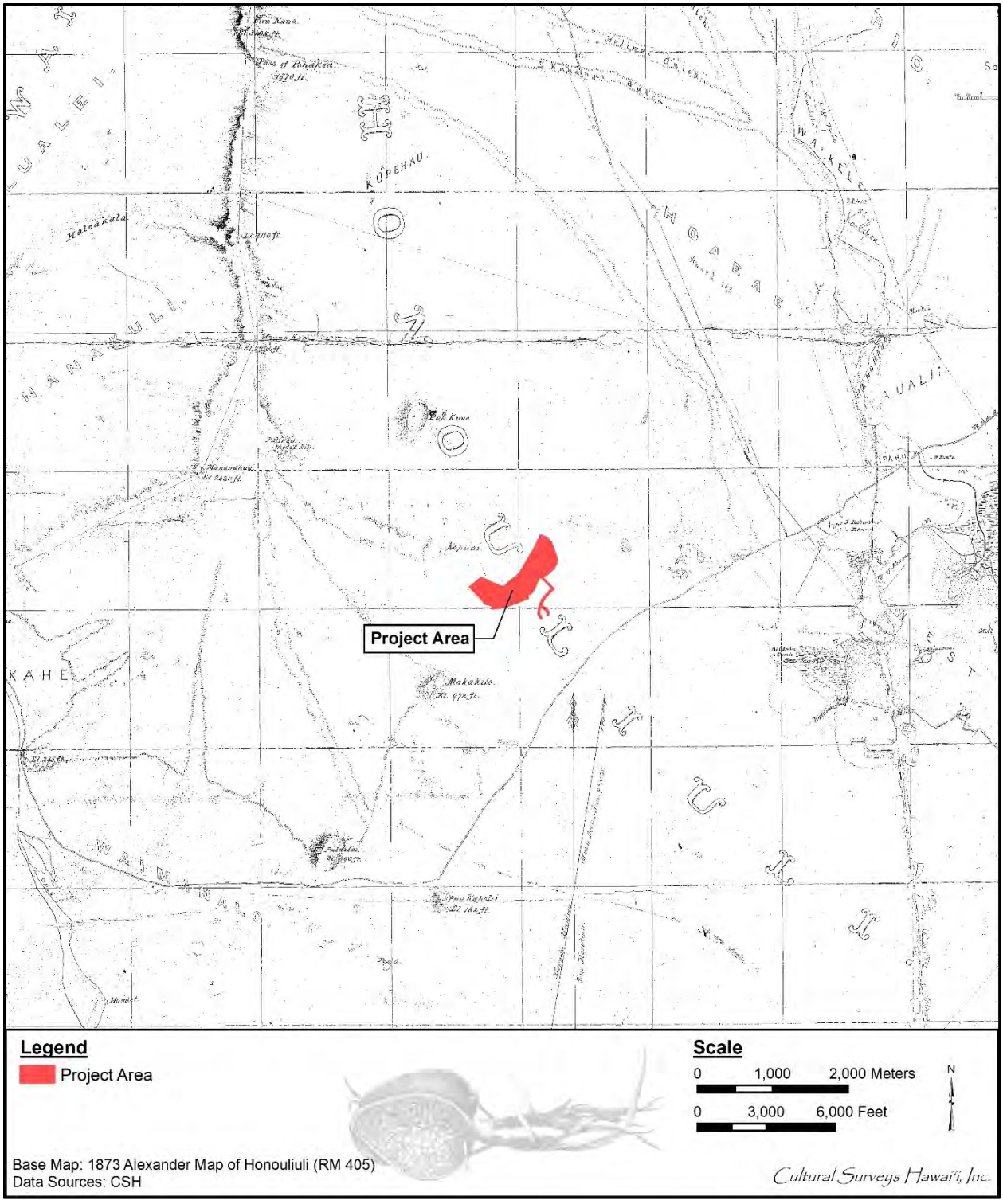

Figure 10. Portion of 1873 Alexander map of Honouliuli (RM 405) showing trail network in vicinity of project area

3.1.3 The Māhele and the Kuleana Act

During the Māhele of 1848, 99 individual land claims in the *ahupua‘a* of Honouliuli were registered and awarded by King Kamehameha III. No *kuleana* land claims were made for land within the current project area or vicinity. The vast majority of the Land Commission Awards (LCA) were located in Honouliuli near the taro lands of the *‘ili* of Pu‘uloa and the Pu‘uloa Salt Works. The largest award (Royal Patent 6071, LCA 11216, *‘Āpana* [parcel] 8) in Honouliuli Ahupua‘a was granted to Miriam Ke‘ahi-Kuni Kekau‘onohi on January 1848 (Native Register 1848). Kekau‘onohi acquired a deed to all unclaimed land within the *ahupua‘a*, including 43,250 acres encompassing the present project area.

Samuel Kamakau relates the following about Kekau‘onohi as a child:

> Kamehameha’s granddaughter, Ke-ahi-Kuni Kekau-onohi […] was also a tabu chiefess in whose presence the other chiefesses had to prostrate and uncover themselves, and Kamehameha would lie face upward while she sat on his chest. [Kamakau 1961:208–209]

Kekau‘onohi was one of Liholiho’s (Kamehameha II’s) wives, and after his death, she lived with her half-brother, Luanu‘u Kahala‘i‘a, who was governor of Kaua‘i (Kamakau 1961:20). Subsequently, Kekau‘onohi ran away with Queen Ka‘ahumanu’s stepson, Keli‘i-ahonui, and then became the wife of Chief Levi Ha‘alelea. Upon her death on 2 June 1851, all her property passed to her husband and his heirs. When Levi Ha‘alelea died, the property went to his surviving wife, who in turn leased it to James Dowsett and John Meek in 1871 for stock running and grazing.

3.1.4 Mid- to Late 1800s

In 1877, James Campbell purchased most of Honouliuli Ahupua‘a for a total of $95,000. He then drove off 32,347 head of cattle belonging to Dowsett, Meek, and James Robinson and constructed a fence around the outer boundary of his property (Bordner and Silva 1983:C-12). In 1879, Campbell brought in a well-driller from California to search the ‘Ewa Plain for water and successfully “tapped artesian water which, from internal pressure, forced its way to the surface without being pumped” (Hitch 1992:79). Following this discovery, plantation developers and ranchers drilled numerous wells in search of the valuable resource. By 1881, the Campbell property of Honouliuli prospered as a cattle ranch with “abundant pasturage of various kinds” (Briggs in Haun and Kelly 1984:45). Within ten years of the first drilled well in ‘Ewa, the addition of a series of artesian wells throughout the island supplied most of Honolulu’s water needs (Armstrong and Bier 1983).

In 1889, Campbell leased his property to Benjamin Dillingham, who subsequently formed the Oahu Railway & Land Company (OR&L) in 1890. To attract business to his new railroad system, Dillingham subleased all land below 200 ft elevation to William Castle who in turn sublet the area to the Ewa Plantation Company for sugarcane cultivation (Frierson 1972:15). Dillingham’s Honouliuli lands above 200 ft elevation that were suitable for sugarcane cultivation were sublet to the Oahu Sugar Company.

Ewa Plantation Company was incorporated in 1890 and operated into modern times. The plantation grew quickly with the abundant artesian water. As a means to generate soil deposition on the coral plain and increase arable land in the lowlands, the Ewa Plantation Company installed

ditches running from the lower slopes of the mountain range to the lowlands, then plowed the slopes vertically just before the rainy season to induce erosion (Frierson 1972:17).

The Oahu Sugar Company was incorporated in 1897 and included lands in the foothills above the ‘Ewa Plain and Pearl Harbor. Prior to commercial sugar cultivation, the lands occupied by the Oahu Sugar Company were described as being “of near desert proportion until water was supplied from drilled artesian wells and the Waiahole Water project” (Condé and Best 1973:313). The Oahu Sugar Company took control of the Ewa Plantation lands in 1970 and continued operations into the 1990s.

Dillingham’s *mauka* (inland, toward the mountains) lands in western Honouliuli that were unsuitable for commercial sugar production remained pasture for grazing livestock. From 1890 to 1892, the Ranch Department of the OR&L Company desperately sought water for their herds of cattle, tapping plantation flumes and searching for alternative sources of water. Ida von Holt shared the following account of her husband Harry’s (Superintendent of the OR&L Ranch Department) search for water in the foothills of the Wai‘anae Range:

> One of those places is on the old trail to Pālehua, and had evidently been a place of which the Hawaiians had known, for its name is Kalo‘i (the taro patch), and even in dry weather water would be standing in the holes made by the cattle, as they tried to get a drop or two. [von Holt 1985:136]

It is believed that the spring depicted in this account may have been identified during an inventory survey for the adjacent Pālehua East B project (Tulchin and Hammatt 2005). The spring was located along the upper slopes of the southern face of Kalo‘i Gulch. A second account is given of the discovery of spring water in an area over the ridge on the north side of Kalo‘i Gulch:

> Shouting to the men to come over with their picks and shovels, he [Harry von Holt] soon got them busy clearing away lots of small stones and earth. Almost at once they could see that there were evidences of a paved well, and at about three feet down they came upon a huge flat rock, as large around as two men could span with their arms. Digging the rock loose and lifting it to one side, what was their astonishment to find a clear bubbling spring! [von Holt 1985:138]

Following the discovery, two old Hawaiians began to ask Von Holt about the spring:

> Finally he [Harry von Holt] got them to explain that the spring, called ‘Waihuna’ (Hidden Spring) had been one of the principal sources of water for all that country, which was quite heavily populated before the smallpox epidemic of 1840 […] A powerful Kahuna living at the spring had hidden it before he died of the smallpox, and had put a curse on the one who disturbed the stone, that he or she would surely die before a year was out. [von Holt 1985:138–140]

3.1.5 1900s

In 1913, the Waiahole Water Company, a subsidiary of the Oahu Sugar Company, began a project to transport irrigation water from the well-watered windward side of O‘ahu, through the Ko‘olau Range, to the fields and mill of the Oahu Sugar Company in ‘Ewa. The water system, named the Waiahole Ditch System, was declared “an engineering feat of epic proportion for those times” (Condé and Best 1973:37). The original system, when completed, collected water from

stream intakes and water tunnels from Kahana Valley in the north to Waiāhole Valley in the south. The main tunnel extended through Waiāhole Valley to Waiawa, and water was then transported by ditch westward to Honouliuli, covering approximately 22 miles (Condé and Best 1973:37). The ditch system was completed in 1916 and, with some modifications, much of the ditch is in use today. This active portion of the ditch extends from the windward side of the island into Honouliuli. Remnant, inactive portions of the system extend southwest onto the ‘Ewa Plain. The remnant portion of the Waiahole Ditch crosses through the southwestern portion of the present project area.

Much of the *mauka* lands in western Honouliuli, including ridges and deep gulches, were unsuitable for commercial sugar cultivation and remained pasture land for grazing livestock. The Donn 1906 map suggests the present project area was at the edge of sugarcane cultivation at that time (Figure 11). By 1920, however, much of the lands of Honouliuli were used for commercial sugarcane cultivation (Frierson 1972:18).

A 1919 map (Figure 12) shows ditches, reservoirs, roads, and railroad lines downslope of the project area. This map shows an unimproved road alignment just south of the project area, understood as the Pālehua Road, approximating a traditional Hawaiian footpath into the uplands. However, a 1922 map (Figure 13 and Figure 14 showing annotations), shows the called out Pālehua trail as jogging into the southwest portion of the project area. This 1922 map shows pineapple fields in at least 13 locations among the foothills of the southeast Wai‘anae Range. The nearest of these pineapple fields wrapped around Pu‘u Kapua‘i some 500 m to the northwest. At least six (typically quite small) plantation camps were scattered along the bottom of these foothills with the nearest being about 500 m to the north of the project area. The Kupihau Ranch Station is shown about 2.6 km to the north. The water troughs and tanks shown upslope of the ranch station attest to the cattle operations in the vicinity at that time.

By 1925, most of the project area is depicted as within Oahu Sugar Company plantation Field 30 (Figure 15). The extreme upslope end of the project area still appears to be outside the area of sugarcane cultivation, in keeping with the depiction on the 1906 Donn map (compare with Figure 11).

In the late 1920s, the main residential communities were at the northeast edge of the ‘Ewa Plain and the largest community was still located at Honouliuli Village. ‘Ewa was primarily a plantation town, focused around the sugar mill, with a public school as well as a Japanese school. Additional settlement, in Waipahu, centered around the Waipahu sugar mill operated by the Oahu Sugar Company. However, small plantation camps were scattered within the extensive sugarcane fields (as indicated in Figure 14).

By 1936, however, “Pump Camp 5” had been established on either side of a pipeline that bisected the present project area, as seen on a 1936 U.S. Army War Department map (Figure 16). The 1936 map indicates approximately seven houses on the northeast side of the pipeline and 17 houses on the southwest side of the pipeline within the present project area at that time. The central pipeline extended downslope from the Waiahole Ditch to a large pump house structure that still exits just southeast (outside) of the project area. The alignment of the Waiahole Ditch crossing the western portion of the project area, and a roughly parallel road just upslope, are clearly depicted. It appears a spur plantation railroad serviced Pump Camp 5 connecting to the northeast and continuing a short distance to the southeast.

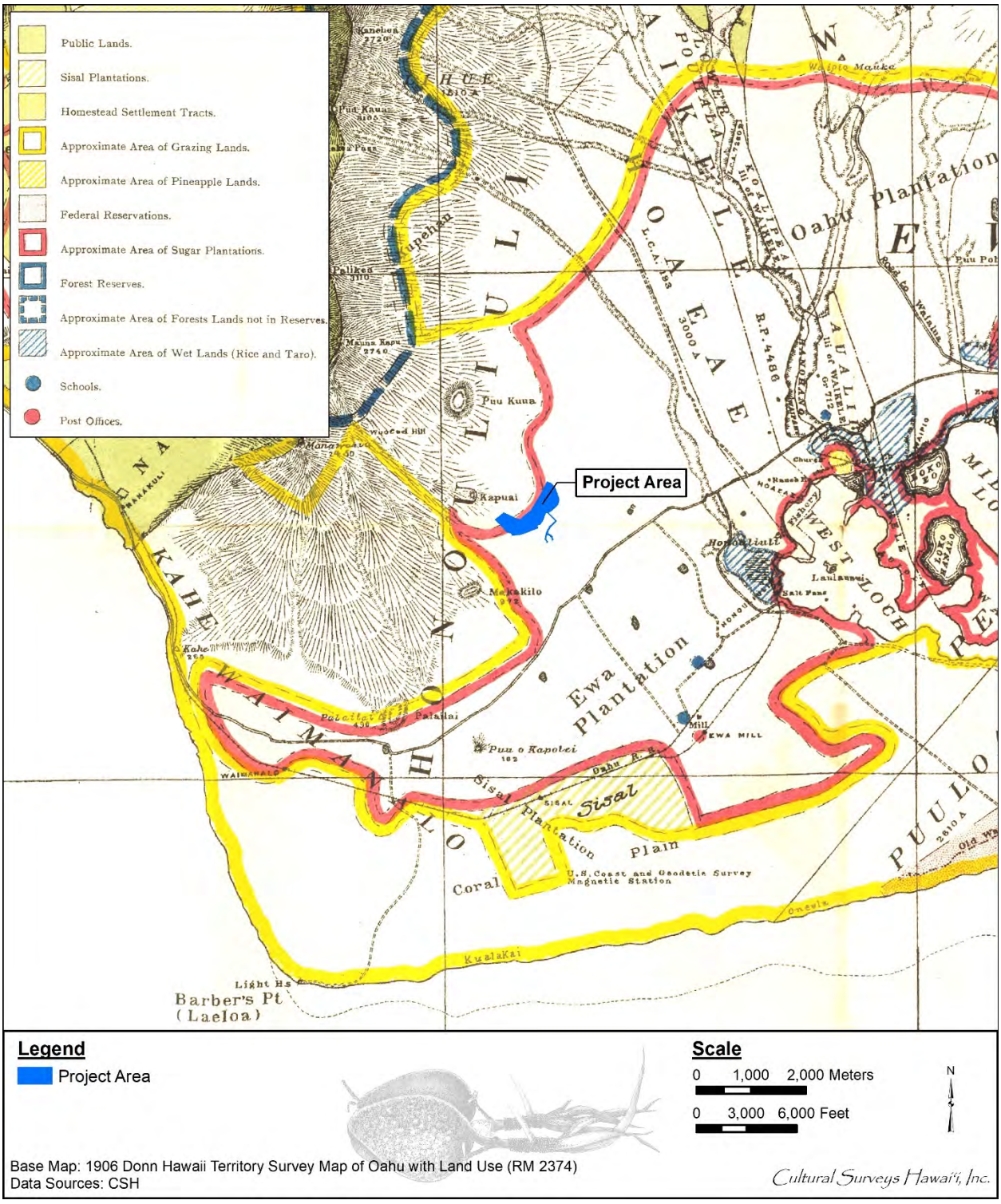

Figure 11. Portion of the 1906 Donn Hawaii Territory Survey map of Oahu with land use (RM 2374) showing breakdown of land use in southwest O‘ahu

