

---

**ARCHAEOLOGICAL SUBSURFACE SURVEY IN AREAS B  
THROUGH F AT MAKUA MILITARY RESERVATION, MĀKUA  
AHUPUA‘A, WAI‘ANAE DISTRICT, O‘AHU ISLAND, HAWAI‘I  
TMK: 08-02-001**

---

Prepared for:

Directorate of Public Works  
Environmental Division  
US Army Garrison, Hawai‘i  
Schofield Barracks, 96857



Revised February 2015



ARCHAEOLOGICAL SUBSURFACE SURVEY IN AREAS B  
THROUGH F AT MAKUA MILITARY RESERVATION, MĀKUA  
AHUPUA‘A, WAI‘ANAE DISTRICT, O‘AHU ISLAND, HAWAI‘I

Prepared by:

Alton J. Exzabe B.A.  
Richard D. Davis M.A.

Directorate of Public Works  
Environmental Division  
Cultural Resources Section  
US Army Garrison, Hawai‘i  
Schofield Barracks, 96857

Revised February 2015



## **EXECUTIVE SUMMARY**

The US Army Garrison, Hawai'i's (USAG-HI) Cultural Resources Section (CRS) has conducted an archaeological subsurface survey in the Makua Military Reservation (MMR). This survey was conducted in accordance with the June 20, 2012 ruling by Judge Susan Oki Mollway of the United States District Court for Hawaii in the case of Malama Makua v. Gates. This report complies with the court's order for the Army to complete subsurface archaeological surveys of Areas A through F as identified in Exhibit 1 to Dr. Laurie Lucking's April 7, 2010 deposition, in accordance with the terms and conditions set forth in paragraph 6(c) of the 2001 Settlement Agreement and paragraphs 1, 5, and 9 of the 2007 Settlement Agreement. The subsurface survey was carried out in accordance with the provisions of Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended; the Archaeological Resources Protection Act of 1979 (ARPA), and its implementing regulations.

This project implemented the Army's 2001 and 2007 Settlement Agreements with Malama Makua to complete "surface and subsurface" archaeological surveys of all areas within the Company Combined-Arms Assault Course circumscribed by the south firebreak road," except for areas suspected of containing ICMs (Improved Conventional Munitions). A subsurface survey was conducted from November 2005 to December 2006 for all areas in which there were no surface archaeological features and in areas in close proximity to these features (USAG-HI 2007). On October 27, 2010, the U.S. District Court found that Areas A to F were not surveyed as agreed upon. The ruling required the Army to conduct a subsurface survey of Areas A through F taking into account safety considerations and restrictions. The decision led to the 2012 Order. The CRS conducted the subsurface survey of area B through F. Area A was not surveyed because the USAG-HI Safety Director determined Area A not safe for survey, consistent with the method used in 2005.

Fieldwork was conducted between May and December 2013. This subsurface survey covered by this report found no subsurface archaeological features or intact cultural deposits. The findings of this survey are consistent with the conclusions of the previous study that in this area cultural deposits are absent where no surface features were present.

A total of 113 Shovel Test Probes (STPs) were selected for the random sample. Of these, 83 STPs were excavated and 30 STPs were not excavated due to one or more of the reasons set out in the research design. Previously unidentified surface features, remnants of shallow terraces, were found near STP locations C6 and D6. These

features are immediately adjacent to sites -4542 and -4545 and within the site protection markers already in place.

Charcoal fragments found to have originated from native and Polynesian introduced woods were recovered from STP E6. Charcoal from unidentified sources was also present in STP C28, but neither sample was associated with cultural deposits. These charcoal samples cannot date significant cultural activity due to lack of association. STP C37 contained one artifact, a hammer stone. This single artifact was not within a layer with other cultural deposits or associated with other features. This location is not considered to be an archaeological site based on the single artifact.

With respect to long-term management, the boundaries of sites -4542 and -4545 will be adjusted to encompass the two terrace remnants. The site protection markers do not need to be adjusted as the areas marked with Seibert Stakes already include the two terrace features.

# TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY .....</b>	<b>I</b>
<b>TABLES.....</b>	<b>V</b>
<b>FIGURES .....</b>	<b>V</b>
<b>INTRODUCTION.....</b>	<b>1</b>
<b>PROJECT DESCRIPTION.....</b>	<b>1</b>
<b>PHYSICAL ENVIRONMENT.....</b>	<b>5</b>
<b>GEOLOGY.....</b>	<b>5</b>
<b>SEDIMENTS.....</b>	<b>5</b>
<b>CLIMATE.....</b>	<b>7</b>
<b>VEGETATION.....</b>	<b>7</b>
<b>HISTORY AND LAND USE .....</b>	<b>7</b>
<b>TRADITIONAL .....</b>	<b>7</b>
<b>PLACE NAMES.....</b>	<b>10</b>
<b>HISTORIC ACCOUNTS.....</b>	<b>11</b>
<b>POPULATION .....</b>	<b>11</b>
<b>LAND COMMISSION AWARDS .....</b>	<b>11</b>
<b>RANCHING.....</b>	<b>12</b>
<b>MILITARY.....</b>	<b>12</b>
<b>PREVIOUS ARCHAEOLOGY .....</b>	<b>13</b>
<b>SETTLEMENT PATTERN MODEL.....</b>	<b>13</b>
<b>PREVIOUS SUBSURFACE TESTING AND SURVEY.....</b>	<b>20</b>

<b>METHODS AND PROCEDURES .....</b>	<b>21</b>
<b>RESEARCH ISSUES.....</b>	<b>21</b>
<b>FIELD METHODOLOGY.....</b>	<b>21</b>
STRATIFIED RANDOM SAMPLING .....	21
ROLES AND RESPONSIBILITIES OF THE FIELD ARCHAEOLOGIST .....	29
DATA COLLECTION AND FIELD METHODS.....	29
<b>RESULTS .....</b>	<b>31</b>
<b>EXCAVATED STP.....</b>	<b>35</b>
<b>UNEXCAVATED STP.....</b>	<b>52</b>
<b>LABORATORY ANALYSIS .....</b>	<b>64</b>
<b>ARTIFACTS .....</b>	<b>64</b>
<b>CONCLUSIONS AND RECOMMENDATIONS.....</b>	<b>67</b>
<b>FIGURE 50 MAP SHOWING SEIBERT STAKE LOCATIONS AND STP C6 AND D6</b>	<b>68</b>
<b>REFERENCES.....</b>	<b>69</b>
<b>APPENDIX A: EXHIBIT 1 OF THE APRIL 7, 2010, DEPOSITION OF LAURIE LUCKING.....</b>	<b>71</b>
<b>APPENDIX B: RANDOMLY GENERATED NUMBERS .....</b>	<b>73</b>
<b>APPENDIX C: INADVERTENT DISCOVERY PLAN .....</b>	<b>79</b>
<b>APPENDIX D: SOIL DESCRIPTION TABLE .....</b>	<b>82</b>
<b>APPENDIX E: TAXA IDENTIFICATION REPORT .....</b>	<b>94</b>
<b>APPENDIX F: RISK ANALYSIS FOR ENTRY INTO AREA A.....</b>	<b>97</b>
<b>APPENDIX G: PUBLIC REVIEW .....</b>	<b>100</b>

## TABLES

Table 1 Sediment types at MMR.....	5
Table 2 Vegetation found at MMR.....	7
Table 3 Place Names associated with MMR and surrounding areas.....	10
Table 4 Known archaeological sites located at MMR.....	15
Table 5 Shovel Test Probe Summary.....	31
Table 6 STP B1 Sediment Description.....	36
Table 7 STP B2 Sediment Description.....	37
Table 8 STP B3 Sediment Description.....	38
Table 9 STP B16 Sediment Description.....	39
Table 10 STP B29 Sediment Description.....	40
Table 11 STP C28 Sediment Description.....	41
Table 12 STP C37 Sediment Description.....	43
Table 13 STP D4 Sediment Description.....	45
Table 14 STP E2 Sediment Description.....	46
Table 15 STP E6 Sediment Description.....	47
Table 16 STP F3 Sediment Description.....	50

## FIGURES

Figure 1 Project Location.....	3
Figure 2 Soil types at MMR.....	6
Figure 3. Archaeological sites in the vicinity of the project area.....	19
Figure 4 Subsurface Survey, Areas B-F.....	22
Figure 5 Subsurface Survey, Area B.....	23
Figure 6 Subsurface Survey, Area C.....	24
Figure 7 Subsurface Survey, Area D.....	25
Figure 8 Subsurface Survey, Area E.....	26
Figure 9 Subsurface Survey, Area F.....	27
Figure 10 Map of STP Locations.....	34
Figure 12 Profile of STP B1.....	36
Figure 11 Photo of STP B1.....	36
Figure 13 Photo of STP B2.....	37
Figure 14 Profile of STP B2.....	37
Figure 15 Profile of STP B3.....	38
Figure 16 Profile of STP B3.....	38
Figure 17 Profile of STP B16.....	39
Figure 18 Photo of STP B16.....	39
Figure 19 Photo of STP B29.....	40
Figure 20 Profile of STP B29.....	40
Figure 21 Photo of STP C28.....	41

Figure 22 Profile of STP C28 .....	41
Figure 24 Map of STP C28.....	42
Figure 24 Profile of STP C37 .....	43
Figure 25 Photo of STP C37 .....	43
Figure 26 Map of STP C37.....	44
Figure 27 Photo of STP D4 .....	45
Figure 28 Profile of STP D4 .....	45
Figure 29 Photo of STP E2 .....	46
Figure 30 Profile of STP E2.....	46
Figure 31 Photo of STP E6 .....	47
Figure 32 Profile of STP E6.....	47
Figure 33 Map of STP E6.....	49
Figure 34 Profile of STP F3.....	50
Figure 35 Profile of STP F3.....	50
Figure 36 STP B5, located on edge of road cut and steep slope. STP indicated by orange flag	53
Figure 37 STP B13, located in drainage. STP location indicated by orange flag .....	54
Figure 38 STP B14 located in drainage. STP indicated by orange flag .....	55
Figure 39 STP B26, located in Kalena stream. STP located between yellow flagging .....	56
Figure 40 STP D1, located on steep slope. STP indicated by orange flag.....	57
Figure 41 STP D11, located on steep slope and in wash. STP indicated by orange flag .....	58
Figure 42 STP E1, located in wash. STP location indicated by orange flag.....	59
Figure 43 STP C6, located near an unrecorded remnant terrace. STP indicated by pink flag and arrow.....	60
Figure 44 The remnant terrace near STP C6 is less than 7m from the boundary of site -4545..	61
Figure 45 STP D6, located on unrecorded rock and earthen terrace. STP location indicated by orange flag.....	62
Figure 46 The terrace near STP D6 is less than 12m from the boundary of site -4542.....	63
Figure 47 Artifact MMR2013-1 .....	65
Figure 48 Artifact MMR2013-1, showing base.....	65
Figure 49 Map showing STP 37 which is less than 20m from the boundary of site -4546.....	66
Figure 50 Map showing Seibert stake locations and STP C6 and D6.....	68

## **INTRODUCTION**

The US Army Garrison, Hawai'i's (USAG-HI) Cultural Resources Section (CRS) has conducted an archaeological subsurface survey in the Makua Military Reservation (MMR). This survey was conducted in accordance with the June 20, 2012 ruling by Judge Susan Oki Mollway of the United States District Court for Hawaii in the case of Malama Makua v. Gates. This report complies with the court's order for the Army to complete subsurface archaeological surveys of Areas A through F as identified in Exhibit 1 to Dr. Laurie Lucking's April 7, 2010 deposition, in accordance with the terms and conditions set forth in paragraph 6(c) of the 2001 Settlement Agreement and paragraphs 1, 5, and 9 of the 2007 Settlement Agreement.

The subsurface survey was coordinated and overseen by the USAG-HI's Interim Cultural Resources Manager (CRM), Richard Davis, as the Principal Investigator meeting the minimum professional qualifications for archaeology under Secretary of Interior's Standards (36 CFR, part 61). In addition, the CRM served as the Quality Assurance/Quality Control (QA/QC) manager for all archaeological work. The subsurface survey was carried out in accordance with the provisions of the Antiquities Act of 1906; Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended; the Archaeological Resources Protection Act of 1979 (ARPA), and its implementing regulations.

## **PROJECT DESCRIPTION**

This project implemented the Army's 2001 and 2007 Settlement Agreements with Malama Makua to complete "surface and subsurface" archaeological surveys of all areas within the Company Combined-Arms Assault Course circumscribed by the south firebreak road," except for areas suspected of containing ICMs (Improved Conventional Munitions). A subsurface survey was conducted from November 2005 to December 2006 for all areas in which there were no surface archaeological features and in areas in close proximity to these features (USAG-HI 2007). The survey's objective was to determine a presence or absence of intact cultural deposit within the project area where no surface features were apparent due to either the natural deterioration of surface structures or other effects from the change in use of the area over time. Findings showed that in areas where no surface features were present, no intact cultural deposits were found and that known site boundary buffers are accurately depicted.

On October 27, 2010, the U.S. District Court found that Areas A to F (Appendix A) were not surveyed as agreed upon. The ruling requires the Army to conduct a subsurface

survey of Areas A through F taking into account safety considerations and restrictions. The decision led to the 2012 Remedy Order.

Fieldwork was conducted between May and December 2013. This survey was carried out by the DPW's CRS. The methods applied to carry out this survey were the same as those used during the previous subsurface survey. This report focuses on the execution of the subsurface survey of Areas B through F (Figure 1). Area A was not surveyed because it was determined not safe for survey by the USAG-HI Safety Director (Appendix F). Figure 1 shows Areas B through F which are located within the south firebreak road (which is also the CCAAC boundary). The majority of Areas B through F is located in the regularly maintained grass-cut areas within the CCAAC. These areas are surface cleared of unexploded ordnance (UXO). The portions that are not similarly maintained were surface cleared by UXO escorts prior to entry into those areas.

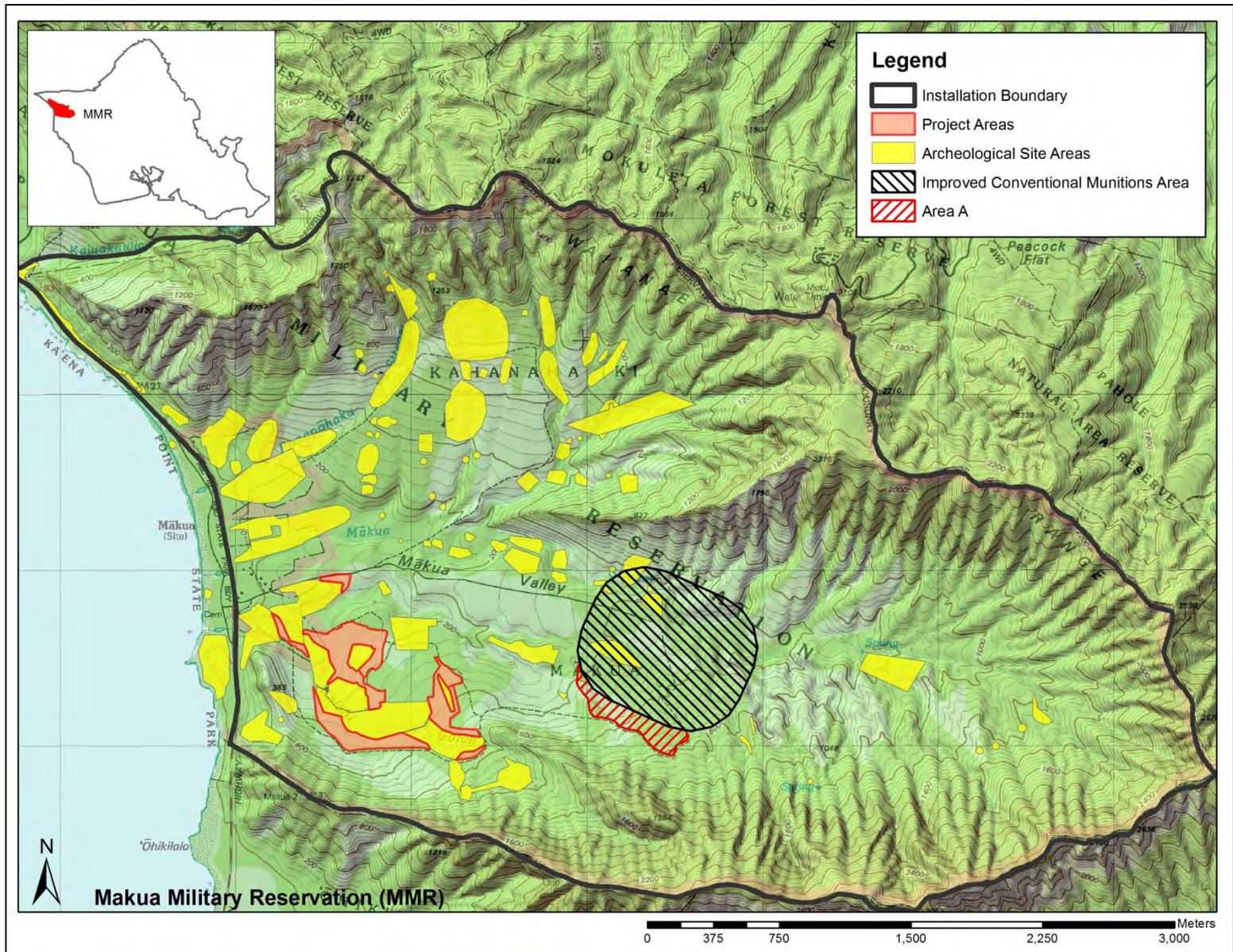


Figure 1 Project Location

**This page has been left intentionally blank.**

## PHYSICAL ENVIRONMENT

Mākua Military Reservation, located in the Wai‘anae District on the leeward coast of O‘ahu, encompasses 4,195 acres within the traditional ahupua‘a of Mākua and Kahanahāiki as well as Ko‘iahi Gulch and a portion of Keawa‘ula Valley (Kelley and Quintal 1977:1).

### GEOLOGY

Mākua and Kahanahāiki were once separated, but the ridge between the two valleys has undergone erosion and only a portion remains separating the upper valleys (Cordy 2002:115). Mākua and Kahanahāiki are bound on the north, south and east sides by the Wai‘anae mountain range, which was formed by a volcanic caldera remnant (Robins et al 2005:4).

### SEDIMENTS

Complex mixtures of soils occur in Mākua and Kahanahāiki. The upper slopes of both valleys are classified as Rock Outcrop (rRO) or Rock Land (rRK), only able to hold a thin covering of soil. The upper portion of valleys consists of Lolekaa (LoB, LoC, and LoE) and Helemano (HLMG) silty clay soils. These soils vary depending on the elevation and slope at which they occur. The central plain consists mostly of Stony Land (rST). The lower section of the valley inland of Farrington Highway is made up of Pulehu (PsA, PvC, and PuB), Lualualei (LPE), Ewa (EmA) and Mamala (MnC) soils (Foot et al..1972). Table 1 shows the sediment types, while Figure 2 illustrates the soil type across MMR.

Table 1 Sediment types at MMR.

SEDIMENT TYPE	DESCRIPTION
Ewa (EmA)	Ewa silty clay loam, moderately shallow
Helemano (HLMG)	Helemano silty clay, 30 to 90 percent slopes
Lolekaa (LoB)	Lolekaa silty clay, 3 to 8 percent slopes
Lolekaa (LoC)	Lolekaa silty clay, 8 to 15 percent slopes
Lolekaa (LoE)	Lolekaa silty clay, 25 to 40 percent slopes
Lualualei (LPE)	Lualualei extremely stony clay, 3 to 35 percent slopes
Mamala (MnC)	Mamala stony silty clay loam, 0 to 12 percent slopes
Pulehu (PsA)	Pulehu clay loam, 0 to 3 percent slopes
Pulehu (PuB)	Pulehu clay loam, 2 to 6 percent slopes
Pulehu (PvC)	Pulehu very stony clay loam, 0 to 12 percent slopes
Rock Land (rRK)	Rock land
Rock Outcrop (rRO)	Rock outcrop
Stony Land (rST)	Stony land



## CLIMATE

The MMR area receives approximately 5 to 40 inches of rain per year (Robins et al 2005:4), with the upper valley receiving the majority of the rainfall (Cordy 2002:17). Three intermittent streams, Kalena Stream located in Ko'iahi Gulch, Mākua Stream in the center, and Punapōhaku in the north, flow through MMR draining directly into the ocean (Robins et al 2005:4, Cordy 2002:117). According to early maps, at least five springs were located in Mākua Valley (Kelly and Quintal 1977:4).

## VEGETATION

Vegetation observed during this and previous surveys of Mākua valley include *koa haole*, *kiawe*, *klu*, *ki*, *kukui*, unidentified canopy trees, and various shrubs and grasses (Robins et al. 2005:4). Christmas berry, guava, and java plum have also been observed throughout MMR (Carlson et al. 1996:4). Guinea grass is the dominant species in the lowland areas. Table 2 lists the types of vegetation commonly found in the project area.

Table 2 Vegetation found at MMR.

Common Name	Scientific Name
Christmas berry	<i>Schinus terebinthifolius</i>
Guava	<i>Psidium guajava</i>
Guinea grass	<i>Panicum maximum</i>
Java plum	<i>Eugenia cuminii</i>
Koa haole	<i>Leucaena glauca</i>
Ki	<i>Cordyline terminalis</i>
Kiawe	<i>Prosopis pallida</i>
Klu	<i>Acacia farnesiana</i>
Kukui	<i>Aleurites molluccana</i>

## HISTORY AND LAND USE

Mākua Valley has a deep history that spans traditional, historic, ranching, and military use time periods. This section discusses the past history and land use of MMR.

### TRADITIONAL

Information about a place can be found from sources such as *mo'olelo* (stories, legends or tales), chants, and place names. A limited amount of information specifically pertaining to Mākua's traditional period was found and is presented below. The reader

is referred to Kelly and Quintal (1977) and Cordy (2002) for an in-depth and general discussion of the greater Wai'anae area.

Mākua, which literally translates as “the parents” (Pukui and Mookini 1981:143), is also the “name of a famous fisherman who, with a chief named Kawela, fished off Ka'ena Point” (Kelly and Quintal 1977:18). Another famous name associated with the Mākua area is Pau, the son of Hua and Hikimolulolea, who ruled from 'Ōhikilolo to Keawa'ula. Pau was born in 'Ōhikilolo, “a place belonging to his mother” (Kamakau in Sterling and Summers 1978:83). It is unclear as to whether Pau was the father of Huanui'ikala'ila'i, who according to Kelly and Quintal, ruled from 'Ōhikilolo to Keawa'ula. Citing Malo (1951:247), Kelly and Quintal state that Huanui'ikala'ila'i ruled the area from 'Ōhikilolo to Keawa'ula during the mid-11<sup>th</sup> Century (Kelly and Quintal 1977:21). He was the son of Kapohaakia and Pau (Malo 1951:247 cf Kelly and Quintal 1977:21).

Mākua is described as a place where travelers on their way to Ka'ena would rest. The following is a *mo'olelo* about the “red-eyed one” who, intending to go to Makaha, became lost and ended up in Mākua (Tī, 1959:98):

Makua was a resting place for travelers and a place to spend the night. The morning was cool for the journey on to Kaena...at Makua, there was a trail up the mountain down to kawaihapai, where it met the trail from Kaena. It was said that this was the trail on which the “red-eyed one” became lost, but it may have been another one. A red eyed person who went from Mokuleia intending to go to Makaha, mistakenly went by way of Kawaihapai, thereby arriving at Makua instead. Hence the saying Makole iho hewa i Makua (Red-eyed one goes by mistake of Makua)”

In addition to being a resting place for travelers, Mākua was once the “traditional haunt of expert *lua* fighters” (Pukui and Mookini 1981:143). The following tells the tale of the 'Ōlohe, professional robbers, in Mākua (Sterling and Summers 1978:84 cf. Beckwith 1970:343):

*Olohe* or *Ha'a* people, were hence a well recognized class in old days, skilled in wrestling and bone-breaking (*lua*) and with hairless bodies. It is said that they used to pull out their hair and smear their bodies with oil in order to give no hold to an antagonist. Legend represents them as professional robbers or even with man-eating habits, who used to station themselves at a narrow pass along the high way and kill and rob travelers... Makua, one of the most western valleys in Wai'anae, is a traditional haunt on Oahu. Here Makaioulu met two robber women who were professional bone-breakers.

Another *mo'olelo* titled “He Mo'olelo Ka'ao no Hi'iaka-i-ka-poli-o-Pele,” tells of Hi'iaka's travel to Mākua, Keawa'ula and Kaena. This story, transcribed in Hawaiian by Stephen Desha, Sr., Julia Keonaona-Desha and J.W.H.I Kihe, was published in *Ka Hoku Hawaii* from September 18 to July 17, 1928 and was translated by Maly and Maly (2003:205, 208-215). The reader is referred to Maly and Maly (2003) for the complete mo'olelo of Hi'iaka in the Mākua area. Some excerpts from the story that mention place names in the vicinity of Mākua are as follows. Hi'iaka and her companions traveled by foot from “Ka-leina-a-ka-'uhane” to Wai'anae. At Kīlauea, located to the north of Keawa'ula, Hi'iaka “caused the sweet water to appear, thus Keawa'ula had fresh water” (Maly and Maly 2003:208). Hi'iaka and her companions continued their travels to “Kipuka kai o Kīlauea” where they saw people jumping into the ocean, called lele kawa. The place where people were jumping into the ocean was called, “Ke ki'o kai o Kīlauea.” While at “Ke ki'o kai o Kīlauea,” a girl leapt into the ocean, hit a rock and died. Hi'iaka jumped into the ocean, retrieved the girl's body and brought her back to shore. (Maly and Maly 2003:208-210).

Hi'iaka continued her travel overland and,

...came to the “one 'ōpioio o Mākua” (clean white sands of Mākua). Hi'iaka then saw the people of this place, and they were adorned with the maile lau li'i o Ko'iahi (small leafed maile of Ko'iahi). They were indeed beautiful to behold along the shore, adorned in the famous maile of this mountain. Drawing nearer, Hi'iaka saw her relatives in the uplands, Mailelali'i and Ko'iahi, and her love for them overflowed, and she called out in a chant to them.

(Maly and Maly 2003:211)

After their feast, Hi'iaka, her companions and her relatives went to the “one kani o Mākua (resonating {barking} sands of Mākua)” (Maly and Maly 2003:213).

Kāneana, also known as Mākua Cave, was the home of shark gods. It was once the dwelling place of a shark goddess when she was in human form (Kelly and Quintal 1977:21). Another story of Kāneana is of Nanaue, a “shark-man,” would bring his victims by an underground channel into Kāneana Cave, and place their bodies “on a certain slimy stone and await his leisure and appetite” (Sterling and Summers 1978:82). He was the son of Kamahoali'i, “the king of all sharks in Hawaiian waters,” and Kalei (Kelly and Quintal 1977:22).

## PLACE NAMES

Traditional place names ascribed to areas, places, land masses, and structures can also provide information about the importance of an area. Below is a table of place names associated with MMR and its surrounding area.

Table 3 Place Names associated with MMR and surrounding areas.

Traditional Place Name	Translation	Location
Kaahihi		Heiau in Mākua
Ka'ena	The heat (Pukui et al. 1981)	Ahupua'a (a traditional land division term) north of MMR
Kahanahāiki	to breathe fast, this is the fast breathing of a woman in labor, during childbirth (Kila in Gollin et al. 2013)	Ahupua'a comprising a portion of MMR
Ka'ie'iewaho	Name of a channel between O'ahu and Kauai. The outer Ka'ie'ie. Ka'ie'ie – the 'ie'ie vine. (Pukui et al. 1981)	Keawa'ula
Kalena	The lazy one (Pukui et al. 1981)	Stream in Ko'iahi Gulch
Kāneana	Kāne's cave. (Pukui et al. 1981)	Also known as Mākua Cave. Located in southern portion of MMR
Kānehunamoku	Floating, hidden land of creation of Kāne; also the original name of Mākua (Kila in Gollin et al. 2013)	Mākua
Keawa'ula	The red harbor. (Pukui et al. 1981)	Located north of MMR
Kīlauea	Spewing, much spreading (Pukui et al. 1981)	Located north of Keawa'ula
Ko'iahi	Fire adze (Pukui et al. 1981)	Gulch located in southern portion of MMR
Kumuakuopio		Heiau in Mākua
Kuaokalā	The back of the sun (Kila in Gollin et al. 2013)	Mountainous area northwest of MMR
Mākua	Parents (Pukui et al. 1981)	traditional ahupua'a comprising a portion of MMR
'Ōhikilolo	Prying out brains (Pukui et al. 1981)	Ahupua'a south of MMR
Punapōhaku	Rocky spring (Pukui et al. 1981)	stream in Kahanahāiki
Ukanipo		heiau in Mākua
Wai'anae	Mullet water (Pukui et al. 1981)	Moku within which MMR is located; and also ahupua'a

## HISTORIC ACCOUNTS

Information gathered from historic documents and interviewees indicate that sugar cane, sweet potato, Indian corn, watermelon, pumpkin, cucumber, tobacco, cotton, and pineapple were among the crops grown in the valley. (Kelly and Quintal 1977:16,55). *Pili* grass was also abundant in Mākua (Kelly and Quintal 1977:16). An interviewee notes that although (s)he has never seen taro growing in Mākua, (s)he noted that Mākua is the one valley where taro could be planted because of the abundance of water (Kelly and Quintal 1977:54). In his journals from 1822 to 1849, Levi Chamberlin describes Mākua as a place with no trees, where sugar cane and potatoes were cultivated. However, he notes that no taro was grown there (Sterling and Summers 1978:84). He also noted a “sandalwood-cutter hut” in the mountains (Robins et al 2005:9). Ko’iahi, which is located on the south of MMR and literally translates as “fire adze,” was known as the place where the “finest *maile-lau-li’i* formerly grew” (Pukui et al 1981:115).

