

ARCHAEOLOGICAL
ASSESSMENT
DATED MARCH 2020

APPENDIX

E - 1

**FINAL ARCHAEOLOGICAL ASSESSMENT REPORT
FOR HAWAIIAN CEMENT QUARRY EXPANSION
LOCATED AT TMK: (2) 3-8-004:001 portion
PŪLEHU NUI *AHUPUA'A*, KULA *MOKU*;
WAILUKU DISTRICT
ISLAND OF MAUI**

**FOR: planning@mauicounty.gov, dsa.subdivision@mauicounty.gov and Mr. Dave Gomes
Hawaiian Cement dave.gomes@hawaiacement.com**

**BY: Mr. Reynaldo Nico Fuentes (M.A.), Ms. Lisa J. Rotunno-Hazuka (B.A.)
and Ms. Jenny O'Claray-Nu (B.A.)**

**UPDATED MARCH 2020
REVISED SEPT 2017
REVISED JULY 2015
OCTOBER 2014**

**ATLAS ARCHAEOLOGY
Mr. Reynaldo Nico Fuentes
POB 1368
WAILUKU, HI 96784**

EXECUTIVE SUMMARY

Under contract to Mr. David Gomes of Hawaiian Cement, and pursuant to recommendations by the State Historic Preservation Division-SHPD (Doc. No. 0603JP55), Archaeological Services Hawaii, LLC (ASH) conducted an archaeological inventory survey (AIS) with negative results for the proposed rock quarry expansion site comprised of 41.968 acres. The subject parcel is located within a larger 2008-acre parcel, Parcel 1 (TMK: (2) 3-8-004:001), situated along the isthmus of Maui, Pūlehu Nui *ahupua'a*, Wailuku District, Kula *Moku*, TMK: (2) 3-8-004:001 pors. Due to an absence of findings, an archaeological assessment (AA) report was submitted and reviewed by SHPD in 2015 (Log. No. 2014.04654 and Doc. No. 1505MD19). Several revisions were recommended by SHPD and the revised AA report was submitted in 2015 and 2017 but not reviewed. Due to changes in SHPD review and submittal procedures in April 2018, and a permit issue for ASH, this revised AA report was updated and prepared under the supervision of Atlas Archaeology.

Pūlehu Nui was actively settled during both the pre-Contact and historic periods and most of the population appeared to be centered within the *mauka* and *makai* areas. However during the historic period, these marginal or intermediate zones were utilized for commercial sugar and or ranching and contained Plantation Camps dispersed across the landscape.

The subject parcel is presently under various stages of cultivation, 8.8 acres in the southwest corner was recently harvested of sugarcane and the remaining 33.168 acres is actively cultivated. The inventory level procedures consisted of background research, a pedestrian survey and subsurface testing. The fieldwork procedures performed by ASH personnel occurred on 14 and 28 June 2014 and 3 and 12 July 2014 by archaeologist, Mr. Reynaldo N. Fuentes (B.A.) and supervisory archaeologist, Ms. Jenny O'Claray-Nu. Overall coordination for the project was executed by Ms. Lisa Rotunno-Hazuka (B.A.) and Mr. Jeffrey Pantaleo (M.A.), was the principal investigator. Recent revisions and update to the report were prepared under the direction of principal investigator, Mr. Reynaldo N. Fuentes (M.A.) of Atlas Archaeology.

A total of 17 backhoe trenches and 2 dozer cuts were executed within the approximate 42 acre parcel and all were negative for cultural remains. Documentation of the soil profiles indicated agricultural disturbances and alluvial deposits in the upper layers. Five test trenches (TR's 1-5) and two bulldozer cuts (BD 1-2) were placed in this 8.8 acre section and all trenching was devoid of cultural remains. The remaining 33.168 acres was cultivated in sugarcane and TR's 6-17 were executed in the cane haul roads of this section. The seventeen trenches averaged 4.0 m long by 1.00 m wide with a depth varying between 1.0 m-3.0 m. The two bulldozer cuts ranged from 12.0 to 15.0 m long by 5.0 m wide with an overall depth of 1.6 m.

Due to the negative findings at the project area, along with an absence of any former Plantation Camps in the area and following HRS §13-284-7, the overall project will have “no effect” on historic properties.

The negative results were anticipated in this marginal/transitional zone due to the prior disturbances and 2011 AIS investigations (Rotunno-Hazuka et al. 2011) in the adjoining project to the west. Thus, no further archaeological procedures or mitigation measures are warranted for the 42.0-acre project area.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	i
LIST OF FIGURES.....	iiiv
LIST OF TABLES	vvi
THIS PAGE LEFT INTENTIONALLY BLANK	0
INTRODUCTION.....	1
PROJECT AREA DESCRIPTION	1
EXISTING PROJECT CONDITIONS.....	6
ENVIRONMENTAL SETTING.....	6
BACKGROUND.....	11
LAND TENURE	11
PREVIOUS ARCHAEOLOGY	11
SITE EXPECTABILITY	16
METHODS AND PROCEDURES	16
FIELD WORK	16
LAB WORK	18
RESULTS	18
TRENCH 1.....	21
TRENCH 2.....	22
TRENCH 3.....	23
TRENCH 4.....	25
TRENCH 5.....	26
BULLDOZER CUT 1.....	28
BULLDOZER CUT 2.....	29
TRENCH 6.....	31
TRENCH 7.....	32

TRENCH 8.....	34
TRENCH 9.....	35
TRENCH 10.....	37
TRENCH 11.....	38
TRENCH 12.....	39
TRENCH 13.....	40
TRENCH 14.....	42
TRENCH 15.....	43
TRENCH 16.....	44
TRENCH 17.....	45
DISCUSSIONS AND RECOMMENDATIONS	47
REFERENCES.....	50
APPENDIX A.....	52

LIST OF FIGURES

Figure 1. Location of Current Project Area (purple) and Previous Archaeological Assessment (red).....	3
Figure 2. USGS Quadrangle Showing Location of Project Area (purple and red) and Various Plantation Camps Including Kihei Camp 3 and Camp 13.....	4
Figure 3. Location of Project Area (purple), Plantation Camps 13 and 3 (red) and LCA 5230 on Tax Map Key 3-8-004.....	5
Figure 4. Overview from the south of 8.8 acre portion of Project Area	6
Figure 5. Map of Maui Showing Traditional Kula Moku and Pūlehu Nui Ahupua`a (adapted from Tomonari-Tuggle-2001).....	8
Figure 6. Location of Project Area on Web Soil Survey Map (outlined in blue).....	9
Figure 7. Aerial Photograph of Project Area (purple outline).....	9
Figure 8. Sugar Cane Field Map Showing Project Area and Test Excavations (TR's 1-17 and BD's 1-2) (note yellow highlighted area is the 8.8 acre section of the project area).....	10
Figure 9. Plan View Map Showing Previous Archaeological Studies near the Project Area	14

Figure 10. USGS Quadrangle Map Showing Previous Archaeological Studies near Project Area	15
Figure 11. Enlarged Map Showing Location of TR's 1-17 and BD 1-2	19
Figure 12. Overview Photograph of Trench 1 (View to North)	21
Figure 13. Photograph of Trench 1 West Wall	22
Figure 14. Photograph of Trench 2 East Wall.....	23
Figure 15. Overview Photograph of Trench 3 (View to East)	24
Figure 16. Photograph of TR-3 North Wall	24
Figure 17. Overview Photograph of Trench 4 (View to North)	25
Figure 18. Photograph of Trench 4 West Wall	26
Figure 19. Overview Photograph of Trench 5 (View to North)	27
Figure 20. Photograph of Trench 5 West Wall	27
Figure 21. Overview Photograph of Bulldozer Cut 1 (View to West)	28
Figure 22. Photograph of Bulldozer Cut 1 North Wall.....	29
Figure 23. Overview Photograph of Bulldozer Cut 2 (View to West)	30
Figure 24. Photograph of Bulldozer Cut 2 North Wall.....	30
Figure 25. Overview Photograph of Trench 6 (View to West)	31
Figure 26. Photograph of Trench 6 South Wall	32
Figure 27. Overview Photograph of Trench 7 (View to North)	33
Figure 28. Photograph of Trench 7 North Wall	33
Figure 29. Overview Photograph of Trench 8 (View to East)	34
Figure 30. Photograph of Trench 8 North Wall	35
Figure 31. Overview Photograph of Trench 9 (View to East)	36
Figure 32. Photograph of Trench 9 North Wall	36
Figure 33. Overview Photograph of Trench 10 (View to East)	37
Figure 34. Photograph of Trench 10 North Wall	38
Figure 35. Overview Photograph of Trench 12 (View to West)	39
Figure 36. Photograph of Trench 12 North Wall	40
Figure 37. Overview Photograph of Trench 13 (View to East)	41
Figure 38. Photograph of Trench 13 North Wall	41
Figure 39. (Left) Overview Photograph of Trench 14 (View to West); (Right) Photograph of North Wall Trench 14 (View to Northwest.....	42
Figure 40. Photographs of TR-15 Overview (View to West) (left); and South Wall (right)	43
Figure 41. Overview Photograph of Trench 16 (View to West)	44
Figure 42. Photograph of Trench 16 North Wall	45

Figure 43. Overview Photograph of Trench 17 (View to West)	46
Figure 44. Photograph of Trench 17 South Wall	46
Figure 45. Development Map Showing Project Area (Red), Former A.A. Parcel (Green) and Possible Future Expansion Areas (Purple)	50

LIST OF TABLES

Table I. Summary of Backhoe Trenches 1-17 and BD's 1 and 2	20
--	----

THIS PAGE LEFT INTENTIONALLY BLANK

INTRODUCTION

Under contract to Mr. David Gomes of Hawaiian Cement located at Mokulele Hwy, Pu`unēnē, Hi 96753 and pursuant to recommendations by the State Historic Preservation Division-SHPD (Doc. No. 0603JP55), Archaeological Services Hawaii, LLC. (ASH) conducted archaeological inventory survey procedures (AIS) for the proposed 41.968 acre rock quarry expansion site situated in Pūlehu Nui *ahupua`a*, Kula *Moku*, Wailuku District, TMK: (2) 3-8-004:001 por (Figures 1-4). This revised AA report was prepared according to recommendations by SHPD (Log. No. 2014.04654 and Doc. No. 1505MD19) and the rules and regulations set forth in the Hawaii Administrative Rules (HAR) §13-284-5(5)(A) and 276-5(a)(c).

The proposed activity encompasses a long-term project comprised of rock mining within fallow and cultivated sugarcane fields. Due to a lack of surface structural remains during the pedestrian survey, inventory level testing through mechanical excavations was deemed appropriate. A total of 17 trench (TR1-17) and 2 bulldozer excavations (BD1-2) were conducted to determine presence/absence, extent and significance (if applicable) of subsurface historic properties including burial features. All mechanical test excavations were negative for buried cultural remains.

PROJECT AREA DESCRIPTION

The project area, comprised of 41.968 acres, is situated within a larger 2008.69 acre parcel on the isthmus of Maui approximately 5.6 km (3.5 mi) to 6.0 km (4.0 mi) inland from the Mā`alaea coastline and 0.75 km (.5 miles) east (*mauka*) of the intersection Mokulele Highway and Meha Meha Loop (road to Hawaiian Cement and the Animal Shelter). The subject parcel area is bounded to the west by a prior archaeological assessment (Rotunno-Hazuka et al. 2011) and a paved access road designated Upper Kihei Road, to the south by Kolaloa Gulch, to the north by an irrigation ditch and active sugar cane fields, and east by active sugar cane. As exhibited on Figures 2 and 3, two former historic plantation camps, Kihei Camp 3 and Camp 13. Kihei Camp 3 appeared to be located approximately 2500 ft. (762 m) SE and across Kolaloa Gulch. Camp 13 was approximately 7500 ft. (2286 m) north from the current project area.

The entire parcel (2008.69-acres) including the 41.968-acre project area has been altered through compounded disturbances from sugar cane cultivation and prior rock mining. The subject parcel is comprised of two sections. One section contains 8.8 acres and was grubbed of all vegetation

and located within the southwestern portion of the project area. The remaining section consists of over 33.0 acres that are currently cultivated in sugarcane (Figure 4).

