip of level land between the shoreline and the pu`u has been heavily modified by human habitation for an unknown period of time. This is another indication that the landform is relatively stable. Recall that in our facies model, presented in the prior section on Shoreline Findings, this bench represents continued eruption of Kilauea after the formation of the littoral cone. Extreme storm events may wash laterally over this area when large waves overtop the boulder beach. Boulders, tossed by extreme storms behind the berm to the north, are abundant. This has not happened recently as is clear from the mature vegetation and developed soil.

Quantification of Erosion Rate

Historical Aerial Photos

Aerial imagery was examined for evidence of major changes in shoreline profile during historic times. The oldest image found included one captured by the Navy in 1954 (#1756 23/35, on 12 November) of the Makuu coastline. A 1965 photo (6270 EKL12cc-31 on 6 February) taken 53 years earlier in a USDA series was also examined and both were compared to a 2017 Google Earth image.

Careful inspection of these 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. The scale of the photos and the precision of even digital measurements allowed only very general conclusions. When enlarged to a scale appropriate for our analysis each pixel on the 1965 photo was in excess of 10 ft. The larger scale 1954 image was even more “grainy” with pixels equivalent to 20 ft. or more. Both images were acquired at 600 dpi.

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. Imagery registered over this period of 63 years show no evident changes; no quantifiable change in coastline morphology or location could be determined. In fact, an argument for stasis can be made based on the general shape and configuration of the coast and shore. The same boulder beach is distinguishable, as is the wide coastal shelf (see Figure 10).

Unknown differences in tidal level and surf conditions at the times individual photography was obtained also contribute to the lack of precision. The average diurnal range of tides is 1.67 ft.; on a beach with a slope of 30% (1:3) this translates to approximately 5 ft. of horizontal change, adding another confounding variable to our photogrammetric methods. It is thus doubtful that horizontal changes of less than 10 ft. can be documented with this method over this period of time. Changes of a greater magnitude should be obvious, however, and none were noted.

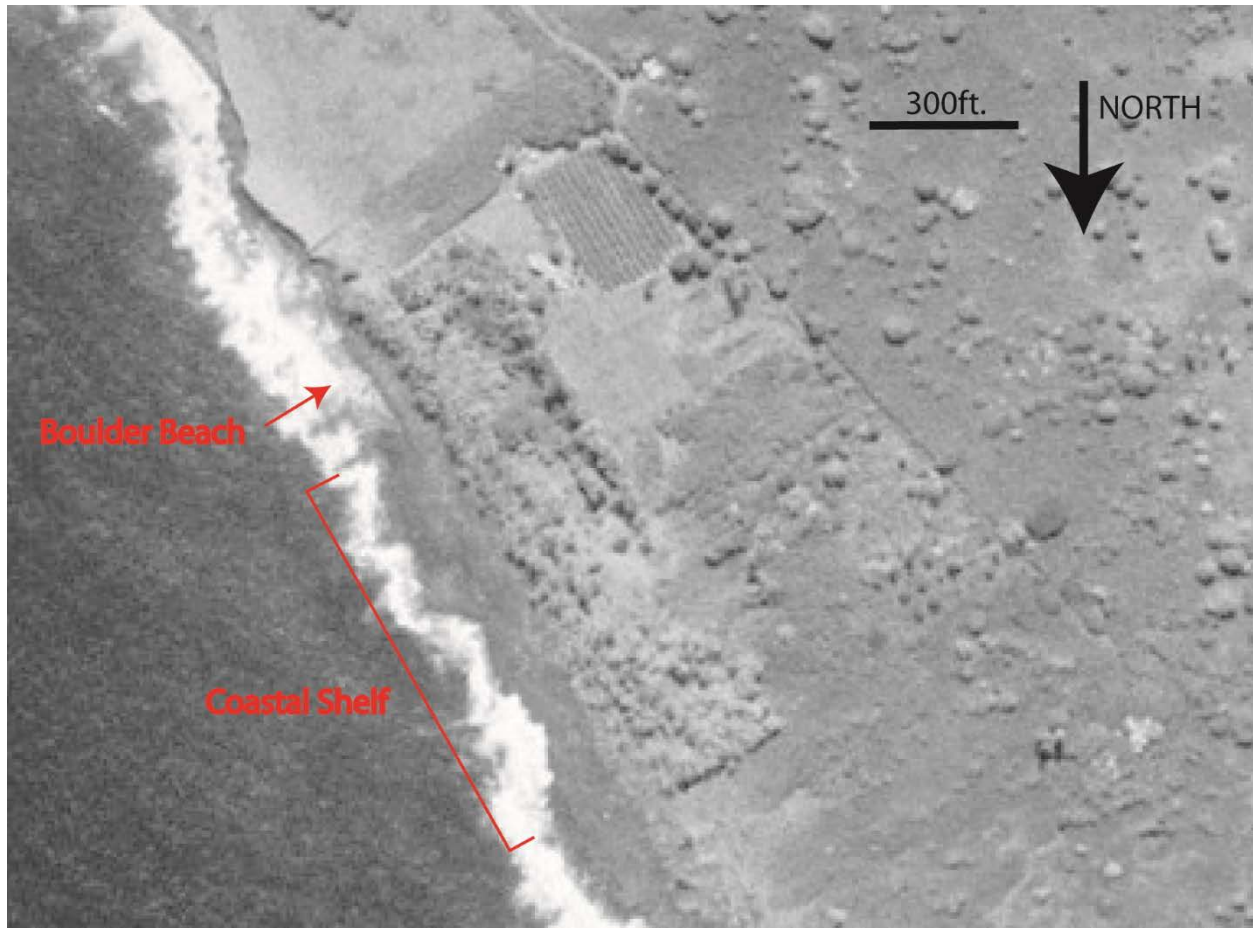


Figure 10 1954 aerial photo with approximate subject property boundaries in red.

Thus, based on the available aerial photo data and its limits, a minimum and a maximum range of possible difference can be established. The minimum, with no noted distinctions would be 0 in/yr. The maximum, however, is defined by what the coarse imagery might be “hiding”. A value equal to the possible error (given their scale and resolution, 20 ft. in the case of the 1954 photo, or 10ft. for the 1965 photo) divided by the period of analysis. Therefore a rate of between 0 – 2.2 inches per year is justified based on the 1965 photo. While the 1954 photo provides us the greatest longitudinal age range, normally lending more confidence, its larger scale leaves us with a greater *potential* maximum rate of 3.8 inches per year.

Geo-historic inference

Given the ambiguity of the photogrammetric approach, an additional method was employed. Using the framework and assumptions of the geological data presented above, an independent evidence-based inference can be made. In order to do so, our assumptions regarding the formation of the littoral bench must be accepted and its date accepted as between 750 – 1,500

years ago. If so, the current width between what was the leading edge of lava flow “p3” and the current shoreline represents the sum total of erosion since the formation of the current coast.

This width was measured digitally from current (Google) aerial photos at ten locations along the property’s ocean frontage, approximately every 100 ft. A minimum width of 195 ft. was obtained and a maximum of 242 ft. The average width of the coastal shelf was 215 ft., with a standard deviation of 16 ft.

This geo-historical method results in an AAER of a minimum of 1.68 inches/year (for a 1,500 yr interval); maximum = 3.48 inches per year (if “p3” is in fact closer to 750 years old). The mid-point of this estimate yields a rate of 2.58 inches per year.

Table 1, below, summarizes the above results.

Source	Minimum (inches/year)	Maximum (inches/year)
1954 aerial photo	0	3.8
1965 aerial photo	0	2.2
“p3” geology	1.68	3.48

Table 1 Summary of Average Erosion Hazard Rates for the Kamahele Farms property.

This method of erosion rate calculation is problematic because the actual rate is constantly changing with conditions. The migration of the “shoreline” (berm) only began when the original sea cliff could be overtopped by waves, refer to Figure 8. 1,750 years ago sea level was 25-30 ft. lower than today, the coastal cliff would not have been overtopped and very little erosion would have occurred. Late Holocene sea level rise accelerated erosion by allowing ever more frequent overtopping of storm waves. The berm at the shoreline is a result of this cumulative process. If sea levels were to rise above the low coastal bench (another 3 ft., perhaps) it would have dramatic consequences for future erosion rates. We turn to a discussion of the importance of seal level changes below.

Effects of Subsidence and Sea Level Rise (SLR) on Shoreline

Predicting Sea Level Rise (SLR) is a notoriously difficult task. 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. Over a period of 81 years this translates to a rate of .49 in/yr. 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.

Sea level rises' effect on the erosion of sandy beaches has been predicted to be two orders of magnitude greater than the amount of rise. This general prediction is borne out by mathematical models of the interaction between sea level and sedimentary equilibria (Bruun 1962). In a confirmation of these theoretical effects based on the evaluation of continental scale historical data sets and the operationalization of the model, Zhang et al. (2004) conclude that there is a "multiplicative association" between climate change, resultant sea level rises, and coastal erosion. Their modeling leads them to conclude that the effect of coastal erosion, already severe in the 20th C., will be much worse in the 21st. While their discussion focuses on sandy beaches, the theory holds for hard coasts as well – though the response times would differ.

A "worst-case" eustatic sea-level rise estimate of 78 inches by the end of this century (.96 in/yr) 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. 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).

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 ft. (based on Hawaii Volcano Observatory (USGS) data in Hwang and Brooks (2007). Such *episodic* seismic induced subsistence is impossible to anticipate or measure. On the basis of InSAR (Synthetic Aperture Radar Interferometry) remote sensing data, Hwang and Brooks (*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, 7 - 8 miles to the northwest of the East Rift Zone, are necessarily much lower as a result of their distance from Kilauea's tectonically active rift zone.

The potential changes in eustatic SLR must be added to predicted isostatic changes in crustal subsidence rates for easternmost Puna. These changes are summarized in Table 2, below.

	MINIMUM (inches per year)	MAXIMUM (inches per year)
Land subsidence (positive isostatic change) Hwang et al 2007.	0.31	0.67
Global Sea-level rise (positive eustatic change) Fletcher 2010, Solomon 2007 and Pfeffer 2008.	0.49	0.96
Sea-level rise (sum)	0.80	1.63

Table 2 Summary of potential sea level rise.

The durability and height of the coastal sea cliff on the southeast corner of the property (greater than 12 ft. at high tide) 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. However, at the northwest corner low lying land behind the low coastal bench and protected only by the boulder berm will be subject to increasing inundation events.

Anderson and others (2015) studied this phenomenon in the context of low-lying “soft” coasts (beaches) 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 ft. possible in some places. The relevancy of this study to “hard” substrates such as those at this location is minimal. However, if and when sea levels do rise above the current “hard” bench (a rise of even a foot or two might suffice) effects behind those barriers could be swift and dramatic. This is something to consider in planning for the low-lying inland areas of the northern portions of the property.

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.* (2002:150) portray highly generalized hazards assessments for significant stretches of Hawaii's coastlines; they rate the specific hazards for the area of Puna fronting the Property. These hazards are rated on an ascending scale from 1 (low) to 4 (high) as shown in the following Table:

Hazard Type	Relative Threat
Tsunami (1-4)	4
Stream Flooding (1-4)	4
High Waves (1-4)	4
Storms (1-4)	3-4
Erosion (1-4)	3
Sea Level Change (1-4)	3-4
Volcanic/Seismic (1-4)	4
Overall Hazard Assessment (1-7)	6-7

Table 3 Summary of coastal hazards present at the Kamahale Farm property.

Elevated threats of the “Volcanic/Seismic” type are due to the Makuu coast's susceptibility to lava flows and the periodic morphological changes caused by Kilauea's active East Rift Zone (ERZ). Kilauea's south flank has generated 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). A hazard intensity rank of 4 indicates “frequent” seismic activity and recommends for a UBC seismic zone factor of ≥ 2 (Fletcher et al. 2002:3).

Other volcanic hazards include the threat of inundation by lava flows. The Kamahale Farm property lies in a USGS defined hazard zone 3 (Wright *et al.* 1992). It is a fair distance from the active East Rift Zone or summit of Kilauea (Zone 1). In addition, the elevated topography affords some protection from future flows. As occurred in the past, lava flows may surround, but perhaps not inundate, the high lying areas of the property.

There is a possibility of tsunamis threatening this coastline, and the hazard rank of 4 reflects this

fact. The high rating is a result of the historical occurrence of tsunami as well as the low slope of the coastline. 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 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 of modern time to hit the island came in 1960 when a 35 ft. high wall of water, focused by Hilo Bay, completely decimated the low-lying coastal areas of Hilo. The effects of a tsunami are highly variable, dependent on both local and extra-regional factors. For example, on the southeast shore this wave amounted to only 13 ft in height (Fletcher et al. 2002:7).

The coastal plain 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 ft. horizontally – this would hold especially true for the northwestern portion of the property which is largely low-lying. This does not account for additional surge and momentum. There is, however, no indication or historic recording of the 1960 tsunami or any previous one overrunning the property area. The higher ground of the littoral cone would mitigate some of these effects locally if such a tsunami were to occur. It is, however, for this reason that Fletcher’s sea-level change risk rating is 3-4 for the reference area of Makuu.

Erosion is seen as a moderate concern in the project area, generally, with a rank of 3. Fletcher explains that erosion in the area is “chronic”. While this generalization is based on broad agreement that beaches and seawalls have suffered historical losses, those losses are site specific.

Fletcher et al. (*ibid.*) also rank the property relatively high in risk for high wave damage and storm impacts. As discussed above, this portion of the Hawaiian island is subject to rapidly building swells of greater than 12 ft. in height that occur with seasonal frequency. The storm risk ranking of 3 – 4 indicates that over-wash of the shoreline is frequent. Flood impacts from large storm events or tsunami are likely to impact the northwest half of the property disproportionately, as the elevated littoral hill (cone) provides a physical barrier to inland encroachment. This threat is not to be taken lightly. The 4 rating corresponds to the properties location in a watershed which can receive greater than 7.9 inches of rain per month and has few mitigation measure in place in the event of a flood (Fletcher et al. 2002:3). No evidence of past flooding was observed, although water can be expected to pond for short periods in low-lying areas.

Overall, the Kamahale property is in a relatively risky zone, with a myriad of hazards to contend with. Fletcher et al. rank this area with an overall hazard assessment (OHA) of “high”, between 6 -7 on a scale of 7. This would seem alarming. However, in a national assessment of coastal vulnerability conducted by Woods Hole for the United States Geological Survey six variables were examined in the construction of an alternate, “Coastal Physical Vulnerability Index” or, CVI (Thieler Hammer-Klose 2000). These include mean tidal range, coastal slope, rate of relative sea-level rise, shoreline accretion and erosion rates, mean wave height and geomorphology. The geomorphology, calculated erosion rate, mean tidal range and coastal slope variables can be considered in this case as moderate, while two of the factors listed might cause some concern, sea-level rise and significant wave events.

Summary

The Kamahele Farm property, like all land on Kilauea volcano is unique in character due to the specific physical setting and historical impact of volcanic activity molded over the eons by the action of the ocean.

As a hard rock coast, it is difficult to assess in the same terms used for the many beaches and soft sand shorelines of the older islands of Hawaii. Hard coastlines are at one extreme of a “sensitivity scale” in this regard - they are slow responding systems (Hansom 2001). Coastlines such as those at the Kamahele Farm are susceptible to particular types of High Magnitude – Low Frequency (HMLF) events. For coasts on this end of the sensitivity scale “low frequency” needs to be better defined. This can only be done with longer term studies of a scope that extends beyond a single parcel. Ideally, monitoring studies would include highly accurate means of terrain mapping such as is available today with LiDAR technology (Rosser 2005).

Several independently derived erosion rate estimates were calculated based on historical and geological data. These were derived empirically and treated in as quantitative a manner as the data permitted. We arrive at a final AAER for the Kamahele Property of **2.58 inches/year**. While the erosion rate here represents an average annual rate based on estimated changes measured over large spans of time, the actual erosion rate for any given year may vary greatly based on extreme weather or geologic events that could impact the property coastline at any given time. We conclude that the present shoreline is currently stable. However, the annual erosion rate could change dramatically, especially in face of the changing climate conditions. These changing climate conditions are certain to exacerbate storm-wave and potential flooding in the northeast portion of the property.

The proposed house site is located on the backside of the littoral cone, 30 feet or more above sea level. No structures of any type are planned for the shoreline area. From the author’s perspective and given the results of this study, this is the safest area for construction.

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APPENDIX B

ARCHAEOLOGICAL INVENTORY SURVEY REPORT

**GARRETT SINGLE FAMILY RESIDENCE - CONSERVATION DISTRICT USE PERMIT
APPLICATION**

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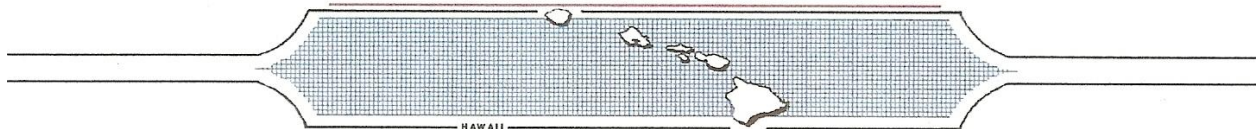
**AN ARCHAEOLOGICAL INVENTORY SURVEY REPORT FOR
A 13.436-ACRE PROPERTY IN KEA'AU, MAKU'U AHUPUA'A,
PUNA DISTRICT, HAWAI'I ISLAND, HAWAI'I
[TMK: (3) 1-5-010:009]**

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AUGUAT 2019
DRAFT

Prepared for:
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ABSTRACT

Under contract to property owner Kamahele Farms, LLC, Scientific Consultant Services, Inc. (SCS) conducted an archaeological inventory survey (AIS) of 13.436 acres of land [TMK: (3) 1-5-010:009] located in Maku‘u Ahupua‘a, Puna District, Island of Hawai‘i, Hawai‘i.

The property address is 15-2145 Government Beach Road. The property owner’s mailing owner’s address is 8216 N 14th Street, Phoenix, AZ 85020-3890. The point of contact is Mr. Robert Garrett. Mr. Garrett can be contacted by phone at 623-330-7244 or by email at bellgroup4930@yahoo.com. The property owner is proposing to build a single family dwelling on the property. The AIS study was conducted as supporting documentation for a Special Management Area (SMA) permit application and construction permit application.

Prior to fieldwork, a search of geological maps, aerial photos, historical maps, historical documents, and archaeological reports was conducted. Pedestrian survey and site recording was conducted March and April, 2019 by SCS Senior Archaeologists Glenn Escott M.A. and Suzan Escott, B.A. The fieldwork took a total of 64 person-hours to complete. A series of northwest/southeast transects spaced three meters apart were walked across the entire project area. Ground cover consisted of mown grass, trees and some low ferns and bushes. Ground visibility was very good.

Five archaeological sites were identified on the current project area. The sites were the former Kamahele House location (Site #50-10-45-7476), an agricultural complex of rock walls and rock mounds (Site #50-10-45-18980), a family burial plot (Site #50-10-45-18987), the property boundary rock walls (Site #50-10-45-TS-1), and a short rock wall segment (Site #50-10-45-TS-2). The sites are the remains of Historic era to Modern era habitation and agriculture. Site 18980 is likely a late pre-Contact era to Historic era site. Site 7476 burned down in 2014 during Hurricane Iselle and is no longer present on the property. The two modern petroglyphs at Site #50-10-45-18981 is not a historic property and the site number should be struck.

All of the sites, except the petroglyphs (Site 18981), are significant under criterion "d" as they are likely to yield information important to history. The Site 18987 family burial plot is also significant under criterion "e" as it has importance to Hawaiian cultural beliefs and practices. Information recorded at the sites during the current study has adequately ascertained the age and function of the sites and documentation contained in this report is sufficient to warrant no further work at four sites. Site 18980 and Site 18987 are recommended for preservation.

This report contains background information outlining the project area environmental and cultural contexts, a presentation of previous archaeological work within the study area and in the immediate vicinity, an assessment of expected archaeological patterns, an explanation of project methods, project findings, significance assessments, recommendations and the proposed project effect determination. The overall proposed project determination is effect with agreed upon mitigation.

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INTRODUCTION

PROJECT AREA DESCRIPTION

Under contract to property owner Kamahale Farms, LLC, Scientific Consultant Services, Inc. (SCS) conducted an archaeological inventory survey (AIS) of 13.436 acres of land [TMK: (3) 1-5-010:009] located in Maku‘u Ahupua‘a, Puna District, Island of Hawai‘i, Hawai‘i (Figure 1 through Figure 4). The property address is 15-2145 Government Beach Road. Parcel 009 is located approximately seven miles southeast of Kea‘au town and just south of the Hawaiian Paradise Park (HPP) residential subdivision. The property is bounded on the east by the Pacific Ocean, the west by Government Beach Road, and on the north and south by residential properties.

The property owner is proposing to build a single family dwelling on the property. The AIS study was conducted as supporting documentation for a Special Management Area (SMA) permit application and construction permit application. The property owner point of contact is Mr. Robert Garrett. The property owner’s mailing owner’s address is 8216 N 14th Street, Phoenix, AZ 85020-3890. Mr. Garrett can be contacted by phone at 623-330-7244 or by email at bellgroup4930@yahoo.com.

METHODS

The archaeological inventory survey 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 contained in Hawai‘i Administrative Rules 13§13-276. The investigation included the following procedures:

1. SCS conducted historical and archaeological archival research including a search of historic maps, aerial photos, written records, Land Commission Award documents, State and County Planning and Tax Records documents, and previous archaeological reports.
2. SCS conducted oral interviews with cultural informants.
3. SCS carried out a 100% pedestrian survey of the project area.
4. SCS conducted subsurface testing.
5. SCS documented all historic properties identified within the project areas.
6. SCS assessed all sites for significance and made recommendations for site disposition.

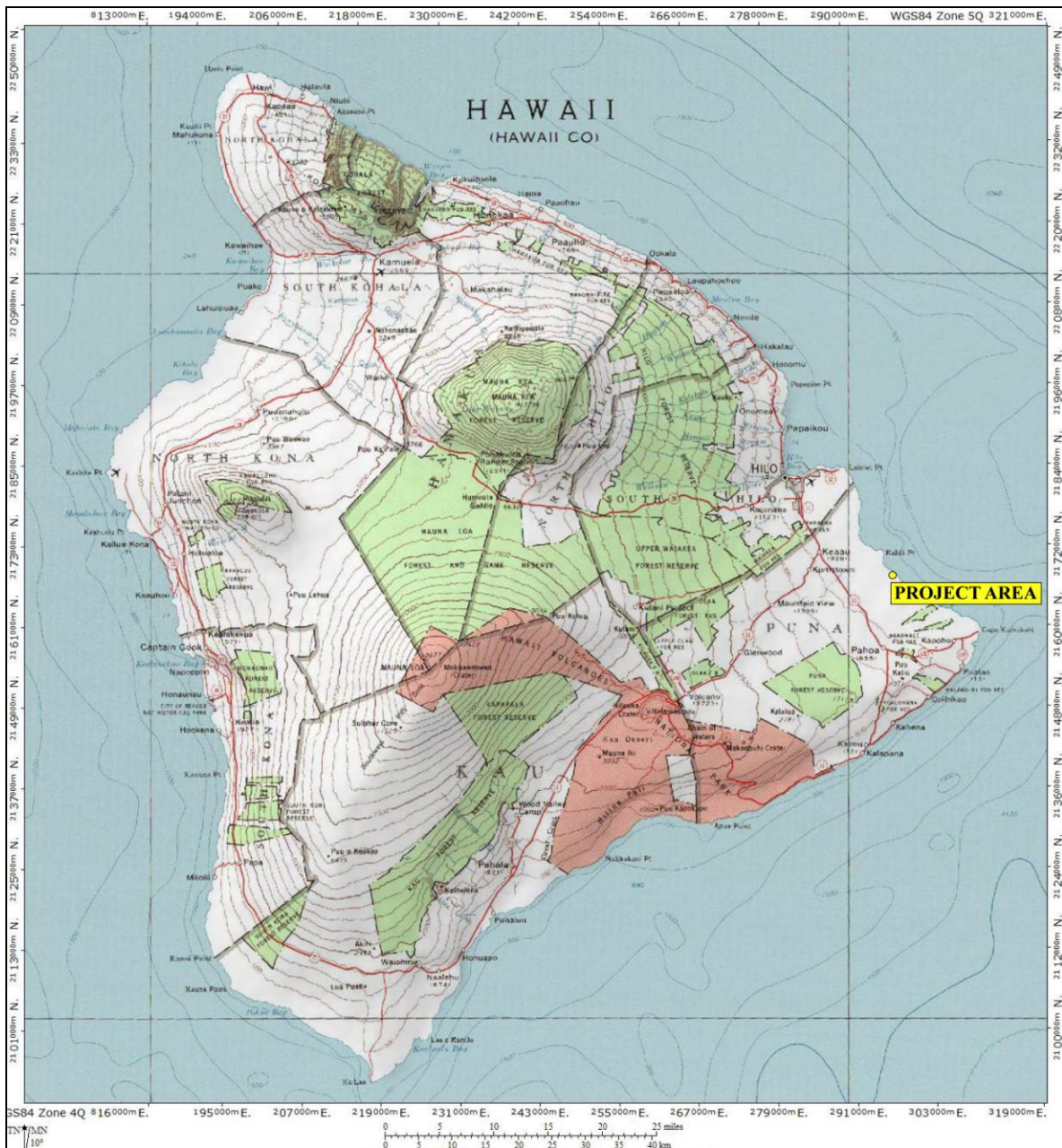


Figure 1: 5,500 K-Series Map of Hawai'i Showing Location of Project Area (National Geographic Topo!, 2003. Data Sources: National Geographic Society, USGS).

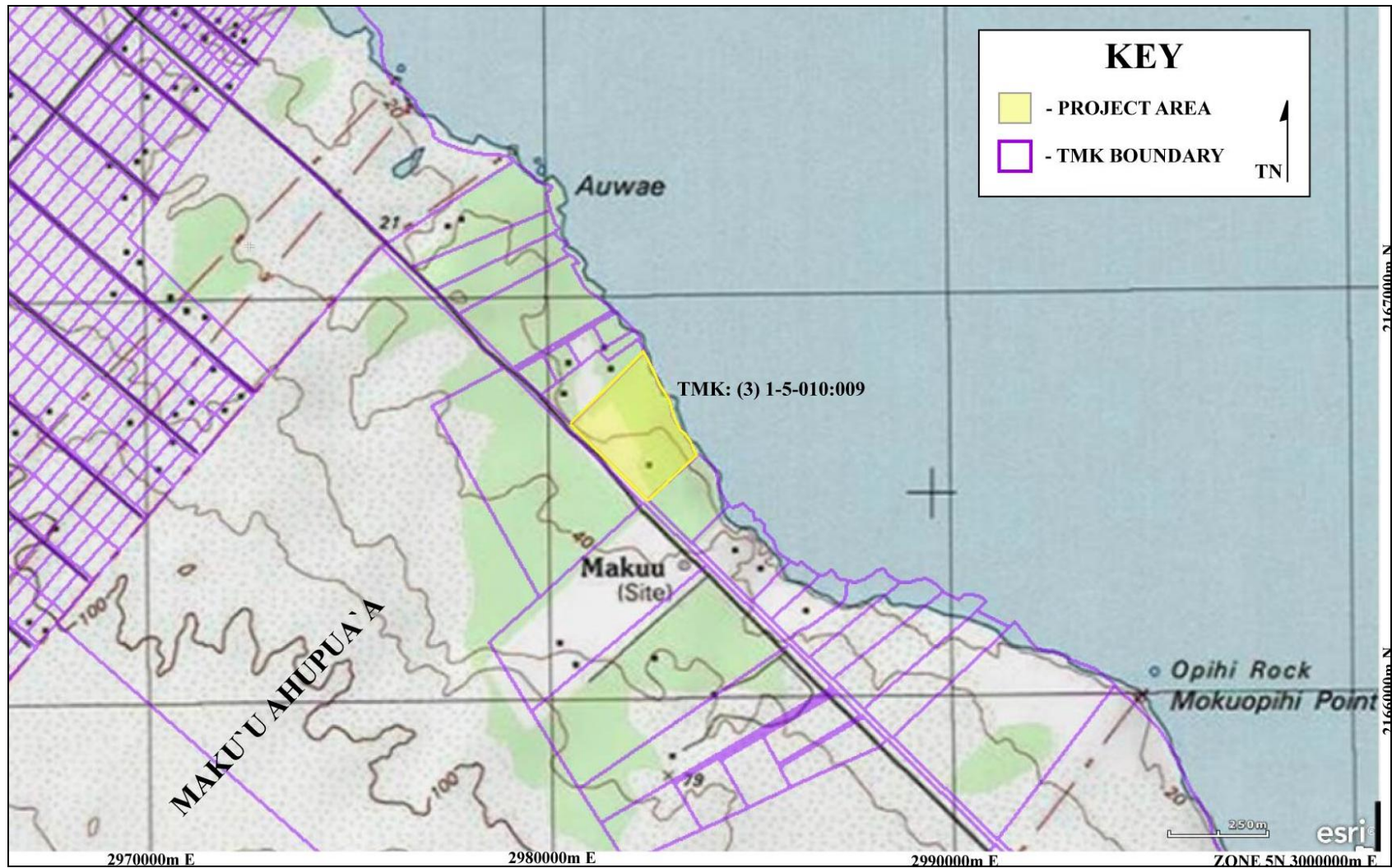


Figure 2: 7.5-Minute Series USGS Topographic Map Showing the Location of Project Areas and TMK Parcels (Keaau Ranch Quadrangle. ESRI, 2013. Data Sources: National Geographic and County of Hawai'i Planning Department, 2019).



Figure 4: Aerial Photograph Showing Project Areas, Kea'au, HI, Zone 5 North, 298310 m E, 2166660 m N. (Google Earth, 2013 Image. Data Sources: Digital Globe, GeoEye, Earthstar, USDA, and USGS).

Prior to fieldwork, a search of geological maps, aerial photos, historical maps, historical documents, Hawai'i County Planning records, and previous archaeological reports was conducted.

A pedestrian survey was conducted March and April, 2019 by SCS Senior Archaeologists Glenn Escott M.A. and Suzan Escott, B.A. The fieldwork took a total of 64 person-hours to complete. A series of northwest/southeast transects spaced three meters apart were walked across the entire project area. Ground cover consisted of mown grass, trees and some low ferns and bushes. Ground visibility was very good. Glenn Escott was the principal investigator and project director for the current study.

Sites were plotted with Global Position System (GPS) using Universal Transverse Mercator (UTM) projection (Zone 5 North) and WGS84 datum. Written descriptions, scale plan view drawings, and photographs were generated for all of the archaeological features identified. Color photographs were taken of individual site features using a 25 cm long north arrow scale divided into 10 cm black and white increments

Five 0.5 m diameter shovel probes (SP) were excavated at Site #50-10-45-18980. The shovel probes were excavated in natural stratigraphic layers. Matrix removed from shovel probes was screened for cultural material through 1/8th inch mesh.

Four stratigraphic trenches 11.0 to 12.0 meters long by 0.75 meters (45.0 linear meters total) were excavated by backhoe to determine soil stratigraphy at the project area, and to identify subsurface features and diagnostic artifacts. All of the trenches terminated in culturally sterile sediment or on bedrock. Matrix removed from stratigraphic trenches was visually inspected for the presence of artifacts and was not screened. Descriptions of the number and thickness of stratigraphic layers were recorded for each trench. Soil colors were recorded using Munsell color charts, and soil composition was recorded with the aid of the U.S. Department of Agriculture Soil Survey Manual. Profiles were drawn and photographs were taken for all stratigraphic trenches.

CONSULTATION

Members of the Kamahale *'ohana* were interviewed at the property concerning the structures and features that were located on the project area property, as well as activities that took place there.

This report contains background information outlining the project area environmental and cultural contexts, a presentation of previous archaeological work within the study area and in the immediate vicinity, current survey expectations based on the previous work, descriptions of all sites documented during the AIS field work, and significance assessments and recommendations.

ENVIRONMENTAL SETTING

The project area is situated on level to moderately sloping land between 0 feet (0 m) to 30.0 feet (9.0 m) above mean sea level (amsl). The project area substrate is a Kīlauea lava flow dated between 750 and 1,500 years ago (Wolfe and Morris 1996). Soil in the project area is ‘Opihikao series (rOPE) extremely rocky muck overlaying pāhoehoe lava (Sato 1973:43). The soil is thin and well drained with 3% to 25% slopes.

There is a low littoral cinder cone located at the center of the property, in the area of the house (see house location in Figure 4). Soil in the southwest 2/3 of the property has relatively deep cinder soil and was used for watermelon and vegetable farming, as well as pasture for cows, sheep and more recently horses. This area is primarily mown grass for the house yard.

