

ARCHAEOLOGICAL
MONITORING PLAN
DATED MARCH 2020

APPENDIX

E-2



FINAL

**Archaeological Monitoring Plan
for the Hawaiian Cement Quarry Mining Site
Increments 2 and 4 Expansion Project,
Pūlehu Nui Ahupua‘a, Wailuku District, Maui Island,
TMK: (2) 3-8-004:001 por.**

**Prepared for
Hawaiian Cement**

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March 2020

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Management Summary

Reference	Archaeological Monitoring Plan for the Hawaiian Cement Quarry Mining Site, Increments 2 and 4 Expansion Project, Pūlehu Nui Ahupua‘a, Wailuku District, Maui Island, TMK: (2) 3-8-004:001 por. (Yucha and Hammatt 2020)
Date	March 2020
Project Number(s)	Cultural Surveys Hawai'i, Inc. (CSH) Job Code: PULEHUNUI 17
Investigation Permit Number	CSH will likely complete the archaeological monitoring fieldwork under archaeological fieldwork permit number 20-07, issued by the Hawai'i State Historic Preservation Division (SHPD) per Hawai'i Administrative Rules (HAR) §13-13-282.
Agencies	County of Maui; SHPD
Land Jurisdiction	Private (Hawaiian Cement)
Project Funding	Private
Project Location	The project area is located on the western flank of Haleakalā along the edge of the central isthmus of Maui. The project area borders Upper Kīhei Road and is east (<i>mauka</i>) of the Puunene Armory and Maui Raceway Park. Increment 2 is located on the south side of Kolaloa Gulch and west side of Upper Kīhei Road. Increment 4 is located on the north side of Kolaloa Gulch and east side of Upper Kīhei Road. The project area is depicted on a portion of the 1992 Puu o Kali U.S. Geological Survey 7.5-minute topographic quadrangle.
Project Description	The proposed project will include cement quarry mining within the entire footprint of Increments 2 and 4. Overlying agricultural soils will be stripped away from the surface to expose the shallow underlying bedrock. The bedrock will be quarried and processed. No quarrying will occur within Kolaloa Gulch.
Project Acreage	Increment 2 is 56.7 acres (22.9 hectares). Increment 4 is 57.9 acres (23.4 hectares). In total, the project area is 114.6 acres (46.4 hectares).
Project-Related Disturbance	The proposed project will include quarrying and removal of bedrock throughout the entire footprint of the project area. Overlying agricultural soils will be stripped away from the surface to expose the shallow underlying bedrock. The bedrock will be quarried and processed. No quarrying will occur within Kolaloa Gulch
Historic Preservation Regulatory Context	In 1990, Archaeological Consultants Hawai'i (ACH) completed a walk-through reconnaissance survey of the Hawaiian Cement Quarry expansion areas including Increments 2 and 4 (Kennedy 1990). At the time of the survey, the entire property was covered in active

	<p>commercial sugarcane fields. No historic properties were identified during the survey and no further work was recommended.</p> <p>In 2010, Archaeological Services Hawai'i (ASH) conducted an archaeological inventory survey for the 24.476 acres for expansion within Increment 1 of the Hawaiian Cement Quarry (Rotunno-Hazuka et al. 2011). The study included the excavation of 20 backhoe-assisted test excavations that documented the agricultural plow zone developed over eroding and solid basalt bedrock. No historic properties were identified and as such, the study was termed an "archaeological assessment" in accordance with §13-284-5(5)(A). The study recommended no further work. The study was reviewed and accepted by the SHPD on 8 August 2012 (SHPD Log No.: 2011.0298 and 2011.0340; Doc. No.: 1208JP01).</p> <p>In 2014, ASH returned to the area to conduct an archaeological inventory survey of Increment 3 of the Hawaiian Cement Quarry (Fuentes et al. 2015 Draft). The study included the excavation of 17 backhoe-assisted test excavations with no historic properties identified. As such the study was termed an "archaeological assessment" in accordance with §13-284-5(5)(A). The study was submitted to the SHPD on 13 October 2014. The SHPD requested revisions to the study in a 12 May 2015 historic preservation review letter (SHPD Log No.: 2014.04654; Doc. No: 1505MD19). The study was revised and resubmitted to the SHPD in July 2015 and again in September 2017 with no response. Quarrying work in Increment 3 began and has continued without SHPD acceptance of the archaeological inventory survey.</p> <p>In order to address proposed quarry expansion in Increments 2 and 4, the landowner and project agency are proposing to conduct archaeological monitoring for identification purposes.</p> <p>This archaeological monitoring plan (AMP) is intended to support the proposed project's historic preservation review under Hawai'i Revised Statutes (HRS) §6E-42 and HAR §13-13-284. It is also intended to support any project-related historic preservation consultation with stakeholders, such as state and county agencies and interested Native Hawaiian Organizations (NHOs) and community groups. In consultation with the SHPD, this document fulfills the requirements of HAR §13-13-279-4.</p>
<p>Historic Properties Potentially Affected</p>	<p>No historic properties have been identified within the project area or vicinity.</p>
<p>Monitoring Recommendations</p>	<p>Archaeological monitoring will begin with the completion of a 100% coverage pedestrian inspection to confirm that there are no historic properties on the surface of the project area. This inspection will be</p>

	<p>completed prior to the start of project-related ground disturbance and the results will be provided to the SHPD.</p> <p>Archaeological monitoring will be conducted intermittently during the excavation of soils overlying bedrock within the project area and will include a combination of on-site and on-call strategies. CSH recommends that overlying sediment removal from the project area be scheduled to be completed in one effort as opposed to as needed during the quarrying effort if possible. An on-site archaeological monitor will observe sediment excavation for up to five (5) full days to confirm that there are no subsurface historic properties within the sediment deposits of the project area. If there are no significant finds during this effort, the remainder of sediment excavation will proceed under on-call archaeological monitoring with an archaeologist conducting spot checks once every 10 business-days (approximately twice per month) to record progress and confirm that subsurface conditions have not changed. No archaeological monitoring will occur during quarrying of basalt bedrock.</p> <p>In the event of significant finds, the SHPD will be notified. If human remains are identified, construction activity in the vicinity will be stopped and no exploratory work of any kind will be conducted unless specifically requested by the SHPD. All human skeletal remains that are encountered during excavation will be handled in compliance with HAR §13-13-300 and HRS §6E-43.</p>
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Section 1 Introduction

1.1 Project Background

At the request of Hawaiian Cement, Cultural Surveys Hawai‘i, Inc. (CSH) has prepared this archaeological monitoring plan (AMP) for the Hawaiian Cement Quarry Mining Site, Increments 2 and 4 Expansion Project, Pūlehu Nui Ahupua‘a, Wailuku District, Maui Island, TMK: (2) 3-8-004:001 (por.). The project area is located on the western flank of Haleakalā along the edge of the central isthmus of Maui. The project area borders Upper Kīhei Road and is east (*mauka*) of the Puunene Armory and Maui Raceway Park. Increment 2 is located on the south side of Kolaloa Gulch and west side of Upper Kīhei Road. Increment 4 is located on the north side of Kolaloa Gulch and east side of Upper Kīhei Road. The project area is depicted on a portion of the 1992 Puu o Kali U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Figure 1), a tax map plat (Figure 2), and a 2016 aerial photograph (Figure 3).

The proposed project will include cement quarry mining within the entire footprint of Increments 2 and 4 (Figure 4). Overlying agricultural soils will be stripped away from the surface to expose the shallow underlying bedrock. The bedrock will be quarried and processed. No quarrying will occur within Kolaloa Gulch.

1.2 Historic Preservation Regulatory Context

In 1990, Archaeological Consultants Hawai‘i (ACH) completed a walk-through reconnaissance survey of the Hawaiian Cement Quarry expansion areas including Increments 2 and 4 (Kennedy 1990). At the time of the survey, the entire property was covered in active commercial sugarcane fields. No historic properties were identified during the survey and no further work was recommended.

In 2010, Archaeological Services Hawai‘i (ASH) conducted an archaeological inventory survey for the 24.476 acres for expansion within Increment 1 of the Hawaiian Cement Quarry (Rotunno-Hazuka et al. 2011). The study included the excavation of 20 backhoe-assisted test excavations that documented the agricultural plow zone developed over eroding and solid basalt bedrock. No historic properties were identified and as such, the study was termed an “archaeological assessment” in accordance with §13-284-5(5)(A). The study recommended no further work. The study was reviewed and accepted by the SHPD on 8 August 2012 (SHPD Log No.: 2011.0298 and 2011.0340; Doc. No.: 1208JP01; Appendix A).

In 2014, ASH returned to the area to conduct an archaeological inventory survey of Increment 3 of the Hawaiian Cement Quarry (Fuentes et al. 2015 Draft). The study included the excavation of 17 backhoe-assisted test excavations with no historic properties identified. As such the study was termed an “archaeological assessment” in accordance with §13-284-5(5)(A). The study was submitted to the SHPD on 13 October 2014. The SHPD requested revisions to the study in a 12 May 2015 historic preservation review letter (SHPD Log No.: 2014.04654; Doc. No.: 1505MD19; Appendix A). The study was revised and resubmitted to the SHPD in July 2015 and again in September 2017 with no response. Quarrying work in Increment 3 began and has continued without SHPD acceptance of the archaeological inventory survey.

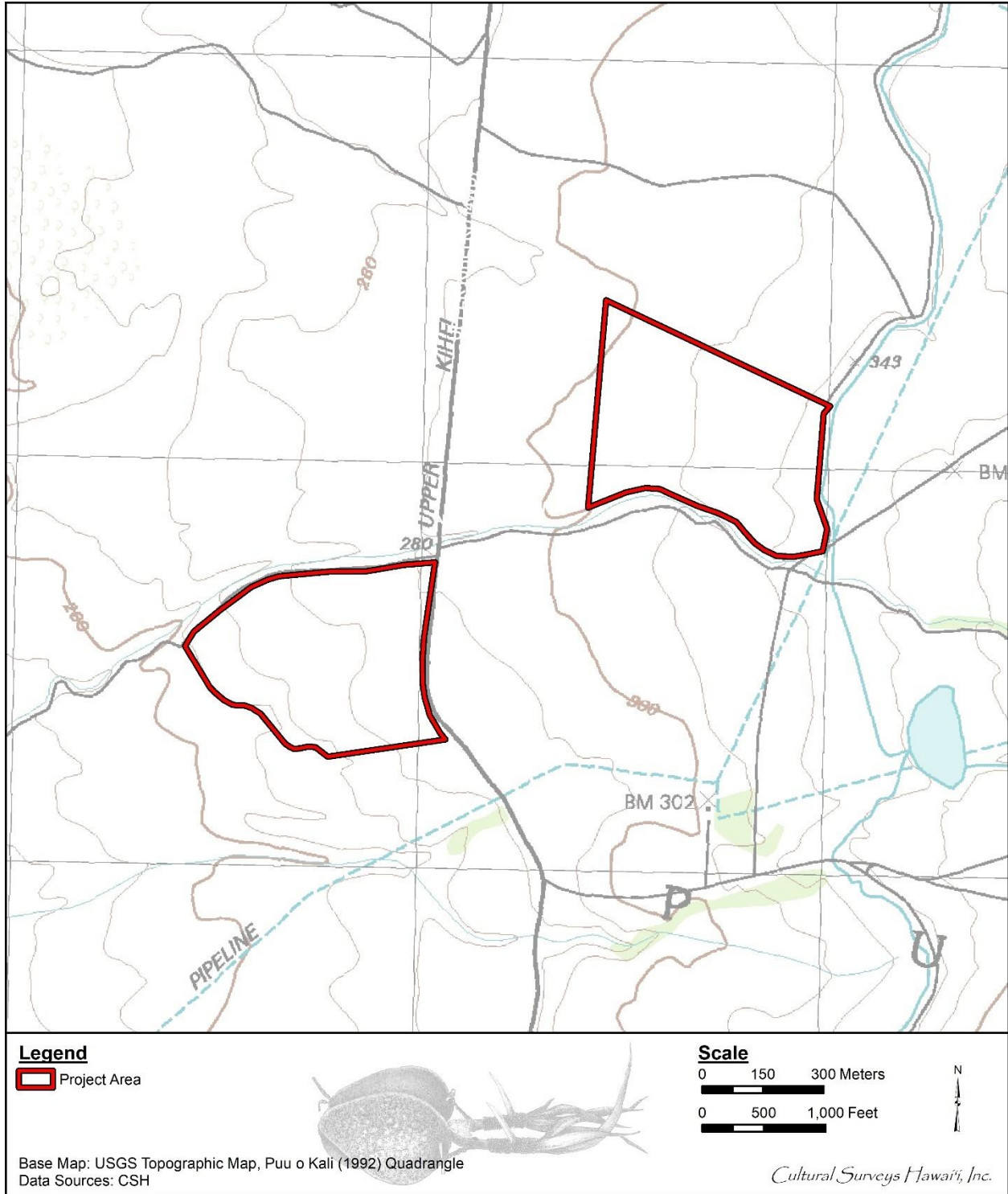


Figure 1. Portion of the 1992 Puu o Kali USGS 7.5-minute topographic quadrangle showing the location of the project area (U.S. Geological Survey 1992)

