

# **Draft Environmental Assessment**

## **PROPOSED KULA RIDGE RESIDENTIAL WORKFORCE HOUSING SUBDIVISION (TMK 2-3-01:174)**

Prepared for:

**Kula Ridge, LLC**

March 2008



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## **Executive Summary**

**Project Name:** Kula Ridge Residential Workforce Housing Subdivision

**Type of Document:** Draft Environmental Assessment

**Legal Authority:** Chapter 343, Hawai`i Revised Statutes

**Agency Determination:** Anticipated Finding of No Significant Impact

**Applicable Environmental Assessment Review “Trigger”:** Use of State and County rights-of-way for intersection improvements

**Location:** Maui Island  
Waiakoa, Kula  
TMK 2-3-01:174

**Applicant:** Kula Ridge, LLC  
1849 Wili Pa Loop  
Wailuku, Hawai`i 96793

**Approving Agency:** County of Maui  
Department of Housing and Human Concerns  
One Main Plaza  
2200 Main Street, Suite 546  
Wailuku, Hawai`i 96793-2155  
Contact: Vanessa Medeiros  
Telephone: (808) 270-7805

**Consultant:** Munekiyo & Hiraga, Inc.  
305 High Street, Suite 104  
Wailuku, Hawai`i 96793  
Contact: Rowena Dagdag  
Telephone: (808) 244-2015

**Project Summary:** The applicant is proposing the development of an approximately 116-lot single-family residential subdivision consisting of 70 affordable house-lot units and 46 market-priced lots, with onsite infrastructure improvements. Other improvements include site grading, and utilities installation covering water and drainage systems. The Department of Health has granted permission to utilize individual wastewater systems.

# **I. PROJECT OVERVIEW**

# I. PROJECT OVERVIEW

## A. BACKGROUND

The applicant, Kula Ridge LLC, proposes to develop the Kula Ridge Residential Workforce Housing Subdivision Project in Kula, Maui, Hawai'i (TMK (2) 2-3-001:174). See **Figure 1** and **Figure 2**. For clarity purposes, the proposed Kula Ridge Residential Workforce Housing Subdivision Project is referred to as the "Ridge Project". Situated on the southwestern flank of Haleakala, the project site is currently undeveloped and vegetated with pasture grass. The subject property is approximately 48.12 acres in size and was formerly used as pasture land.

To the north of the site is Keahuaiwi Gulch. See **Figure 3**. Vacant pasture land bounds the property to the south. The Kula Community Center, Gateball Field and Tennis Courts and the Holy Ghost Church are located to the immediate west of the property along Lower Kula Road. Single-family residences are also found along the western boundary of the project site.

Bordering the project site to the north and east, is the proposed Kula Ridge Mauka subdivision. Refer to **Figure 1**. Kula Ridge Mauka is proposed to be a 21-lot agricultural subdivision at TMK (2) 2-3-001:023 (hereafter referred to as "Mauka Subdivision") and is owned by a separate entity, Kula Ridge Mauka LLC. Refer to **Figure 1**.

The land underlying the Ridge Project site lies within the State "Agricultural" district and is designated for "Rural" and "Single-Family" uses by the Makawao-Pukalani-Kula Community Plan. County zoning for the property is "Interim".