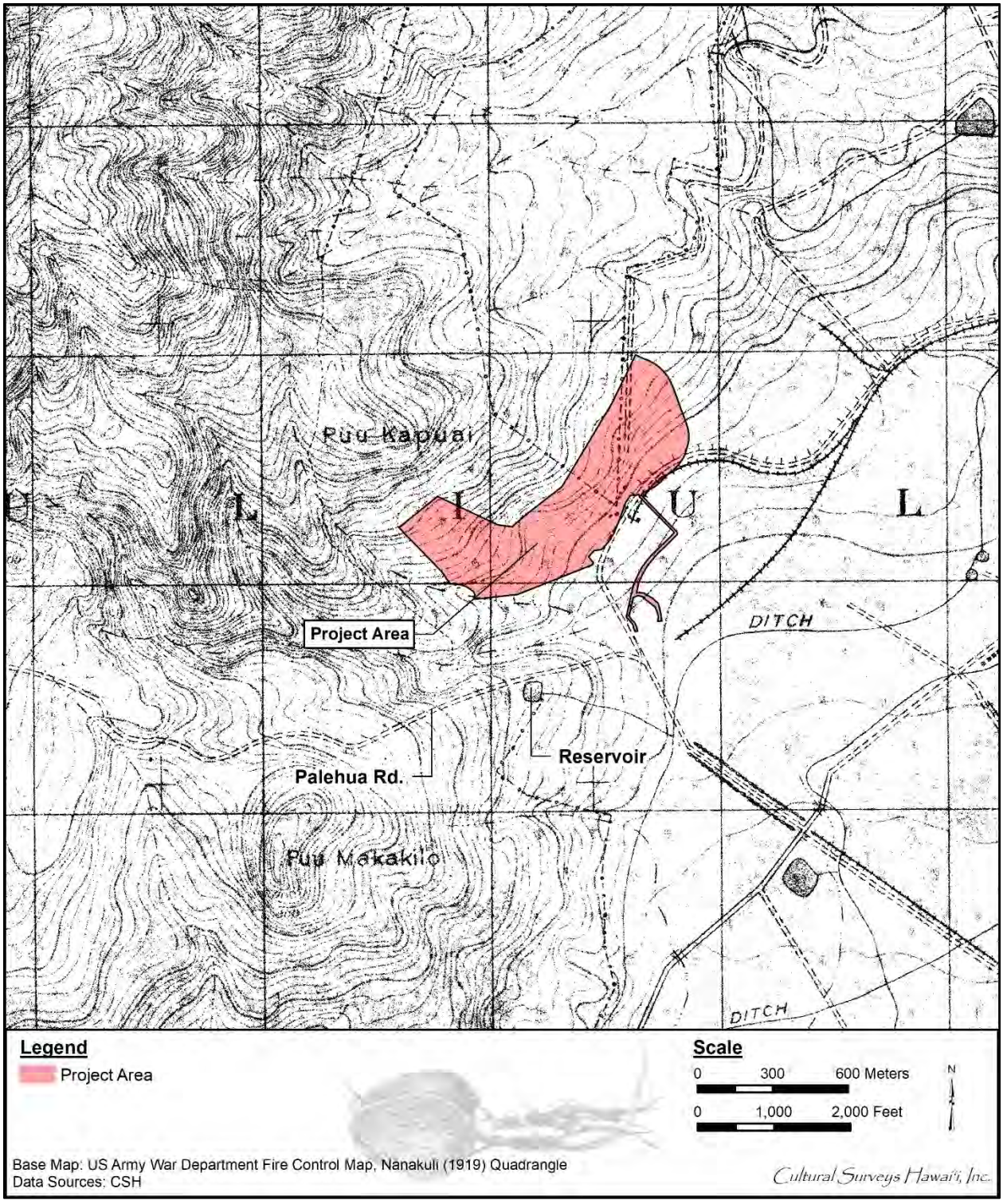

Figure 12. Portion of 1919 U.S. Army War Department fire control map, Nanakuli quadrangle showing the project area

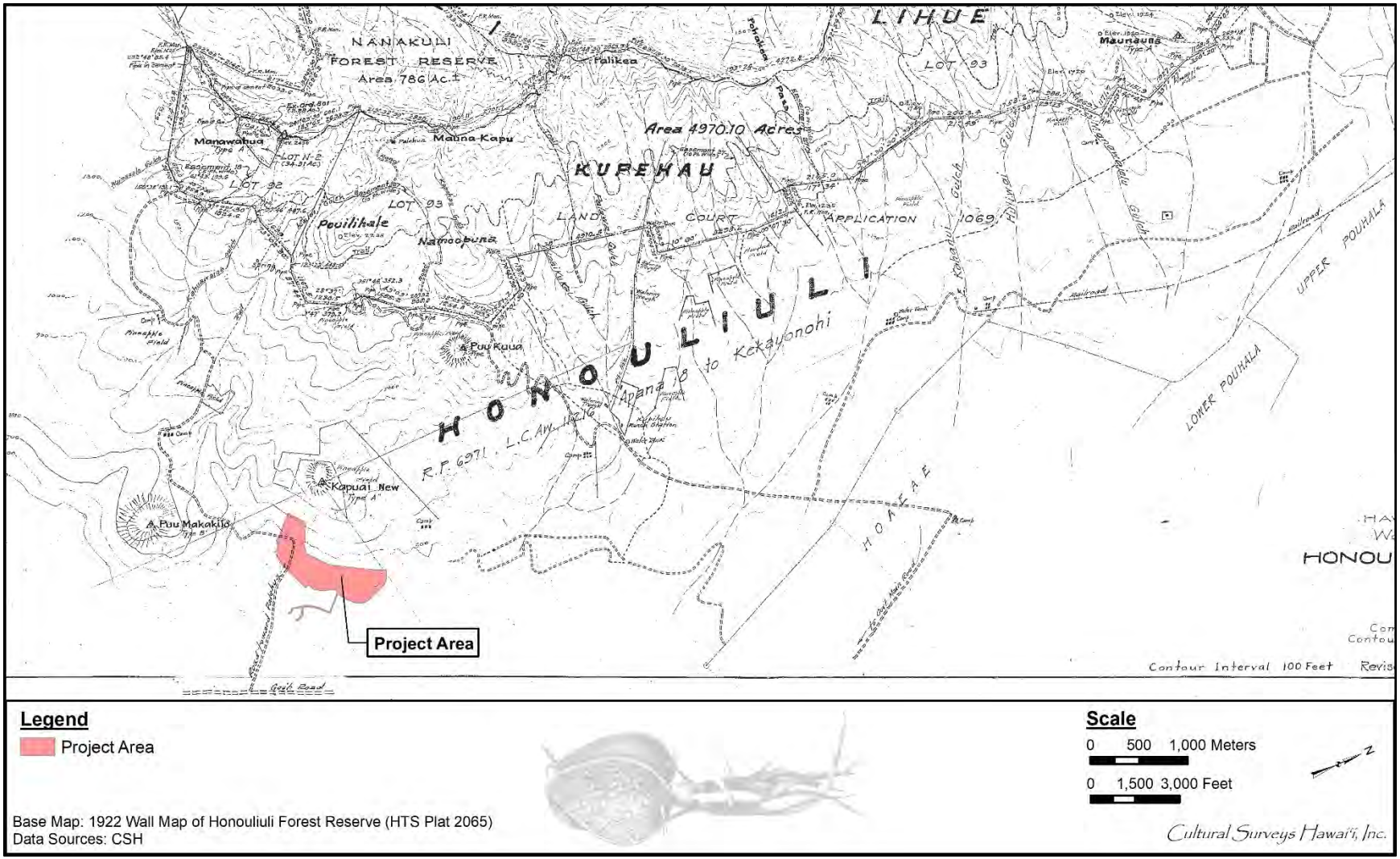

Figure 13. Portion of 1922 Wall map of Honouliuli Forest Reserve (HTS Plat 2065) showing the location of the project area

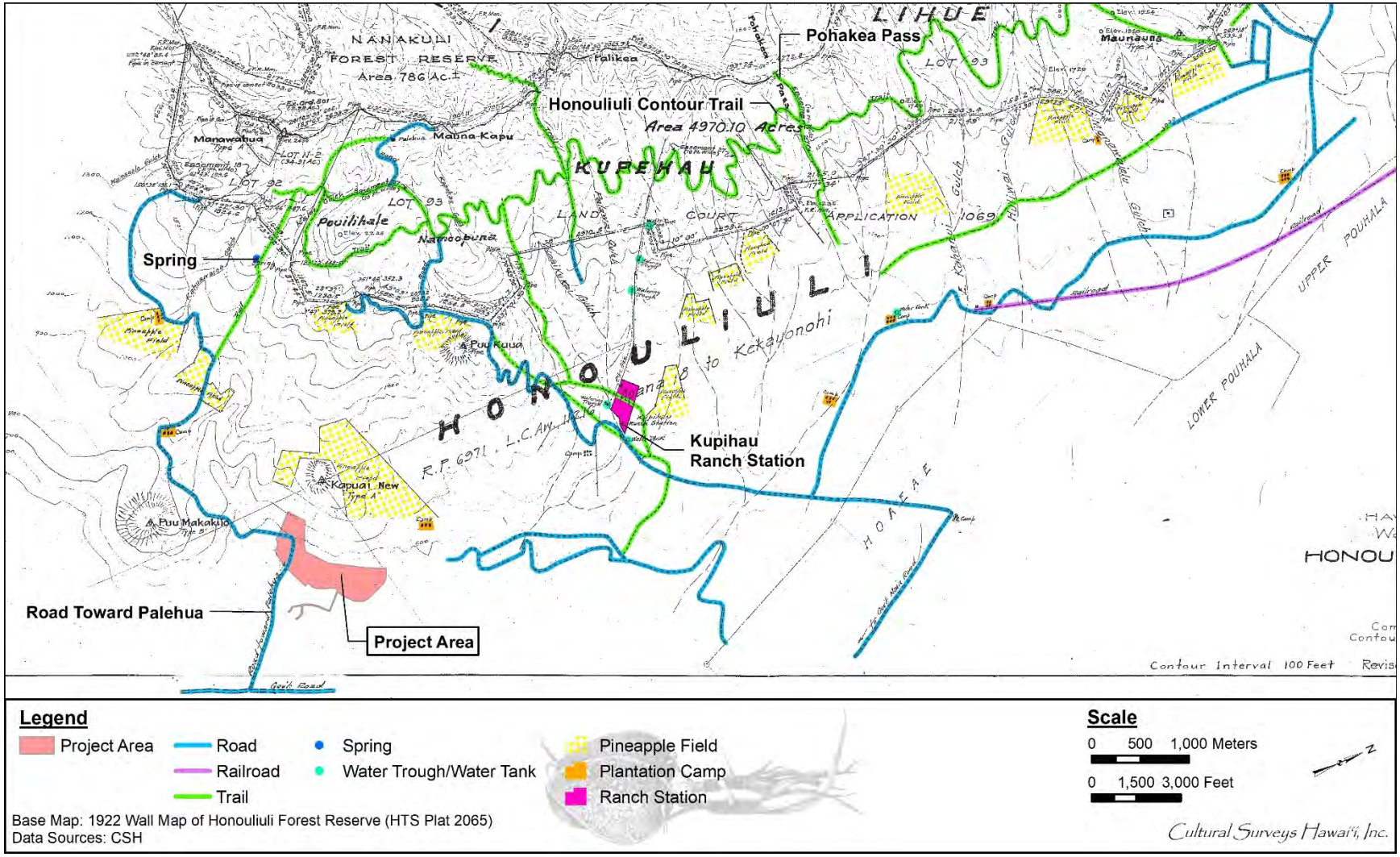

Figure 14. 1922 Wall map of Honouliuli Forest Reserve (HTS Plat 2065) showing the location of the project area with annotations

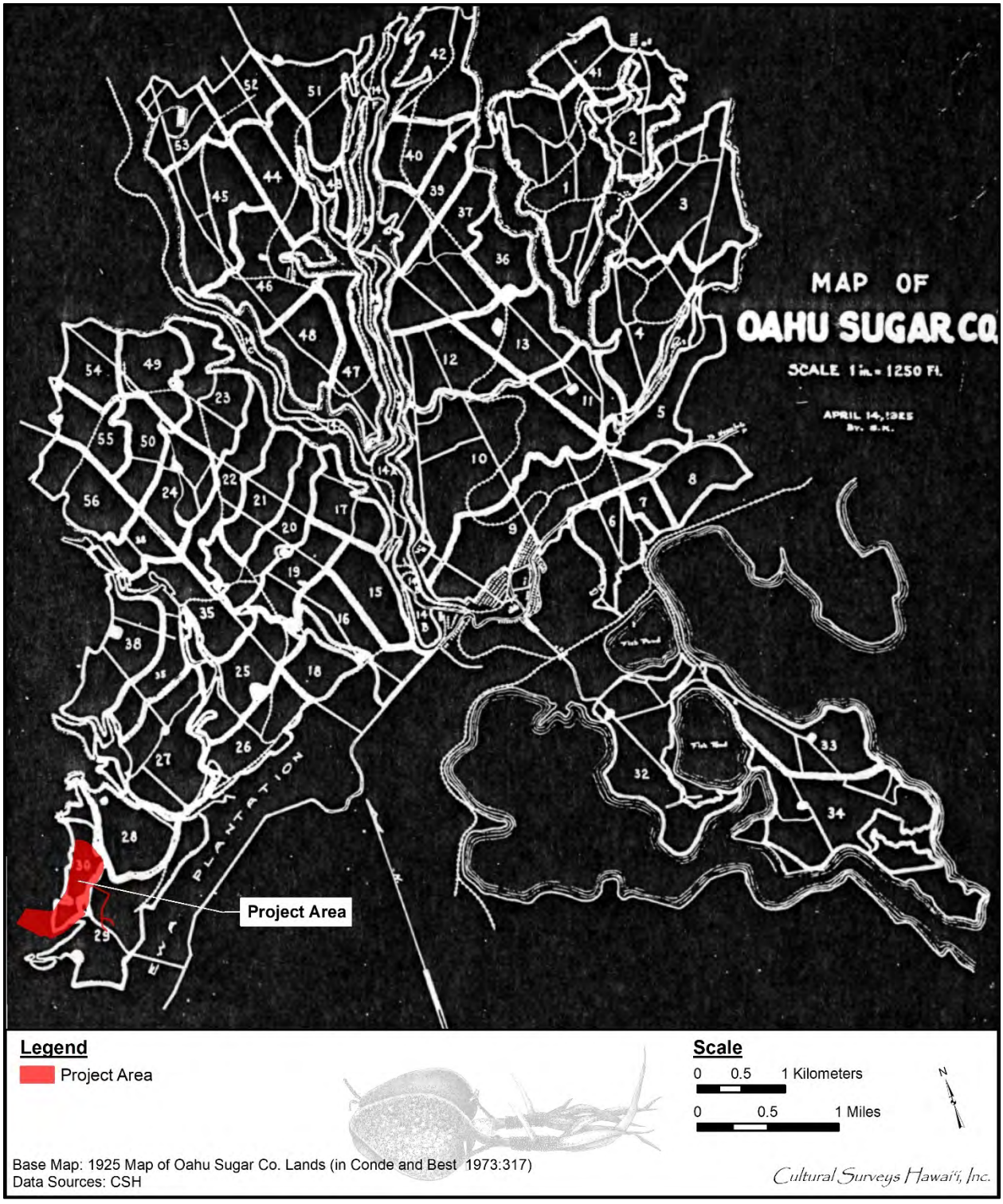

Figure 15. 1925 Oahu Sugar Company plantation map showing project area (red) as largely within former Field 30 (Condé and Best 1973:317)

