TCP Hawai‘i, LLC

Documenting Traditional Cultural Properties of Hawai‘i
Preserving and Restoring Cultural and Natural Resources of Hawai‘i

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November 15, 2021

To: **Lisa Kettley, PM (via email)**
Tetra Tech, Inc.
737 Bishop St., Suite 2340
Honolulu, Hawaii 96813

Re: **Letter Memo – Completion of Installation/Marking of Temporary (Construction) Preservation Buffer around SIHP # 50-80-09-2273, Features 14 (por.) & 19 in Support of Waiawa 2 Solar Project**

Aloha Ms. Kettley,

This letter memo with exhibits serves as notification of the recent completion of the installation of preservation buffers around the aforementioned site-features. The landowner is Kamehameha Schools. The temporary (construction) preservation buffers have been established in advance of construction and vegetation clearing associated with AES's Waiawa 2 Solar project.

The work was conducted according to the specifications described in an SHPD-accepted (Log No. 2015.01827, Doc No. 1509SL01 dated September 14, 2015) archaeological preservation plan (PP) by Monahan (2015) (the PP is attached to this letter memo). Specifically, a 10-foot buffer was marked around the entire site-feature #19 (reinforced slope/dam) and a 100-foot section of site-feature #14 (basalt-lined irrigation ditch).

The preservation buffers were physically established on October 22, 2021, by Dodge Watson and Fred LaChance, under my direct supervision.

Figure 1 shows the location of the two preservation buffers.

Figure 2 shows the two ends of the irrigation ditch section (portion of site-feature #14), recorded with sub-meter accurate Trimble GPS.

Figures 3 and 4 show a portion of the temporary buffer along the north side of site-feature 19.

Please let me know if you have any questions about this letter memo.

With aloha,

Christopher M. Monahan, Ph.D.
Principal Investigator, Archaeologist, TCP Hawai‘i, LLC
150 Hamakua Dr., #810, Kailua, HI 96734
(808) 754-0304, mookahan@gmail.com

c: Nick Molinari, AES

EXHIBIT "35"

Figure 1. Annotated aerial image showing location of temporary (construction) preservation buffers

Figure 2. Sub-meter accurate (Trimble) GPS points for the two ends of the preserved section of flume

Figure 3. North-facing rock-retaining slope at site-feature #19; facing south

Figure 4. Another view of north-facing rock-retaining slope at site-feature #19; facing south

FINAL

ARCHAEOLOGICAL PRESERVATION PLAN
STATE SITE NO. 50-80-09-2273
FEATURES 14 (PORTION), 19, 22 & 23 (PORTION)
KAMEHAMEHA SCHOOLS' LAND IN WAIAWA AHUPUA'A, 'EWA DISTRICT, O'AHU ISLAND, HAWAI'I

TMK (1) 9-6-004:024 (portion)

Prepared for:
Kamehameha Schools
567 South King Street, Suite 200
Honolulu, HI 96813

Prepared by:
Christopher M. Monahan, Ph.D.
TCP Hawai'i, LLC
333 Aoloa Street, #303
Kailua, HI 96734

May 2015

TABLE OF CONTENTS

LIST OF FIGURES

ABSTRACT — EXECUTIVE SUMMARY

TCP Hawai‘i has developed this Archaeological Preservation Plan for four features of State Site # 50-80-09-2273, an extensive system of infrastructure built, maintained and used by plantation workers to manage, store, transport and distribute water for commercial sugarcane. Part of the system may date to as early as the late 19th century, but the most formal components—and those that will be preserved as a result of this plan—date from the 1920s. This site complex and components of two other historic properties were identified in a recent Archaeological Inventory Survey by Monahan (2015). This plan includes (1) Feature 22, a large water-distribution and -retention basin of the plateau east of Gulch A, which will be preserved in its entirety; (2) a representative (75-ft. [25-m] long) section of Feature 23, a cut basalt and mortar irrigation ditch leading into the Feature 22 basin; (3) Feature 19, a large dam-like retention structure in the west end of Gulch B, which will be preserved in its entirety; and (4) a representative (100-ft. [30-m] long) section of Feature 14, a cut basalt and mortar irrigation ditch draining into Gulch B and directly associated with the Feature 19 dam. All of the components listed in HAR § 13-277 are described in this report.

INTRODUCTION

TCP Hawai‘i prepared this Archaeological Preservation Plan for four features of State Site # 50-80-09-2273, an extensive system of plantation infrastructure once used to irrigate commercial sugarcane. The site and features, which were built in the early 20th century, were identified during an Archaeological Inventory Survey (AIS) (Monahan 2015) of a 1,395-acre project area in Waiawa and Waipi‘o Ahupua‘a, ‘Ewa District, O‘ahu, TMK (1) 9-4-006:034 por., 035 por., 036, 037 por.; 9-6-004:024 por., 025, 026; 9-6-005:001 por. (Figure 1 through Figure 3). The landowner is Kamehameha Schools (KS). The AIS project area is the entire parcel subject to a recent Land Use Commission (LUC) review (KS' Motion to Amend Decision and Order – Ref. No. P-14388, LUC Docket No. A87-610), plus two existing access roads into the property and two linear transects (utility tie-ins for a proposed solar farm development project). SunEdison is working with KS and Hawaiian Electric Company to develop a 50 Megawatt solar facility on a portion of the LUC project area.

The AIS project area is just west of Pearl City, mauka[1] of the H-1 freeway and east of the H-2 freeway. The Waiawa Correctional Facility is a short distance north (mauka) of the AIS project area. The Waiāhole Ditch System (State Site # 50-80-09-2268) crosses Waiawa Ahupua‘a near the correctional facility. Nearly the entire project area (~90%) is in Waiawa Ahupua‘a; the rest is in Waipi‘o Ahupua‘a. Prior to the AIS fieldwork, based on archival research and previous archaeological surveys in the project area (Barrera 1987; Goodman and Nees 1991; Thurman et al. 2012), we believed there was a low potential for identifying traditional (precontact) Hawaiian sites: nearly the entire project area was mechanically grubbed, graded, plowed, planted and harvested repeatedly for at least 80 years starting in the late 19th century by commercial agriculture (first pineapple and then sugarcane). The ahupua‘a[2] of Waiawa above the H-1 was part of LCA 7713:46 to Victoria Kamāmalu, sister of Alexander Liholiho (Kamehameha IV) and Lot Kamehameha (Kamehameha V). Many small kuleana parcels were awarded makai (south) of the H-1 around Pearl Harbor. There are no other LCAs in the AIS project area.

Historic Preservation Context

As a privately-funded development on private land subject to a land use change, the project's AIS was designed to satisfy the general requirements of HRS § 6E-42 and HAR § 13-284; and the specific details in HAR § 13-276. In March, 2014, we initiated consultation with Susan Lebo, Ph.D., Lead O‘ahu Archaeologist, State Historic Preservation Division (SHPD), regarding the SunEdison solar project, 99% of which consists of previously-impacted (by commercial plantation agriculture) plateau lands. We obtained a determination letter (Log No. 2014.01283, Doc No. 1404SL16) dated April 21, 2014, in which SHPD concurred with our assessment recommending an AIS of the entire (447-acre) solar project area. SHPD also requested an opportunity to review and accept a report that detailed the findings of the AIS prior to commencement of any project construction-related ground-disturbing activity. In June, 2014, while we were completing this AIS, SHPD, in a letter to the State Office of Planning, commented (Log No. 2014.02357, Doc No. 1405GC14 dated June 12) on the subject LUC motion and recommended an AIS of the entire 1,395-acre project area. On July 8, 2014, we began additional AIS fieldwork needed to satisfy SHPD's recommendation. In April, 2015, we received SHPD's acceptance letter of the final AIS report for the entire project area (see Appendix A).

Based on the final, accepted AIS, mitigation for this project consists of preparation of an Archaeological Preservation Plan, written in accordance with HAR § 13-277, that will be implemented by the landowner and lessee (SunEdison) following approval from the SHPD. The subject report includes all relevant contents described in HAR § 13-277. Readers wanting additional details on the AIS should refer to Monahan (2015).

[1] Hawaiian words are not italicized since Hawaiian is an official state language rather than a "foreign" language.
[2] We do not systematically define all Hawaiian words or provide a glossary of definitions for the same reason we do not italicize Hawaiian words (see Pukui and Elbert 1986 or http://wehewehe.org/ for Hawaiian dictionaries).

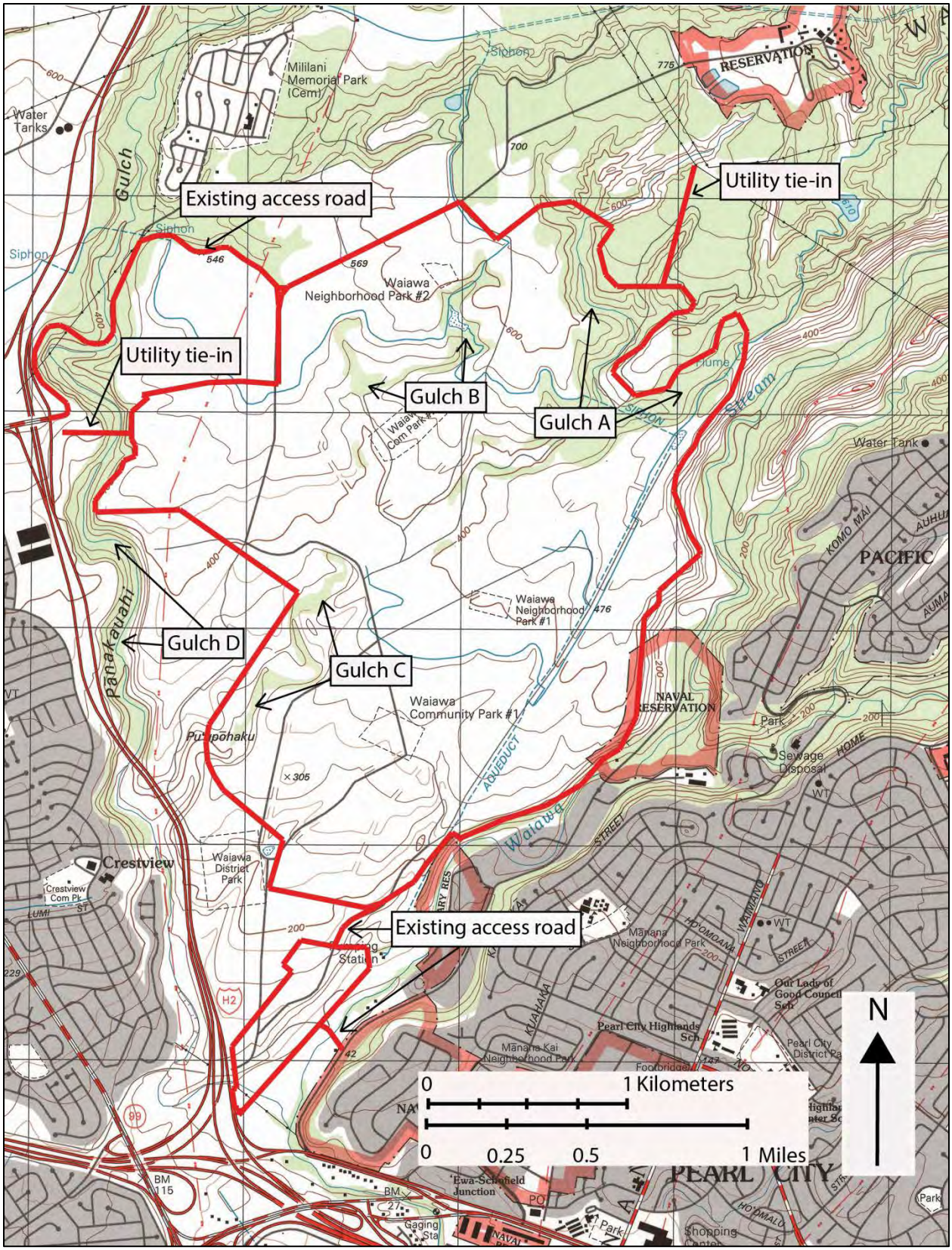

Figure 1. Project area depicted on a portion of USGS 7.5-minute series topographic map 1998 Waipahu quadrangle (base map, www.usgs.gov)