## POPULATION

The Missionary population census provided a district wide population of 1,868 for the Wai’anae District in 1832 (Kelly and Quintal 1977:34). Kelly and Quintal (1977:34), estimated a population of approximately 312 to 375 people (and possibly larger) inhabited Kahanahāiki and Mākua during pre-European times. Cordy (2002:119) suggests an estimate of 300 to 400 people in the 1700s. See Kelly and Quintal (1977:36-39) for a discussion on Missionary accounts of Mākua Valley.

## LAND COMMISSION AWARDS

In 1845, the Hawaiian Government-established Board of Land Commissioners took “applications and testimonies from native tenants for claims to land that had previously been held by them under tenure” (Schilz et al. 1994: 14).

A total of nine Land Commission Awards (LCA) were awarded to claimants in Kahanahāiki, ten in Mākua, and two in Keawa’ula, totaling more than 201 acres (Kelly and Quintal 1977:35, 36). See Figures 9 and 10 in Kelly and Quintal (1977: 19, 20).

After the Mahele of 1848, the Hawaiian legislature passed the Kuleana Act of 1850, permitting the Board of Land Commissioners to “hold hearings for land claim testimony by people who filed claims prior to February 14, 1848” (Kelly and Quintal 1977:35).

## **RANCHING**

Under the Mahele of 1848, Mākua, Kahanahāiki and one half of Keawa'ula ahupua'a became Government Land. To supplement the Hawaiian Government's income, parcels of Government land were sold or leased (Kelly and Quintal 1977:39). General Lease No. 113, the first lease in Mākua valley recorded, was given to father and son, Joseph and John Booth, in 1864 for cattle ranching purposes. The 25-year lease was for 2,223 acres. The lease was subsequently transferred to Samuel Andrews in 1871. Andrew's lease was extended for 21 more years and ended in 1910 (Kelly and Quintal 1977:39). Following Andrew's lease, L.L. McCandless was issued a 10-year lease. After McCandless' lease expired, James Frank Wood won a 21-year lease at an auction on December 25, 1925. By this time, the lease included 990 acres in Kahanahāiki, 1,215 acres in Mākua and land in Keawa'ula, Kuaokala and Keawa'ula totaling 4, 875 acres (Kelly and Quintal 1977:40, 41). After Woods, McCandless regained control of the lands leased and maintained the lease until the U.S. Government gained control of the lands in 1941 (Kelly and Quintal 1977:43).

## **MILITARY**

The earliest use of MMR by the US military was in 1929 where two parcels, registered to the Territory of Hawai'i, and a kuleana parcel were used for the installation of gun emplacements (Zulick and Cox 2001:20). In 1941, the Army acquired Mākua and subsequently cancelled McCandless's lease in 1942 (Kelly and Quintal 1977:43). In 1942, occupants were directed to leave Mākua by the US government. Fair market value of the land was established and occupants were paid for their holdings in 1943.

In 1943, the Lands of Mākua and Kahanahāiki was granted by the Territory of Hawai'i to the Army "to assist in the war efforts extending for the duration of the war and six months thereafter" (Kelly and Quintal 1977:82). In 1964, the state of Hawai'i granted the U.S. Government a 65-year lease of 30,287.33 acres, including Mākua. During the same year, President Johnson signed Executive Order 11166 setting aside public lands and other properties at Mākua for the United States Government (Kelly and Quintal 1977:87). MMR has been under the control of the Army since then. The reader is directed to Kelly and Quintal (1977) for a detailed discussion of Mākua's military history.

## **PREVIOUS ARCHAEOLOGY**

Three heiau in Mākua, (Kaahihi, Ukanipo, and Kumuakuopio), were recorded by Thomas Thrum in 1906 in the earliest survey conducted in the valley. Since the first formal archaeological survey of MMR by Rosendahl in 1977, over 115 traditional Hawaiian and historic sites have been identified within MMR (Robins et al 2005b:8). Robins et al (2005:12) provides a discussion of previous archaeological work and sites identified within MMR. Table 4 lists the known archaeological sites in MMR.

## **SETTLEMENT PATTERN MODEL**

Information gathered from historic documents and from previous archaeological work in MMR indicates that traditional Hawaiian sites are “distributed among three geographical areas,” the lower (20-100 ft ASL), middle (200-600 ft ASL), and upper (800-1200 ft ASL) elevations (Robins et al 2005b:8).

Habitation, ceremonial and agricultural features, and a large petroglyph panel are located in the lower elevation sites, also called Near Coastal sites (Robins et al 2005b:13) or Coastal Zone site (Robins et al 2005:17). These sites are located in the lower portion of Ōhikilolo Ridge and on a raised reef outcrop. Ceremonial sites within the coastal zone include Ukanipo heiau, Kumuakuopio heiau, the no longer extant Kaahihi heiau, and fishing shrines. Ukanipo heiau was placed on the National Register of Historic Places in 1982. Remnant features of Kumuakuopio are included in Site 5926, a site complex with historic walls, a spring and other features (Zulick and Cox 2001:113). Historic features from ranching and military activities and LCA boundaries were also located within the lower elevations near the coast and in the vicinity of Mākua Stream (Robins et al 2005b:14).

According to historical accounts, a permanent settlement was located along the Mākua and Kahanahāiki coast, likely preceded by temporary structures, such as fishing huts, from inhabitants of Makaha or “better watered valleys” (Robins et al 2005b:15). The settlement on the coast remained until the residents were removed in 1941 when the land was transferred to the U.S. Government (Robins et al 2005b:15).

Middle elevation, or Middle Zone, sites (200-600 ft ASL) are comprised of permanent and temporary habitation, ceremonial, transportation, and agricultural features and petroglyphs are located on the slope east and north of Ko‘iahi Gulch, south of Mākua Stream and east of Ukanipo heiau (Robins et al 2005b:14, Robins et al 2005:17). Possible burials, a possible piko stone, and Site 6623, a habitation site comprised of multiple features interpreted as a “high status residence,” was identified within the middle elevation in the area of Mākua Stream Gulch (Robins et al 2005b:14). Middle

elevation sites date to no earlier than 1535 to the post-contact area (Robins et al 2005b:15). Two areas of upland settlement in the lower and middle zones associated with dryland cultivation, as well as a third area in the upper zone have been identified (Robins et al 2005b:15).

According to Robins et al (2005:144), the presence of agricultural features clustered around Ko'iahi suggests Kalena Stream was a water source that supported viable cultivation of crops in the dry, kula lands. The location of a possible agricultural small heiau within the gulch may have also indicated the presence of a water source (Robins et al 2005b:144). Runoff from rainfall on Ohikilolo Ridge may have also supported viable cultivation in Ko'iahi Gulch (Robins et al 2005b:144). According to Robins et al (2005b:144):

Given the absence of non-indigenous cultural materials associated with the sites, occupation of the lower middle slopes of Mākua were generally confined to the pre-Contact and early-Contact periods. Short-term occupation began as early as the 14<sup>th</sup> and 15<sup>th</sup> centuries, and a majority of the permanent occupations began around the 17<sup>th</sup> Century. Activities at the Site 4546 complex began as early as the 13<sup>th</sup> century, which reflects early expansion of the coastal settlement on the near shore watersheds and initial development of inland crops on the slopes above.

Sites in the upper elevations, or Upper Zone sites (Robins et al 2005:17), of Mākua Valley (800-1200 ft ASL), are located on the east and south slope of the valley and consist of agricultural features, mound and terrace concentrations, and a habitation site with a modified spring (Robins et al 2005b:14).

Dates ranging from AD 1290 to 1950 were obtained from Radiocarbon analysis of five charcoal samples from sites 4542, 4543, 4544, 4546, and 5456 (Robins et al 2005b:14). Radiocarbon analysis of charcoal samples from Site 5456, an *imu* complex, provided calibrated dates from four *imu* ranging from 1400-1450, one *imu* between 1490-1670, and another *imu* from 1290-1435. (Robins et al 2005b:14). Radiocarbon dating of subsurface features in Site 4546 indicates a long span of occupation from 1295-1795 (Robins et al 2005b:134). Dates from habitation features (Sites 4542, 4543, 4544) ranged from 1535 to 1950 (Robins et al 2005b:15).

Robins et al (2005b:145) conclude:

In general, the settlement patterns in all these leeward valleys are similar, in that inland settlement developed along the margin of productive agricultural land. The Ko'iahi Gulch Complex seems to represent a slight variation in this pattern, with intensive dryland agriculture developed closer to the coast, possibly due to specific hydrographic

elements (such as Kalena Stream and Ōhikilolo Ridge) that provided sufficient moisture for dryland agriculture, at least during the rainy season. Table 4 summarizes the known archaeological sites in MMR and the subsequent map, Figure 3, depicts the project areas in relationship to nearby surface archaeological sites.

Table 4 Known archaeological sites located at MMR.

State Site Number	Site Description	Archaeological Study
-177	cave	McAllister 1933
-178	sand platform	Thrum 1906
-179	platform	McAllister 1933
-180	platform	Thrum 1906
-181	Ukanipo Heiau	McAllister 1933
-182	modified spring	McAllister 1933
-183	platform	McAllister 1933
-4536	walls, stone lined well	Eble et al. 1995
-4537	mounds, terrace, wall, platform	Eble et al. 1995
-4538	enclosure, c-shapes	Eble et al. 1995
-4539	wall	Eble et al. 1995
-4540	terraces, walls, enclosures, platforms, c-shapes	Eble et. al 1995
-4541	walls, enclosures, c-shapes	Eble et al. 1995
-4542	mounds, terraces, walls, enclosures, platform, C-shapes, caches	Eble et al. 1995; Zulick and Cox 2001
-4543	mounds, terraces, walls, enclosures, C-shapes, fire pit	Eble et al. 1995; Williams et al. 2002
-4544	mounds, terraces, enclosures, alignments, C-shapes, petroglyph	Eble et al. 1995; Williams et al. 2002
-4545	mounds, wall	Eble et al. 1995
-4546	mounds, terraces, walls, enclosures	Eble et al. 1995; Williams and Patolo 2000
-4547	mounds, wall, enclosure	Eble et al. 1995; Williams et al. 2002
-4627	mounds, terraces, enclosure	Carlson et al. 1996
-4628	mound, terraces, cache	Carlson et al. 1996
-4629	mounds	Carlson et al. 1996
-4630	terraces, wall, spring	Carlson et al. 1996
-5456	earth ovens ( <i>imu</i> )	Williams and Patolo 2000
-5587	mound, terrace, enclosures	Williams and Patolo 2000
-5588	terraces	Williams and Patolo 2000
-5589	terrace, platform	Williams and Patolo 2000
-5590	terrace, mound, modified boulder (pecked)	Williams and Patolo 2000
-5595	walls, enclosure	Williams et al. 2002
-5734	enclosure	Williams et al. 2002
-5735	lithic scatter	Williams et al. 2002

State Site Number	Site Description	Archaeological Study
-5920	mounds, walls, modified boulder (pecked)	Zulick and Cox 2001
-5921	mounds, terrace, alignment	Zulick and Cox 2001
-5922	mound, alignment, modified outcrop	Zulick and Cox 2001
-5923	mounds, terraces, walls, enclosures, platforms, alignments, c-shape, uprights, modified outcrop	Zulick and Cox 2001
-5924	alignments	Zulick and Cox 2001
-5925	walls	Zulick and Cox 2001
-5926	wall, upright slabs, modified outcrop, well, dike fed spring, petroglyph	Zulick and Cox 2001
-5927	walls, enclosure, alignment	Zulick and Cox 2001
-5928	wall	Zulick and Cox 2001
-5929	bunker, gun emplacement, platform	Zulick and Cox 2001
-5930	platforms	Zulick and Cox 2001
-5931	wall	Zulick and Cox 2001
-5932	path with retaining wall	Zulick and Cox 2001
-9518	trail	Rosendahl 1977
-9520 (reassigned to -5775- through -5778 in Robins et al. 2005)	Ukanipo Heiau Site Complex	Rosendahl 1977
-9521 (reassigned to -6607 in Robins et al. 2005)	see 6607	Rosendahl 1977
-9522 (reassigned to- 6601, -6596, -6598 in Robins et al. 2005)	see 6601, 6596, 6598	Rosendahl 1977
-9523 (reassigned to 4627- 4629, 5920 in Robins et al. 2005)	see 4627, 4629, 5920	Rosendahl 1977
-9524 (reassigned to -4542, -4547, -5923 in Robins et al. 2005)	see 4542, 4547, 5923	Rosendahl 1977
-9525	wall	Rosendahl 1977
-9526 (reassigned to -5926 in Robins et al. 2005)	see 5926	Rosendahl 1977
-9533	terrace	Rosendahl 1977
-6499	mounds, terraces, walls, enclosures	Robins et al. 2005
-6500	mounds, terraces	Robins et al. 2005
-6501	mounds, terraces	Robins et al. 2005
-6502	mound	Robins et al. 2005
-6503	terraces	Robins et al. 2005
-6504	terraces, enclosure, c-shape, u-	Robins et al. 2005

State Site Number	Site Description	Archaeological Study
	shape	
-6505	mounds, terraces, enclosures, platforms, walls, u-shapes	Robins et al. 2005
-6506	walled terrace	Robins et al. 2005
-6507	wall	Robins et al. 2005
-6508	mound, terrace	Robins et al. 2005
-6509	enclosure, wall	Robins et al. 2005
-6510	mound, enclosure	Robins et al. 2005
-6511	mounds, terrace	Robins et al. 2005
-6512	terraces	Robins et al. 2005
-6513	mounds, terraces, enclosures, walls	Robins et al. 2005
-6514	enclosure	Robins et al. 2005
-6525	enclosure	Robins et al. 2005
-6526	enclosures	Robins et al. 2005
-6527	c-shape	Robins et al. 2005
-6528	mounds	Robins et al. 2005
-6593	terraces, petroglyph	Robins et al. 2005
-6594	mound	Robins et al. 2005
-6595	terraces, upright	Robins et al. 2005
-6596	mound, terraces, walls, petroglyphs	Robins et al. 2005
-6597	mounds, terraces, enclosures, walls, C-shape, petroglyph	Robins et al. 2005
-6598	mounds, terraces, walls, C-shape, L-shape	Robins et al. 2005
-6599	C-shape	Robins et al. 2005
-6600	mounds, terraces, walls, enclosures	Robins et al. 2005
-6601	enclosure	Robins et al. 2005
-6602	mounds, terraces, enclosures, walls, modified outcrop	Robins et al. 2005
-6603	mounds, terraces, enclosures, petroglyphs	Robins et al. 2005
-6604	terrace	Robins et al. 2005
-6605	mounds, walls	Robins et al. 2005
-6606	mounds, terraces, enclosures, U-shapes	Robins et al. 2005
-6607	mounds, terraces, walls, enclosures	Robins et al. 2005
-6608	enclosure	Robins et al. 2005
-6609	wall	Robins et al. 2005
-6610	terraces, wall	Robins et al. 2005
-6611	mounds, enclosures	Robins et al. 2005
-6612	mounds, terraces, walls, alignment	Robins et al. 2005

State Site Number	Site Description	Archaeological Study
-6613	terraces, petroglyph, grinding stone	Robins et al. 2005
-6614	terrace	Robins et al. 2005
-6615	mounds, terraces, walls	Robins et al. 2005
-6616	terraces, enclosures, walls, petroglyphs	Robins et al. 2005
-6617	terrace, c-shape	Robins et al. 2005
-6618	mounds, terrace, enclosure, L-shape	Robins et al. 2005
-6619	walls	Robins et al. 2005
-6620	mounds, walls	Robins et al. 2005
-6621	mounds, walls, enclosures, C-shapes, petroglyph	Robins et al. 2005
-6622	mound	Robins et al. 2005
-6623	terraces, enclosure, alignment	Robins et al. 2005
-6624	mounds	Robins et al. 2005
-6625	terraces	Robins et al. 2005
-6626	mounds	Robins et al. 2005
-6627	concrete basin gun emplacement	Robins et al. 2005
-6628	terraces, enclosure, ramp	Robins et al. 2005
-6629	mound, terraces	Robins et al. 2005
-6630	mound, terrace, enclosure	Robins et al. 2005
-6631	wall	Robins et al. 2005
DPW32	terrace	DPW 2005
DPW33	enclosure, alignment	DPW 2005
Unnumbered site identified during 2006 DPW-ENV subsurface survey	mounds, terraces	USAG-HI 2007
Unnumbered site identified during 2006 DPW-ENV subsurface survey	mounds, terraces	USAG-HI 2007
Unnumbered site identified during 2006 DPW-ENV subsurface survey	kiawe fence posts, wire fencing	USAG-HI 2007

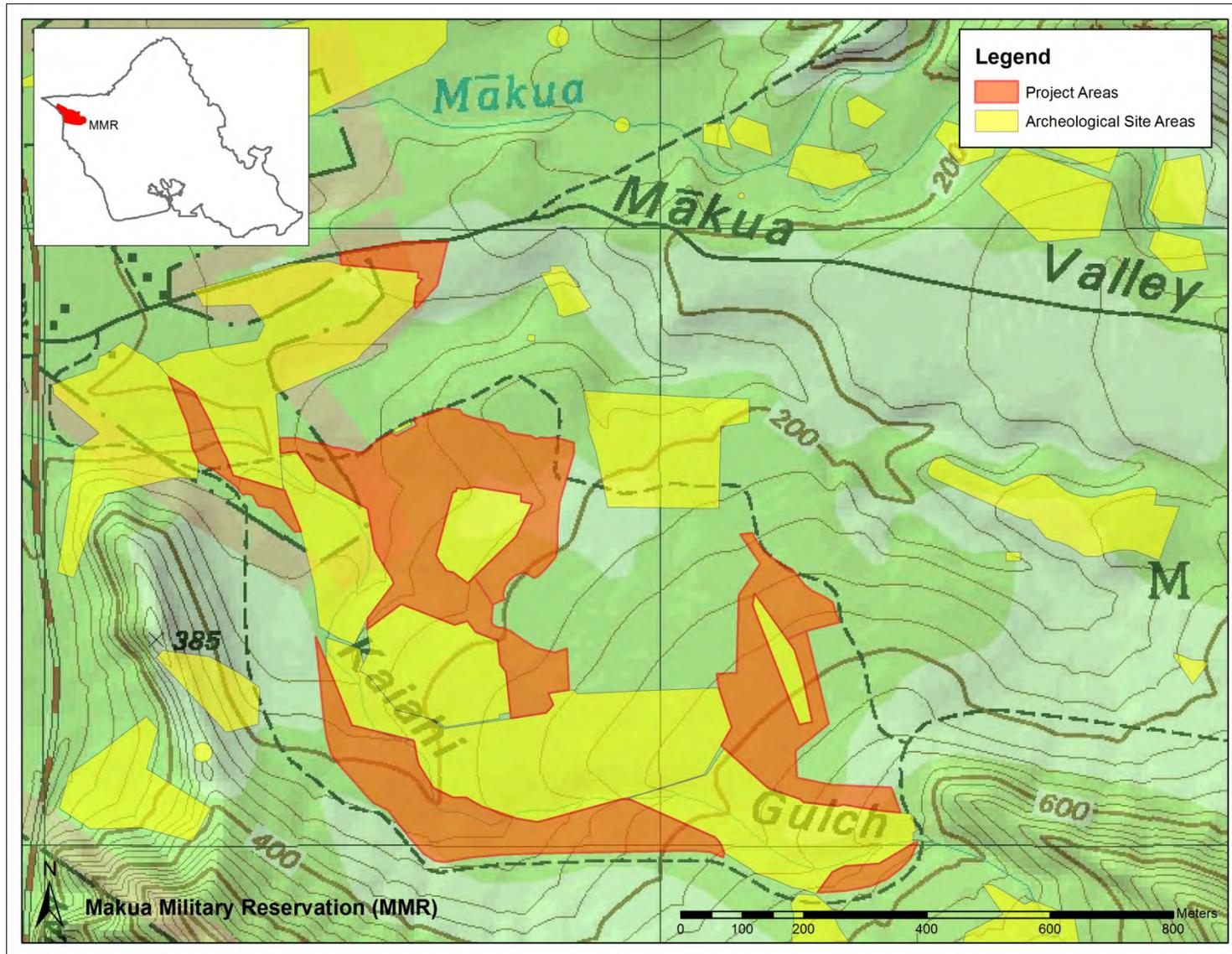


Figure 3. Archaeological sites in the vicinity of the project area.

## PREVIOUS SUBSURFACE TESTING AND SURVEY

Within the CCAAC, subsurface testing was previously completed on several occasions: Eble et al. (1995) tested three sites (50-80-03-4542, -4543, -4544), Williams and Patolo (2000) conducted testing at Site 50-80-03-5456, Williams et al. (2002) did one test unit each at sites -4543, -4544, and -4546, and Robins et al., (2005) completed subsurface testing at eight sites (-4537, -4538, -4542, -4543, -4544, -4545, -4546, and -4547). These studies were done in locations where surface features were present, and yielded traditional Hawaiian artifacts and deposits. A correlation between the presence of surface remains and intact subsurface deposit was made clear in previous fieldwork. One of the areas tested, (-5456, by Williams and Patolo, 2000) contained subsurface features (*imu*, or earth ovens) which were uncovered during construction grading operations. Because the area was graded prior to an archaeological survey taking place, it is unknown whether surface features had been present.

A subsurface survey was conducted by the USAG-HI Cultural Resources Section in 2005 and 2006 using as stratified random sampling plan (USAG-HI 2007). The survey's objective was to determine a presence or absence of intact cultural deposits within the project area where no surface features were apparent due to either the natural dilapidation of surface structures or other effects from the change in use of the area over time. Findings showed that in areas where no surface features were present, no intact cultural deposits were found and that known site boundary buffers are accurately depicted.

## **METHODS AND PROCEDURES**

This section contains details regarding the archaeological field methods and procedures that were carried out for this project.

### **RESEARCH ISSUES**

Archaeological survey objectives were to identify and document the presence or absence of in-situ cultural deposits to be used as an indicator of site distribution, either traditional or non-traditional, and the extent of sites beyond the surface architecture.

Areas within the CCAAC are known to contain traditional Hawaiian and historic agriculture, ranching, and military sites. Most of the sites within the CCAAC are located along the perimeter, near natural drainages. The presence or absence of cultural deposits may reveal additional information regarding site distribution.

Due to the intensity of land modification that has taken place from historic land use during the ranching era and then for military training, surface architecture may no longer exist in some areas. Subsurface cultural deposits have the potential to indicate the extent of sites beyond their surface architecture and provided additional data for the long-term management of these sites.

### **FIELD METHODOLOGY**

#### **STRATIFIED RANDOM SAMPLING**

Stratified random sampling groups members of the population into relatively homogeneous subgroups. With random sampling each unit of the population has an equal probability of occurring. The project area, Areas B through F, is approximately 44 acres (Figure 4). In order to conduct a survey across the area, a map was created using Geographical Information System (GIS) software. A 20 meter grid was laid over the each of the individual areas. Each grid crossing was assigned a number. Numbers were generated using an online random number generator program (see Appendix B). Universal Transverse Mercator coordinates were selected using the numbers corresponding to the map. Figures 5 through 10 depict the randomly selected shovel test probes (STP) for Areas B through F.