The southwest half of the property is mown grass and ferns, and the northeast half is coconut grove with some native trees. The northeastern edge of the property is pāhoehoe coastal flats flanked by large piles of boulders thrown ashore by storm surge. The southwest half of the property was used in the Modern era as watermelon fields. Rainfall in the project area is between 120 and 200 inches per year. Natural drainage in the area runs from west to east.

Plant communities in southwest half of the project are dominated by grasses, ferns and introduced ornamental and fruit trees including various citrus trees, Cook pine (*Araucaria columnaris*), coconut palm (*Cocos nucifera*), avocado (*Persea americana*), ulu (*Autocarpus altilis*), gunpowder (*Trema orientalis*), Moluccan albezia (*Falcataria moluccana*), and bingabing (*Macaranga mappia*). The coastal half of the property contains coconut palms, *hala* (*Pandanus tectorius*), *naupaka* (*Scaevola taccada*), False *kamani* (*Terminalia catappa*), and *ki* (*Cordyline fruticosa*).

HISTORICAL AND CULTURAL CONTEXTS

Many archaeologists believe that Hawai‘i Island was first settled around A.D. 1,000 by people sailing from the Marquesas (Athens et al. 2014; Dye 2011; Kahn et al. 2014; Kirch 2011; Kirch and McCoy 2007; Mulrooney et al. 2011; Reith et al. 2011; Wilmhurst et al. 2011a and 2011b). An article published in the Journal of Archaeological Science reviewing radiocarbon dates recovered at archaeological sites on the Island of Hawai‘i suggests that, by relying on only carbon samples from short-lived plant remains, the most reliable dates point to initial Polynesian colonization of Hawai‘i Island occurring between A.D. 1220 and 1261 (Reith et al. 2011:2747). Hilo was, by most estimates, one of the first settlements on the Island of Hawai‘i.

The rich marine resources of Hilo Bay and the gently sloping forests of Mauna Loa and Mauna Kea provided abundant resources. Fresh water was available from the Wailoa and Wailuku rivers and smaller streams such as Waiākea, Waiolama, Pukihāe, and ‘Alenaio. The current project area is located in Maku‘u Ahupua‘a, Puna District, roughly twenty kilometers southeast of Hilo (Figure 5).

PRE-CONTACT ACCOUNTS OF SOUTH HILO AND PUNA DISTRICTS

The earliest account of Hilo appears in ‘Umi-a-Liloa’s (1600–1620) conquest of the Island of Hawai‘i, which establishes Hilo as a royal center by the sixteenth century. In the account, ‘Umi-a-Liloa began his conquest of the Island of Hawai‘i by defeating chief Kulukulu‘ā, who lived in Waiākea, and the other chiefs of Hilo (Kamakau 1992:16–17). ‘Umi-a-Liloa’s second son, Keawe-nui-a-‘Umi, ruled Hamākua, Hilo, and Puna from his residence at Hilo (*ibid*: 34). It was from Hilo that he waged war on the Kona chiefs and unified the island. Keawe-nui-a-‘Umi’s descendants single handedly continued rule for many generations from Hilo.

After the death of Keawe-nui-a-‘Umi the kingdom was divided into three parts and was established under warring chiefs; Hilo was ruled by Kumalae-nui-pu‘awa-lau and his son Makua (*ibid*: 45). It was during the period of time that Kamehameha I was born. Kalani‘ōpu‘u’s grandson, Keoua Kuahu‘ula and nephew Kamehameha vied for control over the six chiefdoms constituting the island kingdom and Keoua conquered Hilo chief Keawe-mau-hili and harvested the benefits for a short time only to be vanquished by Kamehameha I late in 1791.

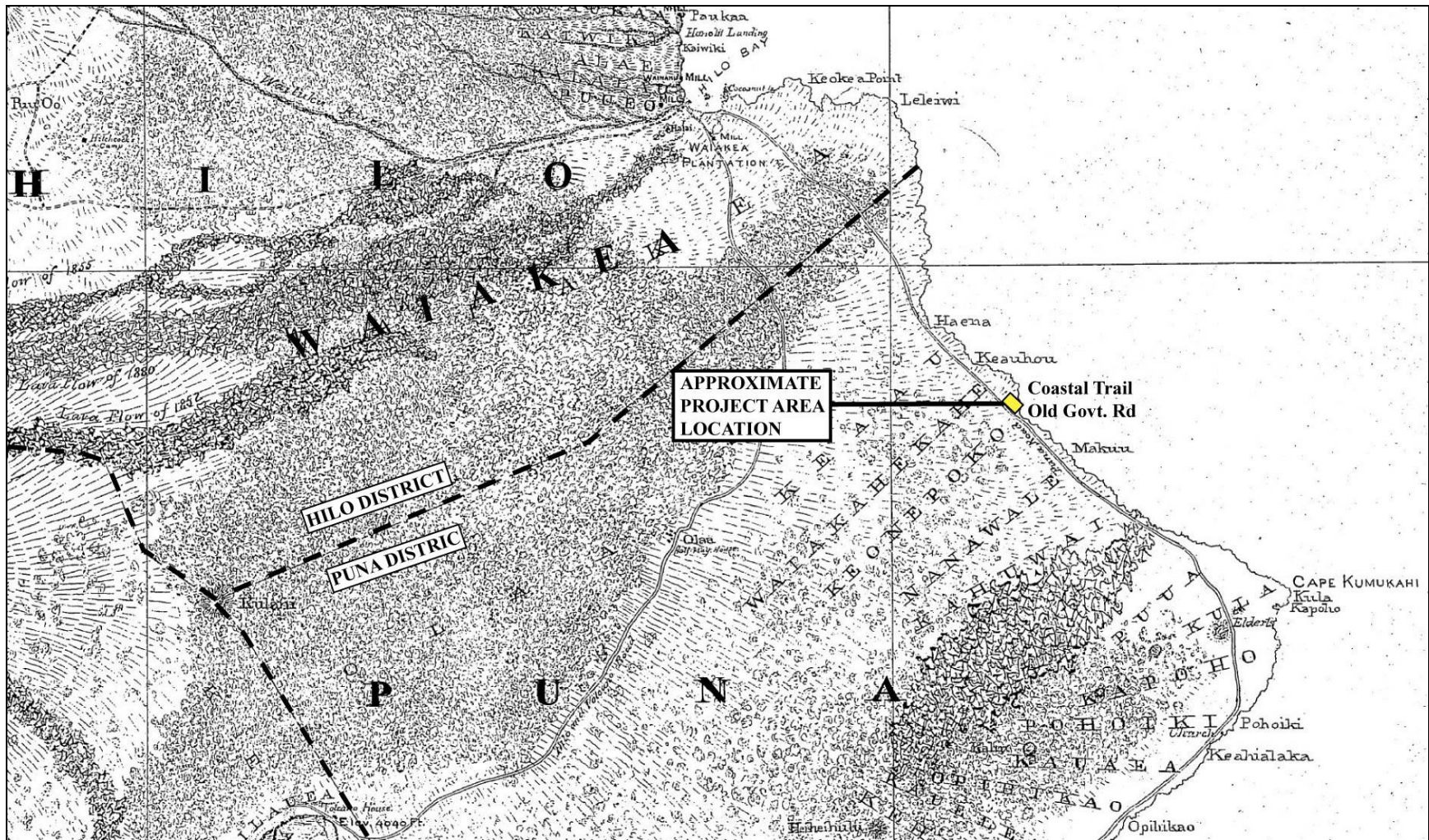


Figure 5: Portion of Map of the Island of Hawai‘i Showing the Locations of Project Area and Place Names (Wall 1886).

Kamehameha's son Liholiho was born in Hilo in November 1797 (Kamakau 1992:22). Waiākea was inherited by Lihiliho after Kamehameha's death. The *'ili kūpono* of Pi'opi'o and its royal fishpond were given to his favorite wife, Ka'ahumanu.

Situated along the windward coast of Hawai'i Island, Puna is a verdant and abundant district with good rainfall and rich soils (see Figure 5). However, it is also subject to volcanic eruptions and has been covered by new lava in many places over the last 1,000 years (Cordy 2000:17, and 22). Much of the district's coastal areas have thin soils, and there are no good deep water harbors. The ocean along the Puna coast is often rough and wind-blown.

As a result of these two factors, settlement patterns in Puna tend to be dispersed and without major population centers. Villages in Puna tend to be spread out over larger areas and often are inland, and away from the coast, where the soil is better for agriculture (*ibid*: 45). The lack of population centers also had an effect on the development of a hierarchy of district rulers. Puna was often not strongly tied together by a tight web of allegiances between *ali'i* and *konohiki*. As a result, Puna was often conquered and ruled by stronger district leaders in Hilo or Ka'ū (Kamakau 1992:17 and 77).

Puna District was famous for its valuable products, including "hogs, gray *kapa* cloth (*'eleuli*), tapas made of *mamaki* bark, fine mats made of young pandanus blossoms (*'ahuhinalo*), mats made of young pandanus leaves (*'ahua'o*), and feathers of the *'o'o* and *mamo* birds" (*ibid*:106). Puna was also famous for its abundant *ulu* (breadfruit).

Kea'au and neighboring 'Ōla'a Ahupua'a were well known for their valuable natural and hand-made products. Both *ahupua'a* were located along the southern boundary of South Hilo District (see Figure 5). The two *ahupua'a* were often the source of forest products for the Hilo's ruling elite. Moreover, Kea'au cut 'Ōla'a off from the ocean, so that families living along the coast in Kea'au often traded marine resources for upland forest products from family members living in small communities in upland 'Ōla'a.

Historical accounts pertaining to lands of the project area region are scarce but provide some information on traditional residence patterns, land-use, and subsistence. William Ellis passed through Maku‘u Ahupua‘a in 1823 while travelling along the coastal trail from Kilauea to Waiākea Ahupua‘a, Hilo (see Figure 5). Ellis’ journey took him along the coast past the project area. Ellis did not describe the region of Maku‘u Ahupua‘a, but stopped in a small inland village in Honolulu Ahupua‘a, and rested in the shade of a canoe house along the coast of Waiakahiula Ahupua‘a (Ellis 1963:294-295), both south of Maku‘u (Figure 6). Honolulu Village and a nearby village were inland and small, and the population was dispersed.

Ellis also described a village, likely Hā‘ena, in Kea‘au Ahupua‘a, north of Maku‘u (see Figure 5). The village was large and populous with an abundance of taro, sweet potato and sugarcane gardens (Ellis 1963:296). He suggested the area was made more fertile by a flowing stream where he quenched his thirst.

TESTIMONY BEFORE THE COMMISSION TO QUIET LAND TITLES

With the Māhele of 1848 and the two Acts of 1850, authorizing the sale of land in fee simple to resident aliens and the award of *kuleana* lands to native tenants, land tenure in Hawai‘i arrived at a significant turning point (Chinen 1961:13). The *ahupua‘a* of Kea‘au was granted to William C. Lunalilo as part of Land Commission award (LCA) 8559-B.

There were no Land Commission awards made in Maku‘u Ahupua‘a. Three small Land Grants (LG) were purchased along the coast in Maku‘u and Halona Ahupua‘a (Figure 6 and Figure 7). LG 1013 was purchased by D.W. Maiau, LG 1014 was purchased by Kea, and LG 1537 was purchased by Kapohana. D. W. Maiau was a teacher at the nearby Maku‘u schoolhouse. The current project area is the eastern portion of LG 1014 purchased by Kea.

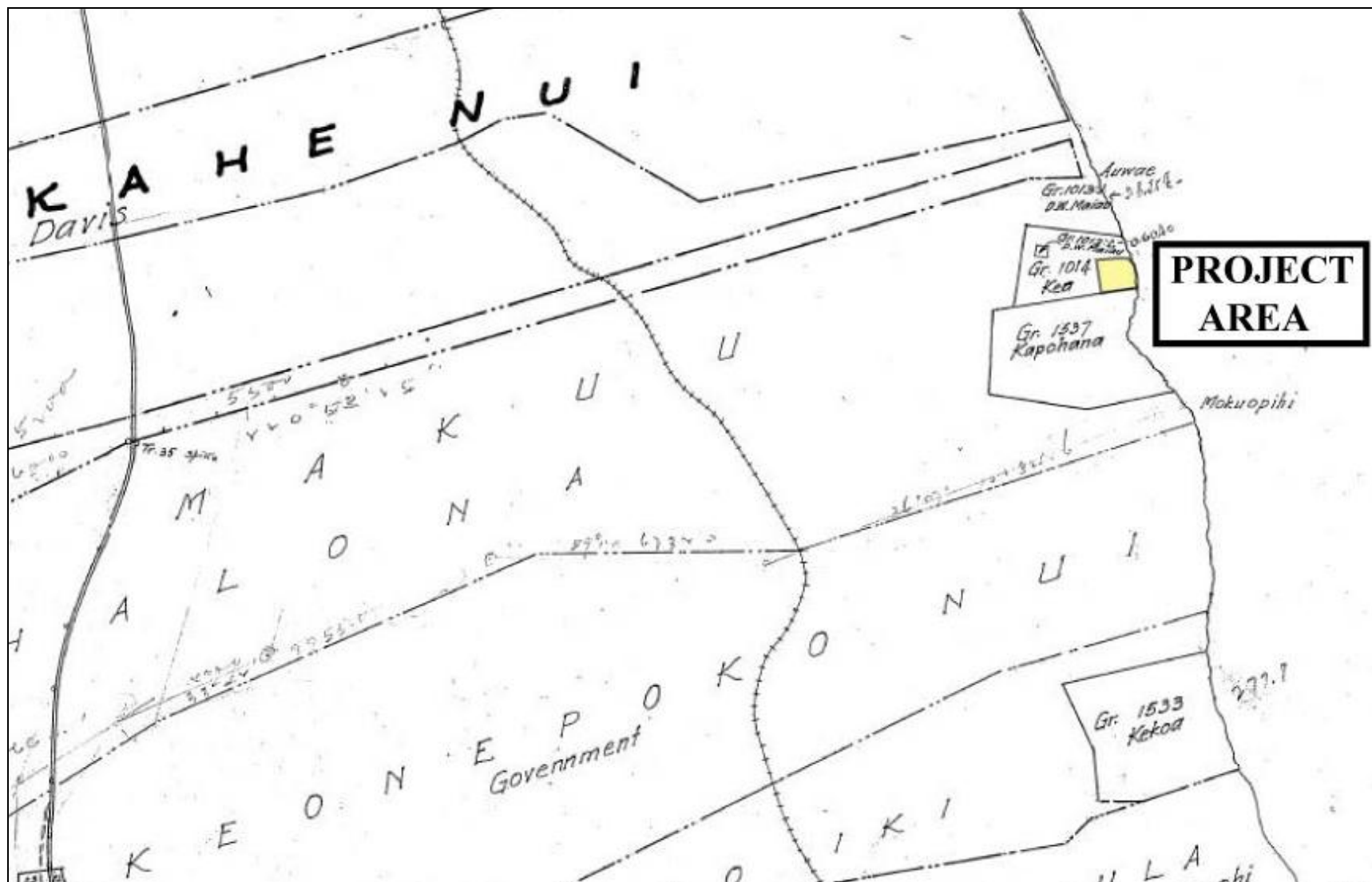
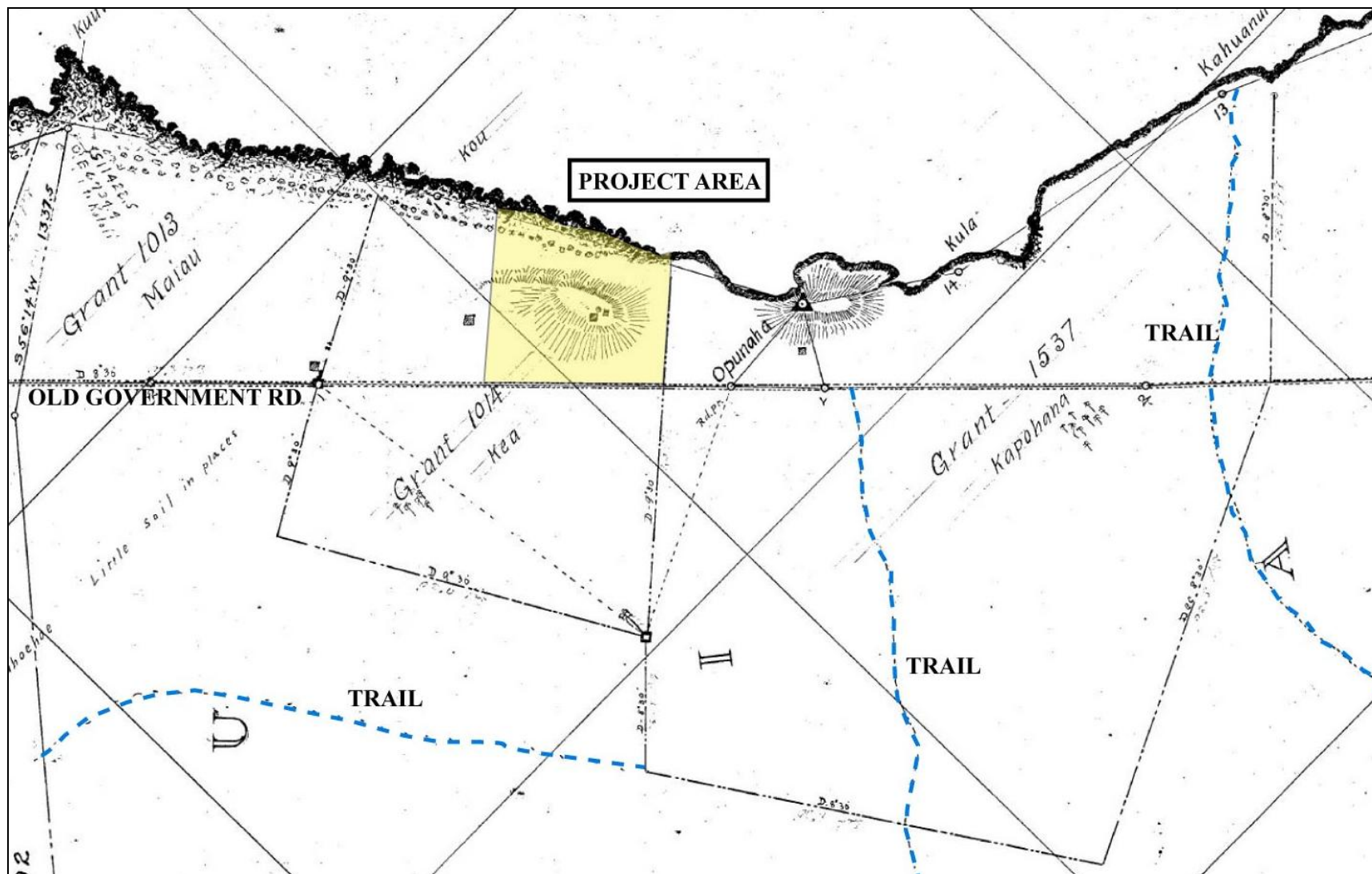


Figure 6: Portion of Map of Puna District Showing Locations of the Project Area and Land Commission Awards (Wall 1927).



CHANGING RESIDENTIAL AND LAND-USE PATTERNS (1845-1865)

Between 1845 and 1900, traditional land-use and residential patterns began to change drastically. In particular, the regular use of Hilo Bay by foreign vessels, the growth of tourism, the presence of the whaling industry, the establishment of missions in the Hilo area, the legalization of private land ownership, the introduction of cattle ranching, the introduction of sugar cane cultivation, and the construction of Government Roads and railroad lines all brought about changes in settlement patterns and long-established land-use patterns (Kelly *et al.* 1981). Much of the change in residential location and the growth of towns in Puna District were driven by the availability of arable land suited to commercial crops and the location of newly constructed roads.

The traditional travel route through Puna was along the coast (see Figure 5 and Figure 8). The trip was made along a foot trail that led through the coastal and near coastal villages. That trail lead from the modern day Lili‘uokalani Gardens area to Hā‘ena along the Puna coast. The trail is often called the old Puna Trail and/or Puna Road. There is an historic trail/cart road that is also called the Puna Trail (*Ala Hele Puna*) and/or the Old Government Road that continues from the south end of the Puna Trail through Waiakahiula Ahupua‘a heading to points south. Lass (1997) also refers to the entire route from Hilo to Ka‘ū as the Puna-Ka‘ū trail.

THE PUNA TRAIL AND OLD GOVERNMENT ROAD

There is an historic trail that leads from the modern day Lili‘uokalani Gardens in Waiākea to Hā‘ena along the Puna coast. The trail is often called the old Puna Trail and/or Puna Road. There is an historic trail/cart road that is also called the Puna Trail (*Ala Hele Puna*) and/or the Old Government Road that continues from the south end of the Puna Trail heading to points south. Lass (1997) also refers to the entire route from Hilo to Ka‘ū as the Puna-Ka‘ū trail.

Whatever name the trail/cart road alignment is called by, it likely incorporated segments of the traditional Hawaiian trail system often referred to as the *ala loa* or *ala hele* (Hudson 1932:247, Kuykendall 1966:23-25, Lass 1997:15, and Maly 1999:5). Lass suggests the full length of the Puna Trail, or Old Government Road, might have been constructed or improved just before 1840 (Lass 1997:15). The trail was called the Old Government Road, or *Ala Nui Aupuni* (Maly 1999:5). The alignment was first mapped by the Wilkes Expedition of 1804-41 (see Figure 8).

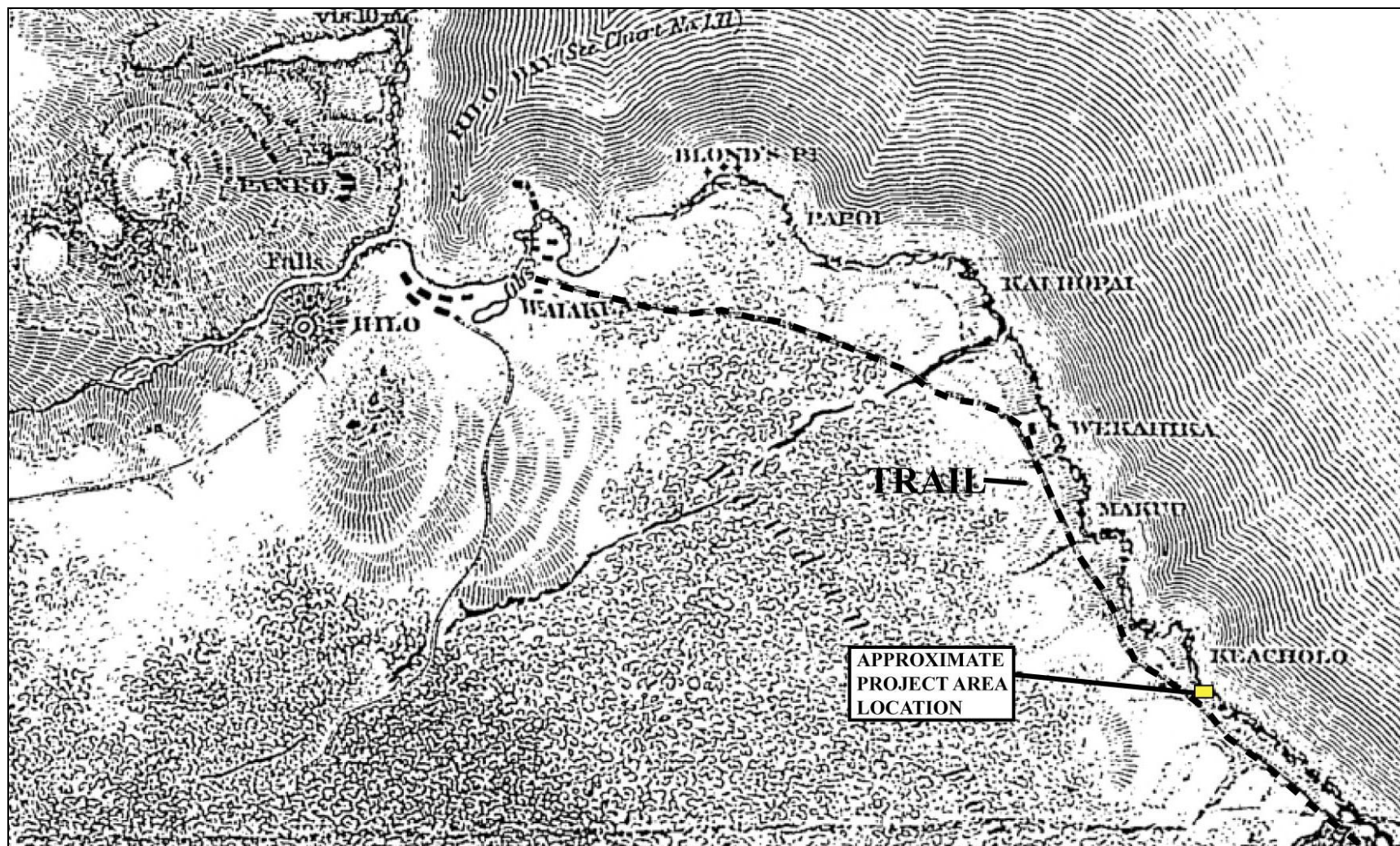


Figure 8: Location of Project Area and Old Government Road from Hilo Bay through Puna District on Portion of Registered Map 424 Drawn by the Wilkes Expedition of 1840-1841.

A general description of the area between the Old Government Road and the newer upper road from Hilo through Kea'au to Pahoa was recorded in 1889 by the Surveyor General of the Hawaiian Government Survey. The description affords a glimpse into inland and coastal settlement patterns and land use.

The first settlement met with after leaving Hilo by the sea coast road, is at Keaau, a distant 10 miles where there are less than a dozen inhabitants; the next is at Makuu, distant 14 miles where there are a few more, after which there is occasionally a stray hut or two, until Halepuaa and Koae are reached, 21 miles from Hilo, at which place there is quite a village; thence to Kaimu there are only a few scattered settlements here and there. A good many of those living along the lower road have their cultivating patches in the interior, along or within easy accessibility to the new road (Alexander 1891, cited in Maly 1999:107).

The 1889 description contrasts with Ellis' in which he described numerous villages just sixty-six years earlier. The 1889 description suggests depopulation along the majority of the Puna near-coastal area. In both descriptions, the people in this area appear to have lived somewhat inland, between the coast and the inland gardens. In 1889 people were cultivating small patches of *kalo*, *'awa*, and coffee as well as other food items in the inland gardens. The patches were placed in pockets of soil in holes amidst the lava flows. Additionally, sweet potatoes were grown on rock mounds. By 1889, it appears that very few people lived along the Old Government Road (Maly 1999:6). The Surveyor General stated,

The old sea coast road cannot be kept in repair with the means now at its disposal and its condition each year is becoming more unsafe and ruinous, there is but little travel over it; it has been shown that there is little land capable of cultivation or development either side of it and whatever travel there is now over it would soon be entirely diverted to the upper road (Alexander 1891, cited in Maly 1999:107).

The new road being constructed from Hilo through Kea'au to Pahoa was designed to allow access to the more arable inland areas. People who traditionally had lived along the Puna coast were moving toward Hilo and into the more fertile upland areas of Puna in

order to find paid work and to produce cash crops for local markets and for export. In particular, people began to work in the inland areas to grow sugarcane.

The same was true of the trail from Hilo, through Kea‘au, and on to Kīlauea Crater (Volcano Road). An improved Volcano Road was built from Hilo to Kīlauea between 1889 and 1893 partly to accommodate tourism, but also to increase access to forest products and agricultural land. Numerous small field parcels belonging to the ‘Ōla‘a Sugar Company and the ‘Ōla‘a Coffee Company were located along this route. The improved Volcano Road is Route 11, though it has been straightened and improved several times since its initial construction.

The modern history of land-use in Kea‘au Ahupua‘a is tied to the development of commercial agriculture and the construction of transportation routes. The potential to use Kea‘au's rich arable land for commercial prospects was recognized as early as the 1870s when it was leased for coffee growing and for cattle grazing. In 1881, the entire *ahupua‘a* was purchased at auction by Samuel Damon, William H. Shipman, and E. Elderts from trustees of the deceased William C. Lunalilo Estate. Shipman bought out the two partners within three years of purchasing the land.

William H. Shipman operated a cattle ranch in Kapoho Ahupua‘a and was the owner of the Waiākea Stock Ranch. Shipman was also co-owner of the Shipman Meat Market, later the Hilo Meat Company. Shipman leased portions of Kea‘au Ahupua‘a to the ‘Ōla‘a Sugar Company beginning in 1899. It was the development of ‘Ōla‘a Sugar Company fields, the construction of the sugar mill in Kea‘au, and the construction of the numerous sugar company camps, that created modern day Kea‘au town as a small commercial and residential center.

SUGARCANE, RAILROADS AND COMMERCE

The ‘Ōla‘a Sugar Company, established in 1899, became the largest sugarcane plantation and milling operation in Puna District. By the 1950s the ‘Ōla‘a Sugar Company was in debt and sugar production and sales were stagnant. The company stockholders changed the company name to the Puna Sugar Company, Ltd. and sold off land to invest in new equipment and upgrade their facilities. By 1966, the company was debt free and making a good profit. American Factors (AMFAC) bought out the minority shareholders in 1969 and Puna Sugar Company became a subsidiary of AMFAC.

AMFAC expanded sugarcane processing in the 1970s through new extraction facilities upgrades at the mill in Kea‘au (‘Ōla‘a Mill) and by building a 15KW bagasse and trash burning power plant next to the mill. Hilo Electric Light Company (HECO) agreed to purchase 12.5KW of power for their customers.

Puna Sugar Company, like many other sugar companies, struggled in the late 1970s and early 1980s due to changes in the sugar market that made sugar production less profitable. By the start of 1982, AMFAC had decided to close Puna Sugar Company. The work of selling off assets and preparing severance packages took three full years. The sugar mill was sold to Fiji Sugar Corporation in 1988 and the power plant operation taken over HECO.

MODERN LAND USE

The project area and surrounding lands were not used for growing sugarcane as the soil is too shallow. The area remained primarily unaltered and undeveloped grasslands with a large variety of introduced and invasive species. The land north of the current project area, 15.6 square miles in total, was purchased by David Watumull from W.H. Shipman, Ltd in 1959. The land was subdivided into nearly 8,800 lots within the newly created Hawaiian Paradise Park (HPP) subdivision.

Currently, the land along the coast near the project area is primarily privately owned. Some of the lots have homes on them and others are still undeveloped. Some of the lands further *mauka* of Government Beach Road are owned by the Department of Hawaiian Homelands (DHHL) and the State of Hawai‘i.

LG 1014 purchased by the Kea family was subdivided and the northeast corner of the property was purchased by the Kamahale-Kamoe family by at least in the first two decades of the 1900s. Frank Kamahale and Ann Kamahale (née Kamoe) had eight children including Ulrich “Sonny” Kamahale. The family was living on the property when Ann passed and she and other Kamoe family members are buried in a family plot (Site #50-10-45-18987) on the property. Sonny (April 15, 1923-November 6, 2002) lived on the property and grew produce there until he passed away. Sonny’s house (Site #50-10-45-7476) and the property were later sold after Sonny passed. Site 7476 burned down in 2014 during Hurricane Iselle and is no longer present on the property.

PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS

The majority of previous archaeological studies near the project area have been conducted on lands along the coast (Figure 9) and in Kea‘au Ahupua‘a, slightly inland, west of the project area.

There are six coastal Kea‘au archaeological studies conducted northeast of the current project area (Ewart and Luscomb 1974, Hammatt 1978, Hudson 1932, Lass 1997, Stokes 1919, and Thrum 1908). Two literature reviews, one with oral interviews, were also conducted for coastal Kea‘au Ahupua‘a (Maly 1999, McEldowney 1979a and 1979b). Thrum (1908) and Stokes (1919) were the first to record sites in Puna District. They recorded *heiau* in the Puna area but none near the Old Government Road (OGR) or the current project area.

Hudson (1932) conducted an archaeological survey of the east Hawaiian coast. Eighty-five sites were recorded between Hilo and Cape Kumukahi. Hudson described the excellent condition of the portion of the OGR between Kea‘au and Kapoho. He documented several sites in Hā‘ena including a fishpond, a *ko‘a* (fishing shrine) with an upright stone, and another site with two upright stones. Clark (1985), in his book on Hawai‘i Island beaches noted that the site Hudson (1932) had recorded with two upright stones was still present, but that only one stone remained upright. The *ko‘a* recorded by Hudson could not be relocated during a more recent survey of the area (Lass 1997).

Ewart and Luscomb (1974) conducted an archaeological reconnaissance survey along a 16-mile proposed road corridor from the Hilo-Puna district boundary to the south edge of the Hawaiian Beaches subdivision (see Figure 9). The north half of the project corridor was approximately 0.5 to 1.0 mile inland from the coastal cliffs and ran parallel to the coast. The south half of the project corridor, from just south of Pākī Bay to the southern terminus, ran along the coast.