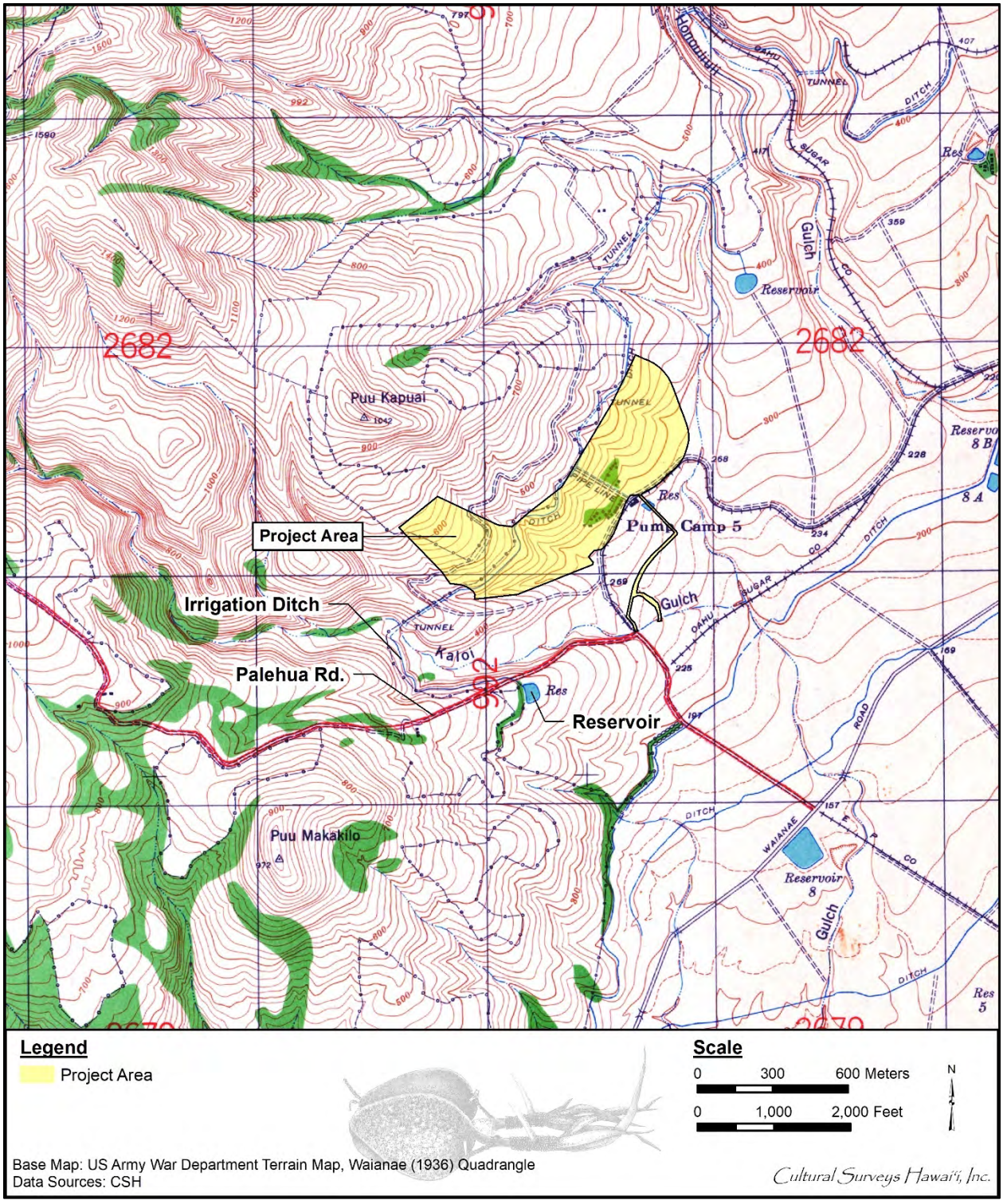

Figure 16. Portion of the 1936 U.S. Army War Department terrain map, Waianae quadrangle showing the location of the project area

A 1943 U.S. Army War Department map (Figure 17) shows much the same scene, though the unimproved road crossing the western portion of the project area now wraps around Pu‘u Kapua‘i. Additional new, unimproved roads suggest the expansion of sugarcane fields. The extensive system of fences depicted upslope indicates cattle ranching was still a significant enterprise.

Historic maps of the Makakilo area indicate a lack of any other significant development in the area into the 1940s. Major land use changes came to western Honouliuli when the U.S. Military began development in the area. Military installations were constructed near the coast as well as in the foothills and upland areas. Barbers Point Military Reservation (a.k.a. Battery Barbers Point from 1937–1944), located at Barbers Point Beach, was used beginning in 1921 as a training area for firing 155 mm guns (Payette 2003). Also in the vicinity were Camp Malakole Military Reservation (a.k.a. Honouliuli Military Reservation), used from 1939, and Gilbert Military Reservation, used from 1922–1944. Barbers Point Naval Air Station (NAS), in operation from 1942 into the 1990s, was the largest and most significant base built in the area. It housed numerous naval and defense organizations, including maritime surveillance and anti-submarine warfare aircraft squadrons, a U.S. Coast Guard Air Station, and components of the U.S. Pacific Fleet.

Fort Barrette (a.k.a. Kapolei Military Reservation and Battery Hatch), located atop Pu‘u ‘o Kapolei to the southwest, was used from 1931 to 1948 for housing four 3-inch anti-aircraft batteries (Payette 2003). In the 1950s, the site was used as a Nike missile base. Palailai Military Reservation, located atop Pu‘u Pāla‘ila‘i in Makakilo to the west, was in service from 1921, housing Battery Palailai and Fire Control Station B (Payette 2003). Fire Control Station A was located atop Pu‘u Makakilo approximately 1.4 km to the southwest of the project area. From 1942 to 1945 the Pu‘u Makakilo Training Area, including lands in and around Pu‘u Makakilo, was used for military training during World War II (Environment Hawai‘i 1992).

The 1951 aerial photograph (Figure 18) clearly shows the two neighboring housing areas of Pump Camp 5 within the central portion of the project area (just northwest and southwest of the pump house building or pumping station which remains just outside the project area). While the majority of the project area was under sugarcane cultivation, it appears the southwest portion, west or upslope of the Waiahole Ditch, was not under cultivation at that time, used instead as grazing lands. The west portion of the project area appears to have been previously cultivated but appears fallow. Extensive areas north of Pu‘u Kapua‘i appear to be under pineapple cultivation.

The 1953 USGS map (Figure 19) shows much the same landscape as the 1943 map (see Figure 17) except the railroads have now all disappeared—quickly replaced by trucking after World War II. A naval reservation is shown on the southeast base of Pu‘u Makakilo. An access road developed to service the present quarry is now depicted running up the mouth of Kalo‘i Gulch, parallel to and just north of the Kalo‘i Stream channel. The initial date of construction of an industrial quarry within Kalo‘i Gulch—depicted to the south (outside) of the current project area—is uncertain, though historic maps indicate a construction window between 1943 and 1952. In 2004, CSH conducted an archaeological inventory survey whereby the quarry was documented and designated an historic property, SIHP # 50-80-12-6680.

The 1968/1969 USGS map (Figure 20) no longer shows Pump Camp 5, which had been prominent at least as early as 1936 (see Figure 16) and lasted until at least 1953 (see Figure 19). The “Pumping Station” immediately southeast of the project area is still labeled and in general the plantation infrastructure (other than the train lines) appears active. The road up Kalo‘i Gulch,

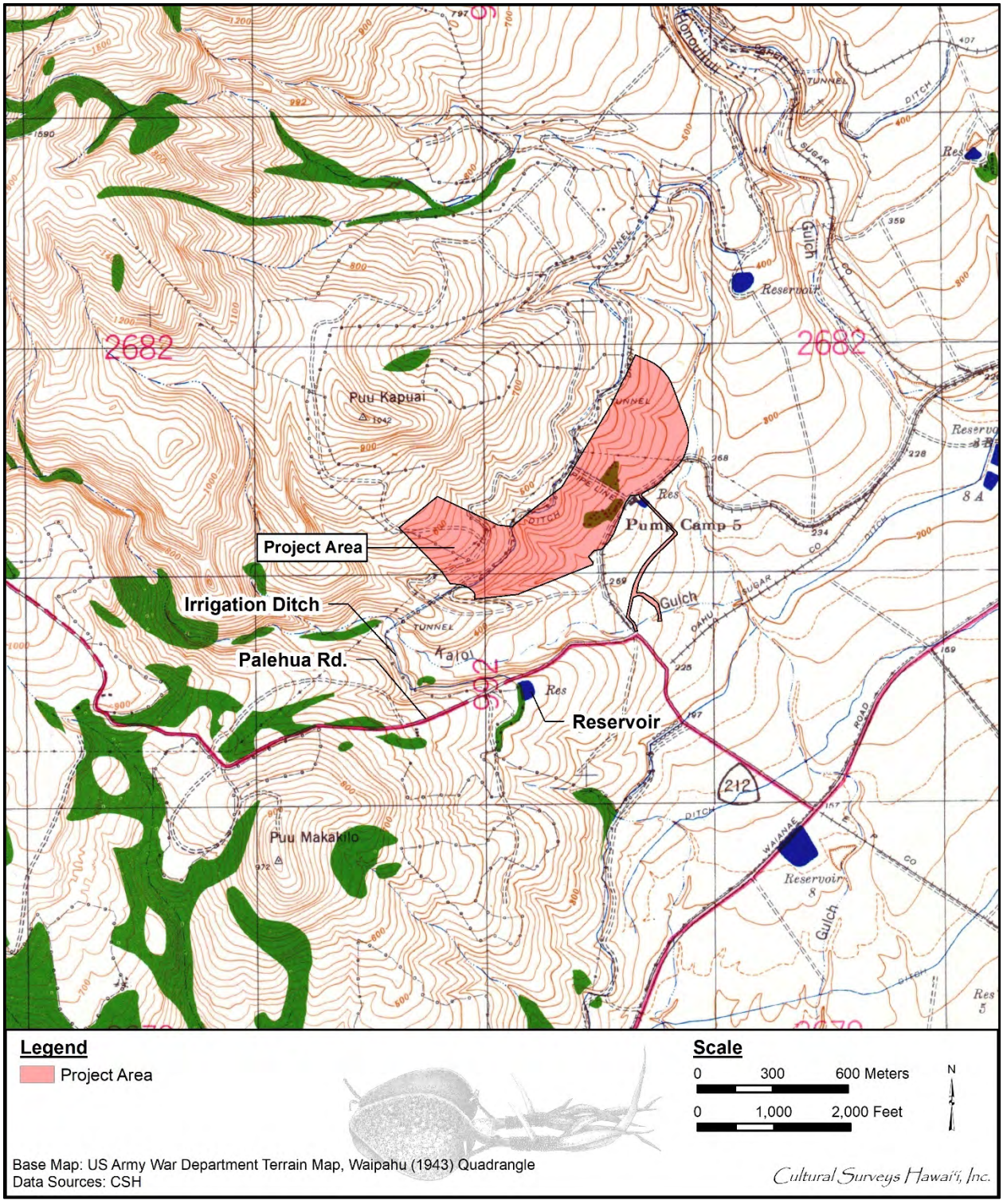

Figure 17. Portion of the 1943 U.S. Army War Department terrain map, Waipahu quadrangle showing the project area

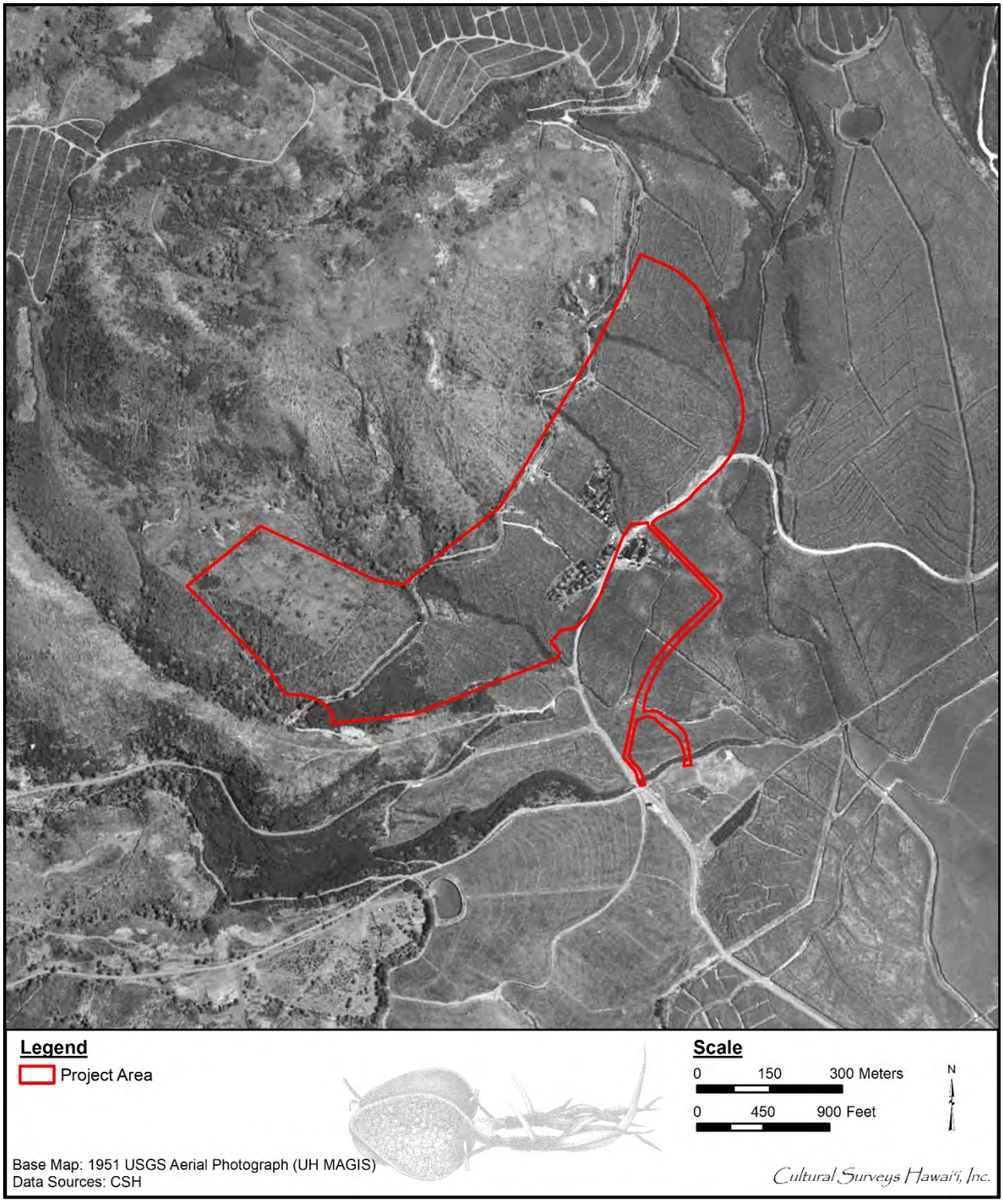

Figure 18. 1951 USGS aerial photograph (UH MAGIS) showing the project area

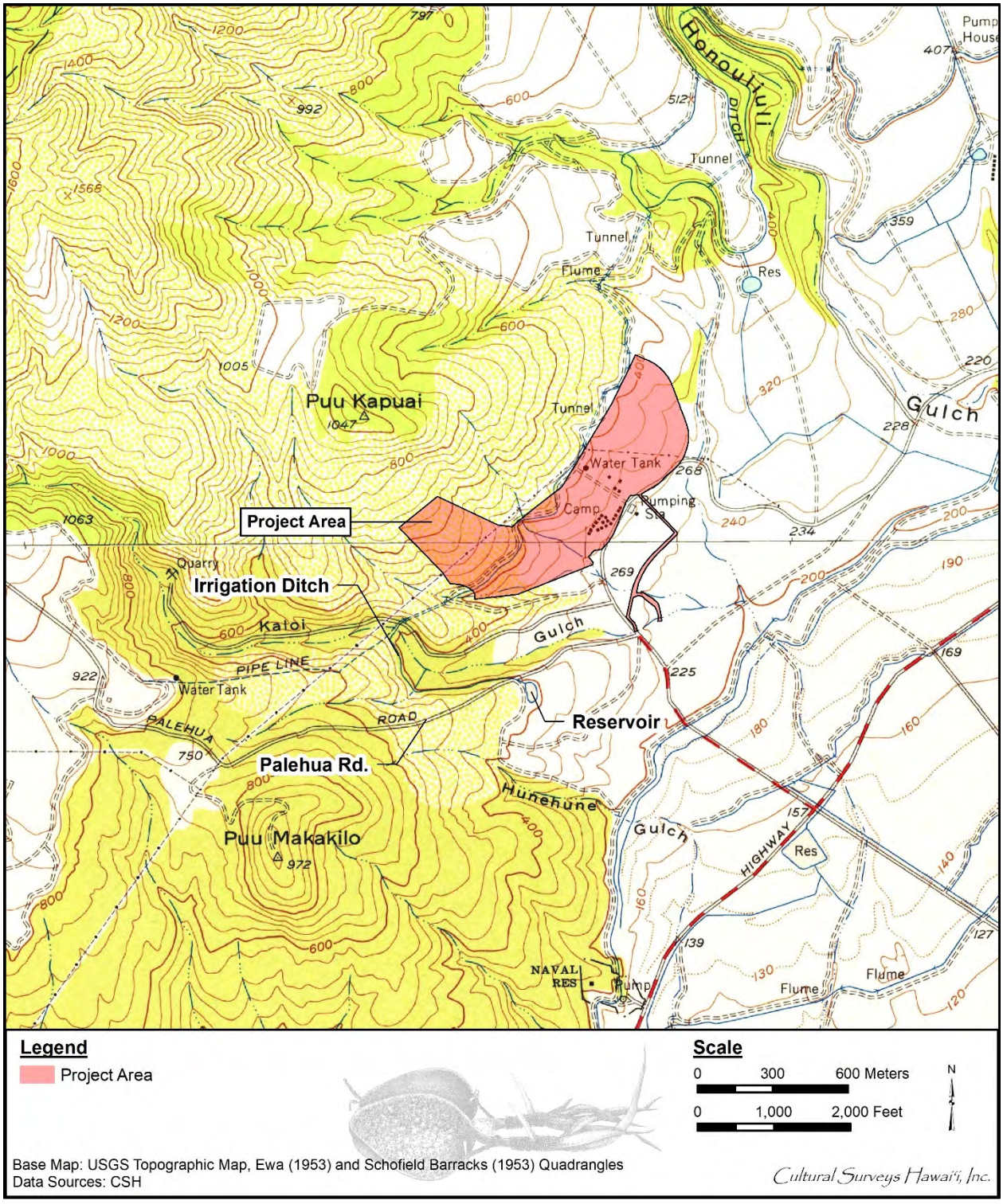

Figure 19. Portion of the 1953 Ewa and Schofield Barracks USGS topographic quadrangles showing the project area