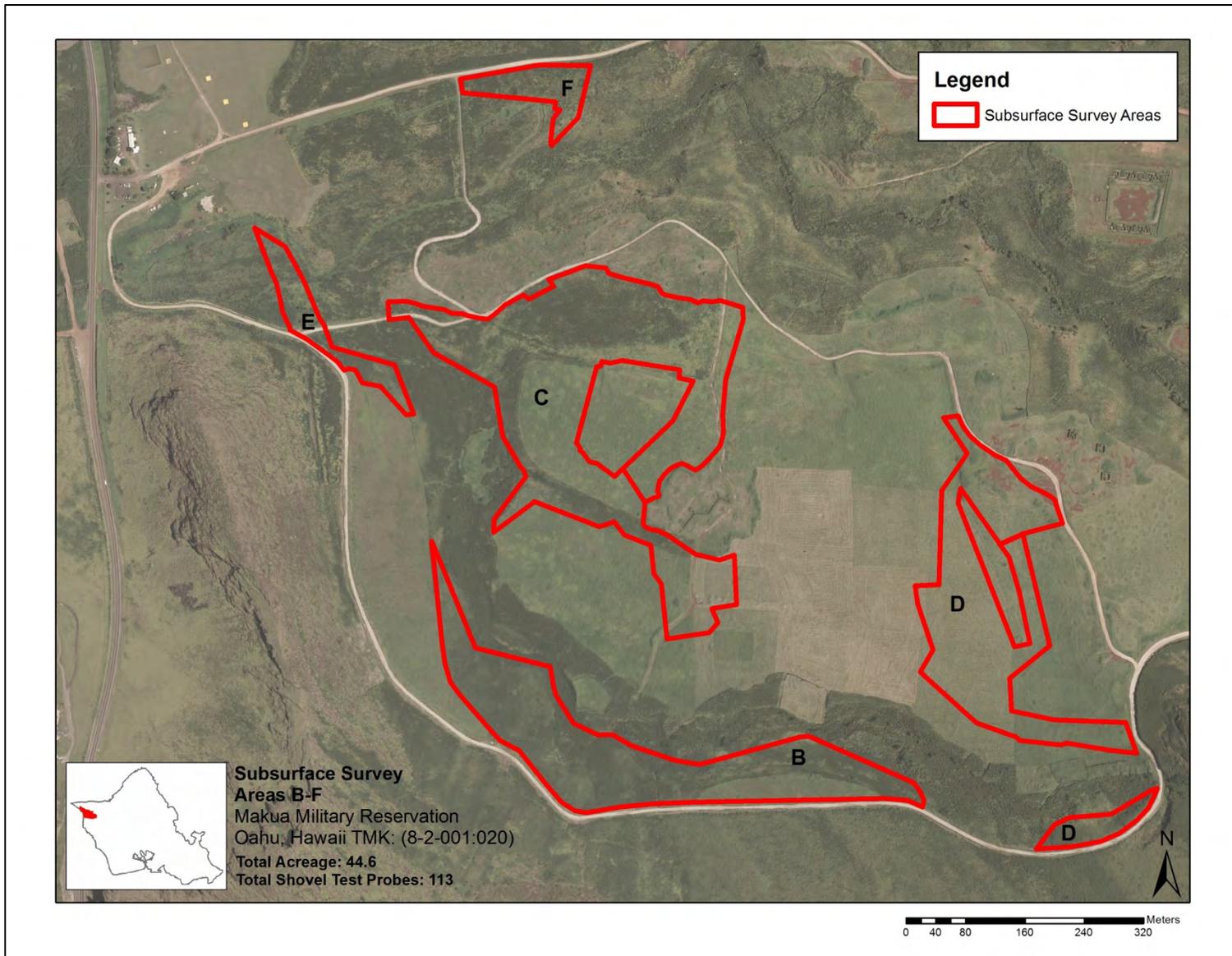


Figure 4 Subsurface Survey, Areas B-F

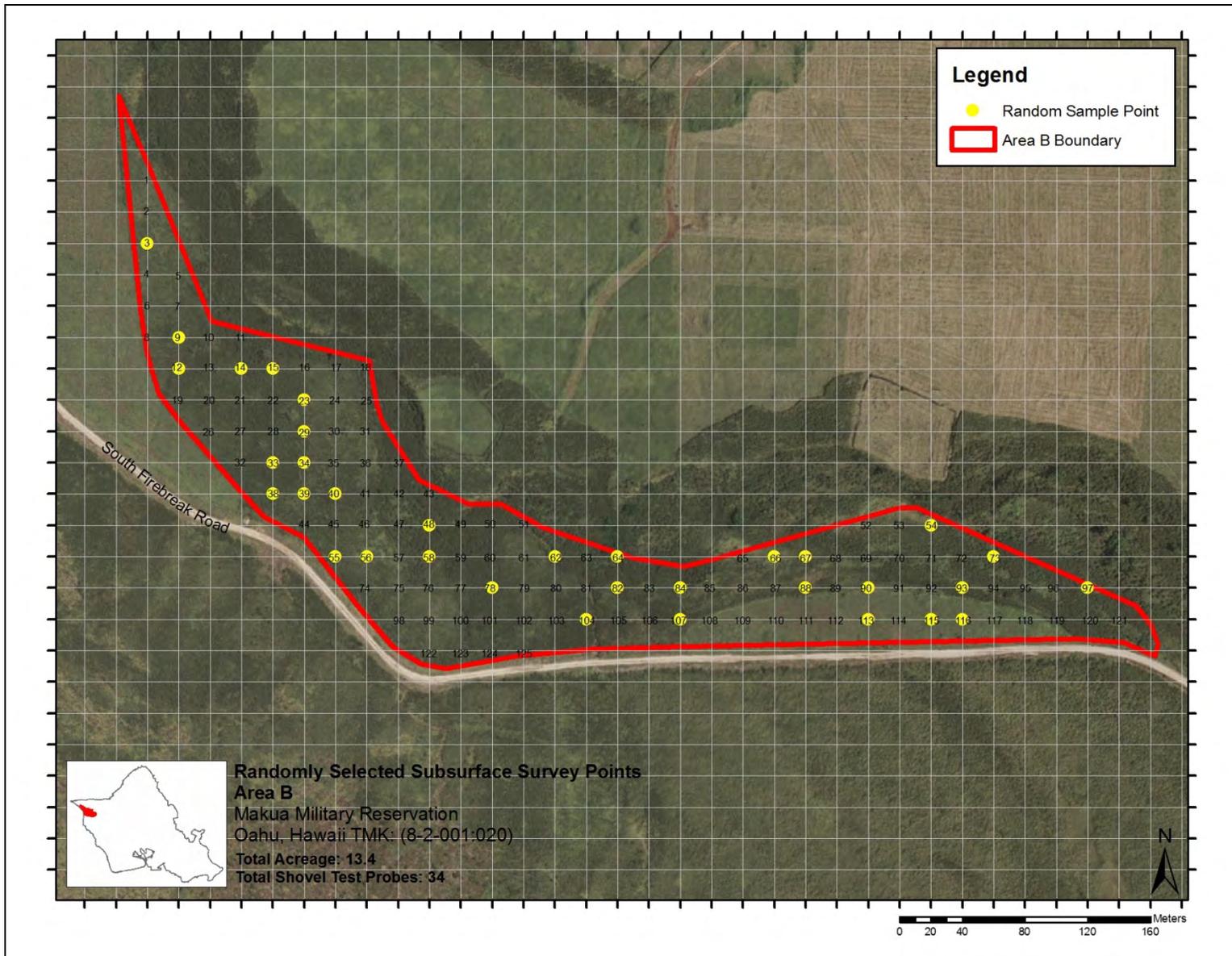


Figure 5 Subsurface Survey, Area B

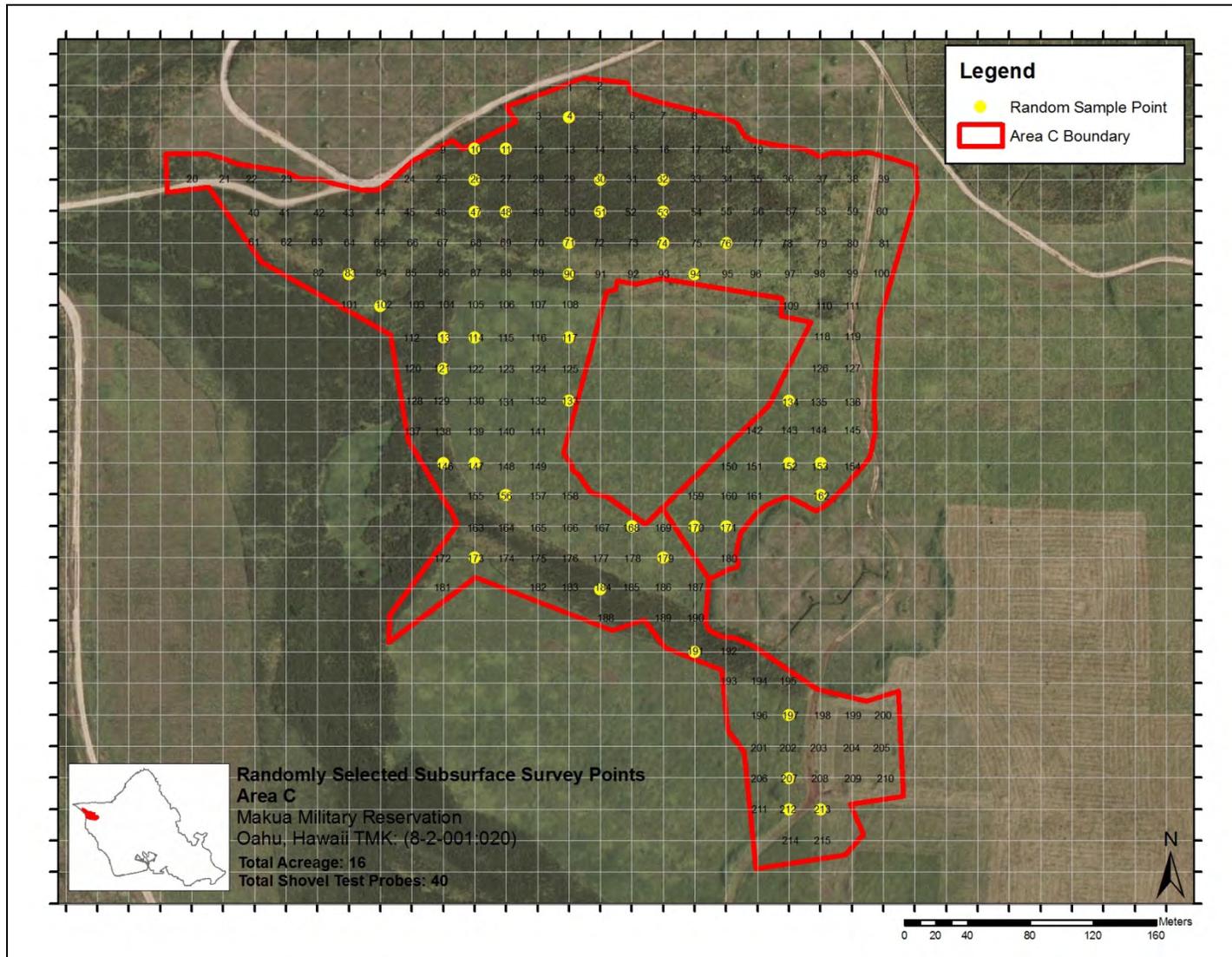


Figure 6 Subsurface Survey, Area C

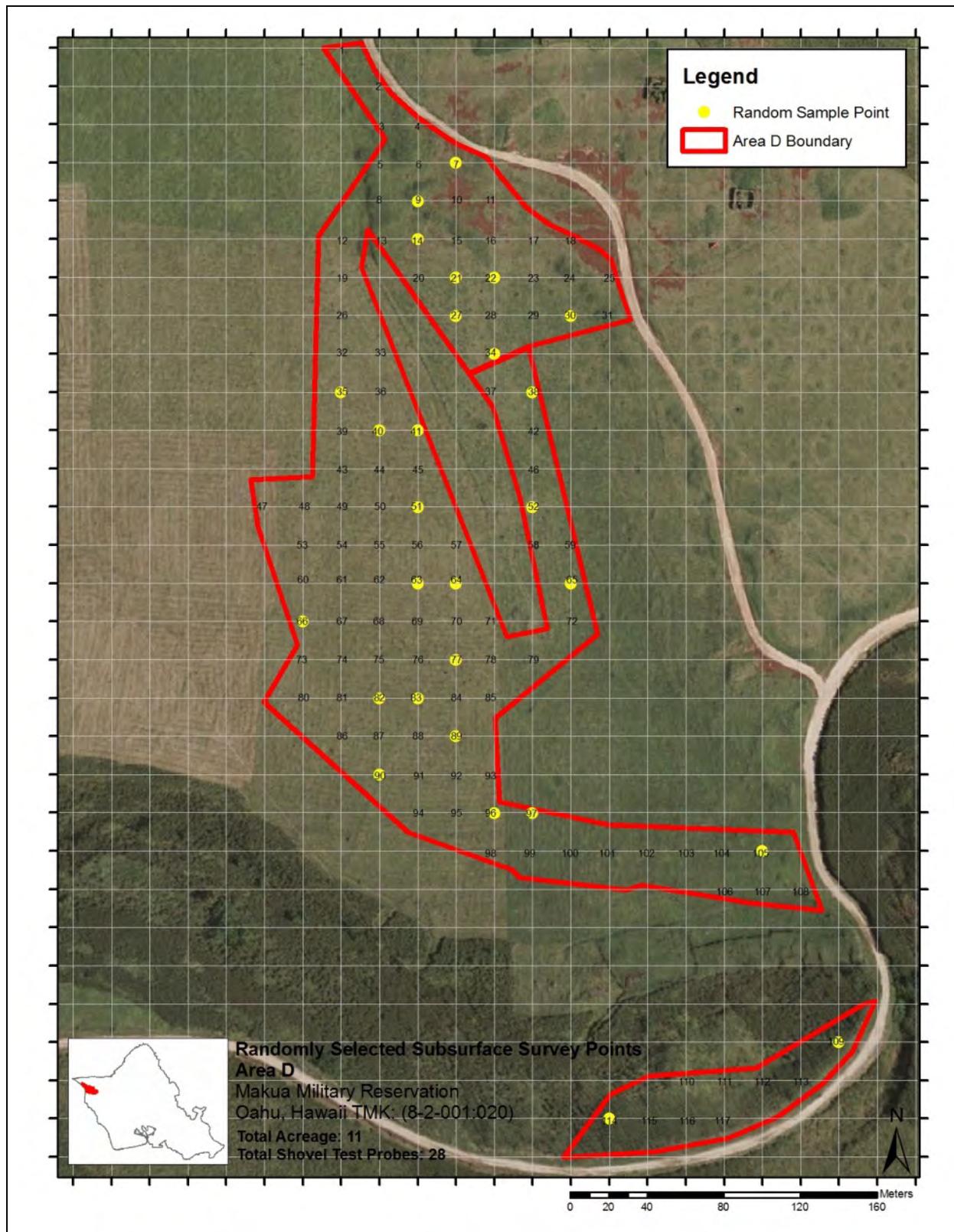


Figure 7 Subsurface Survey, Area D

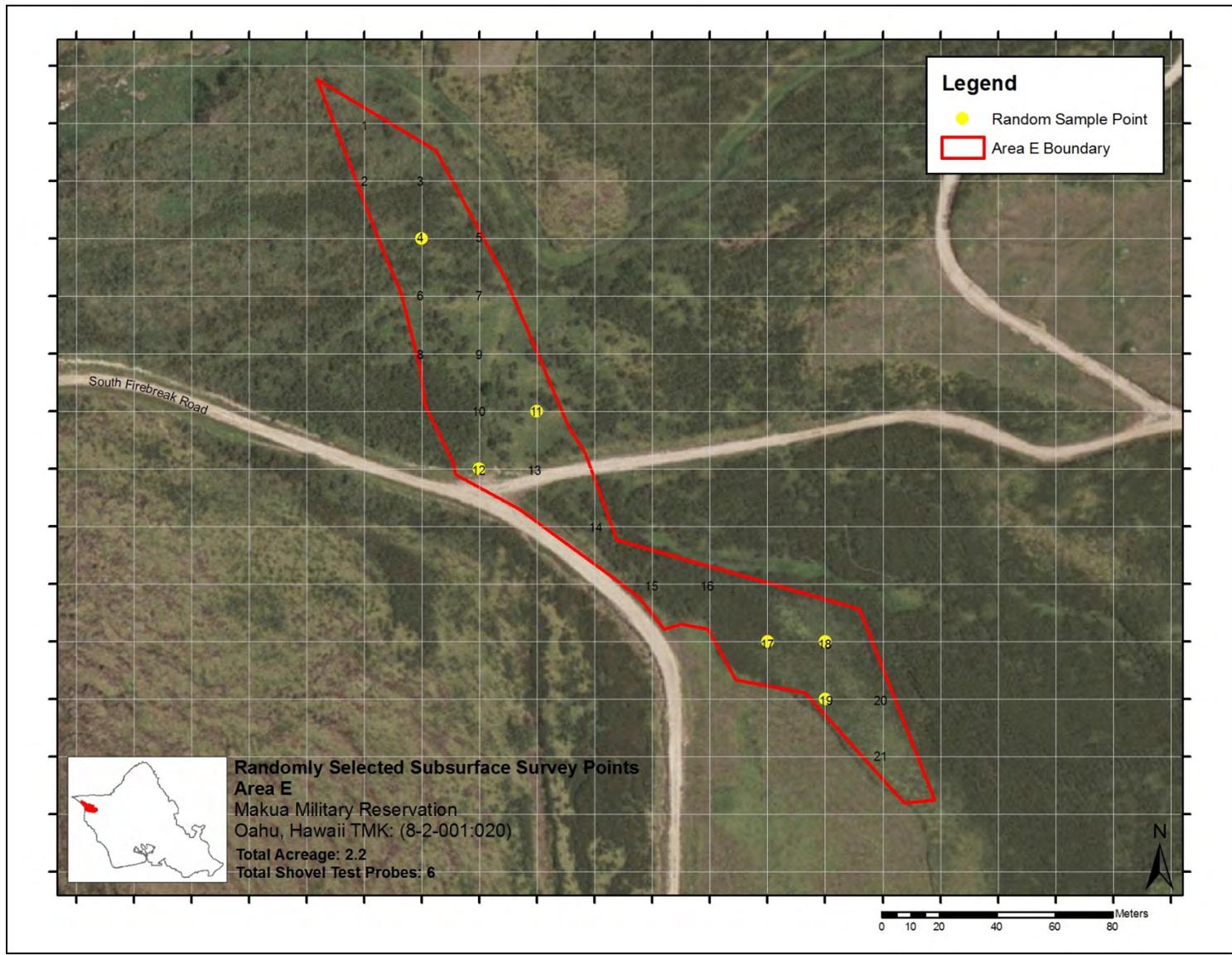


Figure 8 Subsurface Survey, Area E

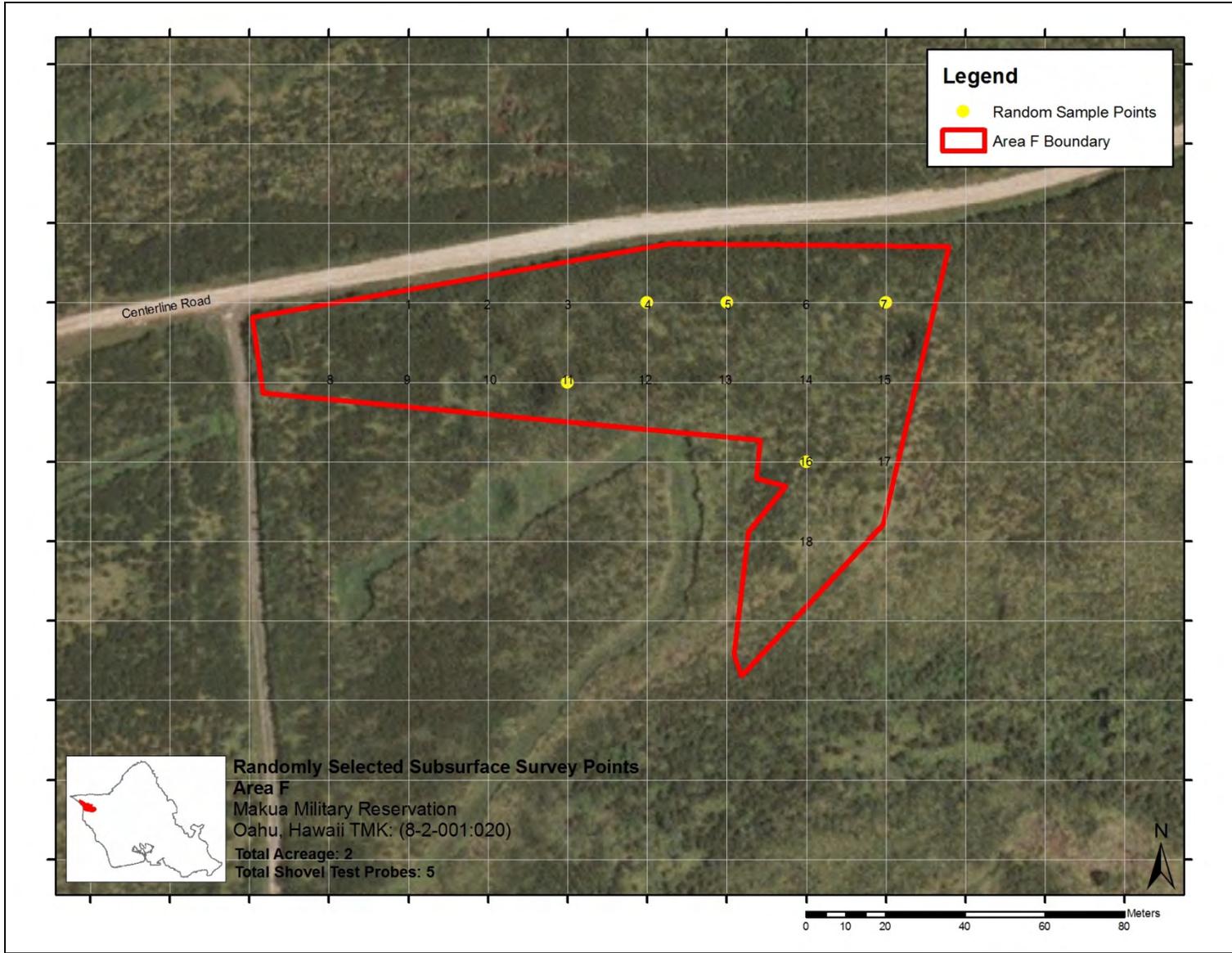


Figure 9 Subsurface Survey, Area F

In the field, archeologists used the coordinates to navigate to each location to conduct the STP. To access STPs located in areas where the vegetation is not maintained, trails were created to each position. The vegetation clearance to create these trails was performed by a UXO technician team. The trails and work area around each STP were determined to be surface cleared of UXO. Prior to performing excavations, the STP and work area immediately around the excavation location were investigated for subsurface metal anomalies by the UXO technician. Subsurface anomaly investigations continue to take place at every 10 centimeter depth increments. At any time during excavations, if a subsurface anomaly was located, the excavation immediately ceased and the excavation was backfilled.

The total number of STPs for Areas B through F was based on its acreage and the probability of encountering in-situ subsurface cultural deposits. In the previous subsurface survey conducted by USAG-HI in 2006, the area designated as "Area 2" was determined to have the highest probability of containing intact cultural deposits; therefore it had the highest concentration of STPs, with an average of 2.5 STPs per acre. Areas B through F were treated as high probability areas and used the 2.5 STP per acre formula. Based on the total acreage of Areas B through F, 113 shovel probes were planned.

All probes were excavated unless excluded from the survey due to one or more of the following reasons:

- (1) Terrain was too steep to safely conduct excavation as determined by the UXO technician and field supervisor collectively.
- (2) Probe was located in a stream or other water drainage. Stream deposits are ever changing, leaving no deposit of integrity.
- (3) A metal anomaly was detected below the surface in a probe location by the UXO technician.
- (4) Probe was located in the vicinity (within 3 meters) of a previously unknown archaeological feature and/or site.
- (5) Thick vegetation (i.e., koa haole and guinea grass) which covered the probe location could not safely be removed by the UXO technician team.

## **ROLES AND RESPONSIBILITIES OF THE FIELD ARCHAEOLOGIST**

Archaeologist(s) maintained a daily log and recordation forms containing the following information:

- (1) Planned Activities
- (2) Number of shovel test probes excavated
- (3) Cultural deposits observed
- (4) Description of GPS data collected
- (5) Number of shovel test probes not excavated (if any) and reason why

Recordation also consisted of GPS mapping of previously unrecorded cultural resources that were observed as the sampling strategy was implemented (e.g., surface architecture, artifacts). The GPS data collected in the field was converted to GIS data layers, then overlain and presented on topographic maps, aerial photography, and historic imagery (as available). Digital photography was used to document site conditions, shovel probe units, and all cultural resources observed, except human remains and associated funerary objects.

## **DATA COLLECTION AND FIELD METHODS**

This section describes procedures for: (1) how data was collected in the field; (2) how recordation and analysis in the laboratory occurred; and (3) the reporting of all survey and analyses results.

The archaeologist(s) identified, recorded, and analyzed all subsurface deposits (i.e., in situ, disturbed, non-cultural, recent historic, and modern). The data collected was sufficient to (1) characterize the nature of all major deposits and strata, regardless of cultural content; (2) determine their known extent through vertical and horizontal space; and (3) if significant cultural deposits were found, these methods would have permitted the evaluation of the resource in terms of NHRP criteria in 36 CFR Part 60.

Field documentation included stratigraphic profiles and photographs. Stratigraphic profiles were drawn for each excavated STP. Photographs and profiles of all STP were taken. Planned methods included detailed documentation by high resolution digital photographs and measured profile drawings for any excavation that revealed evidence of in situ features, but none of the tests revealed such features. All sediments in each unit were described using United States Department of Agriculture (1951) criteria and Munsell (1975) color designations. All excavated soils were screened using 1/8<sup>th</sup> inch screen mesh.

No human remains or other cultural items as defined in NAGPRA were found and the Inadvertent Discovery Plan (Appendix C) was not activated during this fieldwork.

Artifacts (exclusive of human remains and cultural items as defined under NAGPRA) recovered during the survey were brought to the USAG-HI's Cultural Resources facility in Schofield Barracks, Hawai'i, where they were washed, sorted, cataloged, and analyzed under the direction of the CRM. The traditional artifact found was analyzed by source material, method of manufacture, and artifact function. No historic artifacts were found. All catalog and analysis information has been entered into a Microsoft Access database. Following analysis, all artifacts (and samples) were packaged by provenience, artifact type, and material. Packaging consisted of acid free, 4-mil polyurethane bags with an acid free paper label in accordance with federally accepted standards. All data (laboratory and field) generated has been stored in a Microsoft Access relational database compatible with Government programs and which may easily be integrated into an existing GIS database.

Unknown archaeological features that were identified during the project, which are associated with existing sites, had their locations recorded using GPS devices. Detailed recordation of the site did not take place during this project. The GPS data was provided to the CRM. The CRM will determine when the recording of the find will take place.

## RESULTS

A total of 113 STPs were planned for Areas B through F. A total of 83 STPs were excavated. A total of 30 STPs were not excavated for reasons explained in the Field Methodology section. A comprehensive table detailing the results of all STPs is in Appendix D. A summary of the results is provided in Table 5 below and the subsequent map depicts the STP locations.

Table 5 Shovel Test Probe Summary

Area	STP No.	Grid Location	No. of Layers	STP Size (cm)	Max. Depth (cmbs)	Excavated?	Cultural Material(s) Present?
B	B1	B38	1	50×50	60	Yes	No
B	B2	B33	2	45×45	55	Yes	No
B	B3	B39	1	65×65	10	Yes	No
B	B4	B40	1	60×60	40	Yes	No
B	B5	B56	N/A	N/A	N/A	No	N/A
B	B6	B55	1	50×50	45	Yes	No
B	B7	B58	N/A	N/A	N/A	No	N/A
B	B8	B78	N/A	N/A	N/A	No	N/A
B	B9	B104	1	55×55	60	Yes	No
B	B10	B82	1	50×50	20	Yes	No
B	B11	B84	1	50×50	40	Yes	No
B	B12	B107	N/A	N/A	N/A	No	N/A
B	B13	B88	N/A	N/A	N/A	No	N/A
B	B14	B93	N/A	N/A	N/A	No	N/A
B	B15	B90	1	50×50	20	Yes	No
B	B16	B113	3	50×50	56	Yes	No
B	B17	B115	2	50×50	60	Yes	No
B	B18	B116	2	50×50	50	Yes	No
B	B19	B97	2	50×50	60	Yes	No
B	B20	B9	1	50×45	40	Yes	No
B	B21	B12	1	50×45	32	Yes	No
B	B22	B3	1	45×40	45	Yes	No
B	B23	B54	1	42×45	43	Yes	No
B	B24	B73	1	45×45	50	Yes	No
B	B25	B48	1	50×50	32	Yes	No
B	B26	B62	N/A	N/A	N/A	No	N/A
B	B27	B64	1	50×50	35	Yes	No
B	B28	B67	1	55×55	25	Yes	No
B	B29	B66	1	45×55	14	Yes	No
B	B30	B14	2	50×40	50	Yes	No
B	B31	B15	2	50×45	65	Yes	No
B	B32	B23	1	50×45	20	Yes	No
B	B33	B29	2	50×45	50	Yes	No
B	B34	B34	1	40×40	50	Yes	No

C	C1	C117	1	50×50	55	Yes	No
C	C2	C133	1	50×50	55	Yes	No
C	C3	C114	1	50×50	60	Yes	No
C	C4	C147	N/A	N/A	N/A	No	NA
C	C5	C156	1	50×50	50	Yes	No
C	C6	C168	N/A	N/A	N/A	No	N/A
C	C7	C179	N/A	N/A	N/A	No	N/A
C	C8	C170	N/A	N/A	N/A	No	N/A
C	C9	C171	1	45×45	60	Yes	No
C	C10	C152	1	50×50	10	Yes	No
C	C11	C153	1	45×45	60	Yes	No
C	C12	C162	N/A	N/A	N/A	No	N/A
C	C13	C173	1	40×40	55	Yes	No
C	C14	C197	N/A	N/A	N/A	No	N/A
C	C15	C213	N/A	N/A	N/A	No	N/A
C	C16	C212	N/A	N/A	N/A	No	N/A
C	C17	C207	1	50×50	55	Yes	No
C	C18	C134	N/A	N/A	N/A	No	N/A
C	C19	C90	2	45×45	48	Yes	No
C	C20	C71	1	50×50	50	Yes	No
C	C21	C113	1	45×45	45	Yes	No
C	C22	C121	1	45×45	47	Yes	No
C	C23	C146	1	50×50	45	Yes	No
C	C24	C32	1	50×45	50	Yes	No
C	C25	C53	1	50×50	55	Yes	No
C	C26	C74	1	50×45	50	Yes	No
C	C27	C76	1	55×55	55	Yes	No
C	C28	C94	2	45×45	50	Yes	No (non-cultural charcoal)
C	C29	C51	1	45×45	50	Yes	No
C	C30	C30	1	45×45	15	Yes	No
C	C31	C4	N/A	N/A	N/A	No	N/A
C	C32	C48	1	40×40	50	Yes	No
C	C33	C47	1	48×48	50	Yes	No
C	C34	C26	1	48×50	65	Yes	No
C	C35	C10	1	40×50	58	Yes	No
C	C36	C102	1	50×50	45	Yes	No
C	C37	C83	1	45×45	62	Yes	Yes (hammer stone)
C	C38	C11	1	50×50	30	Yes	No
C	C39	C184	1	50×50	50	Yes	No
C	C40	C191	1	45×45	50	Yes	No
D	D1	D109	N/A	N/A	N/A	No	N/A
D	D2	D105	2	50×50	40	Yes	No
D	D3	D97	2	50×50	55	Yes	No
D	D4	D96	1	55×60	60	Yes	No
D	D5	D89	1	40×45	40	Yes	No
D	D6	D90	N/A	N/A	N/A	No	N/A
D	D7	D82	1	45×45	38	Yes	No

D	D8	D83	1	40×40	60	Yes	No
D	D9	D77	1	50×50	40	Yes	No
D	D10	D64	1	45×45	59	Yes	No
D	D11	D114	N/A	N/A	N/A	No	N/A
D	D12	D65	1	50×50	40	Yes	No
D	D13	D52	1	40×40	60	Yes	No
D	D14	D51	N/A	N/A	N/A	No	N/A
D	D15	D63	1	45×45	58	Yes	No
D	D16	D40	N/A	N/A	N/A	No	N/A
D	D17	D41	N/A	N/A	N/A	No	N/A
D	D18	D66	1	45×45	60	Yes	No
D	D19	D35	N/A	N/A	N/A	No	N/A
D	D20	D38	1	50×50	60	Yes	No
D	D21	D34	N/A	N/A	N/A	No	N/A
D	D22	D27	1	45×45	60	Yes	No
D	D23	D9	N/A	N/A	N/A	No	N/A
D	D24	D14	1	45×45	50	Yes	No
D	D25	D21	1	40×40	21	Yes	No
D	D26	D22	1	40×40	50	Yes	No
D	D27	D30	N/A	NA	NA	No	N/A
D	D28	D7	1	50×50	60	Yes	No
E	E1	E12	N/A	N/A	N/A	No	N/A
E	E2	E11	1	45×45	45	Yes	No
E	E3	E17	1	70×70	15	Yes	No
E	E4	E19	1	50×50	48	Yes	No
E	E5	E18	1	50×50	28	Yes	No
E	E6	E4	5	50×50	50	Yes	No (non-cultural charcoal)
F	F1	F4	N/A	N/A	N/A	No	N/A
F	F2	F5	1	30×30	52	Yes	No
F	F3	F7	1	40×40	50	Yes	No
F	F4	F11	2	35×35	26	Yes	No
F	F5	F16	N/A	N/A	N/A	No	N/A

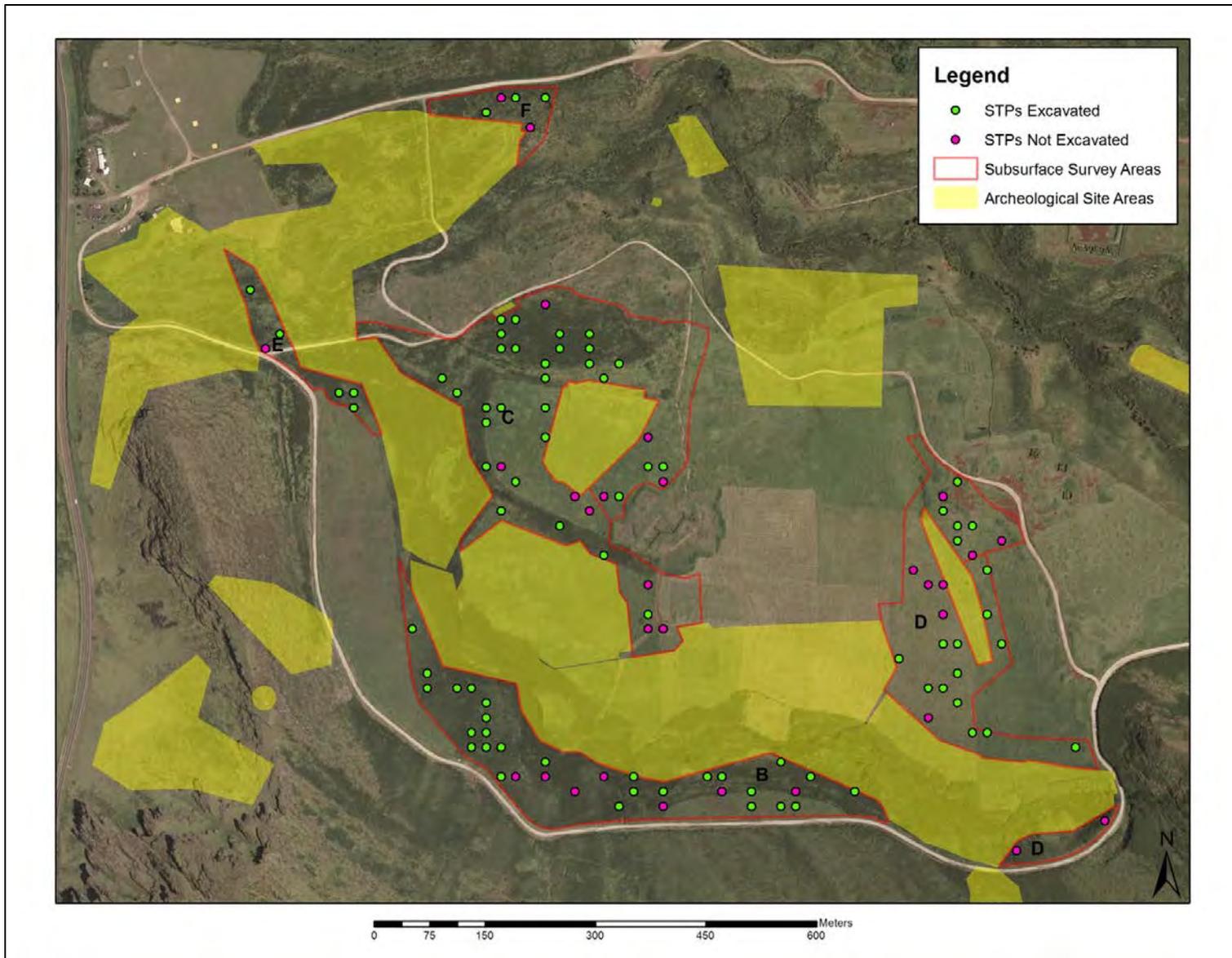


Figure 10 Map of STP Locations

## **EXCAVATED STP**

Once STPs locations were determined to be absent of metal anomalies by the UXO technician, excavations proceeded. STP excavations ceased at various depths due to a variety of reasons; based on the absence of cultural material down to a depth where the field supervisor determined that a reasonable effort to identify materials was made (approximately 60 centimeters below surface (cmbs); when the presence of boulders or high concentration of rocks within the probe made excavation impassable; when the concentration of sterile saprolite became abundant; or when metal anomaly signals were detected at deeper depths by the UXO technician.