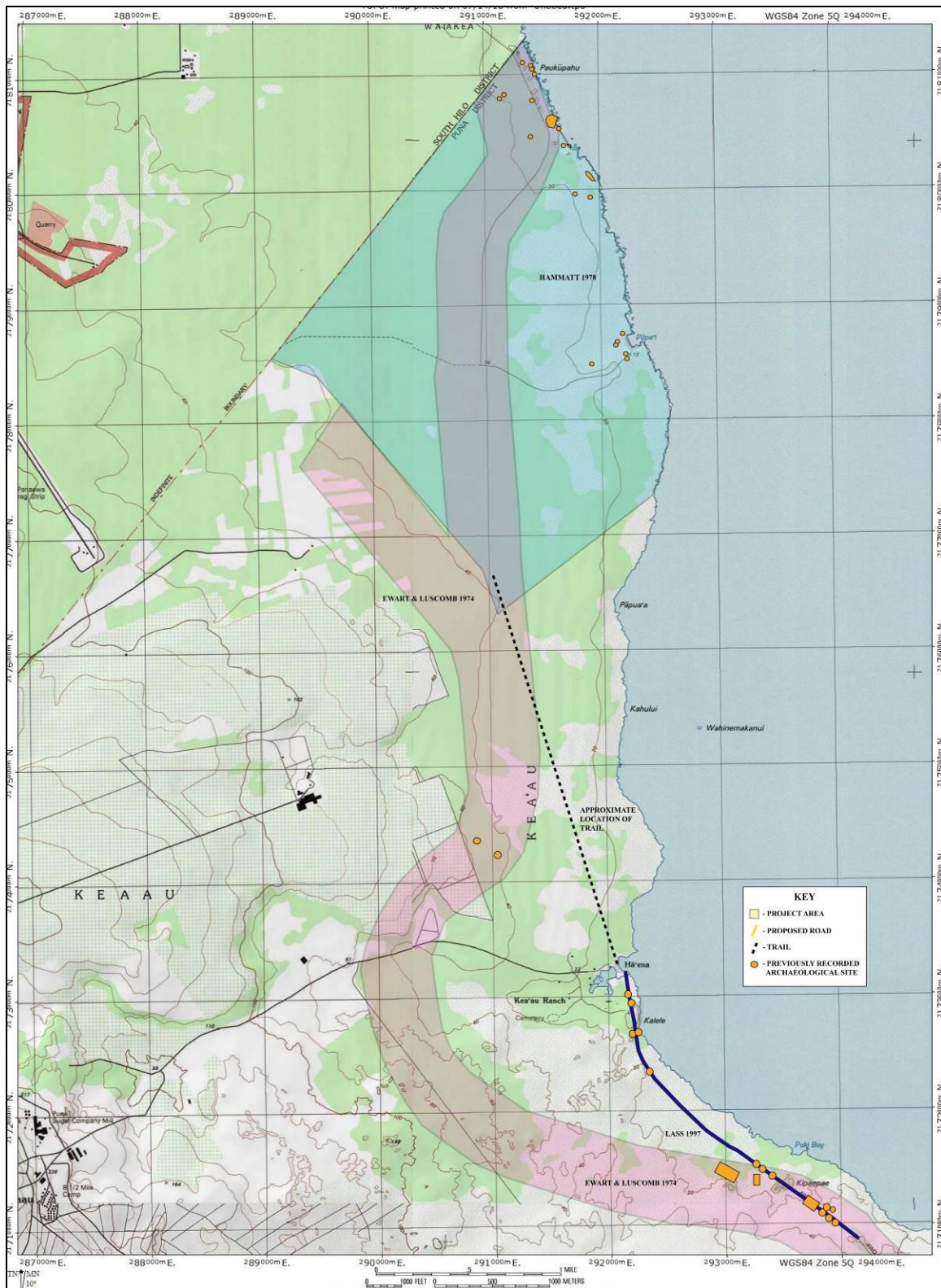


Figure 9: 7.5-Minute Series USGS Topographic Map (Kea'au Ranch Quad) Showing Location of Coastal Kea'au Ahupua'a Previous Archaeological Studies (National Geographic Topo!, 2003. Data Sources: National Geographic Society, USGS).

Thirty sites were documented in the Kea'au Ahupua'a portion of the survey corridor (Ewart and Luscomb 1974:14). The majority of sites documented in Kea'au Ahupua'a were clustered in the northern portion of the study corridor, and along the OGR south of Hā'ena. Site types included rock walls (n=10), complexes (n=9), enclosures (n=6), a platform (n=1), a rock shelter (n=1), a rock mound (n=1), and L-shape enclosure (n=1), and a modified outcrop (n=1). The age and function of sites was not determined during the brief reconnaissance survey.

The authors recommended a Phase I archaeological survey, suggesting that any future study should focus on variations in prehistoric settlement patterns as they relate to varying coastal topography (Ewart and Luscomb 1974:47). In particular, future study should focus on resources availability and settlement patterns. Resources determining settlement include ground water availability and ocean access for canoes.

Hammatt (1978) conducted an archaeological reconnaissance survey in the northeast corner of Kea'au Ahupua'a, approximately two miles north of the current project area (see Figure 9). Twenty seven archaeological and/or historical sites were documented along the coast (Hammatt 1978:3). Sites were classified as either stone structures including walls, platforms, enclosures, *heiau* and small shelters; cultural deposits, mainly midden and other habitation remains; or places of historical significance.

All of the stone structure sites, with the exception of two sites interpreted as *heiau* (Site 6475 and Site 6476), were assessed to be in poor condition and were not recommended for further study. Sites containing midden were recommended for preservation and the historically significant sites were recommended for preservation with interpretive signage. The report also recommended vegetation clearing and resurvey of the coastal portion of the project area to identify additional sites.

McEldowney (1979a and 1979b) conducted a literature review of east Hawai'i that included the OGR. This work compiled known sites such as the Hā'ena complex (50-HA-A1-65) and the fishpond at Hā'ena (50-HA-A1-64). The OGR was referred to as the "Hilo to Puna trail" and was not given a site number. McEldowney noted it as Historic a Historic era site but suggested it likely was constructed from a pre-Contact era trail.

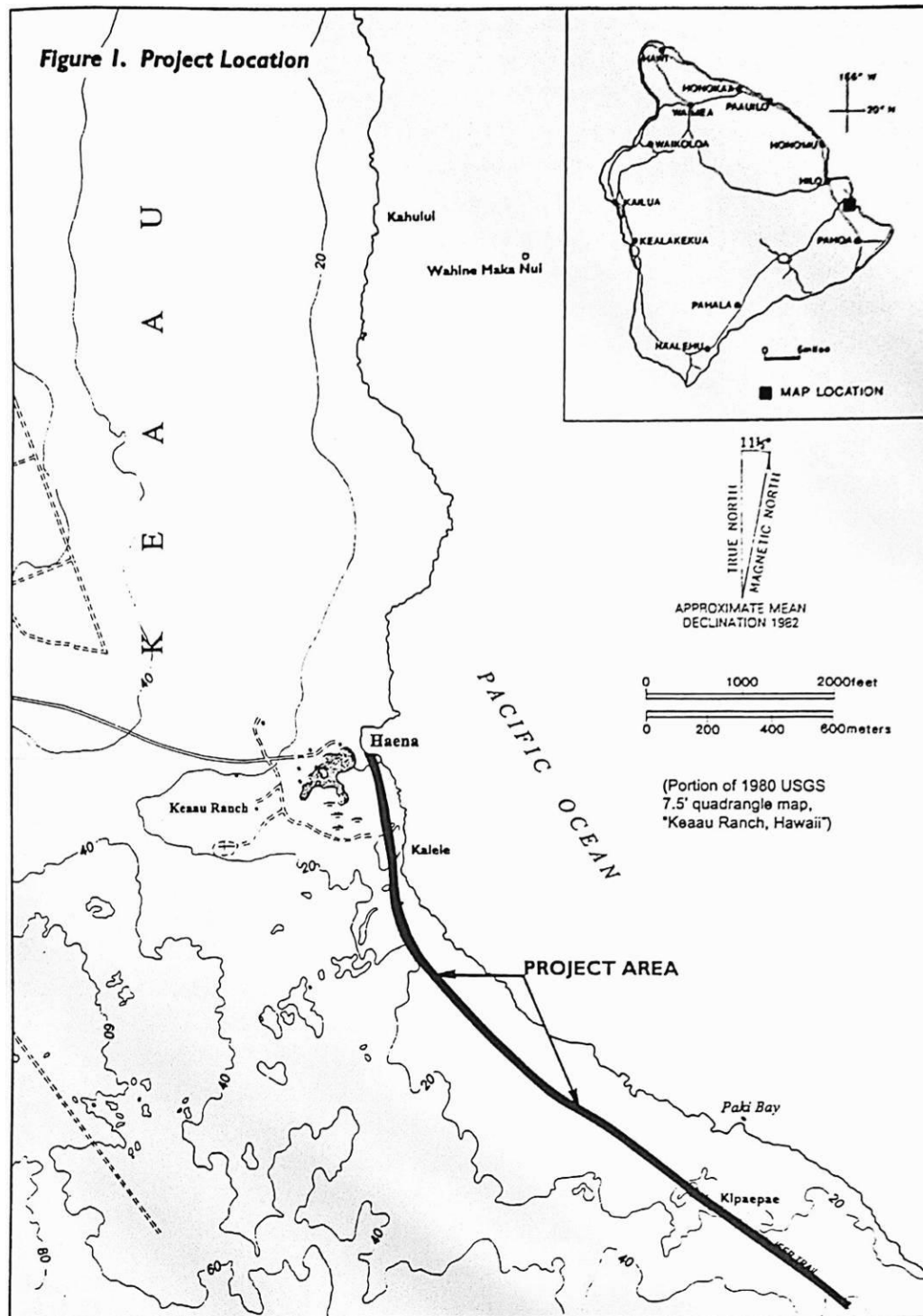
Barbara Lass (1997) conducted an archaeological reconnaissance survey along the OGR from Hā'ena south (see Figure 10 and Figure 11). The study corridor covered approximately three miles of coastline from Hā'ena to Hawaiian Paradise Park (HPP) subdivision. The south end of the study corridor is located approximately ½ mile (0.8km) north of the end of Beach Road. The reconnaissance survey was conducted as part of a proposal to construct a public hiking trail along the OGR.

Lass documented 15 archaeological sites (Table 1), including the OGR (Site #50-10-36-21273). Several sites outside of the project area corridor were identified during the survey, including a *heiau* near Pākī Bay, a possible residential complex near Site #50-10-36-21266, and names scratched into pāhoehoe at Pākī Bay. Lass recommended that a hiking trail would not negatively impact the archaeological sites along the OGR and could be a useful resource for educating the public about the history and archaeology of the area.

Lass's research determined the Old Government Road was under construction around 1868 and the portion within her project area was first referenced in 1869 when a Puna road supervisor planned to work on five miles between Waikahekahe (possibly referenced as Wekahika by Wilkes) and Hā'ena. From researching the road construction documents, Lass states:

After 1881 when the new Puna road was completed, the section of Old Government Road between Hilo and Ha'ena was probably used less often and perhaps even largely abandoned except for casual or local use. The section of Old Government Road within the project area and to the south, however, was not only apparently still used but was probably an important transportation route; otherwise, the new connecting road between the Volcano Road and Kea'au would presumably not have been built (Lass 1997:22).

The majority of the sites documented along the OGR by Lass were interpreted as agricultural features and later military features. Lass concluded Site #50-10-36-21264 may correspond with Site A1-27 as documented by Ewart and Luscomb (1974) and Site A1-17 (Ewart and Luscomb 1974) may correspond to either/all of Site #50-10-36-21259, 21260, and/or 21261.



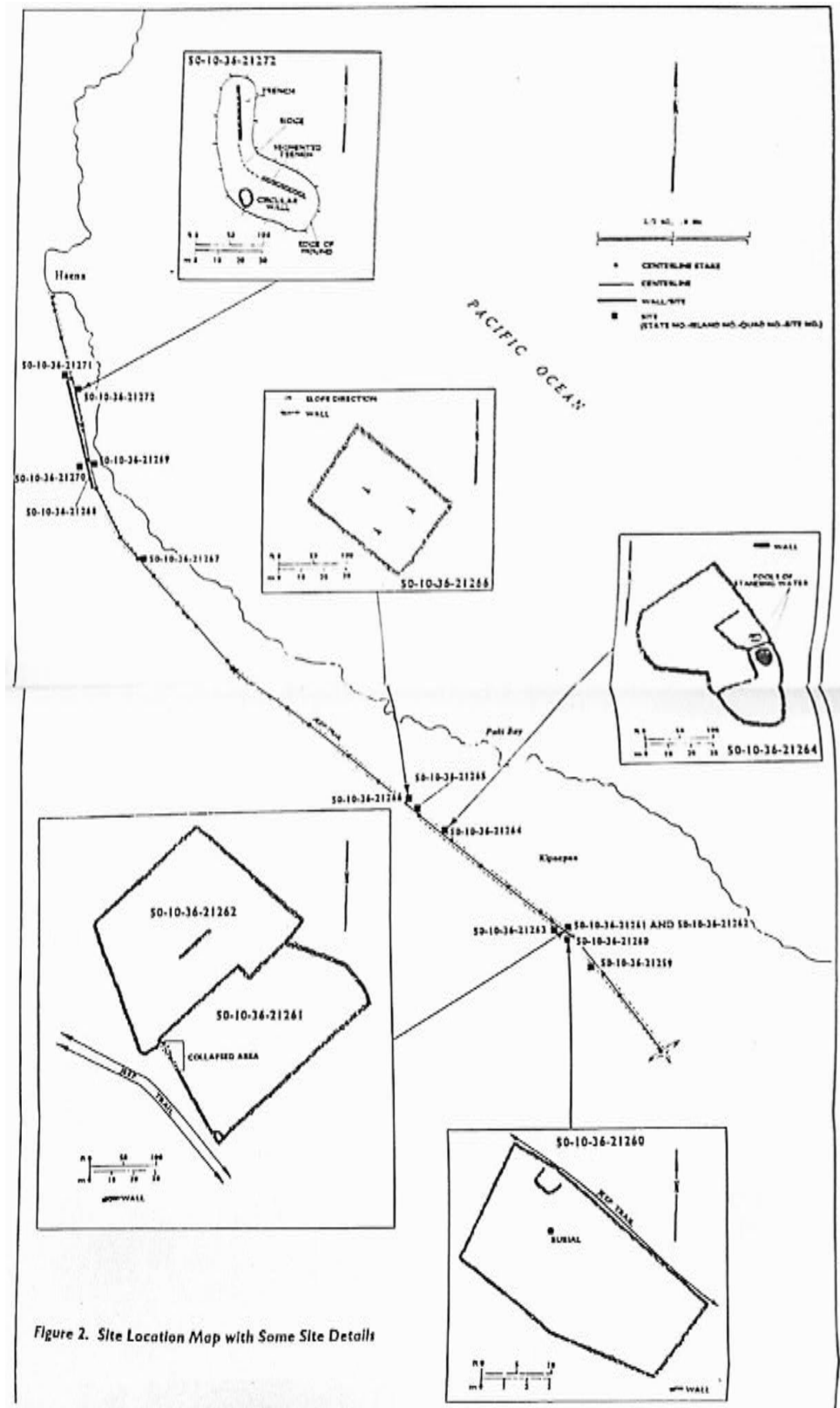


Figure 11: Map of Lass (1997) Project Area Site Locations and Site Plan View Drawings.

Table 1: Site Summaries of Barbara Lass (1997) Archaeological Reconnaissance Survey.

SIHP# 50-10-36:	Site Type	Age	Size	Description
21273	Old Government Road-Puna Trail	Pre-Contact to Historic	-	The main road used by the Puna district in the nineteenth century. The OGR was likely constructed over a pre-Contact/early post-Contact pedestrian trail. The road consists of cobblestone pavement, raised and/filled areas, waterworn rocks (‘ili‘ili), wall sides and curbstone. It is still in good condition.
21259	Rock Wall	Historic	29 m long, 0.6 m wide, and approx. 0.9-0.7 m in height	This wall is adjacent and parallel to the <i>mauka</i> side of the Old Government Road. The wall stands over a meter taller than the OGR on the mauka side indicating the possible function of preventing soil erosion.
21260	Rock wall enclosure with various features	Historic	109 m long on the side near the road, 102 m long on the opposite side, 47 m long on the north end, 37 m long on the south end. 0.5 m wide and 0.8-0.9 m tall.	The features include a rock pile, a smaller walled enclosure, a small segment of retaining wall and a burial platform. It was probably used for horticulture.
21261	Connected (to 21262) rock wall enclosure	Historic	69 m long on the north end, 87 m long on the south end, 50 m long on remaining sides.	These walls are roughly rectangular and run perpendicular to the OGR. Portions of the walls have collapse. The stones were piled. It contains horticultural characteristics
21262	Connected (to 21261) rock wall enclosure	Historic	60 m long on the north end, 73 m long on the south end (shared with 21261), 56 m on the side adjacent to the OGR, 63 m on last side	These walls are roughly rectangular and run perpendicular to the OGR. Portions of the walls have collapse. The stones were piled and appears to have been used for horticulture.
21263	Rock wall	Unknown	16 m long, 0.6 m wide, and 8 m in height	This rock wall is parallel to the OGR.
21264	Rock wall enclosure	Unkown	Approximately 90 m long (parallel to the OGR), 50 m across, 0.5m wide and 0.8-0.9 m in height.	This roughly oval enclosure is on the ocean side of the OGR. Several walls divide the interior of the enclosure into smaller sections. The marshy conditions would allow for the cultivation of taro and other crops.
21265	L-shaped wall	Unknown	10 m long (parallel to the OGR) and 5 m (perpendicular to the OGR), 0.5 m wide and 1 m in height	This site is located 5 m from the OGR on the makai side.

SIHP# 50-10-36:	Site Type	Age	Size	Description
21266	Rock wall enclosure	Historic	50 m long (2 sides parallel to the OGR), 36 m long on one end, and 33 m long on othe other, 0.5 m wide, and 1-1.2 m in height.	This site contains, soil, ti plants and piled rocks. It is located on the makai side of the OGR. Portions of the wall have collapsed. It is interpreted as being used for agriculture.
21267	Modified depression or Kīpuka	Unknown	11 m long, 9.5 m in width, and 1.5 m in depth	The long axis is parallel to the OGR. Parts of the interior are lined with rock. A pedestrian rock entrance is located at the north end. It appears to be agricultural in function.
21268	Rock wall		425 m long, 1.2-1.8 m in height and 0.8 m wide.	This wall is parallel and adjacent to the road. It is on the mauka side. A portion of the wall is breached at 165 m from South end. It leads to Shipman properties including the Shipman cemetery.
21269	Rock wall	Unknown	12.2 m in length (mauka end), 7.6 m of collapse, 15.3 m gap and a large rock on the makai end. It is 1.1 m tall and 1.0 m wide.	Portions of the wall are collapsed. The wall damage is probably due to the high surf.
21270	Concrete trough	Historic, WWII, Modern	2.2 m in length, 2.6 m in width and 1.0 m in height	It is likely the trough was constructed on site due to visible cement layers. The middle of the trough has a raised central platform. Twentieth century debris was present. It was either used for ranching or the military.
21271	Concrete bunker	Historic, WWII	3.5 m on each side in length, 1.9 m from ground to overhang roof.	It is located adjacent to the road. It conatins metal platforms for either gun mounts or obseration instruments. It resembles WWII bunkers seen in Hawai‘i.
21272	Modified trenches	Historic/WWII	North trench: 14.2m long, 2.0 m wide, 1.0 m deep. South trench: 14.5 m long, 1.4 m wide and 1.0 m deep.	Located on the makai side of the OGR. This site is two constructed trenches located on a hill along the coastline which indicates they were for WWII defense or surveillance.

Kepa Maly (1999) conducted historical and archival research, previous archaeological research and collected oral interviews for Kea‘au Ahupua‘a and the Kea‘au portion of the Puna Trail (the Old Government Road), specifically TMK: (3) 1-6-001. Maly determined the agricultural sites reported by Lass (1997) were probably constructed during the pre-Contact era and modified in the 1800s when cattle began to damage gardens and house gardens.

Maly argued that the types of sites present in the overall area, such as habitation, enclosures, near-by *heiau*, possible burials and agriculture, suggest the coastal area surrounding the OGR are the remains of coastal settlements. The oral history component of his study supported this conclusion. He concurred with Lass that the use of the OGR as a public hiking trail would help foster a better historical understanding of coastal Kea‘au Ahupua‘a. Maly recommended preservation treatments for the trail, including not paving the OGR, making the public aware it is illawful to damage or disrespect archaeological and cultural sites, an ongoing effort to consult with lineal and cultural descendents concerning future preservation treatments and access.

Maly’s study also added to Lass’s archaeological work through interviews and research to present a deeper understanding of the previously recorded archaeological sites. Maly determined that Site 21267 is one of two early Historic era schools in Kea‘au Ahupua‘a (School Grant 4, Lot 18). Schools at that time were enclosed by rock walls to keep animals out of the school yard where students cultivated gardens (Maly 1999 citing an 1865 letter from Hitchcock to Bishop).

According to interviews collected by Maly, rock wall Site 21269 was used as both a boundary between the Shipman and Fisher’s properties and for ranching purposes. There was once a gate in the wall that crossed the OGR corridor. The wall continued to the ocean.

Oral interviews indicated that Site 21270 was part of the Fisher’s chicken farm complex (1923-1942). The feature may have been part of processing activities. It was located under one of the long chicken houses. Maly’s interviews stated that Site 21272 was used during WWII primarily as a camp site and Roy Blackshear noted outhouses were possibly built over them. John Ka‘iewe stated that, when he was younger, the site was used as a shelter by fishermen. The flat area on the *makai* side of Site 21272 contains stones which may be remnants of a previous site.

Ewart and Luscomb (1974) recorded 22 archaeological sites along the coast of Waikahekahe and Maku‘u Ahupua‘a (Figure 12 and Table 2). Sites were clustered on either side of Beach Road and consisted of agricultural and habitation complexes. Sites included rock walls, small enclosures and agricultural rock clearing mounds.

Coastal Waikahekahe and Maku‘u archaeological sites were primarily agricultural and habitation complexes containing rock walls, agricultural rock clearing mounds, rock walls, enclosures, pavements, platforms, rock lined wells, and burial features. The sites appear to be primarily pre-Contact to Historic era in age. Site 18975 is a possible *heiau* complex (Figure 13).

RECENT STUDIES IN MAKU‘U AND SURROUNDING AHUPUA‘A

Seventeen archaeological studies have been conducted in Maku‘u, Pōpōki and Halona Ahupua‘a (Figure 14 and Table 3). The studies were conducted in the upland and coastal regions surrounding the current project area and shed light on pre-Contact to Historic era land use. The most striking feature of the studies is the low distribution of archaeological sites documented in the upland project areas. Aside from lava tubes containing pre-Contact era habitation features and burials, only three archaeological features were documented in the upland project areas. Upland features included a possible ceremonial complex (enclosure, platform, rock wall, and rock wall), a rock mound and an agricultural terrace. The lack of sites in the uplands is consistent with early written accounts documenting traditional habitation areas along the coast to a little over one mile inland.

Komori and Peterson (1987) conducted a cultural and biological resources survey along a corridor roughly 2.5 to 3.0 kilometers (1.55 to 1.86 miles) from the coastline. Five agricultural complexes, habitation and burial platforms, burial and refuge caves, and petroglyphs were documented within the project area. All of the sites are pre-Contact to early post-Contact era in age.

Studies conducted along the coastline documented clusters of pre-Contact to early Historic era habitation and agricultural sites including enclosures, platforms, rock walls, rock mounds, burials, petroglyphs, rock lined springs and water catchments, and remnant trail segments.

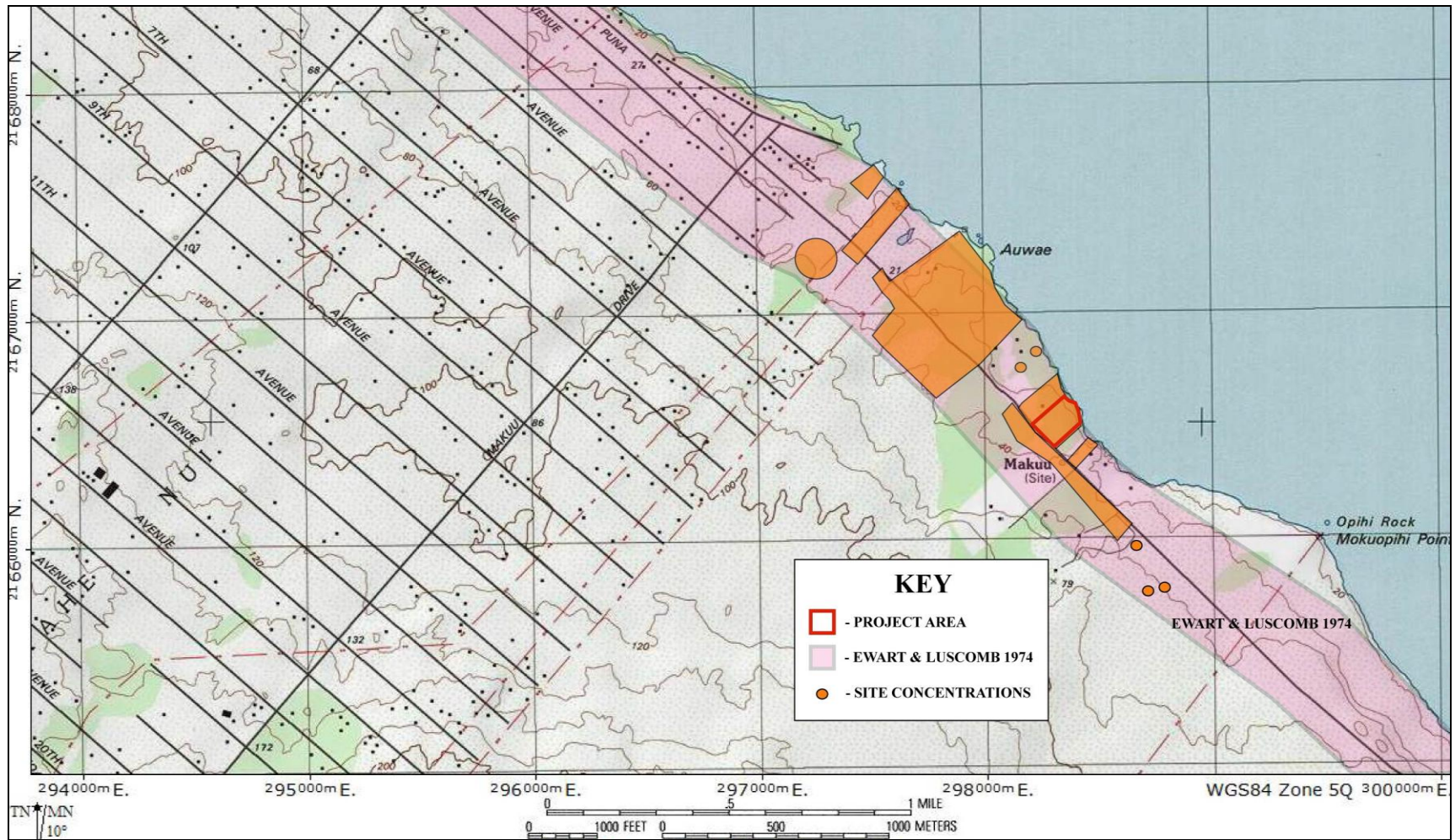


Figure 12: 7.5-Minute Series USGS Topographic Map (Kea'au Ranch Quad) Showing Location of Coastal Sites Recorded in Ewart and Luscomb (1974) (National Geographic Topo!, 2003. Data Sources: National Geographic Society, USGS).

Table 2: Inventory of Waikahekahe and Maku‘u Ahupua‘a Archaeological Sites (Ewart and Luscomb 1974).

SIHP# 50-10- 45:	Site Type	Ahupua‘a	Description	Research Potential
18973	Complex	Waikahekahe	Rock walls, retaining walls, walled depressions, and possible platforms	Good
18974	Complex (Agriculture and Habitation)	Waikahekahe	Rock walls, retaining walls, walled depressions, possible pavements, and platforms	Good
18975	Complex	Waikahekahe	Rock walls, retaining walls, platforms, rock mounds, and possible <i>hieau</i>	Excellent
18976	Complex (Agricultural)	Maku‘u	Free-standing and retaining walls and small mounds	Good
18977	Wall	Maku‘u	Wall	N/A
18978	Complex	Maku‘u	Free-standing and retaining walls, a mound, a possible <i>kuleana</i> wall, and an enclosure	Mediocre
18979	Wall & Enclosure	Maku‘u	Rock wall and enclosure	Some
18980	Complex (Agriculture)	Maku‘u	Rock walls and rock mounds	Good
18981	Petroglyphs	Maku‘u	Modern petroglyphs	N/A
18982	Complex	Maku‘u	Walls, faced areas, a mound with an upright stone, and a rock-lined well	Negligible
18984	Complex (Agriculture and Habitation)	Maku‘u	Trails, several enclosures, and terraces	Excellent
18985	Wall	Maku‘u	Rock wall	Some
18987	Burials	Maku‘u	Historic grave yard	N/A
18987	Complex (Agriculture and Habitation)	Maku‘u	Walls, enclosures, mounds, depressions, and platforms	Good
18988	Complex (Agriculture and Habitation)	Maku‘u	Walls and platforms	No Longer Present
18989	Petroglyph Field	Maku‘u	Petroglyphs	Good
18990	Possible Burial	Maku‘u	Rock mound	N/A
18991	Enclosure	Maku‘u	Rock lined depression	N/A
19005	Possible Burial	Maku‘u	Rock mound	N/A
20598	Trail	Maku‘u	Coastal trail	Good
4222	Petroglyph Field	Maku‘u	Petroglyphs	Good
7476	Kamahele House	Maku‘u	Historic house	No Longer Present

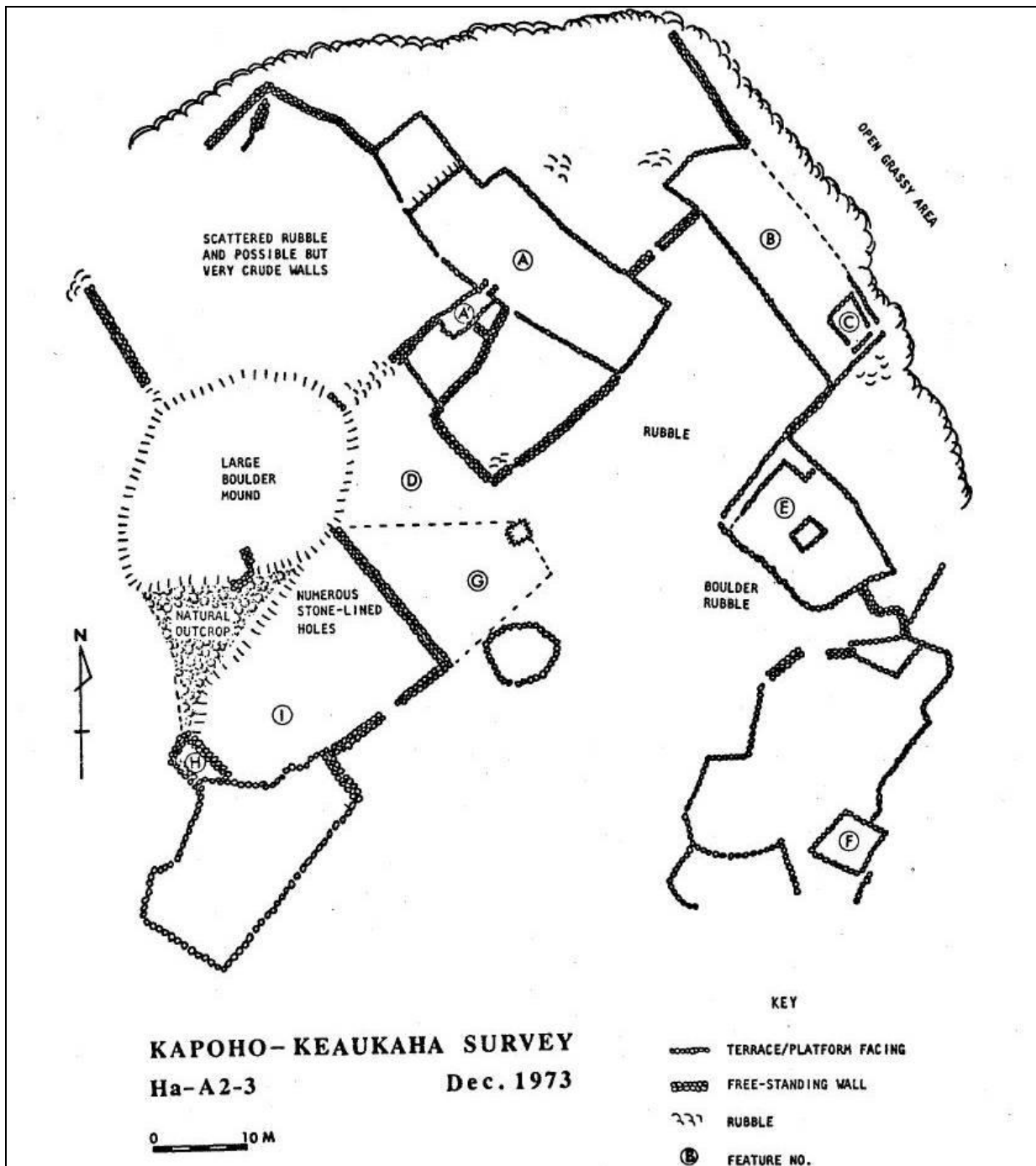


Figure 13: Site 18975 Plan View Map (Ewart and Luscomb 1974:24).