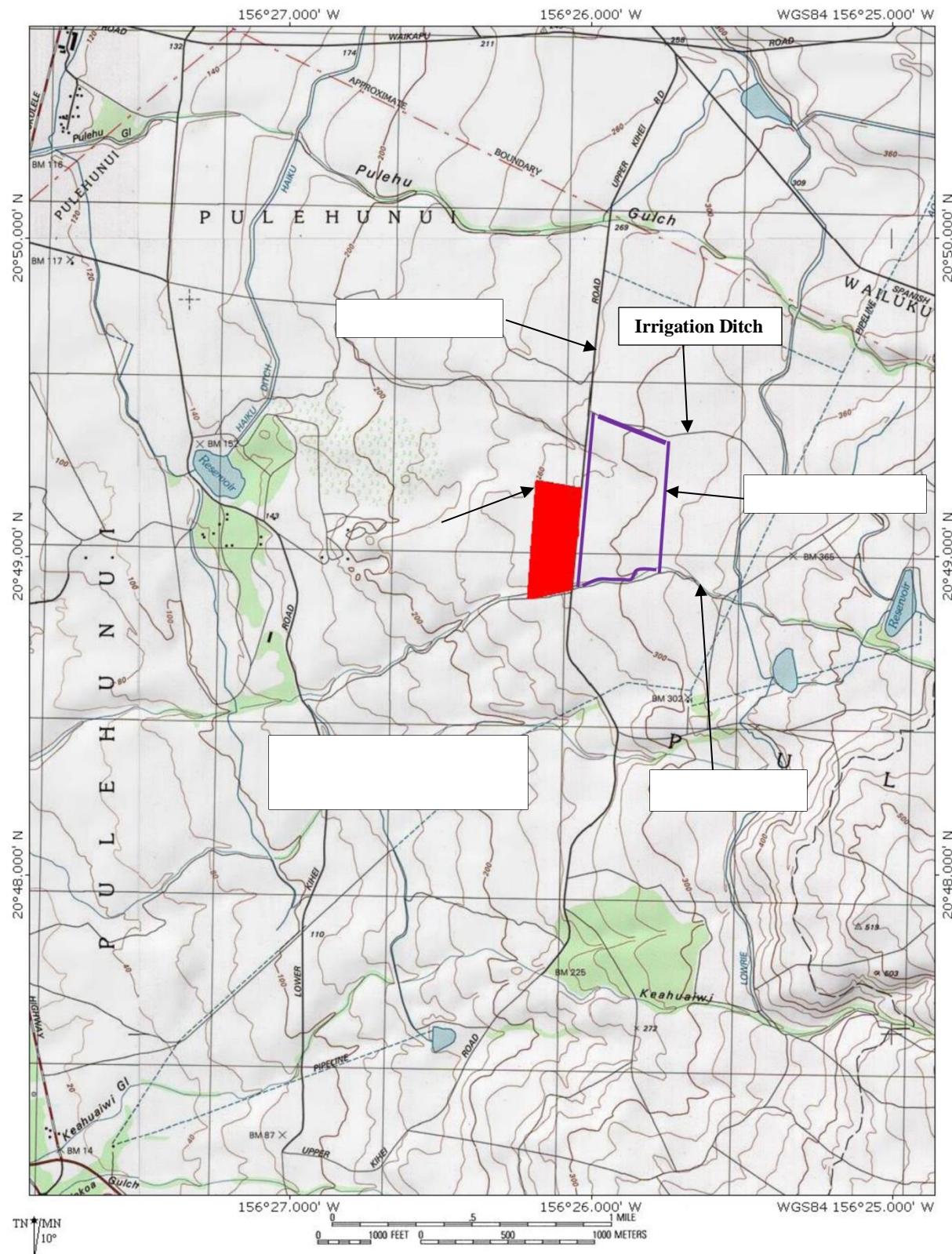


Figure 1. Location of Current Project Area (purple) and Previous Archaeological Assessment (red)

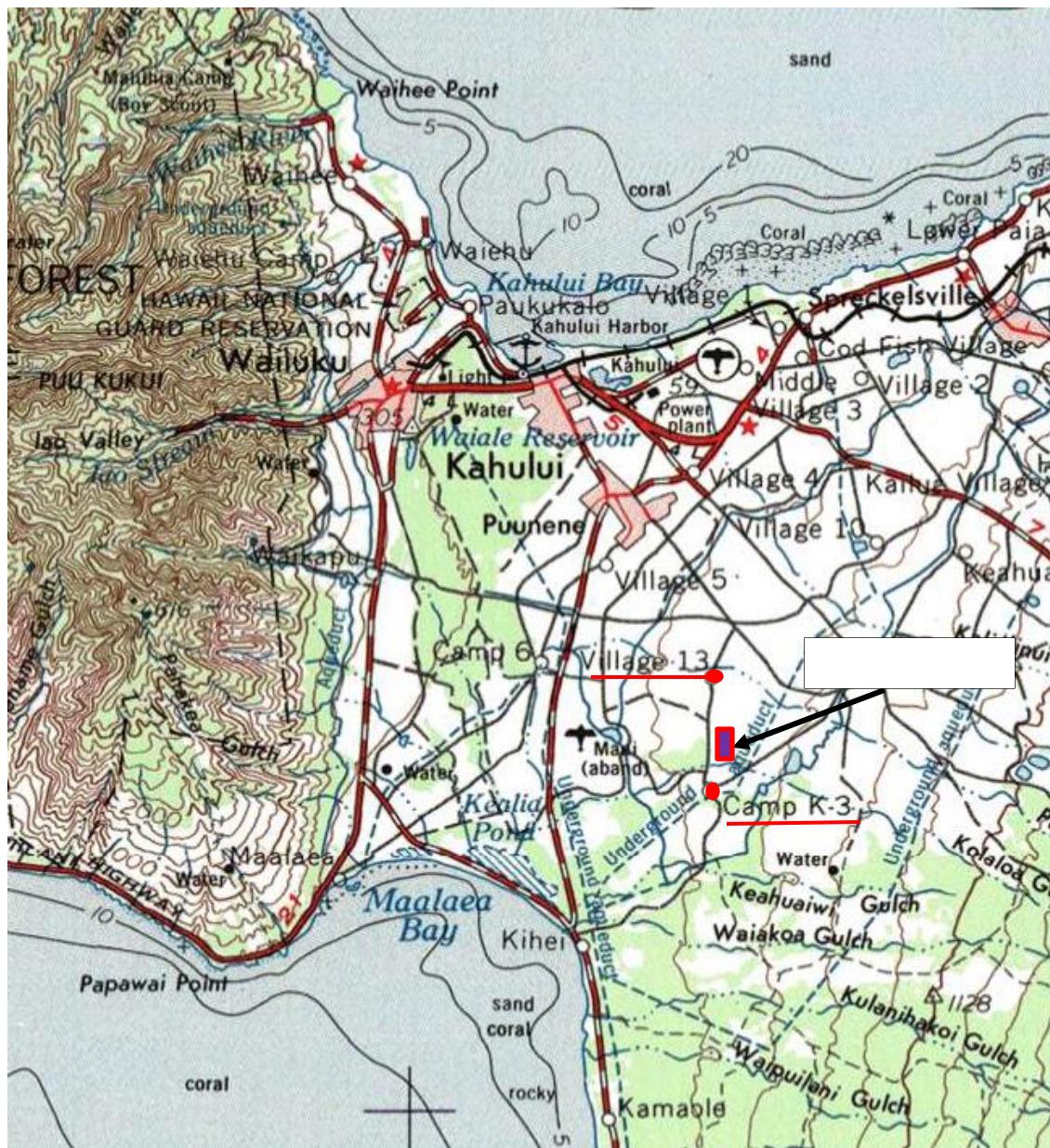


Figure 2. USGS Quadrangle Showing Location of Project Area (purple and red) and Various Plantation Camps Including Kihei Camp 3 and Camp 13

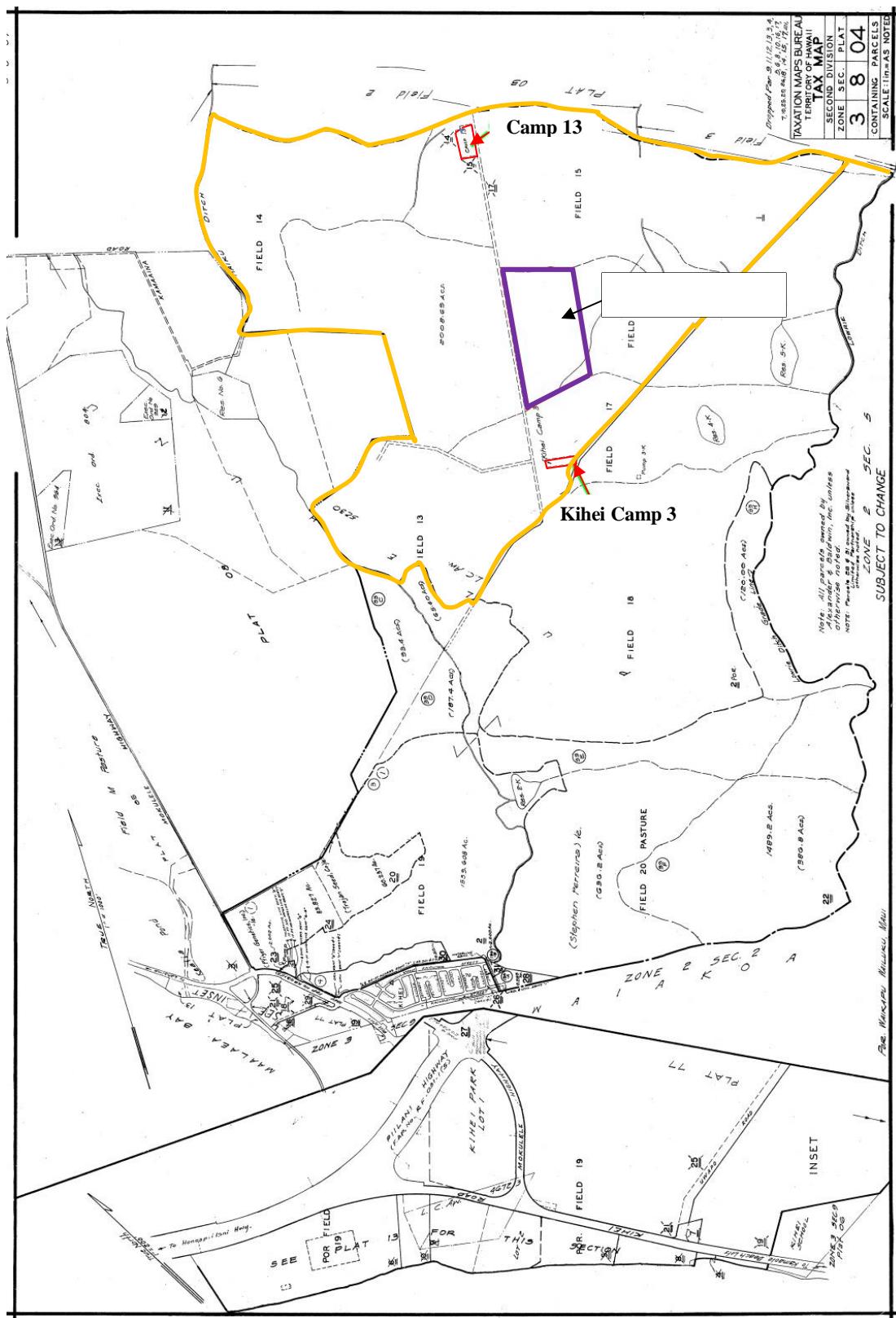


Figure 3. Tax Map Key 3-8-004 Showing Location of Project Area (purple), Plantation Camps 13 and 3 (red), LCA 5230 and extent of Parcel 1 (TMK: (2) 3-8-004:001) (gold)

EXISTING PROJECT CONDITIONS

The subject parcel is presently under various stages of cultivation. The first test area comprised an 8.8-acre **section of land** in the southwest corner. This portion was previously harvested and a drainage basin was constructed. The area adjacent to the drainage contains large linear stockpiles for safety purposes, to prevent vehicular and pedestrian traffic from entering the drainage area. The remaining 33.0-acres of the project area was cultivated in sugar cane.



Figure 4. Overview from the south of 8.8 acre portion of Project Area

ENVIRONMENTAL SETTING

The subject parcel is within the *ahupua'a* of Pūlehu Nui, a narrow triangular shaped section of land that stretches 15 miles at its base on the sand plains of central Maui, abutting and east of Waikapū *ahupua'a*, to a point at the peak of Kilohana on the rim of Haleakala (Tuggle 2001:12). Pūlehu Nui was part of the traditional *moku* Kula but is now part of the modern district Wailuku (Figure 5). As exhibited on Figure 5, Pūlehu Nui is bounded by a portion of Waikapū *ahupua'a* to the west, Wailuku *ahupua'a* to the north and by **Kula Moku** on the remaining sides. A very small portion of Pūlehu Nui is adjacent to the coast on the southwest.