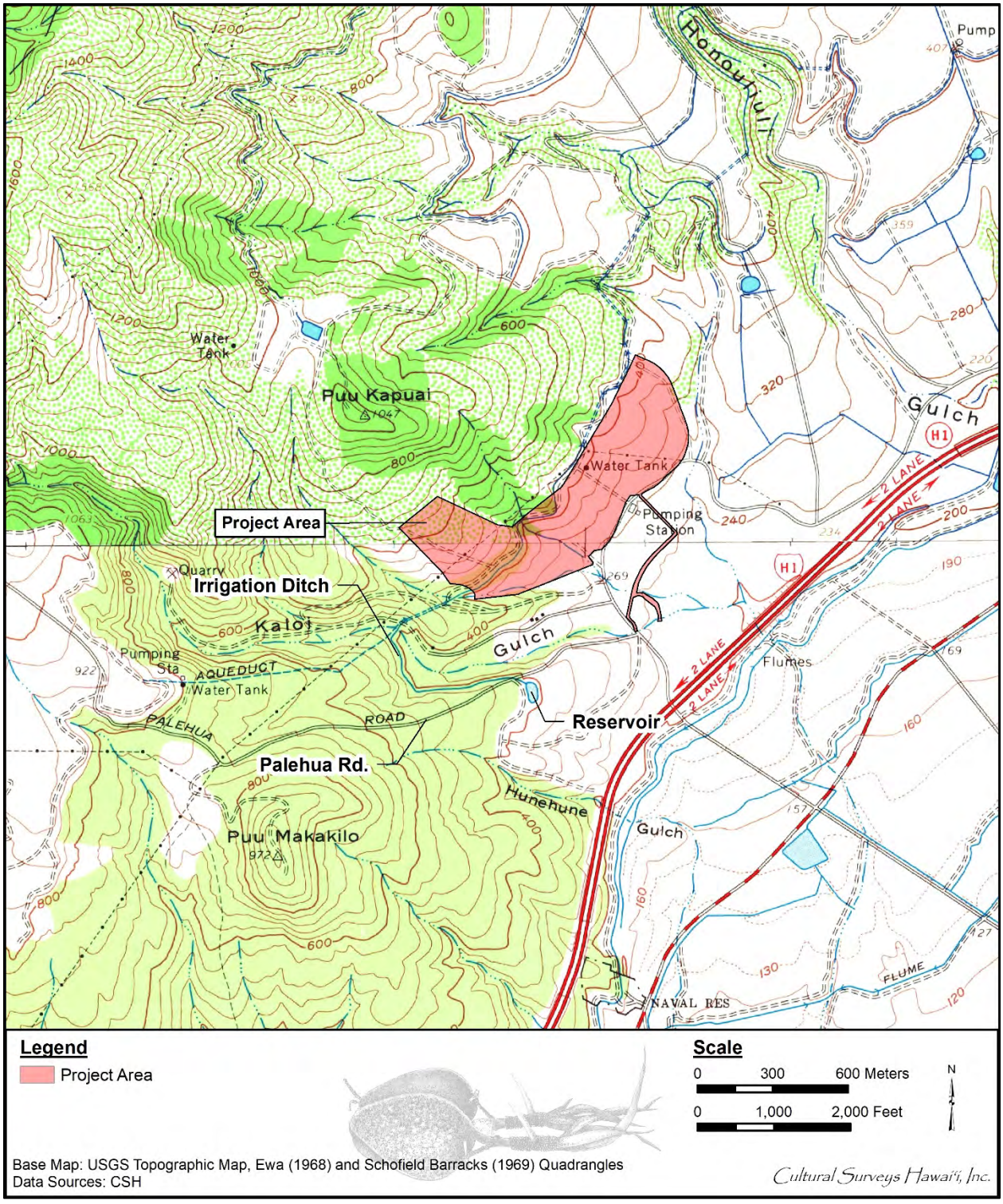

Figure 20. Portion of the 1968 Ewa and 1969 Schofield Barracks USGS topographic quadrangles showing the project area

depicted as improved in 1953, is now shown as unimproved, suggesting abandonment of some quarrying operations.

3.1.6 Contemporary Land Use

Modern maps of the Makakilo area indicate vast changes to the project area and surrounding lands, including the retreat of the sugarcane fields, the construction of the H-1 Freeway, and the partial construction of the Pu‘u Makakilo Golf Course and Grace Pacific Makakilo Quarry.

A 1968 USGS aerial photograph (Figure 21) shows virtually the entire project area still utilized for sugarcane, though there is no trace of the former Pump Camp 5 residential areas that appear to be entirely covered with cane. Many of these plantation homes are understood to have been slightly raised on “tofu-block” foundations that allowed for relatively complete demolition, leaving only the remnants of privies and trash pits. The 1968 photograph also shows new fields to the northwest (see Figure 21).

In 1969 and 1970, Pacific Concrete and Rock Company, Ltd. began subsurface drilling on the southward facing slopes of Pu‘u Makakilo for a new quarry location. The company’s previous quarry in Pu‘u Pāla‘ila‘i that had been in operation for the past 22 years was nearly exhausted. The newly proposed Makakilo Quarry would “encompass 72 acres of actual total quarry area and 188 acres of green belt buffer. Of the 72 acres of actual quarry area, only a maximum of 18 acres will be under active quarrying at any given time” (Cerny 1972:1).

A 1977 USGS aerial photograph (Figure 22) appears to display decreased sugarcane cultivation in the Wai‘anae foothills. It is not clear if the project area is in active cultivation or not. Clearly by 1993 (Figure 23) sugarcane cultivation within the project area is finished, although it remains active immediately southeast of the project area.

Sometime in the early 1990s, a group of Japanese investors poured $70 million into the development of the Pu‘u Makakilo Golf Course. The golf course’s exact date of construction is unclear; however, the proposed area was surveyed by Sinoto in 1988 (Sinoto 1988). The golf course was situated on the slopes of Pu‘u Makakilo just north of the rock quarry. During a burst bubble in the Japanese investment market the project foundered, and the course and buildings were purchased by Grace Pacific in 1994 (*Honolulu Advertiser*, May 2004:31). Construction of the golf course resulted in grading and terracing of a large area southwest of the present project area for fairway construction.

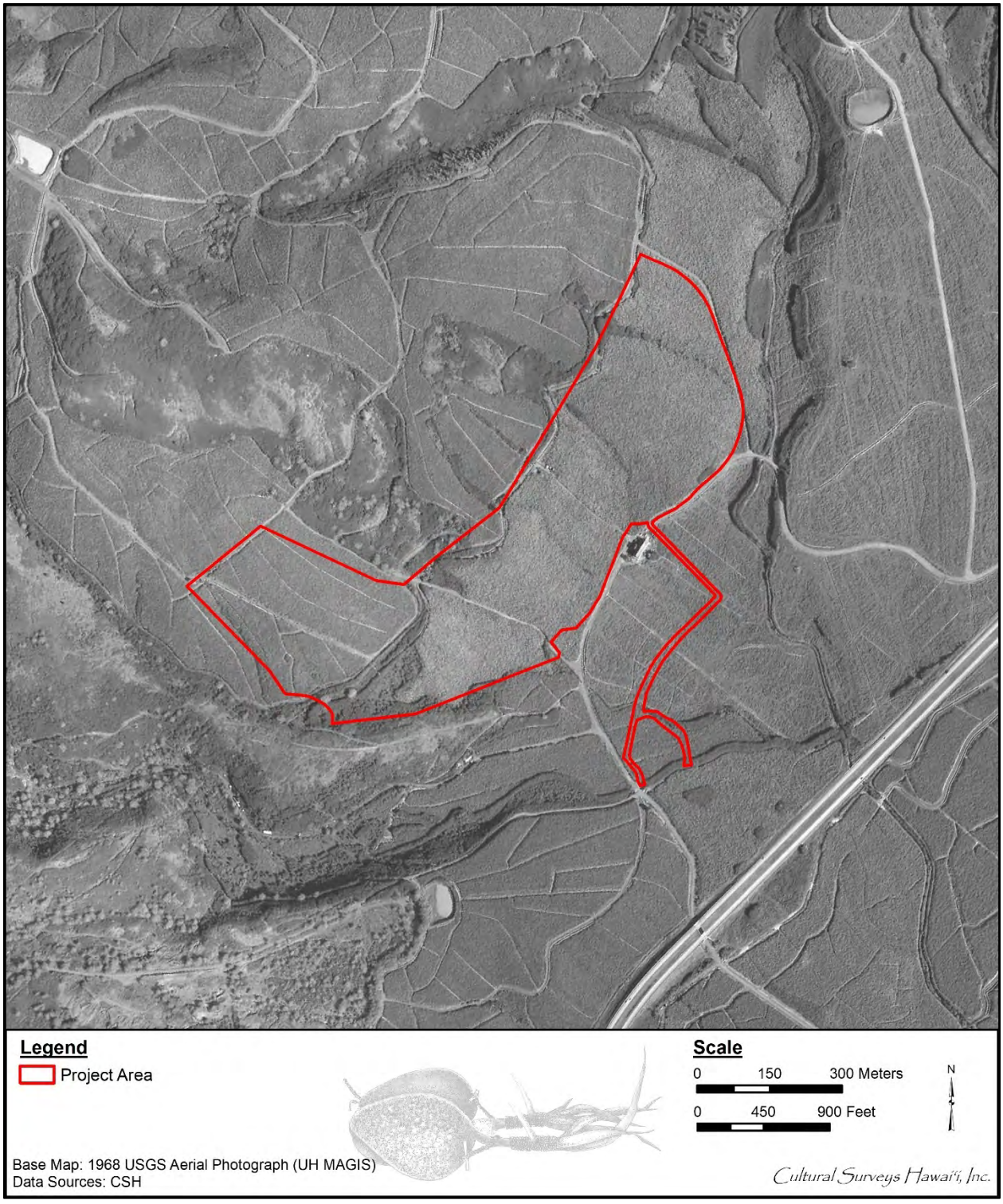

Figure 21. 1968 USGS aerial photograph (UH MAGIS) showing the project area

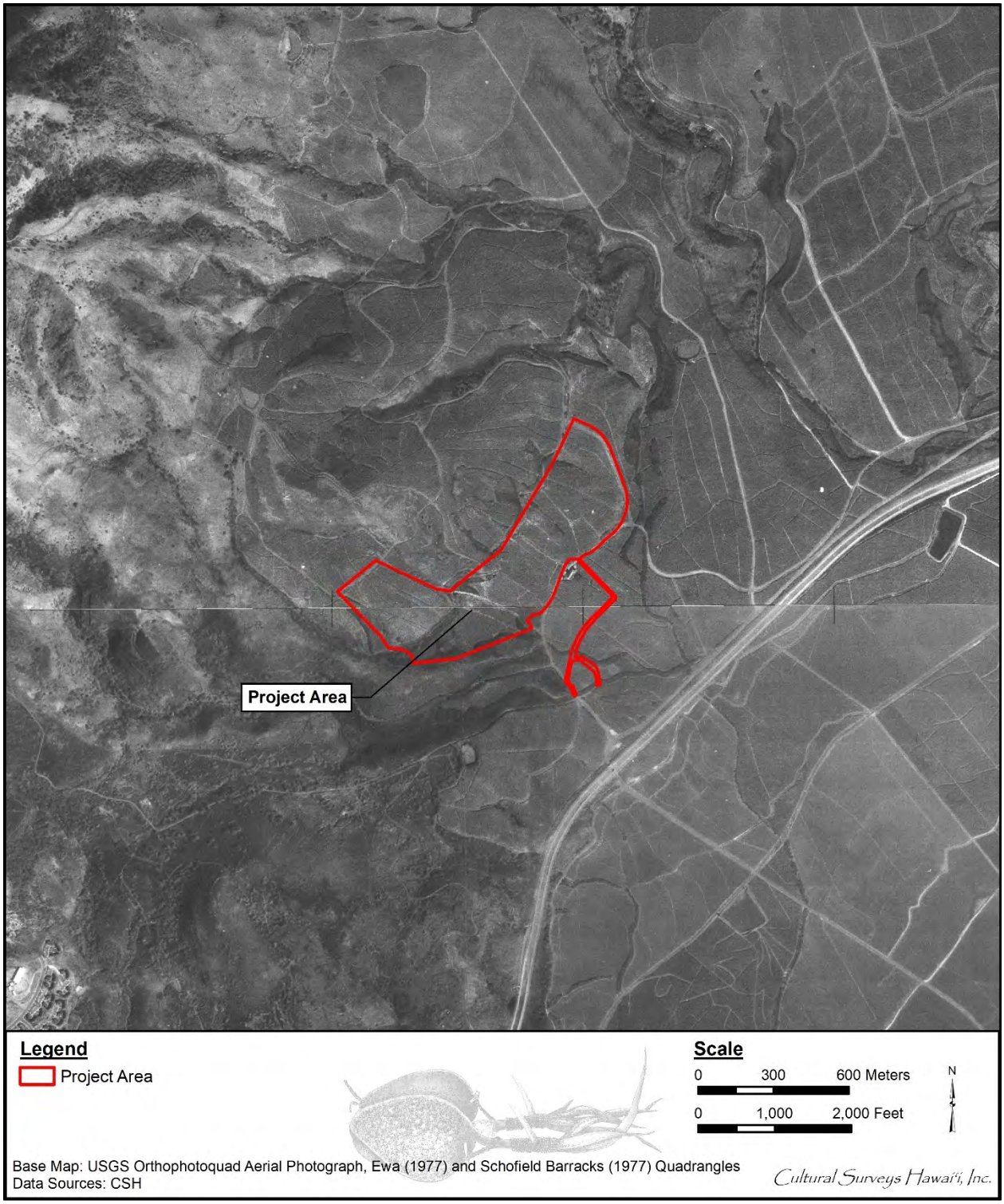

Figure 22. 1977 USGS Orthophotoquad aerial photograph, Ewa and Schofield Barracks quadrangles showing the project area

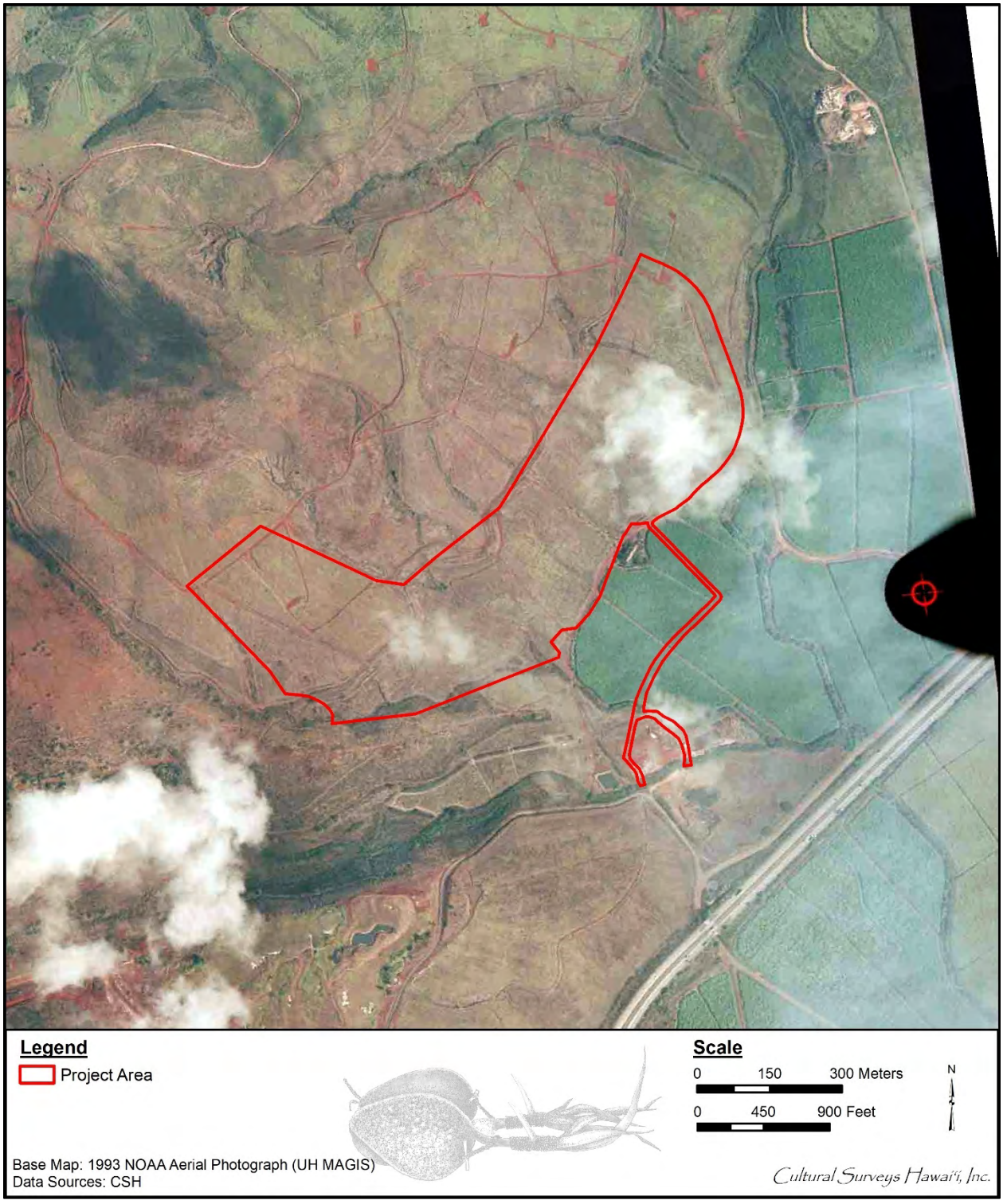

Figure 23. 1993 NOAA aerial photograph (UH MAGIS) showing the project area

3.2 **Previous Archaeological Research**

Previous archaeological studies in the vicinity (within approximately 1.5 km) of the current project area are shown in Figure 24 and Table 1, and a summary of these studies follows. Figure 25 and Table 2 show the locations of historic properties in the vicinity of the project area. There are no sites documented by McAllister (1933) in his early archaeological reconnaissance study of O‘ahu in the vicinity of the project area.