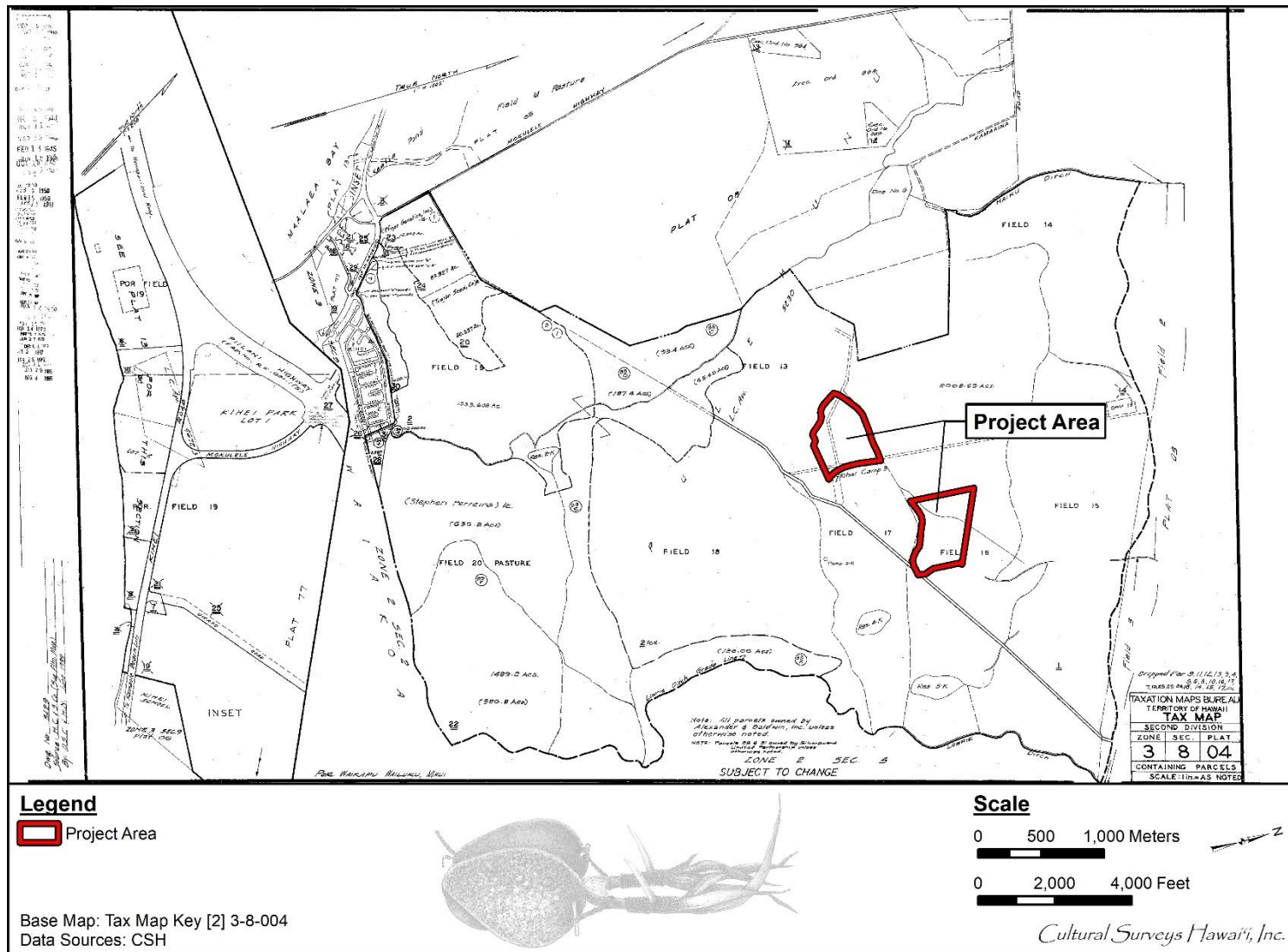


Figure 2. Tax Map Key (TMK) [2] 3-8-004 showing the project area (Hawaii TMK Service 2014)

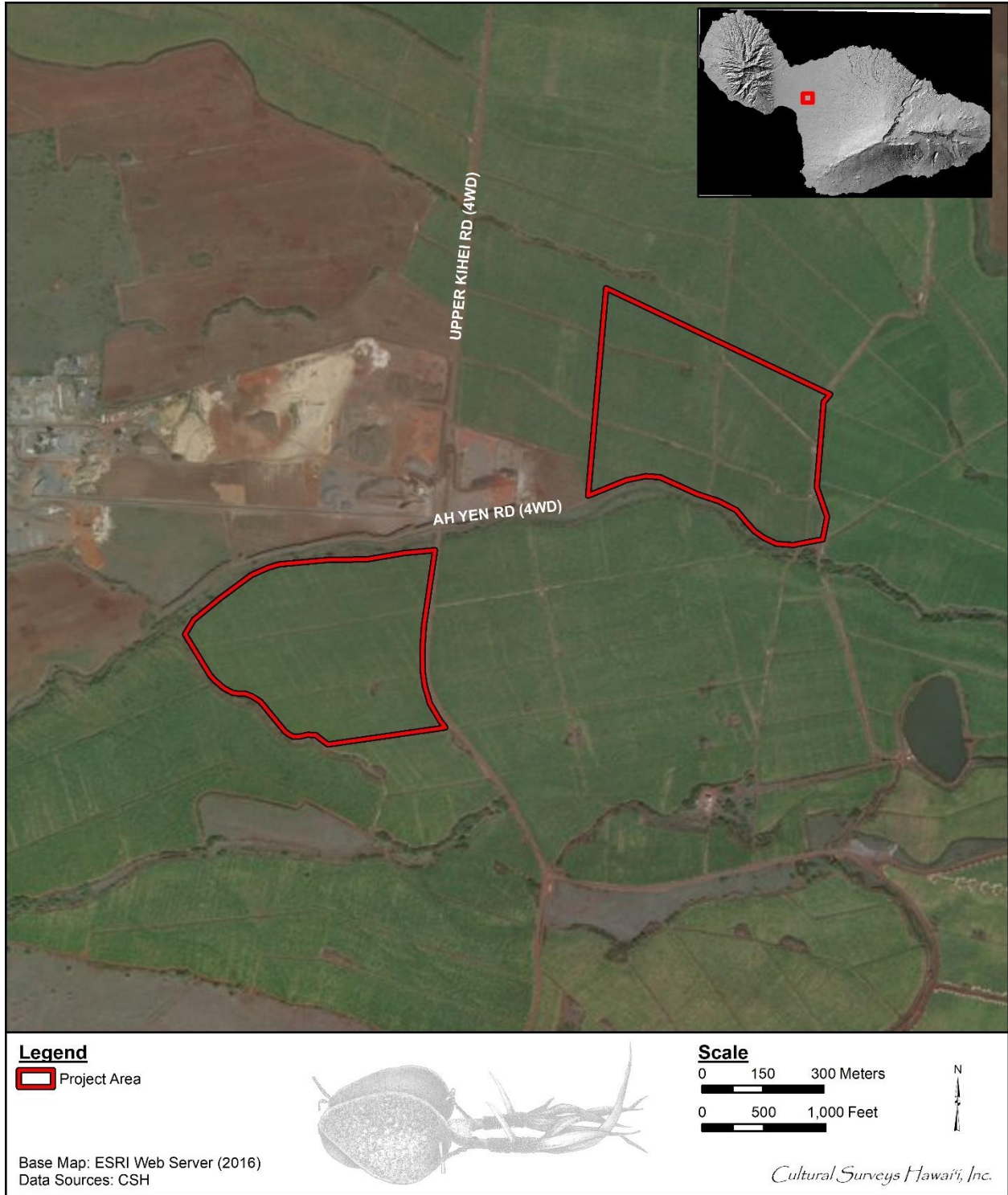


Figure 3. Aerial photograph of the project area (Esri 2016)

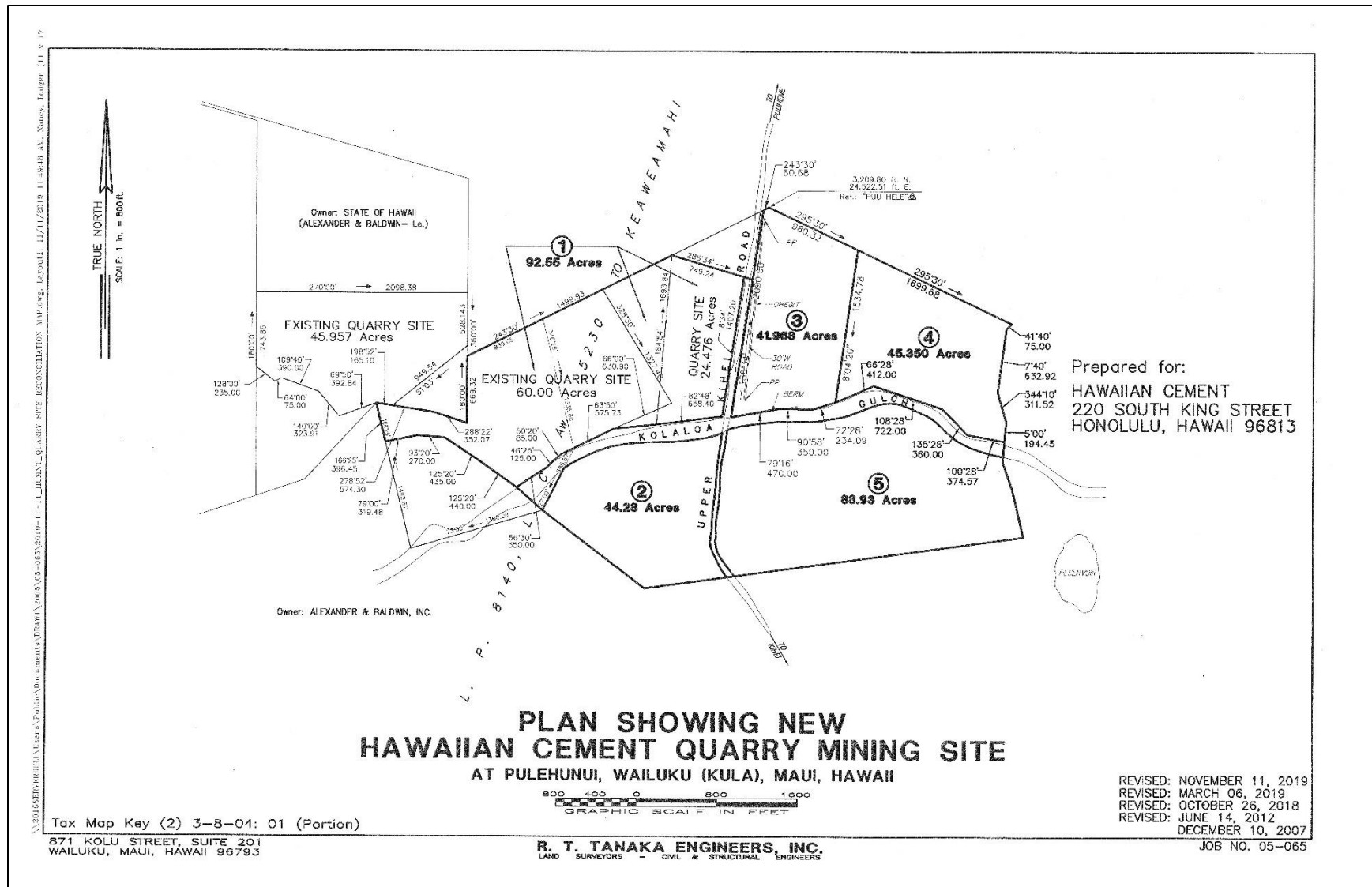


Figure 4. Hawaiian Cement Quarry Mining Site plan showing the location of Increments 2 and 4 (R.T. Tanaka Engineers Inc. 2019)

AMP for the Hawaiian Cement Quarry, Increments 2 and 4, Pūlehu Nui, Wailuku, Maui

TMK: [2] 3-8-004:001 por.

In order to address proposed quarry expansion in Increments 2 and 4, the landowner and project agency are proposing to conduct archaeological monitoring for identification purposes.

This archaeological monitoring plan (AMP) is intended to support the proposed project's historic preservation review under Hawai'i Revised Statutes (HRS) §6E-42 and HAR §13-13-284. It is also intended to support any project-related historic preservation consultation with stakeholders, such as state and county agencies and interested Native Hawaiian Organizations (NHOs) and community groups. In consultation with the SHPD, this document fulfills the requirements of HAR §13-13-279-4.

1.3 Environmental Setting

1.3.1 Natural Environment

The current project area is located on the western flank of Haleakalā along the edge of the level central isthmus of Maui. The project area is located approximately 4.75 km (2.95 mi) from the nearest shoreline fronting Kīhei and is 64 to 106 m (210 to 348 ft) above mean sea level. The topography of the project area is a gentle westward slope. The project area, and overall quarry site, is bisected by Kolaloa Gulch, a perennial tributary to Keālia Pond. Other nearby gulches include Pūlehu Gulch to the north of the project area and Keāhuaiwi Gulch to the south of the project area.

In 2014, the average monthly air temperature for the project area was between 21.43°C (70.58°F) in January and 25.50°C (77.90°F) in August, with an average annual air temperature of 23.51°C (74.31°F) (Giambelluca et al. 2014). The vicinity of the project area received a mean annual rainfall of 327.0 mm (12.87 inches) between 1978 and 2007, according to the University of Hawai'i 2011 *Online Rainfall Atlas of Hawaii* (Giambelluca et al. 2013). The mean monthly rainfall varied between 1.4 mm (0.06 inch) in June and 82.4 mm (3.24 inches) in January. This pattern of rainfall and low annual precipitation rate once sustained a lowland, dry shrubland, and grassland native ecosystem (Pratt and Gon 1998).

Vegetation with the project area includes fallow sugarcane (*Saccharum officinarum*) fields that have become overgrown with *koa haole* (*Leucaena leucocephala*), wild bitter melon (*Momordica charantia*), and other invasive trees, vines, and grasses.

According to the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Foote et al. (1972), the project area's soils consist of Alae cobbly sandy loam, 0 to 3 percent slopes (AcA), Pulehu silt loam, 0 to 3 percent slopes (PpA), Pulehu silt loam, 3 to 7 percent slopes (PpB), Pulehu clay loam, 0 to 3 percent slopes (PsA), Pulehu cobbly clay loam, 0 to 3 percent slopes (PtA), Waiakoa extremely stony silty clay loam, 3 to 7 percent slopes (WhB) (Figure 5).