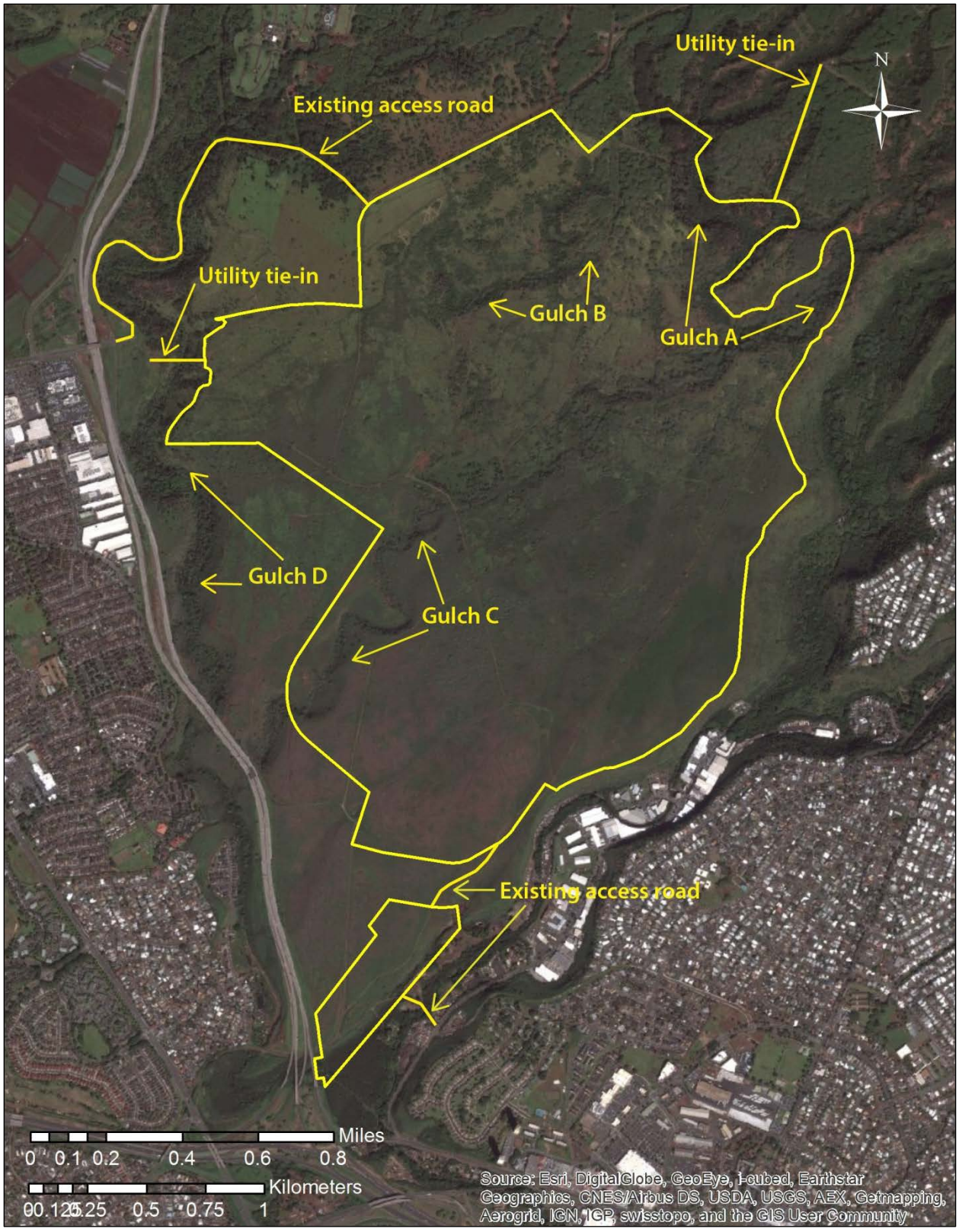

Figure 2. Project area depicted on aerial image (base map from ESRI)

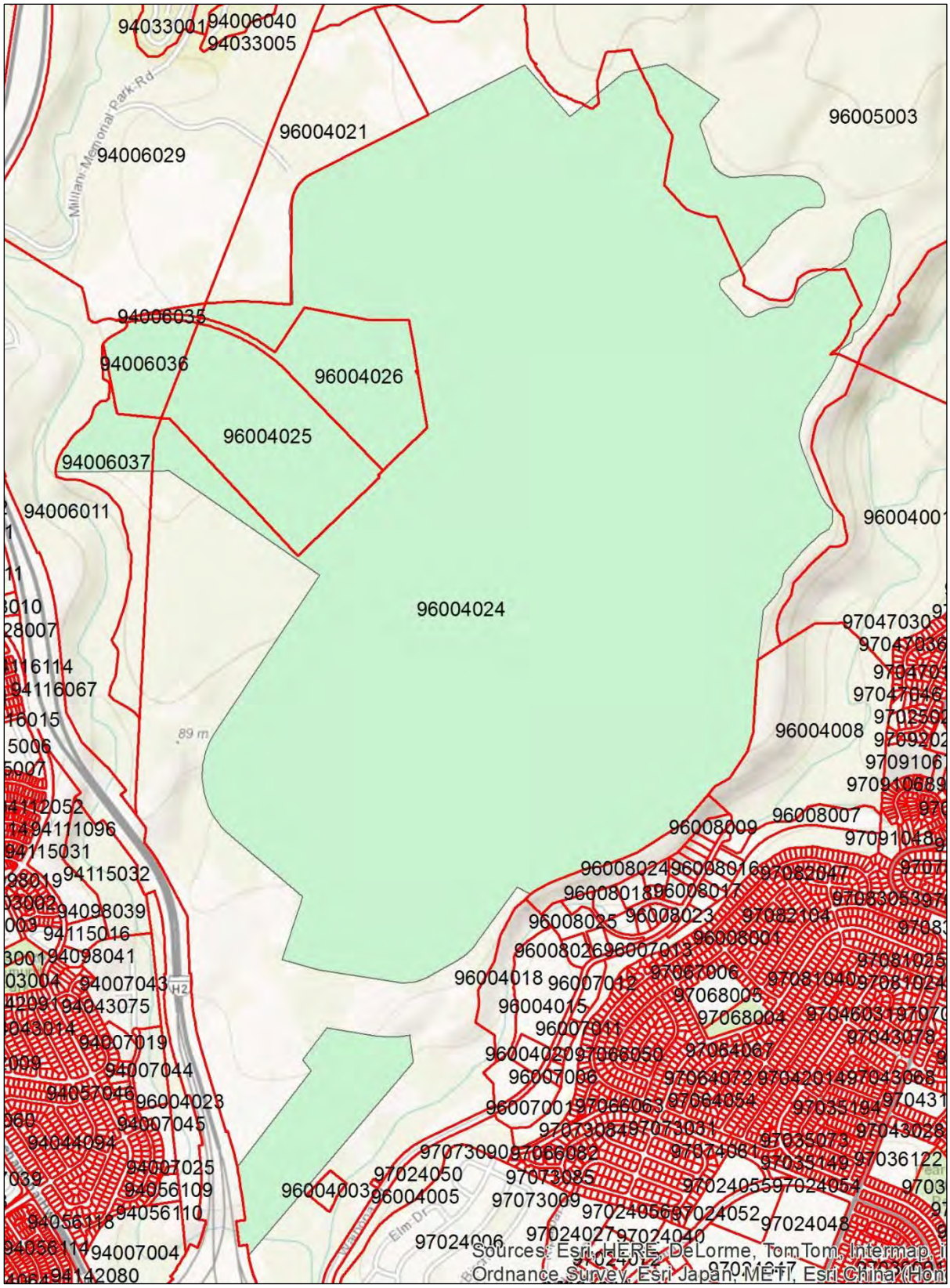

Figure 3. TMK map of the project area; data downloaded from City and County of Honolulu Office of Planning (http://planning.hawaii.gov/gis/download-gis-data/), processed using ESRI software

SITE AND FEATURE DESCRIPTIONS

This Archaeological Preservation Plan includes four features of the plantation irrigation complex, State Site # 50-80-09-2273: (1) Feature 22, a large water-distribution and -retention basin of the plateau east of Gulch A, one of the most formal structures in the project area, which will be preserved in its entirety; (2) a representative (75-ft. [25-m] long) section of Feature 23, a cut basalt and mortar irrigation ditch leading into the Feature 22 basin; (3) Feature 19, a large dam-like retention structure in the west end of Gulch B, which will be preserved in its entirety; and (4) a representative (100-ft. [30-m] long) section of Feature 14, a cut basalt and mortar irrigation ditch draining into Gulch B and directly associated with the Feature 19 dam. After describing Site 2273 in more detail, these four features are also described.

State Site # 50-80-09-2273

Site 2273 is an extensive system of infrastructure built, maintained and used by plantation workers to manage, store, transport and distribute water for commercial sugarcane. According to Goodman and Nees (1991), Site 2273 was initially built in the early 1900s by the Oahu Sugar Company as a network of ditches, flumes, siphons, reservoirs, pumping stations and a well. Based on our observations during the AIS fieldwork (Monahan 2015), the major components of Site 2273 were built after 1916, when completion of the Waiāhole Ditch made available large quantities of water from the Koʻolau Mountains. We documented inscribed dates as early as 1925 on some features of this system. Operation of this system may have been interrupted altogether or simply altered by World War II, when parts of the current project area and its environs were used for military training. After the war, sugarcane agriculture continued up to the 1970s.

Goodman and Nees (1991) identified a total of 35 features distributed over a larger (3,600-acre) project area compared with the current (1,395-acre) project area. Our survey resulted in the identification of 25 features, which extend all throughout the current project area; many of these features also continue outside of the project area to the north, west and south. We observed the following types of features: a concrete-lined retention basin; a large, dam-like feature associated with a retention basin; ferrous-metal siphons (80-cm diameter); cut basalt and mortar ditches; earthen ditches; prefabricated flumes; industrial-sized (hand-operated) valves; small culverts; and large, formally-constructed cut basalt and mortar water-distribution basins.

Because Goodman and Nees (1991:59, Figure 20) provided numbers for 35 features at Site 2273, but since it is not always clear which of these they actually observed in the field or which numbers correspond exactly to which features, we assigned new feature numbers. Wherever possible, we have also included what we believe the corresponding Goodman and Nees feature number is. Figure 4 and Figure 5 depict all sites and features identified in the AIS project area. Table 1 is a summary of Site 2273 features identified in the AIS project area.