Soils of the project area according to the USDA and Soil Survey Maps shows six soil zones within the project area; Alae cobbly sandy loam (AcA) 0 to 3% slope, Pulehu silt loam (PpB) 3 to 7%, Pulehu cobbly silt loam (PrB) 3 to 7%, Pulehu clay loam (PsA) 0 to 3% slope, and Waiakoa very stony silty clay loam (WgB) 3 to 7% slope, and Waiakoa extremely stony silty clay loam (WhB) 3 to 7% slope (Figure 6). The total area is occupied by 4.8% AcA, 10.8% PpB, 52.9% PrB, 6.5% PsA, 24.3% WgB, and 0.7% WhB. The Pulehu series consist of well-drained soils on alluvial fans and stream terraces around Maui. They developed in alluvium washed from basic igneous rock. The soils are nearly level to moderately sloping. Elevations range from nearly sea level to 300 feet. The Waiakoa series consist of well-drained soils on uplands of Maui. These soils developed in material weathered from basic igneous rock. The upper part of profile is influenced by volcanic ash. These soils are gently sloping to moderately steep. Elevations range from 100 to 1,000 feet.

All soils can be utilized in multiple ways; truck crops, pasture lands, home sites and wildlife habitats, however in this instance the primary use was sugarcane cultivation and a rock quarry plant (Figure 7).

Test trenches were placed across the project area to obtain a representative sample of the subsurface conditions and indicate that soils generally consist of dark reddish brown to light brownish gray with moderate variability due to burning episodes associated with sugarcane (Figure 8). Soils contain high frequencies of cobbles, and the surface lacks humic layer components. Trenches near the southern boundary exhibit lenses of black cinders and is consistent with what mining operations have encountered while drilling and blasting (pers. Comm. with Mr. Gomes).

The climate for these two zones is typically dry, in particular the low elevation areas of which the current project are falls. Annual rainfall is less than 35 inches and occurs primarily in winter months; additionally mean annual air temperature falls between 73 and 75 degrees. Surface streams are absent however the large Kolaloa Gulch bounding the project area to the south may run under time of heavy rain.

Vegetation within the project area consists of the cultivated sugarcane (*Saccharum officinarum*) and various other unidentified weeds and grasses. It was observed that concentrations of these unidentified weeds and grass were present within Kolaloa Gulch (see Figure 7).



Figure 5. Map of Maui Showing Traditional Kula Moku and Pūlehui Nui Ahupua'a
(adapted from Tomonari-Tuggle-2001)



Figure 6. Location of Project Area on Web Soil Survey Map (outlined in blue)



Figure 7. Aerial Photograph of Project Area (purple outline)

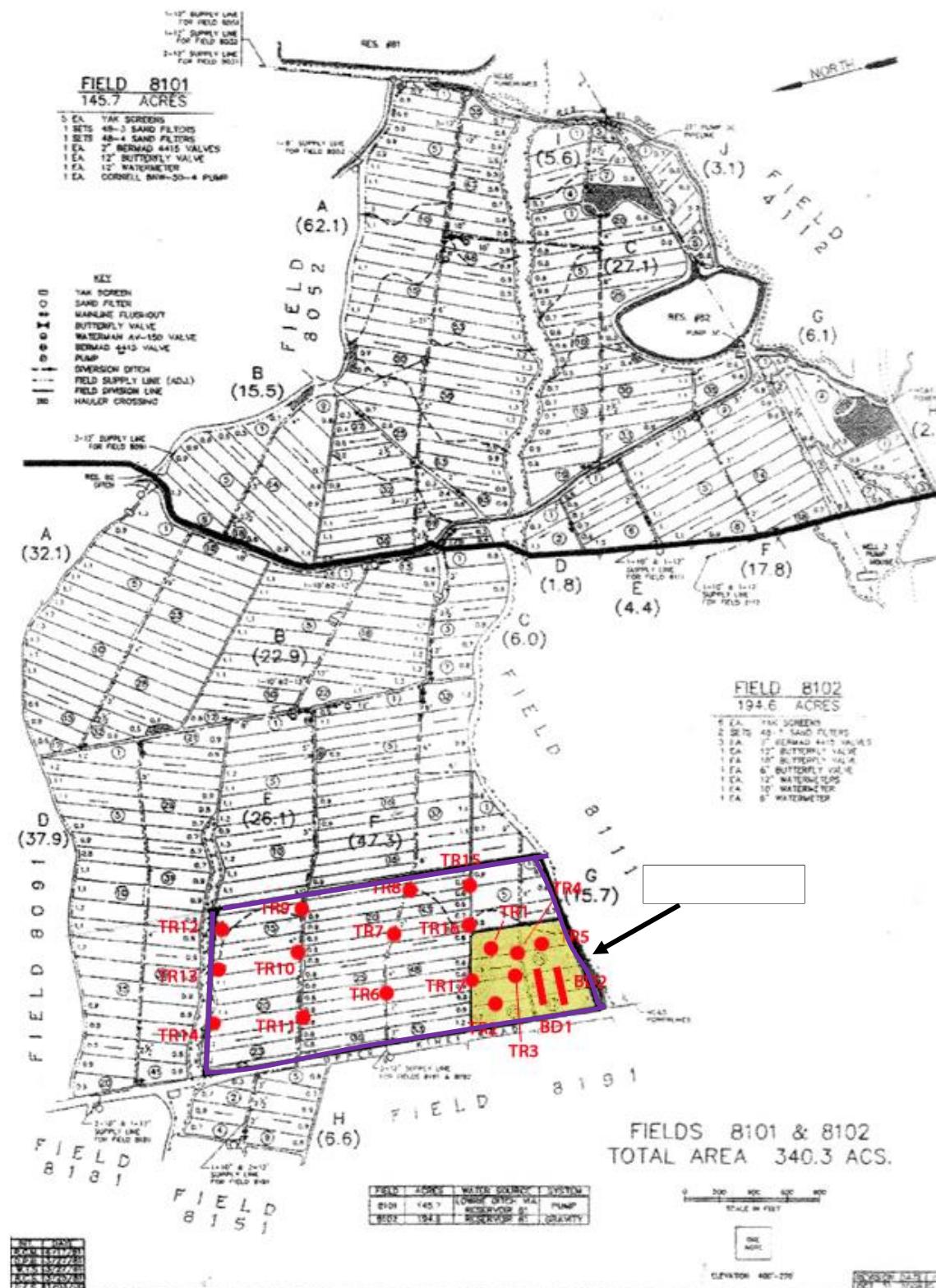


Figure 8. Sugar Cane Field Map Showing Project Area and Test Excavations (TR's 1-17 and BD's 1-2) (note yellow highlighted area is the 8.8 acre section of the project area)

BACKGROUND

As this report is an archaeological assessment, a brief background of the subject parcel and its surroundings is presented here. For a detailed background study of the Pulehu Nui and Waikapū *ahupua`a*, the reader is referred to Tomonari-Tuggle et al. (2001) and Hill et al. (2007).

Based on the background research, it appears that Pūlehu Nui was actively settled during both the pre-Contact and historic period era's and that most of the population appeared to be centered within the *mauka* and *makai* areas. After the Plantation Camps were razed, cultivation of sugarcane continued and ranching also became a dominant activity within this intermittent zone.

LAND TENURE

The project area is situated within LCA 5230 which is comprised of approximately 1668 acres and was awarded to Keawemahi by the King in 1843 (see red arrows Figure 3). This grant was subsequently assigned Royal Patent 8140 but unfortunately no land use was ascribed to Keawemahi's land grant (Waihona 'Aina 2000). As exhibited on Figure 3, no other LCA or Grants are within the immediate vicinity; however thirteen land commission awards were applied for within the *ahupua`a* of Pulehu Nui, most of which were more inland and comprised of *kula* lands (Hill et. al. 2007:26). These kula lands were utilized for the cultivation of sweet potato and Irish potato. Hill also stated that one LCA was situated along the coast and referred to fishing rights.

PREVIOUS ARCHAEOLOGY

Few studies have been conducted within this central isthmus, intermittent area. The most notable investigations closest to the project area are presented below in Figures 9 and 10. A more comprehensive background section is presented in the Tomonari-Tuggle et al. 2001 and Hill et al. 2007.

The project area was subjected to a walk-through reconnaissance survey over two decades ago in 1990 by Archaeological Consultants of Hawaii (ACH). During this investigation, no historic properties were identified and ACH opined that no further archaeological work was necessary (Kennedy 1990: 2).

In 1991, Sinoto and Pantaleo conducted an archaeological inventory survey for the Proposed Kihei Gateway Complex in North Kihei and identified the footings of a bridge, Site 50-50-09-31, that was probably related to a cane railroad and Kihei Camp 1 (Sinoto and Pantaleo 1991) (see Figure 10).

In August of 1995 an inventory survey was conducted by Scientific Consultant Services for the Pu'unēnē Bypass/ Mokulele Highway. The pedestrian survey covered a portion of the Pūlehu nui and Wailuku *ahupua'a*. The area covered was approximately 10 miles and consisted primarily of active sugar cane fields. Survey expectations suggested that minimal to no archaeological evidence would be identified. Reasons for the lack of archaeological evidence were provided in the original report and are cited below: "Several factors may account for the lack of archaeological remains: extensive disturbance associated with prior sugarcane cultivation, highway and private construction activities...and/or little or no prehistoric occupation or use of the area." (Burgett and Spear 1997: 7).

In 1999 an AIS was conducted of The Naval Air Station Pu'unene (NASP) which was comprised of 1875 acres. The survey identified five sites composed of 180 features. The five sites are State Inventory of Historic Places 50-50-09-4164, Sugarcane plantation features Site 4800, Post-war ranching features, Site 4801, Old Kihei railroad bed Site 4802, and the Haiku Ditch and reservoir 4803 (Tuggle 2001:70). The NASP dates to just prior to WWII and was composed of multiple facilities, of which the "Hot Mix Plant" appears to be within the current project area (field 13). When the 1999 survey was conducted the proposed quarry location (current project area) was known and is shown in the eastern most portion of the NASP (Tuggle 2001:71). Features in the sugarcane plantation of Site 4800 consist of canals, roadbeds, and miscellaneous glass and porcelain fragments from Camp 6. Features interpreted as Post-war ranching elements from Site 4801 consist of corrals, watering troughs and fence post. The Old Kihei railroad bed, Site 4802 was identified as a concentration railway spikes and berm consistent with railroad berm forms.

The field inspection of 81.50 acres by Cultural Surveys Hawaii, Inc. (Hill et. al. in 2007) produced negative findings.

In 2010, ASH performed an Archaeological Assessment (AA) of 24.476 acres (Rotunno-Hazuka et. al 2011). During the procedures, a total of 20 backhoe trenches were executed across the project area that were negative for intact cultural remains. The excavations revealed that the project area had been disturbed by continuous agricultural activities and recent grading for rock mining. During the initial pedestrian surface survey, isolated marine shells, recent glass shards and concrete fragments along with agricultural materials consisting of plastic sheeting, irrigation tubing, PVC pipes and etc. were observed and scattered within the S-1 and S-2 areas.

Documentation of the soil profiles exhibited that all trenches contained upper layers of the

agricultural till zone within Layers I and II and these layers contained gravel, the above agricultural materials, fragments of glass and metal bolts for machinery. Most trenches contained about 3.0 ft. of soil overlying decomposing bedrock and or dense bedrock, Layers III and IV. The thickest soil deposits within the project area were noted along Kolaloa Gulch, and appeared to be from episodic flooding and or intentional buildup of the road for flood control purposes. The marine shells noted on the surface likely originated from imported sand (Grade B) material which is utilized as a soil conditioner providing nutrients (phosphorus) for the sugarcane (personal communication with Hawaiian Cement personnel).

The AA further recommended that,

“..As no intact deposits of cultural materials were noted during the survey, no further archaeological work including monitoring is warranted for the subject parcel. Similarly, it appears that future archaeological investigations in the adjoining areas may be unwarranted unless historic plantation camps are situated within the subject parcels, and or significant deposits are discovered in the future. In those parcels which contain plantation camps, subsurface testing should be concentrated around the camp unless scattered cultural deposits or surface structural remains are noted elsewhere during the pedestrian sweep (Rotunno-Hazuka et. al 2011:63).