Alae Series soils are described as:

This series consists of excessively drained soils on alluvial fans on the island of Maui. These soils developed in volcanic ash and recent alluvium derived from basic igneous rock. They are nearly level to gently sloping. Most areas have cobblestones on the surface. Elevations range from 50 to 600 feet. The annual rainfall amounts to 12 to 20 inches. The mean annual soil temperature is 74° F. Alae soils are geographically associated with Ewa, Pulehu, and Waiakoa soils.

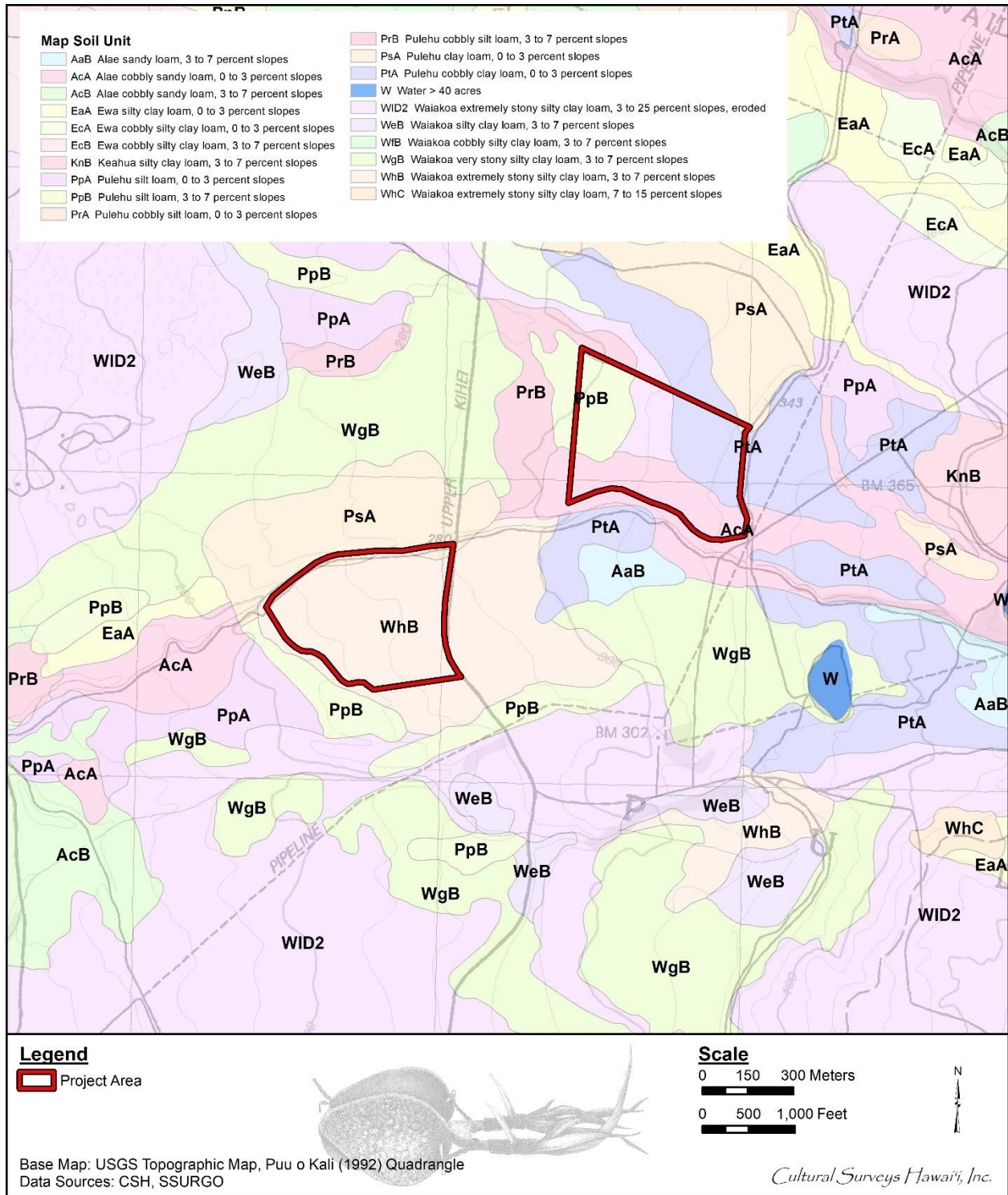


Figure 5. Overlay of *Soil Survey of the State of Hawaii* (Foote et al. 1972), indicating soil types within and surrounding the project area (U.S. Department of Agriculture Soils Survey Geographic Database [SSURGO] 2001)

These soils are used for sugarcane and pasture. Small areas are used for truck crops. The natural vegetation is feather fingergrass, kiawe, and uhaloa.(Foote et al. 1972:14)

Pulehu Series soils are described as:

This series consists of well-drained soils on alluvial fans and stream terraces and in basins. These soils occur on the islands of Lanai, Maui, Molokai, and Oahu. They developed in alluvium washed from basic igneous rock. The soils are nearly level to moderately sloping. Elevations range from nearly sea level to 300 feet. The annual rainfall amounts to 10 to 35 inches. The mean annual soil temperature is 74° F. Pulehu soils are geographically associated with Ewa, Jaucas, Kealia, Lualualei, Waialua, and Mala soils.

These soils are used for sugarcane, truck crops, pasture, homesites, and wildlife habitat. The natural vegetation consists of bermudagrass, bristly foxtail, fingergrass, kiawe, klu, lantana, koa haole, and sandbur. (Foote et al. 1972:115)

Waiakoa Series soils are described as:

This series consists of well-drained soils on uplands on the island of Maui. These soils developed in material weathered from basic igneous rock. The upper part of the profile is influenced by volcanic ash. These soils are gently sloping to moderately steep. Elevations range from 100 to 1,000 feet. The annual rainfall amounts to 12 to 20 inches; most of it occurs in winter. The mean annual soil temperature is 74° F. Waiakoa soils are geographically associated with Keahua and Keawakapu soils.

These soils are used for sugarcane, pasture, homesites, and wildlife habitat. The natural vegetation consists of buffelgrass, feather fingergrass, ilima, kiawe, uhaloa, and zinnia. (Foote et al. 1972:126)

1.3.2 Built Environment

The quarry site includes infrastructure and equipment that is used to quarry, transport, refine, and store quarry products. Infrastructure includes crushing equipment, conveyors, office and maintenance buildings, and storage buildings. The surrounding area includes fallow sugarcane fields that have remained uncultivated since the closing of commercial sugar cultivation in Central Maui in 2016. The Puunene Armory and Maui Raceway Park are located west of the project area.

Section 2 Background Research

2.1 Traditional and Historical Background

The division of Maui's lands into political districts occurred during the rule of Kaka'alaneo, under the direction of his *kahuna* (chief), Kalaiha'ōhi'a (Beckwith 1970:383). This division resulted in twelve districts, or *moku*, during traditional times: Kula, Honua'ula, Kahikinui, Kaupō, Kīpahulu, Hāna, Ko'olau, Hāmākua Loa, Hāmākua Poko, Wailuku, Kā'anapali, and Lāhainā. The current project area is located on the western flank of Haleakalā in the *moku* of Kula and *ahupua'a* of Pūlehu Nui. Overall, Pūlehu Nui Ahupua'a begins at Kilohana Peak, on the summit ridge of Haleakalā, and ends at a mid-point on the west shore of the central plains at a shared boundary with Waikapū Ahupua'a, encompassing a total area of 16,687.78 acres (McCully 1879).

2.1.1 Mo'olelo and Traditional Accounts

While the mythological and traditional accounts of the area are relatively scarce, an analysis of the *wahi pana* (place names/sacred sites) meanings for the region may yield some insight into the patterns of life in the area prior to Western contact (Table 1). In *Native Planters in Old Hawaii*, E. S. C. Handy et al. (1991:23-24,42) summarizes the relationship that traditional Hawaiians have had with the natural environment best in the following passage:

The sky, sea, and earth, and all in and on them are alive with meaning indelibly impressed upon every fiber of the unconscious as well as the conscious psyche. Hawaiian poetry and folklore reveal this intimate rapport with the elements (Handy et al. 1991:23-24)

(T)he relationship which existed from very early times between the Hawaiian people ... is abundantly exemplified in traditional mele (songs), in pule (prayer chants), and in genealogical records which associate the ancestors, primordial and more recent, with their individual homelands, celebrating always the outstanding qualities and features of those lands. (Handy et al. 1991:42)

The provided place names, together with the environmental data, suggest that the lands of coastal Pūlehu Nui were rich in marine resources. Previous research on pre-Contact occupation in Kula District (Kolb et al. 1997) has suggested that most permanent habitations were in the uplands with a smaller permanent population located along the coastline. While a reconstruction of the coastal archaeological landscape of Kula Moku underscores the importance of the uplands as a focus of agriculture and habitation, Hawaiian traditions and the presence of four fishponds are evidence that the coastal environs were also a focus of settlement and marine resource collection.

Lands surrounding the current project area were also a site of conflict between the Hawai'i Island chief Kalani'ōpu'u and Maui Island chief Kahekili and is perhaps an explanation for the origins for such place names as "Waiakoa" and "Keāhuaiwi".

Table 1. Place names documented in the vicinity of the project area (from Pukui et al. (1974) unless otherwise noted)

Place Name	Meaning/Translation
Alakoa	<i>Lit.</i> , “soldier’s street” (p. 9)
Kalaepohaku	<i>Lit.</i> , “the stony promontory” (p. 72-73)
Kale‘ia	<i>Lit.</i> , “the abundance”, possibly in reference to the resources available from the fishponds and offshore fishing grounds (p. 76)
Kalepolepo	<i>Lit.</i> , “the dirt” (p. 77)
Ka‘ōpala	<i>Lit.</i> , “the rubbish”; dividing line between Pūlehu Nui and Waikapū Ahupua‘a (p. 86)
Keāhuaiwi	<i>Lit.</i> , “the bone pile”; the name of a gulch immediately adjacent to and north of Waiakoa Gulch (p. 101)
Keālia	<i>Lit.</i> , “salt encrustation”; a pond near Kīhei and major salt pan location (Sterling 1998:95)
Kīhei	<i>Lit.</i> , “cape or cloak”; sandy point and boundary marker between Pūlehu Nui and Waikapu (Sterling 1998:255); commonly used place name for the South Maui area
Kīheipūko‘a	<i>kīhei</i> literally translates as “cape or cloak” and <i>pūko‘a</i> literally translates as “coral head”; Kīheipūko‘a was a place near Keālia between Kalepolepo and Ma‘alaea (Sterling 1998:257)
Kohemālamalama	<i>Lit.</i> , “bright vagina”; also the ancient name for Kaho‘olawe
Kō‘ie‘ie	<i>Lit.</i> , “a plaything for floating in the rapids”, ancient name of Kalepolepo (Sterling 1998:252)
Kolaloa	<i>Lit.</i> , “much sexual excitement”, the name of the gulch that bisects the project area
Kula (<i>moku</i>)	<i>Lit.</i> , “plain”; always an arid region (Handy in Sterling 1998:242)
Pūlehu (gulch)	<i>Lit.</i> , “broiled”, possibly in reference to abundant sweet potato cultivation in the uplands (p. 193)
Pūlehu Nui (<i>ahupua‘a</i>)	“large <i>pūlehu</i> ”
Waiakoa	<i>Lit.</i> , “water (used) by warrior”; the name of the gulch of the project area (p. 220)

The earliest account concerning Kīhei and Hawaiian politics is given by Samuel Kamakau (1961:70) during the time of Alapa'i and Kekaulike:

Alapa'i sailed from Kohala on Hawai'i...But when he landed at Mokulau in Kaupō (Maui) and heard that Ke-kau-like was dying, he gave up all thought of war and wished only to meet Ke-kau-like and his (half) sister Ke-ku'i-apo-iwa-nui...He landed at Kīheipukoa with all his chiefs and fighting men...While he was at Kīhei, Alapa'i heard that the ruling chief of Oahu was making war upon Molokai. Most of the chiefs of Molokai...were of Hawai'i...Alapa'i's sympathy was aroused, for these were his own brothers and children (relatives), and he made ready to go to their help on Molokai. (Kamakau 1961:70)

Other accounts involve the continuing conflict between Kahekili of Maui Island and Kalani'ōpu'u of Hawai'i Island during the late 18th century. Following a losing battle at Kaupō in 1775, Kalani'ōpu'u dedicated several war heiau on Hawai'i Island to aid in the defeat of Kahekili. Upon hearing this news Kahekili sent for the kahuna (priest) Kaleopu'upu'u who directed construction of the *heiau* of Kaluli and Pu'uohala on the north side of Wailuku.

In 1776, the army of Kalani'ōpu'u landed at Keoneo'o'io, with their war canoes extending to Makena at Honua'ula and proceeded to ravage the countryside. Kalani'ōpu'u landed with additional forces at Kīhepuko'a at Kealia to Kapa'ahu, 800 strong and eager to drink the waters of Wailuku:

Across the plains of Pu'u'ainako (Can-trash-hill) and Kama'oma'o shone the feather cloaks of the soldiers ... Ka-hekili was at Kalanihale just below Kihahale and above the plateau of Ka'ilipoe at Pohakuaokahi ... Kaleopu'upu'u [said] to Kahekili, "The fish have entered the sluice; draw in the net." (Kamakau 1961:85)

The forces of Kahekili descended upon and destroyed the soldiers of Kalani'ōpu'u, slaying the Alapa (elite soldiers of Kalani'ōpu'u) on the sandhills at the southeast of Kalua. Only two men escaped to Kīheipuko'a to tell Kalani'ōpu'u the news of their defeat. After a second day of warfare Kalani'ōpu'u sued for peace and was granted such by Kahekili and his messengers at Kīheipuko'a (Kamakau 1961:88-89).