3.2.1 Bordner 1977

In 1977, the Archaeological Research Center Hawaii, Inc. (Bordner 1977) conducted an archaeological reconnaissance survey of a then proposed Kalo‘i Gulch landfill location, approximately 500 m west of the present project area. The study concluded the lower section of the gulch had been extensively modified through quarrying operations and cattle ranching. Foundations of both crushing and loading facilities were noted. In the upper reaches of the property, three walls of possible pre-Contact origin were documented between 1,250 and 1,300 ft elevation and designated as SIHP #s 50-80-12-2600, -2601 and -2602. These three historic properties were in the extreme, upslope end of the large property more than 1.5 km from the present project area. SIHP # 50-80-12-2600 was a low (only 0.61 m, or 2 ft high) wall of poorly stacked *pāhoehoe*, approximately 7.62 m (25 ft) long set on top of a small knoll jutting out from the slope. SIHP # 50-80-12-2601 is described as a wall built on the stream terrace cut following the course of the stream and constructed of stacked *pāhoehoe* with a total length of 67.70 m (222.1 ft), an average height of 0.91 m (3.0 ft) and incorporating in situ boulders into the wall. The wall appeared to have been constructed so as to protect a stream terrace from erosion. It also retained a terrace measuring approximately 12 m (39.4 ft) by 31 m (101.7 ft). SIHP # 50-80-12-2602 was a free-standing 18.2 m (59.7 ft) wall of stacked *pāhoehoe* that had the appearance of being a boundary wall. The historic properties were regarded as of “a marginal status” and no further archaeological work was recommended for the area covered by the reconnaissance survey.

3.2.2 Sinoto 1988

In 1988, the Bishop Museum Applied Research Group conducted a surface survey for a then proposed Makakilo Golf Course just southwest of the current project area (Sinoto 1988). The study concluded the majority of the project area had been damaged by severe erosion. No surface historic properties were documented and subsurface testing was deemed unnecessary. Just west (outside) of the golf course property, one deteriorated wall segment was documented on the northeast slope of Pu‘u Makakilo. The wall, designated SIHP # 50-80-12-1975, may have served as an “historic erosional control feature” (Sinoto 1988:1). Due to the deteriorated condition of the wall remnant, no further work was recommended.

3.2.3 Spear 1996

Scientific Consultant Services, Inc. conducted an archaeological reconnaissance survey of a large area extending from south of the H-1 freeway to the north side of Renton Road (Spear 1996). No historic properties were identified.

3.2.4 Dega et al. 1998

In 1998, Scientific Consultant Services, Inc. (SCS) conducted an archaeological inventory survey for the University of Hawai‘i, West O‘ahu Campus project area (Dega et al. 1998). The

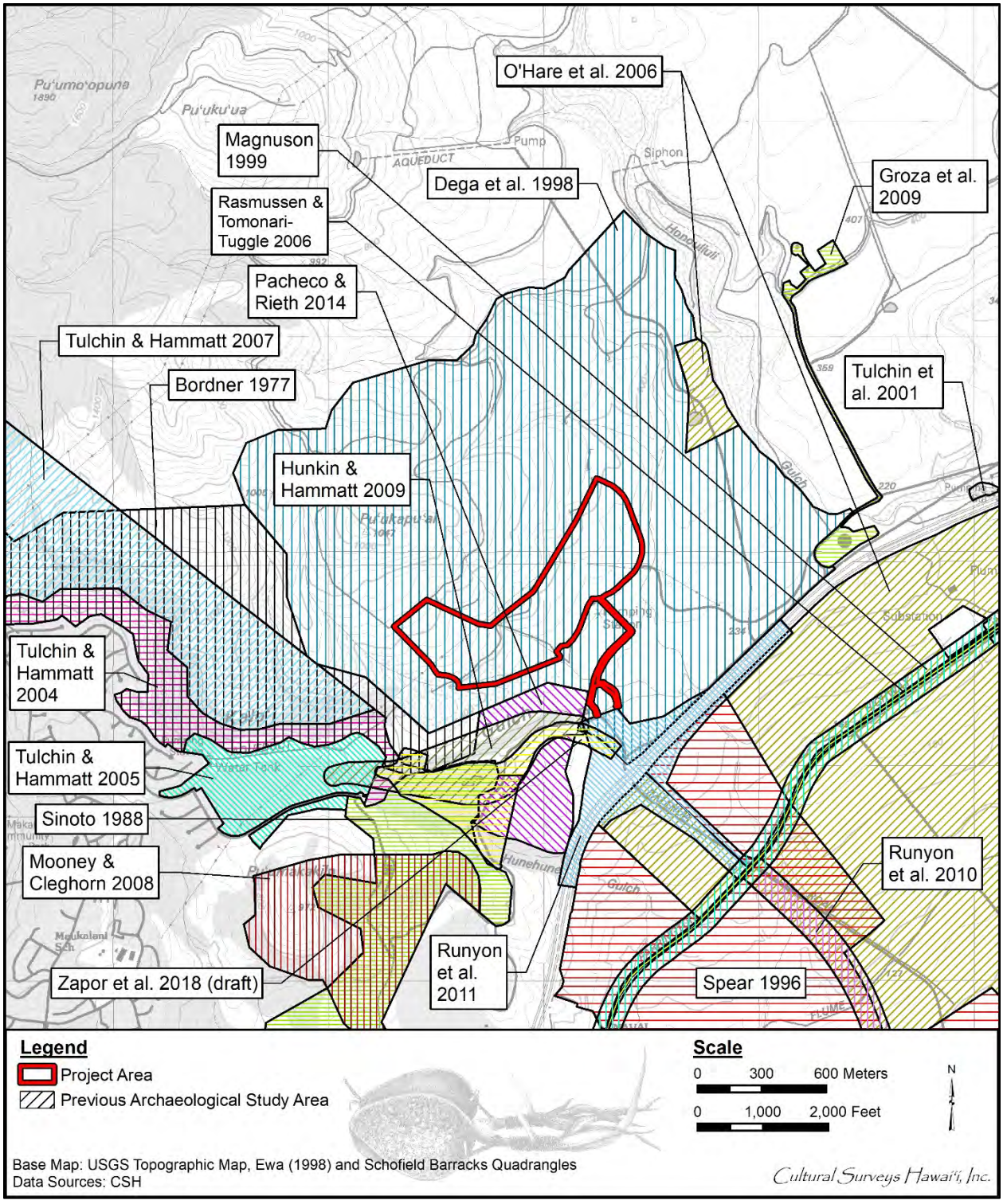

Figure 24. Portion of the 1998 Ewa and Schofield Barracks USGS topographic quadrangles showing the locations of previous archaeological studies in the vicinity (within approximately 1.5 km) of the project area

Table 1. Previous archaeological studies within the vicinity (within approximately 1.5 km) of the project area

Reference	Type of Study	Location	Results
Bordner 1977	Archaeological reconnaissance survey	Proposed Kalo‘i Gulch landfill location	Three walls designated as SIHP #s 50-80-12-2600, -2601 and -2602 in extreme west, upslope end of property, more than 1.5 km from present project area (hence not depicted in Figure 25)
Sinoto 1988	Archaeological reconnaissance survey	Makakilo Golf Course	Documented a low stacked boulder wall outside the property: SIHP # 50-80-09-1975
Spear 1996	Archaeological reconnaissance survey	East Kapolei, TMK: [1] 9-1-016:017	No historic properties identified
Dega et al. 1998	Archaeological inventory survey	UH West O‘ahu, TMK: [1] 9-2-002:001	Documented two historic property complexes: historic irrigation and plantation infrastructure system (SIHP # 50-80-08-5593) and Waiahole Ditch System (SIHP # 50-80-09-2268)
Magnuson 1999	Archaeological reconnaissance survey	‘Ewa Plain	Identified six concrete bridges, a railroad track, and a set of unidentified concrete features; no SIHP #s assigned
Tulchin et al. 2001	Archaeological inventory survey	Proposed ‘Ewa Shaft Renovation project, Honouliuli Gulch, adjacent to west-bound lanes of H-1, TMK: [1] 9-2-001	Identified one historic property: SIHP # 50-80-08-6370, stone wall alignment; also documented large pumping station and shaft building
Tulchin and Hammatt 2004	Archaeological inventory survey	86-acre proposed Pālehua Community Association, TMKs: [1] 9-2-003:078 por. and 079	Four historic properties identified: a complex of concrete and iron structures associated with industrial rock quarry operations (SIHP # 50-80-12-6680); three boulder mounds believed related to land clearing or ditch construction by Oahu Sugar Co. (SIHP # 50-80-12-6681); a small terrace believed to function as historic water diversion feature (SIHP # 50-80-12-6682); and a remnant portion of Waiahole Ditch (SIHP # 50-80-09-2268)

Reference	Type of Study	Location	Results
Tulchin and Hammatt 2005	Archaeological inventory survey	71-acre proposed Pālehua East B project, Makakilo, TMKs: [1] 9-2-003:076 and 078	Three historic properties identified: pre-Contact agricultural alignment and mound (SIHP # 50-80-12-6666), plantation-era stacked basalt boulder walls and a ditch (SIHP # 50-80-12-6667), and single alignment of upright basalt boulders and small, low terrace (SIHP # 50-80-12-6668)
O’Hare et al. 2006	Archaeological inventory survey	Ho‘opili East Kapolei	Documented six previously identified historic properties: plantation infrastructure (SIHP # 50-80-12-4344); railroad berm (SIHP # 50-80-12-4345); northern pumping station (SIHP # 50-80-12-4346); central pumping station (SIHP # 50-80-12-4347); southern pumping station (SIHP # 50-80-12-4348); and documented four newly identified features of SIHP # 50-80-12-4344: a linear wall, stone-faced berm, concrete ditch, and concrete catchment
Rasmussen and Tomonari-Tuggle 2006	Archaeological monitoring	Waiau Fuel Pipeline corridor	No historic properties identified
Tulchin and Hammatt 2007	Archaeological literature review and field inspection	Approx. 790-acre parcel, TMK: [1] 9-2-003:002 por. and 005 por.	Documented features interpreted as related to pre-Contact indigenous Hawaiian habitation (SIHP #s 50-80-08-2316 and 50-80-12-2602); historic ranching and related features (SIHP # 50-80-12-2601); and historic quarrying and related features (SIHP # 50-80-12-6680) and various pre- and post-Contact features (designated with temporary #s CSH1–CSH22)
Mooney and Cleghorn 2008	Archaeological reconnaissance survey	TMK: [1] 9-2-003:018	No historic properties identified
Groza et al. 2009	Archaeological inventory survey	TMKs: [1] 9-2-001:001 por., 004, 005, 006, 007 por.; 9-2-002:002	No historic properties identified

Reference	Type of Study	Location	Results
Hunkin and Hammatt 2009	Archaeological inventory survey	TMKs: [1] 9-2-002:006; 9-2-003:079	Documented two newly identified historic properties: irrigation ditches (SIHP #s 50-80-12-6950 and -6951); and one previously identified historic property, Waiahole Ditch (SIHP # 50-80-09-2268)
Runyon et al. 2010	Archaeological monitoring	TMKs: [1] 9-2-002:006; 9-2-003:079	No historic properties identified
Runyon et al. 2011	Archaeological monitoring	TMKs: [1] 9-1-018:001, 003, 004, 005; 9-2-002:001, 006	Documented two historic properties: a water diversion and a trash deposit (SIHP #s 50-80-12-4664 and -7128)
Pacheco and Rieth 2014	Archaeological inventory survey	East Kapolei Solar Farm, TMK: [1] 9-2-002:006 por.	Documented SIHP # 50-80-12-7433, an unpaved early twentieth century agricultural (ranching and/or sugarcane cultivation) road, understood as created between 1918 and 1928
Zapor et al. 2018	Archaeological inventory survey	Makakilo Dr extension project, TMKs: [1] 9-2-002:007, 009, 009; 9-2-003:074, 092; 9-2-039:110, 114; and 9-2-045:001	Documented two historic properties: SIHP # 50-80-09-2268, remnant portion of Waiahole Ditch, and SIHP # 50-80-12-6951, irrigation ditches; identified one new feature of Waiahole Ditch, an earthen mound and stacked stone wall, interpreted as likely remnants of a reservoir (Feature D)

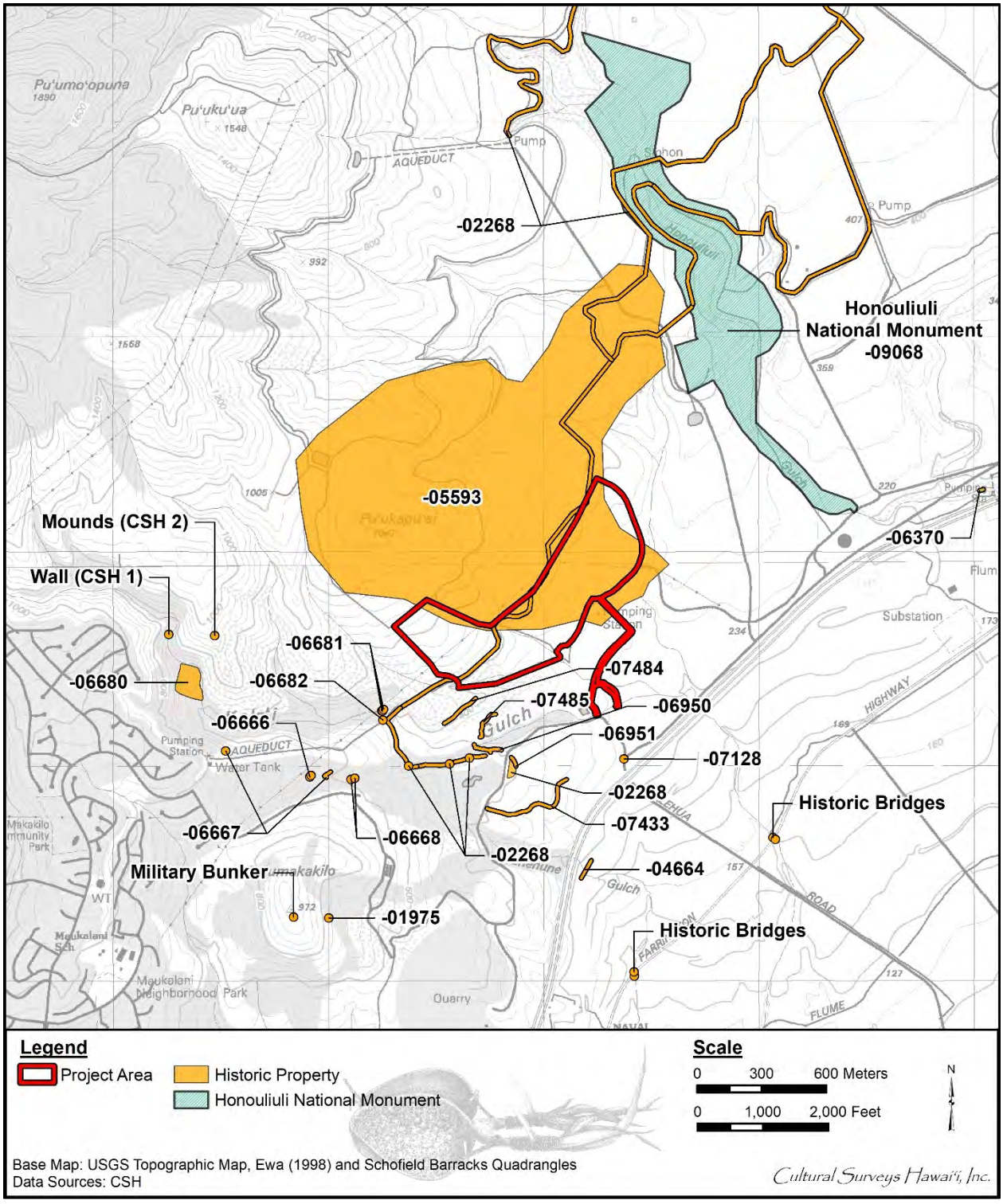

Figure 25. Portion of the 1998 Ewa and Schofield Barracks USGS topographic quadrangles showing the locations of previously identified historic properties in the immediate vicinity of the project area (note the SIHP # -5593 property boundary is defined as the Dega et al. 1998 project area and not the true extent or location of its features)