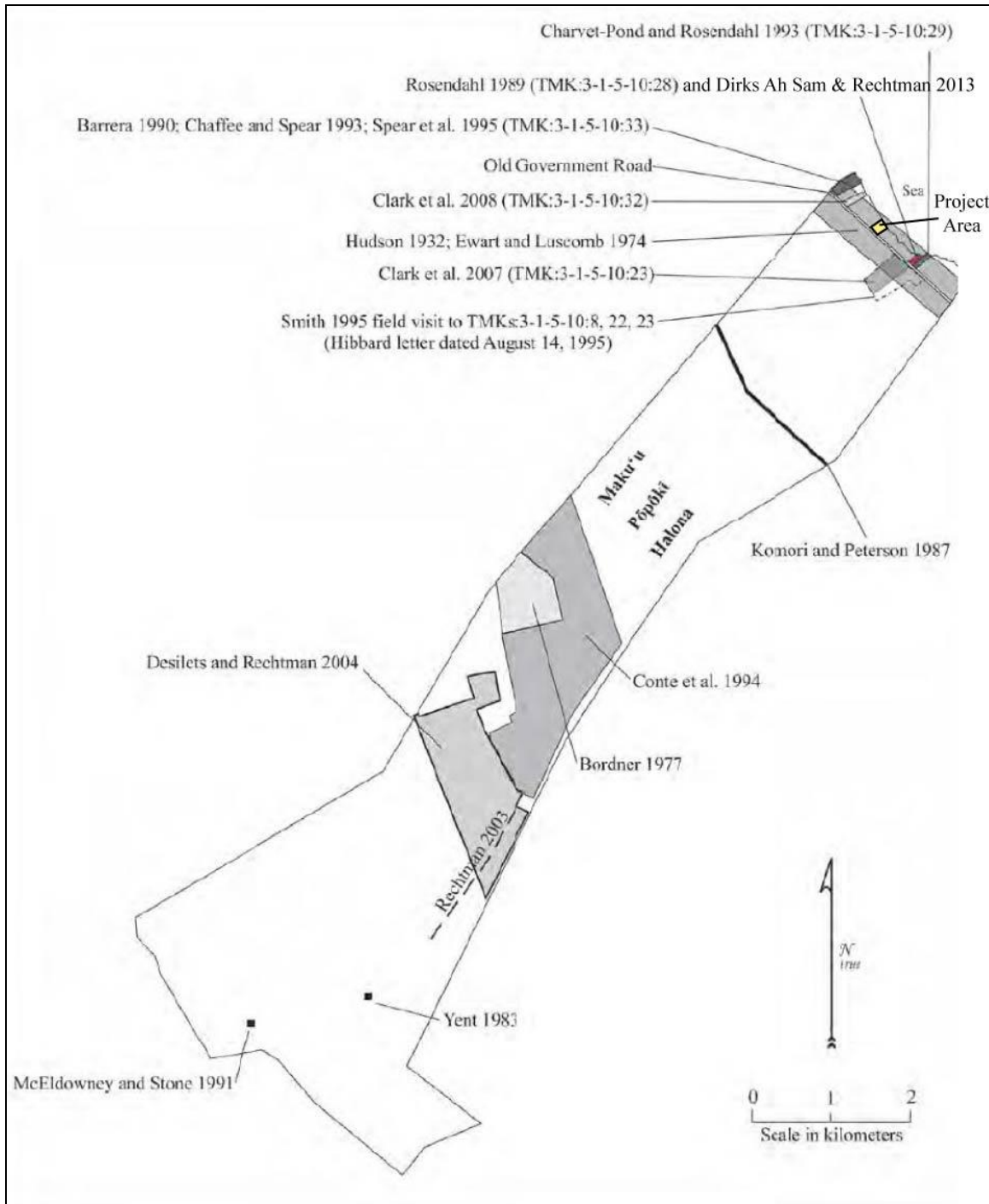


Figure 14: Map Showing Recent Previous Archaeological Studies in Maku'u and Surrounding Ahupua'a (Adapted from Dirks Ah Sam and Rechtman 2013:11).

Table 3: Previous Archaeological Studies in Maku‘u, Pōpōki and Hālona Ahupua‘a.

Author/Date	Type of Study	Ahupua‘a
Barrera & Lerer 1990	Archaeological Inventory Survey	Maku‘u
Bordner 1977	Reconnaissance Survey	Maku‘u
Chaffee & Spear 1993	Burial Testing	Maku‘u
Clark et al. 2007	Archaeological Inventory Survey	Pōpōkī
Clark et al. 2008	Archaeological Inventory Survey	Maku‘u
Charvet-Pond & Rosendahl 1993	Archaeological Inventory Survey	Maku‘u, Hālona, Pōpōkī
Conte et al. 1994	Archaeological Inventory Survey	Maku‘u, Hālona, Pōpōkī
Desilets & Rechtman 2004	Archaeological Inventory Survey	Maku‘u, Hālona, Pōpōkī
Dirks Ah Sam & Rechtman 2013	Archaeological Inventory Survey	Pōpōkī
Hudson 1932	Archaeological Survey	Various
Ewart & Luscomb 1974	Reconnaissance Survey	Various
Komori & Peterson 1987	Cultural & Biological Resource Survey	Various
McEldowney & Stone 1991	Archaeological/Environmental Survey	Various
Yent 1983	Archaeological Survey	Maku‘u
Rechtman 2003	Archaeological Assessment	Maku‘u, Hālona
Rosendahl 1989	Field Inspection	Maku‘u, Hālona, Pōpōkī
Spear et al. 1995	Data Recovery	Maku‘u

PREVIOUS ARCHAEOLOGY WITHIN THE PROJECT AREA

Ewart and Luscomb (1974) recorded six sites within the project area and a single coastal trail segment on the property southeast of the current project area (Table 4 and Figure 15). Sites 18980, 18982 and 18988 were recorded as agricultural complexes, likely pre-Contact to early Historic era, consisting of rock mounds, rock walls, platforms, and a well.

Table 4: Inventory of Previous Documented Sites at the Project Area.

SIHP# 50-10- 45:	Site Type	Description	Research Potential
7476	Kamahele House	Historic house	No Longer Present
18980	Complex (Agriculture)	Rock walls and rock mounds	Good
18981	Petroglyphs	Modern petroglyphs	None
18982	Complex	Walls, faced areas, a mound with an upright stone, and a rock-lined well	Negligible
18987	Burials	Historic graves	N/A
18988	Complex (Ag. & Habitation)	Walls and platforms	Moderate
20598	Trail	Coastal trail	Good

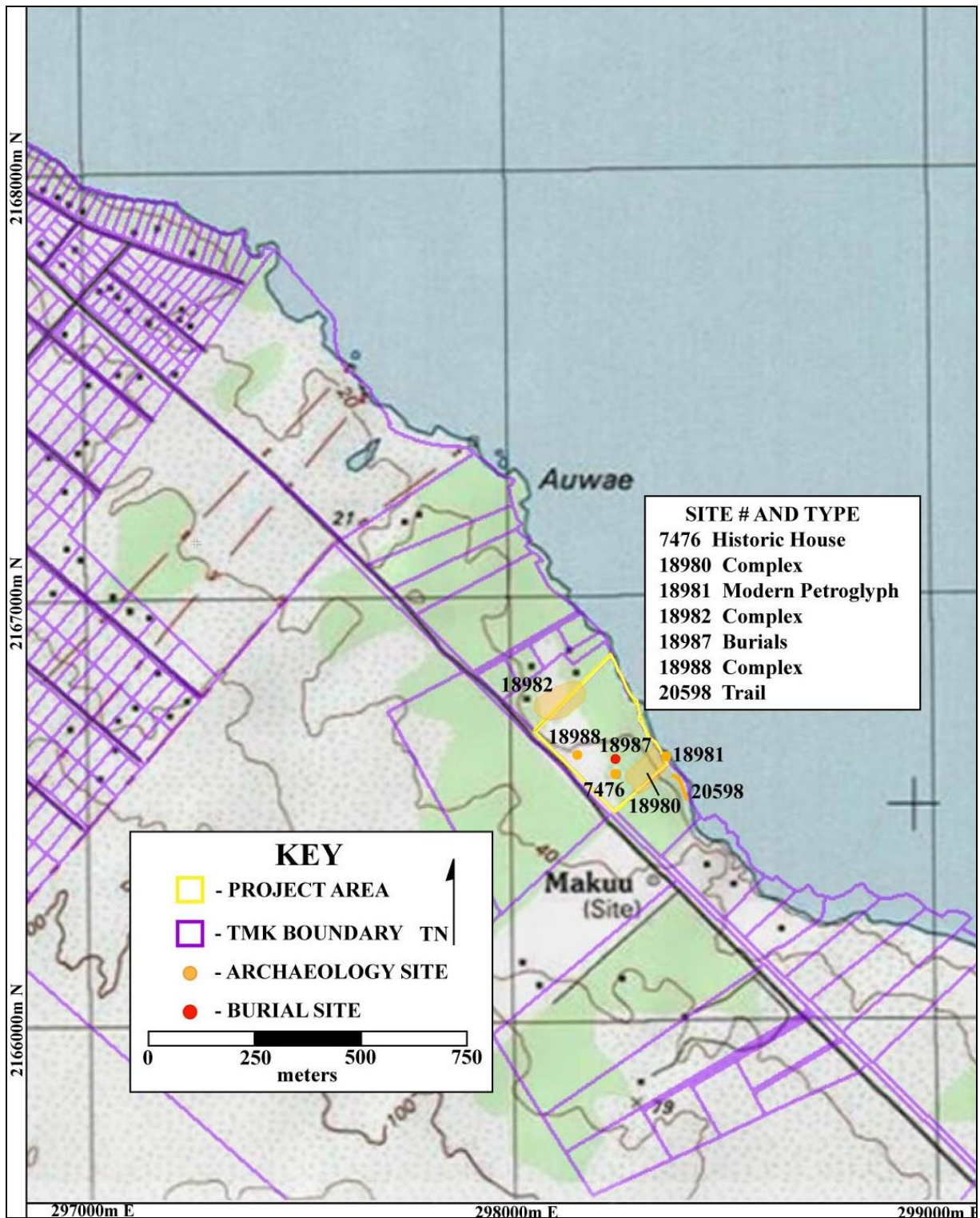


Figure 15: 7.5-Minute Series USGS Topographic Map Showing the Location of Previously Documented Sites on Parcel 009 (Kea‘au Ranch Quadrangle. ESRI, 2013. Data Sources: National Geographic and Hawai‘i County Planning Department, 2013).

Site 18980 is in the southeast corner of the parcel just *mauka* of the coastal pāhoehoe flats. The site contained agricultural rock mounds and walls. Site 18982 was recorded along the northwest boundary of the property, primarily on the property northwest of the current project area. A shallow well or spring was located on the current project area. Site 18988 was no longer present when the Ewart and Luscomb (1974) survey was conducted, but the property owner, Sonny Kamahele, told the surveyors in 1973 that there were platforms, walls and an enclosure that were removed to expand his watermelon fields.

Site 7476 was the Kamahele and Kamoe house located in the southwest quadrant of the property. The house is listed on the Hawai‘i Register. The house burned down in 2014 during Hurricane Iselle and is no longer present on the property. Site 18987 is the family burial plot containing Sonny’s maternal grandmother (née Kamoe) and six other individuals.

Site 18981 are three modern petroglyphs carved into two large rocks located on the coastal pāhoehoe flat in the south east corner of the property. The petroglyphs read “72 MIKE N TINA,” “72 GUY HA” and “MIKE N TINA.”

Site 20598 is a remnant segment of trail located along the coastal cliff on the property southeast of the project area. The trail is constructed of waterworn boulders placed side by side on to two meters wide (Ewart and Luscomb 1974:28).

The Ewart and Luscomb (1974) study determined that Site Complex 18980 had good research potential while the modern petroglyphs at Site 18981 had no research potential. Site Complex 18982 was determined to have negligible research potential. No intrusive additional research was recommended for Burial Site 18987 and that Site Complex 19988 had only moderate research potential as it is no longer present on the ground surface. No recommendation was made in the report for house Site 7476 and it is no longer present. Trail Site 20598 was determined to have good research potential but is not within the current project area, though a search should be made to determine if it continues onto the current project area.

KAMAHELE FAMILY CONSULTATION

Consultation with the Kamahele family was conducted at the property on Saturday April 27, 2019. Seven individuals, including Greg DeConte, Kenneth Ha, Richard Ha, June Ha, Shayne Kamahele, Puanani Mukai, and Darrell Pakele attended and were interviewed. In addition, SCS Senior Archaeologist Glenn Escott spoke to Sheldon Kamahele at an earlier date on the property. Richard Ha has written several posts on his family blog describing Uncle Sonny Kamahele and his watermelon farm at Maku‘u. The following description of Uncle Sonny and his Maku‘u farm includes a summary of the April 27 meeting and Richard Ha’s posts. Figure 16 shows the location of flora zones and land-use areas from Historic to Modern eras.

All of the family members remembered the property well, especially Uncle Sonny Kamahele’s house and farm. Although Uncle Sonny passed away in 2002, many of the family members visited him on his Maku‘u farm from the time they were very young. It seemed for a long time that Uncle Sonny’s farm was far away from Pāhoa and most places as the road access was limited. Richard, whose maternal grandmother was Sonny’s sister, writes

My extended Kamahele family came from Maku‘u. When we were small kids, Pop took us in his ‘51 Chevy to visit.

He turned left just past the heart of Pāhoa town, where the barbershop is today. We drove down that road until he hit the railroad tracks, and then turned left on the old railroad grade back toward Hilo. A few miles down the railroad grading was the old Maku‘u station. It was an old wooden shack with bench seats, as I recall. That is where the train stopped in the old days. A road wound around the pāhoehoe lava flow all the way down the beach to Maku‘u. That was before there were the Paradise Park or Hawaiian Beaches subdivisions.

We did not know there was a district called Maku‘u; we thought the family compound was named Maku‘u. Of the 20-acre property, maybe 10 acres consisted of a kipuka where the soil was ten feet deep. The 10 acres on the Hilo side were typical pāhoehoe lava. The property had a long oceanfront with a coconut grove running the length of the oceanfront. It was maybe 30 trees deep and 50 feet tall.



Figure 16: Aerial Photograph Showing Project Areas, Kea'au, HI, Zone 5 North, 298310 m E, 2166660 m N. (Google Earth, 2013 Image. Data Sources: Digital Globe, GeoEye, Earthstar, USDA, and USGS).

The old-style, two-story house sat on the edge of a slope just behind the coconut grove. If I recall correctly, it had a red roof and green walls. Instead of concrete blocks as supports for the posts, they used big rocks from down the beach.

There was no telephone, no electricity and no running water. So when we arrived it was a special occasion. We kids never, ever got as welcome a reception as we got whenever we went to Maku‘u.

The person who was always happiest to see us small kids was tutu lady Meleana, my grandma Leihulu’s mom. She was a tiny, gentle woman, maybe 100 pounds, but very much the matriarch of the family. She spoke very little English but it was never an issue. We communicated just fine.

We could not wait to go down the beach. Once she took us kids to catch ‘ohua—baby manini. She used a net with coconut leaves as handles that she used to herd the fish into the net. I don’t recall how she dried it, but I remember how we used to stick our hands in a jar to eat one at a time. They were good.

She would get a few ‘opihi and a few haukeuke and we spent a lot of time poking around looking at this sea creature and that.

Between the ocean in the front and the taro patch, ulu trees, bananas and pig pen in the back, there was no problem about food. I know how Hawaiians could be self-sufficient because I saw it in action.

The house was full of rolls of stripped lauhala leaves. There were several lauhala trees and one was a variegated type. I don’t recall if they used it for lauhala mats but it dominated the road to the house.

There were lauhala mats all over the place, four and five thick. There was a redwood water tank, and a Bull Durham bag hung on the kitchen water pipe as a filter [Richard Ha January 2, 217 blog post].

Family members recalled that the kitchen was outside along the north side of Sonny’s house. There was a cast iron wood burning stove in the kitchen. The floor of the house was made of wooden boards over the bare earth ground. Sonny had a wooden bed on which he laid *lauhala* mats for the mattress. The bathroom was a separate

structure north of the kitchen. Sonny had a water catchment and an electric generator for power.

Sonny kept pigs and cows and would net *nenue* and other fish to supplement the vegetables he grew on his property. Sonny would also go to town most Friday's for anything else he needed. Sonny was a well known farmer and he made an annual income growing watermelons up until 2000. People would come from all over to buy his watermelons. Sonny had about twelve hills of watermelons with four plants growing in each hill (Richard Ha January 30, 2017 blog post). In addition, he grew tomatoes, corn, *ulu*, *kalo*, coconuts, and bananas.

Puanani, Uncle Sonny's primary caretaker when he was older, remembered that Sonny's maternal grandmother was buried at the family grave plot northeast of the house. She thought that one of the grandmother's sons who had died during the war might also be buried there. She didn't know the names of the other individuals buried there but was certain they were from the Kamoe and Kamahale family. She thought it was possible that some of the deceased family members' ashes might have been scattered off the coastline of the property.

Family members remembered most fondly fishing and swimming along the shoreline. They remembered that there was a shallow spring along the northwest edge of the property that Sonny dug out and made a shallow well. The well had a pump that Sonny installed. They also remembered that Uncle Sonny kept the west half of the property around the house and watermelon fields well maintained by cutting the grass often and weeding. None of the family members were aware of any cultural practices, other than fishing, that occurred on the property.

EXPECTED ARCHAEOLOGICAL PATTERNS

Based on previous archaeological studies, historical research and family interviews it is expected that pre-Contact to early Historic era agricultural and habitation features will be located on the current project area. The features will likely include rock walls, rock clearing mounds, possible enclosures, and the Kamahale house Site 7476. It is also possible that coastal trail Site 20598 might continue onto the current project area.

RESULTS OF FIELDWORK

Five archaeological sites were identified in the project area (Table 5 and Figure 17). Three of the sites (Site #50-10-45-7476, 18980 and 18987) were previously recorded in Ewart and Luscomb (1974) and two sites are previously undocumented. The three previously identified sites include a cement foundation at the Kamahele House (Site 7476), an agricultural complex (Site 18980) and the family burial plot (Site 18987). Two newly recorded sites include the rock wall along the boundary of Parcel 009 (Site TS1) and a short rock wall segment (Site TS2) in the southeast corner of the project area. Site 18981 recorded in Ewart and Luscomb (1974) is two modern petroglyphs and is not a historic property.

Table 5: Inventory of Archaeological Sites Identified Within the Project Area.

SIHP #50-10-45:	SITE TYPE	SITE FUNCTION	SITE AGE
7476	Kamahele House	Habitation	Historic era
18980	Complex (Agriculture)	Rock walls and rock mounds	Pre-Contact to early post-Contact era
18987	Burials	Historic graves	Historic era
TS-1	Rock Wall	Property Boundary	Historic era
TS-2	Rock Wall	Road edge	Historic era

SITE 07476

KAMAHELE HOUSE FOUNDATION

FUNCTION:

Habitation

AGE:

Modern

DIMENSIONS:

10.37 m NW/SE by 6.1 m by 16 cm Height

CONDITION:

Poor

INTEGRITY:

Lacks Integrity

SURFACE ARTIFACTS:

Modern Debris

EXCAVATION:

None

DESCRIPTION:

Site 7476 is the foundation located where the Kamahele House once stood (see Figure 17). The foundation is toward the center of the project area in an area of mown grass, northeast of two avocado trees, and northwest of a large stand of Cook pines (Figure 18). The concrete foundation is 10.37 m (34 ft) long by 6.1 m (20 ft) wide and is raised approximately 16 cm (6.3 inches) above ground surface (Figure 19 and Figure 20). The house burned down in 2014 during Hurricane Iselle and is no longer present. Family members remembered the house was a post-and-pier wood structure with wood floors boards. They didn't recall a cement foundation and this might have been poured by the subsequent owner. Site 7476 was destroyed by an accidental house fire in 2014, is in poor condition, is no longer present and lacks formal integrity. No further work is recommended at Site 7476.

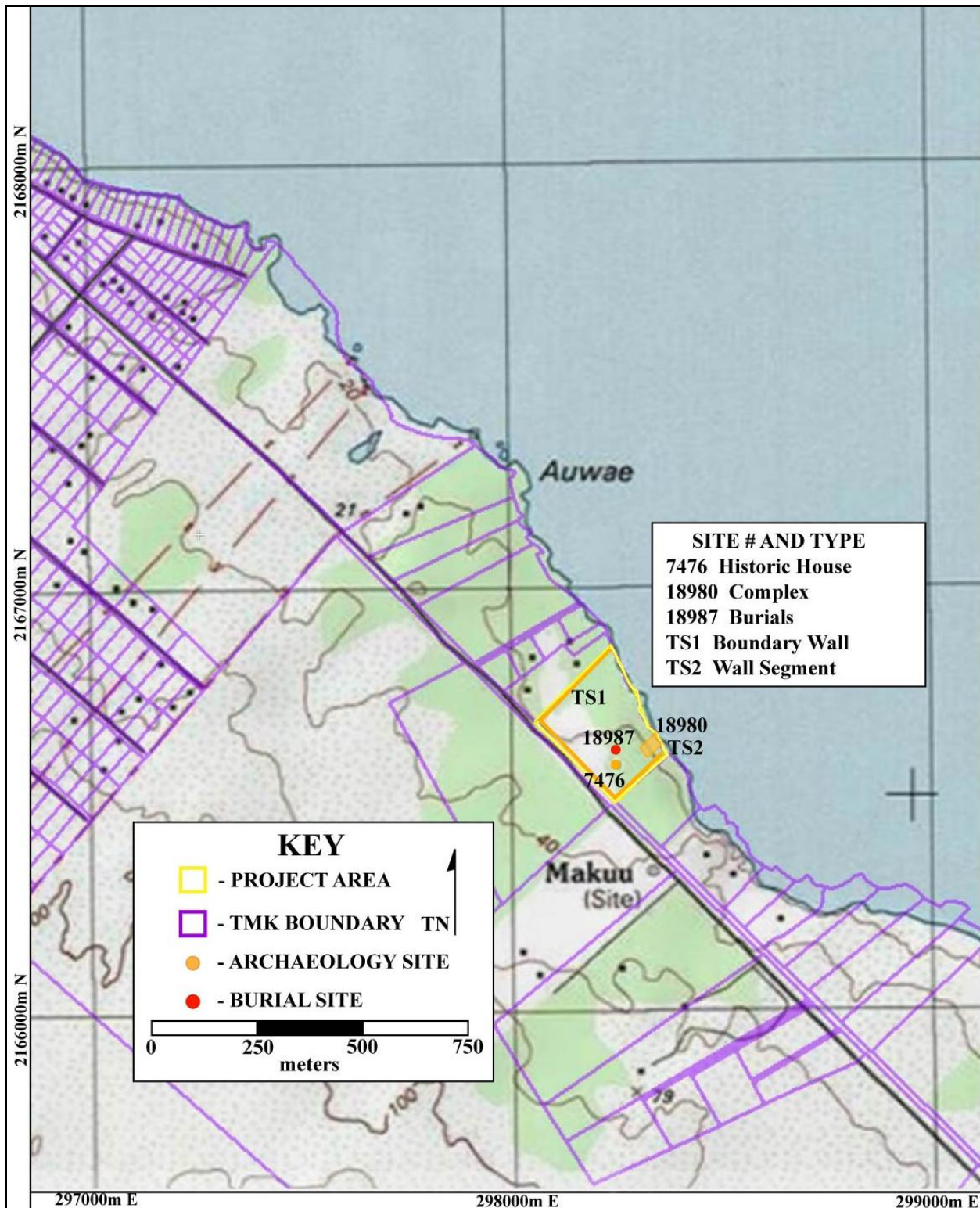


Figure 17: 7.5-Minute Series USGS Topographic Map Showing the Location of Archaeological Sites Documented on Parcel 009 (Kea‘au Ranch Quadrangle. ESRI, 2013. Data Sources: National Geographic and Hawai‘i County Planning Department, 2013).



Figure 18: Aerial Photograph of Site 7476 Kamahale House, Kea'au, HI, Zone 5 North, 298310 m E, 2166660 m N. (Google Earth, 2013 Image. Data Sources: Digital Globe, GeoEye, Earthstar, USDA, and USGS).

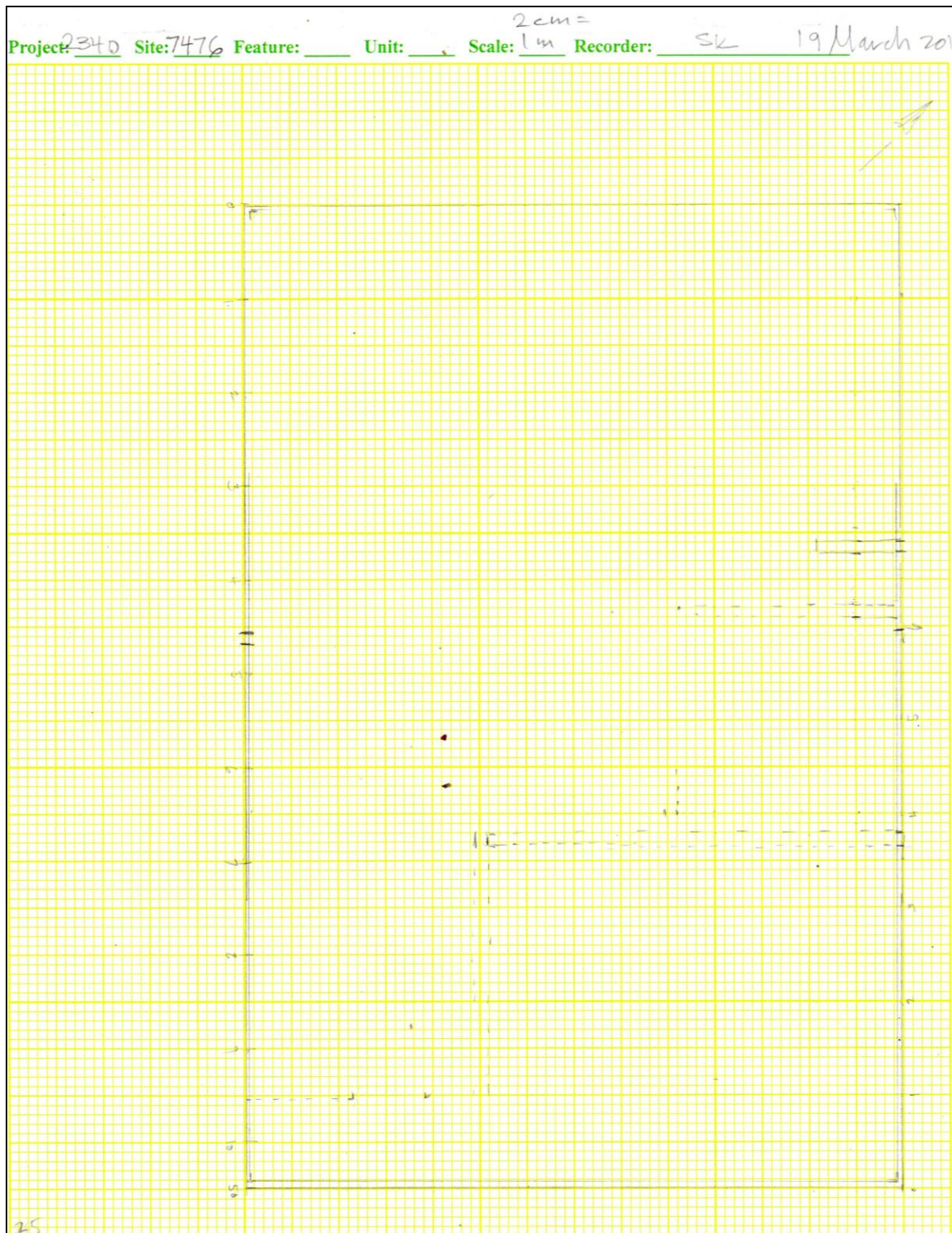


Figure 19: Site 7476 Foundation Plan View Map.



Figure 20: Photograph of Site 7476 Foundation Looking North.

SITE 18980**AGRICULTURAL COMPLEX**

FUNCTION:	Agriculture
AGE:	Pre-Contact to Historic Era
DIMENSIONS:	45.0 m N/S by 20.0 m
CONDITION:	Good
INTEGRITY:	Unaltered: retains integrity of location, setting, materials, and workmanship
SURFACE ARTIFACTS:	Modern Trash
EXCAVATION:	Five Shovel Probes
DESCRIPTION:	Site 18980 is an agricultural complex located in the southeast quadrant of the property (see Figure 16). The complex consists of seven features located in a level thin soil area with <i>hala</i> tree, palm trees, <i>ti</i> plants, and ferns (Figure 21). The site is bordered on the east by a linear pile of boulders thrown up by storm surge. The ground surface slopes gently upwards to the west.

Feature 1 is a low linear rock mound at the south end of Site 18980. Feature 1 is 15.0 m long (E/W) by 0.7 to 1.1 m wide and has a maximum height of 0.38 m (Figure 22). The rock mound is constructed of angular and subangular basalt cobbles and small boulders piled on the ground surface. There is no stacking or facing evident in the feature construction. The rock mound was constructed to delineate space, possibly marking the edge of a garden area. Feature 1 appears to be unaltered and is in good condition.

Feature 2 is a low linear rock mound 5.4 m north of Feature 1. Feature 2 is 6.8 m long (NW/SE) by 1.1 to 2.5 m wide and has a maximum height of 0.62 m (Figure 23). The rock mound is constructed of angular and subangular basalt cobbles and small boulders piled on the ground surface. There is no stacking or facing evident in the feature construction. The rock mound appears to be a clearing or planting, possibly a sweet potato planting mound. Feature 2 appears to be unaltered and is in good condition.

Feature 3 is a low linear rock mound 1.7 m north of Feature 2. Feature 3 is 4.8 m long (NW/SE) by 2.3 m wide and has a maximum height of 0.54 m (Figure 24). The rock mound is constructed of angular and subangular basalt cobbles and small boulders piled on the ground surface. There is no stacking or facing evident in the feature construction. The rock mound appears to be a clearing or planting, possibly a sweet potato planting mound. Feature 3 appears to be unaltered and is in good condition.