Coastal Pūlehu Nui also shows a few vestiges of the lifestyles and subsistence activities of the *maka'āinana* (commoner) that lived there as well as the works of powerful *ali'i*. Keālia Pond has been known as a source of high-quality salt from the pans in its immediate vicinity. In *Ancient Sites of Maui, Moloka'i, and Lana'i*, author Van James (2002:71) states, in reference to Keālia Pond:

It is also the name and site of a former fishpond. Little is known about the ancient history of Keālia fishpond, but judging from its size, it must have been an important producer of fish stock, particularly *awa* (milkfish) and *'ama'ama* (mullet). Ditches and sluice gates were built at least 400 years ago to let these and other nearshore fish into the pond. A *ko'a* (fishing shrine) or possible *heiau* platform stands near the site. (James 2002:71)

Given its location on the leeward shores of the central isthmus of Maui, and its regular access to the freshwater runoff emanating from Waikapū Stream to the north and Kolaloa Gulch to the southeast, the area had access to many resources (salt, fish, irrigation, etc.) valued and utilized by

the population. This wetland environment also attracts many species of waterfowl in the winter months when water levels in the pond rise with seasonal flooding. These would have also served as a potential source of nourishment for subsistence communities in the region (James 2002:72).

Further testament of resource gathering in the area comes from neighboring Kō'ie'ie Fishpond (Figure 6) which can still be seen along the Kīhei coastline. This fishpond was once part of a broader distribution of these types of structures along the coast. To this effect James (2002:73,74) states:

In ancient times at least three or four *kuapā* (walled) fishponds were built along the Kīhei (“cloak”) coastline. With the exception of Kō'ie'ie pond, the names of the other ponds have been lost, and little is known about any of their histories. In such cases it was said that *Menehune* constructed them.

It [Kō'ie'ie] is a small pond of three arcs. At low tide, another fishpond ruin can be seen just south of Kō'ie'ie Fishpond, and still further south along the coast is yet another nameless ancient pond wall. (James 2002:73,74)

The associations of these fishponds to the *menehune*, placing their times of construction in deep antiquity, suggest that this site may have been in use in very early times. What is known regarding the fishponds here is that they had been rebuilt several times prior to, and during the first days of, Western contact. To this effect (James 2002:73-74) documents that:

It is here at Kalepolepo that Kamehameha I is said to have beached his canoes for battle against Central Maui. The beaches were black with his fleet, and the Waikapū Stream that empties into nearby Keālia Pond was declared *kapu*. Later, Kamehameha, who noticed Kō'ie'ie to be in disrepair, had the fishpond rebuilt. It is recorded that chief 'Umilīloa, in the mid-1500s, also had the pond walls rebuilt. (James 2002:73-74)

Given its history of rehabilitation from conquering Hawai'i Island chiefs, it is believed that the fishpond at Kō'ie'ie was “a royal pond always stocked with the best fish” (James 2002:74). Further associations between Hawaiian royalty and Kō'ie'ie Fishpond are also exemplified by a story from the early historic period when Kihawahine, the family *'aumakua* of the Kamehameha line of chiefs, appeared at Kō'ie'ie Fishpond in saffron-yellow robes following the death of one of Kamehameha's sons at Kalepolepo in 1815 (James 2002:74).

2.1.2 Early Historic Period

Kīhei was one of the locations visited by Captain George Vancouver. A monument at Mai Poina 'Oe Ia'u Beach Park in Kīhei commemorates Vancouver's onshore expedition in 1792, when he first met the ruling chief Kahekili. With its sheltered coastline and easy access to upcountry resources over a vast slope, Kīhei would continue to be a common stop for visiting ships.

During the early and middle 1800s, the Hawaiian demography was affected by two dramatic factors: radical depopulation resulting from Western disease; and nucleation around the developing port towns. The traditionally Hawaiian population was largely dispersed and, although there were royal centers and areas of more concentrated population, these areas never came close to rivaling the populations of the historic port towns that developed on Hawai'i's shorelines during the 1800s.



Figure 6. Ko'ie'ie Fishpond as viewed from the shore, near former site of Kalepolepo (James 2002:73)

In this regard, Kuykendall (1938) notes that in the period from 1830 to 1854:

The commercial development during this period, by magnifying the importance of a few ports, gave momentum and direction to a townward drift of population; the population of the kingdom as a whole was steadily going down, but the population of Honolulu, Lahaina and Hilo was growing. (Kuykendall 1938:313)

Kuykendall's observation likely captures the demographic pattern at the Kalepolepo entrepot, a hub of early historic activity for Kīhei and eventually all of Kula Moku, located approximately one mile to the south of the current project area (Kolb et al. 1997:69). The development of Kalepolepo as an entrepot and a focus of Christian life in the 1840s and 1850s most likely increased the population in the immediate vicinity above the pre-Contact population figures, contrary to the island-wide trend of depopulation. That the population and areal extent of the Kalepolepo community reached its zenith during the mid-1800s, appears to be supported by Kolb et al. (1997:68):

The ancient village of Kalepolepo was relatively small, and was built around an economy primarily based upon the exploitation of ocean resources--primarily the excellent fishing grounds as well as three large fishponds. However, as the number of visiting ships increased, Kalepolepo soon became an important provisioning area. By 1850 we know that the economic opportunities were attracting a number of European entrepreneurs. (Kolb et al. 1997:68)

In 1820 the whaling industry was introduced in Hawai'i. Although the whaling trade centered on Lāhainā, mainly affecting the Kula/Kīhei area through agricultural demands, Clark (1980:47) notes that "From the 1840s to the 1860s a small whaling station was maintained at Kalepolepo [Kīhei]." The introduction of whaling to the Maui community brought with it an increased demand for foodstuffs and in particular the long-lasting Irish potato.

After 1830, dryland agriculture in the old Kula District expanded with a focus on Irish potato cultivation. The California Gold Rush of 1849 further intensified the demand as a California-Hawai'i potato trade began to flourish. Kula became the area of highest potato production and was known as "the potato district" (the area between 2000 and 5000 ft. elevation). During this time, sugar cultivation and ranching were established in the Kula region. According to Helen Wong Smith, sugar was present prior to 1846, with six sugar producers operating on the slopes of Haleakalā, and ranching occurred in the area prior to the 1840s (Brown and Haun 1989:C-7 and C-6). Much of the produce, sugar, and livestock moved down the Kalepolepo and Kekuawaha'ula'ula Trails to the landing at Kalepolepo, just south of the project area. (Donham 1992:5) notes that the inundation of land clearing and cultivation associated with the Gold Rush resulted in "deforestation [which] adversely affect[ed] the amount of rainfall in the district, and periods of drought became more common."

Around 1849 John Halstead built the Koa House at Kalepolepo in Kīhei. The building, part store and part residence, thrived on both the trade of the whaling industry and the then thriving potato industry. During the Gold Rush years, the store became "an emporium for Irish potatoes" and served as a gathering place for the whaling sailors (Burgett and Spear 1995:6). David Malo created a balance for the boisterous whaling crowd by constructing the Kilolani Church at Kalepolepo around 1852. Potato production thrived in Kula from 1830-1850 until successful potato cultivation and production in California and Oregon resulted in a decline in the Hawai'i

trade (Burgett and Spear 1995:6-7). Halstead ran his store until 1876, closing shop when the potato industry diminished (Janion 1977:25-31).

2.1.3 The Māhele and the Kuleana Act

The most significant change in land-use patterns and allocation came with the Māhele of 1848 and the privatization of land in Hawai'i. This action hastened the shift of the Hawaiian economy from that of a subsistence-based economy to that of a market-based economy. During the Māhele, all of the lands in the Kingdom of Hawai'i were divided between *mō'ī* (king), *ali'i* (chief), *konohiki* (overseer of an *ahupua'a*), and *maka'āinana* (tenants of the land) and passed into the Western land tenure model of private ownership. On 8 March 1848, Kamehameha III further divided his personal holdings into lands he would retain as private holdings and parcels he would give to the government. This act paved the way for government land sales to foreigners, and in 1850 the legislature granted resident aliens the right to acquire fee simple land rights (Moffat and Fitzpatrick 1995:41-51).

Native Hawaiians who desired to claim the lands on which they resided were required to present testimony before the Board of Commissioners to Quiet Land Titles. Upon acceptance of a claim the Board granted a Land Commission Award (LCA) to the individual. The awardee was then required to pay in cash an amount equal to one-third of the total land value or to pay in unused land. Following this payment, a Royal Patent was issued that gave full title of ownership to the tenant. But by 1850, the government of Hawaii was offering land for sale to both Native Hawaiians and foreigners. Such lands were referred to as Royal Patent Grants or as Grants.

A total of 13 land commission claims were made in Pūlehu Nui, and nine were awarded (LCAs 0327B, 9671, 9019, 4672, 9672, 9673, 8866, 4567, and 5230). Only one of these awards, LCA 5230, is immediately surrounding and inclusive of the current project area (Figure 7 and Figure 8). Supporting testimony given to the land commissioners indicate that the 1668.78 acres of LCA 5230 were awarded to Keaweamahi by the King in 1843 and never disputed. The testimony given by Kaauwai and Kaiakekua additionally maintained that there were a great many natives that lived within the *ahupua'a* of Pūlehu Nui. The majority of the lands awarded were *kula* used for potato (both sweet potato and Irish potato) cultivation and were primarily located along the upper elevations of Kula Moku (Waihona 'Aina 2000).

In 1879, following the initial division of lands during the Māhele, the western boundary of Pūlehu Nui was disputed by the owners of adjacent lands in Waikapū. The western boundary of Pūlehu Nui that was specified by the Commissioner of Boundaries and surveyed included approximately 2,000 feet along the coastline from a sand spit known as Kīhei to a point of rocks called Kalaepōhaku. The eastern boundary line that was being claimed for Waikapū, however, would cut Pūlehu Nui off from the ocean, this being the more specific issue in the boundary dispute. Testimony was given by *kama'aina* (Native Hawaiian residents) of Pūlehu Nui and/or lands next to it regarding their familiarity with the boundaries of Pūlehu Nui Ahupua'a. All witnesses, with the exception of one, consistently stated the line between Pūlehu Nui and Omaopio was along a ravine or *kahawai*. The line carried along this *kahawai* and continued to follow the same natural boundary to Ka'opala at the bottom of the East Maui slope. Ka'opala meets the bottom of the West Maui slope and creates a depression and this is where the boundary turns course, following the natural depression or shallow *kahawai* to the sea. The court agreed that the boundary likely followed this natural line and concurred with the findings of the Commissioner of

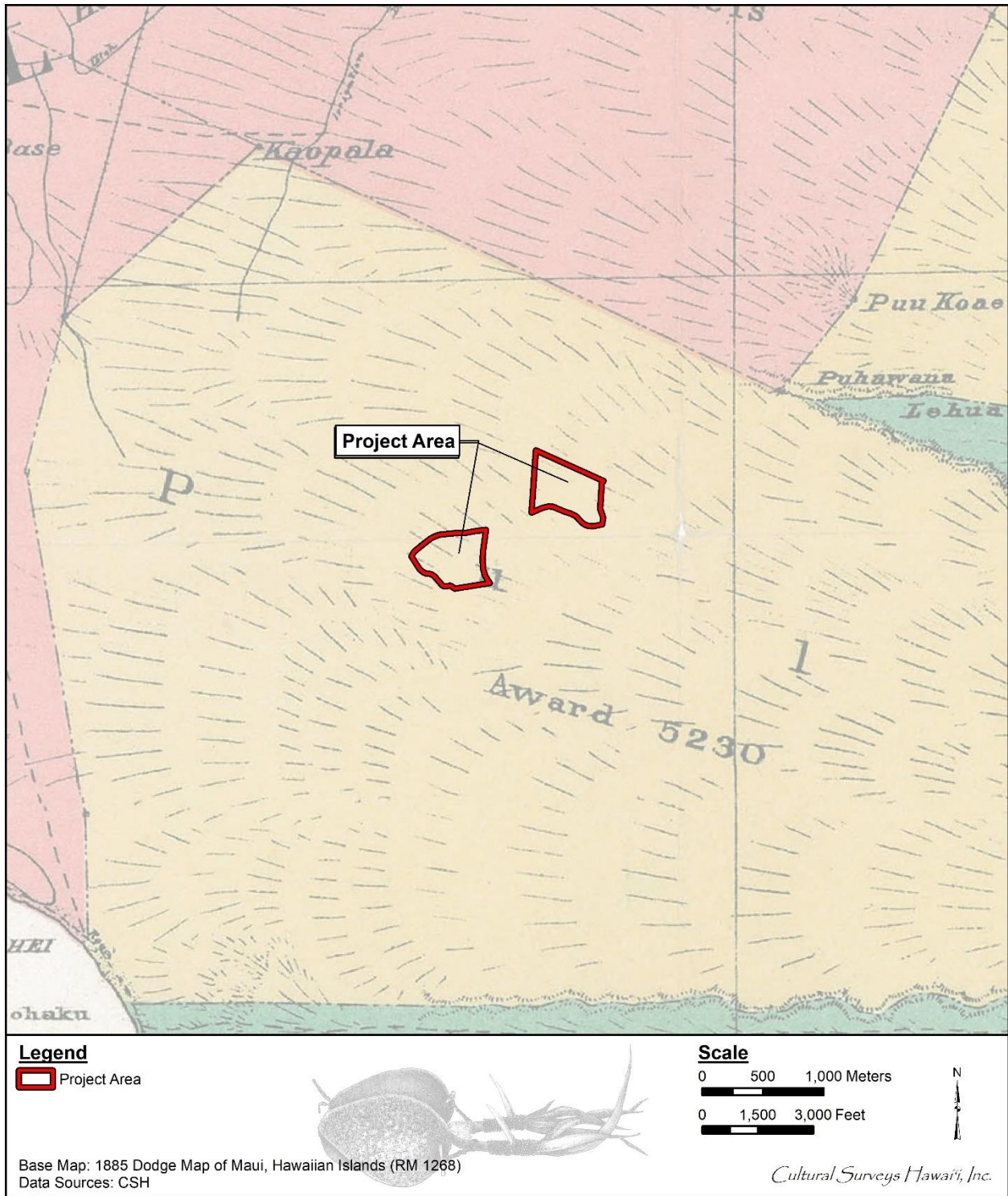


Figure 7. Portion of the 1885 Dodge map of Maui (RM 1268) showing the location of the project area within Award 5230 (Dodge 1885)