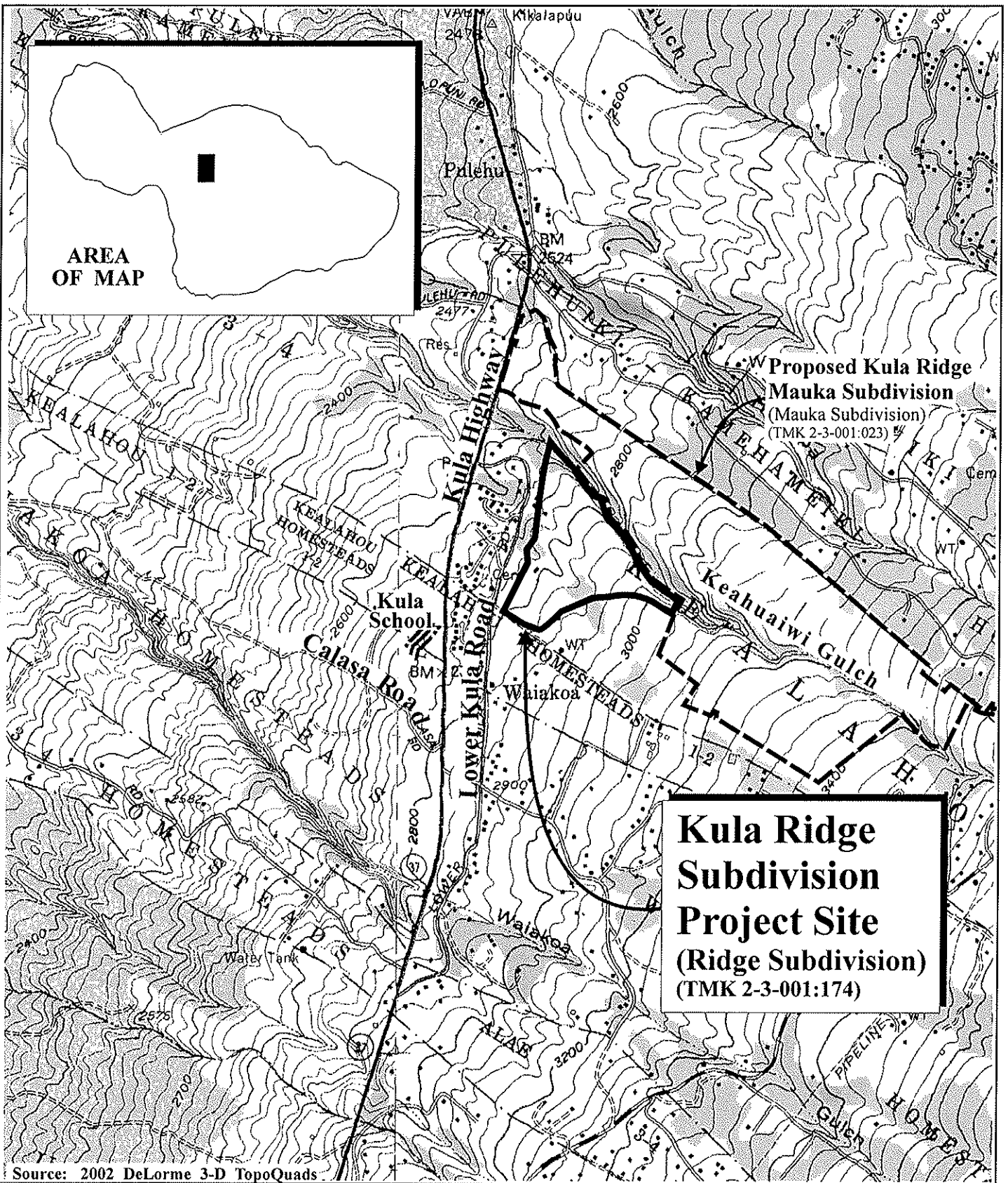
Kula Ridge, LLC is the fee owner of the Ridge Project lands.

## B. PROPOSED ACTION

The Ridge Project involves the development of approximately 116 improved lots with approximately 70 lots set aside for workforce housing or affordable house-lot packages.