However, SHPD recommended that inventory survey procedures should be conducted prior to rock mining activities.

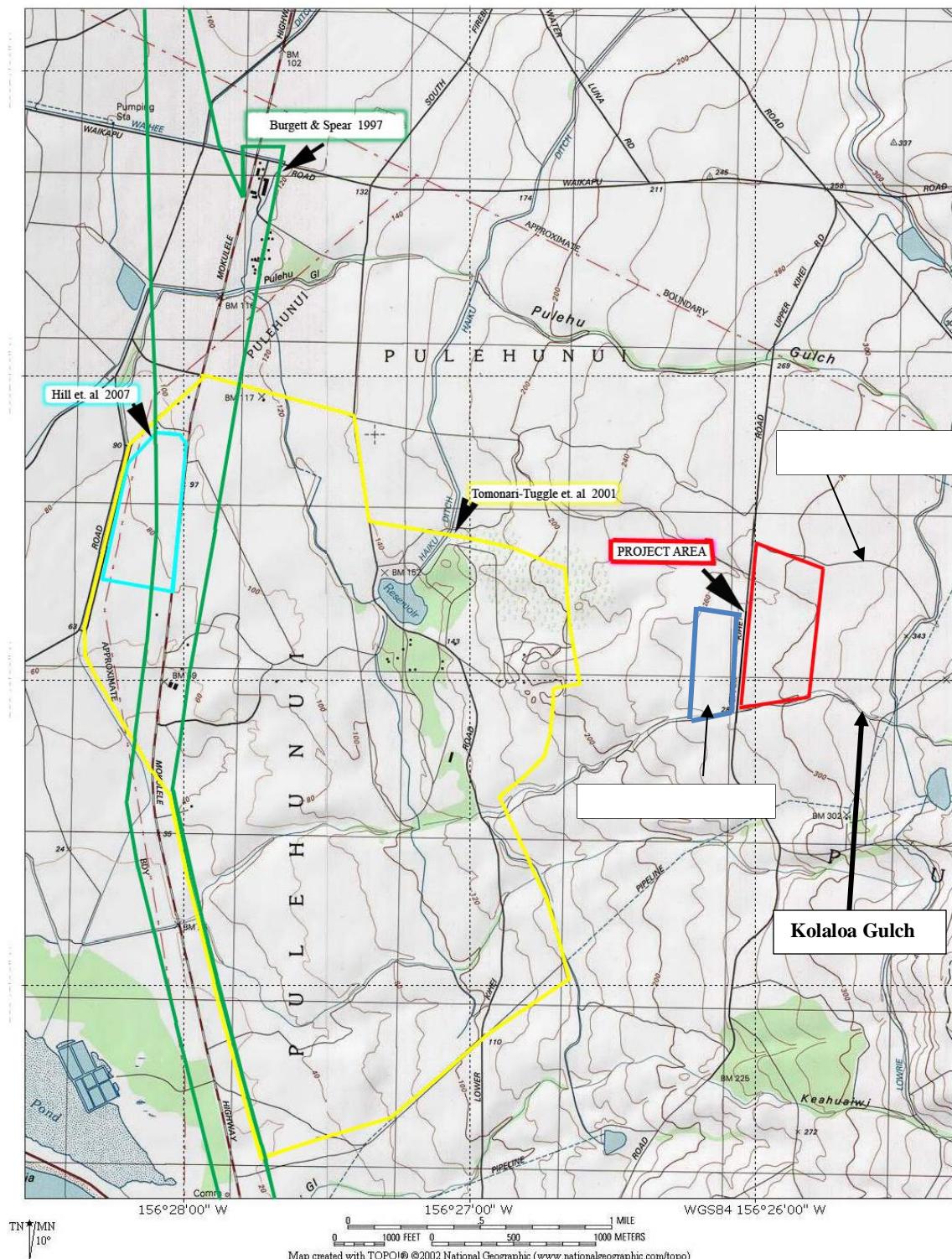


Figure 9. Plan View Map Showing Previous Archaeological Studies near the Project Area

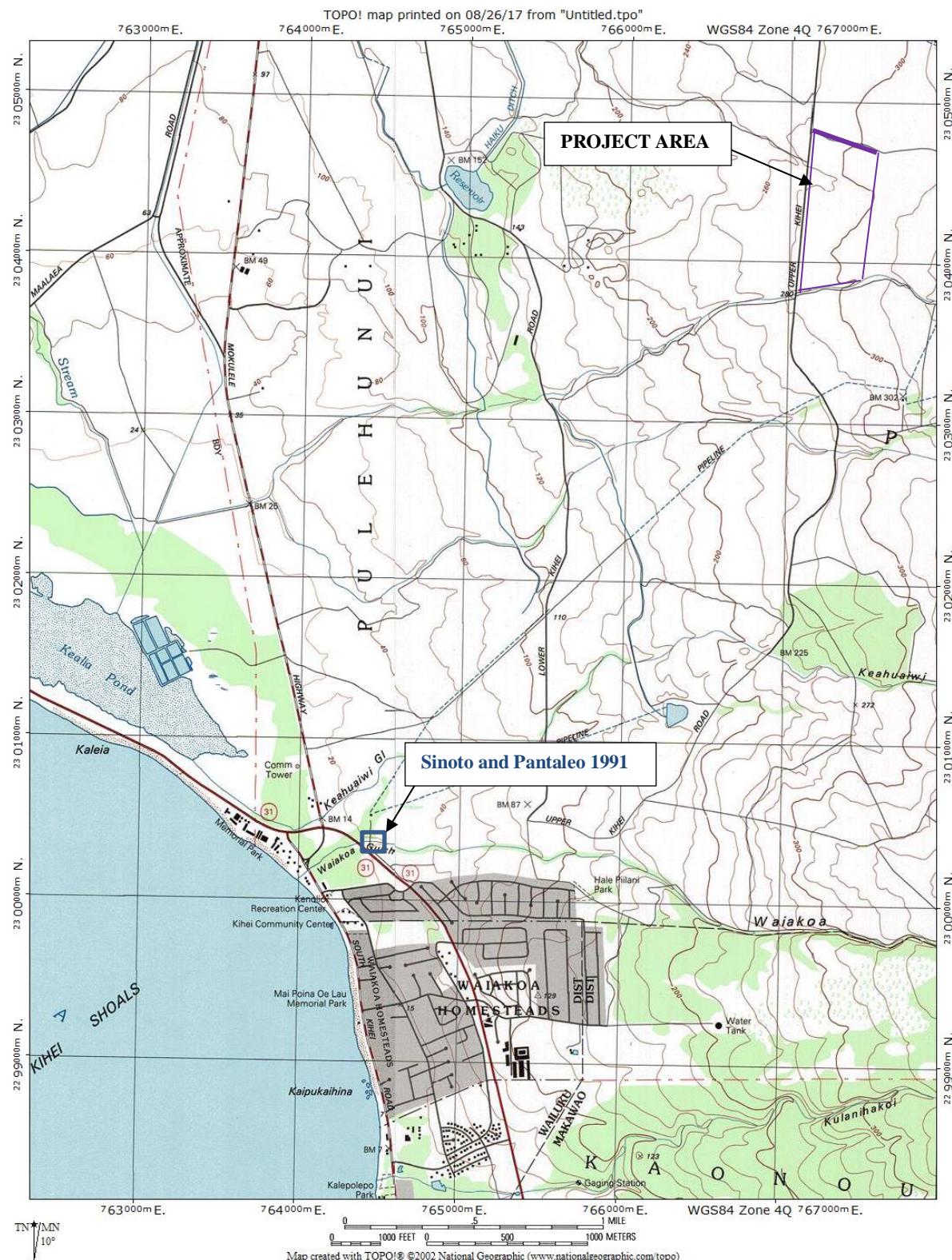


Figure 10. USGS Quadrangle Map Showing Previous Archaeological Studies near Project Area

SITE EXPECTABILITY

Based on the aforementioned information, the project area lies within the intermittent zone which was marginally occupied. It may have contained pre-Contact temporary habitation with small agricultural features, *mauka-makai* trails and possibly ceremonial structures such as *koa*.

Traditional settlement patterns would have centered around the shoreline and near the several fishponds within the area as well as along the lower and upper slopes of Haleakala. Historically, this same settlement pattern would have occurred but with the addition of Plantation Camps positioned along old access roads and railroads. Lastly, ranching era sites consisting of walled enclosures constructed from rock walls or barbed wire, cattle troughs, loading chutes and etc., may have been extant; however due to the extensive grading activities from sugar cane cultivation these historic properties may not have survived.

METHODS AND PROCEDURES

Prior to the commencement of field work, archaeological, historical and geographical archival researches were conducted at the SHPD and ASH libraries. Fieldwork and report synthesis and preparation was conducted by Archaeological Services Hawaii, LLC in 2014 and 2017. Recent revisions and updates to the report were prepared under the supervision of Mr. Reynaldo Nico Fuentes (M.A.) of Atlas Archaeology.

FIELD WORK

Fieldwork was conducted on the 14 and 28 June 2014 and the 3 and 12 July 2014 by archaeologist Mr. Reynaldo N. Fuentes (B.A.), archaeological supervisor Ms. Jenny O'Claray-Nu and project manager Ms. Lisa Rotunno-Hazuka for a total of 55 person hours. Overall coordination and supervision of the project was executed by Ms. Lisa Rotunno-Hazuka (B.A.) and Mr. Jeffrey Pantaleo (M.A.) was the Principal Investigator. Drafting was performed by Ms. Mia Watson.

The parameters of the project area were verified by comparing current landmarks (Upper Kihei Rd, Kolaloa Gulch, sugarcane fields) and natural features along with information provided on TMK maps and aerial photographs provided by the client. Field methods consisted of a pedestrian survey with 5.0 m transect intervals across the entire project area, with the exception of the sugarcane fields where only the cane roads were traversed. The purpose of this walk-through survey was two-fold; to ascertain if any cultural materials were present on the surface and to determine the placement of the backhoe trenches.

Due to an absence of surface structural remains, subsurface testing through backhoe test trenches was conducted. The project area was comprised of two sections, cultivated (78%) and non-cultivated (22%), and portions of the cultivated section were inaccessible for subsurface testing; thus, both non-probabilistic and variations of probabilistic statistical sampling methods were employed. Non-probabilistic strategies may be utilized in areas with accessibility issues, areas with more prominent sites or when the experienced archaeologist decides the testing method based on intuition; however, some form of probabilistic sampling is warranted (Renfrew and Bahn 1996:72). Two probabilistic methods for subsurface testing were utilized. The first method was a form of stratified random sampling where the project area is divided into its natural zones, cultivated (33-acres) and non-cultivated (9%) and the percentage of testing should be equal to the ratio represented by the zones; thus, the cultivated area would comprise 78% of the testing, and the non-cultivated area 22%. (Renfrew and Bahn 1996:72). Since only the roadways of the cultivated section were accessible for subsurface testing (pedestrian survey was conducted), the acreage would actually consist of approximately 9.0 acres for the roadways, and the percentages of testing for both sections would be approximately 50%. The second probabilistic method was systematic random sampling where the areas to be analyzed are chosen at random with a subsequent pre-determined strategy (Hester et al. 2009). “Use of this sample technique guarantees more uniform coverage of an area than would likely occur with simple random sampling” (Hester et al. 2009:29). For the cultivated area, the systematic random method was used and comprised trenching along the roadways were spaced approximately 50.0 m apart. The cultivated area consisted of 33.0-acres and only the roadways (approximately 9.0-acres) were accessible for subsurface testing and consisted of twelve (12) trenches. For the non-cultivated area in the SW quadrant, seven (7) test excavations that consisted of five (5) trenches and two (2) bulldozer cuts were implemented at this 8.8-acre area or approximate 9.0-acre section. There was no pre-determined measurement between the trenches but the trenches and bulldozer cuts were placed to provide uniform coverage across the entire area (see Figure 11). Therefore, a slight modification of the simple random sampling technique was used at the non-cultivated section, and a variation of the stratified random sampling technique was used at both sections, as exemplified by the percentage of testing. The cultivated roadway area contained 63% of the subsurface testing, and the non-cultivated area encompassed 37%, although the goal for each section was 50%. Regardless of the modifications to these statistical sampling methods, the data obtained from the sample set provided reliable probability information.