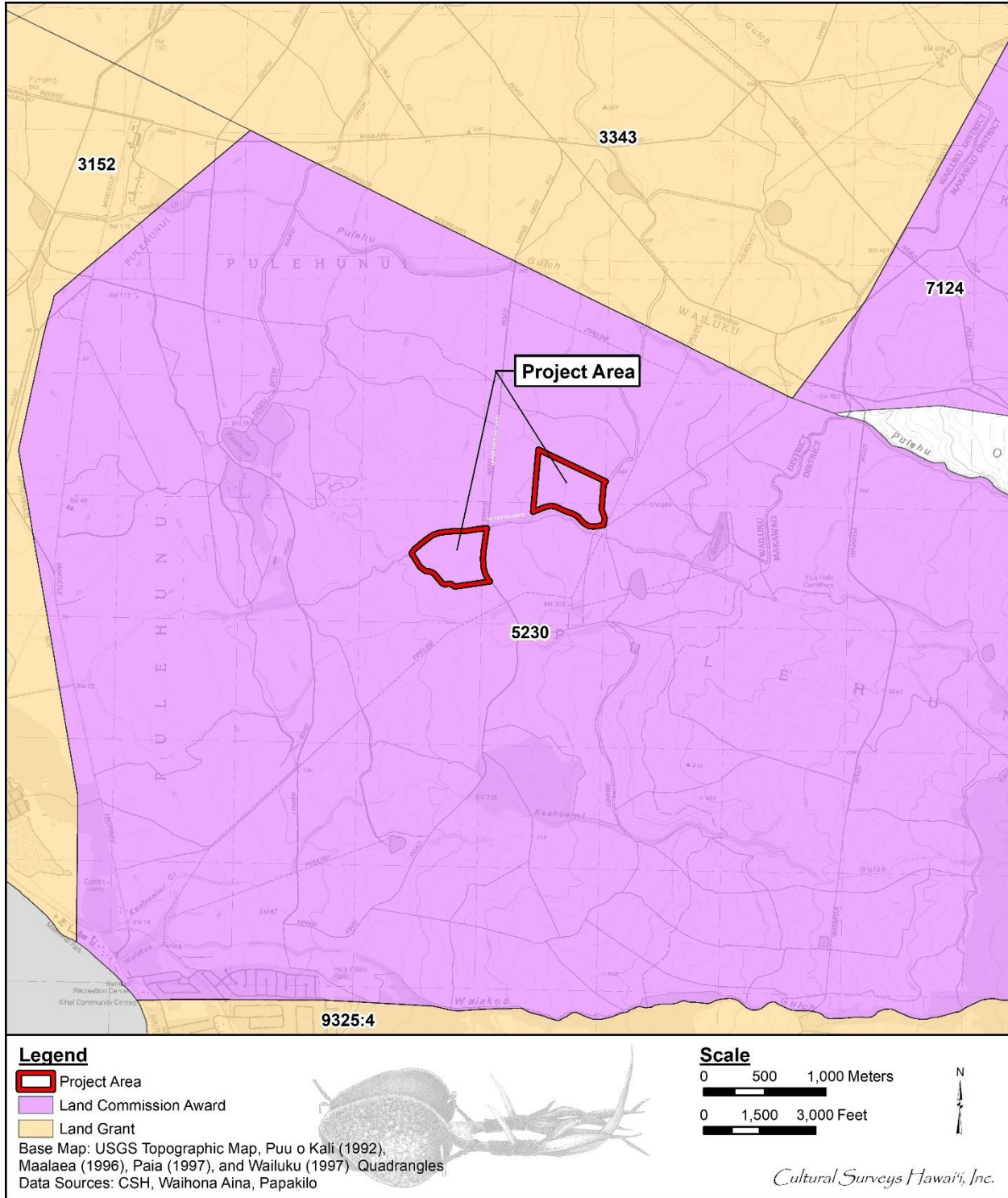


Figure 8. USGS topographic quadrangle map with an overlay of Land Commission Awards and Land Grants recorded in the vicinity of the project area (U.S. Geological Survey 1992, 1996, 1997a, 1997b)

Boundaries. As a result, the original 2,000 feet of coastline from Kīhei to Kalaepohaku that was attributed to Pūlehu Nui Ahupua‘a was upheld. (McCully J Court Opinion, in Sterling 1998:254-257)

2.1.4 Late 1800s through Early 1900s

By the time John Halstead closed shop in 1876, the boom years of Kalepolepo had passed. By 1880 the government survey of the Kula area showed the demarcation of only a few LCAs and those who had received awards had replaced them with grants. Lower Kula consisted primarily of pastureland for ranching (Wong Smith in Donham 1992:B-6). Kennedy (1992:9) notes that at this time *kiawe* (*Prosopis pallida*) was imported to feed cattle and provide wood.

Regarding the settlement at Kalepolepo and the impact of the changes associated with the change to ranching on the general area known as Kīhei, Clark (1980:48) comments:

Halstead finally closed his store in 1876, as demands for his goods had steadily decreased, and moved to Ulupalakua . . . By this time the once thriving Hawaiian village at Kalepolepo had been almost totally abandoned as well. The slopes of Haleakala had gradually become denuded of their forests and torrential rains had caused heavy soil runoffs into the Kalepolepo shoreline. Cattle had trampled down the brush and grassy fields, causing sand dunes to drift and fill up the pond. Clouds of dust filled the air instead of cooling winds. Except for a handful of fishing families, Kalepolepo [and likely the Kīhei area in general] was deserted (Clark 1980:48).

The shift in the economics of coastal Pūlehu Nui to ranching was also noted by E.S. Craighill Handy. He noted that large sections of “Crown Lands” which had not been claimed as *kuleana* [family homestead property] during the Māhele (1848 and later) were given by the Kingdom to various Pūlehu Nui ranchers. The *kiawe* tree was imported and cultivated around 1840 as a source of cattle feed, and the low plains of Pulehu Nui were soon covered in *kiawe* forests (Handy and Handy 1972:510-511). In this manner, upland agricultural pursuits gradually gave way to ranching activities as the demand for locally produced agriculture dropped with the closure of the nearby entrepot at Kalepolepo.

Sugar would soon fill the void, and in late 1898 the Kīhei Plantation Company, Ltd (KPC) was organized with a capitalization of 60,000 shares at \$50 par value. Water was the most critical component in the decision to locate sugar cultivation along the leeward shores of Maui’s arid coastline. The discovery of an ample supply of irrigation water early in 1898 led to the drilling of a large, successful well, but the supply of water was limited (Stearns and Macdonald 1942). Over the next four years, two ditches were developed to supplement the water needs of the 4,873 acres of sugar under cultivation at Kīhei (Gilmore 1936).

The history of the Kīhei Plantation Company begins with the annexation of the Hawaiian Islands by the United States in 1898. Sugar prices were rising due to the outbreak of war between the United States and Spain over the colonies in Cuba, Puerto Rico and the Philippines. Henry P. Baldwin, of the Maui plantation of HC&S, entered into a partnership with O‘ahu businessman Benjamin F. Dillingham to convert Lorrin A. Thurston’s landholdings in Kīhei into a sugar enterprise (Dean 1950:62).

Up to that time, sugar cultivation within the central isthmus of Maui was centered around the main towns of Wailuku and Kahului. Water tunneled from springs in the West Maui Mountains flowed through ditches in Wailuku to irrigate fields as far away as Mā'alaea. Water from the windward rain belt of Kailua ran through a network of ditches from East Maui to Pā'ia, to irrigate fields in Pu'unēnē (Wilcox 1996).

The McCandless Brothers drilled a successful Maui-Type well (U.S. Geological Survey Well 14 / Hawaiian Commercial & Sugar Well K1) in 1899. It was located just inland from the coast in North Kīhei, between Keālia Pond and the Waiakoa Homestead Lands. This well was drilled vertically to approximately 60 feet through the Honomanū basalts, and tunneled laterally over 1,500 feet in order to skim 10 million gallons of fresh irrigation water per day from sources beneath the Kīhei plains (McCandless 1936).

The plantation company in Kīhei built bridges to span streams and gulches flowing through the company fields. The plantation had planned the construction of a mill in North Kīhei, and ordered a plant to be built. It was decided that the new HC&S mill under construction at Pu'unēnē would have more than enough capacity to mill all the cane from the Kīhei fields. The order for the mill was transferred to the 'Ōla'a Sugar Company in Hawai'i, in exchange for a supply of steel rails for new railway requirements at Pu'unēnē. A large-scale Kona storm hit the plantation on November 15th, 1900, and caused immense damage to both Kīhei and the HC&S fields in Pu'unēnē. Bridges were knocked out, buildings were flattened, and washouts filled irrigation ditches with silt. Repairs were effected immediately, with the new HC&S mill at Pu'unēnē commencing operations January 29, 1902 (Dean 1950).

The Kihei Plantation Company had the McCandless Brothers drill two or three additional Maui-Type wells on the north side of reservoir K2 at the discharge end of the existing pipeline of Well 14. The plantation in Kīhei failed in 1908 before the well site was fully developed. It would have been named the HC&S K2 well, and would have included a large pumping station (Stearns and Macdonald 1942).

2.1.4.1 Railway Operations

The Kihei Plantation Company planned to construct a railway to move their cane. The sugar agency of William Dimond & Company placed an order for a locomotive from the Baldwin Locomotive Works in Philadelphia. The order was placed April 1899, and the plantation locomotive "Haleakala" was built and sent on to Maui (Condé and Best 1973).

By March of 1900, the first annual report of the Kihei Sugar Company stated, "It was our intention to complete the main [rail]road only as far as Camp #2, or for about 2 miles, but as the development of Camp #3 required pushing on of the road one and a half miles further, this has been done, having been completed the 15th of February" (Condé and Best 1973:230). An additional six miles of track connected the Kīhei wharf to the various well pumping stations, and north to meet up with HC&S track (Condé and Best 1973). Establishing the railroad at Kīhei made it possible to harvest and transport over two thousand tons of sugar in a single year (Figure 9) (Dean 1950).

The laying of the railroad and the cultivation of the sugar cane was performed primarily by Japanese field labor. Kīhei's plantation Camp #1 was set up inland of the Kīhei wharf and mooring pier. Two stables and a plantation store were located at Camp #1. Hospital services were provided

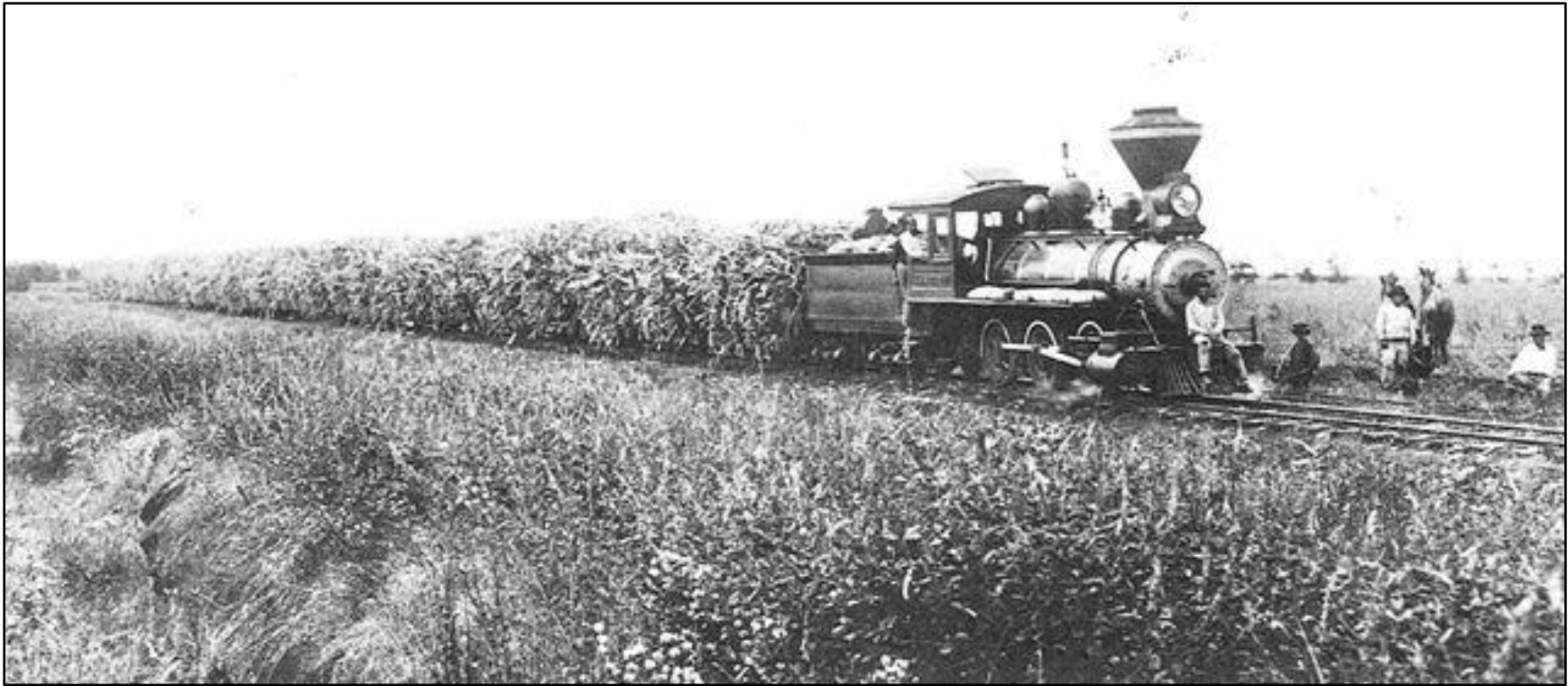


Figure 9. KPC locomotive “Haleakala” transporting cane from Kīhei fields to the mill at Pu‘unēnē, circa 1905 (Condé and Best 1973)

by HC&S in Pu'unēnē. Kihei Camp #3 was located 2 ½ miles north of Kihei Camp 1 at Kolaloa Gulch, along the North Kīhei line of the HC&S railroad (Shoemaker 1907). A 1910 map of the HC&S plantation in Pu'unēnē depicts a portion of the field and rail network surrounding the project area (Figure 10). The "Upper Main R.R. Kihei" extended across Kolaloa Gulch between Increments 2 and 4 of the project area. A spur from this line extended through Increment 4 of the project area to the "K. No 4 Reservoir Ditch. Camp K-3, labeled as "Pump 3-K" is located adjacent to the project area along Makawao Road.