The following pages show a representative sample of excavated STPs. Complete field records and photographs are on file at the USAG-HI:

## STP B1

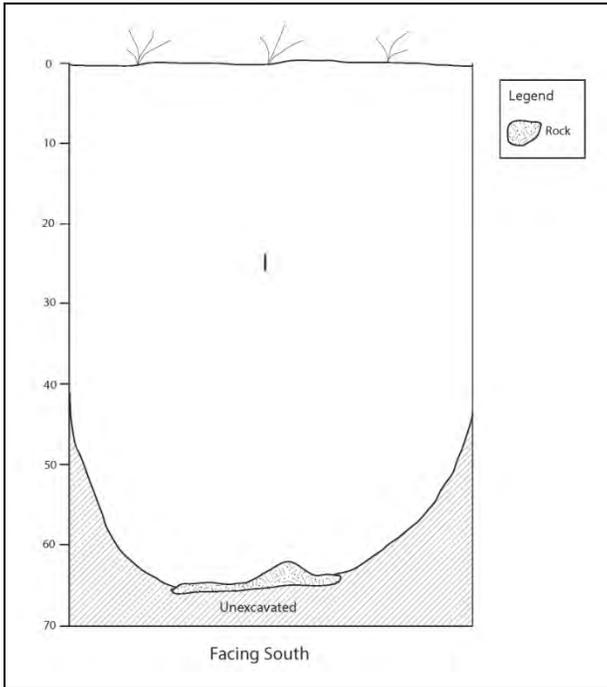


Figure 11 Profile of STP B1



Figure 12 Photo of STP B1

Table 6 STP B1 Sediment Description

Layer	Depth (cmbs)	Munsell Color Description	Sediment Description
I	0-60	10 YR 3/1 Very Dark Gray	Silty clay loam; strong, fine, blocky structure; friable, plastic, stick, wet consistency; very few, very fine roots; 15% rock content, subrounded, basalt cobbles; no burnt or cultural material

STP B1 consisted of a single layer. Layer I is a dark grey silty clay loam sediment layer. The excavation yielded no cultural material. The excavation ceased at 60 cm below the surface due to the absence of cultural material.

## STP B2

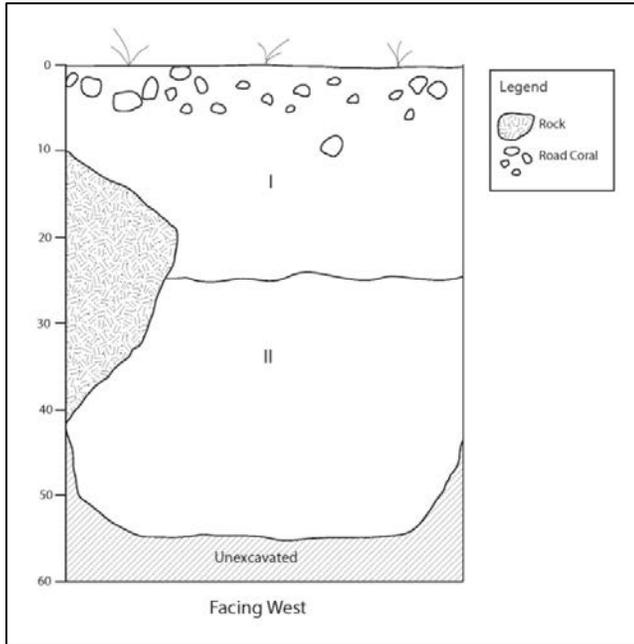


Figure 14 Profile of STP B2



Figure 13 Photo of STP B2

Table 7 STP B2 Sediment Description

Layer	Depth (cmbs)	Munsell Color Description	Sediment Description
I	0-25	5YR 3/4 and 7.5YR 3/3 Dark Reddish Brown and Dark Brown	Coarse sandy loam; weak, coarse, angular-blocky structure; loose, slightly plastic, slightly sticky, wet consistency; common, fine roots; 35% rock content, angular, basalt pebbles; no burnt or cultural material
II	26-55	10YR 3/1 Very Dark Gray	Silty clay loam; strong, fine, angular-blocky structure; firm, moderately plastic, moderately sticky, wet consistency; very few, fine roots; 5% rock content, angular, basalt pebbles; no burnt or cultural material

STP B2 consisted of two layers. Layer I is a mixed dark reddish brown and dark brown coarse sandy loam sediment layer. There was a presence of road gravel and coral in this layer. Layer II is a very dark gray silty clay loam sediment layer. This STP was located in a wash area, 35 m down slope of the firebreak road. The field supervisor determined that a reasonable effort to identify materials was made, the excavation ceased at 55 cmbs, no cultural materials were observed throughout the probe.

## STP B3

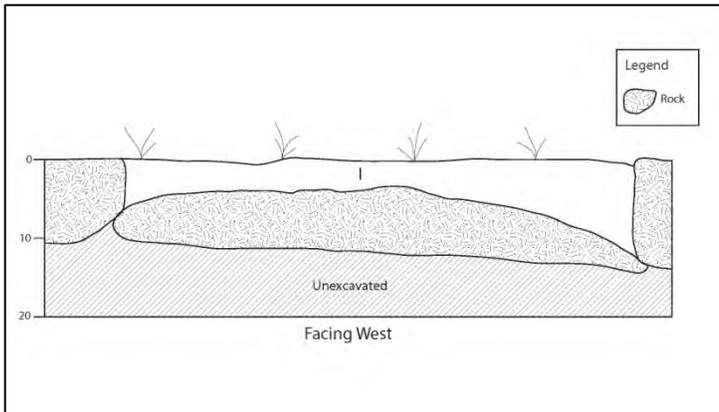


Figure 16 Profile of STP B3



Figure 15 Profile of STP B3

Table 8 STP B3 Sediment Description

Layer	Depth (cmbs)	Munsell Color Description	Sediment Description
I	0-10	5 YR 3/1 Very Dark Gray	Sandy clay loam; moderate, coarse, granular structure; firm, slightly plastic, slightly sticky, wet consistency; common, fine to medium roots; 75% rock content, subrounded, basalt pebbles and cobbles; no burnt or cultural material

STP B3 consisted of a single layer. Layer I was a very dark gray sandy clay loam sediment layer. The excavation yielded no cultural material. The excavation ceased at 10 cm below the surface due to presence of a large rock.

## STP B16

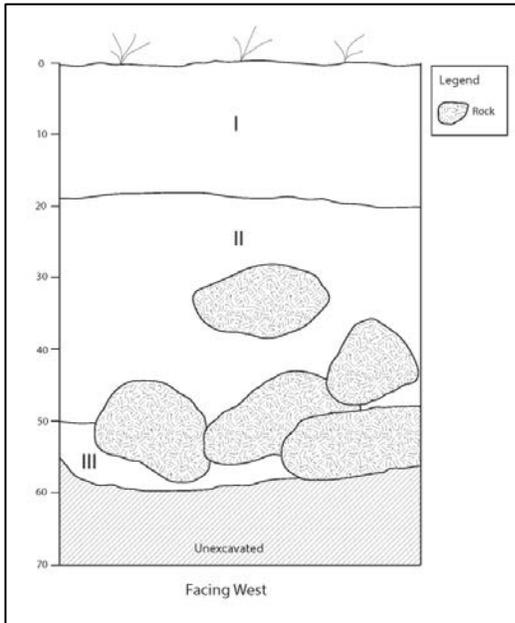


Figure 17 Profile of STP B16



Figure 18 Photo of STP B16

Table 9 STP B16 Sediment Description

Layer	Depth (cmbs)	Munsell Color Description	Sediment Description
I	0-20	7.5 YR 2.5/3 Very Dark Brown	Sandy clay loam; weak, medium, subangular-blocky structure; friable, non-plastic, slightly sticky, wet consistency; many, fine roots; 80% rock content, subangular, basalt pebbles and small cobbles; no burnt or cultural material
II	21-50	7.5YR 2.5/2 Very Dark Brown	Silty clay loam; moderate, fine, subangular-blocky structure; friable, slightly plastic, slightly sticky, wet consistency; common, fine roots; 45% rock content, subangular, basalt cobbles; no burnt or cultural material
III	51-56	10YR 3/1 Very Dark Gray	Silty clay loam; strong, very fine, granular structure; firm, moderately plastic, moderately sticky, wet consistency; no roots; 10% rock content, subangular, basalt cobbles; no burnt or cultural material

STP B16 consisted of three layers. Layer I is a very dark brown sandy clay loam sediment layer. Layer II is a very dark brown silty clay loam sediment layer. Layer III is a very dark gray silty clay loam sediment layer. The excavation yielded no cultural material. The excavation ceased at 56 cm below the surface due to the abundance of rocks within the probe that made excavation impassable.

### STP B29

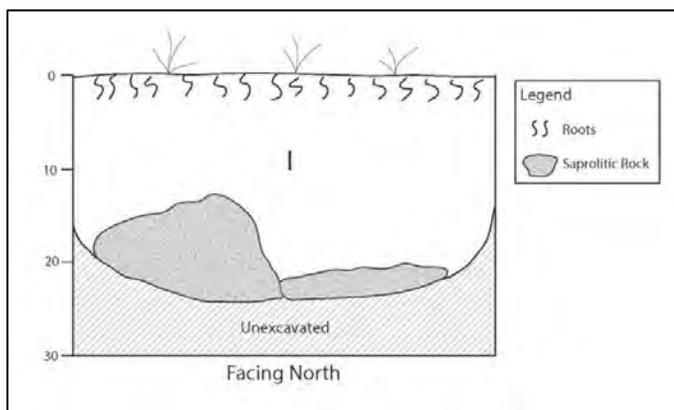


Figure 20 Profile of STP B29



Figure 19 Photo of STP B29

Table 10 STP B29 Sediment Description

Layer	Depth (cmbs)	Munsell Color Description	Sediment Description
I	0-14	5 YR 3/4 Dark Reddish Brown	Silty clay loam; weak, coarse, granular structure; loose, non-plastic, non-sticky, dry consistency; common, coarse roots; 50% rock content, subangular, basalt pebbles; no burnt or cultural material

STP B29 consisted of a single layer. Layer I is a dark reddish brown silty clay loam sediment layer. The excavation yielded no cultural materials. The STP was located approximately 1 m north of drainage. The excavation ceased at 14 cm below the surface due to a dense saprolite.

## STP C28

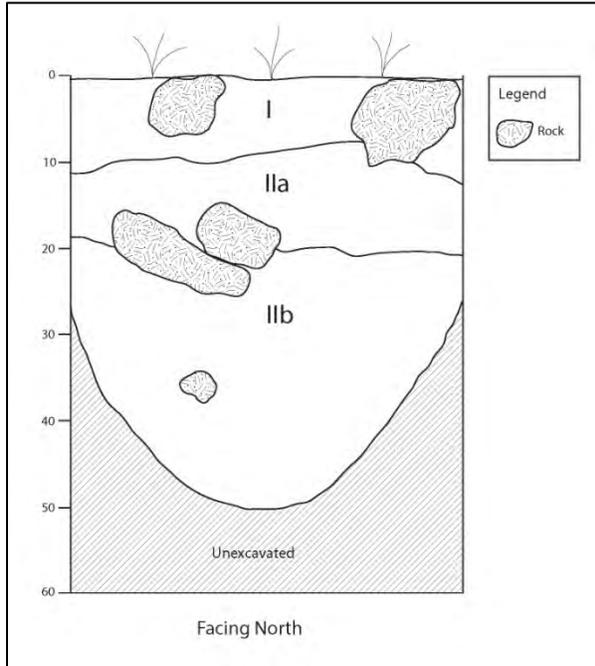


Figure 22 Profile of STP C28



Figure 21 Photo of STP C28

Table 11 STP C28 Sediment Description

Layer	Depth (cmbs)	Munsell Color Description	Sediment Description
I	0-13	10 YR 3/1 Very Dark Gray	Silty clay loam; moderate, fine, subangular-blocky structure; friable, slightly plastic, slightly sticky, wet consistency; very few, very fine roots; 25% rock content, subangular, basalt pebbles to cobbles; no burnt or cultural material
IIa	14-30	10YR 2/1 Black	Silty clay; moderate, very fine, subangular-blocky structure; firm, very sticky, moderately plastic, wet consistency; very few, very fine roots; 25% rock content, subangular, basalt pebbles to cobbles; abundant burnt wood, no cultural materials
IIb	31-50	2.5Y 3/3 Dark Olive Brown	Silty clay, ; moderate, very fine, subangular-blocky structure; firm, very sticky, moderately plastic, wet consistency; very few, very fine roots; 25% rock content, subangular, basalt pebbles to cobbles; flecks of burnt wood, no cultural materials

STP C28 consisted of two layers. Layer I is a very dark gray silty clay loam sediment layer. Layer IIa is a black silty clay sediment level that was present only on the north and west side of the STP. Charcoal flecks were present throughout this layer. A charcoal sample was collected from this level. Layer IIb is a dark olive brown silty clay sediment level. The excavation yielded no cultural material. The excavation ceased at 50 cm below the surface due to the thick, hard, compact clay layer that made the excavation impassable. The charcoal collected could not be analyzed for wood identification because the sizes of the flecks were not large enough for analysis. Although this STP is located less than 6m from site -4545, no cultural deposits were associated with the charcoal flecks noted in the STP. This indicates that the flecks are probably related to a past fire event, rather than sustained cultural activities such as a hearth.

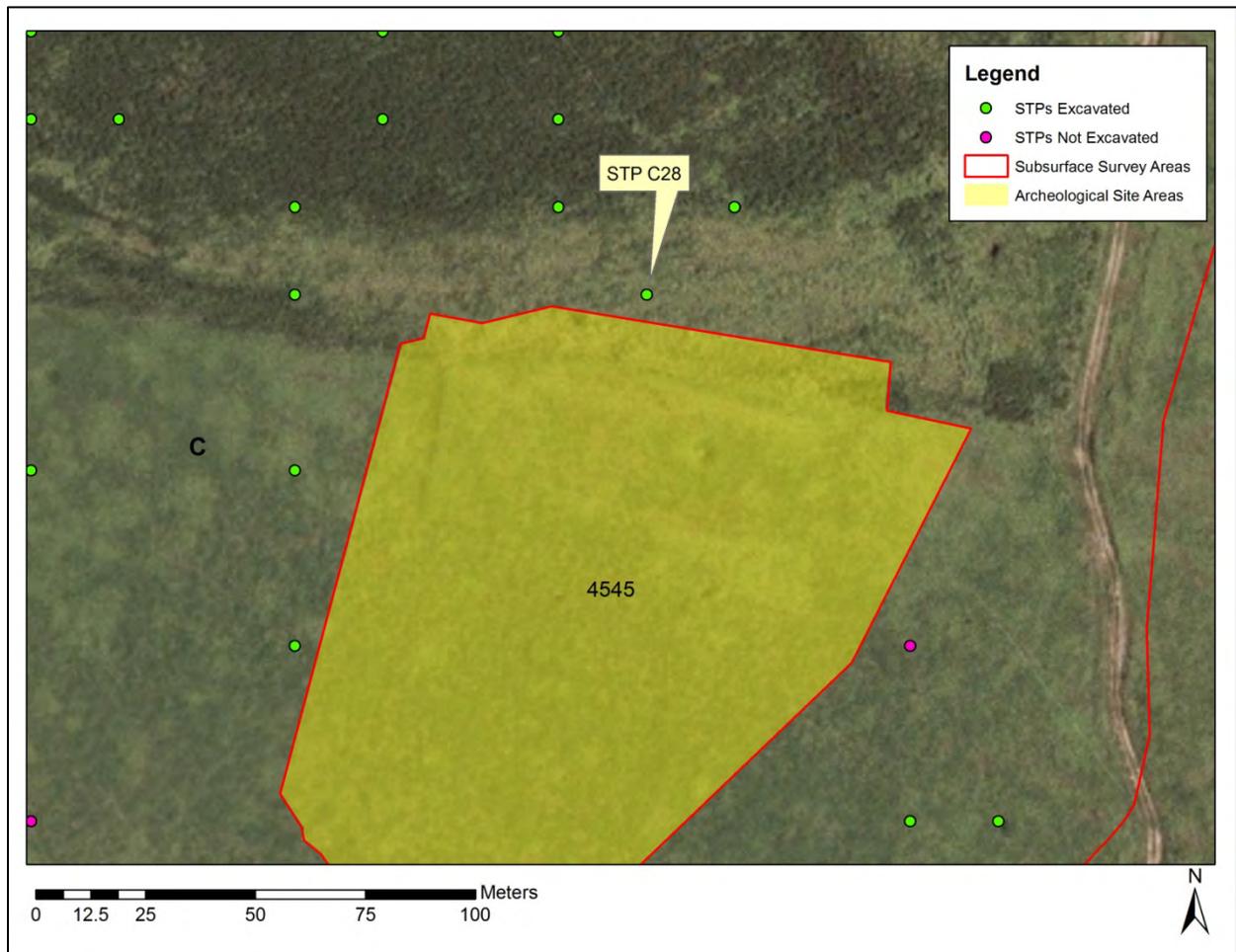


Figure 23 Map of STP C28

## STP C37

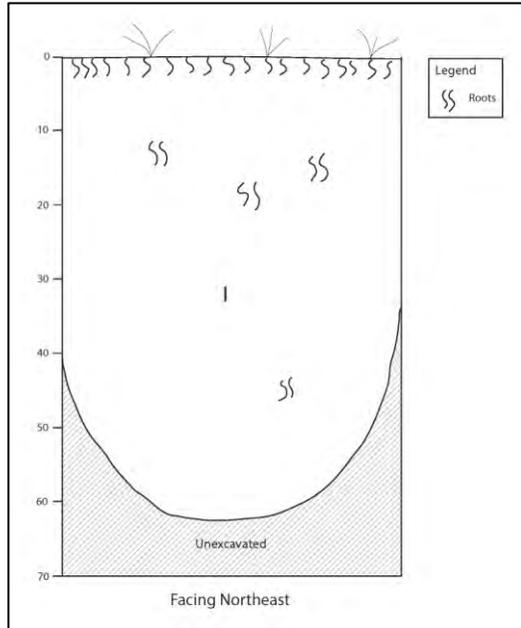


Figure 24 Profile of STP C37



Figure 25 Photo of STP C37

Table 12 STP C37 Sediment Description

Layer	Depth (cmbs)	Munsell Color Description	Sediment Description
I	0-62	5 YR 3/4 Dark Reddish Brown	Silty clay loam; moderate, medium, subangular-blocky structure; firm, slightly plastic, slightly sticky, wet consistency; common, medium roots; 1% rock content, subrounded, basalt pebbles; no burnt material; one ground stone was discovered.

STP C37 consisted of a single layer. Layer I is a dark reddish brown silty clay loam. A hammer stone was found between 20 and 30 cm below the surface. The artifact has one worked surface and signs of other modifications. The excavation ceased at 62 cm below the surface due to a sterile hard pan of saprolite. The excavation yielded no other cultural material, and the artifact was not found in the context of a subsurface feature or cultural deposit. Although the artifact was located approximately 20m north of site -4546, the artifact is considered an isolated find that may have been secondarily deposited in that location as a result of land modification attributed to previous ranching or military activities. Therefore, it is not possible to determine the original provenance of the artifact.

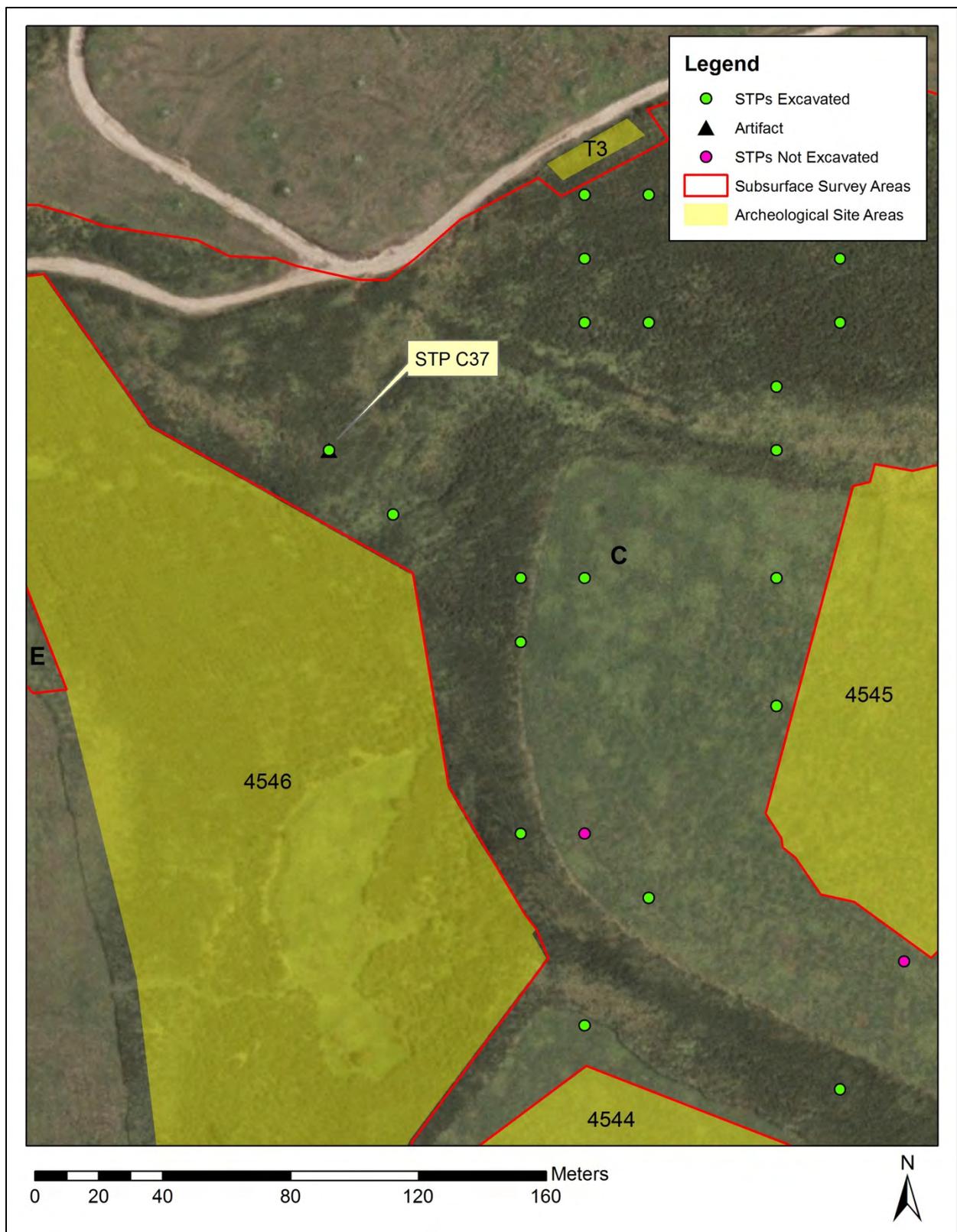


Figure 26 Map of STP C37

## STP D4

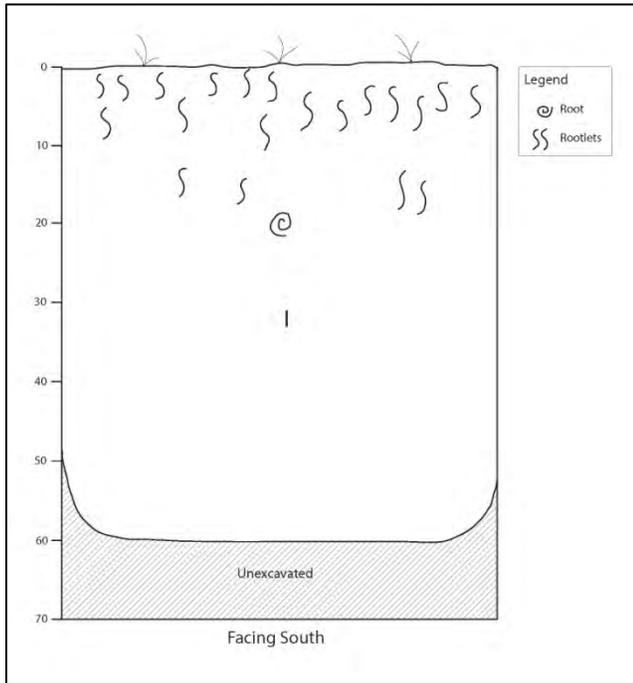


Figure 28 Profile of STP D4



Figure 27 Photo of STP D4

Table 13 STP D4 Sediment Description

Layer	Depth (cmbs)	Munsell Color Description	Sediment Description
I	0-60	5 YR 3/4 Dark Reddish Brown	Silty clay loam; moderate, fine, subangular-blocky structure; firm, slightly plastic, slightly sticky, wet consistency; many, fine to coarse roots; 5% rock content, subangular, basalt pebbles; no burnt or cultural material

STP D4 consisted of a single layer. Layer I is a dark reddish brown silty clay loam sediment layer. The excavation yielded no cultural material. The excavation ceased at 60 cm below the surface due to the absence of cultural material.