Backhoe trenches were excavated utilizing a 3.0 ft. wide bucket and were supervised and monitored by the archaeological personnel. Trenches were plotted utilizing tape and compass to a known surveyed point on the map. All trenches were documented through scaled stratigraphic profiles (Appendix A), photographs and overall dimensions.

LAB WORK

All soil samples collected during the undertaking will be accessioned and analyzed for color and texture utilizing the Munsell color system and the USDA textural classification system. No charcoal samples, midden and or artifacts were collected during the current course of work. All recovered samples, field notes, maps, and photographs generated in connection with the current project are the property of ASH, LLC and will be curated at Archaeological Services Hawaii, LLC, in Wailuku, Maui.

RESULTS

A total of 17 backhoe trenches (TR 1-17) and 2 bulldozer cuts (BD 1-2) were performed in the project area and averaged 4.0 m long by 1.00 m wide and ranged in depth from 0.80 m to 3.0 m (see Figure 11, Table I and Appendix A). As previously discussed, the project area contained two sections, the 8.8-acre non-cultivated section in the SE quadrant and the remaining cultivated section comprised of approximately 33.0-acres. TRs 1-5 and BD 1-2 were placed in the 8.8-acre section and TR's 6-17 were positioned in the 33.0 acres. During the pedestrian survey, scattered agricultural materials comprised of black plastic, PVC fragments, and black irrigation tubing.

All trenches were negative for buried cultural remains and contained a general tripartite or four layer stratigraphic sequence. The four layer soil profile consisted of two soil layers (Layers I and II), overlying a silty loam decomposing "saprolytic" basalt (Layer III) and bedrock (Layer IV). The three strata sequence consisted of Layers I-III where bedrock was absent. The overall, project wide stratigraphic sequence was as follows:

Layer I is a dark brown (7.5yr 3/3), silty loam, slightly plastic, slightly sticky, crumb, friable, with moderate frequency of roots and rootlets. Inclusions consisted of black plastic irrigation. This heavily disturbed layer is commonly referred to as the "till zone".

Layer II is a dark reddish brown (5yr3/4), silt loam, slightly plastic, slightly sticky, crumb, friable. This layer does not appear to be disturbed.

Layer III is a yellowish brown (10yr5/4), silt loam, slightly plastic, slightly sticky, crumb, friable, with a high frequency of decomposing basalt. This layer is undisturbed and referred to as the "saprolytic layer".

Layer IV is a gray (10yr 5/1), basalt layer, non-plastic, non-sticky, massive, indurated. This layer is the bedrock layer.

Trenches that exhibited the four strata overall project stratigraphy were TRs 1, 2, 4, 5, BD1 and BD2, and the tripartite soil profile was encountered at TRs 6, 10, 11, 13, 15 and 17. The remaining trenches, TRs 3, 7, 8, 12 and 16 with the exception of TR9, contained the above strata; however, the overall general sequence was interrupted by environmental or geological events, exhibited as alluvial layers comprised of water worn pebbles and silt lenses, and subangular, pyroclastic cobbles (similar to the material of small cinders) and/or coarse gravel lenses. TR9 contained a single disturbed layer overlying basalt bedrock (LIV). The stratum, identified at TR9 was Layer III of the overall stratigraphic record and therefore indicated the past disturbances of the area where Layers I and II were removed. Decomposing basalt and or bedrock was observed from 0.46 m (TR2) to 2.90 mbs (TR13) but averaged 0.80 m deep. TRs 1-17 and BD1-2 are discussed below and associated stratigraphic profiles presented in Appendix A.

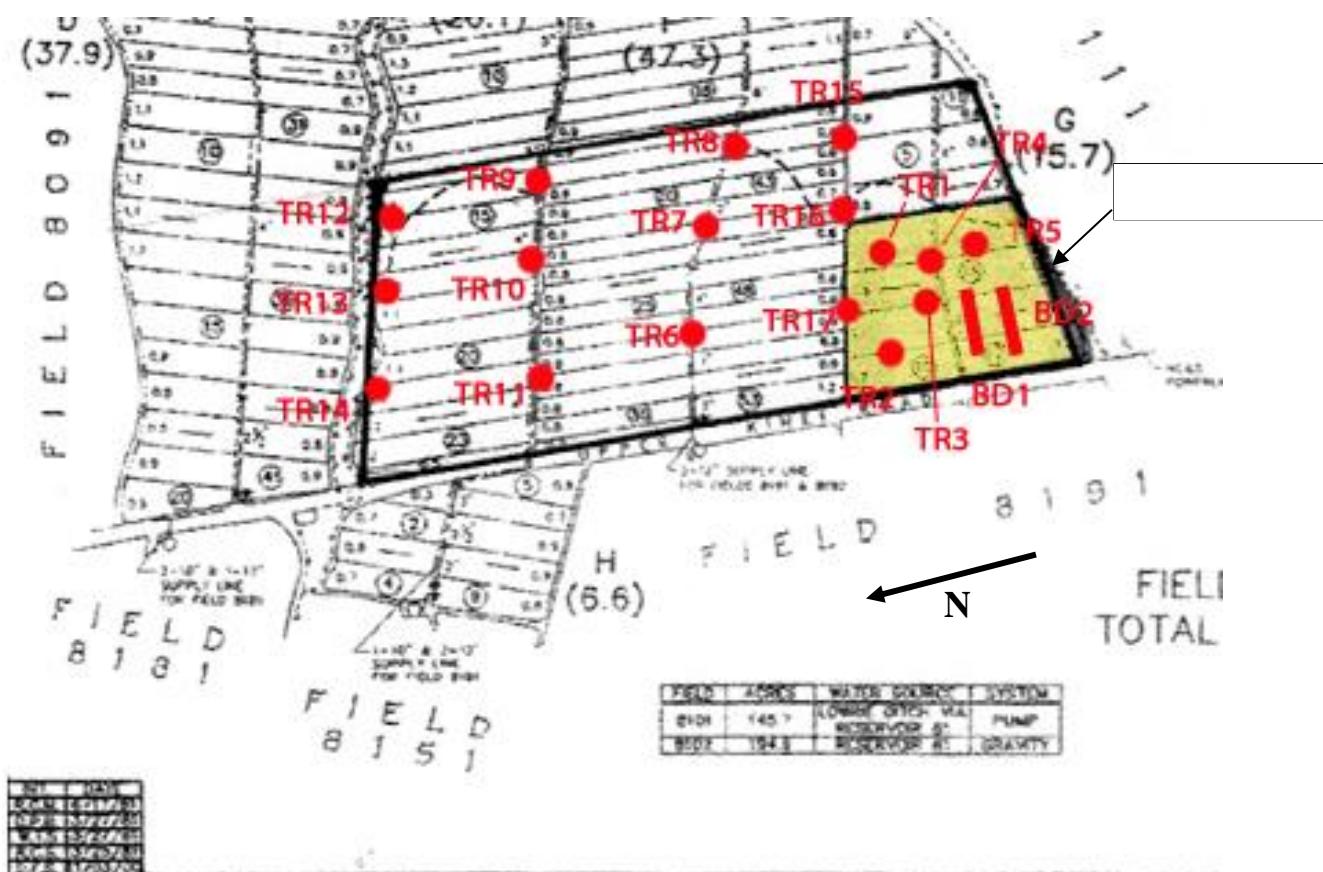


Figure 11. Enlarged Map Showing Location of TRs 1-17 and BD 1-2

Table I. Summary of Backhoe Trenches 1-17 and BD's 1 and 2

TRENCH	LENGTH (m)	WIDTH (m)	DEPTH (m)	ORIENT TR / Profile	LAYER I	LAYER II	LAYER III	LAYER IV	LAYER V	LENS	COMMENTS
1	8	1.5	1.6	360° 90°	7.5YR 3/3	5YR 3/4	10YR 5/4	10yr 5/1	n/a	NO	sterile
2	7	1.5	1.6	360° 90°	7.5YR 3/3	5YR 3/4	10YR 5/4	10yr 5/1	n/a	NO	sterile
3	9	1.5	2	360° 270°	7.5YR 3/3	5YR 3/4	10YR 5/4	10yr 5/4	10yr 5/1	gravel	sterile
4	5	1.5	2	340° 70°	7.5YR 3/3	5YR 3/4	10YR 5/4	10yr 5/1	n/a	NO	irrigation
5	9	1.5	2	360° 90°	7.5YR 3/3	5YR 3/4	10YR 5/4	10yr 5/1	n/a	NO	sterile
BD 1	12	5	1.4	270° 180°	7.5YR 3/3	5YR 3/4	10YR 5/4	10yr 5/1	n/a	NO	irrigation
BD2	15	5	1.6	270° 180°	7.5YR 3/3	5YR 3/4	10YR 5/4	10yr 5/1	n/a	NO	irrigation
6	4.1	1.5	1.6	270° 360°	7.5YR 3/3	5YR 3/4	10YR 5/4	n/a	n/a	NO	Sterile
7	3.9	1.5	2	270° 360°	7.5YR 3/3	5YR 3/4	7.5yr 2.5/1	n/a	n/a	NO	Sterile
8	4	1.5	1.8	270° 360°	7.5YR 3/3	7.5yr 3/1	5YR 3/4	7.5yr 3/1	10yr 5/4	alluvial	Sterile
9	3.9	1.5	0.8	270° 360°	10YR 5/4	n/a	n/a	n/a	n/a	NO	Sterile
10	4	1.5	2	270° 360°	7.5YR 3/3	5YR 3/4	10YR 5/4	n/a	n/a	NO	Sterile
11	4	1.5	2.2	270° 360°	7.5YR 3/3	5YR 3/4	10YR 5/4	n/a	n/a	NO	sterile
12	4	1.5	2.6	270° 360°	7.5YR 3/3	5YR 3/4	10YR 5/4	7.5yr 2.5/1	10yr 5/1	gravel/alluvial cinder	sterile
13	4	1.5	3	270° 360°	7.5YR 3/3	5YR 3/4	10YR 5/1	n/a	n/a	NO	Sterile
14	4	1.5	2.05	270° 360°	7.5YR 3/3	5YR 3/4	5YR 4/6	5YR 3/4	10YR 5/4	alluvial /gravel	Sterile
15	4	1.5	1.2	270° 360°	7.5YR 3/3	5YR 3/4	10YR 5/4	n/a	n/a	NO	sterile
16	4	1.5	1.45	270° 360°	7.5YR 3/3	5YR 3/4	7.5yr 2.5/1	n/a	n/a	NO	sterile
17	4	1.5	1	270° 360°	7.5YR 3/3	5YR 3/4	10YR 5/4	n/a	n/a	NO	sterile

TRENCH 1

TR-1 was placed within the 8.8 acre area in the NE corner of the project area (see Figure 11, Table I and Appendix A). It measured 8.0 m long by 1.5 m wide by 1.60 m deep and was oriented 360° degrees. This section had been previously grubbed during the harvesting of the sugar cane. Testing revealed a four layer stratigraphic sequence (Figures 12 and 13). No cultural materials were observed.

Layer I (0-40cmbs) is a dark brown (7.5yr 3/3), silty loam, slightly plastic, slightly sticky, crumb, friable, with moderate frequency of roots and rootlets. Inclusions consisted of black plastic irrigation. This heavily disturbed layer is commonly referred to as the "tilt zone".

Layer II (39-90cmbs) is a dark reddish brown (5yr3/4), silt loam, slightly plastic, slightly sticky, crumb, friable. This layer does not appear to be disturbed.

Layer III (88-140cmbs) is a yellowish brown (10yr5/4), silt loam, slightly plastic, slightly sticky, crumb, friable, with a high frequency of decomposing basalt. This layer is undisturbed and referred to as the "saprolytic layer".

Layer IV (136-160cmbs+) is a gray (10yr 5/1), basalt layer, non-plastic, non-sticky, massive, indurated. This layer is the bedrock layer.



Figure 12. Overview Photograph of Trench 1 (View to North)



Figure 13. Photograph of Trench 1 West Wall

TRENCH 2

TR-2 was placed within the 8.8 acre area in the NW corner of the project area (see Figure 11, Table I and Appendix A). It measured 7.0 m long by 1.5 m wide by 1.60 m deep and was oriented 360° degrees. This section had been previously grubbed during the harvesting of the sugar cane. Testing revealed a four layer stratigraphic sequence (Figure 14). No cultural materials were observed.

Layer I (0-38cmbs) is a dark brown (7.5yr 3/3), silty loam, slightly plastic, slightly sticky, crumb, friable, with moderate frequency of roots and rootlets. Inclusions consisted of black plastic irrigation. This heavily disturbed layer is commonly referred to as the "tilt zone" ..