When the plantation was forced to close in 1908 due to diminished returns and underdeveloped water sourcing, the entirety of the company's rolling stock was absorbed by a subsidiary of HC&S. This included a Baldwin 10-ton locomotive, two large flat cars, and approximately 235 cane cars. After this merger the rolling stock of the KPC was absorbed into the larger system that connected Kahului and Kihei to plantations further east of the central isthmus. After acquiring the locomotive, the name was changed from "Haleakala" to "Hawaiian Commercial & Sugar #4," becoming renamed again in 1910 as "Kihei" (Figure 11) (Condé and Best 1973:230-231).

2.1.4.2 Water Source Development

The Lowrie Ditch project, named for former HC&S manager William J. Lowrie, brought an additional source of water to the Kīhei plains. His plan was to begin the ditch at the Pāpa'a'ea Reservoir, at the 1,000 ft. elevation, and maintain a four-foot drop per mile following the ditch's initial plunge from the Kailua reservoir. Steep mountain gulches were traversed using the force of the constant weight of water flowing in a series of siphons. The Halehaku Gulch, at 250 feet deep, and the Māliko Gulch, at over 350 feet deep, were both crossed by giant siphons fabricated of three-eighths-inch iron, and set in place by Japanese laborers. At a weir located above Pā'ia, the allocation of water began. The first tenth of the water flow in the Lowrie Ditch was divided out to the Pā'ia Plantation (an 11/20ths share) and the Haikū Plantation (a 9/20ths share). The distance traveled, from Kailua to the plantation's Kīhei boundary, was 21.9 miles (Thrum 1900).

More water was required from wells and the East Maui watershed. The manager for the Kihei Plantation Company, W.F. Pogue, asked the management of HC&S for an even larger allocation of water for the Kīhei lands. In 1901, Samuel T. Alexander ordered the construction of a new ditch, tapping the water sources from Nāhiku to Honomanū. It was determined that the Kihei Plantation Company would receive 2/9ths of the capacity from the enterprise (Figure 12) (Dean 1950).

The Kihei Plantation Company failed to live up to the expectations of its promoters with an inadequate water supply as the key difficulty. With the waters of the Ko'olau Ditch flowing to the Kīhei fields, production appeared to have hit its peak. Although 5,609 tons of sugar was delivered in 1903, high costs required a change of managers in Kīhei, and a reduction of the HC&S milling charge to \$7 per ton. The incoming HC&S manager, Frank Fowler Baldwin, determined that the best course of action was to buy out the company for \$375,000 (Condé and Best 1973).

In 1908, the lands of the Kihei Plantation Company were divided up between five new major business entities of HC&S; the Kailua Plantation Company (994 acres), the Kalialinui Plantation Company (923 acres), the Kula Plantation Company (996 acres), the Makawao Plantation Company (982 acres), and the Pulehu Plantation Company (978 acres) acquired the remaining acreage not included in the railroad right-of-way. Water rights reverted to HC&S, and were reapportioned between the new plantations (Dean 1950). Sugar operations continued in North Kīhei until circa 1968, when HC&S leased lands to a corn research farm.

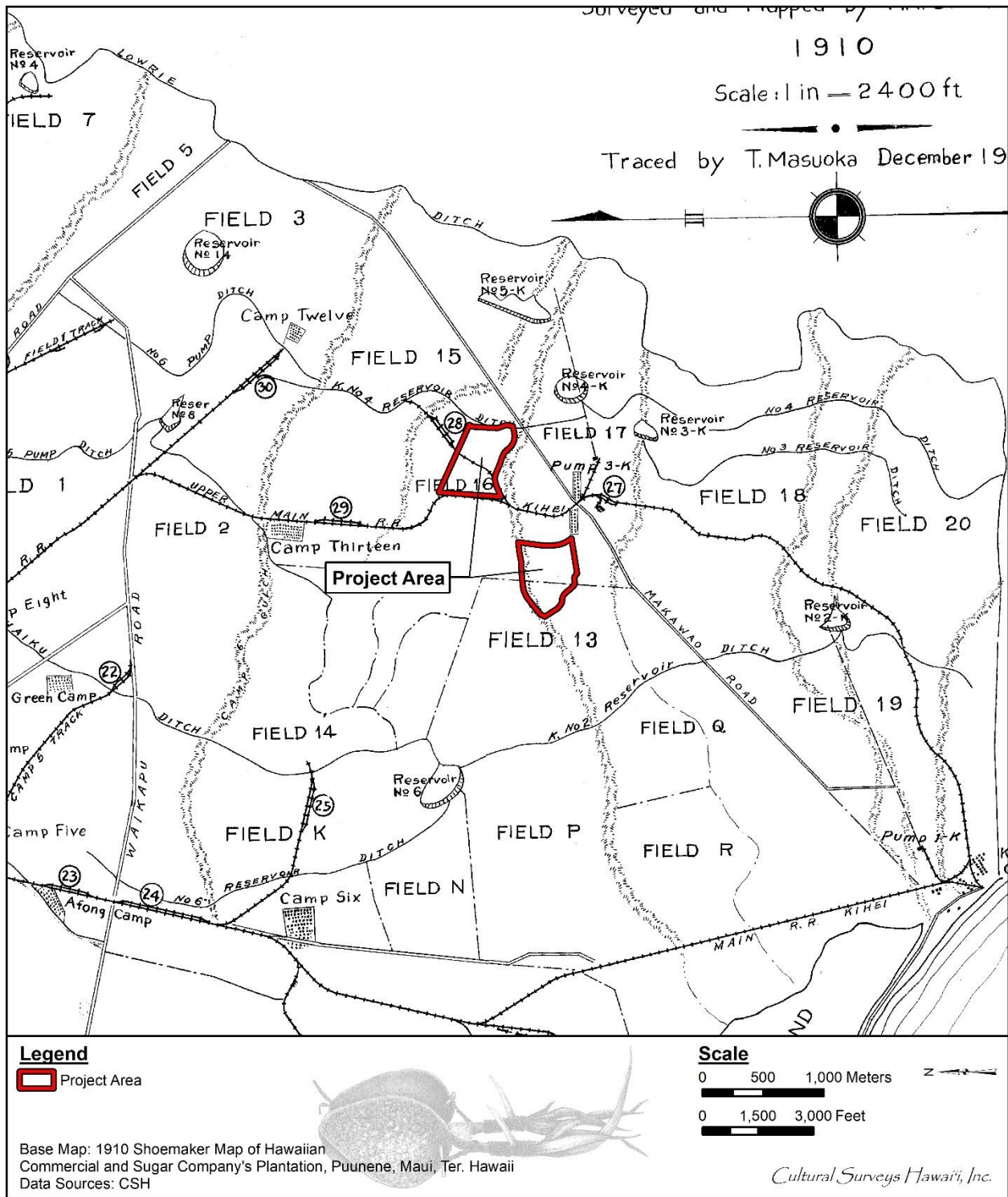


Figure 10. Portion of the 1910 Shoemaker map of the HC&S Plantation in Pu'unenē showing the current project area (Shoemaker 1910)



Figure 11. KPC locomotive servicing HC&S mill as “Hawaii Commercial & Sugar No. 4”
(Condé and Best 1973:231)

H. C. & S. CO.						
Water Deliveries to Kihei Plant. Co., Ltd. During Month of October, 1907.						
DATE	DUMP WATER		MOUNTAIN WATER			
	Inches	Mill. Gall.	Inches	Mill. Gall.		
1	122	041				
2	130	045				
3	152	056				
4	160	060				
5	112	034				
6	070	015				
7			074	017		
8			068	014		
9			126	043		
10			050	005		
11			112	031		
12			218	095		

Pumps were run from the 1st to the 6th inclusive. —
 Water delivered to K.P.Co. — 0 —

Pump water - mill. Gall.	Price	
6 Days 2.53	@ \$12.25	\$30.86
Mountain water		
25 Days 14.27	@ \$5.90	84.21
31 Days 16.80		<u>\$114.57</u>

Figure 12. Portion of an accounting statement for water delivered to the Kihei Plantation Company in 1907 (CSH archives)

2.1.5 Early 1900s to Mid-1900s

The post-WWI years saw HC&S add electricity to some villages. HC&S completed the Waikapū well [Well 7] in 1926 - one of the largest deep wells in the world. The additional capacity of 40 million gallons per day (mgd) was instrumental in planning for more sugar and industry within Maui's central plains. On November 11, 1929, Inter-Island Airways, Ltd. began flying regularly scheduled flights between the Hawaiian Islands. Amphibious eight-passenger Sikorsky S-38 aircraft landed at Mā'alaea Bay, taxied up a concrete ramp, and delivered passengers to waiting automobiles for the trip to Wailuku and points beyond (Saito 2008). By 1936, the airline had purchased three new sixteen-passenger Sikorsky S-43 aircraft to supplement their four S-38's (Kennedy 1937).

Harold T. Stearns traversed the island of Maui between 1932 and 1942, conducting studies of the geology and ground-water resources. Between 1939 and 1940, Gordon A. Macdonald completed geologic maps for the study. Their combined work highlighted the then-recent explorations for water in Pūlehu Nui as a source of drinking water and for dust control during construction of the airport (Stearns and MacDonald 1942). They reported that the isthmus of Maui "was without trees and covered with drifting sand prior to the planting of cane. Old residents report that red dust storms were nearly a daily occurrence. It seems possible that very little water existed under the Maui isthmus, prior to irrigation. If so, the annual pumpage of 45.500 million gallons (average over the past 10 years) represents mostly return flow from the 78.271 million gallons of surface water imported for irrigation. [This measurement establishes that] recovery from wells is about 58% of surface water deliveries."

2.1.5.1 Pre-WWII Aviation History

By 1937, the Civil Aviation Authority (C.A.A.) for the Territory of Hawai'i recommended an airport for Pu'unēnē to accommodate the continued growth of commercial service. The site was approved by the U. S. Army, Inter-Island Airways (later Hawaiian Airlines), HC&S, the Kahului Railroad Company, and the C.A.A. (Balch 1938). Three intersecting runways were designed alongside the existing government roadway and railway lines connecting Kīhei Village to the HC&S mill and village at Pu'unēnē.

By 1938, it was clear that Japanese aggression against mainland China was jeopardizing the political stability of the Pacific region (Morison 1951). Pacific Naval Air Bases (P.N.A.B.) construction engineers were assigned to reinforce United States military outposts across the Pacific. In Hawai'i, the construction of new civilian airports at Kane'ohe (O'ahu), and Pu'unēnē (Maui) was undertaken by U.S. Engineer Department (U.S.E.D.) contractors. Prior to 1940, thirteen separate defense-related construction projects were begun in the Hawaiian Islands, primarily at Pearl Harbor (Woodbury 1946).

The Hepburn Board, a commission of six officers and engineers reporting to the United States Navy, authorized the immediate military-backed expansion of an existing design for a civilian airfield at Pu'unēnē. Quarters for a permanent utility squadron, as well as for rotating Carrier Air Service Units (CASU) crews, were hastily approved (Woodbury 1946). U.S. Engineer Department and Pacific Naval Air Base construction crews began work on June 17, 1940, building quarters and messing facilities for 500 men. The Navy used barracks at the National Guard Camp in Paukūkalo while completing buildings at NAS Puunene (Shettle Jr. 1997).

Two 50,000-gallon above-ground gasoline tanks were erected, and railroad spurs were laid to facilitate a direct supply line with the Kahului Harbor. As work progressed, a slew of change orders added bombproof revetments for aircraft storage, as well as bomb and ammunition magazines. By the time Pearl Harbor on O'ahu was attacked, Naval Air Station Puunene was an active training base (Navy 1947).

The location of Utility Squadron Three (VJ-3) at the Pu'unēnē airfield was found to be ideal for operations involving the use of radio-controlled aircraft for anti-aircraft training. The development of radio-controlled full-scale aircraft was code-named "Project Dog," and began as a military program located on the east coast of the United States in the mid 1930's (Fahrney 1982). "Project Dog" was moved to San Diego in 1938, and finally to the Navy's Maui Airport at Pu'unēnē early in 1940, in order to prove the practicality of radio-controlled assault drones. These were the earliest experiments leading towards the development of the guided missile.

Full-scale fortification of the Hawaiian Islands began in January 1940, immediately after President Franklin D. Roosevelt cancelled all trade agreements with Japan. On May 7, 1940, the U.S. Pacific Fleet was ordered out of the Port of Los Angeles, to be based at Pearl Harbor in the Territory of Hawai'i. This action was designed as a deterrent against further aggression by Japan in the Pacific region (Morison 1951).