Site 2273 was evaluated by TCP Hawaiʻi as significant under criteria c and d for its intrinsic informational value to research on Hawaiian history (d) and as exemplars of a distinctive construction method (c) using skillfully-shaped basalt blocks and mortar. In a letter (Log No: 2014.04229, Doc. No: 1504GC15) dated April 24, 2015, SHPD concurred with these significance assessments.

TCP Hawaiʻi documented 25 component features of this site, which provides important data on the geospatial location, extent and character of the plantation irrigation infrastructure in Waiawa Uka built around or shortly after 1916 by the Oahu Sugar Company; and, excluding the interruption of World War II, continued to be used into the 1970s. In the context of the nearby Waiāhole Ditch System (upslope and mauka of the current project area), Site 2273 played an important role in the early 20th century commercial development of Oʻahu and the Hawaiian Islands.

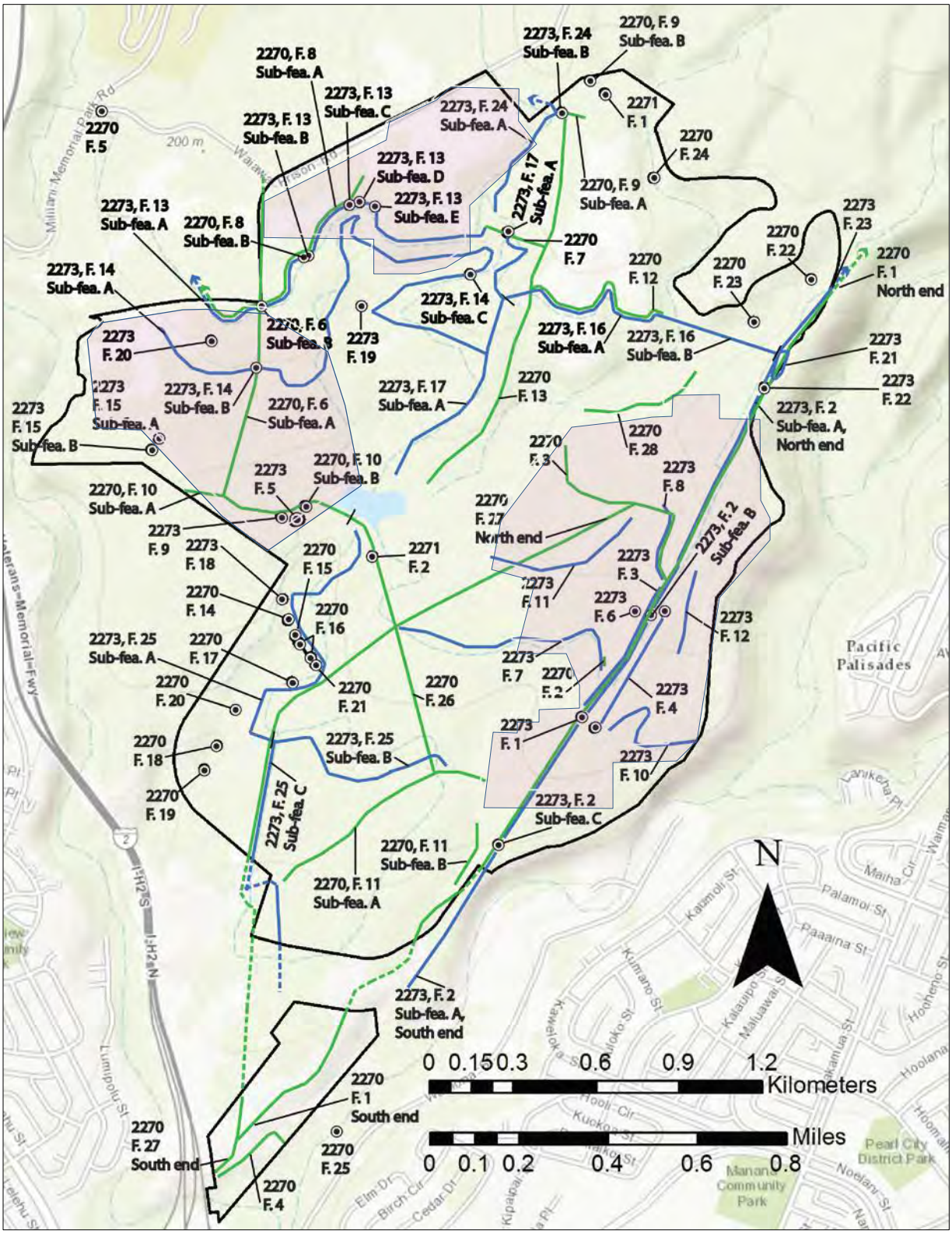

Figure 4. Historic properties and features identified in the AIS by TCP Hawai'i on a topographic map (base map from ESRI in ArcMap); LUC project area in black; SunEdison project area in light pink; roads in green; linear irrigation features in blue; dashed lines indicate feature continues out of project area

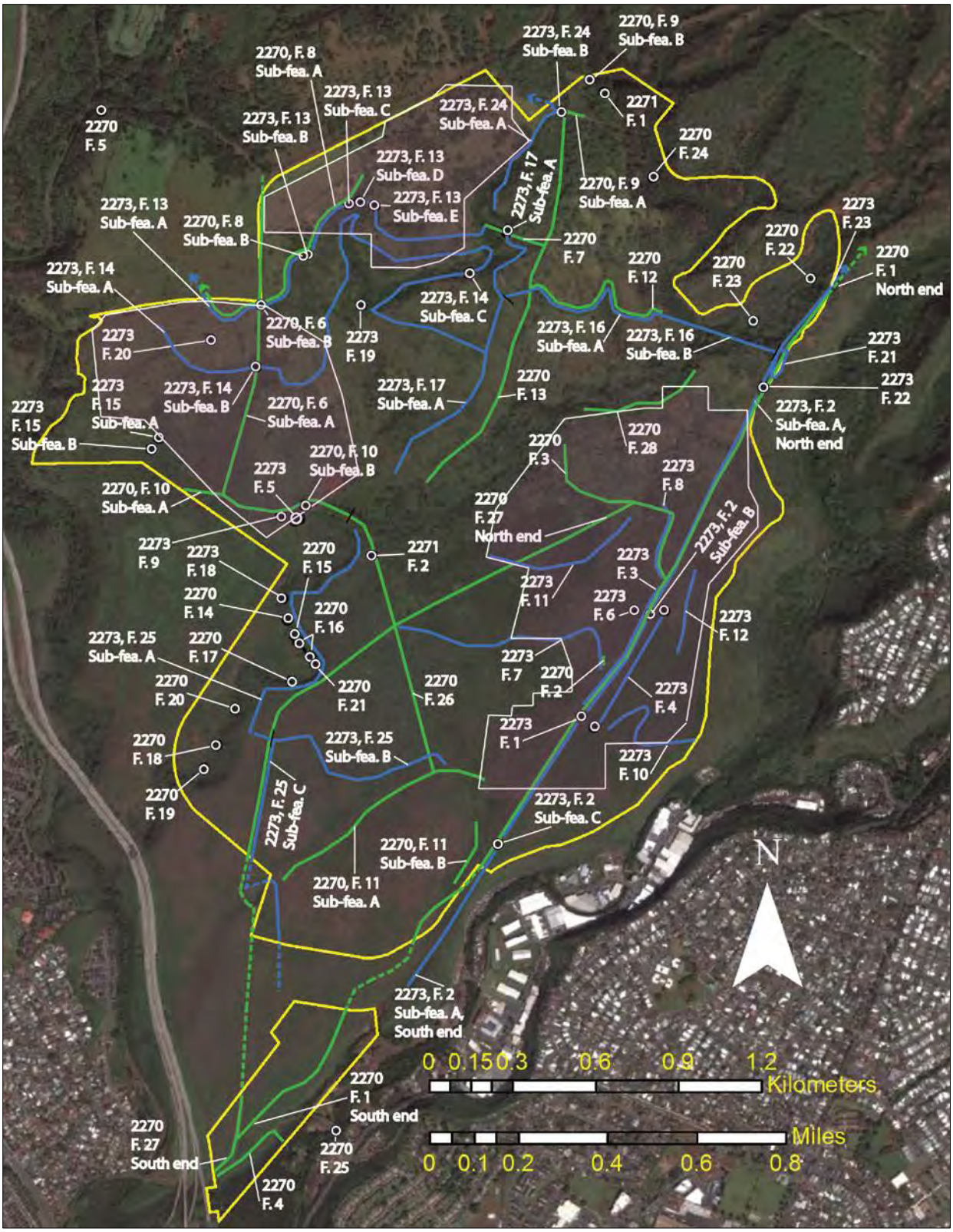

Figure 5. Historic properties and features identified in the AIS by TCP Hawai‘i on aerial image (base map from ESRI in ArcMap); LUC project area in yellow; SunEdison project area in light pink; roads in green; linear irrigation features in blue; dashed lines indicate feature continues out of project area

Table 1. Site 2273 Features Identified in the Current Project Area

Fea.	Other #[1]	Description	Dimensions (Area)	Comments
1	n.a.	Cut basalt and mortar water-distribution basin	10 m (NE/SW) by 7.5 m (NW/SE)	This is one of the most complex formal structures in the project area
2	32	Siphon (80-cm diameter pipe) oriented mauka-makai	2.0 km long (in the project area)	Pipe continues a short distance out of the project area to the south
3	?32	Siphon (80-cm diameter pipe) oriented mauka-makai	600 m long	Portions of this siphon were (by design) buried under an earthen road
4	n.a.	Prefabricated concrete flume (caulked sections)	800 m long	Runs east, upslope, and parallel to main earthen road (Feature 1, Site 2270)
5	n.a.	Prefabricated concrete flume (caulked sections)	20.5 m long	Feature is complete on its west end but broken on its east end
6	n.a.	Metal pole w. marker on concrete footing	5-m tall 3-in. diameter pipe	Possibly marking location of earthen ditch (see text)
7	34	Cut basalt and mortar ditch	970 m long	Partially filled in with sediment
8	?33	Cut basalt and mortar ditch	330 m long	Partially filled in with sediment
9	n.a.	Prefabricated concrete flume (caulked sections)	5.0 m long	Feature is complete on its west end but broken on its east end
10	n.a.	Earthen ditch	530 m long	Heavily overgrown with vegetation
11	33	Earthen ditch	500 m long	Heavily overgrown with vegetation
12	n.a.	Prefabricated concrete flume (caulked sections)	420 m long	Runs parallel up the slope just east of main earthen road (Feature 1, Site 2270)
13	28/31	Cut basalt and mortar ditch	1.5 km (in the project area)	Ditch continues out of project area to the west-northwest
14	27	Cut basalt and mortar ditch	3.4 km long	Ditch disappears in heavy ground cover, possibly buried by sedimentary deposition at its west end
15	n.a.	Earthen ditch ending in a 4-way sluice gate intersection	50 m long	Earthen ditches around 3 sides of the 4-way sluice gate are difficult to identify due to soil erosion and deposition
16	2	Combination cut basalt and mortar ditch and siphon	1.2 km long (ditch is 920 m long, siphon is 300 m long)	Feature traverses east half of project area from just below Gulch A to east end of Gulch B
17	?	Cut basalt and mortar ditch	1.3 km long	Connects Reservoir 1-A w. Reservoir 3
18	n.a.	Ditch-builders lithic processing area	26 m (N/S) by 14 m (E/W)	Abundant large flakes and debitage created with metal (presumably iron) tools