Layer II (38-50cmbs) is a dark reddish brown (5yr3/4), silt loam, slightly plastic, slightly sticky, crumb, friable. This layer appears to be disturbed.

Layer III (46-120cmbs) is a yellowish brown (10yr5/4), silt loam, slightly plastic, slightly sticky, crumb, friable, with a high frequency of decomposing basalt. This layer is undisturbed and referred to as the "saprolytic layer".

Layer IV (120-160cmbs+) is a gray (10yr 5/1), basalt layer, non-plastic, non-sticky, massive, indurated. This layer is the bedrock layer.



Figure 14. Photograph of Trench 2 East Wall

TRENCH 3

TR-3 was placed within the 8.8 acre area in the central portion of the project area (see Figure 11, Table I and Appendix A). It measured 9.0 m long by 1.5 m wide by 2.0 m deep and was oriented 360° degrees. This section had been previously grubbed during the harvesting of the sugar cane. Testing revealed a five layer stratigraphic sequence (Figures 15 and 16). No cultural materials were observed.

Layer I (0-40cmbs) is a dark brown (7.5yr 3/3), silty loam, slightly plastic, slightly sticky, crumb, friable, with moderate frequency of roots and rootlets. Inclusions consisted of black plastic irrigation. This heavily disturbed layer is commonly referred to as the "tilt zone".

Layer II (38-89cmbs) is a dark reddish brown (5yr3/4), silt loam, slightly plastic, slightly sticky, crumb, friable. This layer appears to be disturbed.

Layer III (82-160cmbs) is a yellowish brown (10yr5/4), silt loam, slightly plastic, slightly sticky, crumb, friable, with a high frequency of decomposing basalt. This layer is undisturbed and referred to as the "saprolitic layer".

Lens/Layer IV (159-200cmbs+) is a yellowish brown (10yr 5/4), gravelly sub-angular layer, non-plastic, non-sticky, medium grain, firm. This layer occurs in pockets and in some cases as lenses throughout the region.

Layer V (160-200cmbs+) is a gray (10yr 5/1), basalt layer, non-plastic, non-sticky, massive, indurated. This layer is the bedrock layer and is the target material for the mining operations.



Figure 15. Overview Photograph of Trench 3 (View to East)



Figure 16. Photograph of TR-3 North Wall

TRENCH 4

TR-4 was placed within the 8.8acre area in the central portion of the project area (see Figure 11, Table I and Appendix A). It measured 5.0 m long by 1.5 m wide by 2.0 m deep and was oriented 340° degrees (Figure 17). This section had been previously grubbed during the harvesting of the sugar cane. Testing revealed a four layer stratigraphic sequence (Figure 18). No cultural materials were observed.

Layer I (0-58cmbs) is a dark brown (7.5yr 3/3), silty loam, slightly plastic, slightly sticky, crumb, friable, with moderate frequency of roots and rootlets. Inclusions consisted of black plastic irrigation. This heavily disturbed layer is commonly referred to as the "till zone"..

Layer II (40-100cmbs) is a dark reddish brown (5yr3/4), silt loam, slightly plastic, slightly sticky, crumb, friable. This layer appears to be disturbed.

Layer III (98-142cmbs) is a yellowish brown (10yr5/4), silt loam, slightly plastic, slightly sticky, crumb, friable, with a high frequency of decomposing basalt. This layer is undisturbed and referred to as the "saprolytic layer".

Layer IV (138-180cmbs+) is a gray (10yr 5/1), basalt layer, non-plastic, non-sticky, massive, indurated. This is the bedrock layer.



Figure 17. Overview Photograph of Trench 4 (View to North)



Figure 18. Photograph of Trench 4 West Wall

TRENCH 5

TR-5 was placed within the 8.8 acre area in the SE portion of the project area (see Figure 11, Table I and Appendix A). It measured 9.0 m long by 1.5 m wide by 2.0 m deep and was oriented 360° degrees. This section had been previously grubbed during the harvesting of the sugar cane. Testing revealed a four layer stratigraphic sequence (Figures 19 and 20). No cultural materials were observed.

Layer I (0-42cmbs) is a dark brown (7.5yr 3/3), silty loam, slightly plastic, slightly sticky, crumb, friable, with moderate frequency of roots and rootlets. Inclusions consisted of black plastic irrigation. This heavily disturbed layer is commonly referred to as the "till zone".

Layer II (38-92cmbs) is a dark reddish brown (5yr3/4), silt loam, slightly plastic, slightly sticky, crumb, friable. This layer does not appear to be disturbed.

Layer III (98-174cmbs) is a greyish brown (10YR5/1) and yellowish brown (10YR5/4), silt loam, slightly plastic, slightly sticky, crumb, friable, with a high frequency of decomposing basalt. This layer is undisturbed and referred to as the "saprolitic layer".

Layer IV (170-180cmbs+) is a gray (10YR 5/1), basalt bedrock, non-plastic, non-sticky, massive, indurated. This layer is the bedrock layer and is the target material for the mining operations.



Figure 19. Overview Photograph of Trench 5 (View to North)



Figure 20. Photograph of Trench 5 West Wall

BULLDOZER CUT 1

BD-1 was placed within the 8.8 acre area in the SW portion of the project area (see Figure 11, Table I and Appendix A). It measured 12.0 m long by 1.5 m wide by 1.4 m deep and was oriented 270° degrees (Figure 21). This section had been previously grubbed during the harvesting of the sugar cane. Testing revealed a four layer stratigraphic sequence (Figure 22). No cultural materials were observed.

Layer I (0-32cmbs) is a dark brown (7.5yr 3/3), silty loam, slightly plastic, slightly sticky, crumb, friable, with moderate frequency of roots and rootlets. Inclusions consisted of black plastic irrigation. This heavily disturbed layer is commonly referred to as the "tilt zone".

Layer II (30-50cmbs) is a dark reddish brown (5yr3/4), silt loam, slightly plastic, slightly sticky, crumb, friable. This layer does not appear to be disturbed.

Layer III (50-136cmbs) is a yellowish brown (10yr5/4), silt loam, slightly plastic, slightly sticky, crumb, friable, with a high frequency of decomposing basalt. This layer is undisturbed and referred to as the "saprolytic layer".

Layer IV (136-140cmbs+) is a gray (10yr 5/1), basalt layer, non-plastic, non-sticky, massive, indurated. This layer is the bedrock layer and is the target material for the mining operations.



Figure 21. Overview Photograph of Bulldozer Cut 1 (View to West)



Figure 22. Photograph of Bulldozer Cut 1 North Wall

BULLDOZER CUT 2

BD-2 was placed within the 8.8 acre area in the SW portion of the project area (see Figure 11, Table I and Appendix A). It measured 15.0 m long by 1.5 m wide by 1.6 m deep and was oriented 270° degrees. This section had been previously grubbed during the harvesting of the sugar cane. Testing revealed a four layer stratigraphic sequence (Figures 23 and 24). No cultural materials were observed.

Layer I (0-58cmbs) is a dark brown (7.5yr 3/3), silty loam, slightly plastic, slightly sticky, crumb, friable, with moderate frequency of roots and rootlets. Inclusions consisted of black plastic irrigation. This heavily disturbed layer is commonly referred to as the "tilt zone".

Layer II (56-100cmbs) is a dark reddish brown (5yr3/4), silt loam, slightly plastic, slightly sticky, crumb, friable. This layer does not appear to be disturbed.

Layer III (98-139cmbs) is a yellowish brown (10yr5/4), silt loam, slightly plastic, slightly sticky, crumb, friable, with a high frequency of decomposing basalt. This layer is undisturbed and referred to as the "saprolitic layer".

Layer IV (136-160cmbs+) is a gray (10yr 5/1), basalt layer, non-plastic, non-sticky, massive, indurated. This layer is the bedrock layer and is the target material for the mining operations.

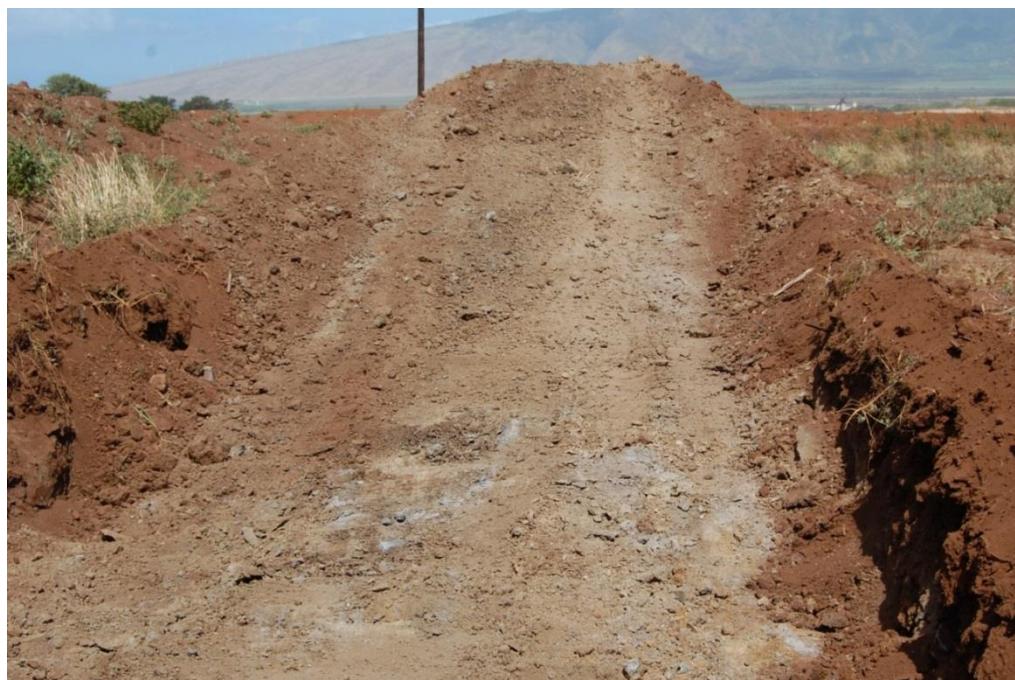


Figure 23. Overview Photograph of Bulldozer Cut 2 (View to West)



Figure 24. Photograph of Bulldozer Cut 2 North Wall

TRENCH 6

TR-6 was placed within the 33.0 acre area in the central portion of the project area (see Figure 11, Table I and Appendix A). It measured 4.1 m long by 1.5 m wide by 1.6 m deep and was oriented 270° degrees (Figure 25 and Table I). This section was an active cane fields and therefore the location of this trench was along a known haul rd. Testing revealed a three layer stratigraphic sequence (Figure 26). No cultural materials were observed.

Layer I (0-20cmbs) is a dark brown (7.5yr 3/3), silty loam, slightly plastic, slightly sticky, crumb, friable, with moderate frequency of roots and rootlets. Inclusions consisted of black plastic irrigation. This heavily disturbed layer is commonly referred to as the "tilt zone".

Layer II (18-90cmbs) is a dark reddish brown (5yr3/4), silt loam, slightly plastic, slightly sticky, crumb, friable. This layer does not appear to be disturbed.

Layer III (86-160+cmbs) is a yellowish brown (10yr5/4), silt loam, slightly plastic, slightly sticky, crumb, friable, with a high frequency of decomposing basalt. This layer is undisturbed and referred to as the "saprolytic layer".



Figure 25. Overview Photograph of Trench 6 (View to West)



Figure 26. Photograph of Trench 6 South Wall

TRENCH 7

TR-7 was placed within the 33 acre area in the central portion of the project area (see Figure 11, Table I and Appendix A). It measured 3.9 m long by 1.5 m wide by 2.0 m deep and was oriented 270° degrees along the existing cane haul road (Figure 27 and Table I). Testing revealed a three layer sequence, where subangular, pyroclastic cobbles, similar to small cinder materials were observed in Layer III (Figure 28). No cultural materials were observed.

Layer I (0-20cmbs) is the till zone and comprised of a dark brown (7.5yr 3/3), silty loam, slightly plastic, slightly sticky, crumb, friable, with moderate frequency of roots and rootlets. Inclusions consisted of black plastic irrigation materials.

Layer II (18-170cmbs) is a dark reddish brown (5yr3/4), silt loam, slightly plastic, slightly sticky, crumb, friable. This layer does not appear to be disturbed.

Layer III (168-200cmbs+) is a black (7.5yr 2.5/1) coarse gravels and pyroclastic small cobbles with greyish black silty clay, moist, non-plastic, non-sticky, medium grain, firm. This layer was also observed in TR16.