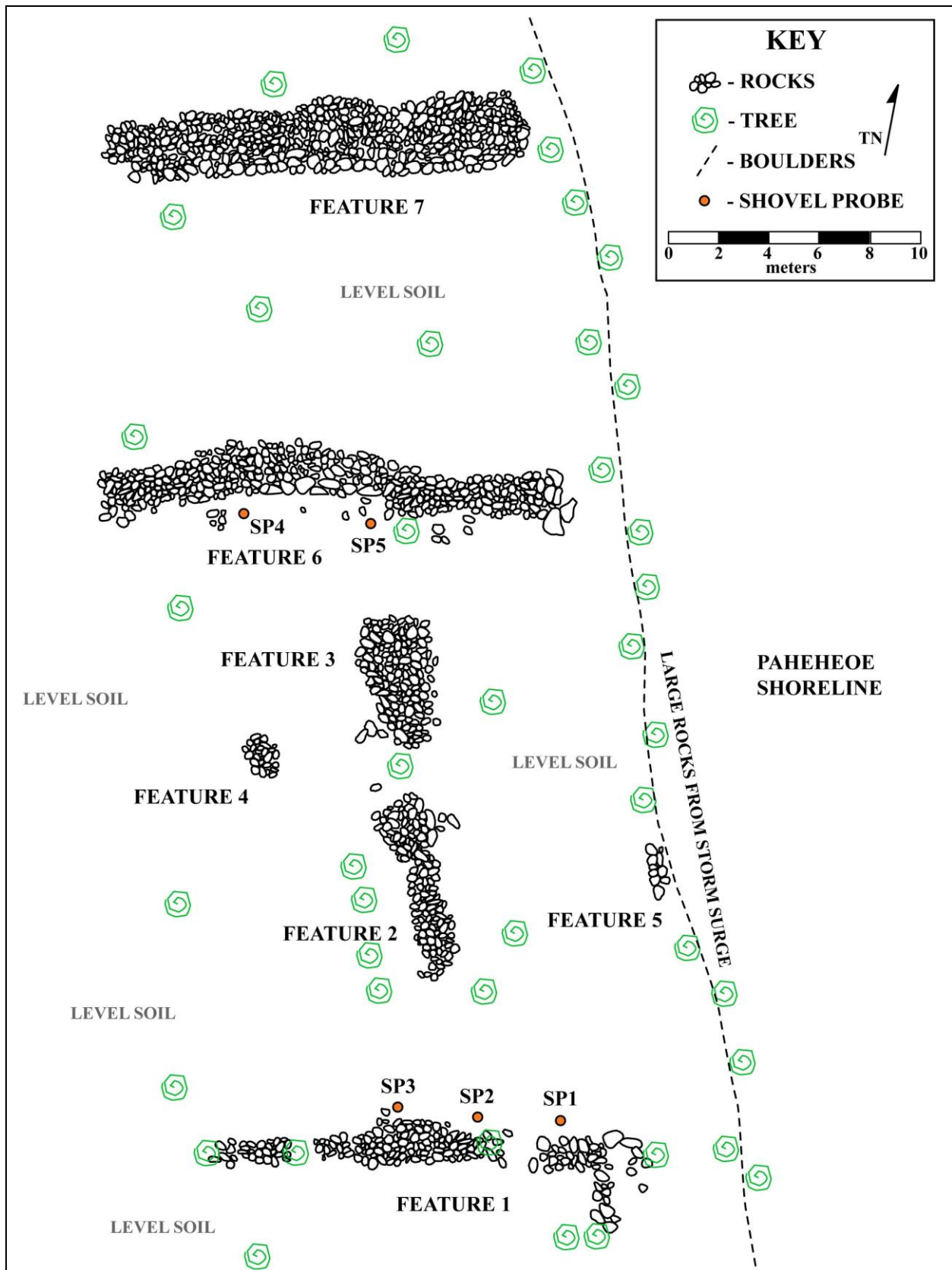


Figure 21: Site 18980 Plan View Map.



Figure 22: Photograph of Site 18980 Feature 1 Linear Rock Mound Looking South.



Figure 23: Photograph of Site 18980 Feature 2 Rock Mound Looking West.



Figure 24: Photograph of Site 18980 Feature 3 Rock Mound Looking South.

Feature 4 is a low rectangular rock mound 4.2 m southwest of Feature 3. Feature 4 is 1.5 m long (NW/SE) by 1.0 m wide and has a maximum height of 0.37 m (Figure 21). The rock mound is constructed of angular and subangular basalt cobbles and small boulders piled on the ground surface. There is no stacking or facing evident in the feature construction. The rock mound is a rock clearing mound within the surrounding garden space. Feature 4 appears to be unaltered and is in good condition.

Feature 5 is a rock facing along a bedrock outcrop 8.0 m east of Feature 2. Feature 5 is approximately 1.0 m long (NW/SE) by 0.4 m wide and has a maximum height of 0.80 m (Figure 21). Feature 5 is constructed of angular and subangular basalt cobbles and small boulders stacked four courses high and one to two courses wide on the ground surface. The feature delineates the eastern boundary of the garden space at Site 18980. Feature 5 appears to be unaltered and is in good condition.

Feature 6 is a rock wall located 5.2 m north of Feature 3. Feature 6 is 19.4 m long (E/W) by 1.4 to 2.0 m wide and has a maximum height of 0.38 m (Figure 25). The rock wall is constructed of angular and subangular basalt cobbles and small boulders stacked three to five courses high on the ground surface. The wall is bi-faced with slightly larger rocks, and filled with rocks that are slightly smaller than the facing rocks. The north edge of the wall is raised higher above the ground surface than is the south edge. The largest rocks in the wall are along the base of the north edge. Those rocks were placed with their flattest largest sides facing the outside edge (north edge) of the wall. The rock mound was constructed to delineate space, possibly marking a division in the garden area. Feature 6 is partially collapsed in places (Figure 26) and is in good condition.

Feature 7 is a rock wall located 12.0 m north of Feature 6. Feature 7 is 16.8 m long (E/W) by 1.1 to 2.3 m wide and has a maximum height of 0.74 m (Figure 27 and Figure 28). The rock wall is constructed of angular and subangular basalt cobbles and small boulders stacked four to five courses high on the ground surface. The wall is bi-faced with slightly larger rocks, and filled with rocks that are slightly smaller than the facing rocks. The largest rocks in the wall are along the base of the wall. Those rocks were placed with their flattest largest sides facing the outside edge (north and south edges) of the wall. The rock mound was constructed to delineate space, possibly marking the northern boundary of the garden area. The west end of the rock wall is covered by fallen trees and dense vegetation. Feature 7 appears to be unaltered and is in good condition.



Figure 25: Photograph of Site 18980 Feature 6 Rock Wall, Overview Looking Southwest.



Figure 26: Photograph of Site 18980 Feature 6 Rock Wall Showing Partial Collapse, Looking West.



Figure 27: Photograph of Site 18980 Feature 7 Rock Wall, Overview Looking Northeast.



Figure 28: Photograph of Site 18980 Feature 7 Rock Wall, South Edge, Looking Southwest.

SITE 18980 SHOVEL PROBE TESTING

Five shovel probes (SP) were excavated at Site 18980 to determine the function and age of the site (Figure 21). SP1, SP2 and SP3 were excavated along the north edge of Features 1 and SP4 and SP5 were dug along the south edge of Feature 6. Shovel probes were excavated to a maximum depth of 0.4 meters and terminated on bedrock or large rocks. Stratigraphy consisted of a single layer of soft, dark brown silt loam with less than 5% gravels, and 1% fine rootlets. There were no artifacts or subsurface deposits encountered in the shovel probes.

SITE 18980 SUMMARY

Site the seven features at Site 18980 are the remains of a small garden area. The southernmost linear rock mound (Feature 1) and northernmost rock wall (Feature 7) mark the boundaries of the garden area. Rock wall Feature 6 delineates space within the garden. It is likely that sweet potatoes were grown on the rock mounds (Features 3 and 4) in the southern $\frac{3}{4}$ of the garden area and taro, or another crop, was grown in the northern $\frac{1}{4}$ of the garden, between Feature 6 and Feature 7. Feature 4 is a rock clearing mound, and all of the features were constructed of rocks removed from the garden area, and so, in some measure, they function as rock clearing features. It is possible that Site 18980 has a pre-Contact era component. It is also likely that the garden was improved and enlarged during the early post-Contact and Historic eras. The large, well-constructed rock walls (Features 6 and 7) are characteristic of post-Contact and Historic era rock walls.

Site 18980 is only slightly altered by storm surges and modern activities, and is in good condition. The property owner has expressed a wish to preserve Site 18980. Site 18980 is recommended for preservation in-place.

SITE 18987**FAMILY BURIAL PLOT**

FUNCTION:	Burial
AGE:	Historic Era
DIMENSIONS:	22.2 m NW/SE by 9.6 m
CONDITION:	Good
INTEGRITY:	Unaltered: retains integrity of location, setting, feeling, materials, and workmanship
SURFACE ARTIFACTS:	None
EXCAVATION:	None
DESCRIPTION:	Site 18987 is a family graves plot located near the center of the property (see Figure 16). It is located in an area of mown grass under coconut palms. The plot is 22.20 m long (NW/SE) by 9.6 m long and has a maximum height of 0.29 m (Figure 29). The plot is trapezoidal in shape with a rectangular extension along the center of the northeast side. The plot is constructed of a perimeter of angular and subangular cobbles and small boulders stacked one to two courses high and one to two courses wide on the ground surface (Figure 30 and Figure 31). The top surface of the plot is level with low cut grass growing on it. There is a pile of loose cobbles and small boulders piled against a palm tree from rock clearing that is not part of the grave plot.

Puanani, Uncle Sonny's primary caretaker when he was older, remembered that Sonny's maternal grandmother was buried at the family grave plot northeast of the house. She thought that one of the grandmother's sons who had died during the war might also be buried there. She didn't know the names of the other individuals buried there but was certain they were from the Kamoe and Kamahele family.

The family burial plot is a Historic to early modern feature. Site 18987 appears to be unaltered and is in good condition. The family burial plot will be preserved in place according to a Burial Site Component of a Preservation Plan (BSCPP) to be written.

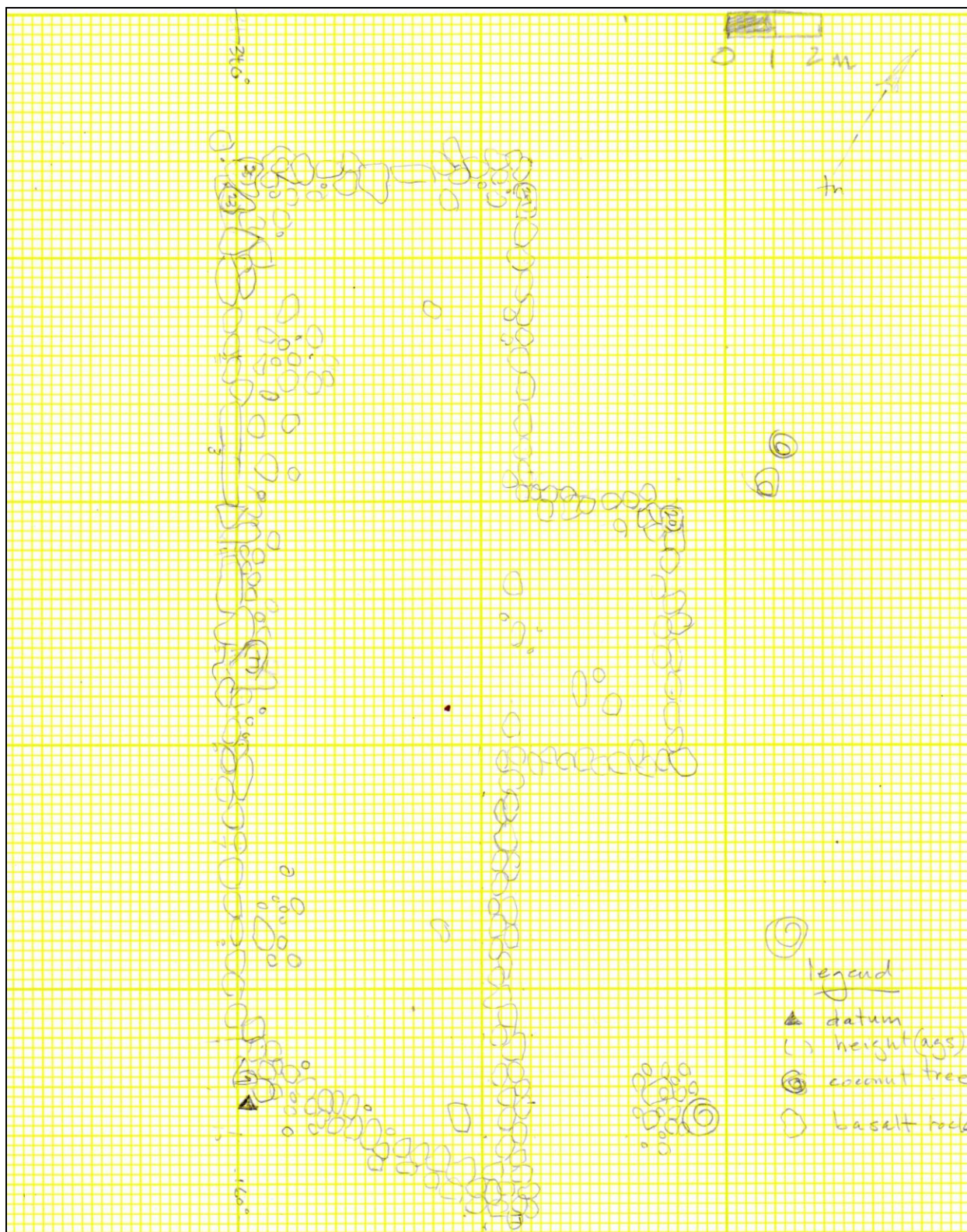


Figure 29: Site 18987 Family Burial Plot Plan View Map.



Figure 30: Photograph of Site 18987 Family Burial Plot Looking North.



Figure 31: Photograph of Site 18987 Family Burial Plot Looking Southeast.

SITE TS-1**ROCK WALL**

FUNCTION: Property Boundary Marker

AGE: Historic Era to Modern Era

DIMENSIONS: 670.0 m long by 1.1 m wide (max.) by 0.91 m height (max.)

CONDITION: Good

INTEGRITY: Unaltered: retains integrity of location, setting, materials, and workmanship

SURFACE ARTIFACTS: None

EXCAVATION: None

DESCRIPTION: Site TS-1 is a Historic era rock wall along the southeast, southwest and northwest boundaries of Parcel 009 (see Figure 16). The wall is approximately 670.0 m long by 0.5 m to 1.1 m in maximum height. The wall is constructed of angular and subangular cobbles and small boulders stacked up to five courses high (Figure 32 through Figure 36). The wall is bi-faced with good facing. The wall is primarily perpendicular to the ground surface and slopes very slightly inward toward the top in places. There are two entrance gates in the wall, the main entrance-driveway gate along the southwest wall, and a small wooden gate along the southeast wall. The wall is partially collapsed in places and is in good condition. No further work is recommended at Site TS-1.

SITE TS-2**ROCK WALL**

FUNCTION: Property Boundary Marker

AGE: Historic Era to Modern Era

DIMENSIONS: 15.0 m long by 1.0 m wide (max.) by 0.91 m height (max.)

CONDITION: Good

INTEGRITY: Unaltered: retains integrity of location, setting, materials, and workmanship

SURFACE ARTIFACTS: None

EXCAVATION: None

DESCRIPTION: Site TS-2 is a Historic era rock wall segment located in the southeast quadrant of Parcel 009 (see Figure 16). The wall is 15.0 m long by 0.7 to 1.0 m wide and is 0.91 m in maximum height (Figure 37, Figure 38 and Figure 39). The wall is constructed of angular and subangular cobbles and small boulders stacked up to four courses high. The wall is bi-faced with good facing. The wall is along the southeast edge of a short dirt road leading from the old house site to the coastline. The wall is partially collapsed in places and is in good condition. No further work is recommended at Site TS-2.

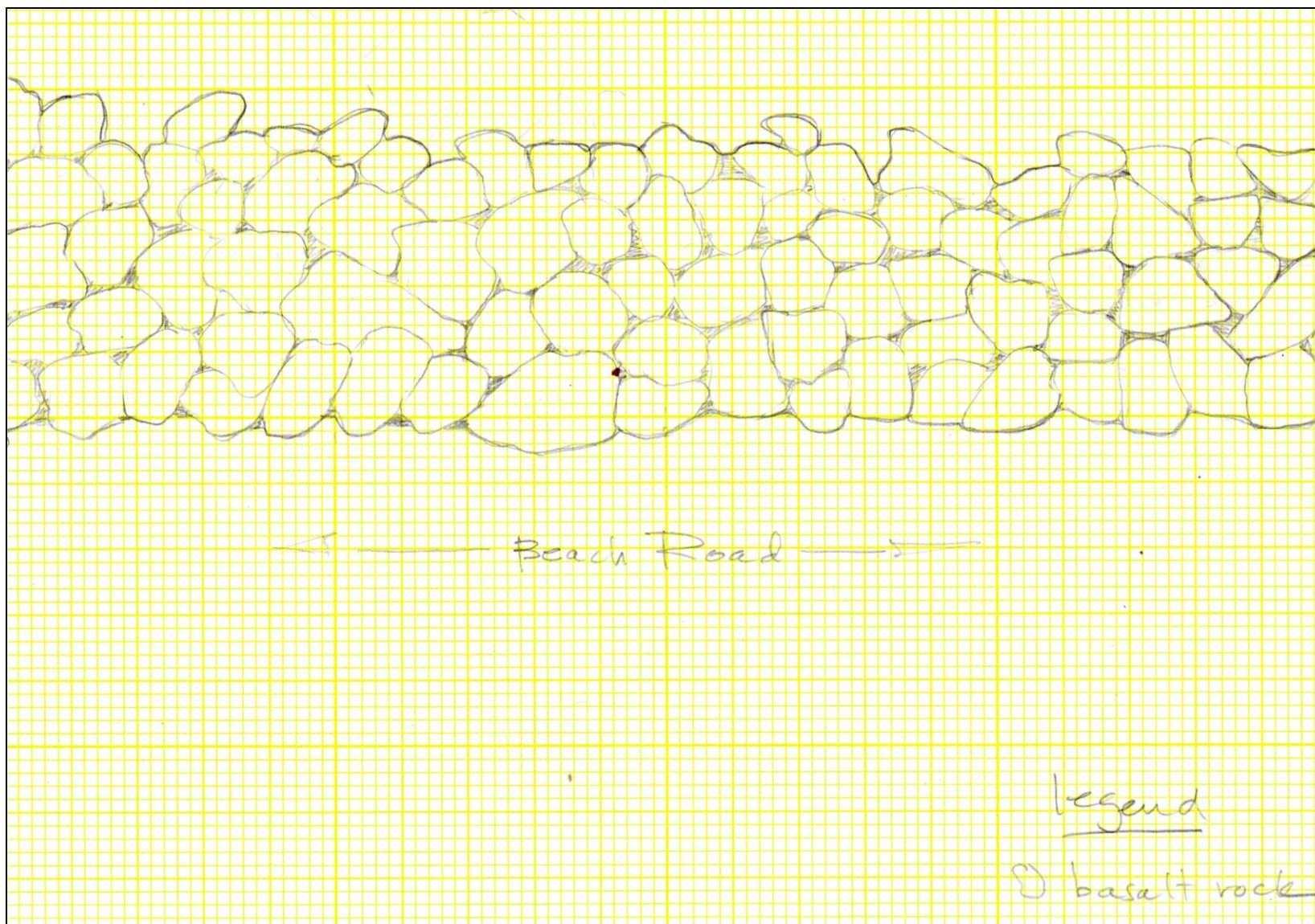


Figure 32: Site TS-1 Southwest Rock Wall Profile Showing Typical Wall Construction.



Figure 33: Photograph of Site TS-1 East End of South East Wall, Near Ocean, Looking Southeast.



Figure 34: Photograph of Site TS-1 Southeast Wall Near South Corner, Looking Southeast.



Figure 35: Photograph of Site TS-1 West Wall along Beach Road, Looking North.



Figure 36: Photograph of Site TS-1 Northwest Wall, Looking Northwest.

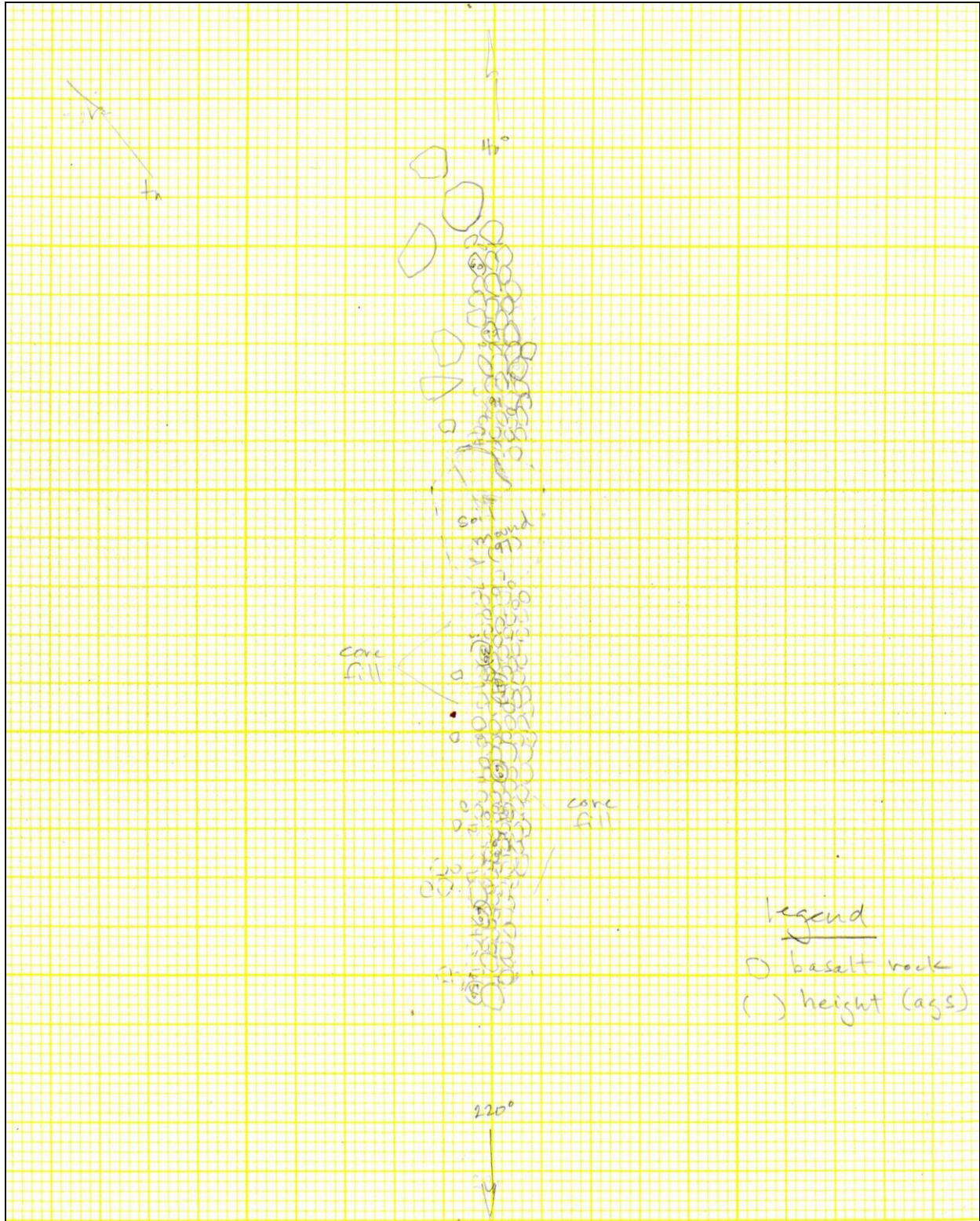


Figure 37: Site TS-2 Rock Wall Segment Plan View Map.



Figure 38: Photograph of Site TS-2 Rock Wall Segment, Looking South.



Figure 39: Photograph of Site TS-2 Rock Wall Segment, Looking South.

PROJECT AREA BACKHOE TRANCHING

Four stratigraphic trenches (ST) 11.0 to 12.0 meters long by 0.75 meters (45.0 linear meters total) were excavated by backhoe to determine soil stratigraphy at the project area (Figure 40) and to identify subsurface features and diagnostic artifacts that might be present at Sites 18982 and 18988.

Site 18982 was recorded along the northwest boundary of the property (Ewart and Luscomb 1974), primarily on the property northwest of the current project area. A shallow well or spring was located on the current project area. Site 18982 surface features were no longer present during the current AIS study.

Site 18988 was no longer present when the Ewart and Luscomb (1974) survey was conducted, but the property owner, Sonny Kamahale, told the surveyors in 1973 that there were once platforms, walls and an enclosure that were removed to expand his watermelon fields.

Sratigraphic Trench-1

ST-1 was excavated in the project area south corner to record project area stratigraphy (See Figure 40). ST-1 was not located in an area known to have archaeological sites or features.

Sratigraphic Trench-2

ST-2 was excavated along the western edge of the project area (see Figure 40) in the location where Site 18988 was said to have once existed. ST-2 was excavated to identify Site 18988 subsurface features or cultural deposits.

Sratigraphic Trench-3

ST-3 was excavated in the project area west quadrant in the location where Site 18982 was previously recorded. (see Figure 40). ST-3 was excavated to identify Site 18982 subsurface features or cultural deposits.

Sratigraphic Trench-4

ST-4 was excavated along the project northwest boundary in the location where Site 18982 was previously recorded. (see Figure 40). ST-4 was excavated to identify Site 18982 subsurface features or cultural deposits.

There were no artifacts, subsurface features or cultural deposits identified in any of the four stratigraphic trenches.

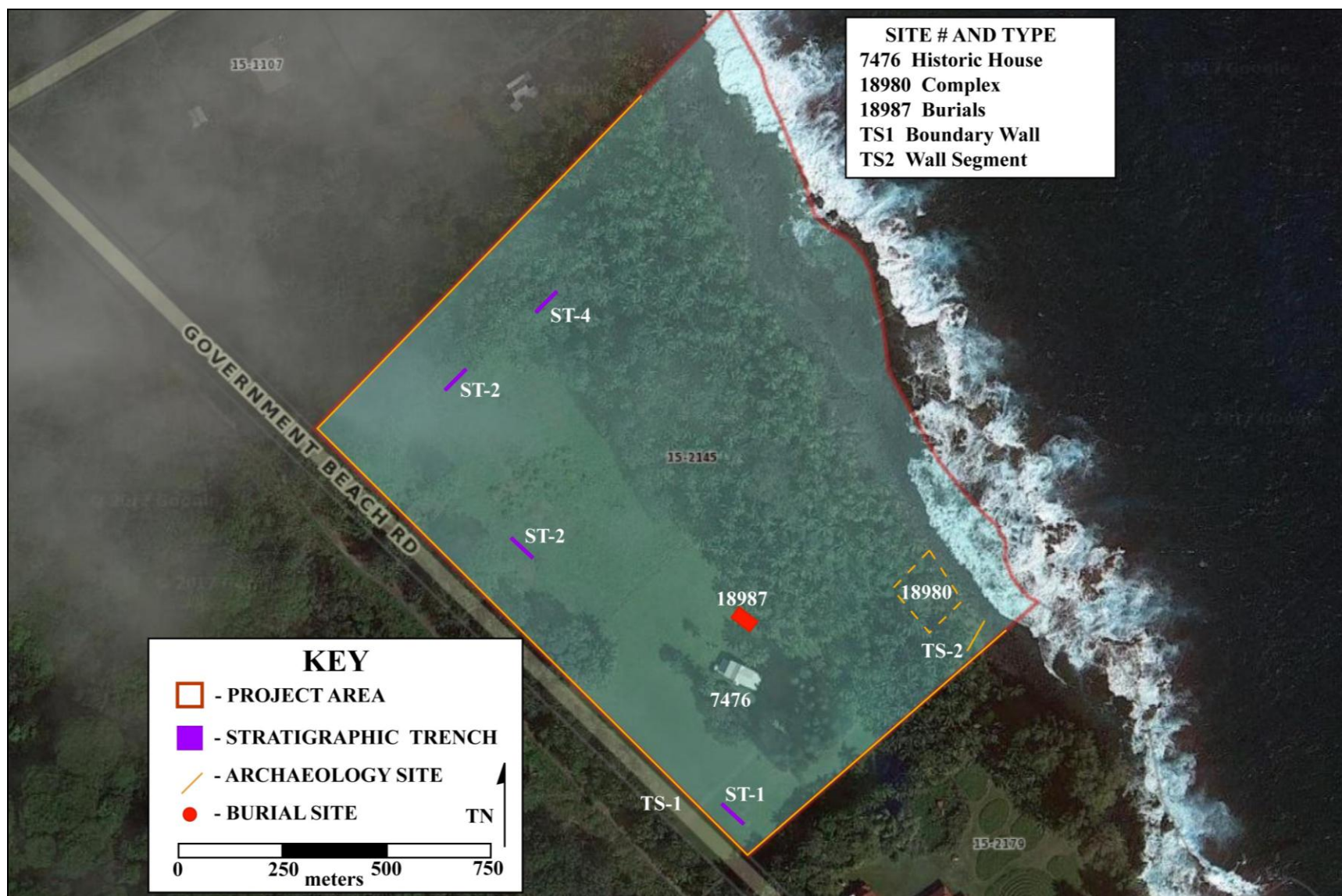


Figure 40: Aerial Photograph Showing Project Area, Sites and Stratigraphic Trenches, Kea'au, HI, Zone 5 North, 298310 m E, 2166660 m N. (Google Earth, 2013 Image. Data Sources: Digital Globe, GeoEye, Earthstar, USDA, and USGS).

CONCLUSION

Five archaeological sites were identified in the project area. Three of the sites (Site #50-10-45-7476, 18980 and 18987) were previously recorded in Ewart and Luscomb (1974) and two were previously undocumented sites. The three previously identified sites include a cement foundation at the Kamahele House (Site 7476), an agricultural complex (Site 18980) and the family burial plot (Site 18987). Two newly recorded sites include the rock wall along the southeast, southwest and northwest boundaries of Parcel 009 (Site TS1) and a short rock wall segment (Site TS2) in the southeast corner of the project area.

The sites are primarily Historic era in age, though Site 18980, an agricultural complex, could possibly have a pre-Contact era component. The Site 18980 features are constructed in the manner of, and have characteristics common to, Historic era features.

Sites identified on the project area were constructed by the Kamahele and Kamoe families as part of a working farm and home. The sites were used up through the modern era.

SIGNIFICANCE ASSESSMENT & RECOMMENDATIONS

The five archaeological sites (Sites 7476, 18980, 18987, TS-1, and TS-2) identified during the AIS study were assessed for significance as outlined in Hawai'i Administrative Rules §13-284-6. To be significant, a historic property shall possess integrity of location, design, setting, materials, workmanship, feeling, and association and shall meet one or more of the following criteria [§13-284-6(b)]:

- (a) It must be associated with events that have made a significant contribution to the broad patterns of our history, or be considered a traditional cultural property [§13-284-6(b)(1)].
- (b) It must be associated with the lives of persons significant in the past property [§13- 284-6(b)(2)].
- (c) It must embody distinctive characteristics of a type, period, or method of construction, or represent a significant and distinguishable entity whose components may lack individual distinction property [§13-284-6(b)(3)].
- (d) It must have yielded or may be likely to yield, information important in prehistory or history property [§13-284-6(b)(4)].
- (e) Have an important value to 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, oral accounts--these associations being important to the group's history and cultural identity property [§13-284-6(b)(5)].

All five sites (Sites 7476, 18980, 18987, TS-1, and TS-2) are significant under criterion "d" as they are likely to yield, or have yielded, information important to history (Table 6). All of the sites have yielded information important to understanding early Historic to early Modern era farms and homesteads along the coast in Puna District. Site 18987 is also significant under criterion e, as it has importance to traditional Hawaiian cultural beliefs and practices.

Table 6: Site Significance and Recommended Treatments.

SIHP #50-10- 45:	TYPE	FUNCTION	SITE AGE	SIGNIFICANCE CRITERIA	RECOMMENDED TREATMENT
7476	Kamahele House	Habitation	Historic Era	d	No Further Work
18980	Complex (Agriculture)	Rock walls and rock mounds	Pre-Contact to early post-Contact Era	d	Preservation
18987	Burials	Historic graves	Historic Era	d, e	Preservation
TS-1	Rock Wall	Property Boundary	Historic Era	d	No Further Work
TS-2	Rock Wall	Road edge	Historic Era	d	No Further Work

No further work is recommended at Sites 7476 (no longer present), Site TS-1 and Site TS-2. Information collected during the AIS study and recorded in this AIS report is sufficient to warrant no further work.

Preservation in-place is recommended at Site 18980 and Site 18987. Preservation at Site 18980 and Site 18987 shall consist of avoidance and protection (conservation) per HAR §13-277-3(1). Site 18980 will be preserved in accordance with an Archaeological Preservation Plan (PP) to be written. Site 18987 will be preserved in accordance with a Burial Site Component of a Preservation Plan (BSCPP) to be written. The overall proposed project determination is effect with agreed upon mitigation.

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APPENDIX C

CULTURAL IMPACT ASSESSMENT REPORT

**GARRETT SINGLE FAMILY RESIDENCE - CONSERVATION DISTRICT USE PERMIT
APPLICATION**

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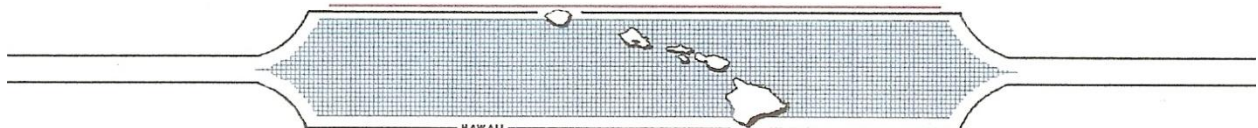
**A CULTURAL IMPACT ASSESSMENT FOR
A 13.436-ACRE PROPERTY IN KEA'AU, MAKU'U AHUPUA'A,
PUNA DISTRICT, HAWAI'I ISLAND, HAWAI'I
[TMK: (3) 1-5-010:009]**

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Glenn G. Escott, M.A.