Table 2. Previously identified historic properties in the vicinity of the project area

SIHP #	Description	Reference
50-80-12-1975	Low-stacked boulder wall segment	Sinoto 1988
50-80-09-2268	Waiahole Ditch System	Goodman and Nees 1991; Hammatt et al. 1996; Dega et al. 1998; Tulchin and Hammatt 2005; Hunkin and Hammatt 2009; Zapor et al. 2018; Shideler and Hammatt 2018
50-80-12-4664	Historic water diversion structure	Nakamura et al. 1993; Runyon et al. 2011
50-80-08-5593	Plantation-era “flumes, aqueducts, ditches, pumps, and other irrigation features”	Dega et al. 1998
50-80-08-6370	Stone wall alignment, likely associated with cattle ranching or pumping station	Tulchin et al. 2001
50-80-12-6666	Alignment and mound	Tulchin and Hammatt 2005
50-80-12-6667	Two walls	Tulchin and Hammatt 2005
50-80-12-6668	Alignment and terrace	Tulchin and Hammatt 2005
50-80-12-6680	Complex of concrete and iron structures associated with industrial rock quarry operations	Tulchin and Hammatt 2005
50-80-12-6681	Three boulder mounds believed related to land clearing or ditch construction by Oahu Sugar Company	Tulchin and Hammatt 2005
50-80-12-6682	Terrace believed to function as an historic water diversion feature	Tulchin and Hammatt 2005
50-80-12-6950	Portion of a plantation-era irrigation ditch	Hunkin and Hammatt 2009
50-80-12-6951	Portion of a plantation-era irrigation ditch	Hunkin and Hammatt 2009
50-80-12-7128	Burned trash fill layer	Runyon et al. 2011

SIHP #	Description	Reference
50-80-12-7433	Unpaved early twentieth century agricultural (ranching and/or sugarcane cultivation) road, understood as created between 1918 and 1928	Pacheco and Rieth 2014
50-80-12-7484	Post-Contact irrigation ditch portion	Pacheco and Rieth 2014
50-80-12-7485	Post-Contact irrigation ditch portion	Pacheco and Rieth 2014
50-80-08-9068	Honouliuli National Monument (Internment Camp)	National Register
Historic Bridges	No SIHP #s assigned, no further documentation or mitigation recommended	Magnuson 1999
Military Bunker	WWII-era bunker	Mooney and Cleghorn 2008
CSH 1	Post-Contact wall related to historic ranching	Tulchin and Hammatt 2007
CSH 2 (Mounds)	Two basalt mounds interpreted as possible trail markers	Tulchin and Hammatt 2007

survey encompassed the entirety of the current project area. Several plantation-era “flumes, aqueducts, ditches, pumps, and other irrigation features occurring within the heavily modified landscape” were noted (Dega et al. 1998:i). The features represented an extensive complex of sugarcane irrigation features used from the 1920s through more recent times. The irrigation complex was designated SIHP # 50-80-08-5593. A portion of the Waiahole Ditch System (SIHP # 50-80-09-2268) (previously recorded by Goodman and Nees 1991) was also documented crossing through the northwest section of the subject parcel and continuing southwest through the lower agricultural fields. No artifacts were recovered from the project area. No further work was recommended for SIHP # 50-80-08-5593.

An overlay of the present project area on the Dega et al. (1998) plan map (Figure 26) indicates it lies entirely within the south/central portion of the 1998 AIS project. While the Dega et al. (1998) plan map should probably be understood as a sketch, it does indicate certain remnants of plantation infrastructure (designated as SIHP # 50-80-08-5593) were present in the property in 1998. Dega et al. (1998) defined the entire project area as the boundaries of SIHP # 50-80-08-5593. However, the identified features represent a substantially smaller area than the overall boundary.

3.2.5 Magnuson 1999

In 1999, an archaeological reconnaissance survey was completed by International Archaeological Research Institute, Inc. (IARII) for a Farrington Highway Expansion project extending along 5.3 km (3.3 miles) of Farrington Highway between Golf Course Road and Fort Weaver Road with a roughly 61-m (200-ft) wide corridor on each side (Magnuson 1999). The project identified six concrete bridges, one railroad track, and “a set of unidentified concrete features” (Magnuson 1999:17). The study concluded the following:

> The sites observed in the Farrington Highway Expansion project are neither exemplary sites of their kind nor unique. Therefore these sites have been adequately recorded during the investigations and no further work is necessary should preservation not be possible. [Magnuson 1999:25]

3.2.6 Tulchin et al. 2001

CSH archaeologists completed an archaeological inventory survey in support of a proposed ‘Ewa Shaft Renovation project. The ‘Ewa Shaft project is within Honouliuli Gulch, adjacent to the west-bound lanes of the H-1 Interstate Highway, approximately 1.7 km east of the present project area. That property included a pumping station enclosure and the surrounding area of approximately 1 acre. The survey documented one historic property, a stone wall alignment designated SIHP # 50-80-08-6370. Subsurface testing was conducted adjacent to the wall. The study interpreted the wall alignment as associated with cattle ranching or the pumping station. The study also documented a portion of the large pumping station and shaft building on the property.

3.2.7 Tulchin and Hammatt 2004

In 2004, CSH conducted an archaeological inventory survey to the west of the current project area for the Pālehua Community Association (PCA) in Makakilo (Tulchin and Hammatt 2004). Three overhang shelters were observed and tested, however, no cultural material was identified during excavation. The study documented several historic properties, including a complex of

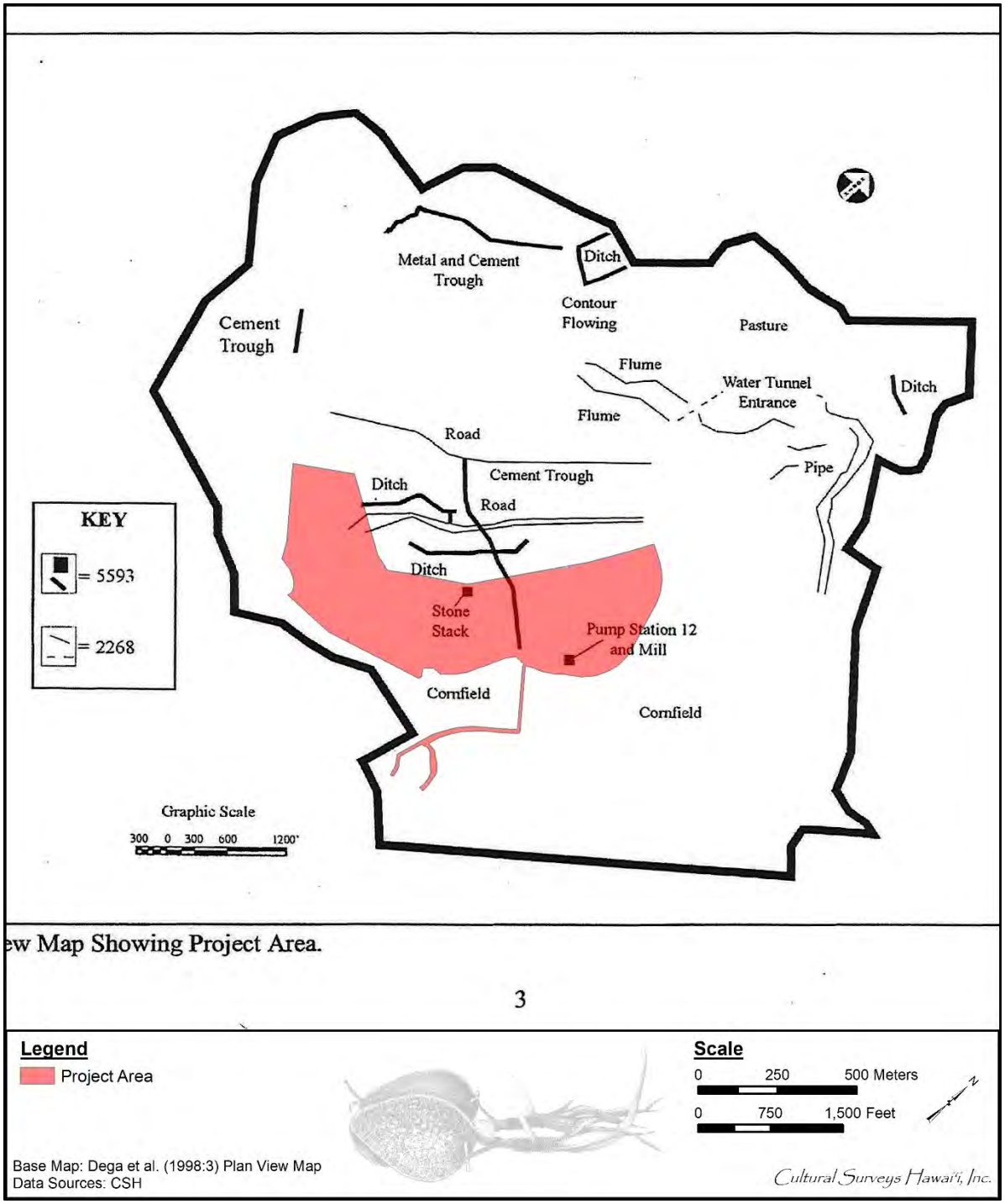

Figure 26. Plan map of the AIS for the University of Hawai‘i, West O‘ahu Campus project area showing historic properties (as of 1998) with an overlay of the current project area (adapted from Dega et al. 1998:3). This overlay suggests “Pump Station 12 and Mill” and a ditch were documented as within the present project area and another ditch and road and “Stone stack” were adjacent to the north side of the present project area (note this is a sketch and locations are approximate)

concrete and iron structures associated with industrial rock quarry operations (SIHP # 50-80-12-6680); three boulder mounds believed to be related to land clearing or ditch construction by the Oahu Sugar Company (SIHP # 50-80-12-6681); a small terrace believed to function as an historic water diversion feature (SIHP # 50-80-12-6682); and a remnant portion of the Waiahole Ditch (SIHP # 50-80-09-2268).

3.2.8 Tulchin and Hammatt 2005

In 2005, CSH conducted an archaeological inventory survey west of the current project area for the proposed Pālehua East B project in Makakilo (Tulchin and Hammatt 2005). The study identified three historic properties, including an alignment and a mound (SIHP #s 50-80-12-6666A and B), two walls (SIHP #s 50-80-12-6667A and B), and an alignment and terrace (SIHP #s 50-80-12-6668A and B). SIHP # 50-80-12-6667 is thought to contain remnants of plantation infrastructure. The historic properties were documented in an unnamed gully south of Kalo‘i Gulch.

3.2.9 O’Hare et al. 2006

In 2006, CSH conducted an archaeological inventory survey of approximately 1,600 acres for the East Kapolei project (subsequently known as the Ho‘opili project) to the southeast of the present project area (O’Hare et al. 2006). The Ho‘opili project was bounded on the east by Fort Weaver Road, *makai* (seaward) by Mango Tree Road, and *mauka* by the H-1 Freeway.

Several historic properties documented by the O’Hare et al. (2006) study were previously identified during an archaeological survey in 1990 (Hammatt and Shideler 1990). These previously identified historic properties included SIHP # 50-80-12-4344, plantation infrastructure; SIHP # 50-80-12-4345, railroad berm; SIHP # 50-80-12-4346, northern pumping station; SIHP # 50-80-12-4347, central pumping station; and SIHP # 50-80-12-4348, southern pumping station.

The survey identified four additional features of SIHP # 50-80-14-4344. These additional features include Feature D, a linear wall along the east bank of Honouliuli Stream; Feature E, a linear wall along the west bank of Honouliuli Stream; Feature F, a stone-faced berm constructed perpendicular to the orientation of the stream; and Feature G, a concrete ditch and concrete masonry catchment basement on the west bank of Honouliuli Gulch. None of the historic properties identified in the O’Hare et al. study (2006) were near the present project area.

3.2.10 Rasmussen and Tomonari-Tuggle 2006

In 2006, IARII conducted archaeological monitoring along the Waiau Fuel Pipeline corridor, extending from the Hawaiian Electric Company’s Barbers Point Tank Farm to the Waiau Generating Station (Rasmussen and Tomonari-Tuggle 2006). The Waiau Fuel Pipeline corridor follows Farrington Highway to Kunia Road, angles *makai* near Kunia Road, then continues east along the OR&L right-of-way near the Pearl Harbor coast. It appears no archaeological monitoring was conducted west of Waipi‘o Peninsula, as the corridor to the west was determined to not be archaeologically sensitive. No historic properties were identified during archaeological monitoring.

3.2.11 Tulchin and Hammatt 2007

In 2007, CSH completed an archaeological literature review and field inspection of an approximately 790-acre parcel at Pālehua, Makakilo (Tulchin and Hammatt 2007). The inspection

covered portions of Makaīwa Gulch, Awanui Gulch, and Kalo‘i Gulch. Overall, 26 historic properties were identified during the field inspection. The study included further documentation of four previously identified historic properties: SIHP # 50-80-08-2316, a *ku‘ula* stone; SIHP # 50-80-12-2601, a pre-Contact wall utilized as a water control feature; SIHP # 50-80-12-2602, a pre-Contact wall possibly utilized for agriculture; and SIHP # 50-80-12-6680, a complex of concrete and iron structures associated with industrial rock quarry operations.

Newly identified historic features (designated with temporary CSH site #s) included CSH 1, wall; CSH 2, mounds; CSH 3, large enclosure; CSH 4, platform; CSH 5, mounds; CSH 6, adze; CSH 7, platform; CSH 8, terraces; CSH 9, enclosure and two small caves; CSH 10, enclosure; CSH 11, mound; CSH 12, platform; CSH 13, enclosure; CSH 14 terrace; CSH 15, wall remnant, hearth, and military “foxhole”; CSH 16, terrace and *hau* thicket; CSH 17, level soil along ridge; CSH 18, enclosure; CSH 19, trail; CSH 20 water tunnel; CSH 21, large boulder with petroglyphs; and CSH 22, enclosure with stone uprights. These potential historic properties were not assigned SIHP #s.

Other than the previously reported SIHP # -6680 complex of structures associated with industrial rock quarry operations, none of the identified historic properties were in the vicinity of the present project area.

3.2.12 Mooney and Cleghorn 2008

In 2008, Pacific Legacy, Inc. conducted an AIS (recorded as an archaeological assessment due to lack of finds) for the proposed Makakilo Quarry expansion (Mooney and Cleghorn 2008). No historic properties were identified; however, the remnants of a modern, abandoned golf course were noted.

3.2.13 Groza et al. 2009

In 2009, CSH conducted an AIS (recorded as an archaeological assessment) for the Ho‘opili project 440-Ft Elevation Reservoir and Water Line project (Groza et al. 2009). No historic properties were identified.

3.2.14 Hunkin and Hammatt 2009

In 2009, CSH completed an archaeological inventory survey for an approximately 62-acre Makakilo Drive extension project (Hunkin and Hammatt 2009). The project documented two newly identified historic properties (SIHP #s 50-80-12-6950 and -6951). Both historic properties are portions of plantation irrigation ditches. The ditches functioned to transport water for irrigation of the sugarcane fields.