Figure 27. Overview Photograph of Trench 7 (View to North)



Figure 28. Photograph of Trench 7 North Wall

TRENCH 8

TR-8 was placed within the haul road in the central portion of the 33.0 acre area (see Figure 11, Table I and Appendix A). It measured 4.0 m long by 1.5 m wide by 1.8 m deep and oriented 270° degrees. TR-8 contained a five layer stratigraphic sequence indicative of alluvial and or flood plain deposits (Figures 29 and 30). No cultural materials were observed.

Layer I (0-24cmbs) is a dark brown (7.5yr 3/3), silty loam, slightly plastic, slightly sticky, crumb, friable, with moderate frequency of roots and rootlets. Inclusions consisted of black plastic irrigation. This heavily disturbed layer is commonly referred to as the "till zone".

Lens/Layer II (21-80cmbs) is a very dark gray (7.5yr 3/1), gravelly silt, non-plastic, non-sticky, crumb, firm. This layer contained low frequencies of water worn basalt pebbles most likely associated with a former stream, or alluvial event.

Lens/Layer III (79-110cmbs) is a dark reddish brown (5yr3/4), silt loam, slightly plastic, slightly sticky, crumb, friable. This layer does not appear to be disturbed.

Layer/Lens IV (110-146cmbs) is a very dark gray (7.5yr 3/1), gravelly silt, non-plastic, non-sticky, crumb, firm. This layer is the same as Lens/Layer II and contained low frequencies of water worn basalt pebbles. Since Layer III interrupts the alluvial deposits of Layers II and IV, this profile likely exhibits periodic flood events and subsidence.

Layer V (142-180cmbs+) is a yellowish brown (10yr5/4), silt loam, slightly plastic, slightly sticky, crumb, friable, with a high frequency of decomposing basalt. This layer is undisturbed and referred to as the "saprolytic layer".



Figure 29. Overview Photograph of Trench 8 (View to East)



Figure 30. Photograph of Trench 8 North Wall

TRENCH 9

TR-9 was placed within the 33.0 acre area in the eastern portion of the project area (see Figure 11, Table I and Appendix A). It measured 3.9 m long by 1.5 m wide by 0.8 m deep and was oriented 270° degrees (Figures 31 and 32). Testing revealed a single stratum that was negative for cultural materials and similar to Layer III of the overall general stratigraphic sequence. This single stratum terminated upon bedrock with decomposing basalt.

Layer I (0-80cmbs) is a yellowish brown (10yr 5/4), silty loam, slightly plastic, slightly sticky, crumb, friable, with moderate frequency of roots and rootlets. Inclusions consisted of black plastic irrigation indicating this layer was part of the "till zone".



Figure 31. Overview Photograph of Trench 9 (View to East)



Figure 32. Photograph of Trench 9 North Wall

TRENCH 10

TR-10 was placed within the 33.0 acre area in the central portion of the project area (see Figure 11, Table I and Appendix A). It measured 4.0 m long by 1.5 m wide by 1.5 m deep, oriented 270° degrees and placed in the cane haul road. Testing revealed a three layer stratigraphic sequence (Figures 33 and 34). No cultural materials were observed.

Layer I (0-20cmbs) is a dark brown (7.5yr 3/3), silty loam, slightly plastic, slightly sticky, crumb, friable, with moderate frequency of roots and rootlets. Inclusions consisted of black plastic irrigation. This heavily disturbed layer is commonly referred to as the "till zone".

Layer II (18-74cmbs) is a dark reddish brown (5yr3/4), silt loam, slightly plastic, slightly sticky, crumb, friable. This layer does not appear to be disturbed.

Layer III (60-150+cmbs) is a yellowish brown (10yr5/4), silt loam, slightly plastic, slightly sticky, crumb, friable, with a high frequency of decomposing basalt. This layer is undisturbed and referred to as the "saprolytic layer".



Figure 33. Overview Photograph of Trench 10 (View to East)



Figure 34. Photograph of Trench 10 North Wall

TRENCH 11

TR-11 was placed within the western portion of the 33.0 acre area within a cane haul road (see Figure 11, Table I and Appendix A). It measured 4.0 m long by 1.5 m wide by 1.2 m deep and was oriented 270° degrees. Testing revealed the same three layer stratigraphic sequence as observed within TR-10 (see Figure 34). No cultural materials were observed.

Layer I (0-20cmbs) is a dark brown (7.5yr 3/3), silty loam, slightly plastic, slightly sticky, crumb, friable, with moderate frequency of roots and rootlets. Inclusions consisted of black plastic irrigation. This heavily disturbed layer is commonly referred to as the "tilt zone".

Layer II (16-80cmbs) is a dark reddish brown (5yr3/4), silt loam, slightly plastic, slightly sticky, crumb, friable. This layer does not appear to be disturbed.

Layer III (72-120+cmbs) is a yellowish brown (10yr5/4), silt loam, slightly plastic, slightly sticky, crumb, friable, with a high frequency of decomposing basalt. This layer is undisturbed and referred to as the "saprolitic layer".

TRENCH 12

TR-12 was placed in the NE portion of the 33.0 acre section (see Figure 11, Table I and Appendix A). It measured 4.0 m long by 1.5 m wide by 2.6 m deep, oriented 270° degrees and situated within a haul road (Figures 35 and 36). TR-12 contained a five layer stratigraphic sequence that was devoid of cultural materials.

Layer I (0-20cmbs) is a dark brown (7.5yr 3/3), silty loam, slightly plastic, slightly sticky, crumb, friable, with moderate frequency of roots and rootlets. Inclusions consisted of black plastic irrigation. This heavily disturbed layer is commonly referred to as the "tilt zone".

Layer II (18-160cmbs) is a dark reddish brown (5yr3/4), silt loam, slightly plastic, slightly sticky, crumb, friable. This layer does not appear to be disturbed.

Lens/Layer III (158-186+cmbs) is a yellowish brown (10yr 5/4), gravelly silt loam, non-plastic, non-sticky, crumb, firm. This layer contained low frequencies of water worn basalt pebbles possibly associated with alluvial deposition.

Lens/Layer IV (182-190cmbs) is a black cinder (7.5yr 2.5/1), gravelly silt layer, non-plastic, non-sticky, medium grain, firm. This layer occurs in pockets and in some cases as lenses throughout the region.

Layer V (189-210 cmbs) is a gray (10yr 5/1), basalt layer, non-plastic, non-sticky, massive, indurated. This layer bedrock.



Figure 35. Overview Photograph of Trench 12 (View to West)



Figure 36. Photograph of Trench 12 North Wall

TRENCH 13

TR-13 was placed within the 33 acre area in the north central portion of the project area (see Figure 11, Table I and Appendix A). It measured 4.0 m long by 1.5 m wide by 3.0 m deep and was oriented 270° degrees. This section was an active cane fields and therefore the location of this trench was along a known haul rd. Testing revealed a three layer stratigraphic sequence (Figures 37 and 38). No cultural materials were observed.

Layer I (0-18cmbs) is a dark brown (7.5yr 3/3), silty loam, slightly plastic, slightly sticky, crumb, friable, with moderate frequency of roots and rootlets. Inclusions consisted of black plastic irrigation. This heavily disturbed layer is commonly referred to as the "tilt zone".

Layer II (16-295cmbs) is a dark reddish brown (5yr3/4), silt loam, slightly plastic, slightly sticky, crumb, friable. This layer does not appear to be disturbed.

Layer III (295-305cmbs+) is a gray (10yr 5/1), basalt bedrock layer, non-plastic, non-sticky, massive, indurated.



Figure 37. Overview Photograph of Trench 13 (View to East)



Figure 38. Photograph of Trench 13 North Wall

TRENCH 14

TR-14 was placed along haul road within the 33.0 acre area in the north central portion of the project area (see Figure 11, Table I and Appendix A). It measured 4.0 m long by 1.5 m wide by 2.05 m deep and was oriented 270° degrees. TR-14 contained a five layer stratigraphic sequence and no cultural materials were observed (Figure 39).

Layer I (0-9cmbs) is a dark brown (7.5yr 3/3), silty loam, slightly plastic, slightly sticky, crumb, friable, with moderate frequency of roots and rootlets. Inclusions consisted of black plastic irrigation. This heavily disturbed layer is commonly referred to as the "tilt zone".

Layer II (8-160cmbs+) is a dark reddish brown (5yr3/4), silt loam, slightly plastic, slightly sticky, crumb, friable. This layer does not appear to be disturbed.

Lens/Layer III (160-1.85cmbs+) is a reddish brown (5yr4/6), pebbly silt loam, non-plastic, non-sticky, crumb, firm. This layer contained low frequencies of water worn basalt pebbles most likely associated with alluvial deposition.

Layer IV (185-195cmbs+) is a dark reddish brown (5yr3/4), silt loam, slightly plastic, slightly sticky, crumb, friable. This layer does not appear to be disturbed.

Layer V (195-205cmbs+) is a dark yellowish brown (10yr5/4), gravelly silt loam, slightly plastic, slightly sticky, crumb, friable.



**Figure 39. (Left) Overview Photograph of Trench 14 (View to West);
(Right) Photograph of North Wall Trench 14 (View to Northwest)**

TRENCH 15

TR-15 was placed within the 33.0 acre area within the cane haul road located in the eastern portion of the project area (see Figure 11, Table I and Appendix A). It measured 4.0 m long by 1.5 m wide by 1.2 m deep, oriented 270° degrees and contained a three layer stratigraphic sequence that was negative for cultural materials (Figure 40).

Layer I (0-20cmbs) is a dark brown (7.5yr 3/3), silty loam, slightly plastic, slightly sticky, crumb, friable, with moderate frequency of roots and rootlets. Inclusions consisted of black plastic irrigation. This heavily disturbed layer is commonly referred to as the "tilt zone".

Layer II (18-81cmbs) is a dark reddish brown (5yr3/4), silt loam, slightly plastic, slightly sticky, crumb, friable. This layer does not appear to be disturbed.

Layer III (81-120cmbs+) is a yellowish brown (10yr5/4), silt loam, slightly plastic, slightly sticky, crumb, friable, with a high frequency of decomposing basalt. This layer is undisturbed and referred to as the "saprolytic layer".



Figure 40. Photographs of TR-15 Overview (View to West) (left); and South Wall (right)

TRENCH 16

TR-16 was placed within the 33.0 acre area in the south central portion of the project area (see Figure 11, Table I and Appendix A). It measured 4.0 m long by 1.5 m wide by 1.45 m deep, oriented 270° degrees and situated within a haul road. TR-16 contained a three layer stratigraphic sequence with the pyroclastic cobbles observed in TR-7 (Figures 41 and 42). No cultural materials were observed.

Layer I (0-20cmbs) is a dark brown (7.5yr 3/3), silty loam, slightly plastic, slightly sticky, crumb, friable, with moderate frequency of roots and rootlets. Inclusions consisted of black plastic irrigation. This heavily disturbed layer is commonly referred to as the "till zone".

Layer II (20-78cmbs) is a dark reddish brown (5yr3/4), silt loam, slightly plastic, slightly sticky, crumb, friable. This layer does not appear to be disturbed.

Layer III (68-150cmbs+) is a (7.5yr 2.5/1), greyish black silty clay with coarse gravels or small pyroclastic cobbles, non-plastic, non-sticky, medium grain, firm. This layer occurs in pockets and in some cases as lenses throughout the layer (similar to LIII in TR7).