Fea.	Other #[1]	Description	Dimensions (Area)	Comments
19	6	Massive slope-retaining feature in Gulch B	38.0 m (E/W) by 33.0 m (N/S)	Part of a dam-like structure at the south end of Reservoir 1-B
20	n.a.	Prefabricated concrete flume (caulked sections)	25 m long	Upper end truncated by a modern (non-historic-age) road
21	8	Cut basalt and mortar lined reservoir	110 m (N/S) by 30 m (E/W)	According to historic maps from the 1930s, this is Reservoir 2-B
22	Part of 2 or 32?	Cut basalt and mortar water-distribution basin	16.0 m (N/S) by 13.0 (E/W)	One of the most complex formal structures in the project area
23	Part of 32?	Cut basalt and mortar ditch	360 m long	Connects with Feature 22 and is damaged on its south end
24	Part of 31	Basalt and mortar ditch	550 m long	Ditch uses natural (sub-rounded), rather than cut and dressed, boulders
25	35, 22	Cut basalt and mortar ditch	2.6 km long (includes 3 sections)	Ditch begins as a cut basalt and mortar ditch, changes into two earthen ditches

[1] Other # – Goodman and Nees (1991) feature number; n.a. = newly-identified feature (not mapped or described in Goodman and Nees); ? = we were unable to determine Goodman and Nees number

Feature 22

This is a large, formally-constructed water-distribution and -retention basin built of cut basalt and mortar in the northeast corner of the project area, on the elevated plateau east of Gulch A and west of a mauka-makai road (Feature 1, Site 2270) (Figure 6). Feature 22 connects with two other major components of the historic-era irrigation system: (1) a cut basalt and mortar ditch (Feature 23) oriented north to south; and (2) a siphon (Feature 2) oriented north to south that traverses nearly the entire east side of the project area. Feature 22 is inscribed with the date "1925," and is one of the earliest large-scale irrigation features built for commercial sugarcane following completion of the Waiāhole Ditch in 1916. Feature 22 consists of three sub-features, and occupies a maximum area of 16.0 m (N/S) by 13.0 m (E/W). It is in good physical condition, exception for a few areas of minor damage by vegetation growth. Other than California grass and koa haole, vegetation at this feature includes several large Christmas berry trees.

Sub-feature A, a rectangular cut basalt and mortar basin measuring 9.0 m (N/S) by 6.0 m (E/W), is connected with a section of flume (Sub-feature C) on its east side and Feature 23—a cut basalt and mortar ditch oriented north to south—on its west side (Figure 7). The wall height is 170 cm above the ground surface. On its east and southeast sides, the wall face is vertical (plumb) and 40 cm thick. The wall flares (tapers out at the base) on the west side, where it is 90 cm thick at the top and 130 cm thick at the base. The southwest wall, where the date "1925" is inscribed in mortar, is 90 cm thick. An old section of displaced ferrous-metal siphon is on the ground surface in the southwest (interior) corner of Sub-feature A, next to an outlet at the base of the wall, now sealed with concrete, that once housed the siphon. There is a rectangular sluice-gate opening along the west wall with two sets of sluice-gate grooves (each 4 cm thick) (Figure 8). These would have controlled water flow between Sub-feature A and the adjacent ditch (Feature 23). Portions of the west wall have been damaged by Christmas berry growth into its constituent rock and mortar. Another set of larger sluice-gate grooves (each 5 cm thick) is at the north end of this sub-feature, where Sub-feature B begins.

Sub-feature B, a triangular cut basalt and mortar connector between the rectangular basin (Sub-feature A) and the adjacent ditch (Feature 23), tapers down from a height of 170 cm above the ground surface (at its south end) to 60 cm above ground surface (at its north end), where it opens into the ditch designated Feature 23 (Figure 9). The west wall of Sub-feature B is constructed in a very unique way, tapering down to a sharp point in both plan and profile perspectives. Another inscribed "1925" is located atop this west wall (Figure 10).

Sub-feature C, a relatively narrow and shallow flume section, constructed mainly of vertically-positioned sections of concrete slabs (seams caulked with mortar), is built off the southeast corner of the main retention basin (Sub-feature A), and separated from it by a pair of sluice-gate grooves (each 3 cm thick), as an overflow device. The far (east) end of this flume is not truncated or damaged by the adjacent earthen road, but, rather, there is a constructed end to this flume. This east end, and the west end around the sluice gate, is partially constructed of cut basalt and mortar as well as the concrete slabs. This sub-feature has a concrete slab bottom; thus, it has a "U"-shaped cross section.

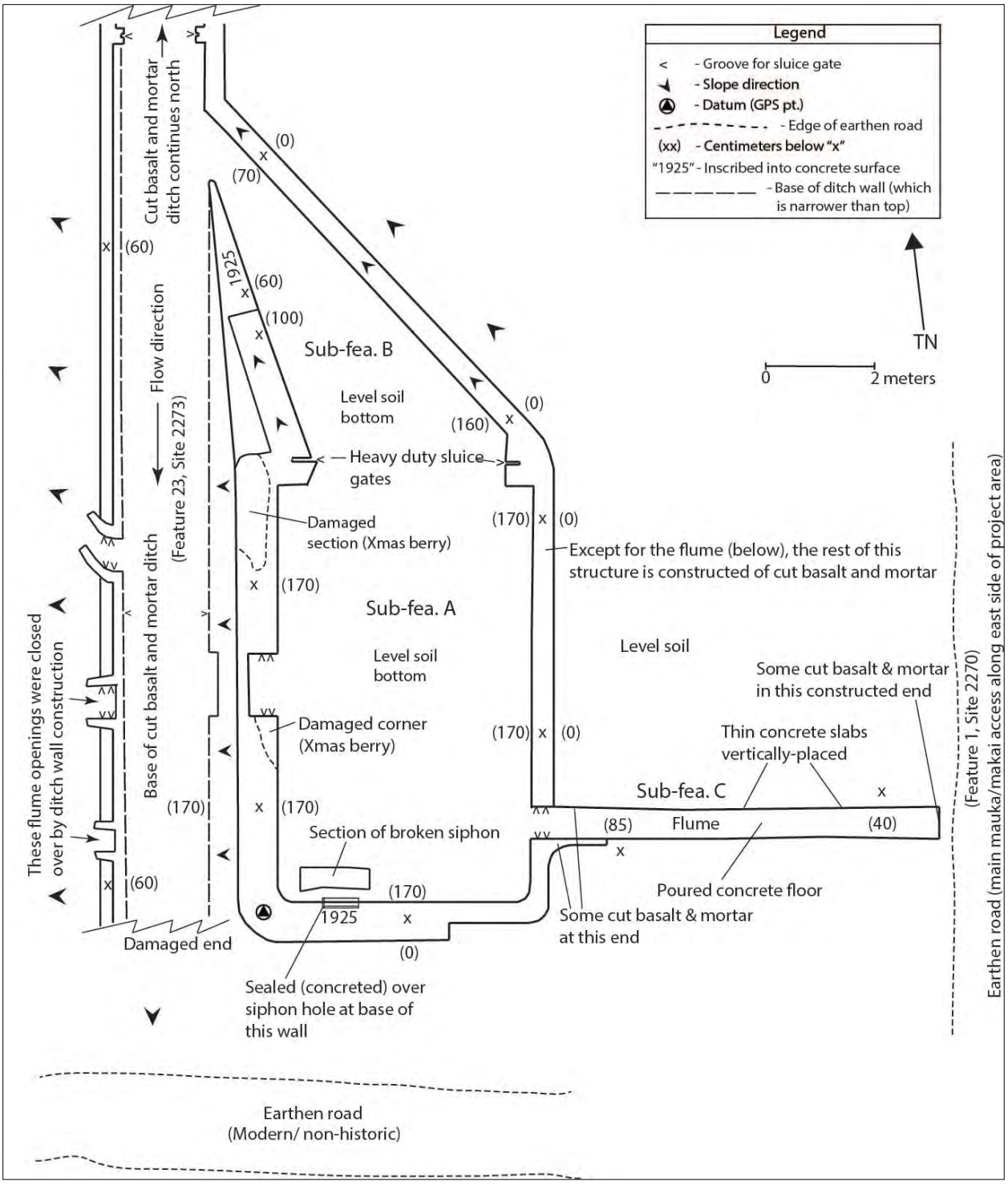

Figure 6. Plan view Feature 22, Site 2273

Figure 7. Cut basalt and mortar ditch (Feature 23, Site 2273) running parallel to Feature 22 and connecting with it by way of the sluice gate at Sub-feature A and the large opening to the left (tall grass) into Sub-feature B, view south; vertical scale bar is 80

Figure 8. Portion of the west wall, Feature 22, Sub-feature A, Site 2273, view northwest; measuring tape is 170 cm high

Figure 9. Opening to the north end of Feature 22, Sub-feature B, view south-southwest; vertical scale is 80 cm high

Figure 10. Inscription on the top of the south wall at Feature 22, Sub-feature A

Feature 23

Feature 23 (Figure 11, and see Figure 7), a typical cut basalt and mortar ditch, is approximately 360 m long from its south end at the large retention basin described above (Feature 22) to where it continues out of the project area to the north. This ditch is relatively narrow, compared with others in the project area; it is approximately 100 cm wide at its interior base, increasing to 130 cm at its interior top. It is currently approximately 80 cm deep, from the top of its structural work to the ground surface in the ditch. When originally constructed, it was about 1.0 m deep. The plan view of its south end shows it has been damaged and truncated by a modern earthen road to the south. The plan view also depicts three small flume openings that would have sent water over the ground surface to the west. Two of these flume openings were constructed over (sealed up) by rock work and mortar in the past.

Figure 11. Representative portion of Feature 23, Site 2273, view north; vertical scale bar is 80 cm high, horizontal measuring tape is 100 cm long

Feature 19

Feature 19 is a massive rock retaining structure with a culvert underneath leading to a hand-operated valve and siphon built and used by plantation workers along the south bank of Gulch B, near its west end. The location of this feature corresponds with the south edge of Reservoir 1-B, suggesting it functioned as a type of dam that could be used to control the level of water in the reservoir with an outlet on the south side (i.e., the siphon valve) to send water over the ground surface in that direction. This is one of the most impressive plantation structures in the project area, and certainly *the* most impressive dry-stacked feature.

This feature, which occupies an area of approximately 38.0 m (E/W) by 33.0 m (N/S) and has portions that are 5.0–6.0 m above the ground surface, consists of three sub-features that collectively represent the remnants of a heavy-duty water diversion, collection and redistribution structure (Figure 12 and Figure 13). In general, this feature is in good to fair physical condition with some naturally-collapsed sections. Numerous, large Christmas berry trees growing into the top of the main retaining structure (Sub-feature A) have caused significant damage, which is ongoing. Compared with most other features in the project area, the vegetation at Feature 19 is relatively sparse and ground visibility is good.

Sub-feature A, the main slope-retaining structure and dam, is constructed of large, cut and dressed basalt boulders fitted onto the steep, natural gulch slope as a kind of heavy-duty veneer; our inspection of this feature, which was relatively difficult and dangerous to accomplish given the steep, slippery slope, indicates there is only one layer of fitted boulders directly over the earthen slope. No mortar was used during construction of this sub-feature. Sub-feature A measures approximately 38.0 m (E/W) by 11.0 m (N/S) by 5.0–6.0 m high (Figure 14). As depicted in the schematic profile below, there is a constructed low ridge between the longer, western portion of this structure and the eastern portion. The culvert travels under this low ridge to the south where it eventually emerges near the siphon valve (Sub-feature C).