In addition to the newly identified historic properties, the project documented a portion of the previously identified SIHP # 50-80-09-2268 alignment. A meeting was held on site within the project area with CSH staff, SHPD staff, and Mr. Shad Kane on 10 February 2009 to discuss the alignment. Mr. Kane led the group along the graded alignment of SIHP # 50-80-09-2268, within the property, indicating the ditch had been constructed over the alignment of an ancient Hawaiian trail. SHPD staff observed the plantation irrigation ditch and associated infrastructure and concurred the alignment was a portion of the Waiahole Ditch System. SHPD staff also concluded the ditch was most likely constructed over the alignment of a pre-Contact Hawaiian trail. SHPD staff expressed a concern that documentation make it clear the pre-Contact Hawaiian trail function

was the dominant function of this designated site in the vicinity (which was then developed as the Waiahole Ditch in the early twentieth century). This discussion of a Hawaiian trail function was understood to apply only to that portion of the Waiahole Ditch System at Kalo‘i Gulch.

Two new features (SIHP # 50-80-09-2268 Features B and C) associated with the main ditch were also documented. These features are drainage-related, with the function of preventing storm water and sediment from entering the main Waiahole Ditch.

3.2.15 Runyon et al. 2010

In 2010, CSH conducted archaeological monitoring for Phase 1B of the North-South Road project (Runyon et al. 2010). No historic properties were identified.

3.2.16 Runyon et al. 2011

In 2011, CSH completed archaeological monitoring for phase 1C of the North-South Road project (Runyon et al. 2011). Two historic properties were identified. A previously identified historic water diversion structure (SIHP # 50-80-12-4664), originally documented by Nakamura et al. (1993), was observed on the southwest edge of Ramp C. A newly identified burnt trash fill layer (SIHP # 50-80-12-7128) was documented directly under Pālehua Road on the west edge of Ramp A.

3.2.17 Pacheco and Rieth 2014

In 2014, IARII conducted an archaeological inventory survey (Pacheco and Rieth 2014) for an East Kapolei Solar Farm project (on approximately 19 acres of TMK: [1] 9-2-002:006).The study documented one historic property: SIHP # 50-80-12-7433, an unpaved early twentieth century road related to ranching and/or sugarcane cultivation in the area, understood as created between 1918 and 1928.

3.2.18 Zapor et al. 2018

CSH conducted a supplemental archaeological inventory survey for the Makakilo Drive Extension project (Zapor et al. 2018). The survey identified two historic properties: remnant portions of the Waiahole Ditch (SIHP # 50-80-09-2268) and irrigation ditches (SIHP # 50-80-12-6951). The project documented an additional feature of the Waiahole Ditch, an earthen mound and stacked stone wall, interpreted as likely remnants of a reservoir (Feature D). SIHP # 50-80-12-6951 was observed as an irrigation ditch and associated retaining wall, pipe, valve, and sluice gate remnants.

3.3 Background Summary and Predictive Model

Background research of Honouliuli Ahupua‘a indicated pre-Contact settlement was centered around the rich cultivated lands of Honouliuli ‘Ili for extensive wetland taro cultivation and abundant coastal resources. The extensive limestone plain also included recurrent use habitations for fishermen and gatherers, and sometimes gardeners. The upland dry forest areas were used for hunting and gathering of forest resources, but likely not for widespread permanent settlement. In the intermediate area between the limestone plain and the upland forests, in the vicinity of the current study area, indigenous Hawaiian activities would have been limited to dryland agriculture within gulches or near springs, and *mauka* to *makai* trails and associated temporary shelters.

Within the “Makaīwa Hills” area, which is southwest of the project area, pre-Contact habitation sites were found clustered in higher elevations above 1,000 ft, and in lower elevations below 500 ft (Hammatt et al. 1991). The higher elevations, where the current study is located, do not contain forest subsistence resources.

In Von Holt’s (1985) accounts of discovering spring water southwest of the study area, it is noted that Kalo‘i had “been a place of which the Hawaiians had known” and the area “had been quite heavily populated before the smallpox epidemic of 1840” (von Holt 1985:138–140). However, there was no mention of observations of any physical evidence of Hawaiian settlement, other than the paved well (Hidden Spring). It is quite possible ranching or agricultural activities destroyed any remnants of Hawaiian occupation prior to the late 1800s.

By 1920, the lands of Honouliuli were used primarily for commercial sugarcane cultivation and ranching (Frierson 1972). Much of the *mauka* lands in western Honouliuli, including ridges and deep gulches, were unsuitable for commercial sugar cultivation and remained pasture land for grazing livestock. Historic maps indicate a lack of any significant development within the study area into the 1940s. Modest constructions in the area included Pālehua Road, allowing access to the uplands of western Honouliuli, as well as plantation infrastructure within and to the south of the study area.

Previous archaeological research in the vicinity of the project area has identified pre-Contact sites including habitation structures (temporary and permanent) and agricultural features (terrace and mounds). Of particular interest are three pre-Contact historic properties located within the *mauka* reaches of Kalo‘i Gulch. All three were determined to be related to erosion control and water management and suggest that in the past water was available, at least on a seasonal basis, in the Kalo‘i Gulch area. Historic properties identified in the vicinity of the study area include plantation-era infrastructure (ditches, flumes, clearing mounds, etc.) related to the Ewa Plantation Company and Oahu Sugar Company.

Based on background research, archaeologists expected to document historic features related to sugarcane cultivation and ranching, including walls, fences, maintained springs, and water tunnels as well as irrigation infrastructure including ditches and flumes related to the Ewa Plantation Company, Oahu Sugar Company, and the Waiahole Ditch System.

Section 4 Results of Fieldwork

The project area consists of a largely undeveloped property with rolling hills and several gulch areas. In general, the sloping lands within the project area are dry, fallow lands that appear to have undergone significant erosion of topsoil. Much of the nearly 101.62-acre project area is covered in thick vegetation including California grass (*Brachiaria mutica*), *koa haole (Leucaena leucocephala*), w*iliwili* (*Erythrina sandwicensis*), sweet acacia or *klu* (*Acacia farnesiana*), and *kiawe* (*Prosopis pallida*) (Figure 27 through Figure 29). The hillside within the project area also exhibited land modification in the form of graded access roads, bulldozed clearings, a portion of the Waiahole Ditch System, and remnants of the abandoned historic irrigation system and plantation infrastructure. Modern barbed wire fences were also observed surrounding the southern border of the project area, indicative of the continued use of portions of the project area for grazing livestock. Cow paths were identified meandering throughout the project area. Various fence posts were observed in the southwest project area, determined not to be associated with those fence lines noted on historic maps of the area based on their location and alignment (Figure 30).

The 1936 U.S. Army War map (see Figure 16) shows a camp (“Pump Camp 5”) located in the central portion of the project area. The camp is last depicted on the 1953 USGS map (see Figure 19). On the 1968 USGS map (see Figure 20) the camp is no longer depicted. An effort was made to identify any remnants of the former camp during fieldwork, but no remnants were identified during the pedestrian inspection.

The pedestrian survey identified two historic properties within the project area: SIHP # 50-80-08-5593, identified as remnant structures associated with water allocation related to plantation activities, and SIHP # 50-80-09-2268, identified as a portion of the Waiahole Ditch System, which extends along the northern boundary of the project area, crossing into the southwest project area and exiting at the southern boundary. Both of these historic properties were previously identified in the immediate area by Dega et al. (1998). The current project documented two features of SIHP # 50-80-08-5593 (Features 1 through 2E), which include retention basins, drain pipes, culvert, sluice gates, and various other components related to water control and retention. Most features of SIHP # 50-80-08-5593 were identified extending northwest to southeast down a slope in the north portion of the project area, designated as a complex related to water control. The complex is related to—and in line with—the pump station and mill building at the base of the hill, just outside the southern boundary of the project area. The complex consists of various water retention components, runoff features, a remnant water tower, pipes, and concrete features likely housing additional pipes. The uppermost components in this complex of features were constructed around a portion of the Waiahole Ditch, and would have utilized water from the ditch, channeling it down the slope to the pump station and mill, where it would have been pumped out to irrigate the surrounding sugarcane fields. One additional feature was identified in the north/central project area.

A remnant portion of the Waiahole Ditch (SIHP # 50-80-09-2268) extends along the northern boundary of the project area. Toward the western portion of the project area, the Waiahole Ditch crosses through the project area and extends to the southwest. The ditch extends underground through much of the project area. Observed portions of the ditch displayed culverts, bridges, tunnels, and flumes. Composition of the ditch varied from entirely earthen portions to concrete

Figure 27. Overview of southwest portion of project area, view to southwest

Figure 28. Overview of southwest portion of project area, view to west

Figure 29. Overview of northern portion of project area, view to northeast

Figure 30. Representative photo of fence posts noted in southwest portion of project area, view to southeast

and basalt lined portions. A former road that is likely an access road for the Waiahole Ditch was noted within the northern and northeastern boundaries of the project area. Portions of the Waiahole Ditch outside the project area were photographed and briefly described, included in the description of the Waiahole Ditch in Section 5 below. The project also documented seven new features of SIHP # 50-80-09-2268 (Features E through K), including sluice gate features, a drainage flume, culverts, and bridges. The portion of the Waiahole Ditch within the project area extends along the northern boundary and northeast-southwest through the southwest project area. Along this trajectory, one of the features was documented near the southern boundary of the project area (Feature E), two toward the central project area (Features F and G), three near the northern boundary of the project area (Features H, I, and J), and one in the northeast project area (Feature K). For detailed descriptions of all features of the two historic properties identified within the project area, refer to Section 5.

Within the project area, the former roads first recorded on the 1936 U.S. Army War Department map are currently in remnant condition. Temporary water diversion remnants related to the roads, identified as portable concrete flumes, were recorded in two locations along the edge of the former roads, in the west portion of the project area. The first documented portable flume spans approximately 10.6 m long and is oriented northeast-southwest (Figure 31). The second documented portable flume spans approximately 10.5 m in length and is oriented east to west (Figure 32). These remnant sections initially consisted of connected concrete troughs used to divert water from one place to another. As these components were temporary fixtures in remnant condition, they do not retain association with any potential historic properties and are not considered features.

Following the initial pedestrian inspection, the project area boundaries were altered slightly, extending to the north and the west, as well as south to encompass the existing access roads to be used for the project. Additional pedestrian inspection was conducted for these areas. The access roads that may be impacted consist of either paved or gravel roads. It is clear that modifications and upgrades have been made to the various access roads over the years. A portion of the northeast-southwest oriented access road is lined with a concrete curb (Figure 33). Some areas of the access road appear to consist of only dirt, though it may be this is actually material deposited on the road due to rain and erosion, and there may still be paved road underneath (Figure 34). This road reaches a junction, and in one direction the pavement continues, while the other direction is gravel (Figure 35). Access manholes for water lines were noted along the paved access road (Figure 36). A modern concrete culvert was noted at the base of the gravel access road (southernmost tip of the project area, west branch), allowing water flow under the road (Figure 37).

An additional, more intact concrete flume was identified *mauka* (northwest) of SIHP # -2268 Feature H, of similar composition to those noted in the western project area. Oriented east/west, this flume extends for 21 m in length, with each segment measuring 75 cm long, 45 cm wide, and 30 cm tall (Figure 38). Each concrete segment has a square hole near the base on each side, with a metal L-shaped insert, likely used for controlling water flow out of the flume (Figure 39). Again, this flume appears to have been used for water diversion related to the access roads.

Archaeologists walked a gulch now situated within the project area from the northern boundary down to the access road (Figure 40). Metal debris from an unknown source was noted within the gulch toward the north edge of the project area (see Figure 40); no historic properties were identified.

Figure 31. Remnant water diversion flume in southern project area, view to northwest

Figure 32. Remnant water diversion flume in southern project area, view to north

Figure 33. Access road encompassed within the project area, paved and lined with concrete curb, view to southwest

Figure 34. Overview of dirt (or dirt-covered) access road, view to northeast

Figure 35. Overview of access road junction, view to south

Figure 36. Access road overview showing water manhole, view to northeast

Figure 37. Overview of modern concrete culvert at the base of the access road (junction with Palehua Road), view to northeast

Figure 38. Overview of concrete flume in central northern project area, view to southeast

Figure 39. Plan view of concrete flume in central northern project area

Figure 40. Overviews of the gulch inside the project area, view to southwest (left), view to northeast with observed metal debris (right)

Section 5 Historic Property Descriptions

Two historic properties were identified within and immediately adjacent to the current project area during this AIS (Figure 41). SIHP # 50-80-08-5593 consists of remnants of an historic irrigation system and plantation infrastructure (Figure 42), and SIHP # 50-80-09-2268 designates (a portion of) the Waiahole Ditch System (see Figure 80). These historic properties within the project area are described below.

5.1 SIHP # 50-80-08-5593

FORMAL TYPE:	Historic Irrigation System and Plantation Infrastructure
FUNCTION:	Agriculture/water control
NUMBER OF FEATURES:	15 total; two newly identified (designated here as Feature 1 and Feature 2 (2A through 2E)
AGE:	1920s and continuing through the early 1990s
SIZE:	625 sq m (designated features only)
LOCATION AND DISTRIBUTION:	Concentrated in northern portion of project area extending in a line northwest-southeast, plus one feature on the southern boundary and one in the northeast project area
TMK:	[1] 9-2-002
LAND JURISDICTION:	State of Hawai‘i
PREVIOUS DOCUMENTATION:	Dega et al. 1998

SIHP # 50-80-08-5593 consists of an historic irrigation system and components of plantation infrastructure. Most of SIHP # 50-80-08-5593 was documented extending northwest to southeast, beginning outside the north boundary of the project area through the central portion. One isolated feature was documented within the northeast project area. The boundaries of SIHP # 50-80-08-5593 extend well beyond the current project area, as features of the historic property were documented northeast of the current project area by Dega et al. (1998). Table 3 lists all features considered components of this historic property both by Dega et al. 1998 and the present study.

5.1.1 Description of SIHP # -5593 by Dega et al. 1998

A 1998 archaeological inventory survey for the (then proposed) University of Hawai‘i West O‘ahu Campus (Dega et al. 1998) addressed a 991-acre area that encompassed the entire present project area. Dega et al. (1998) documented components of a newly identified historic property, designated SIHP # 50-80-08-5593.

The study mentions the mill building and pump station (“Pump Station 12”), “adjacent to the lower agricultural fields” (see Figure 42 through Figure 44). The current study noted the mill building and pump house are presently enclosed by chain-link fencing. The authors of the 1998 study also mention other features including flumes, dikes, dams, and pumps, but do not include documentation of such features. The provided site location map from the 1998 study (Figure 43)

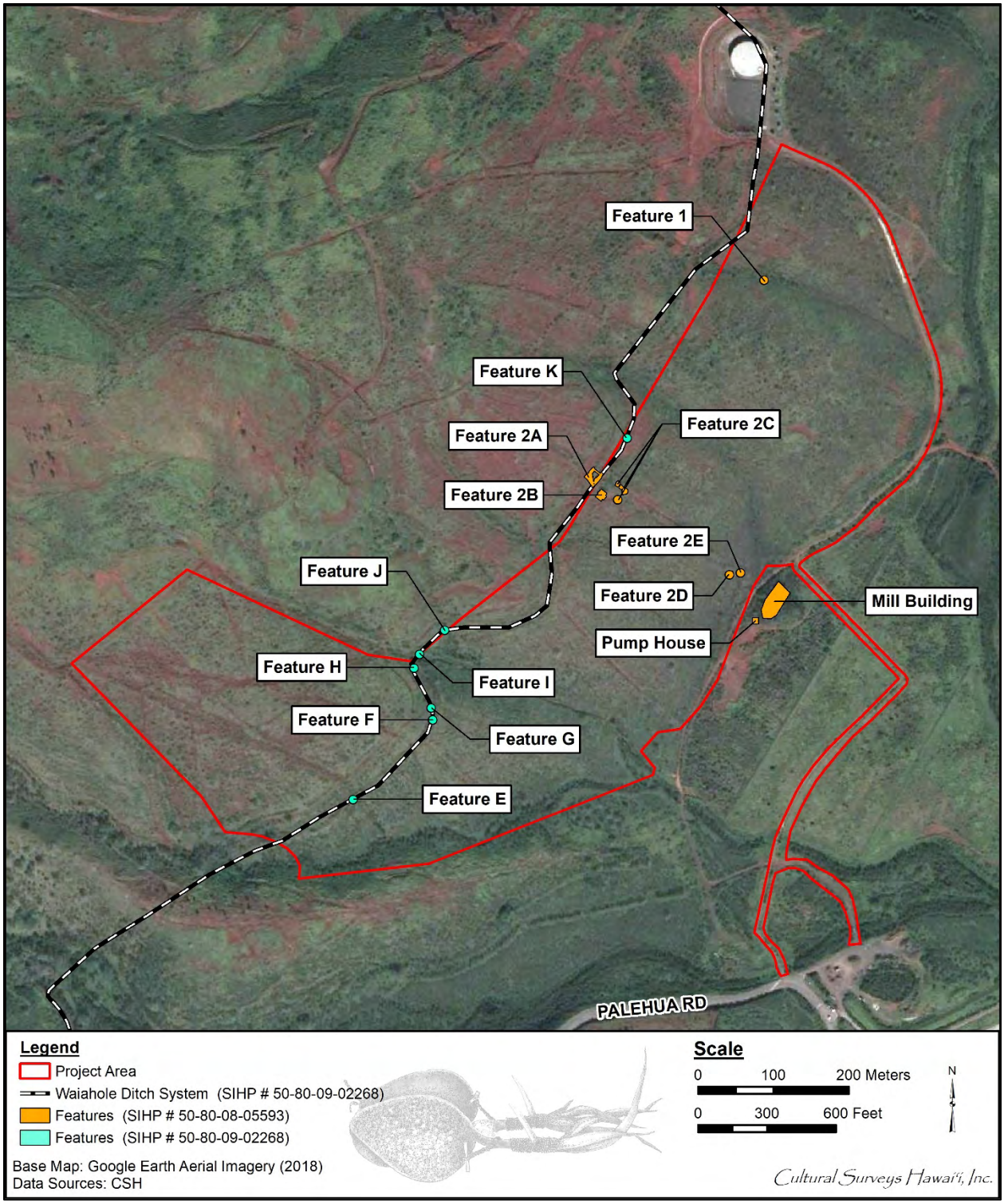

Figure 41. Aerial photograph showing the historic properties identified during the AIS: SIHP # 50-80-08-2268 Feature E through Feature K (shown in green) and SIHP # 50-80-08-5593 Feature 1 and Features 2A through 2E (shown in orange) (Google Earth 2018)