NOVEMBER 2019
DRAFT

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INTRODUCTION

Under contract to property owner Kamahele Farms, LLC, Scientific Consultant Services, Inc. (SCS) conducted a Cultural Impact Assessment (CIA) for the lands of TMK: (3) 1-5-010:009 located in Maku‘u Ahupua‘a, Puna District, Island of Hawai‘i, Hawai‘i (Figure 1 through Figure 4). Parcel 009 is located approximately seven miles southeast of Kea‘au town and just south of the Hawaiian Paradise Park (HPP) residential subdivision. The property is bounded on the east by the Pacific Ocean, the west by Government Beach Road, and on the north and south by residential properties.

The property owner is proposing to build a single family dwelling on the property. The AIS study was conducted as supporting documentation for a Special Management Area (SMA) permit application and construction permit application. The property owner point of contact is Mr. Robert Garrett. The property owner’s mailing owner’s address is 8216 N 14th Street, Phoenix, AZ 85020-3890. Mr. Garrett can be contacted by phone at 623-330-7244 or by email at bellgroup4930@yahoo.com.

The Constitution of the State of Hawai‘i clearly states the duty of the State and its agencies is to preserve, protect, and prevent interference with the traditional and customary rights of native Hawaiians. Article XII, Section 7 requires the State to “protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by *ahupua‘a* tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778” (2000). In spite of the establishment of the foreign concept of private ownership and western-style government, Kamehameha III (Kauikeaouli) preserved the people's traditional right to subsistence.

As a result, in 1850 the Hawaiian Government confirmed the traditional access rights to native Hawaiian *ahupua‘a* tenants to gather specific natural resources for customary uses from undeveloped private property and waterways under the Hawai‘i Revised Statutes (HRS) 7-1. In 1992, the State of Hawai‘i Supreme Court, reaffirmed HRS 7-1 and expanded it to include, “native Hawaiian rights...may extend beyond the *ahupua‘a* in which a native Hawaiian resides where such rights have been customarily and traditionally exercised in this manner” (Pele Defense Fund v. Paty, 73 Haw.578, 1992).

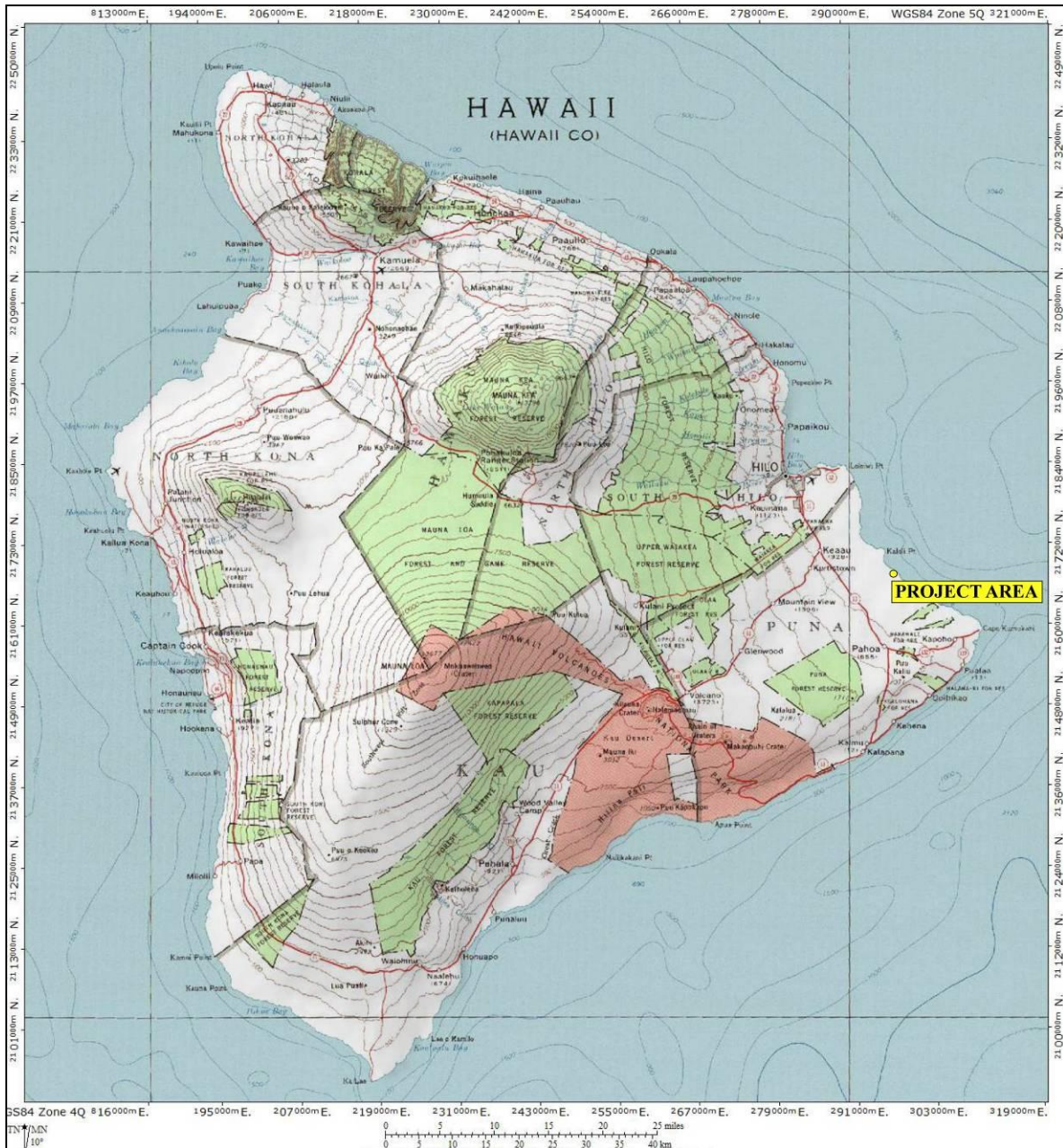


Figure 1: 5,500 K-Series Map of Hawai'i Showing Location of Project Area (National Geographic Topo!, 2003. Data Sources: National Geographic Society, USGS).

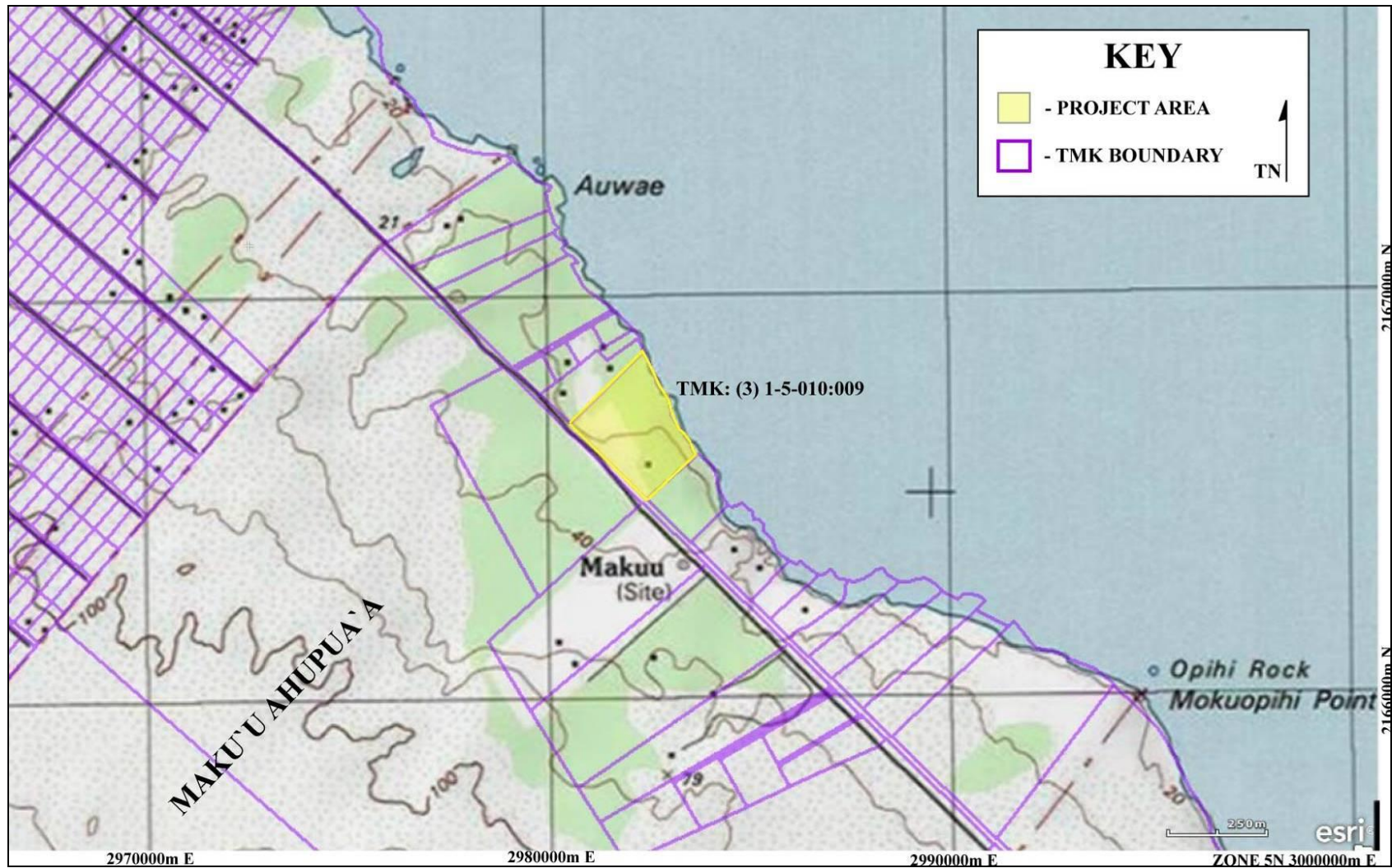


Figure 2: 7.5-Minute Series USGS Topographic Map Showing the Location of Project Areas and TMK Parcels (Keaau Ranch Quadrangle. ESRI, 2013. Data Sources: National Geographic and County of Hawai‘i Planning Department, 2019).

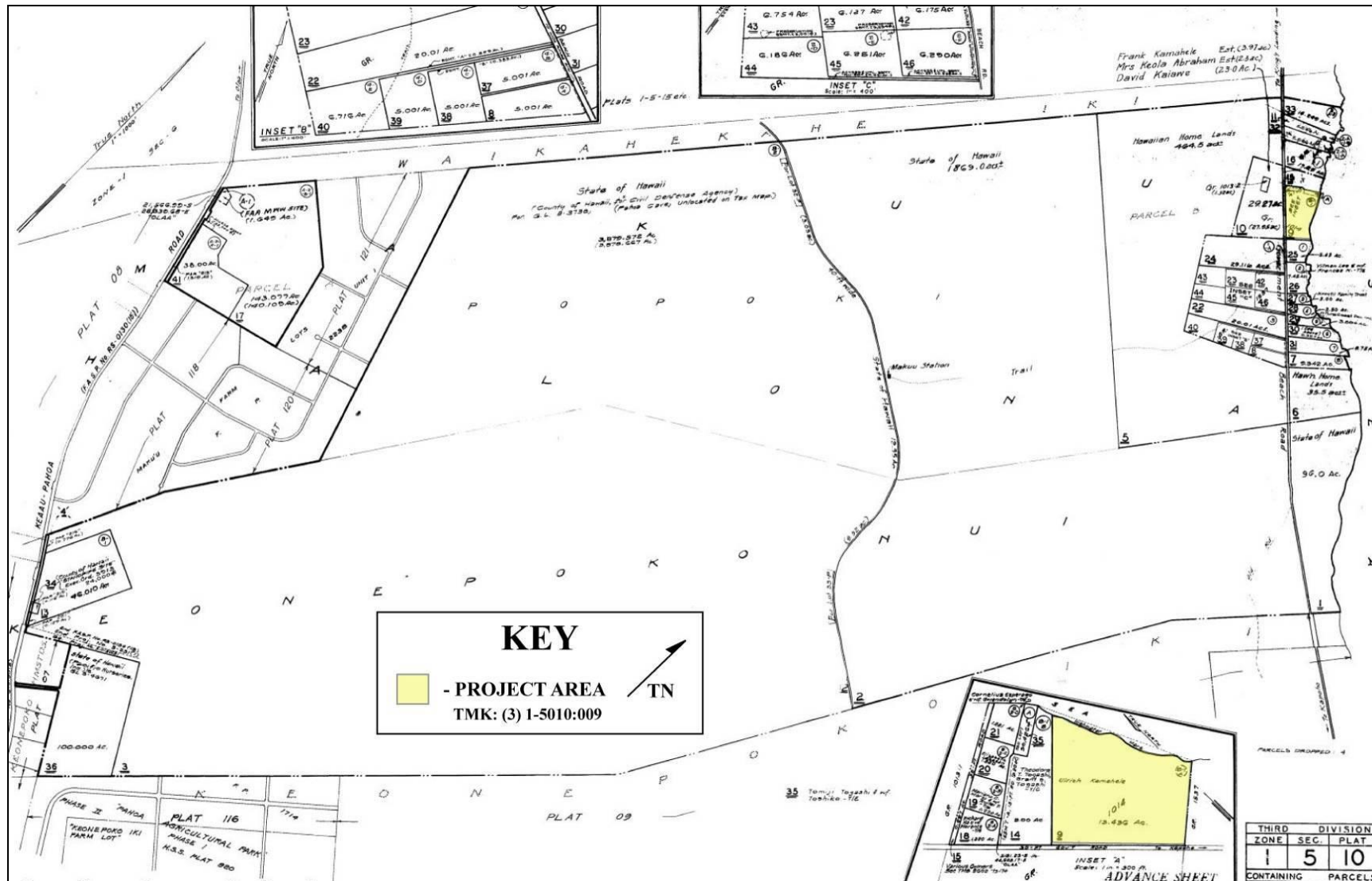




Figure 4: Aerial Photograph Showing Project Areas, Kea'au, HI, Zone 5 North, 298310 m E, 2166660 m N. (Google Earth, 2013 Image. Data Sources: Digital Globe, GeoEye, Earthstar, USDA, and USGS).

Act 50, enacted by the Legislature of the State of Hawaii (2000) with House Bill 2895, relating to Environmental Impact Statements, proposes that:

...there is a need to clarify that the preparation of environmental assessments or environmental impact statements should identify and address effects on Hawai'i's culture, and traditional and customary rights... [H.B. NO. 2895].

Act 50 requires state agencies and other developers to assess the effects of proposed land use or shoreline developments on the “cultural practices of the community and State” as part of the HRS Chapter 343 environmental review process (2001).

Its purpose has broadened, “to promote and protect cultural beliefs, practices and resources of native Hawaiians [and] other ethnic groups, and it also amends the definition of ‘significant effect’ to be re-defined as “the sum of effects on the quality of the environment including actions that are...contrary to the State’s environmental policies...or adversely affect the economic welfare, social welfare, or cultural practices of the community and State” (H.B. 2895, Act 50, 2000).

Thus, Act 50 requires an assessment of cultural practices to be included in the Environmental Assessments and the Environmental Impact Statements, and to be taken into consideration during the planning process. The concept of geographical expansion is recognized by using, as an example, “the broad geographical area, e.g. district or *ahupua‘a*” (OEQC 1997). It was decided that the process should identify ‘anthropological’ cultural practices, rather than ‘social’ cultural practices. For example, *limu* (edible seaweed) gathering would be considered an anthropological cultural practice, while a modern-day marathon would be considered a social cultural practice. According to the Guidelines for Assessing Cultural Impacts established by the Hawaii State Office of Environmental Quality Control:

The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs. The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both manmade and natural, which support such cultural beliefs (OEQC 1997).

This Cultural Impact Assessment involves evaluating the probability of impacts on identified cultural resources, including values, rights, beliefs, objects, records, properties, and stories occurring within the project area and its vicinity (H.B. 2895, Act 50, 2000).

METHODOLOGY

This Cultural Impact Assessment was prepared in accordance with the methodology and content protocol provided in the Guidelines for Assessing Cultural Impacts (OEQC 1997). In outlining the “Cultural Impact Assessment Methodology”, the OEQC states: ...information may be obtained through scoping, community meetings, ethnographic interviews and oral histories... (1997).

The report contains archival and documentary research, as well as communication with organizations having knowledge of the project area, its cultural resources, and its practices and beliefs. This Cultural Impact Assessment was prepared in accordance with the methodology and content protocol provided in the Guidelines for Assessing Cultural Impacts (OEQC 1997). The assessment concerning cultural impacts should address, but not be limited to, the following matters:

- (1) a discussion of the methods applied and results of consultation with individuals and organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints of limitations with might have affected the quality of the information obtained;
- (2) a description of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken;
- (3) ethnographic and oral history interview procedures, including the circumstances under which the interviews were conducted, and any constraints or limitations which might have affected the quality of the information obtained;
- (4) biographical information concerning the individuals and organizations consulted, their particular expertise, and their historical and genealogical relationship to the project area, as well as information concerning the persons submitting information or interviewed, their particular knowledge and cultural expertise, if any, and their historical and genealogical relationship to the project area;
- (5) a discussion concerning historical and cultural source materials consulted, the institutions and repositories searched, and the level of effort undertaken, as well as the particular perspective of the authors, if appropriate, any opposing views,

and any other relevant constraints, limitations or biases;

- (6) a discussion concerning the cultural resources, practices and beliefs identified, and for the resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site;
- (7) a discussion concerning the nature of the cultural practices and beliefs, and the significance of the cultural resources within the project area, affected directly or indirectly by the proposed project;
- (8) an explanation of confidential information that has been withheld from public disclosure in the assessment;
- (9) a discussion concerning any conflicting information in regard to identified cultural resources, practices and beliefs;
- (10) an analysis of the potential effect of any proposed physical alteration on cultural resources, practices or beliefs; the potential of the proposed action to isolate cultural resources, practices or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place, and;
- (11) the inclusion of bibliography of references, and attached records of interviews, which were allowed to be disclosed.

Based on the inclusion of the above information, assessments of the potential effects on cultural resources in the project area and recommendations for mitigation of these effects can be proposed.

ARCHIVAL RESEARCH

Archival research focused on a historical documentary study involving both published and unpublished sources. These included legendary accounts of native and early foreign writers; early historical journals and narratives; historic maps and land records such as Land Commission Awards, Royal Patent Grants, and Boundary Commission records; historic accounts, and previous archaeological project reports.

INTERVIEW METHODOLOGY

Interviews are conducted in accordance with applicable state laws and guidelines. Individuals and/or groups who have knowledge of traditional practices and beliefs associated with a project area or who know of historical properties within a project area are sought for consultation. Individuals who have particular knowledge of traditions passed down from preceding generations and a personal familiarity with the

project area are invited to share their relevant information. Often people are recommended for their expertise, and indeed, organizations, such as Hawaiian Civic Clubs, the Island Branch of Office of Hawaiian Affairs, historical societies, Island Trail clubs, and Planning Commissions are depended upon for their recommendations of suitable informants. These groups are invited to contribute their input, and suggest further avenues of inquiry, as well as specific individuals to interview.

If knowledgeable individuals are identified, personal interviews are sometimes taped and then transcribed. These draft transcripts are returned to each of the participants for their review and comments. After corrections are made, each individual signs a release form, making the information available for this study. When telephone interviews occur, a summary of the information is often sent for correction and approval, or dictated by the informant and then incorporated into the document. Key topics discussed with the interviewees vary from project to project, but usually include: personal association to the *ahupua'a*, land use in the project's vicinity; knowledge of traditional trails, gathering areas, water sources, religious sites; place names and their meanings; stories that were handed down concerning special places or events in the vicinity of the project area; evidence of previous activities identified while in the project vicinity.

In this case, letters with maps and descriptions the project area were sent to individuals and organizations whose jurisdiction includes knowledge of the area with an invitation for consultation. Consultation was sought from Kamaile Puluole-Mitchell, Office of Hawaiian Affairs (OHA) East Hawai'i Island Representative; Jordan Kea Calpito, SHPD Burial Sites Specialist; Sean Naleimaile, State Historic Preservation Division (SHPD) Hawai'i Island Archaeologist; and Kalena Blakemore, Hawai'i Island Burial Council (HIBC) Member. Consultation was also conducted at the project area with members of the Kamahale and Lui families.

If cultural resources are identified based on the information received from these organizations and/or additional informants, an assessment of the potential effects on the identified cultural resources in the project area and recommendations for mitigation of these effects can be proposed. Public notices (Appendix A) were placed in the June 2019 issue of the Office of Hawaiian Affairs (OHA) Ka Wai Ola Newspaper. Public notices were also published in the Honolulu Star-Advertiser, and the Hawai'i Tribune Herald.

PROJECT AREA NATURAL ENVIRONMENT

The project area is situated on level to moderately sloping land between 0 feet (0 m) to 30.0 feet (9.0 m) above mean sea level (amsl). The project area substrate is a Kīlauea lava flow dated between 750 and 1,500 years ago (Wolfe and Morris 1996). Soil in the project area is 'Opihikao series (rOPE) extremely rocky muck overlaying pāhoehoe lava (Sato 1973:43). The soil is thin and well drained with 3% to 25% slopes.

There is a low littoral cinder cone located at the center of the property, in the area of the house (see house location in Figure 4). Soil in the southwest 2/3 of the property has relatively deep cinder soil and was used for watermelon and vegetable farming, as well as pasture for cows, sheep and more recently horses. This area is primarily mown grass for the house yard.

The southwest half of the property is mown grass and ferns, and the northeast half is coconut grove with some native trees. The northeastern edge of the property is pāhoehoe coastal flats flanked by large piles of boulders thrown ashore by storm surge. The southwest half of the property was used in the Modern era as watermelon fields. Rainfall in the project area is between 120 and 200 inches per year. Natural drainage in the area runs from west to east.

Plant communities in southwest half of the project are dominated by grasses, ferns and introduced ornamental and fruit trees including various citrus trees, Cook pine (*Araucaria columnaris*), coconut palm (*Cocos nucifera*), avocado (*Persea americana*), ulu (*Autocarpus altilis*), gunpowder (*Trema orientalis*), Moluccan albezia (*Falcataria moluccana*), and bingabing (*Macaranga mappa*). The coastal half of the property contains coconut palms, *hala* (*Pandanus tectorius*), *naupaka* (*Scaevola taccada*), False *kamani* (*Terminalia catappa*), and *ki* (*Cordyline fruticosa*).

HISTORICAL AND CULTURAL CONTEXTS

Many archaeologists believe that Hawai‘i Island was first settled around A.D. 1,000 by people sailing from the Marquesas (Athens et al. 2014; Dye 2011; Kahn et al. 2014; Kirch 2011; Kirch and McCoy 2007; Mulrooney et al. 2011; Reith et al. 2011; Wilmhurst et al. 2011a and 2011b). An article published in the *Journal of Archaeological Science* reviewing radiocarbon dates recovered at archaeological sites on the Island of Hawai‘i suggests that, by relying on only carbon samples from short-lived plant remains, the most reliable dates point to initial Polynesian colonization of Hawai‘i Island occurring between A.D. 1220 and 1261 (Reith et al. 2011:2747). Hilo was, by most estimates, one of the first settlements on the Island of Hawai‘i.

The rich marine resources of Hilo Bay and the gently sloping forests of Mauna Loa and Mauna Kea provided abundant resources. Fresh water was available from the Wailoa and Wailuku rivers and smaller streams such as Waiākea, Waiolama, Pukihāe, and ‘Alenaio. The current project area is located in Maku‘u Ahupua‘a, Puna District, roughly twenty kilometers southeast of Hilo (Figure 5).

PRE-CONTACT ACCOUNTS OF SOUTH HILO AND PUNA DISTRICTS

The earliest account of Hilo appears in ‘Umi-a-Liloa’s (1600–1620) conquest of the Island of Hawai‘i, which establishes Hilo as a royal center by the sixteenth century. In the account, ‘Umi-a-Liloa began his conquest of the Island of Hawai‘i by defeating chief Kulukulu‘ā, who lived in Waiākea, and the other chiefs of Hilo (Kamakau 1992:16–17). ‘Umi-a-Liloa’s second son, Keawe-nui-a-‘Umi, ruled Hamākua, Hilo, and Puna from his residence at Hilo (*ibid*: 34). It was from Hilo that he waged war on the Kona chiefs and unified the island. Keawe-nui-a-‘Umi’s descendants single handedly continued rule for many generations from Hilo.

After the death of Keawe-nui-a-‘Umi the kingdom was divided into three parts and was established under warring chiefs; Hilo was ruled by Kumalae-nui-pu‘awa-lau and his son Makua (*ibid*: 45). It was during the period of time that Kamehameha I was born. Kalani‘ōpu‘u’s grandson, Keoua Kuahu‘ula and nephew Kamehameha vied for control over the six chiefdoms constituting the island kingdom and Keoua conquered Hilo chief Keawe-mau-hili and harvested the benefits for a short time only to be vanquished by Kamehameha I late in 1791.

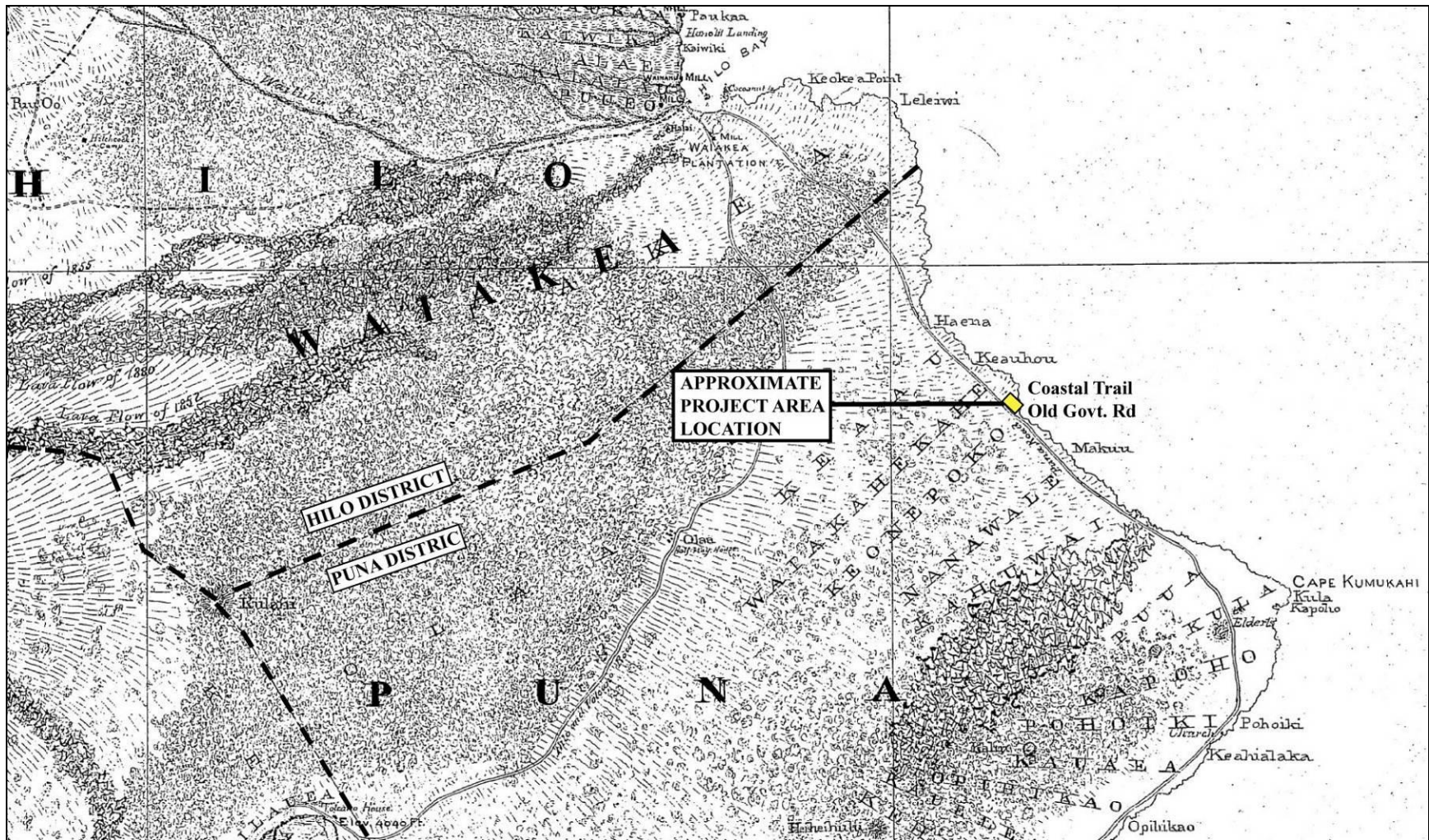


Figure 5: Portion of Map of the Island of Hawai'i Showing the Locations of Project Area and Place Names (Wall 1886).

Kamehameha's son Liholiho was born in Hilo in November 1797 (Kamakau 1992:22). Waiākea was inherited by Lihiliho after Kamehameha's death. The *'ili kūpono* of Pi'opi'o and its royal fishpond were given to his favorite wife, Ka'ahumanu.

Situated along the windward coast of Hawai'i Island, Puna is a verdant and abundant district with good rainfall and rich soils (see Figure 5). However, it is also subject to volcanic eruptions and has been covered by new lava in many places over the last 1,000 years (Cordy 2000:17, and 22). Much of the district's coastal areas have thin soils, and there are no good deep water harbors. The ocean along the Puna coast is often rough and wind-blown.

As a result of these two factors, settlement patterns in Puna tend to be dispersed and without major population centers. Villages in Puna tend to be spread out over larger areas and often are inland, and away from the coast, where the soil is better for agriculture (*ibid*: 45). The lack of population centers also had an effect on the development of a hierarchy of district rulers. Puna was often not strongly tied together by a tight web of allegiances between *ali'i* and *konohiki*. As a result, Puna was often conquered and ruled by stronger district leaders in Hilo or Ka'ū (Kamakau 1992:17 and 77).

Puna District was famous for its valuable products, including "hogs, gray *kapa* cloth (*'eleuli*), tapas made of *mamaki* bark, fine mats made of young pandanus blossoms (*'ahuhinalo*), mats made of young pandanus leaves (*'ahua'o*), and feathers of the *'o'o* and *mamo* birds" (*ibid*:106). Puna was also famous for its abundant *ulu* (breadfruit).

Kea'au and neighboring 'Ōla'a Ahupua'a were well known for their valuable natural and hand-made products. Both *ahupua'a* were located along the southern boundary of South Hilo District (see Figure 5). The two *ahupua'a* were often the source of forest products for the Hilo's ruling elite. Moreover, Kea'au cut 'Ōla'a off from the ocean, so that families living along the coast in Kea'au often traded marine resources for upland forest products from family members living in small communities in upland 'Ōla'a.

Historical accounts pertaining to lands of the project area region are scarce but provide some information on traditional residence patterns, land-use, and subsistence. William Ellis passed through Maku‘u Ahupua‘a in 1823 while travelling along the coastal trail from Kilauea to Waiākea Ahupua‘a, Hilo (see Figure 5). Ellis’ journey took him along the coast past the project area. Ellis did not describe the region of Maku‘u Ahupua‘a, but stopped in a small inland village in Honolulu Ahupua‘a, and rested in the shade of a canoe house along the coast of Waiakahiula Ahupua‘a (Ellis 1963:294-295), both south of Maku‘u (Figure 6). Honolulu Village and a nearby village were inland and small, and the population was dispersed.

Ellis also described a village, likely Hā‘ena, in Kea‘au Ahupua‘a, north of Maku‘u (see Figure 5). The village was large and populous with an abundance of taro, sweet potato and sugarcane gardens (Ellis 1963:296). He suggested the area was made more fertile by a flowing stream where he quenched his thirst.

TESTIMONY BEFORE THE COMMISSION TO QUIET LAND TITLES

With the Māhele of 1848 and the two Acts of 1850, authorizing the sale of land in fee simple to resident aliens and the award of *kuleana* lands to native tenants, land tenure in Hawai‘i arrived at a significant turning point (Chinen 1961:13). The *ahupua‘a* of Kea‘au was granted to William C. Lunalilo as part of Land Commission award (LCA) 8559-B.

There were no Land Commission awards made in Maku‘u Ahupua‘a. Three small Land Grants (LG) were purchased along the coast in Maku‘u and Halona Ahupua‘a (Figure 6 and Figure 7). LG 1013 was purchased by D.W. Maiau, LG 1014 was purchased by Kea, and LG 1537 was purchased by Kapohana. D. W. Maiau was a teacher at the nearby Maku‘u schoolhouse. The current project area is the eastern portion of LG 1014 purchased by Kea in 1857.