## STP E2

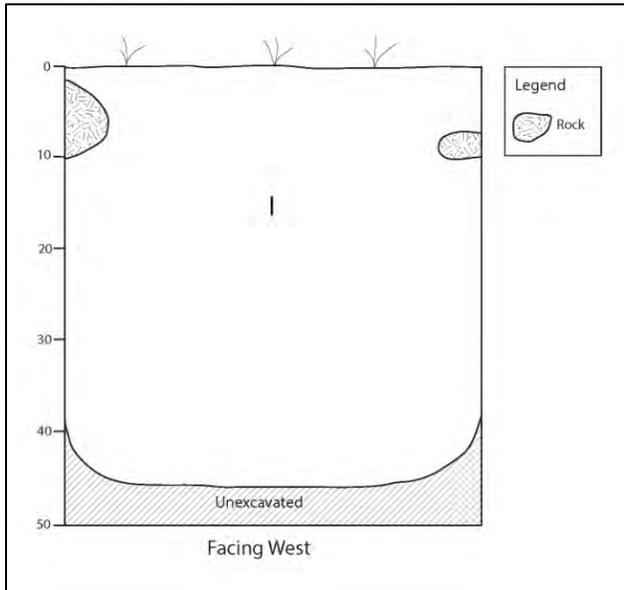


Figure 30 Profile of STP E2



Figure 29 Photo of STP E2

Table 14 STP E2 Sediment Description

Layer	Depth (cmbs)	Munsell Color Description	Sediment Description
I	0-45	7.5 YR 2.5/2 Very Dark Brown	Silt loam; moderate, coarse, angular-blocky structure; friable, moderately plastic, non-sticky, wet consistency; very few, fine roots; 10% rock content, angular, basalt pebbles; no burnt or cultural material

STP E2 consisted of a single layer. Layer I is a very dark brown silt loam sediment layer. The excavation yielded no cultural material. The excavation ceased at 45 cmbs, below the surface because a metal anomaly was detected by the UXO escort.

## STP E6

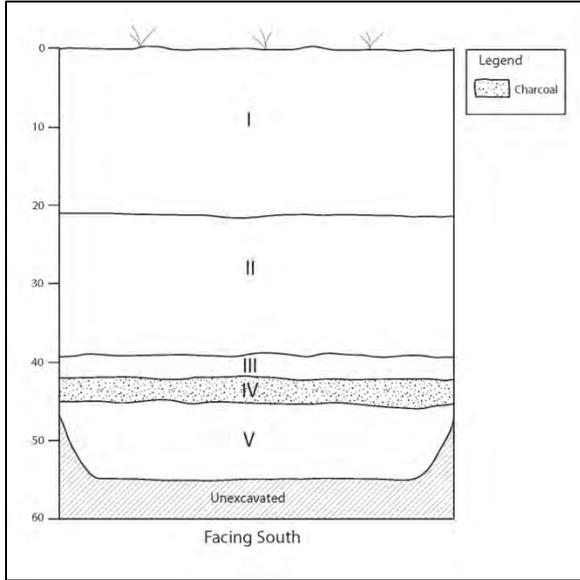


Figure 32 Profile of STP E6



Figure 31 Photo of STP E6

Table 15 STP E6 Sediment Description

Layer	Depth (cmbs)	Munsell Color Description	Sediment Description
I	0-21	7.5 YR 2.5/2 Very Dark Brown	Clay; moderate, medium, granular structure; loose, slightly plastic, slightly sticky, dry consistency; many, very fine roots; 10% rock content, subangular, basalt cobbles; no burnt or cultural material
II	21-39	10YR 2/2 Very Dark Brown	Silty clay; moderate, medium, granular structure; slightly hard, slightly plastic, slightly sticky, dry consistency; many, fine roots; 10% rock content, subangular, basalt pebbles; no burnt or cultural material
III	40-42	7.5YR 2.5/3 Very Dark Brown	Silty clay; moderate, medium, granular structure; slightly hard, slightly plastic, slightly sticky, dry consistency; very few, fine roots; 5% rock content, subangular, basalt pebbles; no burnt or cultural material
IV	42-45	10YR 2/1 Black	Silty clay charcoal; moderate, medium, granular structure; slightly hard, slightly plastic, slightly sticky,

			dry consistency; very few, fine roots; 5% rock content, subangular, basalt pebbles; abundant burnt wood; no cultural material
V	46-55	5YR 2.5/2 Dark Reddish Brown	Silty clay; moderate, medium, granular structure; slightly hard, slightly plastic, slightly sticky, dry consistency; very few, fine roots; 5% rock content, subangular, basalt pebbles; no burnt or cultural material

STP E6 consisted of five layers. Layer I is a very dark brown clay sediment layer. Layer II is a very dark brown silty clay sediment layer. Layer III is a very dark brown silty clay sediment layer. Layer IV is a black silty clay sediment layer consisting mostly of charcoal. A charcoal sample was collected from this layer. Layer V is a dark reddish brown silty clay sediment layer. Kukui nut fragments were encountered throughout the STP. The excavation ceased at 55 cm below the surface due to the abundance of sterile saprolite. The charcoal sample that was collected was analyzed for taxa identification. Results reported that the charcoal was identified as kukui, a Polynesian introduced tree; kolomona, a native tree and; 'ulu, a Polynesian introduced tree (see Appendix G for full report). No other cultural material was found in the STP. The charcoal found gives insight into the type of vegetation that was previously growing in this area. Kukui is abundant still in the area, whereas Kolomana and 'ulu are no longer found in the area. Situated between site -5926 and -4541, the STP is located in the flood plain of Kalena stream, indicating that the sediments observed may be attributed to alluvial processes. Due to the lack of intact cultural deposits in Layer IV, the collected charcoal sample cannot be definitively associated with cultural activities.

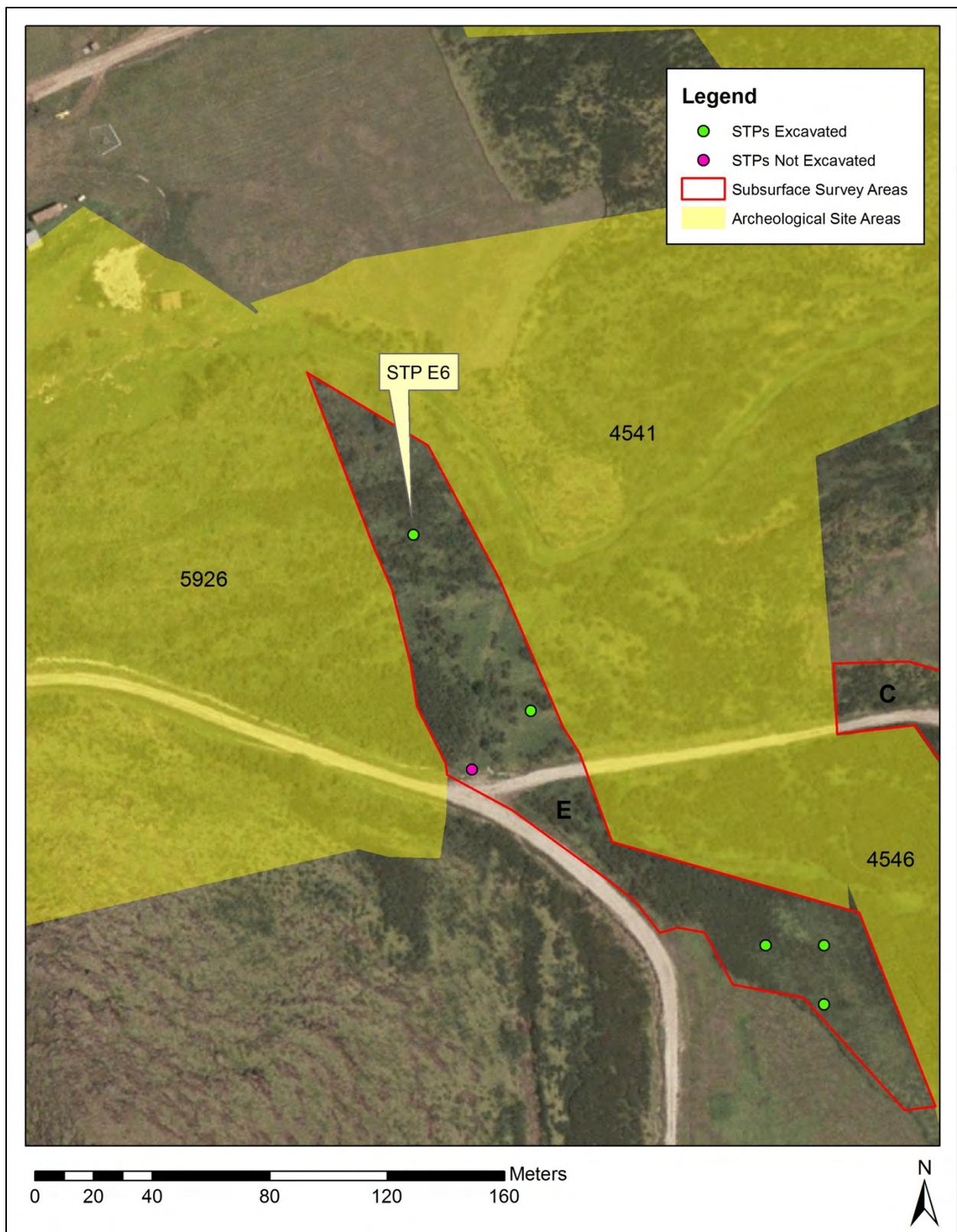


Figure 33 Map of STP E6

## STP F3

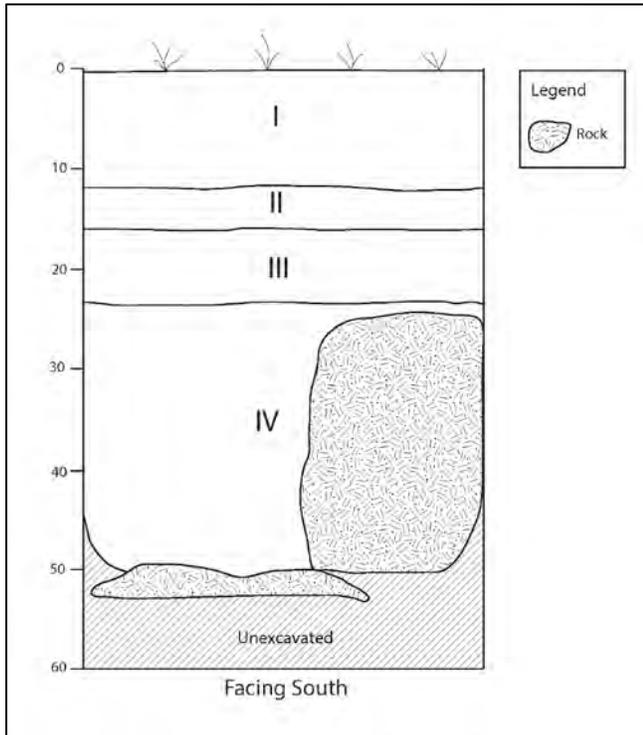


Figure 34 Profile of STP F3



Figure 35 Profile of STP F3

Table 16 STP F3 Sediment Description

Layer	Depth (cmbs)	Munsell Color Description	Sediment Description
I	0-12	5YR 3/3 Dark Reddish Brown	Clay; moderate, medium, subangular-blocky structure; firm, moderately plastic, slightly sticky, wet consistency; very few, medium roots; 5% rock content, subangular, basalt pebbles; no burnt material
II	13-16	5YR 3/2 Dark Reddish Brown	Silty clay; moderate, medium, subangular-blocky structure; firm, moderately plastic, slightly sticky, wet consistency; very few, medium roots; 5% rock content, subangular, basalt pebbles; no burnt or cultural material
III	17-23	5YR 3/2 Dark Reddish Brown	Clay; moderate, medium, subangular-blocky structure; firm, moderately plastic, slightly sticky, wet consistency; very few, medium roots; 5% rock content, subangular, basalt pebbles; no burnt or cultural material

IV	24-50	5YR 4/2 Dark Reddish Brown	Silty clay; moderate, medium, subangular-blocky structure; firm, moderately plastic, slightly sticky, wet consistency; very few, medium roots; 5% rock content, subangular, basalt pebbles; no burnt or cultural material
----	-------	----------------------------	---

STP F3 consisted of four layers. Layer I is a dark reddish brown clay sediment layer. Layer II is a dark reddish brown silty clay sediment layer. Layer III is a dark reddish brown clay sediment layer. Layer IV is a dark reddish brown silty clay sediment layer. The excavation ceased at 50 cm below the surface due to a large boulder.

## **UNEXCAVATED STP**

The following pages document a representative sample of STPs that were not excavated, with photographs and supporting narratives. These STPs locations were not excavated, due to one or more of the following reasons; the terrain was too steep to safely conduct excavation as determined by the UXO technician and field supervisor collectively; the probe was located in a stream or other water drainage; a metal anomaly was detected below the surface in a probe location by the UXO technician; the probe was located in the vicinity (within 3 meters) of a previously unknown archaeological feature and/or site; and thick vegetation (i.e., koa haole and guinea grass) which covered the probe location could not safely be removed by the UXO technician team.



Figure 36 STP B5, located on edge of road cut and steep slope. STP indicated by orange flag

STP B5 was located on a 40 degree slope. Its location is on the edge of a bulldozed road cut. The surrounding area's natural slope is approximately 30 degrees. Due to the heavy disturbance from the road cut, intact cultural or natural layers would not be present.



Figure 37 STP B13, located in drainage. STP location indicated by orange flag

STP B13 was located on the southern slope of a large wash. The wash appears to have been created by water diversion methods associated with the firebreak road. The area between the firebreak road and the wash appears to have been modified by heavy machinery. The northern side of the wash is an earthen berm.



Figure 38 STP B14 located in drainage. STP indicated by orange flag

STP B14 was located on the southern slope of a large wash. This STP is located in the same wash described earlier in the STP B13 description.



Figure 39 STP B26, located in Kalena stream. STP located between yellow flagging

STP B26 was located in a drainage, known as Kalena stream. The surrounding area was abundant with waterworn stream cobbles. Though not located in the current flow corridor of stream, it was evident that the stream once flowed in the STPs location.



Figure 40 STP D1, located on steep slope. STP indicated by orange flag

STP D1 was located on a slope greater than 30 degrees. Within the work area the steepness of the slope greatly increased. The UXO safety technician and field supervisor collectively determined that the area was unsafe to work in.



Figure 41 STP D11, located on steep slope and in wash. STP indicated by orange flag

STP D11 was located in wash on a north facing slope of the adjacent south firebreak road. The wash was most likely created by storm water run-off. It was determined that the likelihood of encountering intact stratigraphic deposits was very low in this area.



Figure 42 STP E1, located in wash. STP location indicated by orange flag

STP E1 was located in a wash adjacent to the south firebreak road. The wash was created as a result of storm water flow from the nearby Kalena stream. Due to alterations to the original stream flow corridor, such as the Range maintenance road that crosses Kalena stream, this wash was created when overflow of the stream occurred during a storm event.



Figure 43 STP C6, located near an unrecorded remnant terrace. STP indicated by pink flag and arrow

STP C6 was not excavated because it was located on a previously unidentified archaeological feature. The feature is a remnant rock retained soil terrace. The terrace is approximately 21m (North/South) by 4.7m (East/West). The retaining portion of the terrace is made up of an alignment of cobbles and small boulders. The face of the terrace is approximately 10cm tall. The STP is located less than 1m from the level soil retained portion of the terrace. The terrace is most likely an agricultural feature associated with site -4545 which is located just north of the terrace.

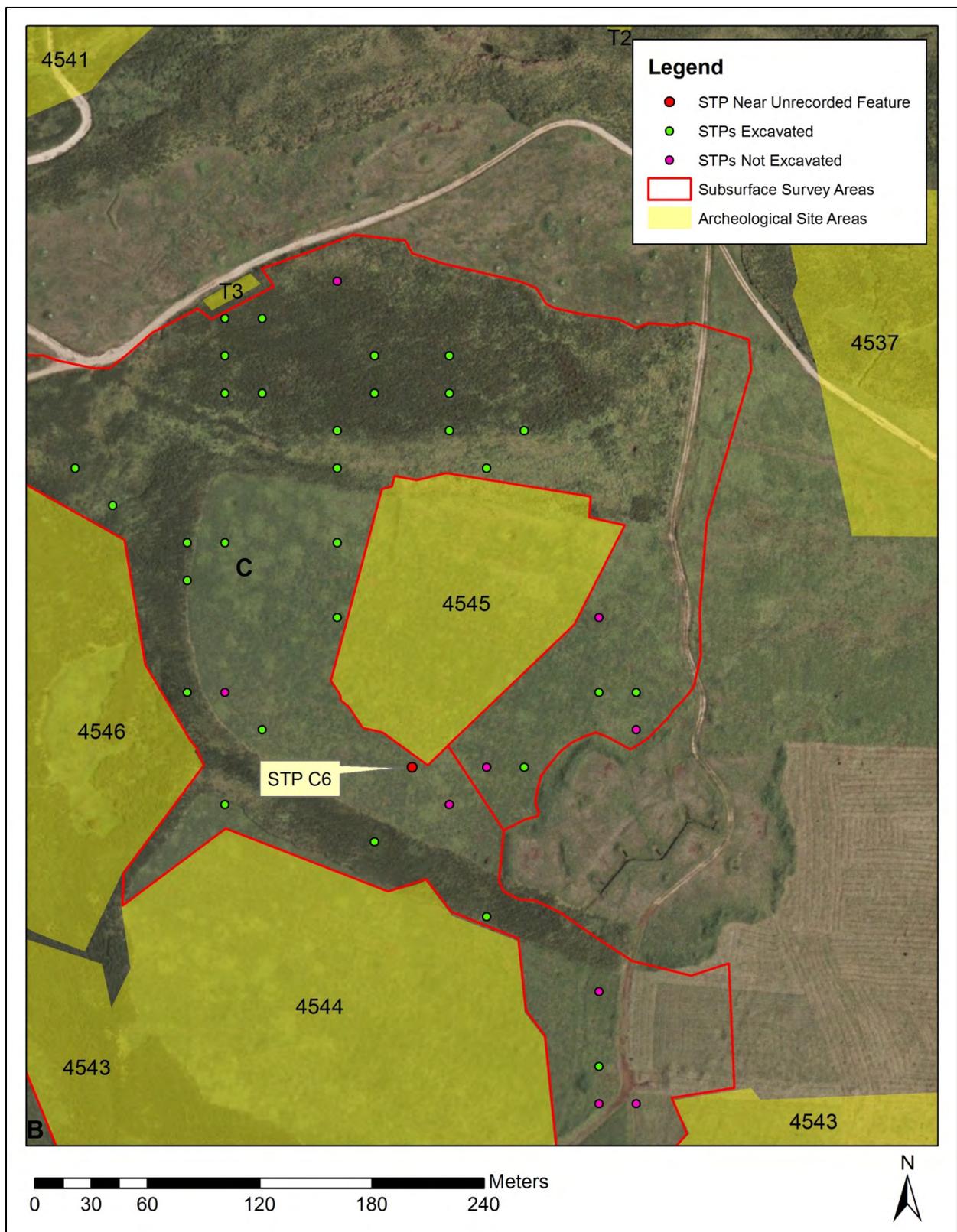


Figure 44 The remnant terrace near STP C6 is less than 7m from the boundary of site -4545



Figure 45 STP D6, located on unrecorded rock and earthen terrace. STP location indicated by orange flag

STP D6 was located less than 3m from a previously unidentified terrace. The terrace is an earthen terrace that stretches across the natural slope from North to South. It is comprised of soil and a few cobbles which form a remnant alignment. The terrace is most likely an agricultural feature associated with site -4542 which is located just south of the terrace. Similar terrace features of site -4542 are located near this terrace, probably serving the same function.

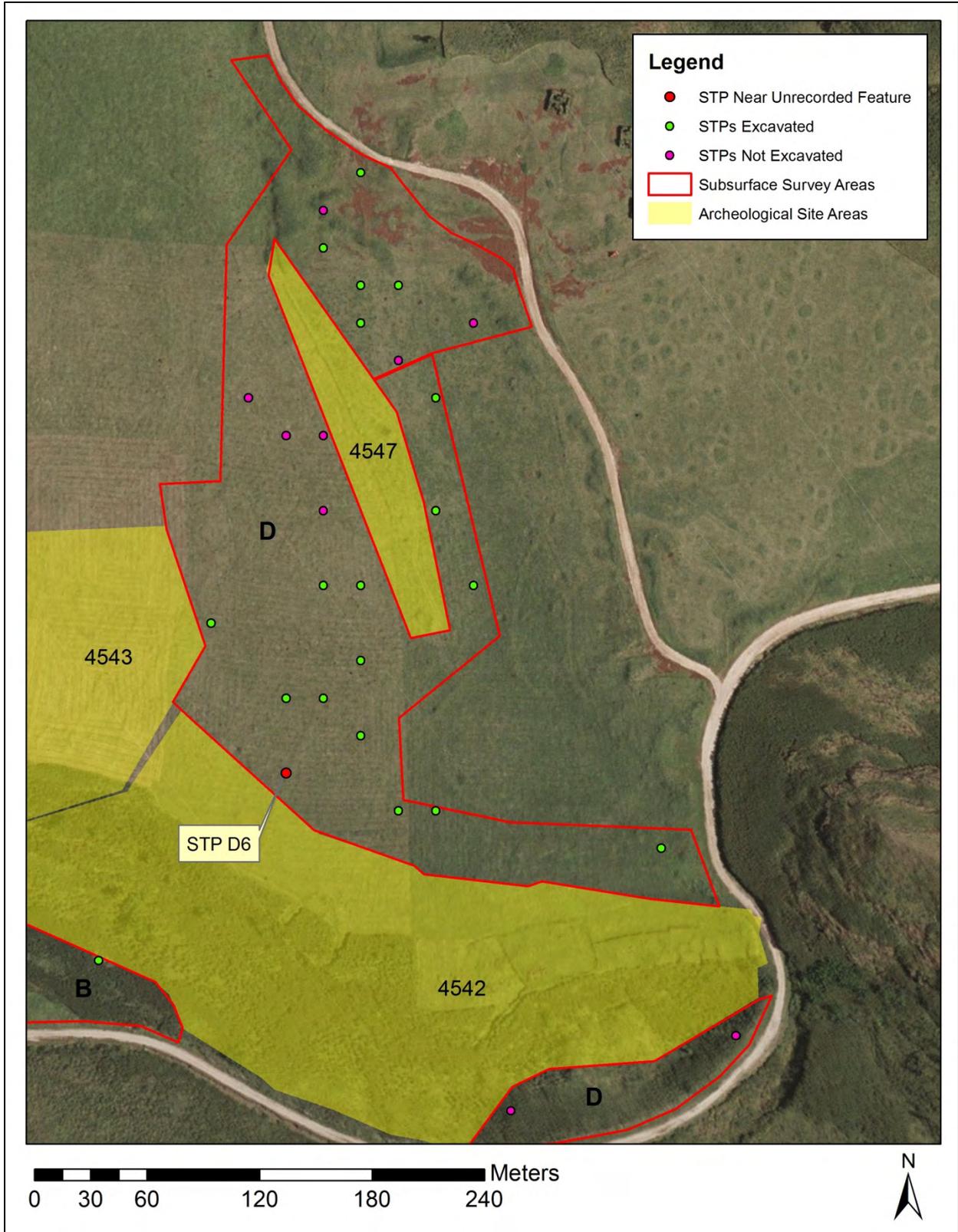


Figure 46 The terrace near STP D6 is less than 12m from the boundary of site -4542

## **LABORATORY ANALYSIS**

A bag list was maintained in the field for all materials collected. Materials were bagged individually by type (e.g. lithics and charcoal) and assigned bag numbers. Items collected that were determined not to be artifacts through analysis are not documented in this report.

## **ARTIFACTS**

One traditional artifact was found during this survey. The artifact, a hammer stone, was found in STP C37. The following is a description of the artifact.

*MMR2013-1* is a basalt hammer stone weighing 486 grams with dimensions of 9.07 cm by 6.47 cm by 5.26 cm. The impact side of the stone shows impact scarring. A section of the stone has a flattened surface, possibly formed by grinding against another stone's surface. Its size and weight fits comfortably in one's hand allowing the stone to be used as a hammer stone. The artifact is at the USAG-HI's Cultural Resources curation facility in Schofield Barracks.

The hammer stone is an isolated artifact, also referred to as an isolate. An isolate is an item that has been previously removed from its original location, displacing it from an archaeological context. Isolates lack clear association with an archaeological site. The isolate is an object that has little or no archaeological significance except for its characteristics as an artifact. Other examples (not involved here) could include projectile points and single flakes. As an isolated artifact, the hammer stone does not meet the eligibility criteria for listing in the National Register of Historic Places and is therefore not considered an historic property.



Figure 47 Artifact MMR2013-1



Figure 48 Artifact MMR2013-1, showing base

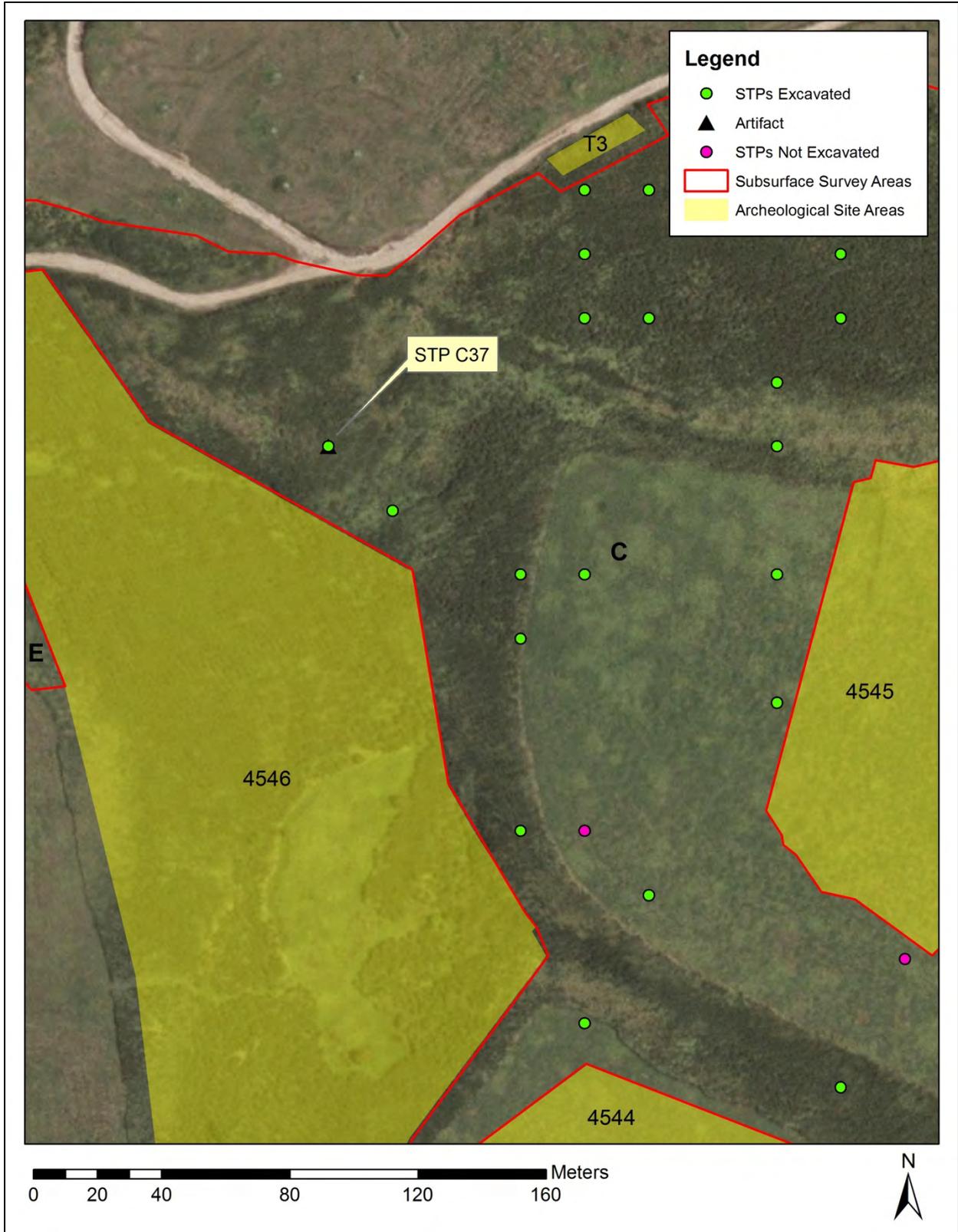


Figure 49 Map showing STP 37 which is less than 20m from the boundary of site -4546

## CONCLUSIONS AND RECOMMENDATIONS

The stratified random sampling plan used to conduct this subsurface survey resulted in negative findings for subsurface archaeological features or intact cultural deposits. Cultural deposits were absent in areas where no surface features were present.

Although charcoal fragments found to have originated from native and Polynesian introduced woods were recovered from STP E6, and charcoal was present in STP C28, neither sample was associated with cultural deposits. Therefore, these fragments are likely a result of a past fire event. The presence of an artifact in an area (STP C37) does not present sufficient evidence to declare definitively that its location can be considered an archaeological site. No STPs contained in-situ cultural deposits subsurface.

With respect to long-term management, most of the current site boundaries within the project area are accurately depicted. The exceptions are the two STP locations (STP C6 and D6) that were located near previously unidentified archaeological features adjacent to site -4542 and -4545. The expansion of the current site boundaries of these two sites to encompass the newly identified features is justified.

Seibert Stakes (markers that indicate off-limit areas), are current site protection measures in place (see Figure 50). Extending site boundaries to encompass the features identified in this survey will not result in changes to the current off-limit areas because the locations fall within the existing protected zones.