Sub-feature B, a culvert passing under Sub-feature A from north to south, has an intake/ opening constructed of shaped basalt slabs and a water conduit constructed of a ferrous-metal siphon (pipe) measuring 80 cm in diameter and 22.5 m long (N/S) (Figure 15). The opening of the culvert on the north side of Sub-feature A is a semi-circular, earthen depression measuring approximately 150 cm in diameter and 140 cm deep. This was once a water catchment where excess gulch water drained through the culvert to the other side of the retaining structure where it collected in a small earthen pool to be siphoned further down the plateau south of Feature 19.

Sub-feature C is a large, hand-operated valve that appears to be made of iron (Figure 16). A manufacturer's stamp on this valve reads as follows: "CHAPMAN VALVE M.F.G. CO., BOSTON, U.S.A." The area between this valve and the back (south) side of Sub-feature A is heavily eroded and channelized. A gently-sloping, partially level soil area immediately west of this valve appears to be the remnants of an old bulldozed access road. The area in and around this possible road is heavily eroded and difficult to definitively describe. We did not find the other (south) end of the siphon that goes through this valve; we presume its other end is buried downslope under modern sedimentary deposition in heavy vegetation.

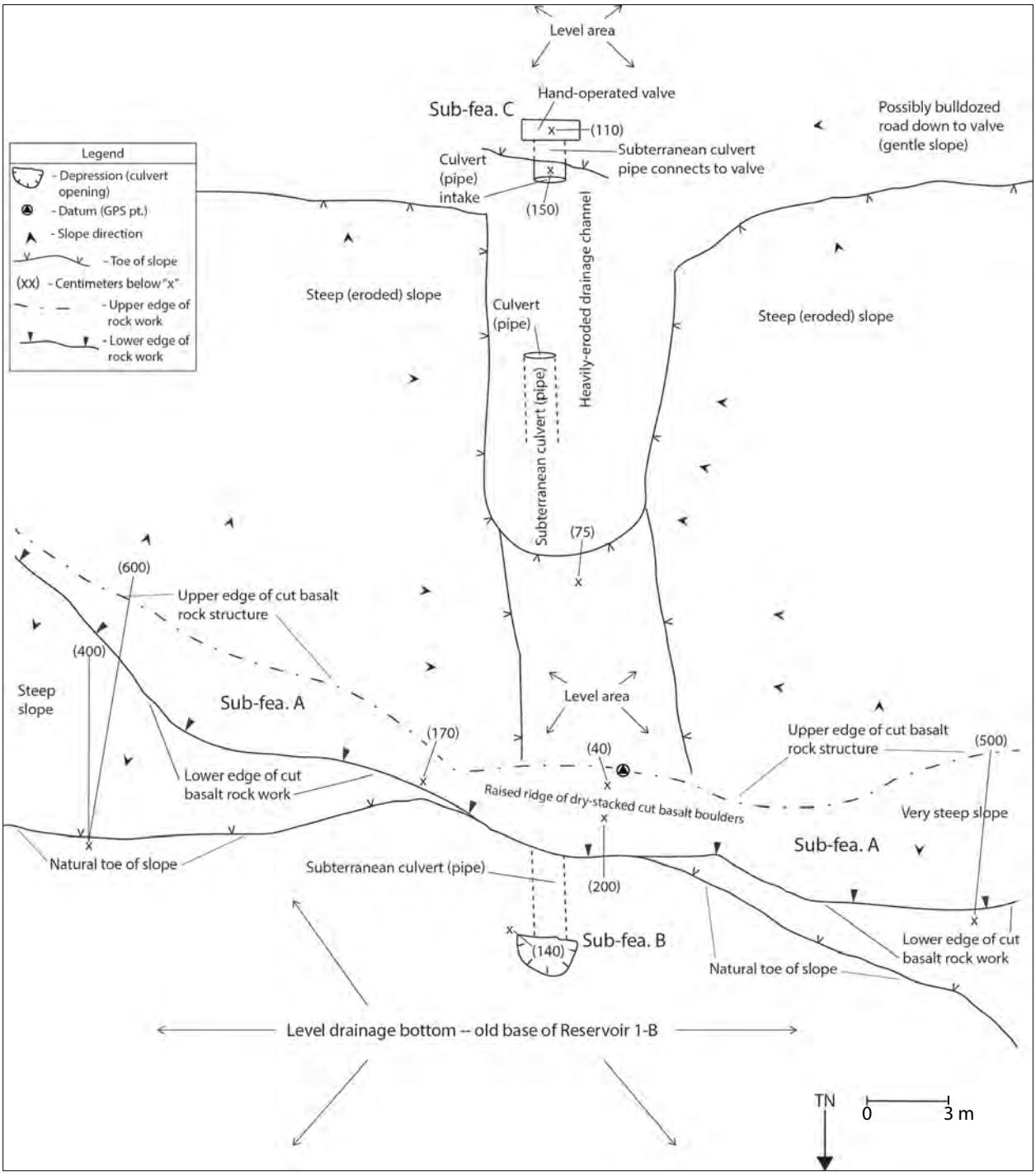

Figure 12. Plan view Feature 19, Site 2273

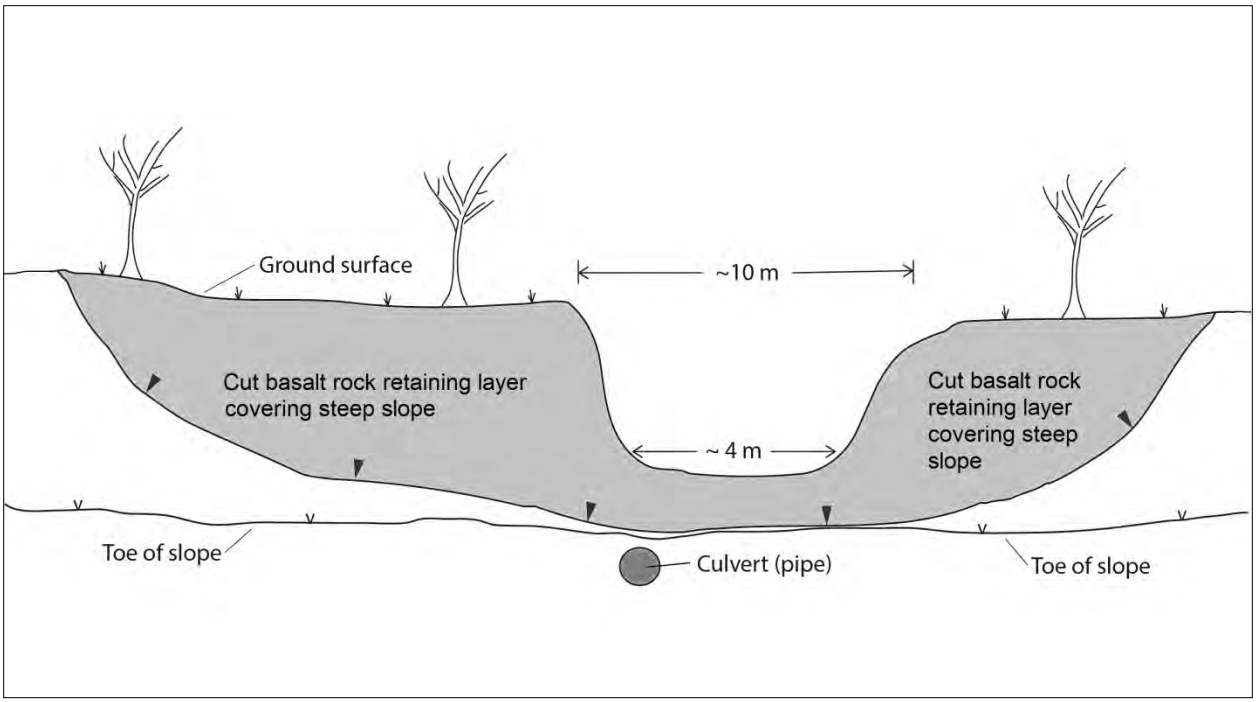

Figure 13. Schematic--<u>not to scale</u>--profile of Feature 19, Site 2273, view south

Figure 14. Portion of west half of Feature 19, Sub-feature A (main retaining structure), Site 2273, view east; scale bar is 120 cm high

Figure 15. Feature 19, Sub-feature B (constructed culvert opening), Site 2273, view south; scale bar is 80 cm high

Figure 16. Feature 19, Sub-feature C, Site 2273, view south; vertical scale bar is 80 cm high

Feature 14

Feature 14 is a very long ditch with cut basalt and mortar sides and a constructed cut basalt and mortar base. We identified three sub-features.

Sub-feature A, the main ditch, is oriented (like Feature 13, which is just upslope) generally east to west across the project area, starting from Reservoir 1-A in the east and eventually exiting the project area in the west. Unlike Feature 13, the east end of Feature 14 is more complex as it makes one large "switch back" between Reservoir 1-A and Reservoir 1-B. The eastern portion of Feature 14, from the south end of Reservoir 1-A, then passing by the east side of Reservoir 1-B, eventually meets up with a mauka-makai oriented irrigation ditch (Feature 17) heading down to Reservoir 3. The west end of Feature 14, as it nears the project area boundary, disappears and may be buried under sedimentary deposition. The entire length of Feature 14, as can be currently identified on the landscape, is approximately 3.4 km (0.8 km on the west side of road Feature 6, and 2.6 km on the east side of this road). Portions of Feature 14 follow along parts of the upper (north) edge of Gulch B. When in operation, the Feature 14 ditch connected with both Reservoir 1-A and Reservoir 1-B. Its maximum exterior width is 185 cm; the interior top of the feature measures 160 cm across; the interior base is 130 cm wide. Depending on the amount of post-abandonment sedimentary deposition within the ditch, its interior height ranges from 60–80 cm. Its depth was originally approximately 1.0 m (Figure 17). Other than being partially buried by sediment in some places, this sub-feature is generally in good physical condition.

Sub-feature B is a culvert under the road Feature 6 (Site 2270) and a cut basalt and mortar sluice gate on the south side of the main ditch (Figure 18). The 80-cm (diameter) concrete pipe underneath the road is nearly completely filled in with sediment. The constructed sluice gate heading south extends for approximately 3.0 m then transitions into an earthen ditch. Both the formal sluice gate and the earthen ditch parallel the road (Feature 6, Site 2270). From the main ditch (Sub-feature A) to the end of the cut basalt and mortar sluice gate, Sub-feature B is approximately 3.0 m long, 65–70 cm wide and 80–85 cm high. This sub-feature is in good physical condition. A pair of sluice-gate grooves are located on either side of the north end of the Sub-feature B sluice gate, and the main ditch (Sub-feature A) also has a set of sluice-gate grooves on either side of the opening to the sluice gate.

Sub-feature C is a sluice gate along a "switch back" section of the main ditch traversing the southern edge of Gulch B. This sluice gate structure is unusual in the project area as it diverts water from the main ditch to the *north*, rather than the south; in this case, it empties water into the Gulch B drainage which eventually flowed west-southwest into Reservoir 1-B (Figure 19). This sub-feature is in poor physical condition, having sustained extensive damage from being located on a steep slope (down to the north into Gulch B) that has eroded over time.