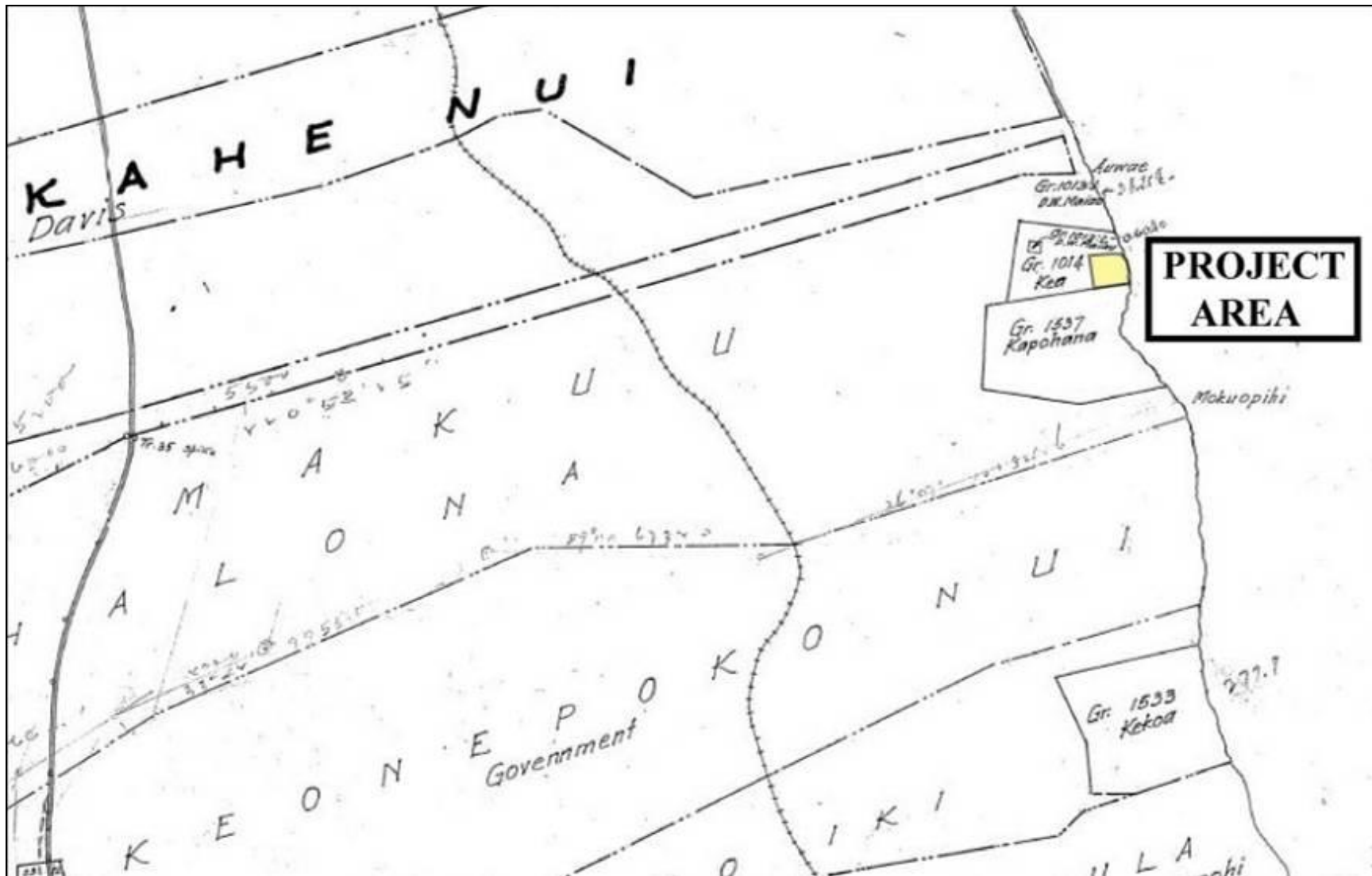
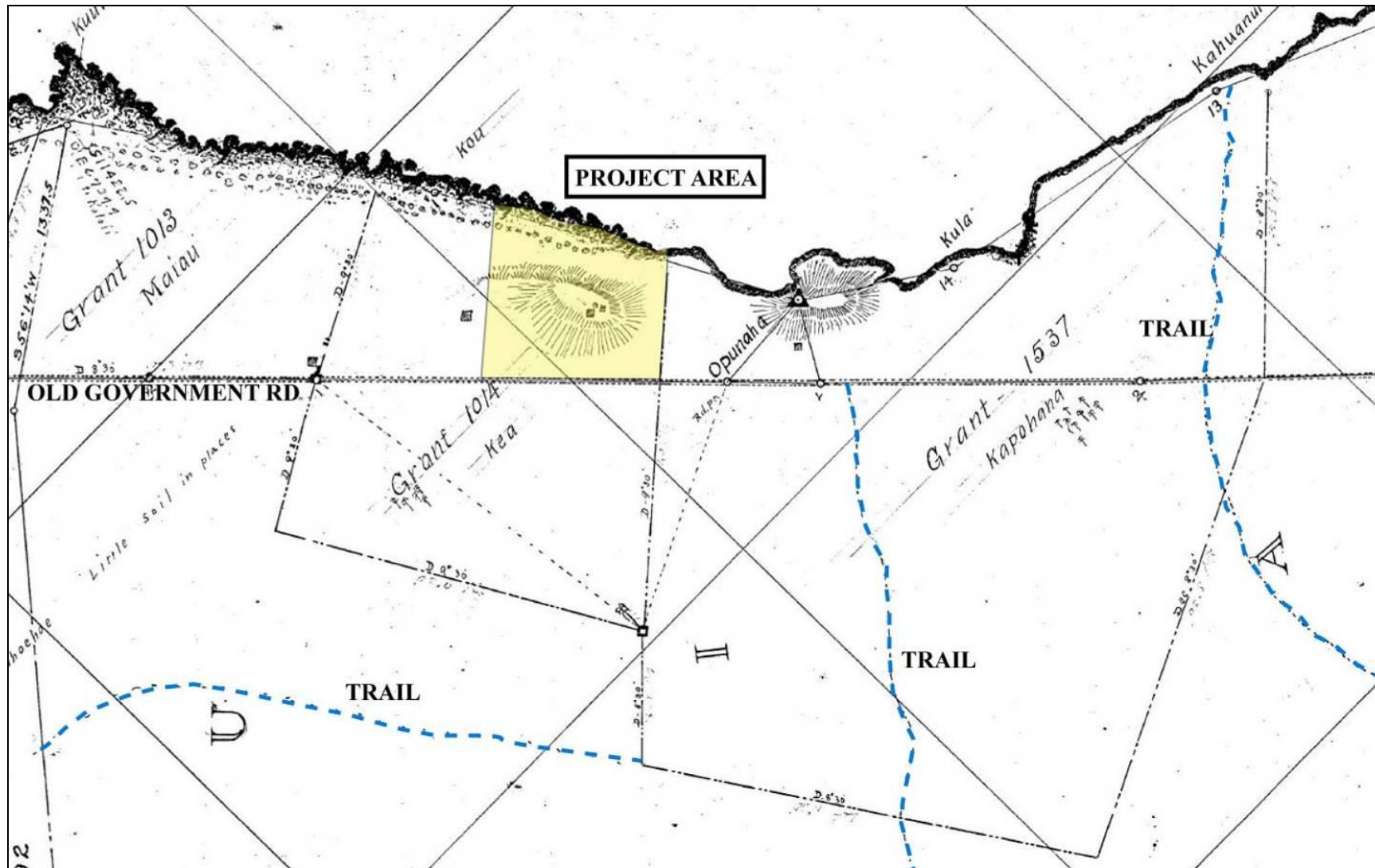


Figure 6: Portion of Map of Puna District Showing Locations of the Project Area and Land Commission Awards (Wall 1927).



CHANGING RESIDENTIAL AND LAND-USE PATTERNS (1845-1865)

Between 1845 and 1900, traditional land-use and residential patterns began to change drastically. In particular, the regular use of Hilo Bay by foreign vessels, the growth of tourism, the presence of the whaling industry, the establishment of missions in the Hilo area, the legalization of private land ownership, the introduction of cattle ranching, the introduction of sugar cane cultivation, and the construction of Government Roads and railroad lines all brought about changes in settlement patterns and long-established land-use patterns (Kelly *et al.* 1981). Much of the change in residential location and the growth of towns in Puna District were driven by the availability of arable land suited to commercial crops and the location of newly constructed roads.

The traditional travel route through Puna was along the coast (see Figure 5 and Figure 8). The trip was made along a foot trail that led through the coastal and near coastal villages. That trail lead from the modern day Lili‘uokalani Gardens area to Hā‘ena along the Puna coast. The trail is often called the old Puna Trail and/or Puna Road. There is an historic trail/cart road that is also called the Puna Trail (*Ala Hele Puna*) and/or the Old Government Road that continues from the south end of the Puna Trail through Waiakahiula Ahupua‘a heading to points south. Lass (1997) also refers to the entire route from Hilo to Ka‘ū as the Puna-Ka‘ū trail.

THE PUNA TRAIL AND OLD GOVERNMENT ROAD

There is an historic trail that leads from the modern day Lili‘uokalani Gardens in Waiākea to Hā‘ena along the Puna coast. The trail is often called the old Puna Trail and/or Puna Road. There is an historic trail/cart road that is also called the Puna Trail (*Ala Hele Puna*) and/or the Old Government Road that continues from the south end of the Puna Trail heading to points south. Lass (1997) also refers to the entire route from Hilo to Ka‘ū as the Puna-Ka‘ū trail.

Whatever name the trail/cart road alignment is called by, it likely incorporated segments of the traditional Hawaiian trail system often referred to as the *ala loa* or *ala hele* (Hudson 1932:247, Kuykendall 1966:23-25, Lass 1997:15, and Maly 1999:5). Lass suggests the full length of the Puna Trail, or Old Government Road, might have been constructed or improved just before 1840 (Lass 1997:15). The trail was called the Old Government Road, or *Ala Nui Aupuni* (Maly 1999:5). The alignment was first mapped by the Wilkes Expedition of 1804-41 (see Figure 8).

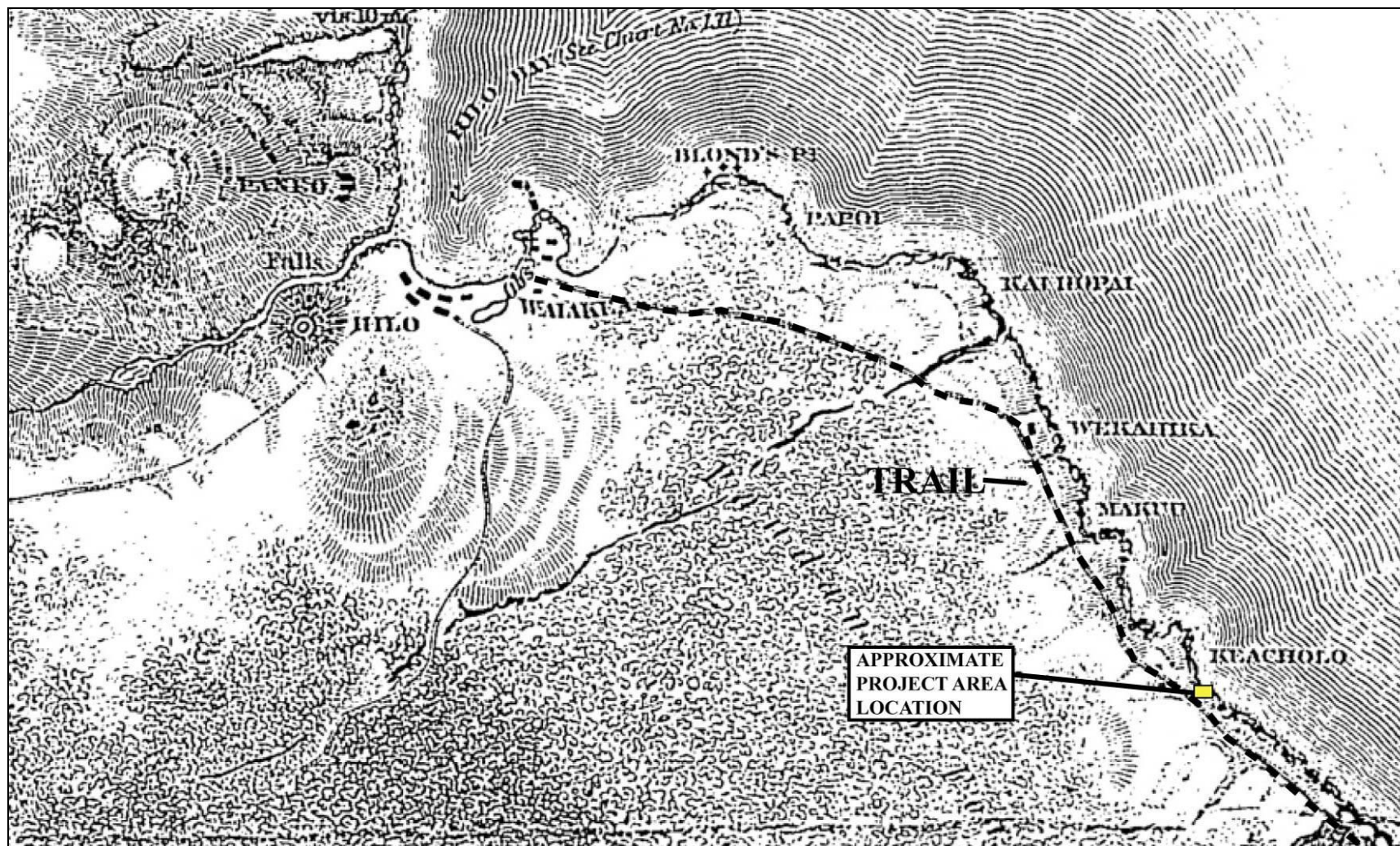


Figure 8: Location of Project Area and Old Government Road from Hilo Bay through Puna District on Portion of Registered Map 424 Drawn by the Wilkes Expedition of 1840-1841.

A general description of the area between the Old Government Road and the newer upper road from Hilo through Kea‘au to Pahoa was recorded in 1889 by the Surveyor General of the Hawaiian Government Survey. The description affords a glimpse into inland and coastal settlement patterns and land use.

The first settlement met with after leaving Hilo by the sea coast road, is at Keaau, a distant 10 miles where there are less than a dozen inhabitants; the next is at Makuu, distant 14 miles where there are a few more, after which there is occasionally a stray hut or two, until Halepuaa and Koae are reached, 21 miles from Hilo, at which place there is quite a village; thence to Kaimu there are only a few scattered settlements here and there. A good many of those living along the lower road have their cultivating patches in the interior, along or within easy accessibility to the new road (Alexander 1891, cited in Maly 1999:107).

The 1889 description contrasts with Ellis' in which he described numerous villages just sixty-six years earlier. The 1889 description suggests depopulation along the majority of the Puna near-coastal area. In both descriptions, the people in this area appear to have lived somewhat inland, between the coast and the inland gardens. In 1889 people were cultivating small patches of *kalo*, *‘awa*, and coffee as well as other food items in the inland gardens. The patches were placed in pockets of soil in holes amidst the lava flows. Additionally, sweet potatoes were grown on rock mounds. By 1889, it appears that very few people lived along the Old Government Road (Maly 1999:6). The Surveyor General stated,

The old sea coast road cannot be kept in repair with the means now at its disposal and its condition each year is becoming more unsafe and ruinous, there is but little travel over it; it has been shown that there is little land capable of cultivation or development either side of it and whatever travel there is now over it would soon be entirely diverted to the upper road (Alexander 1891, cited in Maly 1999:107).

The new road being constructed from Hilo through Kea‘au to Pahoa was designed to allow access to the more arable inland areas. People who traditionally had lived along the Puna coast were moving toward Hilo and into the more fertile upland areas of Puna in

order to find paid work and to produce cash crops for local markets and for export. In particular, people began to work in the inland areas to grow sugarcane.

The same was true of the trail from Hilo, through Kea‘au, and on to Kīlauea Crater (Volcano Road). An improved Volcano Road was built from Hilo to Kīlauea between 1889 and 1893 partly to accommodate tourism, but also to increase access to forest products and agricultural land. Numerous small field parcels belonging to the ‘Ōla‘a Sugar Company and the ‘Ōla‘a Coffee Company were located along this route. The improved Volcano Road is Route 11, though it has been straightened and improved several times since its initial construction.

The modern history of land-use in Kea‘au Ahupua‘a is tied to the development of commercial agriculture and the construction of transportation routes. The potential to use Kea‘au's rich arable land for commercial prospects was recognized as early as the 1870s when it was leased for coffee growing and for cattle grazing. In 1881, the entire *ahupua‘a* was purchased at auction by Samuel Damon, William H. Shipman, and E. Elderts from trustees of the deceased William C. Lunalilo Estate. Shipman bought out the two partners within three years of purchasing the land.

William H. Shipman operated a cattle ranch in Kapoho Ahupua‘a and was the owner of the Waiākea Stock Ranch. Shipman was also co-owner of the Shipman Meat Market, later the Hilo Meat Company. Shipman leased portions of Kea‘au Ahupua‘a to the ‘Ōla‘a Sugar Company beginning in 1899. It was the development of ‘Ōla‘a Sugar Company fields, the construction of the sugar mill in Kea‘au, and the construction of the numerous sugar company camps, that created modern day Kea‘au town as a small commercial and residential center.

SUGARCANE, RAILROADS AND COMMERCE

The ‘Ōla‘a Sugar Company, established in 1899, became the largest sugarcane plantation and milling operation in Puna District. By the 1950s the ‘Ōla‘a Sugar Company was in debt and sugar production and sales were stagnant. The company stockholders changed the company name to the Puna Sugar Company, Ltd. and sold off land to invest in new equipment and upgrade their facilities. By 1966, the company was debt free and making a good profit. American Factors (AMFAC) bought out the minority shareholders in 1969 and Puna Sugar Company became a subsidiary of AMFAC.

AMFAC expanded sugarcane processing in the 1970s through new extraction facilities upgrades at the mill in Kea‘au (‘Ōla‘a Mill) and by building a 15KW bagasse and trash burning power plant next to the mill. Hilo Electric Light Company (HECO) agreed to purchase 12.5KW of power for their customers.

Puna Sugar Company, like many other sugar companies, struggled in the late 1970s and early 1980s due to changes in the sugar market that made sugar production less profitable. By the start of 1982, AMFAC had decided to close Puna Sugar Company. The work of selling off assets and preparing severance packages took three full years. The sugar mill was sold to Fiji Sugar Corporation in 1988 and the power plant operation taken over HECO.

MODERN LAND USE

The project area and surrounding lands were not used for growing sugarcane as the soil is too shallow. The area remained primarily unaltered and undeveloped grasslands with a large variety of introduced and invasive species. The land north of the current project area, 15.6 square miles in total, was purchased by David Watumull from W.H. Shipman, Ltd in 1959. The land was subdivided into nearly 8,800 lots within the newly created Hawaiian Paradise Park (HPP) subdivision.

Currently, the land along the coast near the project area is primarily privately owned. Some of the lots have homes on them and others are still undeveloped. Some of the lands further *mauka* of Government Beach Road are owned by the Department of Hawaiian Homelands (DHHL) and the State of Hawai‘i.

LG 1014 purchased by the Kea family was subdivided and the southeast corner of the property was purchased by the Kamahale-Kamoe family by at least in the first two decades of the 1900s. Frank Kamahale and Ann Kamahale (née Kamoe) had eight children including Ulrich “Sonny” Kamahale. The family was living on the property when Ann passed and she and other Kamoe family members are buried in a family plot (Site #50-10-45-18987) on the property. Sonny (April 15, 1923-November 6, 2002) lived on the property and grew produce there until he passed away. Sonny’s house (Site #50-10-45-7476) and the property were later sold after Sonny passed. Site 7476 burned down in 2014 during Hurricane Iselle and is no longer present on the property.

PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS

The earliest archaeological study written by Ewart and Luscomb (1974) recorded 22 archaeological sites along the coast of Waikahekahe and Maku‘u Ahupua‘a (Figure 9 and Table 1). Sites were clustered on either side of Beach Road and consisted of agricultural and habitation complexes. Sites included rock walls, small enclosures and agricultural rock clearing mounds.

Coastal Waikahekahe and Maku‘u archaeological sites were primarily agricultural and habitation complexes containing rock walls, agricultural rock clearing mounds, rock walls, enclosures, pavements, platforms, rock lined wells, and burial features. The sites appear to be primarily pre-Contact to Historic era in age. Site 18975 is a possible *heiau* complex (Figure 10).

RECENT STUDIES IN MAKU‘U AND SURROUNDING AHUPUA‘A

Seventeen archaeological studies have been conducted in Maku‘u, Pōpōki and Halona Ahupua‘a (Figure 11 and Table 2). The studies were conducted in the upland and coastal regions surrounding the current project area and shed light on pre-Contact to Historic era land use. The most striking feature of the studies is the low distribution of archaeological sites documented in the upland project areas. Aside from lava tubes containing pre-Contact era habitation features and burials, only three archaeological features were documented in the upland project areas. Upland features included a possible ceremonial complex (enclosure, platform, rock wall, and rock wall), a rock mound and an agricultural terrace. The lack of sites in the uplands is consistent with early written accounts documenting traditional habitation areas along the coast to a little over one mile inland.

Komori and Peterson (1987) conducted a cultural and biological resources survey along a corridor roughly 2.5 to 3.0 kilometers (1.55 to 1.86 miles) from the coastline. Five agricultural complexes, habitation and burial platforms, burial and refuge caves, and petroglyphs were documented within the project area. All of the sites are pre-Contact to early post-Contact era in age.

Dirks and Rechtman (2013) recorded a pre-Contact era coastal trail segment (Site 18418) and a Historic era rock wall (Site 18419) roughly 350.0 meters southeast of the current project area (Figure 12). The trail was recommended for preservation.

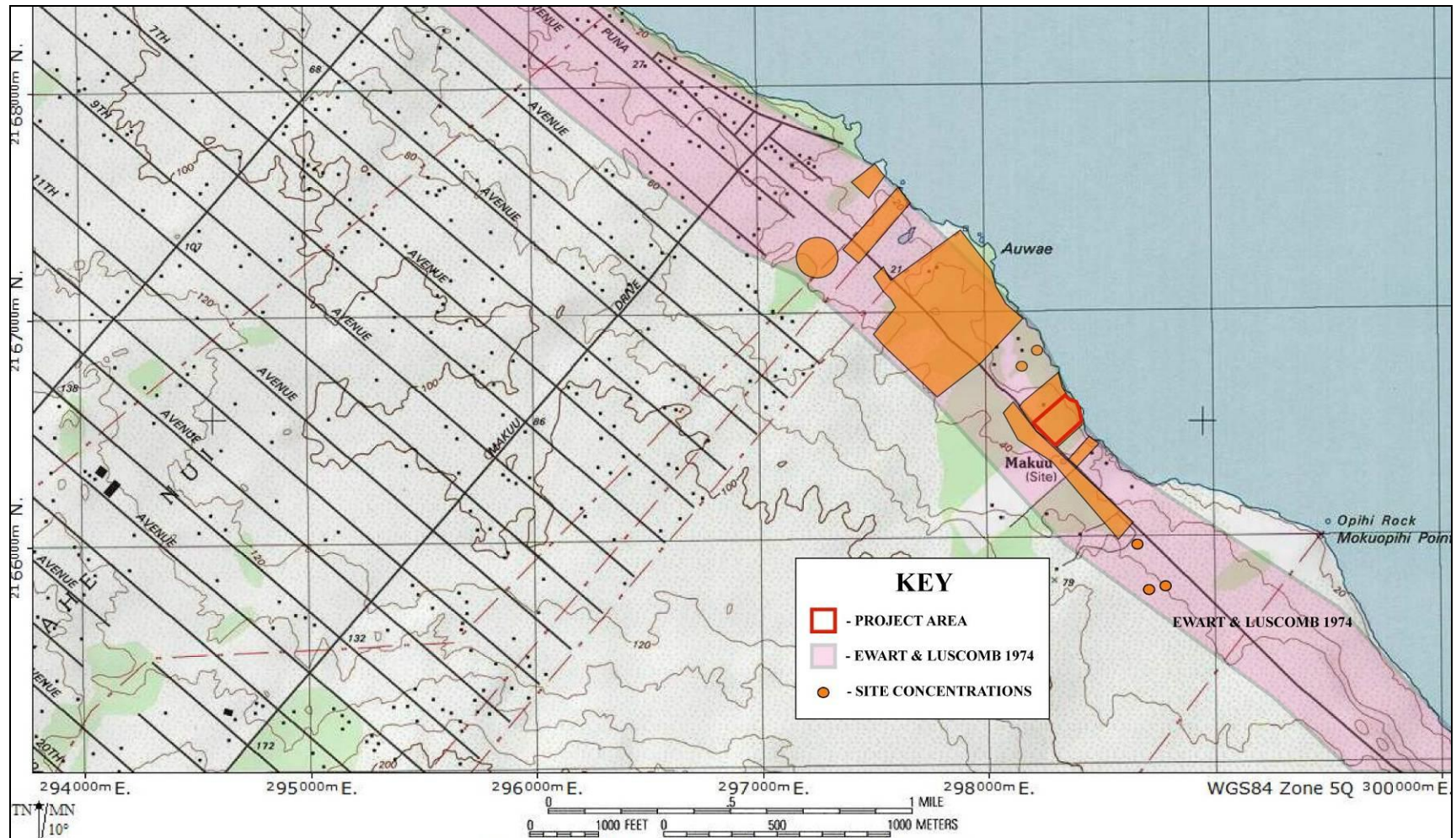


Figure 9: 7.5-Minute Series USGS Topographic Map (Kea'au Ranch Quad) Showing Location of Coastal Sites Recorded in Ewart and Luscomb (1974) (National Geographic Topo!, 2003. Data Sources: National Geographic Society, USGS).

Table 1: Inventory of Waikahekahe and Maku‘u Ahupua‘a Archaeological Sites (Ewart and Luscomb 1974).

SIHP# 50-10- 45:	Site Type	Ahupua‘a	Description	Research Potential
18973	Complex	Waikahekahe	Rock walls, retaining walls, walled depressions, and possible platforms	Good
18974	Complex (Agriculture and Habitation)	Waikahekahe	Rock walls, retaining walls, walled depressions, possible pavements, and platforms	Good
18975	Complex	Waikahekahe	Rock walls, retaining walls, platforms, rock mounds, and possible <i>hieau</i>	Excellent
18976	Complex (Agricultural)	Maku‘u	Free-standing and retaining walls and small mounds	Good
18977	Wall	Maku‘u	Wall	N/A
18978	Complex	Maku‘u	Free-standing and retaining walls, a mound, a possible <i>kuleana</i> wall, and an enclosure	Mediocre
18979	Wall & Enclosure	Maku‘u	Rock wall and enclosure	Some
18980	Complex (Agriculture)	Maku‘u	Rock walls and rock mounds	Good
18981	Petroglyphs	Maku‘u	Modern petroglyphs	N/A
18982	Complex	Maku‘u	Walls, faced areas, a mound with an upright stone, and a rock-lined well	Negligible
18984	Complex (Agriculture and Habitation)	Maku‘u	Trails, several enclosures, and terraces	Excellent
18985	Wall	Maku‘u	Rock wall	Some
18987	Burials	Maku‘u	Historic grave yard	N/A
18987	Complex (Agriculture and Habitation)	Maku‘u	Walls, enclosures, mounds, depressions, and platforms	Good
18988	Complex (Agriculture and Habitation)	Maku‘u	Walls and platforms	No Longer Present
18989	Petroglyph Field	Maku‘u	Petroglyphs	Good
18990	Possible Burial	Maku‘u	Rock mound	N/A
18991	Enclosure	Maku‘u	Rock lined depression	N/A
19005	Possible Burial	Maku‘u	Rock mound	N/A
20598	Trail	Maku‘u	Coastal trail	Good
4222	Petroglyph Field	Maku‘u	Petroglyphs	Good
7476	Kamahele House	Maku‘u	Historic house	No Longer Present

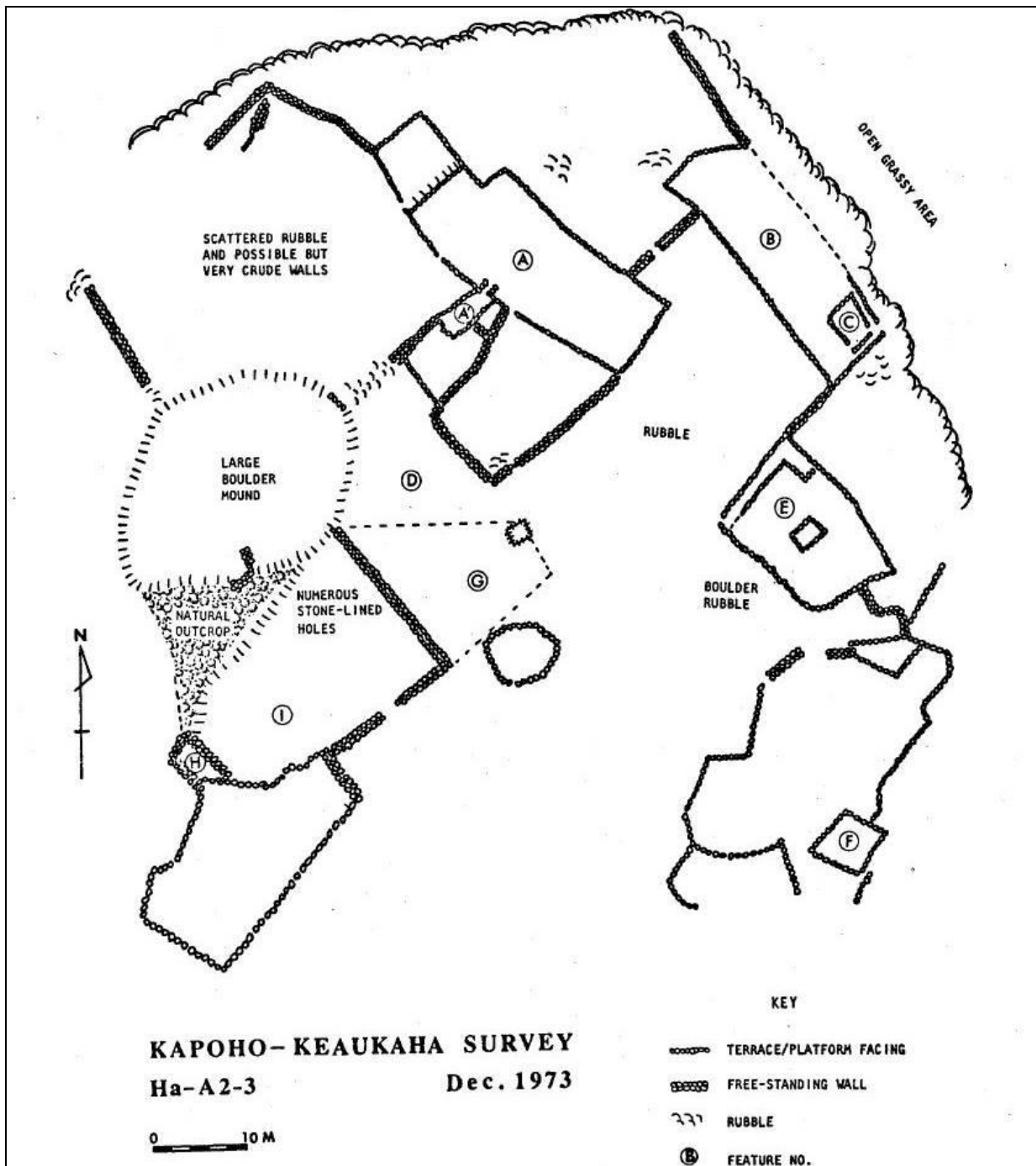


Figure 10: Site 18975 Plan View Map (Ewart and Luscomb 1974:24).