Lieutenant Robert F. Jones commanded VJ-3 at NAS Puunene and advanced the syllabus of testing radio-controlled aircraft to the point where a radio-controlled aerial torpedo was thought to be possible. By April 1941, the Navy's efforts to develop a practical way to control drone aircraft from greater distances was in full swing (Rogers II 2002). In the middle of this research program, Navy Fighting Squadron VF-2 arrived at the Pu'unēnē aerodrome for training purposes in April 1941.

Flying F2A Brewster "Buffalo" fighter aircraft, the "Flying Chiefs" of VF-2 trained on Maui for approximately two months, returning to sea with the U.S.S. Lexington to take part in operations to ferry aircraft and supplies to Midway Island. The training regime of VF-2 included the use of "unrestricted air space for gunnery and tactics and many nearby bombing and strafing targets" (Lacouture 1989). The target range was located at lower 'Ulupalakua and the aircraft used practice bombs filled with lime powder and beach sand to mark their accuracy.

In May 1941, the 1st Battalion of the Army's 299th Infantry Regiment was assigned to establish defensive positions along the exposed coastal areas of Maui. Tents housing the administrative section for the Army's 24th Infantry Division, and the Fourth Platoon Signal Company, Aircraft Warning Air Corps Detachment, were located within a 14-acre section at the Maui Airport at Pu'unēnē (Allen 1950).

Plans were drawn up to expand the airfield to a size large enough to support both a Navy carrier air group and an Army Air Corps bombardment group. On average, pre-war U.S. Navy air groups consisted of 90 aircraft, made up of scout, dive-bomber, fighter, and torpedo divisions. A pre-WWII Army Air Corps bombardment group, consisting of three squadrons of medium or heavy bombers, would have numbered about 30 aircraft (Morison 1953).

2.1.5.2 World War II (1941-1945)

With the outbreak of war between Japan and the United States, NAS Puunene became the command headquarters for both Navy and Army units on the island of Maui. Plantation heavy

equipment and plantation operators worked side by side with U.S. Engineering Department personnel to accelerate construction of defensive positions and immediately lengthen runways at the base. The call for an immediate extension of the runways to military specifications involved extensive engineering to reroute miles of irrigation culverts for HC&S. The dispersion of facilities planned for NAS Puunene would come to utilize over 2,500 acres of land, and involve housing for over 5,000 men (Cotten 1945).

The attack on Pearl Harbor, December 7th, 1941, forced the “Project Dog” program at NAS Puunene to assign its research to safer bases on the mainland United States. Wartime operations for VJ-3 would concentrate exclusively on providing radio-controlled aircraft as realistic targets for fleet anti-aircraft gunnery training exercises (Rogers II 2002). Under wartime conditions, responsibilities for VJ-3 included maintaining an intense schedule of weather flights, rescue flights, and anti-submarine reconnaissance flights in the waters surrounding Maui.

Early in 1942, the first Carrier Air Service Unit, CASU-4, was commissioned at NAS Puunene, and the utility squadron personnel of VJ-3 were reinforced by Naval Air Station Officers. In June 1942, VF-72 (U.S. Navy Fighting Squadron 72), the first of over 150 squadrons of U.S. Navy fighter, bomber, and scout aircraft, arrived for advanced training prior to moving into forward combat areas (Wilcox 2004). For four days in early June 1942, as the Battle of Midway raged 600 miles to the northwest, NAS Puunene personnel were ordered into shelters and revetments, expecting bombing raids by Japanese aircraft sweeping across the Hawaiian archipelago (Vint 2000). With the success of American naval forces at Midway, the threat of a Japanese invasion of the Hawaiian Islands was postponed, and U.S. efforts to outfit military bases in the Hawaiian Islands for wartime training were redoubled.

Anti-aircraft gun emplacements and protective aircraft revetments were given top construction priority by the U.S. Pacific Naval Air Bases supervisors. Heavy equipment and civilian operators from Wailuku Sugar Company and Hawaiian Commercial & Sugar Company were employed at NAS Puunene, with their pay charged back to the U.S. government. Sugar milling at plantations across the Hawaiian Islands was confined to daylight hours until “blackout” procedures for night operations were approved (Allen 1950:289).

U.S. Engineering Department (U.S.E.D.) construction contractors were reinforced at NAS Puunene by additional Pacific Naval Air Bases (P.N.A.B.) personnel in July 1942. Domestic water pipelines were laid by HC&S to supply military camps being constructed at ten separate locations across the central Maui plains, including the Camp 6 location proximate to NAS Puunene. The main government road and the railroad lines that served the wharf at North Kihei were rerouted, as NAS Puunene expanded. The U.S. Army National Guard 108th Regiment, 27th Infantry Division, took up defensive duties along Maui’s coastlines beginning March, 1942, and occupied formal headquarters at NAS Puunene (Army 1948). On November 16, 1942, 400 men forming an advance echelon of the Navy’s 39th Construction Battalion arrived at NAS Puunene, to begin construction of underground fuel bunkers, bombproof buildings, ammunition magazines and an aviation ground school (Cressy 1944).

The establishment in 1943 of NAS Puunene as a “Top Gun” school for fighter-aircraft tactics was based on the Navy’s use of highly-decorated veteran fighter pilots, such as Commanders Edward “Butch” O’Hare, James “Jimmy” Flatley, and James “Jim” Thach to relay the latest intelligence from the front lines to new pilots rotating into combat (Feightner 1997). “Maui Group

Local Naval Defense Forces”, based at NAS Puunene, controlled the training airspace over the Kaho‘olawe aerial bombing ranges, and administered the training schedule (Lundstrom and Ewing 1990). Army National Guard Divisions were assigned to occupation, guard, and training stations in the Hawaiian Islands during World War II. Shoreline defenses held by the 27th Infantry Division on Maui were replaced by men of the 40th Infantry Division (U.S. Army 1947). As elements of both the 27th and 40th Divisions were combined and sent to the South Pacific for combat duty, they were replaced on Maui by regiments from the 33rd Infantry Division (Journal 1948). A resident of Maui during WWII said, “It was common to see groups of soldiers wearing their unit insignias all over Maui: the “Sunshine” [40th Division], and “Golden Cross” [33rd Division], and the last ones stationed here were the “Mohawks” [98th Division]”(Sanford 2004).

As of March 6 1943, the 48th Construction Battalion (“SeaBees”) replaced the 39th C.B., and immediately began construction of a new sewer and water system for NAS Puunene (Turner 1945). Newsletters published by the 39th Seabees (*Shore Lines*) and the 48th Seabees (*Trade Wind*) were joined by an official NAS Puunene newspaper, “To All Hands” (later renamed *The Island Breeze*). The publisher of the “Maui News,” Maui’s leading civilian newspaper, printed a companion weekly named “The Valley Islander,” which incorporated military news from all of the services based on Maui, including the 4th Marine Division in Kokomo (Sanford 2008). All military news in these papers was censored, but personnel changes, “scuttlebutt” gossip columns, and sports highlights featuring teams organized within military leagues on Maui attracted an avid readership.

The 127th SeaBees relieved the 48th SeaBees in May of 1944, and finished an extensive network of ammunition magazines located toward Kīhei of the main air base. The completion of expanded housing areas, a second CASU area, and additional “SeaBees” housing was accomplished before the end of 1944. Two Mobile Construction Battalion Units, CBMU 563 and CBMU 575, arrived to maintain the refrigeration and water purification systems.

On July 1, 1945, NAS Puunene personnel numbered 565 officers and 2,798 enlisted men, including seven Navy nurses, eight WAVES (Women Accepted for Volunteer Emergency Service) officers, and 92 WAVES enlisted personnel (Monthly Station Report of On-Board Personnel, NAS Puunene, “Confidential,” 1 July 1945). Total aircraft on board numbered 271 (Monthly Station Report of On-Board Aircraft, “Confidential,” 1 June 1945). The total number of structures built numbered over 300 (Cotten 1945).

Immediately following the August 1945 surrender of Japan to the military forces of the United States, facilities essential to the operation of Naval Air Station Kahului began to be removed from Pu‘unēnē. The bowling alley, bakery, and other specialized structures at NAS Puunene were relocated to NAS Kahului, only to be partially or entirely destroyed by a series of tidal waves that struck NAS Kahului facilities April 1, 1946 (Priestman 1946).

During 1946, Mauians were allowed to rent residential structures in Housing Area “A”, the area closest to the *pūnāwai* (Reservoir 6) known as “Airport Village”. The cost was reportedly \$36.00 per month (Cabos 2000). By 1947, the HC&S Company began to reclaim over 100 acres of former cane land for sugar cultivation in Parcels 2-B, 2-C, 2-F and Parcel 7 (Figure 13). During 1947, the use of the airstrip at Pu‘unēnē by civilians led some Mauians to believe that the site might be further expanded as a general aviation facility (Belknap 1947). But by the end of 1948, the site of the former Naval Air Station at Kahului had been chosen to replace the Pu‘unēnē site for all future civilian flight operations (Yoklavich et al. 1997).

By quitclaim deed dated December 31, 1948, the lands of the former air base were transferred from the United States back to the Territory of Hawai'i. In 1950, the *Maui News* reported that plans to allow for subsistence farming and the raising of pigs on five to ten-acre plots on former NAS Puunene lands were proceeding (*Maui News*, 8-23-50 1:1) (Figure 14).

The remaining base facilities, most of which were wooden structures, had, by that time, been abandoned or demolished. In May, 1951, the operations of Hawaiian Airlines and Trans-Pacific Airlines (later Aloha Airlines) were moved to the new civilian airport at Kahului, which utilized the runways of the former Naval Air Station Kahului. Thereafter, the airfield at Pu'unēnē was placed on "caretaker status", and sugar cultivation reclaimed much of the land area formerly dedicated to the aerodrome (Figure 15).

2.1.6 Modern Land Use

Many changes occurred in Kīhei following the end of World War II in 1945. With the airfield abandoned, a *Maui News* article reported that Maui farmers had begun to raise alfalfa on some of the land at NAS Puunene (Young 1950). Shortly following statehood in 1959, the County of Maui established a network of Civil Defense fallout shelters across the county, as well as in the Pu'unēnē airport area. Revetment and splinter shelters of the former air base were reorganized for civilian use and stocked with supplies of water, crackers and Geiger counters in the event of an atomic attack. In all, six separate shelters were established within the former boundaries of NAS Puunene, with a combined capacity estimated to accommodate 1,213 people (Figure 16).

Postwar aircraft enthusiasts used the abandoned runways 1-19 and 14-32 for general aviation operations until the early 1960's, when all general (civilian) flight operations were transferred to the Kahului Airport. A short portion of runway 1-19 remained open to support the aerial chemical spraying operations of the HC&S Company. Sanctioned drag races began in 1963, when the Valley Isle Timing Association was organized to regulate drag racing on runway 14-32, at the former airfield. The Hawai'i Army National Guard developed a 30-acre parcel of property within the former air base for use as an armory, which included facilities for helicopter and military vehicle maintenance (Helber et al. 1995).

By the mid-1970's, sugar cultivation operations had demolished all but one of the main runways, and had retaken most of the land area (over 1,400 acres) previously given up for the original pre-war Maui Airport. A 1976 aerial photograph depicts the expanse of sugar cane growth within and surrounding the vicinity of the project area (Figure 17). Since the 1970s, these fields within the project area were further expanded into offshoot portions of Kolaloa Gulch (see Figure 3). The project area continued to be used for commercial sugarcane growth until the closing of HC&S production in 2016.

The Hawaiian Cement Puunene Quarry started in the late-1970s with 28 acres. The quarry was further expended in 1980 to 194 acres. The primary resource of the quarry is basalt that is crushed and used for road base course, concrete and pavement aggregate, railroad ballast, and many other purposes (Yanik 2018).



Figure 13. Postwar NAS Puunene showing a return of some land to sugar cane cultivation in foreground, at center, right; photo dated Feb. 12, 1947, and back stamped "U.S. Army Air Forces Photo Lab," (Command 1947)

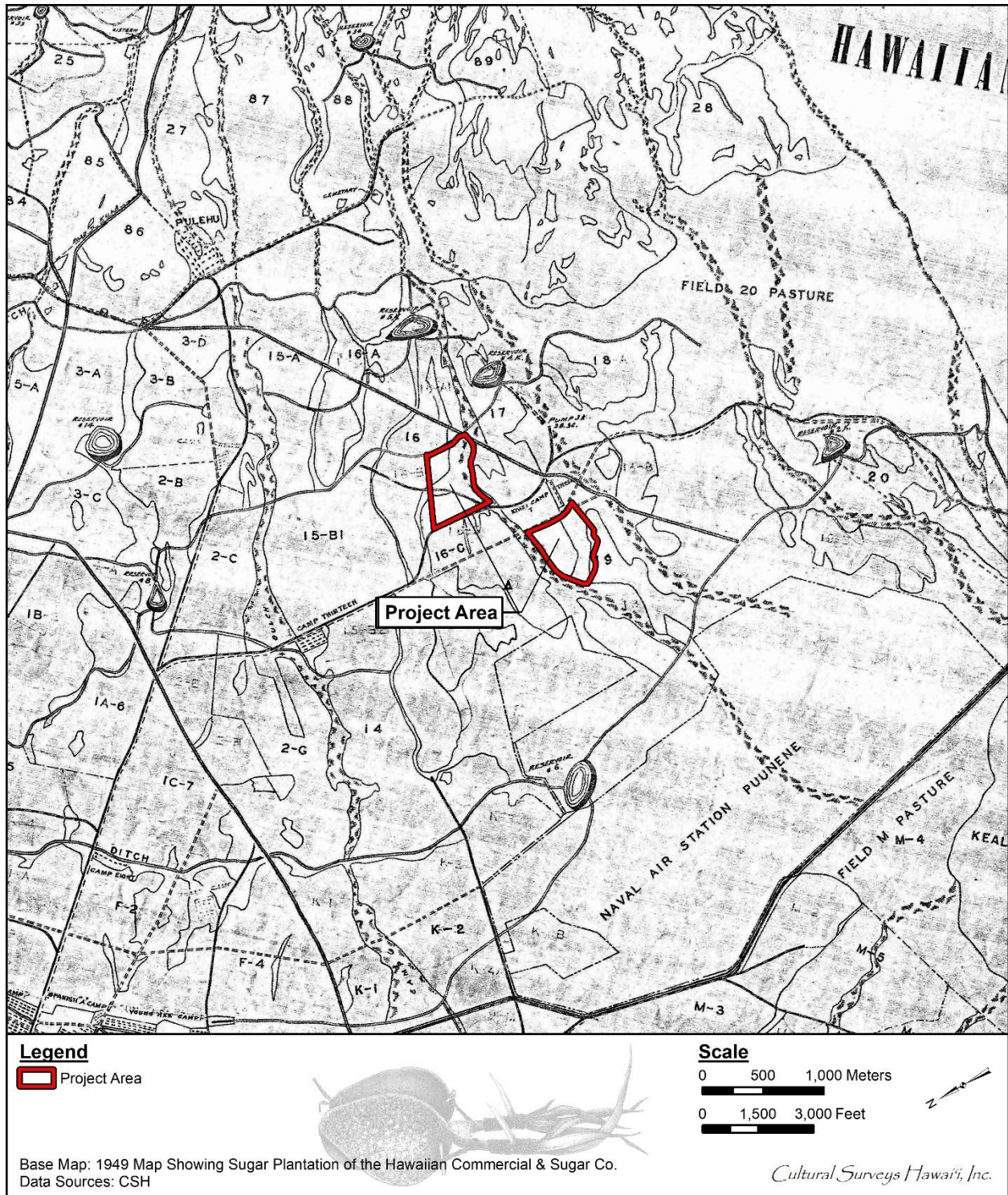


Figure 14. Portion of the 1949 HC&S sugar plantation map showing the boundary of NAS Puunene located west of the current project area (Hawaiian Commercial & Sugar Co. 1949)