Sub-feature C consists of three main components. A cut basalt and mortar sluice gate with wooden sluice gates still in place is located at the top of the slope, built off the main ditch (Figure 20). This upper sluice gate is oriented to north to south. It is approximately 1.5 m long, 50 cm wide and 50 cm high. The west side of this constructed sluice gate is badly damaged and falling down the slope. At the bottom of the slope, a lower sluice gate constructed of relatively thin concrete slabs empties into the gulch bottom (Figure 21). This lower sluice gate is approximately 1.5 m long, 75 cm wide and 40 cm high. Between these two sluice gates, there is a concrete deflection wall that functioned to slow down the water pouring out of the upper sluice gate. Some of this water diverted to the west, as evidenced by an earthen erosional ditch, and some of it flowed down to the next (lower) sluice gate. This heavily-damaged deflection wall is approximately 2.5 m long (E/W) by 30–90 cm thick by 160 cm high.

Figure 17. Representative section of Feature 14, Sub-feature A, Site 2273; view southeast; scale bar is 80 cm high

Figure 18. Feature 14, Sub-feature B, Site 2273, view southeast; culvert under road Feature 6 (Site 2270) is to the left, downslope sluice gate (paralleling the road) is to the right; main ditch (Sub-feature A) continues to the west (lower right in this image); scale bar is 120 cm high

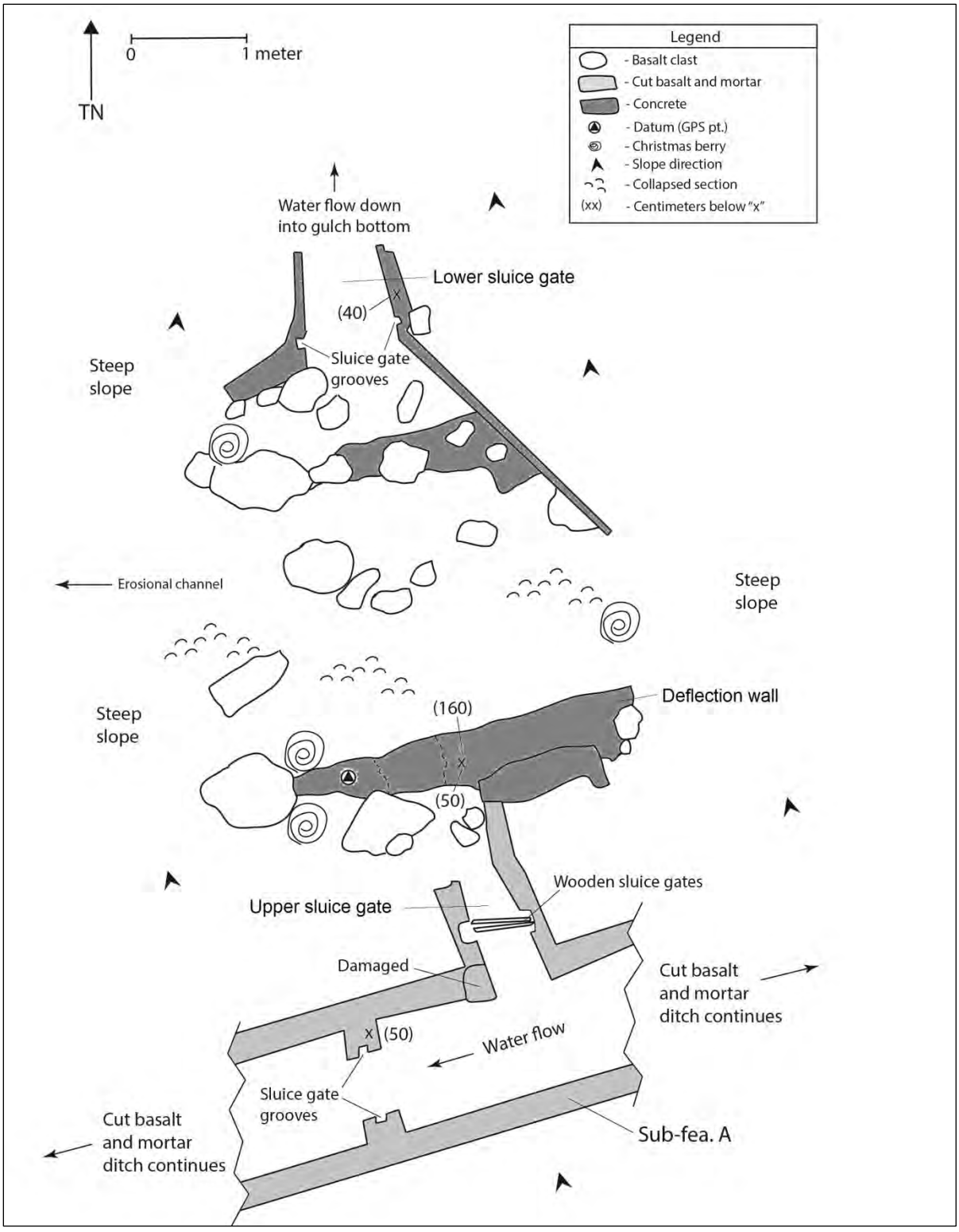

Figure 19. Plan view Feature 14, Sub-feature C, Site 2273

Figure 20. Main ditch (Sub-feature A) and upper (south) portion of Feature 14, Sub-feature C (damaged sluice gate), Site 2273, view east; horizontal scale bar is 120 cm long

Figure 21. Lower (north) portion Feature 14, Sub-feature C, Site 2273, view south; vertical scale bar is 120 cm high; damaged deflection wall is in the middle ground (directly behind the vertical scale bar)

PRESERVATION MEASURES

This section is based on HAR § 13-277. Features 19 and 22 will be preserved in their entirety; a 75 ft. (25 m) long section of Feature 23 (ditch extending 1,180 ft. [360 m] overall) will be preserved; and, a 100 ft. (30 m) long section of Feature 14 (ditch extending 2.1 miles [3.4 km] overall) will be preserved.

Form of Preservation (HAR § 13-277-3)

A Preservation Plan shall identify for each significant historic property which forms of preservation will be implemented. For all four of the features in this plan, we propose "avoidance and protection" as the only form of preservation.

Buffer Zones (HAR § 13-277-4)

According to the preservation rule, each significant historic property buffer zones and depict them on a map of sufficient scale. With the exception of one side of one feature (i.e., a small portion of the east side of Feature 22), all preserved features, or portions of preserved features (as with the two cut basalt and mortar ditches [Features 14 and 23] for which a representative section only will be preserved), shall be surrounded on all sides by a buffer of at least 10 ft. (3 m). We prefer to use English, rather than metric, measurements for the buffers because they will most likely be marked in the field by contractors who are more familiar with feet than meters. Buffers of 10 feet are more than adequate for these features, which are neither fragile—compared with traditional, dry-stacked Hawaiian features, for example—nor difficult to see or avoid on the landscape. As described below (see "Long-term preservation measures"), these buffers will be physically marked on the landscape by permanent fencing. Map depictions of the buffers and specifications for the fencing are described in the section on long-term preservation.

Interim (Short-term) Protection Measures (HAR § 13-277-5)

The rule also states that short-term protection measures are required for significant historic properties that will be near a construction area. None of the four features described in this plan are within the construction footprint for the proposed solar project. However, in March, 2015, while the AIS for this project was still under review, we decided to proactively protect Feature 19 because it is somewhat close to both Phase I construction footprints; and because of the nature of the construction activity we were protecting it against: tree cutting of large trees whose limbs may extend a long distance laterally.[3] To prevent any inadvertent damage to the significant historic property, we installed orange construction fencing around the south and west sides of Feature 19, even though the proposed construction footprint was more than 125 meters away. The fencing (short-term buffer) was established at least 10 ft. (3 m) away from any portion of Feature 19.

On March 9, 2015, Chris Monahan walked to Feature 19 with land surveyors from Sam O. Hirota, Inc. Monahan selected three points that were then staked, flagged and mapped in by Hirota staff using a surveyor-grade GPS (Trimble) device. On March 18, a crew under contract with SunEdison, armed with the GPS data from Hirota and a graphic depiction of how the fencing should be installed (Figure 22), erected approximately 230 feet of orange construction fencing using standard metal stakes, connecting the three points that were previously staked, flagged and recorded with GPS (Figure 23 and Figure 24). Feature 19 only needed to be fenced on two sides (the south and west) because the other sides drop into a deep gulch that will not be impacted in any way by proposed construction.

SunEdison shall ensure the orange construction fencing is intact and in good working order throughout the course of construction activities; shall place avoidance instructions on construction plans and specifications; and shall conduct a pre-construction briefing of the hired construction firms to make them aware of the preservation buffer.

[3] SunEdison needed to conduct tree cutting (leaving intact the lower 5 feet of the trees) by March in order to avoid adverse impacts to bat pupping.

Long-term Preservation Measures (HAR § 13-277-6)

The preservation rule lists eight measures that need to be addressed:

(1) Maintenance measures to be followed – The fencing that marks the permanent buffer shall be maintained in good working order by the landowner, who shall conduct periodic inspections of the preservation fencing and make repairs as needed. As described above, the permanent buffer shall be placed at a minimum of 10 ft. from the structural boundaries of each preserved feature or portion thereof. The one exception to this "10-foot rule" is a small portion of the east side of Feature 22, where the main mauka-makai road, an important fire-break access road within the project area, is just a few feet from the end of the feature. The road cannot be moved to the east, because it is located along the top of the plateau edge (i.e., the terrain east of the road drops precipitously into the steep and deep Waiawa Stream gorge). Figure 25 to Figure 27 depict the permanent (long-term) buffers for the features or portions thereof described in this plan. As stated above, and depicted in the figures below, a 75 ft. (25 m) section of Feature 23 will be preserved; and, a 100 ft. (30 m) section of Feature 14 will be preserved. The permanent fencing shall be constructed of durable materials whose appearance is consistent with the early 20th century features it surrounds. For example, it should not consist of chain link fencing. It should consist of t-post or wood post with barbed wire or hog wire.

(2) Methods for clearing vegetation – As long as the fencing is installed and maintained as described above, there is no need for vegetation maintenance at the preservation features.

(3) The manner in which litter is controlled – As long as the fencing is installed and maintained as described above, there is no need for a litter control plan at the preservation features. The project area, in general, is remote and access is very limited with both of the vehicular entrances controlled by locked gates.

(4) Access to the site and possible use of the site for cultural practices, if appropriate – There are no ongoing cultural practices associated with these features.

(5) Approaches to interpret and inform the public about the site, if appropriate – There is no public access to this project area, and no interpretative programs or signage is planned.

(6) Permanent marked markers, if appropriate – No markers are planned at these preservation features. The fenced buffers shall be recorded internally by the landowner and communicated to their lessees.

(7) If appropriate, provisions to address potential future impacts and site stability – As long as the fencing is installed and maintained as described above, there is no need to mitigate future impacts and site stability.

(8) Provisions for reasonable monitoring of site integrity by the person or agency, and SHPD inspection to assure compliance – As part of its periodic inspection of the fencing marking the permanent buffers, the landowner shall report to SHPD any new damage or impacts to the preservation features; in consultation with SHPD, corrective measures may be taken.

Penalties due to non-compliance are discussed in HAR § 13-277-8, and apply to the implementation of the preservation measures described in this plan.