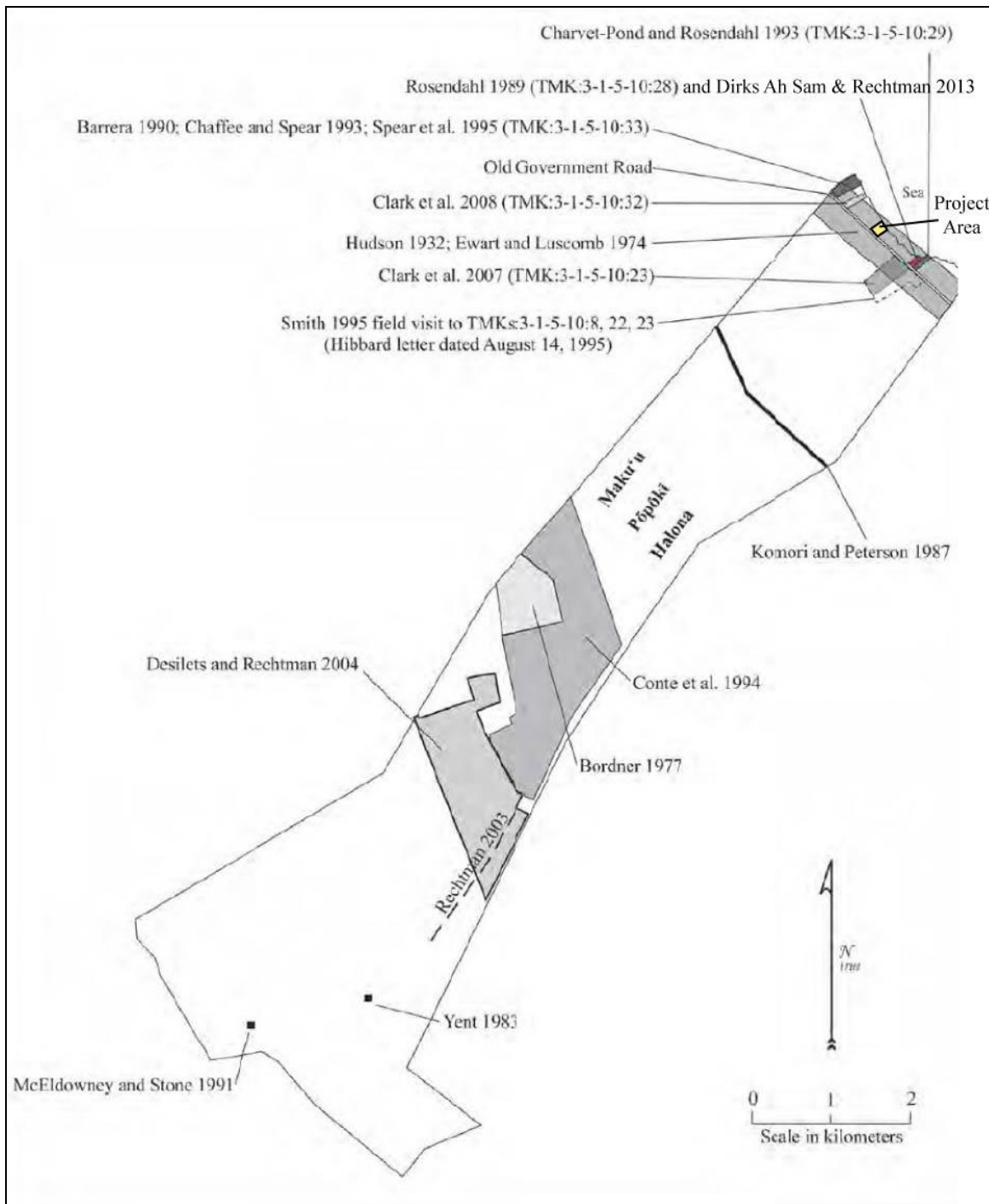


Figure 11: Map Showing Recent Previous Archaeological Studies in Maku'u and Surrounding Ahupua'a (Adapted from Dirks Ah Sam and Rechtman 2013:11).

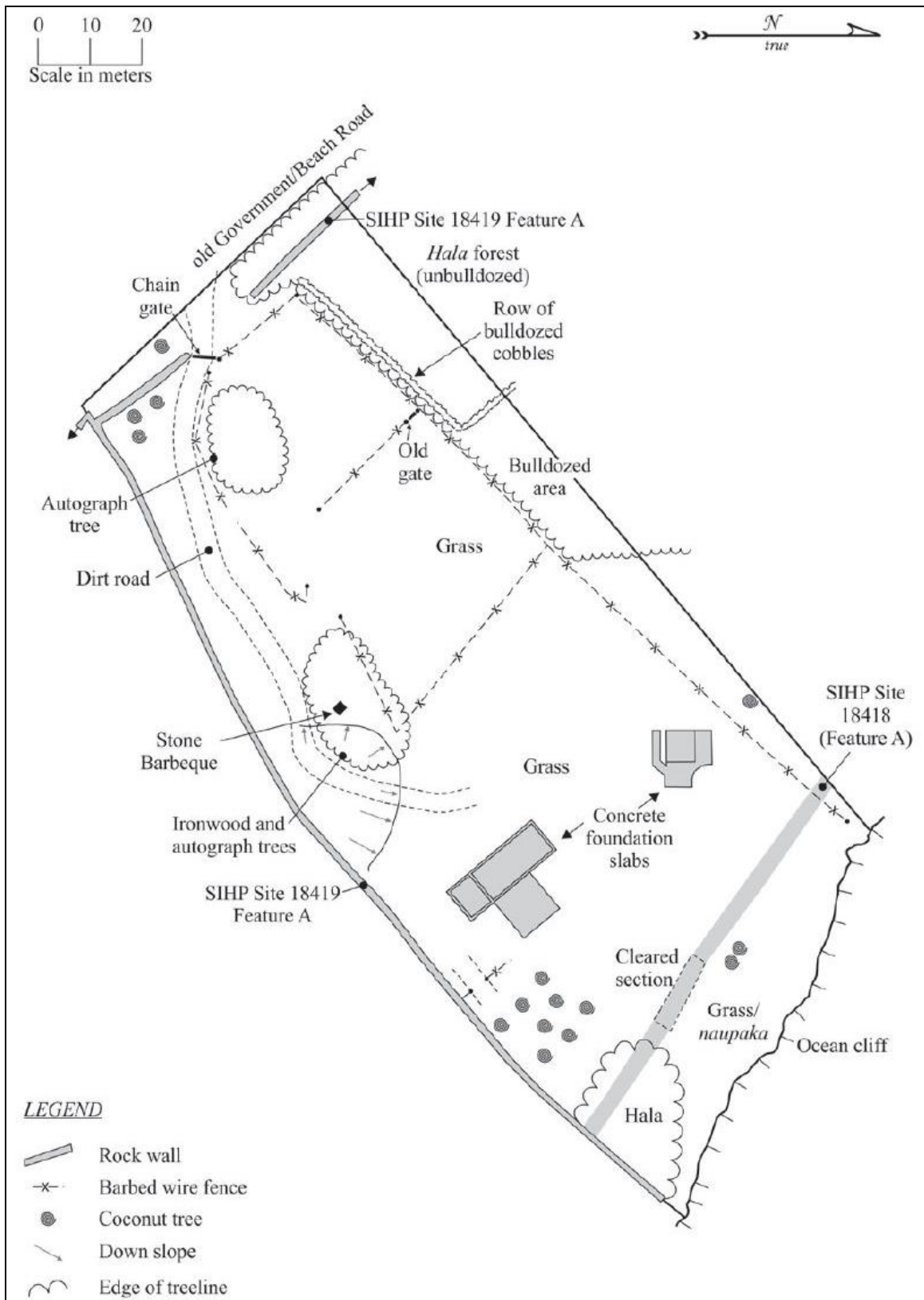


Figure 12: Archaeological Site Plan Map Showing Sites Recorded in Dirks and Rechtman (2013).

Table 2: Previous Archaeological Studies in Maku‘u, Pōpōki and Hālona Ahupua‘a.

Author/Date	Type of Study	Ahupua‘a
Barrera & Lerer 1990	Archaeological Inventory Survey	Maku‘u
Bordner 1977	Reconnaissance Survey	Maku‘u
Chaffee & Spear 1993	Burial Testing	Maku‘u
Clark et al. 2007	Archaeological Inventory Survey	Pōpōkī
Clark et al. 2008	Archaeological Inventory Survey	Maku‘u
Charvet-Pond & Rosendahl 1993	Archaeological Inventory Survey	Maku‘u, Hālona, Pōpōkī
Conte et al. 1994	Archaeological Inventory Survey	Maku‘u, Hālona, Pōpōkī
Desilets & Rechtman 2004	Archaeological Inventory Survey	Maku‘u, Hālona, Pōpōkī
Dirks Ah Sam & Rechtman 2013	Archaeological Inventory Survey	Pōpōkī
Hudson 1932	Archaeological Survey	Various
Ewart & Luscomb 1974	Reconnaissance Survey	Various
Komori & Peterson 1987	Cultural & Biological Resource Survey	Various
McEldowney & Stone 1991	Archaeological/Environmental Survey	Various
Yent 1983	Archaeological Survey	Maku‘u
Rechtman 2003	Archaeological Assessment	Maku‘u, Hālona
Rosendahl 1989	Field Inspection	Maku‘u, Hālona, Pōpōkī
Spear et al. 1995	Data Recovery	Maku‘u

Studies conducted along the coastline documented clusters of pre-Contact to early Historic era habitation and agricultural sites including enclosures, platforms, rock walls, rock mounds, burials, petroglyphs, rock lined springs and water catchments, and remnant trail segments.

PREVIOUS ARCHAEOLOGY WITHIN THE PROJECT AREA

Ewart and Luscomb (1974) recorded six sites within the project area and a single coastal trail segment on the property southeast of the current project area (Table 3 and Figure 13). Sites 18980, 18982 and 18988 were recorded as agricultural complexes, likely pre-Contact to early Historic era, consisting of rock mounds, rock walls, platforms, and a well.

Table 3: Inventory of Previous Documented Sites at the Project Area.

SIHP# 50-10- 45:	Site Type	Description	Research Potential
7476	Kamahele House	Historic house	No Longer Present
18980	Complex (Agriculture)	Rock walls and rock mounds	Good
18981	Petroglyphs	Modern petroglyphs	None
18982	Complex	Walls, faced areas, a mound with an upright stone, and a rock- lined well	Negligible
18987	Burials	Historic graves	N/A
18988	Complex (Ag. & Habitation)	Walls and platforms	Moderate
20598	Trail	Coastal trail	Good

Site 18980 is in the southeast corner of the parcel just *mauka* of the coastal pāhoehoe flats. The site contained agricultural rock mounds and walls. Site 18982 was recorded along the northwest boundary of the property, primarily on the property northwest of the current project area. A shallow well or spring was located on the current project area. Site 18988 was no longer present when the Ewart and Luscomb (1974) survey was conducted, but the property owner, Sonny Kamahele, told the surveyors in 1973 that there were platforms, walls and an enclosure that were removed to expand his watermelon fields.

Site 7476 was the Kamahele and Kamoe house located in the southwest quadrant of the property. The house is listed on the Hawai‘i Register. The house burned down in 2014 during Hurricane Iselle and is no longer present on the property. Site 18987 is the family burial plot containing Sonny’s maternal grandmother (née Kamoe) and six other individuals.

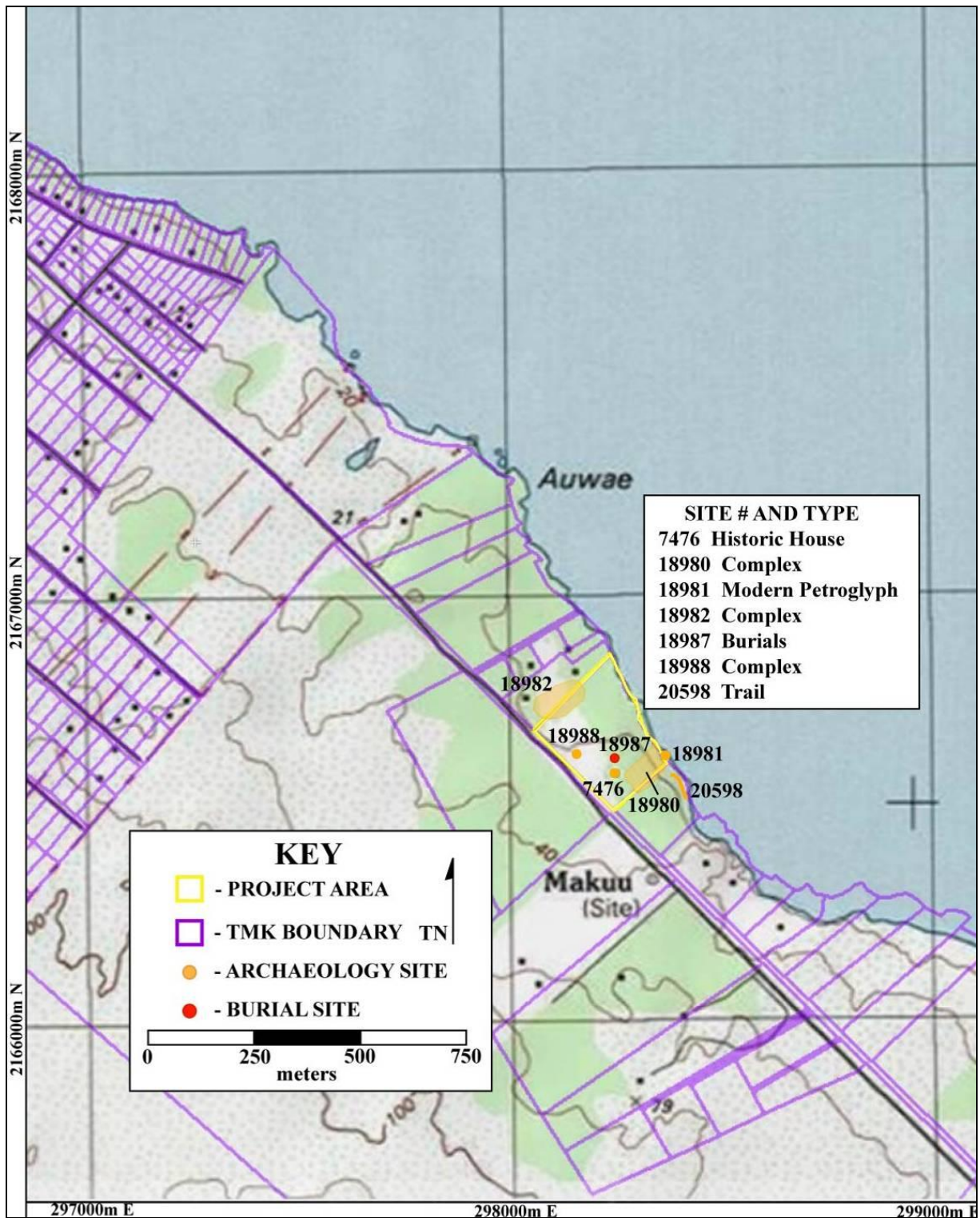


Figure 13: 7.5-Minute Series USGS Topographic Map Showing the Location of Previously Documented Sites on Parcel 009 (Kea‘au Ranch Quadrangle. ESRI, 2013. Data Sources: National Geographic and Hawai‘i County Planning Department, 2013).

Site 18981 are three modern petroglyphs carved into two large rocks located on the coastal pāhoehoe flat in the south east corner of the property. The petroglyphs read “72 MIKE N TINA,” “72 GUY HA” and “MIKE N TINA.”

Site 20598 is a remnant segment of trail located along the coastal cliff on the property southeast of the project area. The trail is constructed of waterworn boulders placed side by side on to two meters wide (Ewart and Luscomb 1974:28).

The Ewart and Luscomb (1974) study determined that Site Complex 18980 had good research potential while the modern petroglyphs at Site 18981 had no research potential. Site Complex 18982 was determined to have negligible research potential. No intrusive additional research was recommended for Burial Site 18987 and that Site Complex 19988 had only moderate research potential as it is no longer present on the ground surface. No recommendation was made in the report for house Site 7476 and it is no longer present. Trail Site 20598 was determined to have good research potential but is not within the current project area, though a search should be made to determine if it continues onto the current project area.

The most recent AIS conducted by SCS (Escott 2019 Draft) identified five archaeological sites in the project area (Table 4 and Figure 14). Three of the sites (Site #50-10-45-7476, 18980 and 18987) were previously recorded in Ewart and Luscomb (1974) and two sites were previously undocumented. The three previously identified sites include a cement foundation at the Kamahale House (Site 7476), an agricultural complex (Site 18980) and the family burial plot (Site 18987). Two newly recorded sites include the rock wall along the boundary of Parcel 009 (Site TS1) and a short rock wall segment (Site TS2) in the southeast corner of the project area. Site 18981 recorded in Ewart and Luscomb (1974) is two modern petroglyphs and is not a historic property.

Table 4: Inventory of Archaeological Sites Identified Within the Project Area.

SIHP #50-10-45:	SITE TYPE	SITE FUNCTION	SITE AGE
7476	Kamahale House	Habitation	Historic era
18980	Complex (Agriculture)	Rock walls and rock mounds	Pre-Contact to early post-Contact era
18987	Burials	Historic graves	Historic era
31111	Rock Wall	Property Boundary	Historic era
31112	Rock Wall	Road edge	Historic era

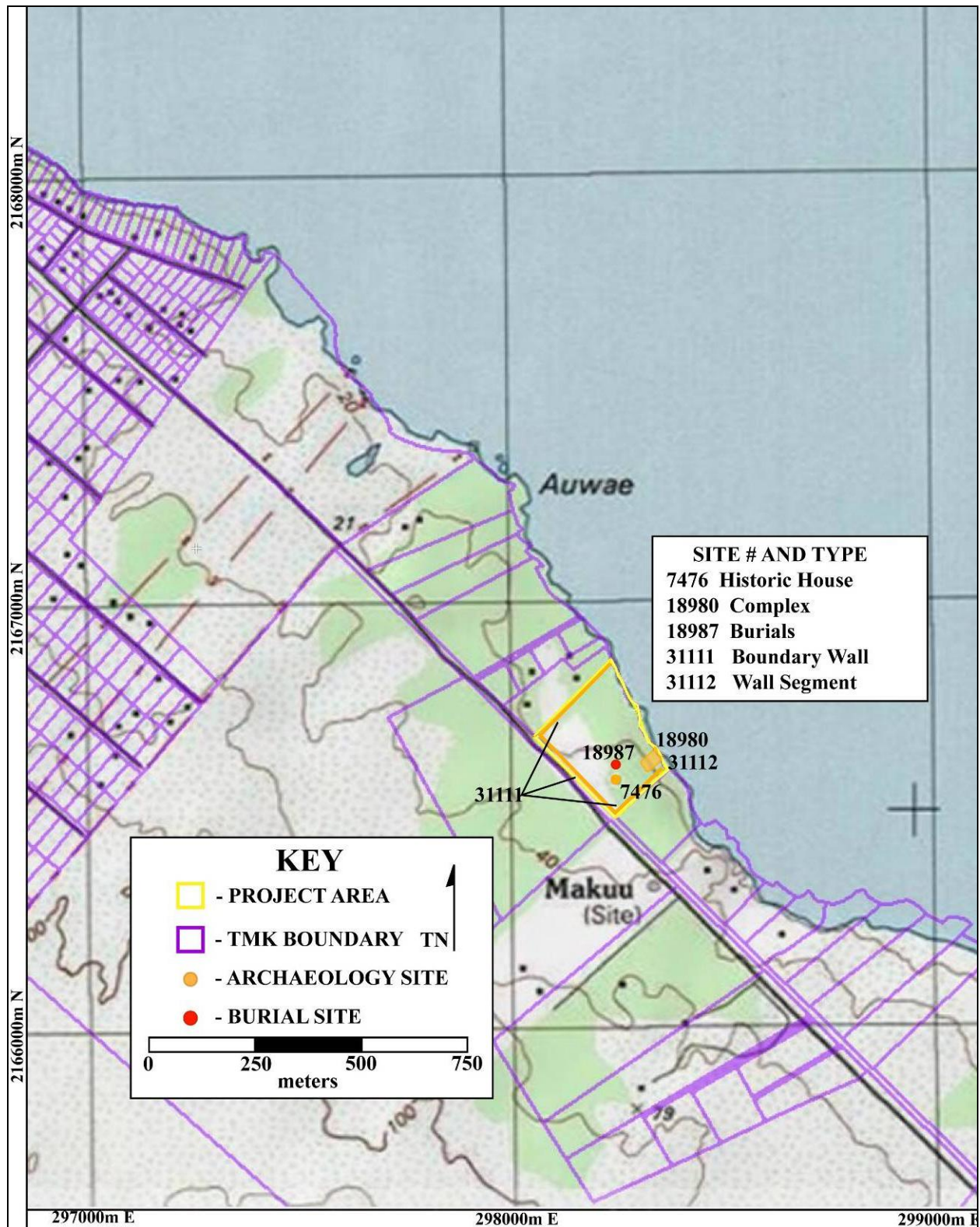


Figure 14: 7.5-Minute Series USGS Topographic Map Showing the Location of Archaeological Sites Documented on Parcel 009 (Kea‘au Ranch Quadrangle. ESRI, 2013. Data Sources: National Geographic and Hawai‘i County Planning Department, 2013).

Sites recorded at the project area are primarily Historic era in age, though Site 18980, an agricultural complex, could possibly have a pre-Contact era component. The Site 18980 features are constructed in the manner of, and have characteristics common to, Historic era features. It is likely that Site 18982 and Site 18988 were pre-Contact era agricultural and habitation sites, but they are no longer present on the property. There were no subsurface remains of the sites within the stratigraphic trenches excavated during the current study. The coastal trail segment (Site 18418) recorded in Dirks and Rechtman (2013) was not present on the current project area.

Sites identified on the project area were constructed by the Kea, Kamahele and Kamoe families as part of a working farm and home. The sites were used up through the modern era. It is likely that Sites 18982 and 18988 were removed during clearing for the farm fields.

Preservation in-place was recommended at Site 18980 and Site 18987. Preservation at Site 18980 and Site 18987 shall consist of avoidance and protection (conservation) per HAR §13-277-3(1). Site 18980 will be preserved in accordance with an Archaeological Preservation Plan (PP). Site 18987 will be preserved in accordance with a Burial Treatment Plan (BTP).

CULTURAL INFORMANT INTERVIEWS

Consultation was sought from Kamaile Puluole-Mitchell, Office of Hawaiian Affairs (OHA) East Hawai‘i Island Representative; Jordan Kea Calpito, SHPD Burial Sites Specialist; Sean Naleimaile, State Historic Preservation Division (SHPD) Hawai‘i Island Archaeologist; and Kalena Blakemore, Hawai‘i Island Burial Council (HIBC) Member (Table 5). Consultation was also conducted at the project area with members of the Kamahele and Lui families.

Table 5: Individuals Responses to CIA Consultation Request.

Name	Affiliation	Responded	Has Knowledge	Cultural Practices
Kalena Blakemore	HIBC Representative	Yes	Some	No
Kamaile Puluole-Mitchell	OHA East Hawai‘i	No	-	-
Sean Naleimaile	SHPD Archaeologist	No	-	-
Jordan Kea Calpito	SHPD Burial Sites Specialist	No	-	-
Greg DeConte	Kamahele Family Member	Yes	Yes	Yes
Kenneth Ha	Kamahele Family Member	Yes	Yes	Yes
Richard Ha	Kamahele Family Member	Yes	Yes	Yes
June Ha	Kamahele Family Member	Yes	Yes	Yes
Shayne Kamahele	Kamahele Family Member	Yes	Yes	Yes
Darrell Pakele	Kamahele Family Member	Yes	Yes	Yes
Puanani Mukai	Sonny Kamahele’s Caretaker	Yes	Yes	Yes
Ramon Lui	Kea Family Descendant	Yes	Yes	Yes
Agnes Lui	Kea Family Descendant	Yes	Yes	Yes
Nicole Lui	Kea Family Descendant	Yes	Yes	Yes

KAMAHELE FAMILY CONSULTATION

Consultation with the Kamahele family was conducted at the property on Saturday April 27, 2019. Seven individuals, including Greg DeConte, Kenneth Ha, Richard Ha, June Ha, Shayne Kamahele, Puanani Mukai, and Darrell Pakele attended and were interviewed. In addition, SCS Senior Archaeologist Glenn Escott spoke to Sheldon Kamahele at an earlier date on the property. Richard Ha has written several posts on his family blog describing Uncle Sonny Kamahele and his watermelon farm at Maku‘u. The following description of Uncle Sonny and his Maku‘u farm includes a summary of the April 27 meeting and Richard Ha’s posts. Figure 15 shows the location of flora zones and land-use areas from Historic to Modern eras.

All of the family members remembered the property well, especially Uncle Sonny Kamahele's house and farm. Although Uncle Sonny passed away in 2002, many of the family members visited him on his Maku'u farm from the time they were very young. It seemed for a long time that Uncle Sonny's farm was far away from Pāhoa and most places as the road access was limited. Richard, whose maternal grandmother was Sonny's sister, writes

My extended Kamahele family came from Maku'u. When we were small kids, Pop took us in his '51 Chevy to visit.

He turned left just past the heart of Pāhoa town, where the barbershop is today. We drove down that road until he hit the railroad tracks, and then turned left on the old railroad grade back toward Hilo. A few miles down the railroad grading was the old Maku'u station. It was an old wooden shack with bench seats, as I recall. That is where the train stopped in the old days. A road wound around the pāhoehoe lava flow all the way down the beach to Maku'u. That was before there were the Paradise Park or Hawaiian Beaches subdivisions.

We did not know there was a district called Maku'u; we thought the family compound was named Maku'u. Of the 20-acre property, maybe 10 acres consisted of a kipuka where the soil was ten feet deep. The 10 acres on the Hilo side were typical pāhoehoe lava. The property had a long oceanfront with a coconut grove running the length of the oceanfront. It was maybe 30 trees deep and 50 feet tall.

The old-style, two-story house sat on the edge of a slope just behind the coconut grove. If I recall correctly, it had a red roof and green walls. Instead of concrete blocks as supports for the posts, they used big rocks from down the beach.

There was no telephone, no electricity and no running water. So when we arrived it was a special occasion. We kids never, ever got as welcome a reception as we got whenever we went to Maku'u.

The person who was always happiest to see us small kids was tutu lady Meleana, my grandma Leihulu's mom. She was a tiny, gentle woman, maybe 100 pounds, but very much the matriarch of the family. She spoke very little English but it was never an issue. We communicated just fine.



Figure 15: Aerial Photograph Showing Project Areas, Kea'au, HI, Zone 5 North, 298310 m E, 2166660 m N. (Google Earth, 2013 Image. Data Sources: Digital Globe, GeoEye, Earthstar, USDA, and USGS).

We could not wait to go down the beach. Once she took us kids to catch ‘ohua—baby manini. She used a net with coconut leaves as handles that she used to herd the fish into the net. I don’t recall how she dried it, but I remember how we used to stick our hands in a jar to eat one at a time. They were good.

She would get a few ‘opihi and a few haukeuke and we spent a lot of time poking around looking at this sea creature and that.

Between the ocean in the front and the taro patch, ulu trees, bananas and pig pen in the back, there was no problem about food. I know how Hawaiians could be self-sufficient because I saw it in action.

The house was full of rolls of stripped lauhala leaves. There were several lauhala trees and one was a variegated type. I don’t recall if they used it for lauhala mats but it dominated the road to the house.

There were lauhala mats all over the place, four and five thick. There was a redwood water tank, and a Bull Durham bag hung on the kitchen water pipe as a filter [Richard Ha January 2, 2017 blog post].

Family members recalled that the kitchen was outside along the north side of Sonny’s house. There was a cast iron wood burning stove in the kitchen. The floor of the house was made of wooden boards over the bare earth ground. Sonny had a wooden bed on which he laid *lauhala* mats for the mattress. The bathroom was a separate structure north of the kitchen. Sonny had a water catchment and an electric generator for power.

Sonny kept pigs and cows and would net *nenue* and other fish to supplement the vegetables he grew on his property. Sonny would also go to town most Friday’s for anything else he needed. Sonny was a well known farmer and he made an annual income growing watermelons up until 2000. People would come from all over to buy his watermelons. Sonny had about twelve hills of watermelons with four plants growing in each hill (Richard Ha January 30, 2017 blog post). In addition, he grew tomatoes, corn, *ulu*, *kalo*, coconuts, and bananas.

Puanani, Uncle Sonny's primary caretaker when he was older, remembered that Sonny's maternal grandmother was buried at the family grave plot northeast of the house. She thought that one of the grandmother's sons who had died during the war might also be buried there. She didn't know the names of the other individuals buried there but was certain they were from the Kamoe and Kamahele family. She thought it was possible that some of the deceased family members' ashes might have been scattered off the coastline of the property.

Family members remembered most fondly fishing and swimming along the shoreline. They remembered that there was a shallow spring along the northwest edge of the property that Sonny dug out and made a shallow well. The well had a pump that Sonny installed. They also remembered that Uncle Sonny kept the west half of the property around the house and watermelon fields well maintained by cutting the grass often and weeding. None of the family members were aware of any cultural practices, other than fishing, that occurred on the property.

LUI FAMILY CONSULTATION

Consultation with the Lui family was conducted at the property on Wednesday October 30, 2019. Mr. Ramon Lui, his wife Agnes and daughter Nicole were present. The Lui family is descended from Kea who first owned L.G 1014. Nicole shared genealogy documents for the Kea family. L.G. 1014 was a 56.4 acre property purchased in 1852. The current project area is the southeast corner of the land grant.

Kea passed in July 1871 and the property was inherited by his wife, Kaohumalu and his five children, Jokepa, Kahokumaka, Kaluahine, Kekuewa, and Kaholowaa. Jokepa was appointed the estate administrator. The family later sold off the property in smaller portions. The Lui family believes that members of their family are present at the burial plot (Site 18987) on the property.

Nicole Lui, a traditional cultural practitioner and historian also knows that Maku'u Ahupua'a and its residents were known for the practices of the "dark arts." The Lui family members were not aware of any cultural practices conducted specifically on the current project area.

SUMMARY

The “level of effort undertaken” to identify potential effect by a project to cultural resources, places or beliefs (OEQC 1997) has not been officially defined and is left up to the investigator. A good faith effort can mean contacting agencies by letter, interviewing people who may be affected by the project or who know its history, research identifying sensitive areas and previous land use, holding meetings in which the public is invited to testify, notifying the community through the media, and other appropriate strategies based on the type of project being proposed and its impact potential.

In the case of the present parcel, consultation was sought from Kamaile Puluole-Mitchell, Office of Hawaiian Affairs (OHA) East Hawai‘i Island Representative; Jordan Kea Calpito, SHPD Burial Sites Specialist; Sean Naleimaile, State Historic Preservation Division (SHPD) Hawai‘i Island Archaeologist; and Kalena Blakemore, Hawai‘i Island Burial Council (HIBC) Member (Table 5). Consultation was also conducted at the project area with members of the Kamahele and Lui families.

Public notices were published in the Office of Hawaiian Affairs Ka Wai Ola Newspaper, and were published in the Honolulu Star-Advertiser and the Hawai‘i Tribune Herald.

Historical and cultural source materials were extensively used and can be found listed in the References Cited portion of the report. Such scholars as I‘i, Kamakau, Chinen, Kame‘eleihiwa, Fornander, Kuykendall, Kelly, Handy and Handy, Puku‘i and Elbert, Thrum, and Cordy have contributed, and continue to contribute to our knowledge and understanding of Hawai‘i, past and present. The works of these and other authors were consulted and incorporated in the report where appropriate. Land use document research was supplied by the Waihona ‘Aina 2007 Data Base.

CIA INQUIRY RESPONSE

As suggested in the “Guidelines for Accessing Cultural Impacts” (OEQC 1997), CIAs incorporating personal interviews should include ethnographic and oral history interview procedures, circumstances attending the interviews, as well as the results of this consultation. It is also permissible to include organizations with individuals familiar with cultural practices and features associated with the project area.

As stated above, consultation was conducted with members of the Kamahale and Lui families. Public notices were printed in the Office of Hawaiian Affairs (OHA) Ka Wai Ola Newspaper. Public notices were also published in the Honolulu Star-Advertiser, and the Hawai‘i Tribune Herald. The public notices did not generate responses from the public. This fact is not surprising since it is unlikely as there no known inland locations in Hilo town where gathering or cultural practices occur.

An analysis of the potential effect of the proposed construction of residences on cultural resources, practices or beliefs, its potential to isolate cultural resources, practices or beliefs from their setting, and the potential of the project to introduce elements which may alter the setting in which cultural practices take place is a requirement of the OEQC (No. 10, 1997). To our knowledge, the only cultural practice associated with the project area fishing. The property owner has stated that the Kamahale and Lui families are welcome on the property at any time, and he will not prevent access for fishing along the property shoreline. Based on historical research and responses from the above listed contacts, it is reasonable to conclude that, there will be no traditional cultural practices affected and there will be no direct adverse effect upon cultural practices or beliefs in the broader project area region.

CULTURAL ASSESSMENT

Based on the results of an Archaeological Assessment of the project area, the results of previous archaeological studies, as well as organizational response, individual cultural informant responses, and archival research, it is reasonable to conclude that, pursuant to Act 50, the exercise of native Hawaiian rights, or any ethnic group, related to gathering, access or other customary activities will not be affected by development activities on this parcel. The proposed project is not a location for past or ongoing cultural practices. The proposed undertaking will not produce adverse effects to any native Hawaiian cultural practices within the project area or in the broader region.

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APPENDIX A: PUBLIC NOTICES AND AFFIDAVITS

**CULTURAL IMPACT
ASSESSMENT NOTICE**

Information requested by Scientific Consultant Services, Inc. of past and ongoing cultural practices on 13.436 acres of land in coastal Maku'u Ahupua'a, Puna District, Island of Hawai'i, TMK: (3) 1-5-010:009. Please respond within 30 days to Glenn Escott at (808) 938-0968. ■

June 2019 Ka Wai Ola Public Notice.

August 2019 Honolulu Star-Advertiser Public Notice.

August 2019 Hawai'i Tribune-Herald Public Notice.