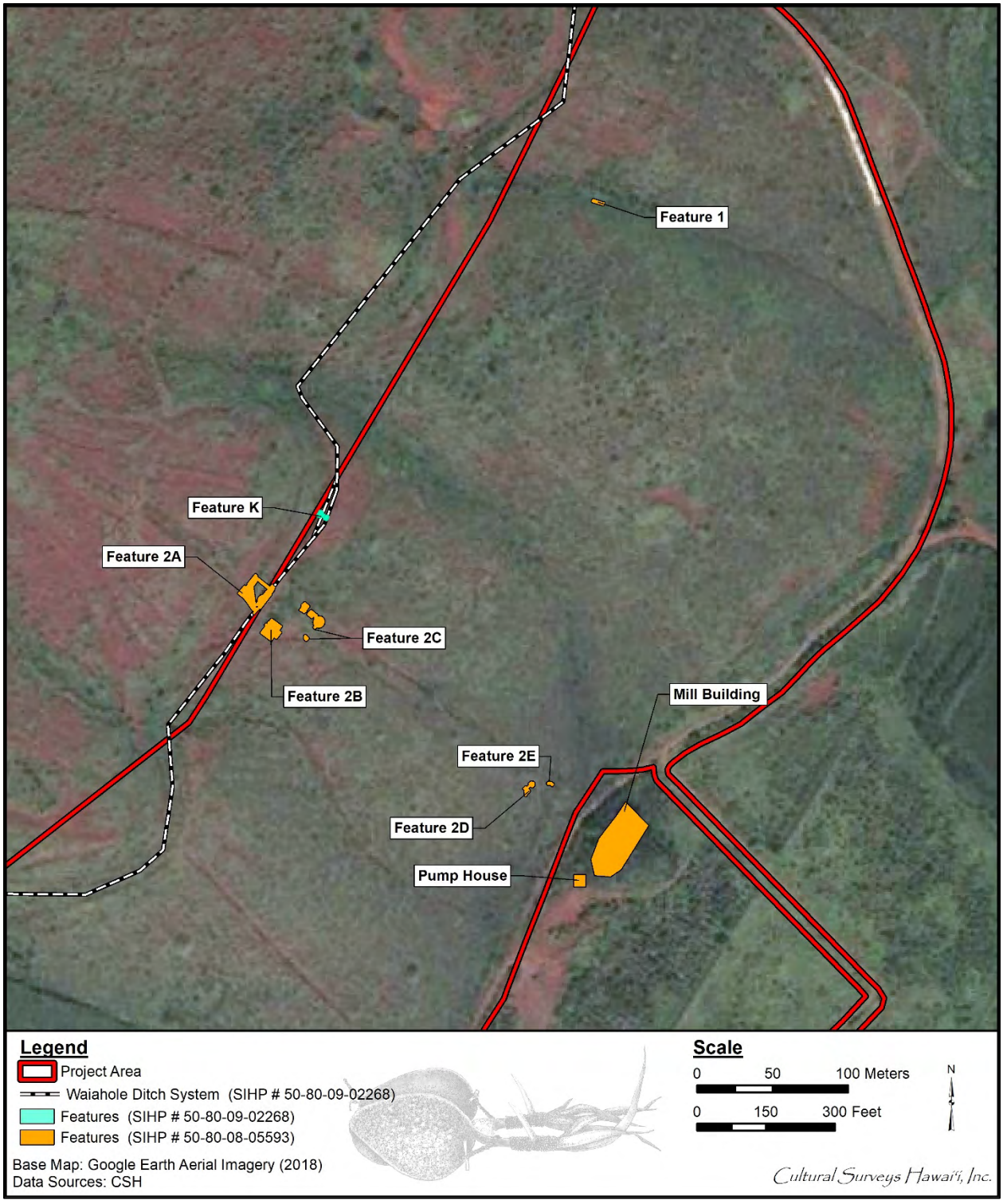

Figure 42. Aerial photograph (Google Earth 2018) depicting the distribution of features of SIHP # 50-80-08-5593 (Feature 1 and Features 2A through 2E) within the project area

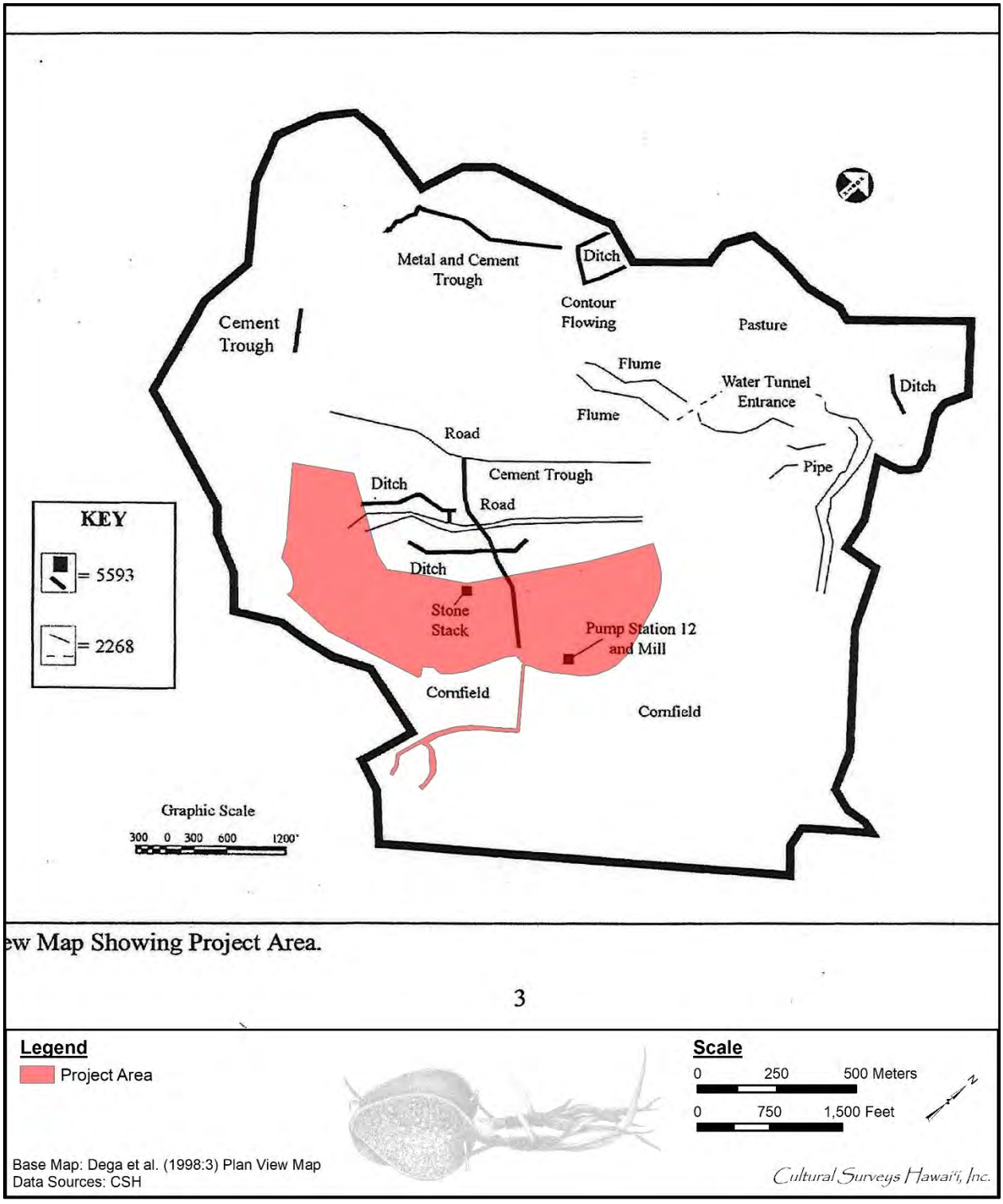

Figure 43. Figure from Dega et al. (1998) showing identified features of two historic properties (Dega et al. 1998:3), with overlay of current project area

Table 3. SIHP # 50-80-08-5593 (Dega et al. 1998 did not designate feature numbers)

Feature #	Brief Description	Reference
—	Mill building containing pumping machinery	Dega et al. 1998
—	Pump House 12	Dega et al. 1998
—	Water pump feature (concrete, wood, and pumping mechanism)	Dega et al. 1998
—	Irrigation system bridge (basalt and mortar, inscribed date of 1928)	Dega et al. 1998
—	Stone stack (not described, plotted on figure)	Dega et al. 1998
—	Two concrete and metal troughs	
—	Four earth-lined water transport ditches	Dega et al. 1998
—	Two concrete troughs, 45 cm wide and 45 cm high	Dega et al. 1998
1	Concrete and metal drain pipes	Current study
2A–2E	Complex including formal portion of the Waiahole Ditch, water catchment/retention features, flumes, and associated pumping mechanisms	Current study

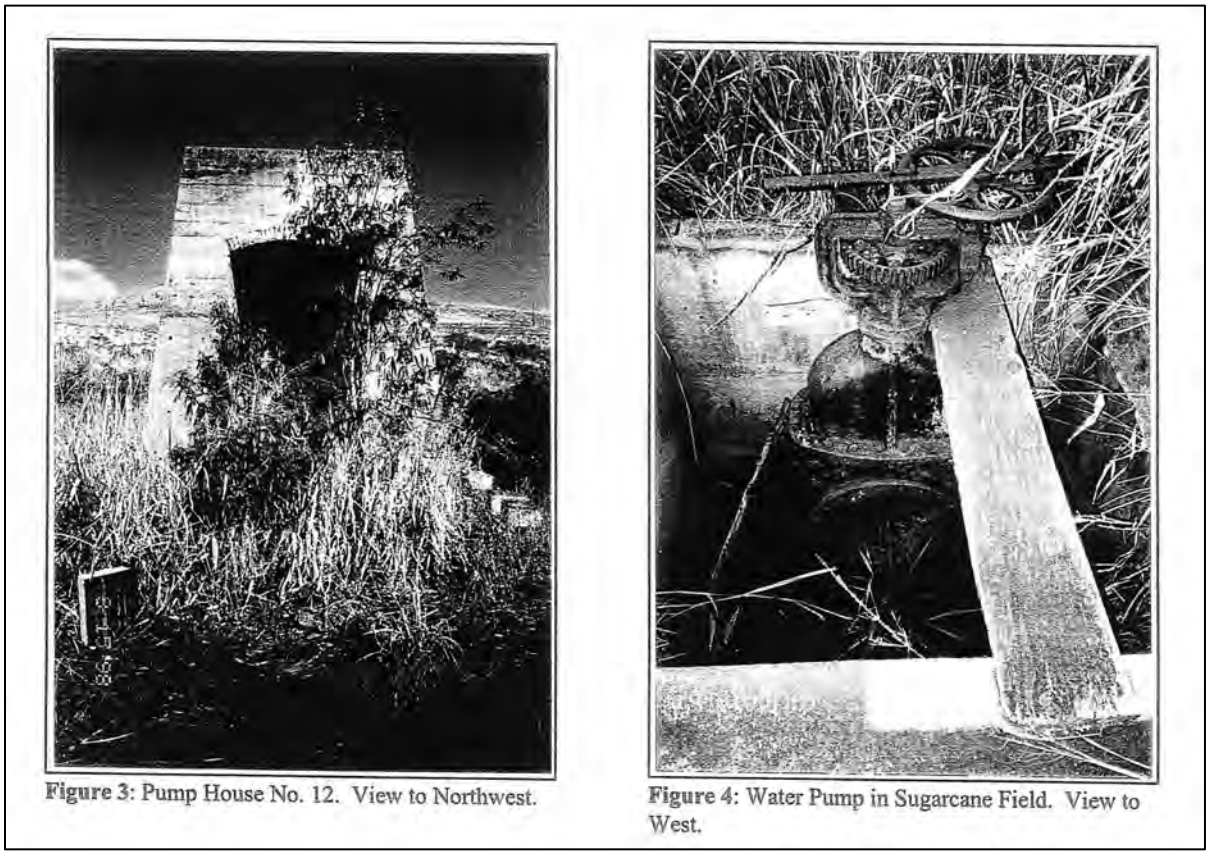

Figure 3: Pump House No. 12. View to Northwest.

Figure 4: Water Pump in Sugarcane Field. View to West.

Figure 44. Features of SIHP # 50-80-08-5593 documented by Dega et al. (1998:15)

calls out a “Stone Stack,” two “Flumes,” a “Water Tunnel Entrance,” and a “Pipe” (or pipes) that appear to have no textual discussion. The study includes a photo that depicts what appears to be a rather elaborate “Irrigation system bridge” dated 1928—understood as relating to at least one of the “Flume” annotations on the plan map (Figure 45) and as outside the present project area.

According to the authors, the study documented various distinct features: two metal and concrete troughs, four small earth-lined water transport ditches, and two concrete ditches or troughs. No feature numbers were designated in the Dega et al. (1998) study. The 1998 study describes the documented components of the historic property as follows:

> Also found on the subject parcel are the remnants of a system which appears to have been designed to gather and transport water for local use. This sites [*sic*] includes a network of small concrete troughs c. 45 cm wide and 45 cm high. These were observed along the summit ridgeline to the northeast of Pu‘u Kapua‘i, from where it entered a ditch system on the lower slopes. Remnant sections of these troughs were also found on the western and southern slopes of Pu‘u Kapua‘i and within the 38 acre parcel which forms the northeastern corner of the project area. Smaller earthen ditches are found throughout the project area, particularly on the east-facing slope at the northern area of the project. Connections of this system with the Waiahole Ditch system were not observed. Water collected and transported through this system was probably used for local ranch operations, extensive sugarcane cultivation, and small-scale agriculture. Because of the leeward location of this parcel, water would flow into this system almost exclusively during Kona or southerly storms. Thus, a total of eight features comprise Site 5593: metal and cement troughs (2), small earth-lined water transport ditches (4), solely cement constructed ditches or troughs (2) and an area containing large clearing mounds adjacent to the lower agricultural fields (1) [The plan view map in their report is referenced].
>
> Of additional interest is a large wooden building (part of Site 5593), presumably constructed in the late 1920’s and utilized through the 1950’s, that occurred on the southern flank of Pu‘u Kapua‘i’s base. This structure and associated pumping system, designated as Pump 12 by Wilcox (1996:106), contained steam engine driven pumps. The preponderance of coal within the building and mechanisms observed through the structure allow for the inference that this indeed was a steam-driven pumping station. These steam pumps were likely needed for transport of water to fields as gravity alone was not enough to propel the water into lower ‘Ewa Plain sugarcane fields. Steam-driven pumps allowed cultivators to propel water into these lower reaches. [Dega et al. 1998:19]

5.1.2 Description of SIHP # -5593 within and adjacent to the Current Project Area

Features documented during the current AIS consist of concrete and metal drain pipes (Feature 1) and a complex of water control features (Features 2A through 2E) associated with the previously documented pump house and mill building (Figure 46 and Figure 47) just southeast (outside) of the present project area. It is likely that subsurface remnants, such as pipes, are present between Feature 2A and the mill building.

Figure 5: Pumping Machinery at Mill Adjacent to Pump House No. 12. View to North.

Figure 6: Irrigation System Bridge. Note Date of 1928 in Center of Bridge. View to Southeast.

Figure 45. Features of SIHP # 50-80-08-5593 documented by Dega et al. (1998:16)