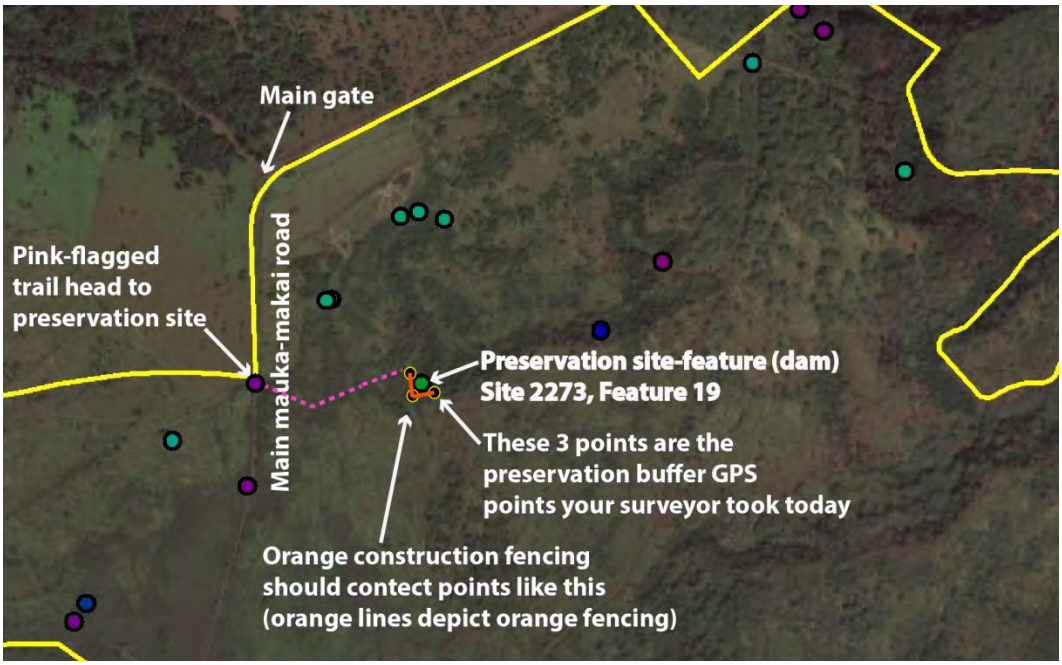

Figure 22. Simplified graphic depiction of how the interim (short-term) buffer at Feature 19 was installed using orange construction fencing between the three GPS points

Figure 23. Top (east) end of the south section of fencing installed as a temporary buffer at Feature 19 on March 18, 2015; facing northeast

Figure 24. Looking down the installed fencing at Feature 19 from the east end of the south section (same as above, from a different angle); facing west-southwest

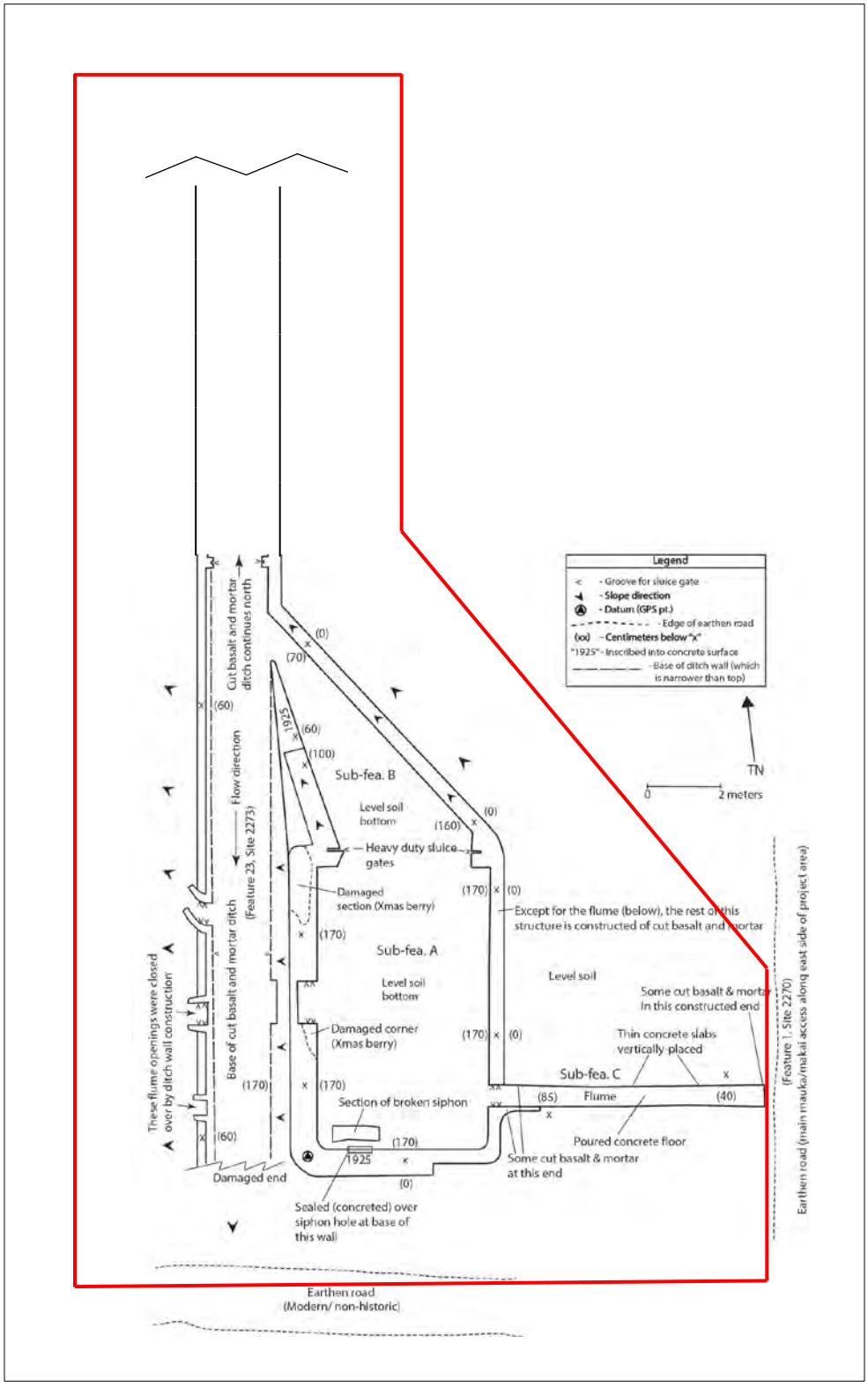

Figure 25. Long-term preservation buffer (red line) around Feature 22 and a portion of Feature 23; buffer measures a minimum of 10 ft. (3 m) from the structural edges of the features

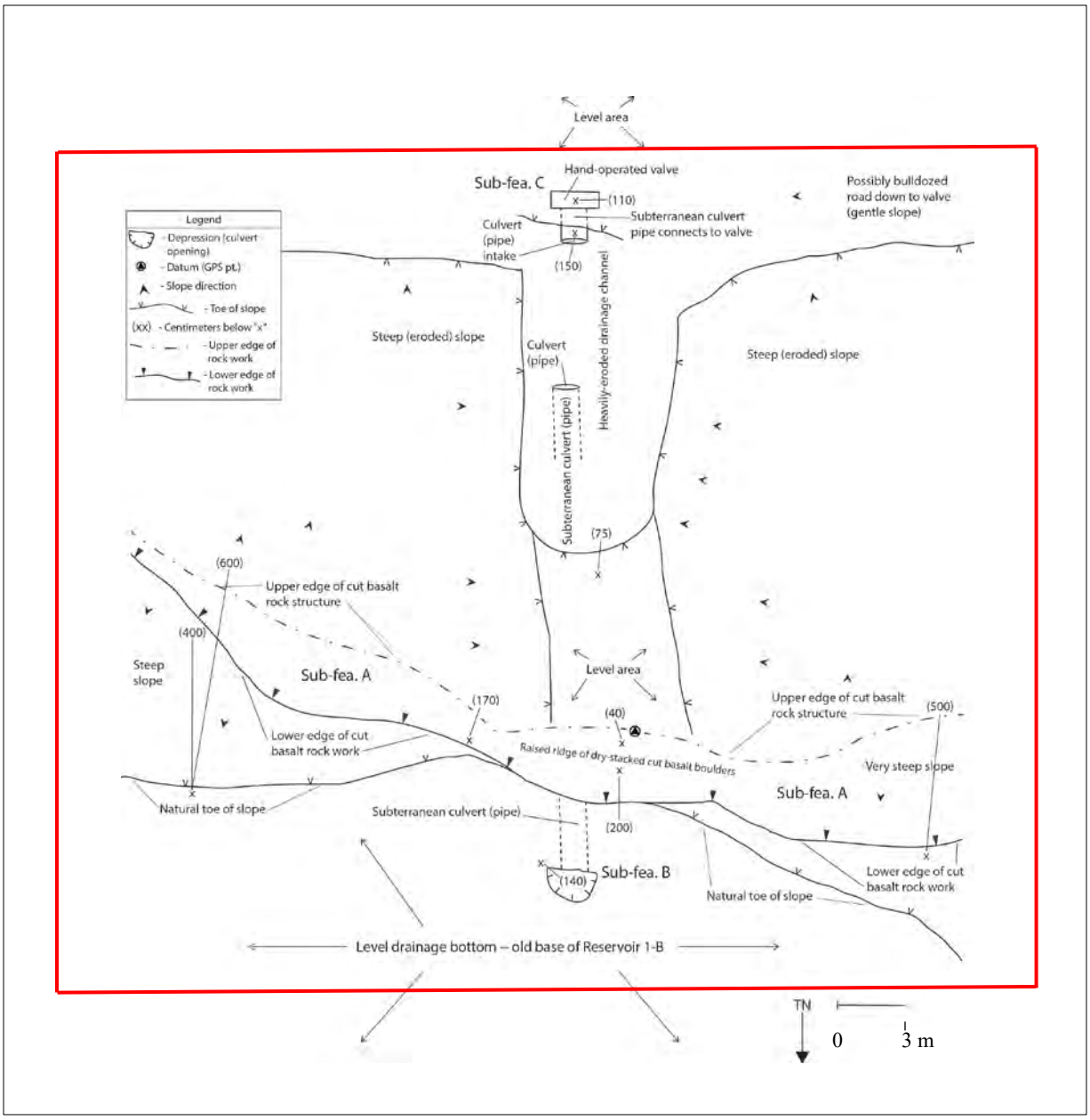

Figure 26. Long-term preservation buffer (red line) around Feature 19; buffers measures a minimum of 10 ft. (3 m) from the structural edges of the feature