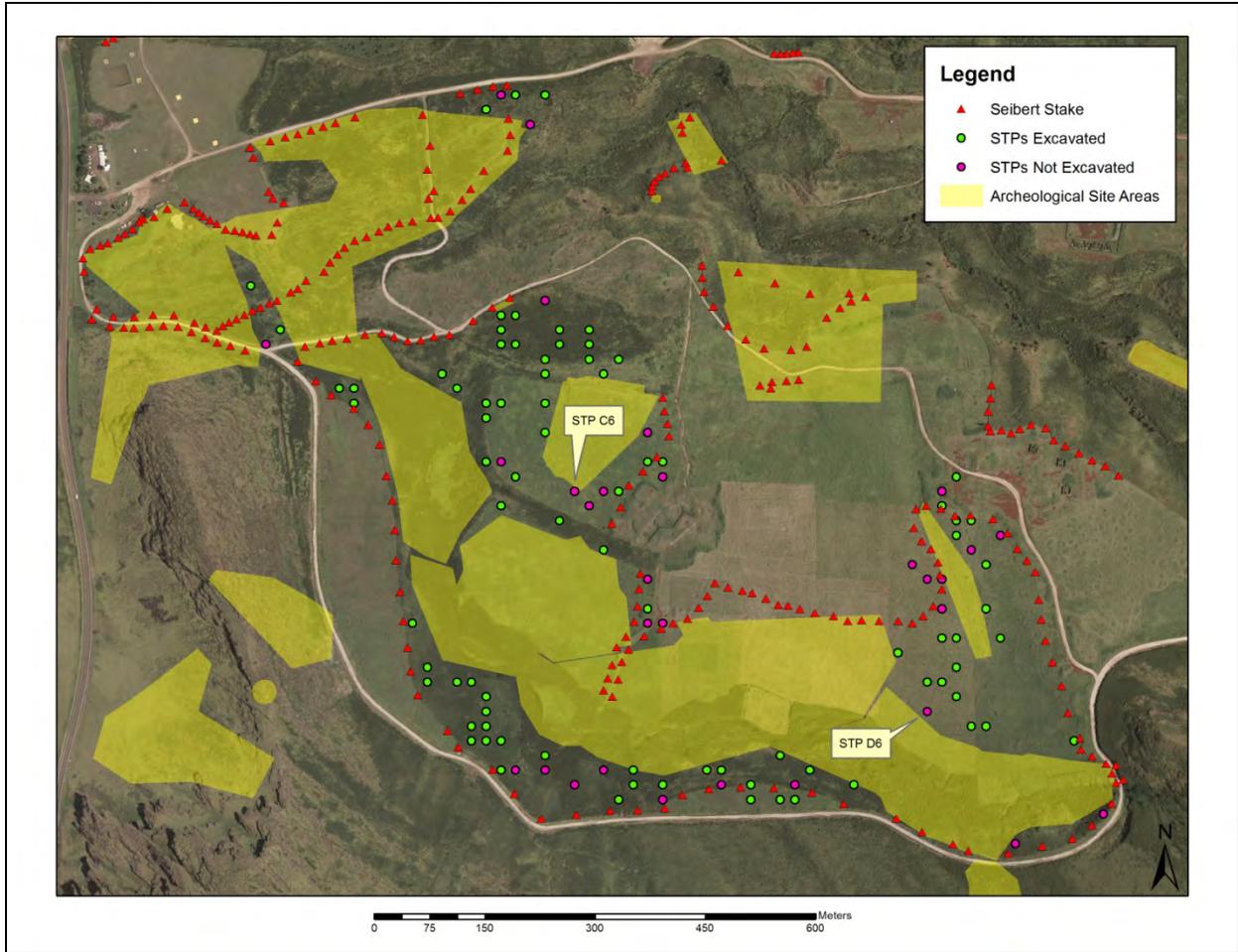


Figure 50 Map showing Seibert stake locations and STP C6 and D6

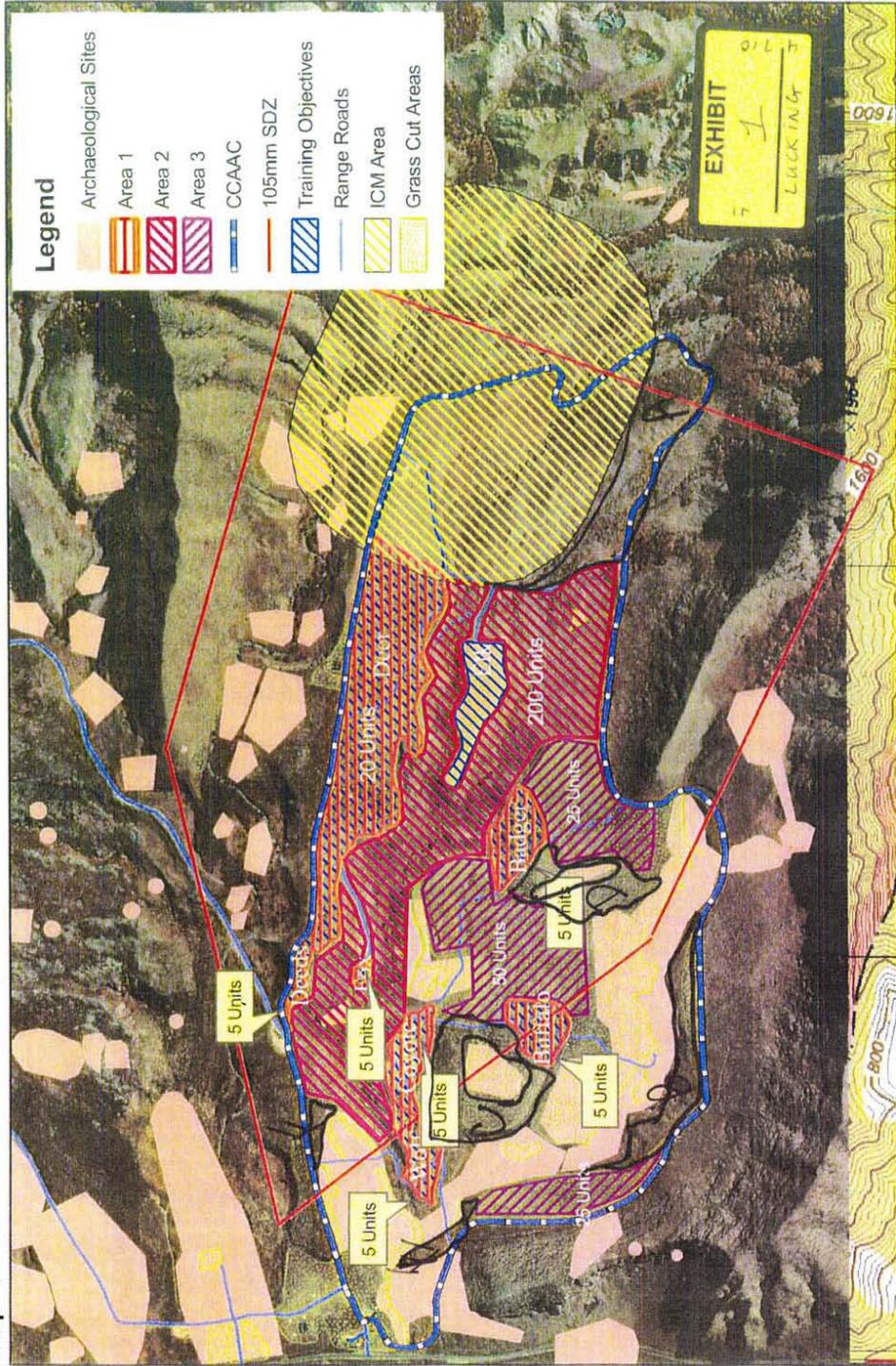
## REFERENCES

- Carlson, I., P. Cleghorn, F. Eble, T. Jackson, and M. Weisler. 1996. *Archaeological Reconnaissance Survey of Proposed Firebreak Road at Makua Military Reservation, Wai'anae District, Island of O'ahu, Hawai'i*. Biosystems Analysis, Inc., Kailua, Hawai'i.
- Cordy, R. 2002  
*An Ancient History of Wai'anae*. Mutual Publishing, Honolulu.
- ĪĪ, J.P. 1959  
*Fragments of Hawaiian History*. Bishop Museum Press, Honolulu. Translated by M.K. Pukui.
- Gollin, L., K. Kamelemela, A. Kay, N. Ishihara, M. Magat and H. Hammat. 2013.  
*Traditional Cultural Places Study/Ethnographic Report for Mākuā*. Prepared for U.S. Army Corps of Engineers, Honolulu District. Cultural Surveys Hawai'i, Kailua Hawai'i.
- Munsell Color. 1975  
*Munsell Soil Color Charts*. 1975 Edition. Munsell Color, Macbeth A division of Kollmorgen Corp., Baltimore.
- Kamakau, S.M. 1991.  
*Tales and Traditions of the People of Old, Nā Mo'olelo a ka Po'e Kahiko*. Bishop Museum Press, Honolulu. Translated by M.K. Pukui, Ed. D.B. Barrere.
- Kelly, M. and S.M. Quintal. 1977.  
*Cultural History Report of Makua Military Reservation and Vicinity Makua Valley, Oahu, Hawaii*. Dept. of Anthropology, Bernice P. Bishop Museum, Honolulu.
- Maly, K. and O. Maly. 2003  
*Volume I: Ka Hana Lawai'a A Me Nā Ko'a O Na Kai 'Ewalu: A History of Fishing Practices and Marine Fisheries of the Hawaiian Islands, Compiled from: Native Hawaiian Traditions, Historical Accounts, Government Communications, Kama'āina Testimony and Ethnography*. Kumu Pono Associates, Hilo, Hawai'i.
- Pukui, M. K., S. H. Elbert and E. T. Mookini. 1981  
*Place Names of Hawaii*, The University Press of Hawaii, Honolulu.
- Robins, J. A.L. González and J.A. Peterson. 2005  
*Archaeological Survey and Protection of Cultural Resources during UXO Removal Activities, Makua Military Reservation, Kahanahāiki and Mākuā Ahupua'a, Wai'anae District, O'ahu Island, Hawai'i (TMK 8-2-01)*. Prepared for U.S. Army Corps of Engineers, Honolulu District. Garcia and Associates, Kailua.

- Robins, J., L. Gilda and J. Peterson. 2005b  
*Archaeological Subsurface Testing and Survey of Sites in the Combined Arms Assault Course, Makua Military Reservation, Makua Ahupua'a, Wai'anae District, O'ahu Island, Hawai'i (TMK 8-2-01)*. Prepared for U.S. Army Corps of Engineers, Honolulu District. Garcia and Associates, Kailua
- Sterling, E. P. and C. C. Summers. 1978.  
*Sites of O'ahu*. Bishop Museum, Honolulu.
- US Army Garrison, Hawaii 2007  
*Archaeological Subsurface Survey Within the Company Combined Arms Assault Course (CCAAC) Circumscribed by the South Firebreak Road, Makua Military Reservation, Mākua Ahupua'a, Wai'anae District, O'ahu Island, Hawai'i (TMK 8-2-01:20)*. U.S. Army Garrison, Schofield Barracks, HI.
- Zulick, L. and D. Cox. 2001  
*Phase I Inventory Survey of Cultural resources on Mākua Military Reservation, O'ahu Island, Hawai'i*. U.S. Army Garrison, Schofield Barracks, HI.

**APPENDIX A: Exhibit 1 of the April 7, 2010, Deposition of Laurie Lucking**

Map 1



Makua Military Reservation  
Proposed Subsurface Survey Areas



Figure 2

**APPENDIX B: Randomly Generated Numbers**



Print 

Download in Excel 

Close 

### Research Randomizer Results

1 Set of 34 Unique Numbers Per Set

Range: From 1 to 125 -- Sorted from Least to Greatest

Job Status: **Finished**

#### Set #1:

3, 9, 12, 14, 15, 23, 29, 33, 34, 38, 39, 40, 48, 54, 55, 56, 58, 62, 64, 66, 67, 73, 78, 82, 84, 88,  
90, 93, 97, 104, 107, 113, 115, 116

---

Random numbers for Area B.



Print 

Download in Excel 

Close 

### Research Randomizer Results

1 Set of 40 Unique Numbers Per Set

Range: From 1 to 215 -- Sorted from Least to Greatest

Job Status: **Finished**

#### Set #1:

4, 10, 11, 26, 30, 32, 47, 48, 51, 53, 70, 74, 76, 83, 90, 94, 102, 113, 114, 117, 121, 133, 134,  
146, 147, 152, 153, 156, 162, 168, 170, 171, 173, 179, 184, 191, 197, 207, 212, 213

---

Random numbers for Area C.



Print 

Download in Excel 

Close 

### Research Randomizer Results

1 Set of 28 Unique Numbers Per Set

Range: From 1 to 117 -- Sorted from Least to Greatest

Job Status: **Finished**

#### Set #1:

7, 9, 14, 21, 22, 27, 30, 34, 35, 38, 40, 41, 51, 52, 63, 64, 65, 66, 77, 82, 83, 89, 90, 96, 97, 105, 109, 114

---



Print 

Download in Excel 

Close 

### Research Randomizer Results

1 Set of 6 Unique Numbers Per Set

Range: From 1 to 21 -- Sorted from Least to Greatest

Job Status: **Finished**

**Set #1:**

4, 11, 12, 17, 18, 19

---

Random numbers for Area E.



Print 

Download in Excel 

Close 

### Research Randomizer Results

1 Set of 5 Unique Numbers Per Set

Range: From 1 to 18 -- Sorted from Least to Greatest

Job Status: **Finished**

**Set #1:**

4, 5, 7, 11, 16

---

Random numbers for Area F.

**APPENDIX C: Inadvertent Discovery Plan**

**INADVERTENT DISCOVERY PLAN  
FOR HUMAN SKELETAL REMAINS AND PREVIOUSLY  
UNKNOWN CULTURAL RESOURCES**

1. Any Employee (or contractor in the employ) of the Garrison who knows or has reason to know that human remains, associated cultural items, or previously unidentified or unanticipated cultural resources have been inadvertently discovered on land owned or controlled by the Garrison, shall provide immediate telephone notification of the discovery, with written back up to the Garrison Commander and the Garrison Cultural Resources Manager (GCRM). Human remains and cultural items include those as defined under the NAGPRA. Cultural resources may be prehistoric or historic; surface or subsurface; and include but are not limited to human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, soil, or other deposits; rocks or coral alignments, paving, wall or other constructed features; and any indication of agricultural or other uses.

2. The Employee or contractor shall also immediately stop any activity in the area of the discovery and protect the human remains, cultural items and unidentified or unanticipated cultural resources unless prevented from doing so due to life/safety concerns. The contractor shall not proceed in that area until directed by the GCRM or designated representatives. The Contractor shall expect reasonable delays of up to 7 calendar days for unidentified cultural resources discoveries.

3. Once contacted regarding an inadvertent discovery, the GCRM, their representative from the Cultural Resources staff or the designated contract project archaeologist will determine the nature and context of the discovery:

- a. If the inadvertent discovery is determined potentially human remains or cultural items, the GCRM or their representative from the Cultural Resources staff will make an in-situ examination of the condition, antiquity, and cultural affiliation of the cultural resource based upon applicable professional standards to determine whether or not the remains and cultural items appear to be Native Hawaiian.
- b. If the previously unidentified or unanticipated cultural resources can positively and unquestionably be determined not to be human remains or associated cultural items, the GCRM, their representative from the Cultural Resources staff or the designated contract project archaeologist will make an in-situ examination to obtain an assessment of the discovery and to determine its susceptibility to damage from ongoing construction activity. In coordination with the GCRM, the construction standoff distance may be increased or decreased and determine what procedures need to be implemented.

**INADVERTENT DISCOVERY PLAN  
FOR HUMAN SKELETAL REMAINS AND PREVIOUSLY  
UNKNOWN CULTURAL RESOURCES**

4. If the examination determines that the human remains or cultural items appear to be Native Hawaiian, the Garrison shall notify the State Historic Preservation Division, Office of Hawaiian Affairs (OHA), Hui Malama I Na Kupuna O Hawaii Nei, and the appropriate Burial Council by telephone, via e-mail, or with written correspondence within 48 hours.
5. If, through consultation with the above parties, the Garrison Commander establishes the human remains and cultural items cannot be left in situ, their excavation and removal shall be undertaken by professional archaeologists employed by the Garrison within 15 working days from the initial contact between the Garrison and the Burial Council.
6. Prior to disposition of the human remains and cultural items, the Garrison shall publish a general notice of the proposed disposition in a newspaper of general circulation in the area which the remains were recovered. The notice shall provide information as the nature and cultural affiliation of the remains and cultural items and shall solicit further claims of ownership. The notice shall be published at least twice, at one-week intervals, and transfer shall not take place until 30 days after the second notice to allow for any additional claimants to come forward.
7. If re-interment is on land owned or controlled by the Garrison, the location of the re-interment shall only be reported to the claimant, the Garrison Commander, and the GCRM.

## Appendix D: Soil Description Table

The below guide is used to interpret the following table.

STP No.	Layer	Depth (cmbs)	Boundary	Structure	Consistence				Texture	Roots	Rock Content	Burnt Material	Cultural Material	Munsell	Description	Reason for Not Excavating	Reason for Ceasing Excavation
					Dry	Wet	Sticky	Plastic									
B-F	I II III IV V etc...	0-60		<u>Grade:</u> *structureless (0) *weak (1) *moderate (2) *strong (3)  <u>Size:</u> *very fine (vf) *fine (f) *medium (m) *coarse (co) *very coarse (vc) *extremely coarse (ec)  <u>Structure:</u> *granular (gr) *angular blocky (abk) *subangular blocky (sbk) *platy (pl) *wedge (weg) *prismatic (pr) *columnar (cpr) *single grain (sg) *massive (m)	*loose (lo)	*loose (lo)	*non-sticky (so)	*non-plastic (po)	*coarse sand (cos)					10 YR 3/4	Dark reddish brown	(1) Terrain was too steep to safely conduct excavation as determined by the UXO technician and field supervisor collectively.  (2) Probe was located in a stream or other water drainage. Stream deposits are ever changing, leaving no deposit of integrity.  (3) A metal anomaly was detected below the surface in a probe location by the UXO technician.  (4) Probe was located in the vicinity (within 3 meters) of a previously unknown archaeological feature and/or site.  (5) Thick vegetation (i.e., koa haole and guinea grass) which covered the probe location could not safely be removed by the UXO technician team.	STP excavations ceased at various depths due to a variety of reasons:  * Absence of cultural material down to a depth where a reasonable effort to identify materials was made  *Presence of boulders or high concentration of rocks within the probe made excavation impassable  *Concentration of sterile saprolite  *Metal anomaly detected at deeper depth

STP No.	Layer	Depth (cmbs)	Boundary	Structure	Consistence				Texture	Roots	Rock Content	Burnt Material	Cultural Material	Munsell	Description	Reason for Not Excavating	Reason for Ceasing Excavation
					Dry	Wet	Sticky	Plastic									
B1	I	0-60	NA	2, f, sbk	NA	fr	s	p	sicl	1, vf	15%, sr, c, B	None	None	10 YR 3/1	Very dark gray	NA	Presence of boulders or high concentration of rocks within the probe made excavation impassable
B2	I	0-25	NA	1, co, abk	lo	lo	ss	ps	cosl	2, f	35%, an, c, B	None	None	5 YR 3/4 + 7.5 YR 3/3	Dark reddish brown + Dark brown	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
	II	25-55	c, s	3, f, abk	fi	fi	s	p	sicl	1, f	5%, an, p, B	None	None	10 YR 3/1	Very dark gray		
B3	I	0-10	NA	2, co, gr	so	fi	ss	ps	scl	2, f/m	75%, sr, p/c, B	None	None	5 YR 3/1	Very dark gray	NA	Presence of boulders or high concentration of rocks within the probe made excavation impassable
B4	I	0-40	NA	2, m, gr	sh	fi	s	p	sic	2, f	50%, sa, c, B	f, o	None	5 YR 3/1	Very dark gray	NA	Presence of boulders or high concentration of rocks within the probe made excavation impassable
B5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(1)	NA
B6	I	0-45	NA	2, m, sbk	so	fi	s	p	sicl	2, m	30%, sa, c, B	None	None	10 YR 3/1	Very dark gray	NA	Presence of boulders or high concentration of rocks within the probe made excavation impassable
B7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA
B8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA
B9	I	0-60	NA	2, m, sbk	sh	fr	ss	p	sc	2, m	25%, sa/ww, p/c, B	t, o	None	2.5 YR 3/2	Dusky red	NA	Concentration of sterile saprolite; absence of cultural material down to a depth where a reasonable effort to identify materials was made
B10	I	0-20	NA	1, f, gr	lo	lo	so	po	ls	2, f	50%, sa, c, B	None	None	10 YR 2/2	Very dark brown	NA	Presence of boulders or high concentration of rocks within the probe made excavation impassable
B11	I	0-40	NA	1, m, gr	so	fi	s	ps	sc	2, f	25%, sa/wr/ww,	t, o	None	7.5 YR 3/1	Very dark gray	NA	Presence of boulders or high concentration of rocks within the

STP No.	Layer	Depth (cmbs)	Boundary	Structure	Consistence				Texture	Roots	Rock Content	Burnt Material	Cultural Material	Munsell	Description	Reason for Not Excavating	Reason for Ceasing Excavation
					Dry	Wet	Sticky	Plastic									
											p/c, B					probe made excavation impassable	
B12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA	
B13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(2)	NA	
B14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(2)	NA	
B15	I	0-20	NA	2, co, gr	lo	NA	ss	p	sc	3, co	90%, sa, b, B	None	None	7.5 YR 2.5/2	Very dark brown	NA	Presence of boulders or high concentration of rocks within the probe made excavation impassable
B16	I	0-20	NA	1, m, sbk	lo	fr	ss	po	scl	3, f	80%, sa, p/c, B	None	None	7.5 YR 2.5/3	Very dark brown	NA	Presence of boulders or high concentration of rocks within the probe made excavation impassable
	II	21-50	c, w	2, f, sbk	so	fr	ss	ps	sicl	2, f	45%, sa, c, B	None	None	7.5 YR 2.5/2	Very dark brown		
	III	51-56	c, w	3, vf, gr	NA	fi	s	p	sicl	None	10%, sa, c, B	None	None	10 YR 3/1	Very dark gray		
B17	I	0-10	NA	2, co, gr	lo	NA	so	po	scl	2, f	25%, sa, c, B	None	None	5 YR 2.5/1	Black	NA	Concentration of sterile saprolite; absence of cultural material down to a depth where a reasonable effort to identify materials was made
	II	11-60	g	2, m, gr	NA	efi	vs	vp	cl	None	10%, sa, p, B	None	None	5 YR 4/1	Dark gray		
B18	I	0-22	NA	1, f, sbk	lo	fr	so	po	scl	2, f	30%, sa, c/p, B	None	None	5 YR 2.5/2	Dark reddish brown	NA	Presence of boulders or high concentration of rocks within the probe made excavation impassable
	II	23-50	c, w	3, vf, gr	sh	fi	s	p	sicl	1, vf	60%, sa, p, B	None	None	10 YR 3/1	Very dark gray		
B19	I	0-12	NA	1, m, sbk	lo	fr	so	po	scl	3, f	5%, sa, p, B	None	None	5 YR 3/2	Dark reddish brown	NA	Concentration of sterile saprolite; absence of cultural material down to a depth where a reasonable effort to identify materials was made
	II	13-60	c, w	1, f, gr	lo	fr	ss	ps	sicl	2, f	5%, sa, p, B	f, o-w	None	5 YR 3/4	Dark reddish brown		
B20	I	0-40	NA	2, vf, sbk	lo	fi	s	vp	sic	2, vf/f	25%, sa, p/c, B	f, w	None	10 YR 3/1	Very dark gray	NA	Presence of boulders or high concentration of rocks within the probe made excavation impassable
B21	I	0-32	NA	2, f, sbk	lo	fi	s	p	sicl	2, vf/f	25%, sa, c, B	None	None	10YR 2/1	Black	NA	Presence of boulders or high concentration of rocks within the probe made excavation

STP No.	Layer	Depth (cmbs)	Boundary	Structure	Consistence				Texture	Roots	Rock Content	Burnt Material	Cultural Material	Munsell	Description	Reason for Not Excavating	Reason for Ceasing Excavation
					Dry	Wet	Sticky	Plastic									
																	impassable
B22	I	0-45	NA	2, vf, sbk	lo	fi	s	p	sic	1, vf/f	20%, sa, p/c, B	None	None	10 YR 3/1	Very dark gray	NA	Presence of boulders or high concentration of rocks within the probe made excavation impassable
B23	I	0-43	NA	1, f, sbk	lo	fr	ss	ps	sicl	2, vf-co	5%, sa, p, B	None	None	5 YR 3/4	Dark reddish brown	NA	Concentration of sterile saprolite
B24	I	0-50	NA	3, f, sbk	vh	fi	ss	ps	sicl	2, vf/f	5%, sa, p, B	None	None	5 YR 3/4	Dark reddish brown	NA	Concentration of sterile saprolite
B25	I	0-32	NA	1, f, gr	lo	vfr	so	po	sl	2, vf/f	30%, sa, p, B	None	None	10 YR 3/2	Very dark grayish brown	NA	Presence of boulders or high concentration of rocks within the probe made excavation impassable
B26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(2)	NA
B27	I	0-35	NA	1, f, gr	lo	vfr	so	po	sl	1, vf/f	30%, sa, p, B	None	None	10 YR 3/2	Very dark grayish brown	NA	Presence of boulders or high concentration of rocks within the probe made excavation impassable
B28	I	0-25	NA	2, co, gr	lo	NA	ss	ps	sicl	3, m	5%, an, p, B	f, w	None	10 YR 3/3	Dark brown	NA	Presence of boulders or high concentration of rocks within the probe made excavation impassable
B29	I	0-14	NA	1, co, gr	lo	NA	so	po	sicl	2, co	50%, sa, p, B	None	None	5 YR 3/4	Dark reddish brown	NA	Concentration of sterile saprolite
B30	I	0-27	NA	2, m, gr	so	NA	ss	ps	sicl	2, f	40%, sr, c, B	None	None	10 YR 3/2	Very dark grayish brown	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
	II	28-50	c, s	3, m, sbk	NA	vh	s	p	c	1, vf	10%, sr, c, B	None	None	10 YR 4/1	Dark gray		
B31	I	0-23	NA	2, m, sbk	sh	NA	ss	ps	sicl	2, m	40%, sa, c, B	f, w	None	10 YR 3/2	Very dark brown	NA	UXO technician decision
	II	24-65	c, s	3, vf, sbk	so	fi	vs	vp	sicl	None	20%, sa, c, B	None	None	10 YR 3/1	Very dark gray		
B32	I	0-20	NA	2, co, gr	sh	NA	so	po	sicl	2, f	5%, sa, p, B	None	None	2.5 YR 2.5/1	Reddish black	NA	Presence of boulders or high concentration of rocks within the probe made excavation impassable
B33	I	0-23	NA	2, m, sbk	so	NA	ss	ps	scl	3, f/m	10%, sa, p/c, B	f, w	None	10 YR 3/3	Dark brown	NA	Presence of boulders or high concentration of rocks within the

STP No.	Layer	Depth (cmbs)	Boundary	Structure	Consistence				Texture	Roots	Rock Content	Burnt Material	Cultural Material	Munsell	Description	Reason for Not Excavating	Reason for Ceasing Excavation
					Dry	Wet	Sticky	Plastic									
	II	24-50	c, s	2, m, sbk	NA	fi	ss	ps	sic	1, vf/f	5%, sa, p/c, B	f, w	None	10 YR 2/2	Very dark brown		probe made excavation impassable
B34	I	0-50	NA	3, m, sbk	NA	vh	s	p	c	1, vf	5%, sa, p/c, B	f, w	None	10 YR 3/1	Very dark gray	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
C1	I	0-55	NA	2, m, sbk	sh	fi	ss	ps	sicl	3, f/m	20%, sa, p, B	None	None	5YR 3/4	Dark reddish brown	NA	Concentration of sterile saprolite; absence of cultural material down to a depth where a reasonable effort to identify materials was made
C2	I	0-55	NA	3, ec, abk	eh	NA	ss	ps	ls	3, co	80%, sr, c, B	None	None	2.5YR 3/6	Dark red	NA	Concentration of sterile saprolite; absence of cultural material down to a depth where a reasonable effort to identify materials was made
C3	I	0-60	NA	2, m, sbk	so	fr	ss	ps	sicl	2, f	5%, sa, p, B	None	None	5YR 3/4	Dark reddish brown	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
C4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA
C5	I	0-50	NA	3, ec, abk	eh	NA	ss	ps	ls	M, vc	30%, sr, c, B	None	None	5YR 3/4	Dark reddish brown	NA	Concentration of sterile saprolite
C6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(4)	NA
C7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA
C8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA
C9	I	0-60	NA	2, m, sbk	so	fr	ss	ps	sicl	2, f/m	5%, sa, p, B	None	None	5YR 3/4	Dark reddish brown	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
C10	I	0-10	NA	2, m, sbk	sh	NA	ss	ps	sil	2, m	5%, sa, p, B	None	None	10R 4/6	Red	NA	Metal anomaly detected at deeper depth
C11	I	0-60	NA	2, m, sbk	h	fi	ss	ps	sicl	2, f/m	5%, sa, p, B	None	None	5YR 3/4	Dark reddish brown	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
C12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA
C13	I	0-55	NA	2, m, sbk	sh	fi	ss	ps	sicl	2, f/co	5%, sa, p, B	None	None	5YR	Dark reddish	NA	Concentration of sterile saprolite;