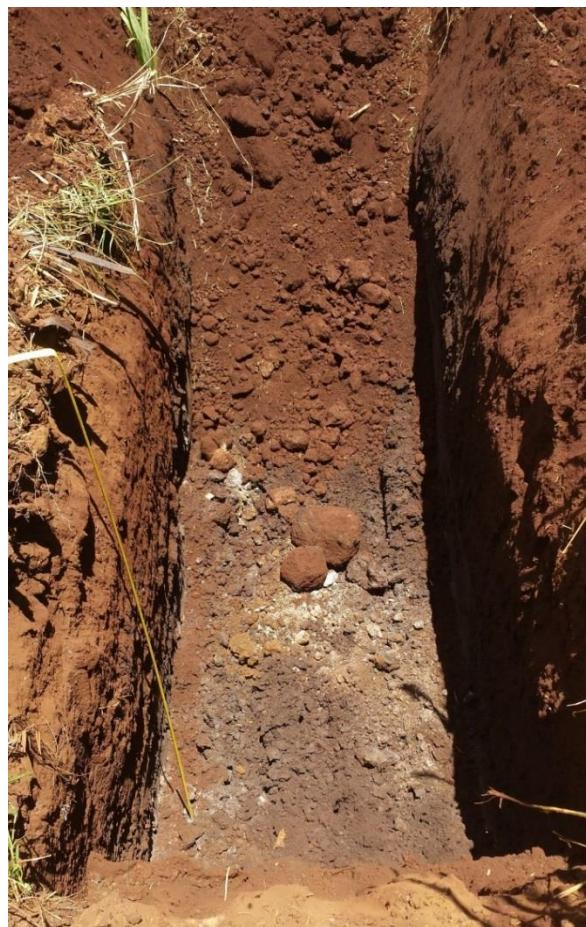


Figure 41. Overview Photograph of Trench 16 (View to West)



Figure 42. Photograph of Trench 16 North Wall

TRENCH 17

TR-17 was placed along the haul road within the 33.0 acre area in the south central portion of the project area (see Figure 11, Table I and Appendix A). It measured 4.0 m long by 1.5 m wide by 1.0 m deep and was oriented 270° degrees. Testing revealed a three layer stratigraphic sequence (Figures 43 and 44). No cultural materials were observed.

Layer I (0-13cmbs) is a dark brown (7.5yr 3/3), silty loam, slightly plastic, slightly sticky, crumb, friable, with moderate frequency of roots and rootlets. Inclusions consisted of black plastic irrigation. This heavily disturbed layer is commonly referred to as the "tilt zone".

Layer II (10-90cmbs) is a dark reddish brown (5yr3/4), silt loam, slightly plastic, slightly sticky, crumb, friable. This layer appears to be disturbed

Layer III (85-105cmbs+) is a yellowish brown (10yr5/4), silt loam, slightly plastic, slightly sticky, crumb, friable, with a high frequency of decomposing basalt. This layer is undisturbed and referred to as the "saprolytic layer".



Figure 43. Overview Photograph of Trench 17 (View to West)



Figure 44. Photograph of Trench 17 South Wall

DISCUSSIONS AND RECOMMENDATIONS

To ascertain the presence/absence of historic properties that could be adversely affected by proposed rock mining activities, inventory level procedures comprised of a pedestrian survey and subsurface testing were performed at the subject parcel. During the survey, no surface structural remains were recorded; however, irrigation and agricultural materials consisting of plastic sheeting, black irrigation tubing, and PVC pipes were scattered across the surface indicative of the compounded tilling disturbances from sugar cane cultivation. Subsurface testing consisted of 17 backhoe trenches (TRs 1-17) and 2 bulldozer cuts (BDs 1 and 2) executed at both sections of the subject parcel and resulted in negative findings. The sampling strategy for the subsurface testing comprised both probabilistic and non-probabilistic sampling methods. The purpose of the probabilistic sampling method was to obtain quantifiable data from the sample set (test areas) in order to make reliable conclusions about the entire area.

Trenches 1-5 and BD 1 and 2 were placed within the 8.8-acre non-cultivated section, and TRs 6-17 were positioned in the cultivated 33.0-acres. The 19 excavations at the project indicated a similar, overall stratigraphic sequence across the 42.0-acre project parcel. The soil profiles exhibited a 3 to 4 layer stratigraphic sequence comprised of two soil layers (Layers I and II) overlying saprolitic (decomposing) basalt and/or bedrock (Layers III and IV). Layer I was disturbed from continuous agricultural activities and identified as the agricultural till zone that extended from 0.10 m to 0.80 mbs, and averaged 0.40 m deep. The saprolitic basalt was recorded from 0.46 m to 2.90 mbs and averaged 0.80 m deep. Variations in this overall sequence were due to prior disturbances and periodic environmental events where lenses/layers of alluvium (silt and water worn pebbles), possible colluvium (gravel) and weathered cobbles similar to pyroclastic material were interspersed between the main project strata. TRs 8, 12 and 14 contained alluvial, episodic flood lenses/layers, where TRs 12 and 14 were positioned on the northern perimeter along an existing ditch. Interestingly, TR8, which contained the thickest alluvial deposit was not located along a visible ditch or gulch, but the episodic flood deposits may be from Kolaloa Gulch to the south. TRs 3, 7, 12 and 16 were placed throughout both sections and exhibited the subangular gravel and pyroclastic cobbles. Since there were no knolls or Pu`u in the area where cinder like material accumulates, the type of environmental factor that created the pyroclastic cobbles in TRs 7 and 16 is indeterminate. TR9 was located in the NE quadrant and contained only 1 stratum as the overall project Layers I and II appeared to be previously removed.

The subject parcel and other localities where rock quarry activities have occurred, such as the Central Maui Landfill and H C&D quarry have exhibited similar environments with relatively

shallow soils overlying dense bedrock. The geology of these areas, i.e. shallow bedrock is one of the main reasons for establishing rock quarries and subsequent landfills (if applicable) in these zones.

The background research, exemplified that Pūlehu Nui was populated during the traditional and historic periods within the *ma uka* and *ma kai* sections of the *ahupua`a*, and no evidence of intermittent habitation was observed in this transitional zone (between the *ma uka* and *ma kai* areas) during the subsurface investigations. The compounded disturbances from a century of grubbing and removing sugar cane, and re-grading the area to prepare for new plantings have likely removed all evidence of traditional occupation. Similarly, remnants of historic habitation have likely been removed; however, localities where Plantation Camps were formally established may contain disturbed or truncated historic deposits. Two Plantation Camps (Kihei Camp 3 and Camp 13) were previously located to the south and north of the subject parcel, yet positioned from 2500 to 7500 ft. away.

Due to the negative findings at the project area, along with an absence of any former Plantation Camps in the area and following HRS §13-284-7, the overall project will have “no effect” on historic properties. The negative results were anticipated in this marginal/transitional zone due to the prior disturbances and 2011 AIS investigations (Rotunno-Hazuka et al. 2011) in the adjoining project to the west. Thus, no further archaeological procedures or mitigation measures are warranted for the 42.0-acre project area.

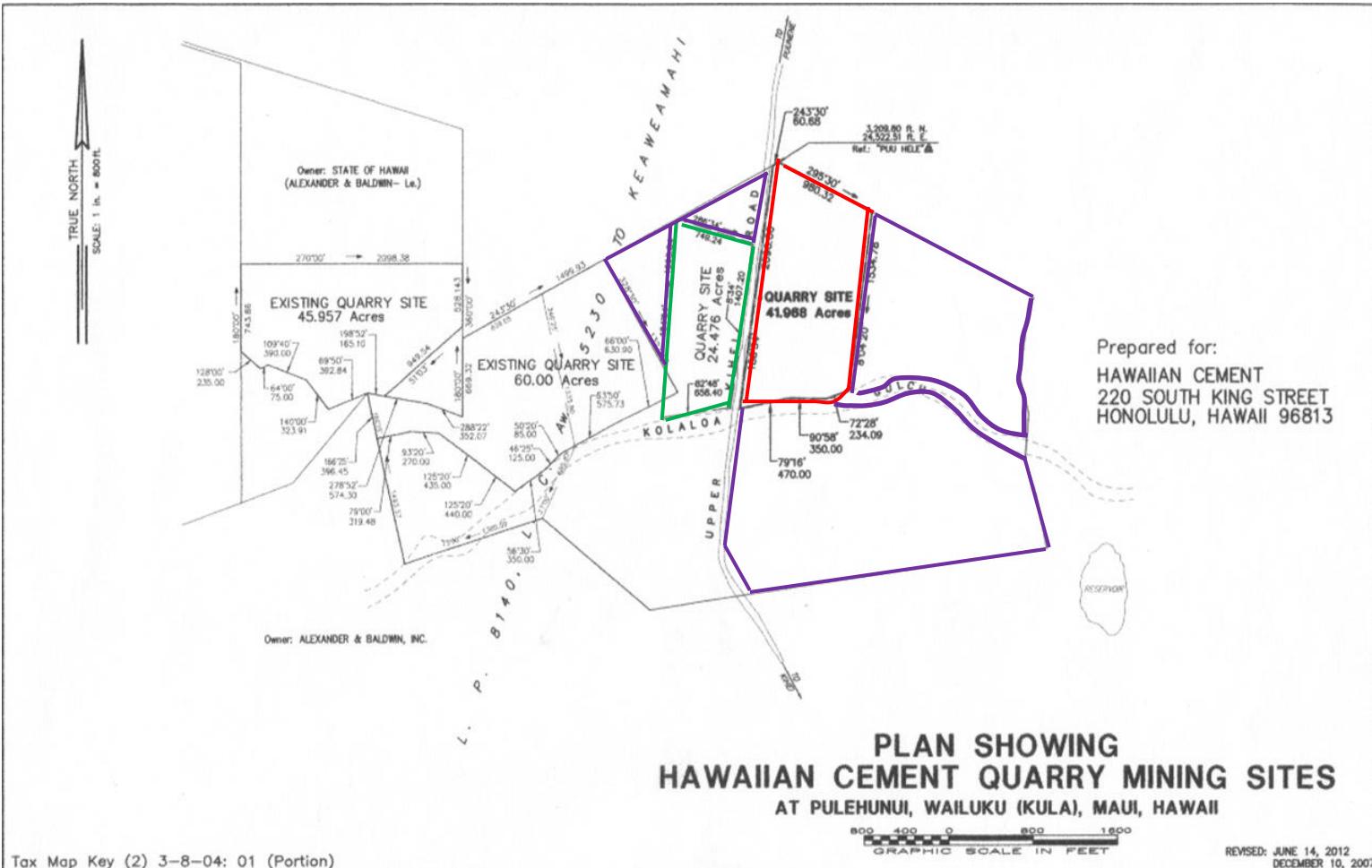


Figure 45. Development Map Showing Project Area (Red), Former A.A. Parcel (Green) and Possible Future Expansion Areas (Purple)

REFERENCES

Burgett, Berdena and Robert Spear

1997 *Inventory Survey of Pu'unēnē Bypass/Mokulele Highway Improvements corridor, Pulehu nui, and Wailuku ahupua'a, Wailuku District, Island of Maui, Hawaii*, Scientific Consultant Services, Inc., Honolulu, Hawaii.

Foote, D.E., E.L. Hill, S. Nakamura, and F. Stephens

1972 *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai*. State of Hawaii. U.S.D.A. Soil Conservation Service, U.S. Government Printing Office, Washington, D.C.

Handy, E.S.C.

1940 *The Hawaiian Planter*. BPBM Bulletin 161. Bishop Museum, Honolulu.

Hester, Thomas, Harry J. Shafer and Kenneth L. Feder

2009 *Field Methods in Archaeology*, Academic Press, San Diego.

Hill, Robert, Tanya Lee-Greig and Hallett H. Hammatt

2007 *An Archaeological Literature Review and Field Inspection Report For an 81.50-Acre Parcel Located at Pulehu Nui and Waikapu Ahupua'a, Wailuku District, Maui Island TMK: (2) 3-8-008:7 pors., 8 pors.* Cultural Surveys Hawaii, Inc. Wailuku, Hawaii.

<http://www.nationalgeographic.com/topo>

<http://www.co.maui.hi.us/757/Tax-Map-Information>

Renfrew, Colin and Paul Bahn

1996 *Archaeology Theories Methods and Practice*. Thames and Hudson Inc, New York, New York.

Rotunno-Hazuka, Lisa and Reynaldo Fuentes, Jenny O'Claray-Nu, Jeffrey Pantaleo

2011 *Final Archaeological Assessment Report for Hawaiian Cement Quarry Expansion Located at TMK: (2) 3-8-004:001 pors. Pūlehu Nui Ahupua'a, Kula Moku, Wailuku District, Island of Maui*. Archaeological Services Hawaii, LLC., Pu'unene, Hi.

Sinoto, Akihiko and Jeffrey Pantaleo

1991 *Archaeological Inventory Survey of the Proposed Kihei Gateway Complex*. Aki Sinoto Consulting, Honolulu.

Tomonari-Tuggle, Myra, David Tuggle, Dawn Duensing, Coral Magnuson, and Usha Prasad

2001 *Fire on the Land: Archaeology, Architecture and Oral History of Former Naval Air Station Puunene, Pulehu Nui, Maui*. International Archaeological Research Institute Inc., Honolulu, Hawaii.

Waihona Aina Corp

2002 The Mahele Database and the Boundary Commission Database (Internet www.waihona.com).