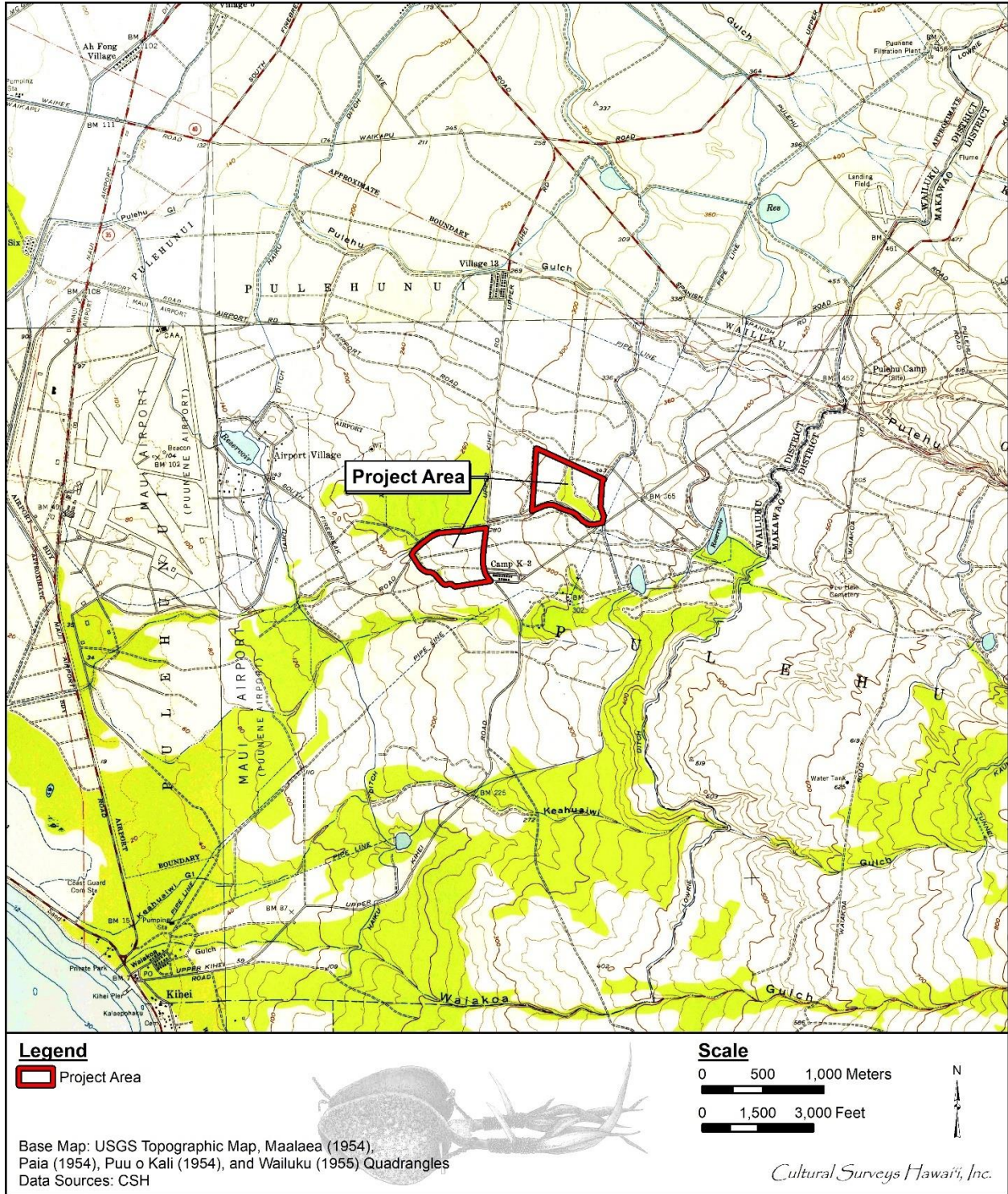


Figure 15. Portion of the 1954 USGS topographic quadrangle depicting the layout of the NAS Puunene (labeled Maui Airport) in the vicinity of the project area

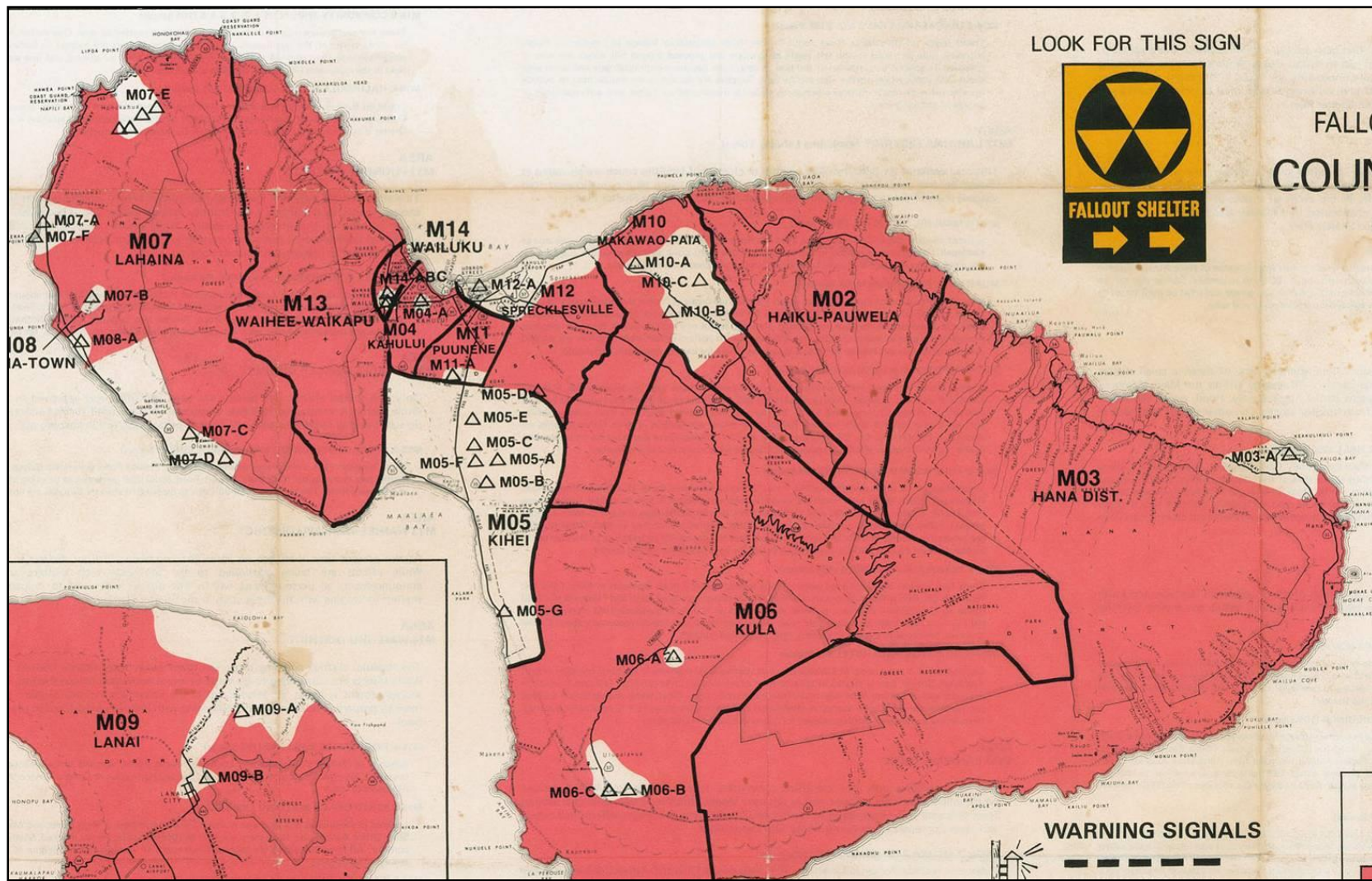


Figure 16. Maui Island map showing MO5 A through F, splinter shelters of the former NAS Puunene that were outfitted as fallout shelters in the 1960's (County of Maui n.d.)

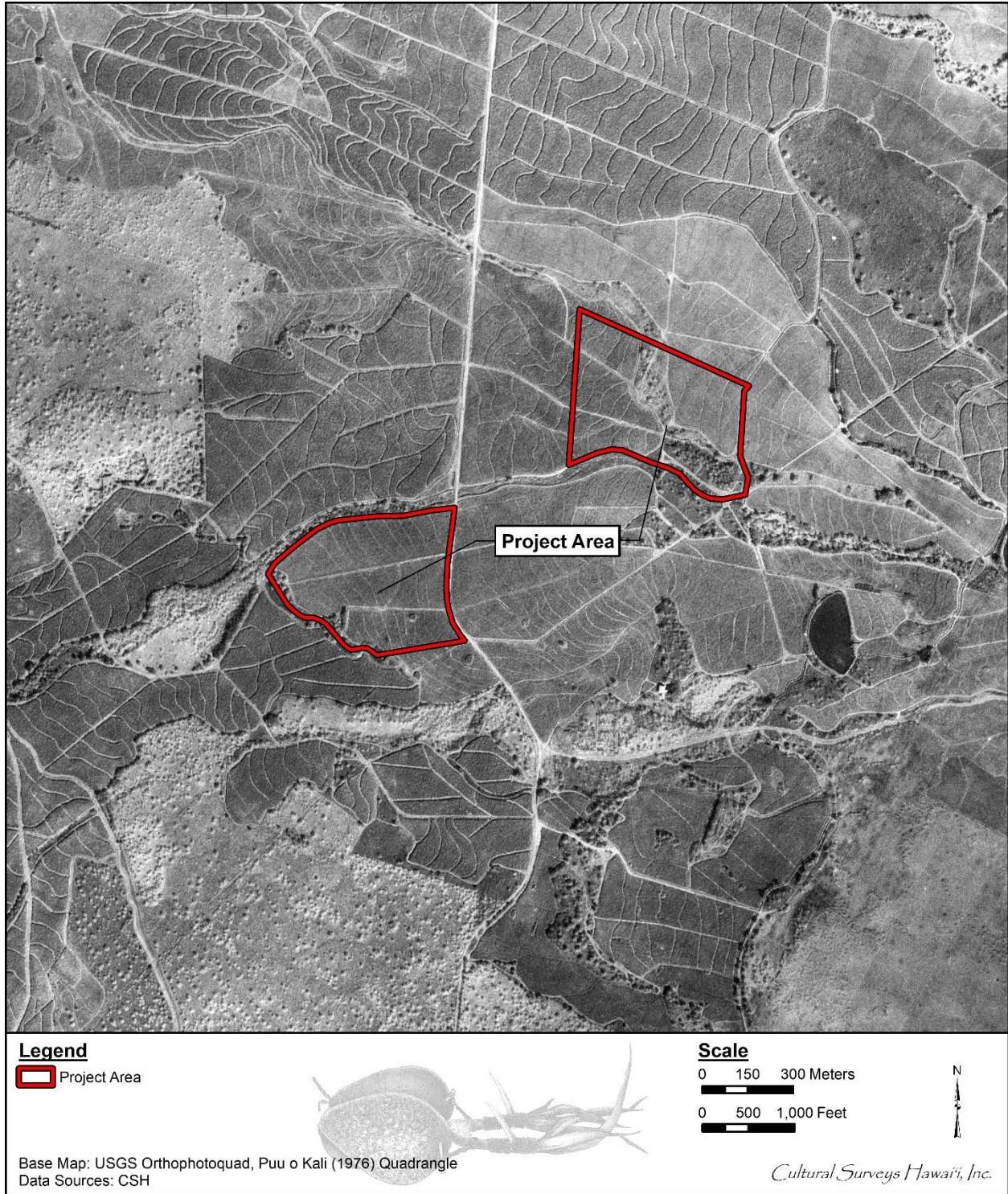


Figure 17. Portion of the 1976 Puu o Kali USGS orthophotoquad showing the expanse of commercial sugar cane fields within and surrounding the current project area (U.S. Geological Survey 1976)