STP No.	Layer	Depth (cmts)	Boundary	Structure	Consistence				Texture	Roots	Rock Content	Burnt Material	Cultural Material	Munsell	Description	Reason for Not Excavating	Reason for Ceasing Excavation
					Dry	Wet	Sticky	Plastic									
													3/4	brown		absence of cultural material down to a depth where a reasonable effort to identify materials was made	
C14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA	
C15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA	
C16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA	
C17	I	0-55	NA	2, co, sbk	h	NA	ss	ps	ls	3, f	5%, sa, p, B	None	None	5YR 3/4	Dark reddish brown	NA	Concentration of sterile saprolite; absence of cultural material down to a depth where a reasonable effort to identify materials was made
C18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA	
C19	I	0-30	NA	2, f, sbk	lo	sh	s	ps	sicl	2, vf/f	10%, sa, p/c, B	None	None	5YR 3/2	Dark reddish brown	NA	Concentration of sterile saprolite
	II	31-48	g	2, m, sbk	lo	sh	s	ps	sicl	1, f	15%, sa, p, B	None	None	5YR 3/4	Dark reddish brown		
C20	I	0-50	NA	2, m, sbk	lo	fr	ss	ps	sicl	2, m	10%, sa, p, B	None	None	7.5YR 3/3	Dark brown	NA	Concentration of sterile saprolite
C21	I	0-45	NA	2, f, sbk	lo	fr	s	ps	sicl	3, f	5%, sa, p, B	None	None	2.5YR 2.5/4	Dark reddish brown	NA	Concentration of sterile saprolite
C22	I	0-47	NA	1, f, sbk	lo	fr	ss	ps	sicl	2, f	15%, sa, p/c, B	t, w	None	5YR 3/4	Dark reddish brown	NA	Concentration of sterile saprolite
C23	I	0-45	NA	2, f, gr	lo	NA	ss	ps	sicl	2, f	25%, sr, c, B	t, w	None	5YR 3/4	Dark reddish brown	NA	Concentration of sterile saprolite
C24	I	0-50	NA	2, f, gr	s, lo	NA	ss	ps	sicl	2, m	10%, sr, c, B	f, w	None	5YR 3/4	Dark reddish brown	NA	Concentration of sterile saprolite
C25	I	0-55	NA	2, f, sbk	lo	fr	ss	ps	sicl	1, vf/f	10%, sa, p, B	f, w	None	5YR 3/4	Dark reddish brown	NA	Concentration of sterile saprolite; absence of cultural material down to a depth where a reasonable effort to identify materials was made
C26	I	0-50	NA	2, m, gr	s, lo	NA	ss	ps	sicl	2, vc	20%, sa, p/c, B	None	None	5YR 3/4	Dark reddish brown	NA	Concentration of sterile saprolite and presence of boulders or high concentration of rocks within the probe made excavation impassable
C27	I	0-55	NA	2, f, sbk	lo	fr	ss	ps	sicl	3, vf/f	10%, sa, p,	f, w	None	5YR	Dark reddish	NA	Concentration of sterile saprolite;

STP No.	Layer	Depth (cmts)	Boundary	Structure	Consistence				Texture	Roots	Rock Content	Burnt Material	Cultural Material	Munsell	Description	Reason for Not Excavating	Reason for Ceasing Excavation
					Dry	Wet	Sticky	Plastic									
											B			3/4	brown		absence of cultural material down to a depth where a reasonable effort to identify materials was made
C28	I	0-13	NA	2, f, sbk	lo	fr	ss	ps	sicl	1, vf/f	25%, sa, p/c, B	None	None	10YR 3/1	Very dark gray	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
	Ila	14-30	g, i	2, vf, sbk	lo	fi	vs	p	sic	1, vf/f	25%, sa, p/c, B	a, w	None	10YR 2/1	Black		
	lib	31-50	g, w	2, vf, sbk	lo	fi	vs	p	sic	1, vf	25%, sa, p/c, B	f, w	None	2.5Y 3/3	Dark olive brown		
C29	I	0-50	NA	2, m, gr	NA	so, lo	ss	ps	sicl	1, f	5%, sr, p, B	t, C14	None	5YR 3/4	Dark reddish brown	NA	Concentration of sterile saprolite
C30	I	0-20	NA	2, m, gr	NA	so, lo	ss	ps	sicl	1, co	75%, ro, b, B	None	None	5YR 3/4	Dark reddish brown	NA	Presence of boulders or high concentration of rocks within the probe made excavation impassable
C31	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA
C32	I	0-50	NA	2, m, gr	so	so	ss	ps	sicl	1, f	5%, sa, p, B	t, w	None	5YR 3/4	Dark reddish brown	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
C33	I	0-50	NA	2, co, abk	NA	sh, fi	ss	ps	sicl	3, co	5%, sr, p, B	None	None	5YR 3/4	Dark reddish brown	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
C34	I	0-70	NA	2, co, sbk	so	NA	ss	po	sicl	1, f	5%, sa, p, B	None	None	5YR 3/4	Dark reddish brown	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
C35	I	0-58	NA	2, co, sbk	so	NA	s	po	sicl	1, f	5%, sa, p, B	None	None	5YR 3/4	Dark reddish brown	NA	Concentration of sterile saprolite
C36	I	0-45	NA	2, m, sbk	NA	fi	ss	ps	sicl	2, f	10%, ro, b, B	None	None	5YR 3/4	Dark reddish brown	NA	Concentration of sterile saprolite
C37	I	0-62	NA	2, m, sbk	NA	fi	ss	ps	sicl	2, m	1%, sr, p, B	None	Hammer stone	5YR 3/4	Dark reddish brown	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
C38	I	0-30	NA	2, m, sbk	sh	NA	ss	ps	sicl	1, f	5%, sr, p, B	None	None	5YR	Dark reddish	NA	Metal anomaly detected at

STP No.	Layer	Depth (cmts)	Boundary	Structure	Consistence				Texture	Roots	Rock Content	Burnt Material	Cultural Material	Munsell	Description	Reason for Not Excavating	Reason for Ceasing Excavation
					Dry	Wet	Sticky	Plastic									
													3/4	brown		deeper depth	
C39	I	0-50	NA	2, co, abk	vfi	NA	ss	ps	sicl	2, f	1%, sr, p, B	None	None	5YR 3/4	Dark reddish brown	NA	Concentration of sterile saprolite
C40	I	0-50	NA	3, co, abk	vh	NA	ss	ps	sicl	3, m	1%, sr, p, B	None	None	5YR 3/4	Dark reddish brown	NA	Concentration of sterile saprolite
D1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(1)	NA
D2	I	0-10	NA	2, m, sbk	sh	fr	so	po	ls	3, co	5%, sa, p, B	None	None	7.5 YR 2.5/2	Very dark brown	NA	Metal anomaly detected at deeper depth
	II	11-40	c, w	2, f, gr	so	fr	ss	ps	sicl	2, m/co	5%, sa, p, B	None	None	7.5 YR 2.5/3	Dark reddish brown		
D3	I	0-15	NA	1, vc, gr	so	NA	so	po	ls	2, f	5%, sr, p, B	t, w	None	7.5 YR 2.5/3	Very dark brown	NA	Concentration of sterile saprolite; absence of cultural material down to a depth where a reasonable effort to identify materials was made
	II	16-55	g	2, co, pl	sh	NA	ss	ps	sicl	1, vf	5%, sr, p, B	t, w	None	2.5 YR 3/4	Dark reddish brown		
D4	I	0-60	NA	2, f, sbk	h	fi	ss	ps	sicl	3, co/f	5%, sa, p, B	None	None	5 YR 3/4	Dark reddish brown	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
D5	I	0-40	NA	2, f, sbk	lo	fr	ss	ps	sicl	3, m/f	5%, sa, p, B	None	None	5 YR 3/4	Dark reddish brown	NA	Metal anomaly detected at deeper depth
D6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(4)	NA
D7	I	0-38	NA	1, m, sbk	so	fr	ss	ps	sicl	2, f	20%, sa, p/c, B	None	None	5 YR 3/3	Dark reddish brown	NA	Metal anomaly detected at deeper depth
D8	I	0-60	NA	2, m, sbk	so	fr	ss	ps	sicl	2, f	10%, sa, p/c, B	None	None	2.5 YR 2.5/3	Dark reddish brown	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
D9	I	0-40	NA	2, m, sbk	h	efi	ss	ps	sicl	2, f	10%, sa, p/c, B	None	None	5 YR 3/3	Dark reddish brown	NA	Concentration of sterile saprolite
D10	I	1-59	NA	3, co, sbk	h	fi	ss	ps	sicl	2, f	60%, sa, p, B	None	None	2.5 YR 2.5/3	Dark reddish brown	NA	Concentration of sterile saprolite; absence of cultural material down to a depth where a reasonable effort to identify materials was made
D11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(1)(2)	NA

STP No.	Layer	Depth (cmts)	Boundary	Structure	Consistence				Texture	Roots	Rock Content	Burnt Material	Cultural Material	Munsell	Description	Reason for Not Excavating	Reason for Ceasing Excavation
					Dry	Wet	Sticky	Plastic									
D12	I	0-40	NA	2, co, sbk	lo	NA	so	po	sicl	3, f	5%, sr, p/c, B	None	None	5 YR 3/4	Dark reddish brown	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
D13	I	0-60	NA	2, m, sbk	so	fi	ss	ps	sicl	2, f	5%, sa, p, B	t, w	None	2.5 YR 2.5/3	Dark reddish brown	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
D14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA
D15	I	0-58	NA	2, m, sbk	sh	fi	ss	ps	sicl	2, f	5%, a-sa, p, B	None	None	2.5 YR 2.5/3	Dark reddish brown	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
D16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA
D17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA
D18	I	0-60	NA	2, m, sbk	sh	fi	ss	ps	sicl	S, f	5%, sa, p, B	None	None	5 YR 3/4	Dark reddish brown	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
D19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA
D20	I	0-60	NA	2, m, sbk	lo	NA	so	po	sicl	3, m	5%, sr, p, B	None	None	5 YR 3/4	Dark reddish brown	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
D21	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA
D22	I	0-60	NA	2, m, sbk	sh	fi	ss	ps	sicl	1, f	5%, sa, p, B	None	None	5 YR 3/4	Dark reddish brown	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
D23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA
D24	I	0-50	NA	2, vc, abk	vh	NA	ss	ps	ls	2, m	1%, sr, p, B	None	None	10 R 3/4	Dark red brown	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made

STP No.	Layer	Depth (cmbs)	Boundary	Structure	Consistence				Texture	Roots	Rock Content	Burnt Material	Cultural Material	Munsell	Description	Reason for Not Excavating	Reason for Ceasing Excavation
					Dry	Wet	Sticky	Plastic									
D25	I	0-21	NA	2, m, sbk	sh	fi	ss	ps	sicl	3, f	5%, sa, p, B	None	None	5 YR 3/4	Dark reddish brown	NA	Metal anomaly detected at deeper depth
D26	I	0-50	NA	3, m, sbk	h	fi	ss	ps	sicl	2, f/m	5%, sa, p, B	None	None	5 YR 3/4	Dark reddish brown	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
D27	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA
D28	I	0-60	NA	2, co, sbk	sh	NA	ss	ps	sicl	s, m	1%, sr, p, B	f, w	None	5 YR 3/4	Dark reddish brown	NA	Absence of cultural material down to a depth where a reasonable effort to identify materials was made
E1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(2)	NA
E2	I	0-45	NA	2, co, abk	NA	fr	so	p	sil	1, f	10%, an, p, B	None	None	7.5YR 2.5/2	Very dark brown	NA	Metal anomaly detected at deeper depth
E3	I	0-15	NA	2, m, gr	lo	NA	so	po	ls	3, f	90%, sr, b, B	None	None	10YR 2/2	Very dark brown	NA	Presence of boulders or high concentration of rocks within the probe made excavation impassable
E4	I	0-48	NA	2, f, gr	lo	fi	s	po	cl	2, f	10%, an, c, B	None	None	10YR 3/1	Very dark gray	NA	Presence of boulders or high concentration of rocks within the probe made excavation impassable
E5	I	0-28	NA	2, m, sg	so	fr	s	po	sicl	3, m	50%, sr, p/c, B	None	None	10YR 3/2	Very dark grayish brown	NA	Presence of boulders or high concentration of rocks within the probe made excavation impassable
E6	I	0-21	NA	2, m, gr	lo	NA	ss	ps	c	3, vf	10%, sa, c, B	None	None	7.5YR 2.5/2	Very dark brown	NA	Concentration of sterile saprolite; absence of cultural material down to a depth where a reasonable effort to identify materials was made
	II	22-39	d	2, m, gr	sh	NA	ss	ps	sic	3, f	10%, sa, p, B	None	None	10YR 2/2	Very dark brown		
	III	40-42	c	2, m, gr	sh	NA	ss	ps	sic	1, f	5%, sa, p, B	None	None	7.5YR 2.5/3	Very dark brown		
	IV	43-45	c	1, m, gr	sh	NA	ss	ps	charcoal /sic	1, f	5%, sa, p, B	a, w	charcoal	10YR 2/1	Black		
	V	46-55	c	2, m, gr	sh	NA	ss	ps	sic	1, f	5%, sa, p, B	None	None	5YR 2.5/2	Dark reddish brown		

STP No.	Layer	Depth (cmts)	Boundary	Structure	Consistence				Texture	Roots	Rock Content	Burnt Material	Cultural Material	Munsell	Description	Reason for Not Excavating	Reason for Ceasing Excavation
					Dry	Wet	Sticky	Plastic									
F1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA	
F2	I	0-52	NA	2, m, sbk	NA	fr	so	p	sic	1, m	7%, sa, p, B	None	None	10YR 3/2	Very dark grayish brown	NA	Presence of boulders or high concentration of rocks within the probe made excavation impassable
F3	I	0-12	NA	2, m, sbk	NA	fi	ss	p	c	1, m	5%, sa, p, B	None	None	5YR 3/3	Dark reddish brown	NA	Presence of boulders or high concentration of rocks within the probe made excavation impassable
	II	13-16	g	2, m, sbk	NA	fi	ss	p	sic	1, m	5%, sa, p, B	None	None	5YR 3/2	Dark reddish brown		
	III	17-23	g	2, m, sbk	NA	fi	ss	p	c	1, m	5%, sa, p, B	None	None	5YR 3/2	Dark reddish brown		
	IV	24-50	g	2, m, sbk	NA	fi	ss	p	sic	1, m	5%, sa, p, B	None	None	5YR 4/2	Dark reddish gray		
F4	I	0-12	NA	2, m, abk	so	NA	ss	ps	ls	1, f	15%, sa, p/c, B	None	None	7.5YR 2.5/2	Very dark brown	NA	Metal anomaly detected at deeper depth
	II	13-25	c, s	2, m, abk	so	NA	ss	ps	sc	2, f	15%, sa, p/c, B	None	None	7.5YR 2.5/3	Very dark brown		
F5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(3)	NA	

**Appendix E: Taxa Identification Report**

## TAXA IDENTIFICATION OF A CHARCOAL SAMPLE FROM MAKUA, O'AHU ISLAND

Gail M. Murakami  
International Archaeological Research Institute, Inc.

February 5, 2014

### INTRODUCTION

This report presents the results of taxa identification of one charcoal sample from Makua, O'ahu. Identification of charcoal found in archaeological context can give insight into the vegetation of the surrounding area at the time that the woods were burned. This information can be used to interpret the environment as well as possible cultural use of specific plants. The identification also facilitates selection of short-lived plants or plant parts for radiocarbon dating to minimize the in-built age problem.

### METHODS

The freshly fractured transverse and tangential facets of each charcoal piece were viewed under magnification of a dissecting microscope. Taxa identifications were made by comparing the anatomical characteristics seen during examination against those of known woods in the Pacific Islands Wood Collection at the Department of Botany, University of Hawai'i, and published descriptions.

### RESULTS

Three taxa were identified in the single charcoal sample analyzed (Table 1). In Table 1, "cf." indicates that the charcoal resembles the taxon specified but its exact identity is uncertain at this time. The identified taxa are described in the Taxa Review below.

Table 1. Taxa Identification in Charcoal Sample MMR13-002 (Site E, Layer IV, 45 cmbs) Collected from Makua, O'ahu Island.

WIDL No.	Taxa	Common/Hawaiian Name	Origin/Habit	Part	Count	Weight, g
Sample MMR13-002, Site E, Layer IV, 45 cmbs						
1337-54	<i>Aleurites moluccana</i>	<i>Kukui</i>	Polynesian Introduction/Tree	Nutshell	4	0.60
1337-55	cf. <i>Senna</i> sp.	<i>Kolomona</i>	Native+Historic Introduction/Tree	Wood	16	0.49
1337-56	cf. <i>Artocarpus altilis</i>	<i>Ulu</i>	Polynesian Introduction/Tree	Wood	4	0.13

## TAXA REVIEW

### *Aleurites moluccana* (L.) Willd. (*Kukui*)

Once cultivated, this Polynesian introduction has escaped into the native forest, where the pale foliage of the 10 to 20 m trees (Wagner et al. 1990:598) can be seen in abundance in moist gulches and valleys. Dyes were once extracted from the bark and roots (Buck 1957:187), the oily kernel was burned for light (Buck 1957:107) or eaten as a relish after baking (Buck 1957:48), and net floats and dugout canoes were made from the soft wood (Buck 1957:297).

### *Artocarpus altilis* (Perkins, ex Z.) Fosb. (*'Ulu*)

Only one variety of this Polynesian introduction is found in the Hawaiian Islands, but as many as 75 varieties may be found in the Pacific (D. Ragone personal communication). The Hawaiian variety seldom bears seeds and was cultivated by suckers in the valleys of the lowlands (Handy and Handy 1972:152). The wood of the 12 to 18 m or more tall trees was once used in the construction of house doors and bodies of canoes; the bark of the young shoot was made into rough tapa (Malo 1951:21, 48). Drums were sometimes made from the trunk (Buck 1957:396). The latex was used as caulking for canoes and birdlime and the fruit was baked or pounded into *poi* (Neal 1965:302-304).

### *Senna* sp.

One native shrub, *Senna gaudichaudii* (*kolomona*), and six naturalized species of *Senna* can be found on O'ahu. The indigenous shrub *S. gaudichaudii* has been recorded primarily from leeward sites, but also rocky coastal sites, disturbed *hala* (*Pandanus*) forest, dry forest, and occasionally lower parts of the mesic forest (Wagner et al. 1990:698-702).

## REFERENCES

### Buck, Peter H. (Te Rangi Hiroa)

1957 *Arts and Crafts of Hawaii*. Bishop Museum Special Publication 45, Honolulu.

### Handy, E. S. Craighill and Elizabeth G. Handy

1972 *Native Planters of Old Hawaii: Their Life, Lore, and Environment*. Bishop Museum Bulletin 233. Bishop Museum Press, Honolulu.

### Malo, David

1951 *Hawaiian Antiquities (Moolelo Hawaii)*. Translated by Nathaniel B. Emerson, 1898. Bishop Museum Special Publication 2 (2nd ed.), Honolulu.

### Neal, Marie C.

1965 *In Gardens of Hawaii*. Bernice P. Bishop Museum Special Publication 50. Bishop Museum Press, Honolulu.

### Wagner, Warren L., Derral R. Herbst, and S. H. Sohmer

1990 *Manual of the Flowering Plants of Hawai'i*. University of Hawaii and Bishop Museum Presses, Honolulu.

## **Appendix F: Risk Analysis for Entry into Area A**



REPLY TO  
ATTENTION OF:

IMPC-HAW-SO

**DEPARTMENT OF THE ARMY**  
US ARMY INSTALLATION MANAGEMENT COMMAND, PACIFIC REGION  
HEADQUARTERS, UNITED STATES ARMY GARRISON, HAWAII  
851 WRIGHT AVENUE, WHEELER ARMY AIRFIELD  
SCHOFIELD BARRACKS, HAWAII 96857-5000

26 September 2012

MEMORANDUM FOR RECORD

SUBJECT: Risk Analysis for Entry into Area Alpha at Makua Military Reservation, Hawaii

1. After careful consideration, the US Army Garrison Hawaii Cultural Resources Manager's request to conduct subsurface archaeological surveys in Area Alpha (A) of the Makua Military Reservation (MMR) is disapproved. The Installation Safety Office will not permit archaeological surveying in Area Alpha on MMR as the activity, to include ground preparations and unexploded ordnance (UXO) clearance presents a high to extremely high hazard risk and cannot be completed in a safe manner. There are multiple safety concerns associated with Army cultural resource personnel entering into and surveying in Area Alpha. In order to conduct a safe ground disturbing survey, Area A would have to be surface and subsurface cleared of UXO. Due to the dense ground cover found on Area A, safe UXO clearance can only be accomplished if preceded by vegetation removal which in this instance is problematic.

2. Location - Area Alpha is between the South firebreak road and the Improved Conventional Munitions (ICM)/Open Burn/Open Detonation (OB/OD) site.

a. The OB/OD site was used for the demilitarization of ordnance by all branches of services in Hawaii to dispose of outdated, coded out, or damaged munitions, including but not limited to 20mm High Explosive Incendiary (HEI), Navy 40mm High Explosive (HE), Army 40mm HE, High Explosive Anti-Tank (HEAT) rounds, ordnance containing Piezo-electric elements in their fuzes, and ordnance containing ICMs.

b. Due to the close proximity of Area Alpha to OB/OD site there is the potential to find some, if not all of the above, listed UXO items.

3. To safely conduct UXO clearance surveys in Area Alpha we would need to eradicate the dense ground cover so that explosive ordnance disposal (EOD) technicians could visually and mechanically detect munitions. This would have to be accomplished either by vegetation removal by hand or via a prescribe.

a. Hand Cutting – This operation is extremely hazardous. To hand cut the vegetation in this area would require placing personnel into an uncleared high hazard impact area and within minimum safety distance of UXOs potential detonation radius.

b. Prescribed Burn - This operation in itself is extremely hazardous. To burn off the area would require positioning wildland firefighters on the firebreak road to include

IMPC-HAW-SO

SUBJECT: Risk Analysis for Entry into Area Alpha at Makua Military Reservation,  
Hawaii

roads inside the ICM area to prevent an escape. This would place personnel within minimum safety distance of UXOs potential detonation radius. Using armored vehicles or heavy equipment would provide protection from fragmentation and some protection from over-pressure depending on the size and type of the exploding ordnance, however, this protection would negate the ability to control or fight the fire.

c. It is the opinion of this office that both of the above mentioned methods of ground clearance required as precursors to UXO removal are too dangerous and neither can be undertaken safely.

4. The point of contact is the undersigned at 655-6749.

Approved by ODA/AN/CDD/DA/711096513  
GERMAN, CLINTON J. 1142965115

CLINTON J. GERMAN  
Director, Installation Safety

## **Appendix G: Public Review**

The 2007 Settlement Agreement required the US Army Garrison, Hawaii to put out the archaeological subsurface survey report for public review and comment. The comment period remained opened for sixty (60) days. The public comment period was publicized pursuant to 40 C.F.R. § 1506.6, including, but not limited to, notice pursuant to 40 C.F.R. § 1506.6(b)(1) to all members of the public who requested to be added to the mailing list for the EIS. A public meeting was also required under the agreement. The following pages are responses to the comments received during the 60-day comment period as well as comments received during the public meeting.

## MMR Archaeological Subsurface Survey Public Comments

1. Comment: Lisa Mitchell- 29 July 2014 Public Meeting Testimony, page 9-11

“...I came because I really want to declare world peace... I would like to continue this conversation with the military, if that’s at all possible, and anyone else interested in spreading the word of peace....”

Response: The Army thanks you for your comment and appreciates your participation in this public review process. Your comment has been considered and has been included as part of the administrative record for this process.

2. Comment: Mana Caceres- 29 July 2014 Public Meeting Testimony, page 12-13

“Some of the methodology, to me. I would have rather traded the 80 little potholes for this survey for maybe even ten one-meter by six-meter trenches done, so that way more information could be seen, it could go possibly a little deeper. I think the majority of these potholes...was shallower than two feet.”

Response: The Army used a stratified sampling plan consistent with both the Secretary of the Interior’s Standards and Guidelines for Archaeological and Historic Preservation (Identification) and the Department of Defense Guidelines regarding Archaeological Inventory Survey Standards and Cost-estimation Guidelines. The method used to conduct this survey was the same method used in the 2005/2006 archaeological subsurface survey, which was found acceptable by the U.S. District Court.

As stated in page 35 of the report, shovel test probe excavations ceased at various depths due to a variety of reasons: based on the absence of cultural material down to a depth where the field supervisor determined that a reasonable effort to identify materials was made approximately 60 centimeters below surface (cmbs); when the presence of boulders or high concentration of rocks within the probe made excavation impassable; when the concentration of sterile saprolite became abundant; or when metal anomaly signals were detected at deeper depths by the UXO technician.

3. Comment: Mana Caceres- 29 July 2014 Public Meeting Testimony, page 13

“With all of the military use of that valley, I imagine that a lot of the A horizon, or the top sediments, were brought in from other places in the Valley due to erosion, you know, the bombing and the erosion. Of course, the cultural layers, in my opinion, are going to be a little bit deeper than two feet.”

Response: The results of the 2005/2006 archaeological subsurface survey determined that areas surveyed had a high level of soil disturbance (to include extensive and widespread bulldozing during range construction), having the A horizon completely removed in some cases. The majority of the areas surveyed, which this report covers, were adjacent to existing

## MMR Archaeological Subsurface Survey Public Comments

archaeological sites with surface and subsurface components. The surrounding landscape in the project area did not present evidence of soils being “brought in from other places.” If soils were brought in, the adjacent sites with surface features would be buried, which is not the case.

### 4. Comment: Mana Caceres- 29 July 2014 Public Meeting Testimony, page 13

“I think if area A is too dangerous to do a subsurface survey, maybe we should consider making it less dangerous so we can conduct a survey in that area.”

Response: In order to conduct a safe ground disturbing survey, Area A would have to be surface and subsurface cleared of unexploded ordnance (UXO). Due to the dense ground cover found on Area A, safe UXO clearance can only be accomplished if preceded by vegetation removal, which in this instance is problematic. Area A is between the South firebreak road and the Improved Conventional Munitions (ICM)/Open Burn/Open Detonation (OB/OD) site. To conduct UXO clearance surveys safely in Area A we would need to eradicate the dense ground cover so that explosive ordnance disposal (EOD) technicians could visually and mechanically detect munitions. This would have to be accomplished either by vegetation removal by hand or via a prescribed burn. Hand cutting vegetation in this area would require personnel to work in an uncleared high hazard impact area and within minimum safety distance of UXO potential detonation radius. To burn off the area would require positioning wildland firefighters on the firebreak road to include roads inside the ICM area to prevent potential fire escape. This would place personnel within minimum safety distance of UXOs potential detonation radius. Using armored vehicles or heavy equipment would provide protection from fragmentation and some protection from blast over-pressure depending on the size and type of the exploding ordnance. However, this protection would negate the ability to control or fight the fire. For these reasons, the Installation Safety Office has determined that accessing these areas is too dangerous to perform UXO clearance and archaeological surveys.

### 5. Comment: Mana Caceres- 29 July 2014 Public Meeting Testimony, page 13

“I think these small little excavation locations were too small to properly get a profile, a side profile of the trench itself.”

Response: This is the same method that was used in the previous 2005/2006 archaeological subsurface survey, which was found acceptable by the U.S. District Court. Profiles, photographs, and sediment descriptions were generated for each excavated shovel test probe.

### 6. Comment: Mana Caceres- 29 July 2014 Public Meeting Testimony, page 13

## **MMR Archaeological Subsurface Survey Public Comments**

“So I have no doubt in my mind this is correct, they didn't see any below-ground architectural features or intact cultural deposits because, in my opinion, they didn't go deep enough to look for them.”

Response: Previous archaeological reports for Makua where subsurface testing was conducted (cited on page 20 of the report) observed the majority of cultural materials at depths 20 to 30 centimeters below surface (cmbs) in areas where there were surface features. The majority of the excavations for this survey ceased at levels between 40 to 60 cmbs. There were no indications of cultural deposits running deeper than that. The reasons for terminating the excavations for this project are explained on page 35 of the report.

7. Comment: Bill Prescott- 29 July 2014 Public Meeting Testimony, page 14-17

“I am the appointed spokesman for Hawaii's Veterans of Foreign Wars, and we fully support, let me tell you, we fully support our military training in Makua, okay.... I ask all of you, for the sake of our local boys who are on active duty and our National Guard people, allow our men to go back there and train.”

Response: The Army thanks you for your comment and appreciates your participation in this public review process. Your comment has been considered and has been included as part of the administrative record for this process.

8. Comment: Al Frenzel- 29 July 2014 Public Meeting Testimony, page 18

“I actually don't have a comment for the public hearing, I have a question...Did we take this opportunity to do an analysis of how much metal was underground, and then we could extrapolate that to what it would take to mitigate and clean up the range if and when it's ever turned over back to the State of Hawaii.”

Response: The purpose of this survey was to determine a presence or absence of intact cultural deposits within the project area where no surface features were apparent due to either the natural deterioration of surface structures or other effects from the change in use of the area over time. Information relating to the potential clean-up of munition was not the purpose of this survey and not covered in the scope. The Army thanks you for your comment and appreciates your participation in this public review process. Your comment has been considered and has been included as part of the administrative record for this process.