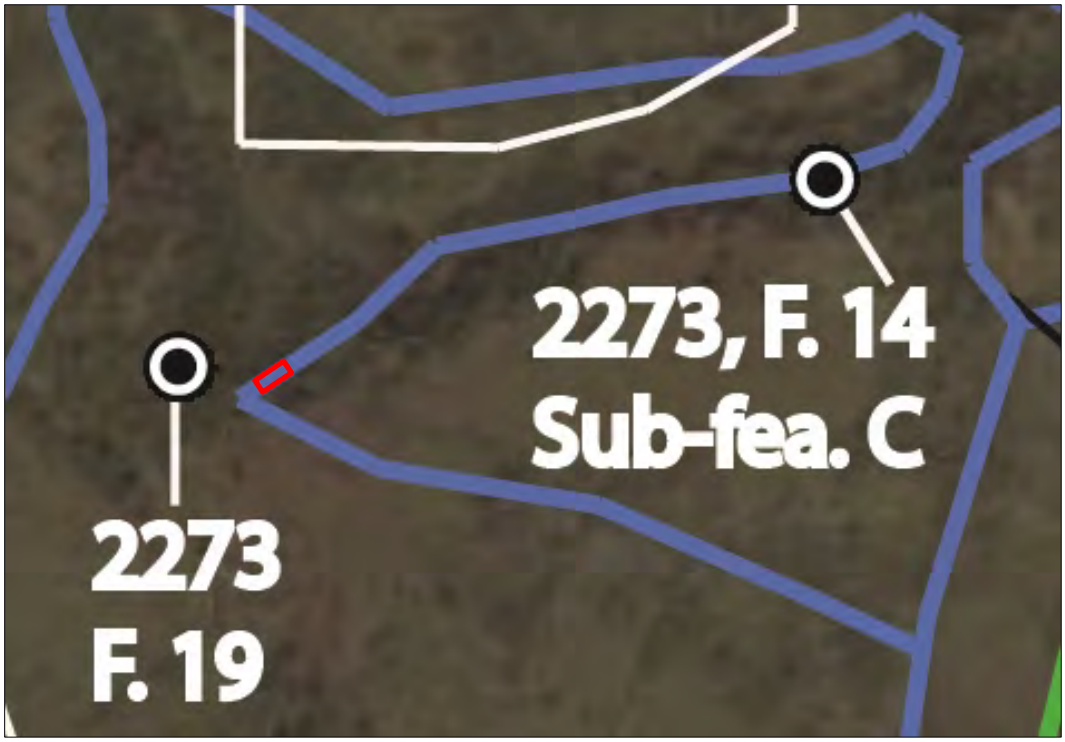

Figure 27. Long-term preservation buffer (red line) around a section of cut basalt and mortar ditch, Feature 14, just east of Feature 19 (dam-like retention structure); buffer measures 100 feet (30 m) long and extends 10 ft. (3 m) beyond the sides of the ditch (to the NW and SE)

CONCLUSION

TCP Hawai‘i has developed this Archaeological Preservation Plan for four features of State Site # 50-80-09-2273, an extensive system of infrastructure built, maintained and used by plantation workers to manage, store, transport and distribute water for commercial sugarcane. Part of the system may date to as early as the late 19th century, but the most formal components—and those that will be preserved as a result of this plan—date from the 1920s. This site complex and components of two other historic properties were identified in a recent Archaeological Inventory Survey (AIS) by Monahan (2015). SHPD's acceptance letter of the AIS is in Appendix A.

This plan includes the following four features: (1) Feature 22, a large water-distribution and -retention basin of the plateau east of Gulch A, and one of the most formal structures in the project area, which will be preserved in its entirety; (2) a representative (75-ft. [25-m] long) section of Feature 23, a cut basalt and mortar irrigation ditch leading into the Feature 22 basin; (3) Feature 19, a large dam-like retention structure in the west end of Gulch B, which will be preserved in its entirety; and (4) a representative (100-ft. [30-m] long) section of Feature 14, a cut basalt and mortar irrigation ditch draining into Gulch B and directly associated with the Feature 19 dam.

As described in detail on pp. 23–24 and graphically depicted on pp. 25–29, we propose "avoidance and protection" as the only form of preservation. With one exception (a short section along the east side of Feature 22, where there is no room for an expanded buffer), permanent buffers of at least 10 ft. (3 m) are described, justified and depicted (see Figure 25, Figure 26 and Figure 27). In March, 2015, as discussed on p. 23, SunEdison (with our assistance) proactively installed a temporary (short-term) buffer (orange construction fencing) at Feature 19 in advance of tree cutting. We propose the installation of permanent fencing, built with materials and methods that are consistent with the early 20th century features it surrounds; and, periodic inspections by the landowner, who shall insure the fencing is maintained in good working order, and report to SHPD any new damage or impacts to the preservation features. Other long-term preservation measures listed in HAR § 13-277, as applicable, are described on p. 24.

REFERENCES CITED

Barrera, W.

1987 Waiawa Ridge, Oahu: Archaeological Survey of Proposed Golf Course. Chiniago, Inc., Honolulu.

Goodman, W., and R. Nees

1991 *Archaeological Reconnaissance and Inventory Surveys of 3,600 Acres in Waiawa Ahupua‘a, ‘Ewa, O‘ahu*, manuscript 022892. Public Archaeology Section, Applied Research Group, Bishop Museum, Honolulu.

Monahan, C.M.

2015 Archaeological Inventory Survey of 1,395 Acres of Kamehameha Schools’ Land in Waiawa and Waipi‘o Ahupua‘a, ‘Ewa District, O‘ahu Island, Hawai‘i, TMK (1) 9-4-006:034 por., 035 por., 036, 037 por.; 9-6-004:024 por., 025, 026; 9-6-005:001 por. TCP Hawai‘i, Kailua, Hawai‘i.

Thurman, D.W., C.R. O’Hare, and C.M. Monahan

2012 Archaeological Reconnaissance Survey of 1,680 Acres of Kamehameha School Lands in Waiawa Ahupua‘a, ‘Ewa District, Island of O‘ahu, TMK [1] 9-4-006:034, 036, 037, 9-6-004:024 & 025. Cultural Surveys Hawai‘i, Kailua, Hawai‘i.

APPENDIX A: SHPD'S ACCEPTANCE LETTER OF THE AIS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD, STE 555
KAPOLEI, HAWAII 96707

April 24, 2015

Chris Monahan, PhD, Principal
TCP Hawai'i LLC
333 Aoloa Street, #303
Kailua, HI 96734

LOG NO: 2014.04229
DOC NO: 1504GC15
Archaeology, Architecture

Dear Dr. Monahan:

SUBJECT: **Chapter 6E-42 Historic Preservation Review**
Archaeological Inventory Survey of 1,395 Acres of Kamehameha Schools' Lands
Waiawa and Waipi'o Ahupua'a, 'Ewa District, Island of O'ahu
TMK: (1) 9-4-006:034, 035, 036, 037; 9-6-004:024, 025, 026; 9-6-005:001

Thank-you for the opportunity to review the draft report titled *Archaeological Inventory Survey of 1,395 Acres of Kamehameha Schools' Land in Waiawa and Waipi'o Ahupua'a, 'Ewa District, O'ahu Island, Hawai'i* (Monahan, September 2014). We received this submittal on September 16, 2014; revised materials on January 10, 2015, and on March 23, 2015. SHPD requested an archaeological inventory survey be conducted due to the potential for proposed project plans to affect historic properties (June 12, 2014; Log No. 2014.02357, Doc. No. 1405GC14). The landowner, Kamehameha Schools (KS), proposes to develop a 50 megawatt solar facility on a portion of the property.

The archaeological inventory survey (AIS) provided surface coverage of the entire 1,395-acre project area which included two existing access roads and two proposed utility tie-ins. Subsurface testing consisted of a single hand-excavated unit placed to examine whether a small, dry-stacked terrace in Gulch C (Site 50-80-09-2273, Feature 21) was pre-Contact or plantation-era in age and association. Large-scale non-historic properties identified within the project area include recent earthen roads with low berms formed when the roads were graded or scraped; evidence of recent modification by civil engineers to control flooding of the landscape near two of the old reservoirs, Gulch C (Reservoir 3 on historic maps) and Gulch B (Reservoir 1-A on historic maps), and a long, heavily-built earthen berm in the northwest portion of the property, north of Gulch A, in an area of former workers' camp.

The AIS indicates that three previous archaeological surveys have included portions of the current project area (Barrera 1987, Goodman and Nees 1991, and Thurman et al. 2012). Portions of a data recovery project also extended into the current project area (Sinoto and Pantaleo 1994, 1995). Five historic properties (Sites 50-80-09-2262, 2270, 2271, 2272, and 2273) have been documented within or extending into the current project area. Of these, three were further documented during the current AIS (Sites 2270, 2271, and 2273); not further documented were Site 2262 (a small lithic scatter) and Site 2272 (WWII and later military concrete buildings and stock pile areas); Site 2262 was fully collected during the Goodman and Nees (1991) survey, and no evidence was found of possible Site 2272 features within the three areas previously identified in Figure 7 as having been used for military storage. Based on the current AIS documentation, Site 2270 is a network of roads and railroad right-of-ways consisting of 28 features, Site 2271 is the remains of workers' camps and other facilities represented by two extant features, and Site 2273 is an irrigation system consisting of 25 features. The most significant features of Site 2271–the Japanese cemetery (Feature 3) and the cannery (Feature 1)–were subject to data recovery work by Sinoto and Pantaleo (1994, 1995). No historic properties were newly identified during the current AIS.

Pursuant to Hawaii Administrative Rule (HAR) §13-284-6, Site 2270 is assessed as significant under Criterion d for its informational value regarding geospatial location, extent, and character of the plantation roads and temporary railroad in Waiawa built around or just after the turn of the 19th/20th century. Site 2273 is assessed as significant under Criterion c for its distinctive construction method and Criterion d for its information value. Like Site 2270, Site 2273 provides important data on geospatial location, extent, and character of the plantation irrigation infrastructure in Waiawa Uka built by the Oahu Sugar Company and its association with the nearby Waiāhole Ditch System (upslope and *mauka* of the current project area). Site 2271 Feature 1 (structural remnants) is assessed as significant under Criterion d for its information content relative to plantation working conditions in the early to middle 20th century, while Site 2271 Feature 2 (camp debris) is assessed as not significant. Per HAR §13-284-7, the project effect determination is "effect, with proposed mitigation commitments." Of the three historic properties, no further work is recommended for Site 2270 and Site 2271 which are assessed as having yielded their informational and research value. The proposed mitigation is "*preservation of certain features of Site 2273*." The specific features are: (1) Feature 22, a large water-distribution and -retention basin of the plateau east of Gulch A, and one of the most formal structures in the project area; (2) a representative section of Feature 23, the cut basalt and mortar irrigation ditch leading into the Feature 22 basin; (3) Feature 19, a large dam-like retention structure in the west end of Gulch B; and (4) a representative section of Feature 14, Sub-feature 3, the cut basalt and mortar irrigation ditch draining into Gulch B and directly associated with the Feature 19 dam. We concur with the site significance assessments and the mitigation commitments.

The AIS report provides an excellent discussion of the project area, physical environs and cultural history background, previous investigations, the project methods and findings, and the site significance assessments and mitigation recommendations. The report meets the requirements of HAR §13-276-5. **It is accepted by SHPD**. Please send one hardcopy of the document, clearly marked FINAL, along with a copy of this review letter and a text-searchable PDF version on CD to the Kapolei SHPD office, attention SHPD Library.

As stipulated in HAR §13-284-7(e), when SHPD comments that the project will have an "effect, with agreed upon mitigation commitments," then detailed mitigation plans shall be developed for SHPD review and acceptance. Per HAR §13-284-8(a)(1)(A), the agreed-upon mitigation measure for this project is preservation of specific features of Site 2273. Pursuant to HAR §13-284-8(e)(5), we look forward to receiving an archaeological preservation plan that meets HAR §13-277.

Please contact Jessica Puff at (808) 692-8023 or at Jessica.L.Puff@hawaii.gov if you have any questions or concerns regarding architectural features. Please contact me at (808) 692-8019 or at Susan.A.Lebo@hawaii.gov if you have any questions or concerns regarding this letter.

Aloha,

Susan A. Lebo

Susan A. Lebo, PhD
Oahu Lead Archaeologist
Acting Archaeology Branch Chief