9. Comment: Paulette Kaleikini- 29 July 2014 Public Meeting Testimony, page 23

## MMR Archaeological Subsurface Survey Public Comments

“...When cultural features are not present above ground in this area, cultural deposits are also not present below ground, that is bullshit, okay, because we find it every day, I'm finding it every day.”

Response: Our conclusions are based on prior fieldwork results from over 20 years of surveys and excavations at Makua and the information gathered for this report---we have not found any cultural deposits in areas where there are no surface features at Makua.

Previous archaeological reports for Makua where subsurface testing was conducted (cited on page 20 of the report) observed the majority of cultural materials at depths 20 to 30 centimeters below surface (cmbs) in areas where there were surface features. The majority of the excavations for this survey ceased at levels between 40 to 60 cmbs. There were no indications of cultural deposits running deeper than that. The reasons for terminating the excavations for this project are explained on page 35 of the report.

10. Comment: Paulette Kaleikini- 29 July 2014 Public Meeting Testimony, page 23

“...you guys didn't go deeper than two feet, okay, there's nothing in that area, nothing, you know that, you know that. Cultural deposits are much deeper, especially in Makua, okay.”

Response: Previous archaeological reports for Makua where subsurface testing was conducted (cited on page 20 of the report) observed the majority of cultural materials at depths of 20 to 30 centimeters below surface (cmbs) in areas where there were surface features. The majority of the excavations for this survey ceased at levels between 40 to 60 cmbs. There were no indications of cultural deposits running deeper than that. The reasons for terminating the excavations for this project are explained on page 35 of the report.

11. Comment: Paulette Kaleikini- 29 July 2014 Public Meeting Testimony

“What you guys were looking for were UXO's, you were not looking for cultural deposits, I saw that right off-the-bat, Alton, that's why I was out of there, because it was a waste of my time, it was nothing but bullshit.”

Response: The purpose of the survey is described in the introduction and project description section on page 1 of the report. The scanning for subsurface metal anomalies, which could be UXO, by the UXO technicians was required for safety procedures, but these activities were not the purpose of the archaeological survey.

12. Comment: Paulette Kaleikini- 29 July 2014 Public Meeting Testimony, page 24-25

## MMR Archaeological Subsurface Survey Public Comments

“You know, I would like to keep the question part open to the public, because I think a lot of questions that we have out there should be answered here, you know, and I don't want to wait for the comment period to see answers to my questions, I would prefer to have it answered right here. I mean, this is why we have open public consultation, is so we can hear up-front. There should be answered here, you know, and I don't want to wait for the comment period to see answers to my questions, I would prefer to have it answered right here. I mean, this is why we have open public consultation, is so we can hear up-front.”

Response: The Army thanks you for your comment and appreciates your participation in this public review process. Your comment has been considered and has been included as part of the administrative record for this process.

13. Comment: Paulette Kaleikini- 29 July 2014 Public Meeting Testimony, page 25

“Why were STP's not excavated, how many STP's were not excavated?”

Response: Reasons for not excavating STPs (shovel test probes) is presented in the Methods and Procedures section of the report on page 28. As mention in the Executive summary and in the Results section of the report, a total of 30 STPs were not excavated.

14. Comment: Paulette Kaleikini- 29 July 2014 Public Meeting Testimony, page 26

“Does the Army plan to do it real soon, or, um, like I think Alton said, some weren't done because it was in areas that they didn't have access to. Well, they should have known that, okay, when they set up these STP's. So are they going to replace these non-accessible STP's with areas that aren't accessible?”

Response: Reasons for not excavating STPs is presented in the Methods and Procedures section of the report on page 28. The method used to conduct this survey was “stratified random sampling”. This is the same method that was used in the 2005/2006 archaeological subsurface survey, which was found acceptable by the U.S. District Court. In a stratified random sampling plan the random choice factor is lost if you substitute the non-accessible STPs and the sampling results are no longer valid.

15. Comment: Paulette Kaleikini- 29 July 2014 Public Meeting Testimony, page 26

“In STP C37, in area C, where is the hammer stone, where is it being curated, will it be put back in the ground? I feel it should.”

Response: The hammer stone is being curated at the USAG-HI Cultural Resources repository on Schofield Barracks.

## MMR Archaeological Subsurface Survey Public Comments

16. Comment: Paulette Kaleikini- 29 July 2014 Public Meeting Testimony, page 26

“What is non-cultural charcoal? If it was natural wood or native Hawaiian wood, explain what kind of wood it was, how deep was this charcoal found, in what context and what sediment, was it a cultural layer? I'd like that explained in what was around this area of the charcoal.”

Response: The conclusion of the report states that charcoal fragments found to have originated from native and Polynesian introduced woods. The fragments were recovered from two STP locations, but neither sample was associated with cultural deposits. These fragments are likely a result of a past fire event which may be natural in origin. There is no association of these charcoal fragments to any cultural activities. Page 41 and 48 of the report provides details of the charcoal found and the specific locations of the finds.

17. Comment: Paulette Kaleikini- 29 July 2014 Public Meeting Testimony, page 26

“I'd like more information about how you reach this conclusion, you know, and will this survey be looked at by the state or, you know, but I hope this is not the final approved survey. Will the courts look at it? I think they should because it's very -- I wouldn't even say it's done, okay, there's a lot of work to be done.”

Response: Conclusions in the report were drawn based on the information collected during fieldwork as well as recordation and analysis in the laboratory. The comments received during the 60-day review period and their responses will be included in the report in an Appendix as part of the administrative record. Comments received that require revisions, will be incorporated into the report. A revised report will be released.

18. Comment: Paulette Kaleikini- 29 July 2014 Public Meeting Testimony, page 26-27

“There were some photos in the report of sediments, they weren't very good photos, because it was very wide, there were potholes, like Mana said, so you couldn't very well see the sediments, I would like to see that. So you would need wider trenches, definitely not potholes, wider trenches, I would say they should go down to at least a shelf four, you know, get deeper than two feet, because up in that area all cultural deposits are much deeper. Our kupuna have lived there for generations, generations, so you won't find their cultural deposits or cultural layer in two feet, okay, it's much deeper than that.”

Response: This is the same method that was used in the 2005/2006 archaeological subsurface survey, which was found acceptable by the U.S. District Court. Profiles, photographs, and sediment descriptions were generated for each excavated shovel test probe.

## MMR Archaeological Subsurface Survey Public Comments

Previous archaeological reports for Makua where subsurface testing was conducted, cited on page 20 of the report, observed the majority of cultural materials at depths of 20 to 30 cmbs in areas where there were surface features. The majority of the excavations for this survey ceased at levels between 40 to 60 cmbs. There were no indications of cultural deposits running deeper than that. The reasons for terminating the excavations for this project are explained on page 35 of the report.

19. Comment: Paulette Kaleikini- 29 July 2014 Public Meeting Testimony, page 27-28

“This survey, what the Army is calling a survey, should be nixed. I know our attorney will cover that part in the court, that it was very shabbily done, should be done again, and this time, you know, with archeologists other than the ones that work for the Army, you know, hire some real professional archeologist and have some cultural monitors there, by all means, where we can approach the trench, be right there by the trench and find out what's happening, look for ourself what's happening, because they have called it cultural monitoring, we were kept on the road when they walked like maybe a quarter mile in, that's bullshit, we couldn't see anything going on from there, okay. So you want to do it right, I mean, you want to do this? Let's do it up right or don't do it at all.”

Response: Paragraph 5 of the 2007 Settlement Agreement (SA) states, “[d]efendants shall allow at least one (1) representative of Malama Makua to observe the field work associated with such surveys. Observers shall observe the work, without interference, from locations identified and deemed clear of UXO by the 25<sup>th</sup> ID’s Installation Fire and Safety Office.” Observers from Malama Makua were present during the survey to view the work. The Safety Office and Range Control deemed that the locations where observers viewed the fieldwork were safe. Cultural monitoring was not a requirement of this survey. Areas where the public has access to have been subsurface cleared of UXO. Under the SA, observers are limited to these areas as well.

The fieldwork was performed by fully-qualified staff and managed by professionals meeting the qualifications of archaeology under the Secretary of Interior’s Standards (36 CFR, part 61).

20. Comment: Hanalei Hopfe- 29 July 2014 Public Meeting Testimony, page 29-32

“I just wanted to comment about the military's presence here in Hawaii....So we expect, you know, life is a two-way street, aloha flows both ways.”

Response: The Army thanks you for your comment and appreciates your participation in this public review process. Your comment has been considered and has been included as part of the administrative record for this process.

21. Comment: Catherine Alana- 29 July 2014 Public Meeting Testimony, page 34

## MMR Archaeological Subsurface Survey Public Comments

"I agree with some of the previous speakers on their particular points, but my specific mana'o is if you can change the wording in the last part of this because I, you know, have had experience, not that I'm an archeologist but I am a cultural practitioner...if you can possibly suggest, if that's what your specific technological information has provided, then you may want to share that. However, to put this down as an absolute I believe is totally incorrect. Specifically, about making a statement when there is not something present above ground or, I mean, either way, because that's not true."

Response: Previous archaeological reports for Makua where subsurface testing was conducted, cited on page 20 of the report, observed the majority of cultural materials at depths of 20 to 30 cmbs in areas where there were surface features. The majority of the excavations for this survey ceased at levels between 40 to 60 cmbs. There were no indications of cultural deposits running deeper than that. The reasons for terminating the excavations for this project are explained on page 35 of the report.

22. Comment: Catherine Alana- 29 July 2014 Public Meeting Testimony, page 35-36

"And if you want to achieve world peace, I think we need to start here, at home, which is to respect all the people that were involved in this and to know that that is just the common sense belief... And so if there was sites that was destroyed, then that's a guarantee that there are other things that are there, and maybe there needs to be different type of technology that can help to discover it so it's not so labor intensive, if that is possible. But in addition with the cultural practitioners or monitors, I believe you folks called that, because when you're dealing with cultures, whether it's our culture here or cultures across the world, it's very important that you don't disturb what is there, and your cultural practitioners in that aina will be able to tell you."

Response: The Army thanks you for your comment and appreciates your participation in this public review process. Your comment has been considered and has been included as part of the administrative record for this process.

23. Comment: Al Frenzel- 29 July 2014 Public Meeting Testimony, page 36-37

"I just wanted to comment, I can't let this go by, because I'm offended, based on what Paulette just announced, that cultural monitors weren't allowed to be over the hole and watch the excavation occur. I'm just offended by that. I'm amazed, if you can be there and it's safe enough for you to be there over that hole, I am sure that the cultural monitors are willing to be there and accept the risk and assign some waiver...I have a whole different realization now of what cultural monitoring is in the Army...I think, based on that alone, this study needs to be redone, just on that alone. It was not done pono with witnesses and observations, you know, they deserve that opportunity, they deserve that right."

## MMR Archaeological Subsurface Survey Public Comments

Response: Observers from Malama Makua were present during the survey to view the work. The Safety Office and Range Control deemed that the locations where observers viewed the fieldwork was safe. Cultural monitoring was not a requirement of this survey. Areas where the public has access to have been subsurface cleared of UXO. Under the SA, observers are limited to these areas as well.

24. Comment: Paulette Kaleikini- 29 July 2014 Public Meeting Testimony, page 37

“So my last question, then, is who will finalize this report, you know, and do we get to see it before it is finalized or is this it or, you know, are they going to revise it, work on it. It needs work before it's finalized. It's up to you if you want to send it up like that because we will, you know, address it somewhere, whether it's in court or wherever, okay.”

Response: The comments and their responses received during the 60-day review period will be included into the report in an Appendix as part of the administrative record. Comments received that require revisions, will be incorporated into the report. A revised report will be released.

25. Comment: Earth Justice/Malama Makua 13 Aug 2014 letter- page 1, 2<sup>nd</sup> and 3<sup>rd</sup> paragraph-

“The Army's claim to have completed surface archaeological surveys of all areas within the south firebreak road cannot be squared with the fact that, virtually every time it goes into the field to conduct archaeological surveys, it finds new surface features. The most recent subsurface surveys are no exception, with the Army discovering two “[p]reviously unidentified surface features, remnants of shallow terraces” that were found near sites 4542 and 4545.”

Response: The Army's claim to have completed surface surveys of all areas within the south firebreak can be reconciled with the fact that new surface features are discovered. The Army conducted its survey in accordance with both the Secretary of the Interior's Standards and Guidelines for Archaeological and Historic Preservation, as well as the Department of Defense Guidelines regarding Archaeological Inventory Survey Standards and Cost-estimation Guidelines. The Secretary of Interior's (SOI) Standards state that identification of historic properties is undertaken to the degree required to make decisions. In addition, per 36 CFR 800.4(b)(1), “the agency shall make a reasonable and good faith effort to carry out appropriate identification efforts....The agency official shall take into account past planning, research and studies, the magnitude and nature of the undertaking and the degree of Federal involvement, the nature and extent of potential effects on historic properties, and the likely nature and location of historic properties within the area of potential effects.” The standard for a completed archaeological survey is not a 100% identification of all resources. The discovery of additional features in this survey points toward the sufficiency of the survey rather than otherwise.

## MMR Archaeological Subsurface Survey Public Comments

26. Comment: Earth Justice/Malama Makua 13 Aug 2014 letter- page 2, footnote 1 “The 2014 Survey inaccurately states that the Army’s field work was performed ‘between May and December 2014.’”

Response: The report has been revised to reflect the correct date: “between May and December 2013.”

27. Comment: Earth Justice/Malama Makua 13 Aug 2014 letter- page 2, paragraph 1

“Having discovered two new surface features, the Army then failed to perform any ‘[d]etailed recordation’ of them, deferring that task until an undefined, future date. Id. at 30. The Army’s failure to provide detailed descriptions of the newly discovered features has deprived Mālama Mākua and other concerned members of the public of a meaningful opportunity to comment on the 2014 Survey, in violation of paragraphs 11 and 12 of the 2007 Settlement Agreement.”

Response: The work plan for this project states, “[d]etailed recordation of the site will not take place during this project. The GPS data will be provided to the CRM. The CRM will determine when the recording of the find will take place”. This project’s objective was to perform an archaeological subsurface survey in the locations identified in the work plan. Subsequent archeological work to record recently identified features are unrelated to the current project and will be conducted at a later date. This is consistent with the settlement agreements and the court’s order.

28. Comment: Earth Justice/Malama Makua 13 Aug 2014 letter- page 2, paragraph 2

“The Army’s discovery of yet more surface features in portions of MMR the Army claims previously to have surveyed thoroughly highlights the extreme, inherent risk to irreplaceable archaeological and cultural resources posed by military training at MMR. Simply put, the Army cannot possibly protect historical and cultural resources that it does not know about.”

“Unfortunately, the Army has proven itself incapable of performing a comprehensive survey of even those archaeological resources that are visible on the surface and, thus, has no way of knowing – or protecting – other, as yet unidentified sites and features.”

Response: The Army has performed thorough and comprehensive surveys. Many factors contribute to the efficacy of an archaeological survey, including topography, weather conditions, vegetation, and other environmental situations. Consequently, additional identification of archaeological features or deposits is always a possibility. This does not invalidate the previous archaeological studies, however, as each has contributed to responsible historic preservation planning, and has served as a useful planning tool. The Secretary of Interior’s (SOI) Standards state that identification of historic properties is undertaken to the degree required to make decisions. SOI Guidelines specify that “Within a comprehensive planning process, identification

## MMR Archaeological Subsurface Survey Public Comments

is normally undertaken to acquire property-specific information needed to refine a particular historic context or to develop any new historic contexts. The results of identification activities are then integrated into the planning process so that subsequent activities are based on the most up-to-date information.” In addition, per 36 CFR 800.4(b)(1), “the agency shall make a reasonable and good faith effort to carry out appropriate identification efforts....The agency official shall take into account past planning, research and studies, the magnitude and nature of the undertaking and the degree of Federal involvement, the nature and extent of potential effects on historic properties, and the likely nature and location of historic properties within the area of potential effects.” The numerous archaeological studies completed in training areas at Makua Military Reservation are sufficient.

29. Comment: Earth Justice/Malama Makua 13 Aug 2014 letter- page 2, paragraph 3

“The 2014 Survey concedes, as it must, that not all of ‘the current site boundaries within the project area are accurately depicted.’ The Army further acknowledges that discovery of the two ‘previously unidentified archaeological features’ justifies ‘expansion of the current site boundaries of [sites 4542 and 4545] to encompass the newly identified features.’”

Response: The concession, if it can be called that, is limited and should be taken in full context from p. 67:

“With respect to long-term management, most of the current site boundaries within the project area are accurately depicted. The exceptions are the two STP locations (STP C6 and D6) that were located near previously unidentified archaeological features adjacent to site -4542 and -4545. The expansion of the current site boundaries of these two sites to encompass the newly identified features is justified.”

Fortunately, the two newly discovered features already fall within protected off-limit areas to training, marked by Seibert stakes, as depicted in Figure 50 of the report.

30. Comment: Earth Justice/Malama Makua 13 Aug 2014 letter- page 2, paragraph 4

“While the latest court-ordered survey slightly expands the Army’s knowledge of the cultural resources within MMR’s boundaries, making it possible to extend protection to two new features, the 2014 Survey leaves little doubt that there are additional surface features about which the Army is entirely ignorant and, which, as a result, are left completely vulnerable to destruction by military training-related activities. The only way to protect Mākua’s cultural riches is for the Army to forgo future military training there, in particular live-fire training, which is inherently destructive.”

## MMR Archaeological Subsurface Survey Public Comments

Response: Many factors contribute to the efficacy of an archaeological survey, including topography, weather conditions, vegetation, and other environmental situations. Consequently, additional identification of archaeological features or deposits is always a possibility. The Army conducted its survey in accordance with both the Secretary of the Interior's Standards and Guidelines for Archaeological and Historic Preservation, as well as the Department of Defense Guidelines regarding Archaeological Inventory Survey Standards and Cost-estimation Guidelines. The Secretary of Interior's (SOI) Standards state that identification of historic properties is undertaken to the degree required to make decisions. In addition, per 36 CFR 800.4(b)(1), "the agency shall make a reasonable and good faith effort to carry out appropriate identification efforts....The agency official shall take into account past planning, research and studies, the magnitude and nature of the undertaking and the degree of Federal involvement, the nature and extent of potential effects on historic properties, and the likely nature and location of historic properties within the area of potential effects". The standard for a completed archaeological survey is not a 100% identification of all resources.

Forgoing military training or live-fire training in particular is not the only way to protect cultural sites in Makua. Prior to live fire training in the past, training scenario planning and coordination with Army Environmental staff established left and right parameters of fire and angle of fire to avoid archaeological sites. The targeted impact area for high explosive rounds was reduced significantly from its historic location, which was virtually the entire reservation, to an area without surface and subsurface archaeological sites. These restrictions plus the use of Seibert stakes and other protective measures give a high degree of protection. The data gathered from this survey has shown that cultural deposits were not found in areas where no surface features were present; therefore measures to avoid impacts to surface features would result in protection of subsurface features as well.

31. Comment: Earth Justice/Malama Makua 13 Aug 2014 letter- page 2, footnote 2

"While the discovery of the two archaeological features gives the Army the opportunity to protect them, in practice, the Army does little to shield irreplaceable cultural properties from harm. Other than the imu at site 5456, none of the scores of identified archaeological sites at MMR are protected by sandbags, plywood or other physical barriers. Marking site boundaries with Seibert stakes, the Army's preferred protective measure, does nothing to prevent damage or destruction of sites from misfired artillery shells, mortars or small arms fire."

Response: The contents of this report document the results of an archaeological subsurface survey conducted in areas referred to as "B through F." This report states that Seibert stakes, which are markers that indicate off-limit areas, are the current site protective measures in place. Other site protective strategies are not described in the document and are beyond the scope and purpose of the report. It should be noted that USAG-HI employs a multi-faceted preservation strategy that requires a variety of protective measures, including cultural resources awareness briefings to every troop, Range responsibility for ensuring training stays within designated zones, and pre-training planning with military personnel. This approach reinforces

## MMR Archaeological Subsurface Survey Public Comments

resource preservation at a systemic level, through education and accountability, and acts as ample protection for historic properties. Additionally, prior to live fire training in the past, training scenario planning and coordination with Army Environmental staff established left and right parameters of fire and angle of fire to avoid archaeological sites. The targeted impact area for high explosive rounds was reduced significantly from its historic location, which was virtually the entire reservation, to an area absent of surface and subsurface archaeological sites. If rounds were to be observed going into the restricted Seibert staked areas, a cease-fire would be ordered. These restrictions plus the use of Seibert stakes and other protective measures like sandbags on petroglyphs give a high degree of protection.

32. Comment: Earth Justice/Malama Makua 13 Aug 2014 letter- page 3, paragraph 1 and 2

“We strongly dispute the Army’s claim that safety concerns preclude subsurface surveys in Area A, relieving the Army of its duty to conduct subsurface archaeological surveys in that portion of MMR.... To comply with the 2001 and 2007 Settlement Agreements, the Army must complete comprehensive subsurface surveys of Area A and then circulate those surveys for public, including expert, review.”

Response: Area A was not surveyed because the USAG-HI Safety Director determined Area A not safe for survey, consistent with paragraph 1 of the 2007 Settlement Agreement. The contents of this report document the results of an archaeological subsurface survey conducted in areas referred to as “B through F.” This is consistent with the settlement agreements and the court’s order.

33. Comment: Earth Justice/Malama Makua 13 Aug 2014 letter- page 3, paragraph 3

“While the Army did carry out some subsurface surveys in Areas B through F, its efforts were so deficient that the 2014 Survey provides no meaningful information about the subsurface cultural resources located in Areas B through F that are at risk from military activities at MMR. Areas B through F extend over approximately forty-four (44) acres, and the Army initially planned to carry out only 113 shovel test probes (“STPs”), which works out to only about 2.5 STPs per acre. Ultimately, the Army actually excavated only 83 STPs, leaving the overwhelming majority of Areas B through F completely unsurveyed.”

Response: We disagree that archaeological subsurface survey efforts have been deficient. Survey results have provided meaningful data regarding the distribution and the presence/absence of archaeological features and cultural deposits in these areas. Areas B through F are sufficiently surveyed. The U.S. District Court ruled on October 27, 2010 that the Army’s survey methods complied with the language of the 2001 and 2007 Settlement Agreements. This survey used the identical method.

## MMR Archaeological Subsurface Survey Public Comments

34. Comment: Earth Justice/Malama Makua 13 Aug 2014 letter- page 3-4, paragraph 4

“The 2014 Survey uses the same flawed methodology the Army employed for other subsurface surveys at MMR. Previously, archaeologist Tom Dye detailed the fatal defects in the Army’s methodology, which preclude the Army’s surveys from providing meaningful information about subsurface archaeological resources at MMR.... Dr. Dye’s critiques apply equally to the Army’s latest effort, which, as noted, use the same flawed methodology.”

Response: Dr. Dye’s critiques of the methodology used in the previous subsurface survey undertaken in response to the 2001 settlement agreement were addressed by the Army in documents submitted to the court in 2010 and the court subsequently found the methodology to be acceptable. The same methodology found acceptable by the court was used in the subsurface survey of Area B-F. The methodology is sound and in keeping with standard archaeological practice. The U.S. District Court ruled on October 27, 2010 that the Army’s survey methods complied with the language of the 2001 and 2007 Settlement Agreements. This survey used the identical method.

35. Comment: Earth Justice/Malama Makua 13 Aug 2014 letter- page 4, paragraph 1

“While the Army’s subsurface archaeological surveys of Areas B through F are inadequate to provide an accurate picture of the range and distribution of subsurface cultural resources threatened by military activities at MMR, the 2014 Survey did confirm that such resources are found in locations where no surface features are present.... the discovery of an ancient hammer stone 20-30 centimeters below the surface, outside the boundaries of site 4546. The Army’s speculation that “the artifact is an isolated find that may have been secondarily deposited in that location by previous ranching or military activities” does not change the fact that the hammer stone is undeniably a subsurface cultural resource located outside the boundaries of identified surface sites.”

Response: The hammer stone is an isolated artifact, also referred to as an isolate. An isolate is an item that has been previously removed from its original location, displacing it from archaeological context. Isolates lack clear association with an archaeological site. The isolate is an object that has little or no archaeological significance except for its characteristics as an artifact. Other examples of isolates (not involved here) include projectile points and single flakes. As an isolated artifact, the hammer stone does not meet the eligibility criteria for listing in the National Register of Historic Places and is therefore, not considered an historic property that requires additional treatment. Text in the report has been revised to clarify this matter. Information gathered from surveys like this one, assist in the management of cultural resources. Although the hammer stone is a resource, isolated artifacts such as this hammer stone are not an indicator of a subsurface site. This survey is adequate in determining the distribution of subsurface cultural resources in MMR.

## MMR Archaeological Subsurface Survey Public Comments

36. Comment: Earth Justice/Malama Makua 13 Aug 2014 letter- page 4, paragraph 2

“The discovery of the hammer stone flatly disproves the Army’s claim that ‘cultural deposits are not found where no surface features were present.’ The Army needs to come to terms with the fact that implementing measures that seek to avoid impacts to only surface features does nothing to protect from harm subsurface cultural resources, like this hammer stone, that are found at MMR outside identified surface sites.”

Response: The hammer stone is an isolated artifact, also referred to as an isolate. An isolate is an item that has been previously removed from its original location, displacing it from archaeological context. Isolates lack clear association with an archaeological site. The isolate is an object that has little or no archaeological significance except for its characteristics as an artifact. Other examples (not involved here) could include projectile points and single flakes. As an isolated artifact, the hammer stone does not meet the eligibility criteria for listing in the National Register of Historic Places and is therefore not considered an historic property that requires additional treatment. An isolated artifact is not a cultural deposit. Text in the report has been revised to clarify this matter. Prior to training in the past, scenario planning and coordination with Army Environmental staff enabled trainers to maintain their direction of fire by establishing left and right parameters to avoid archaeological sites. The targeted impact area for high explosive rounds was reduced significantly from its historic location, which was virtually the entire reservation, to an area absent of surface and subsurface archaeological sites. The data gathered from surveys have shown that cultural deposits are generally found in areas where surface features are present; therefore measures to avoid impacts to the surface features would result in protection of subsurface features as well.

37. Comment: Earth Justice/Malama Makua 13 Aug 2014 letter- page 4, footnote 3

“Because the Army ceased excavating STPs due to “the presence of boulders or high concentration of rocks within the probe,” it failed to make an adequate inquiry to determine whether those boulders or concentrations of rocks are parts of subsurface cultural features, including foundations for surface features that have been destroyed or formerly surface features that have been buried. For example, the rocks found in STP B3 appear to be part of a subsurface wall or other structure, but the Army failed to complete the excavation to allow it to make such an assessment.”

Response: The majority of the STP locations were located in sediment type Stony Land (rST). Stony land is described as extremely stony silty clay loam. The horizons of a typical profile are; horizon 1 occurring 0 to 10 inches and horizon 2 from 10 to 60 inches. The presence of rocks and boulders is common and does not necessarily equate to the presence of an archaeological site, and archaeologists in the field determined that the rock exclusions were not indicative of human agency. The archaeologists in the field observed no evidence within STP B3 and no other evidence in the vicinity of the STP indicative of archaeological features to support the

## MMR Archaeological Subsurface Survey Public Comments

notion that the rocks and boulders encountered were associated with buried archaeological features.

38. Comment: Earth Justice/Malama Makua 13 Aug 2014 letter- page 4, paragraph 3

“Finally, we note that, pursuant to paragraph 5 of the 2007 Settlement Agreement, Mālama Mākua was entitled “to observe the field work associated with [the archaeological] surveys.” During the surveys of Areas B through F, the Army required Mālama Mākua observers to remain so far from the actual survey work that it was impossible for Mālama Mākua to make any assessment of the survey techniques employed or to ensure against harm to cultural resources.”

Response: Paragraph 5 of the 2007 Settlement Agreement also states, “[o]bservers shall observe the work, without interference, from locations identified and deemed clear of UXO by the 25<sup>th</sup> ID’s Installation Fire and Safety Office.” The observers were required to remain on the firebreak roads that had been cleared to the standard for access by non-government personnel outlined in the risk assessment for Makua and based on the opinions of the Garrison Safety Officer and Range Control.

39. Comment: Earth Justice/Malama Makua 13 Aug 2014 letter- page 5, paragraph 1

“In conclusion, we urge the Army to complete additional surface and subsurface archaeological surveys within the south firebreak road to allow for an accurate assessment of the irreplaceable cultural resources threatened by military activities at MMR.”

Response: There have been over 20 archaeological surveys completed at MMR, most of which were within the south firebreak. The numerous archaeological studies completed in training areas at Makua Military Reservation are sufficient for planning purposes. No additional surveys are planned.

40. Comment: Earth Justice/Malama Makua 13 Aug 2014 letter- page 5, paragraph 1

“In addition, based on the limited data collected in the 2014 Survey, the Army must revise the analysis set forth in its final Environmental Impact Statement for MMR to disclose the threats to as yet unidentified surface site boundaries. Clearly, protecting only surface features is inadequate to ensure against damage to or destruction of subsurface cultural resources at MMR.”

Response: The purpose of the survey is described in the introduction and project description section on page 1 of the report. Information presented in this report will aid the USAG-HI in making future decisions relating to the Environmental Impact Statement.