The Ridge Project will provide 59 workforce housing units for the project's proposed 116 lots, meeting the County's affordability criteria for Section 201H-38, Hawai'i Revised



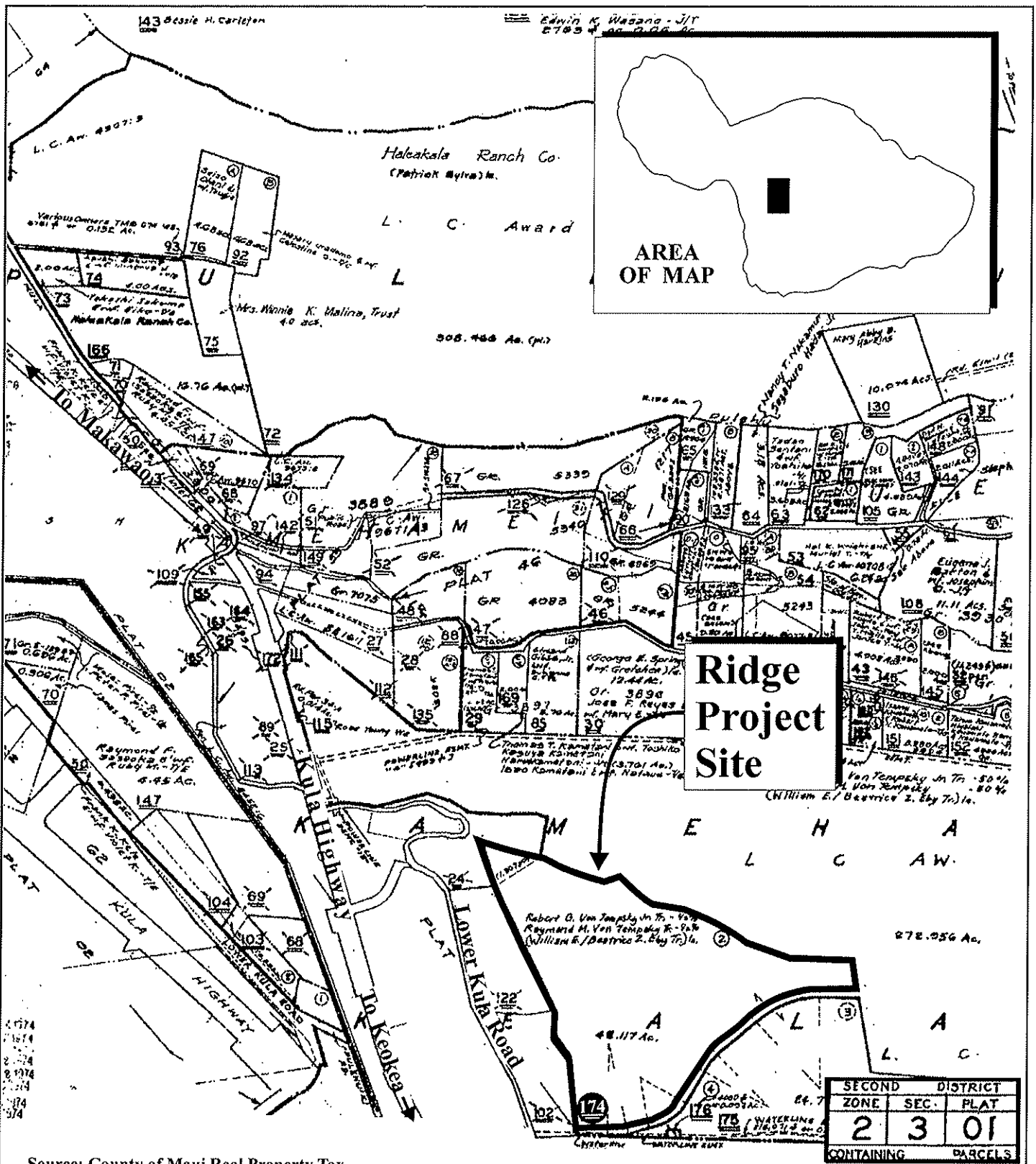


Source: 2002 DeLorme 3-D TopoQuads

**Figure 1** Proposed Kula Ridge Residential Workforce Housing Subdivision  
Regional Location Map

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Source: County of Maui Real Property Tax

Figure 2 Proposed Kula Ridge Residential Workforce Housing Subdivision Tax Map for Proposed Subdivision

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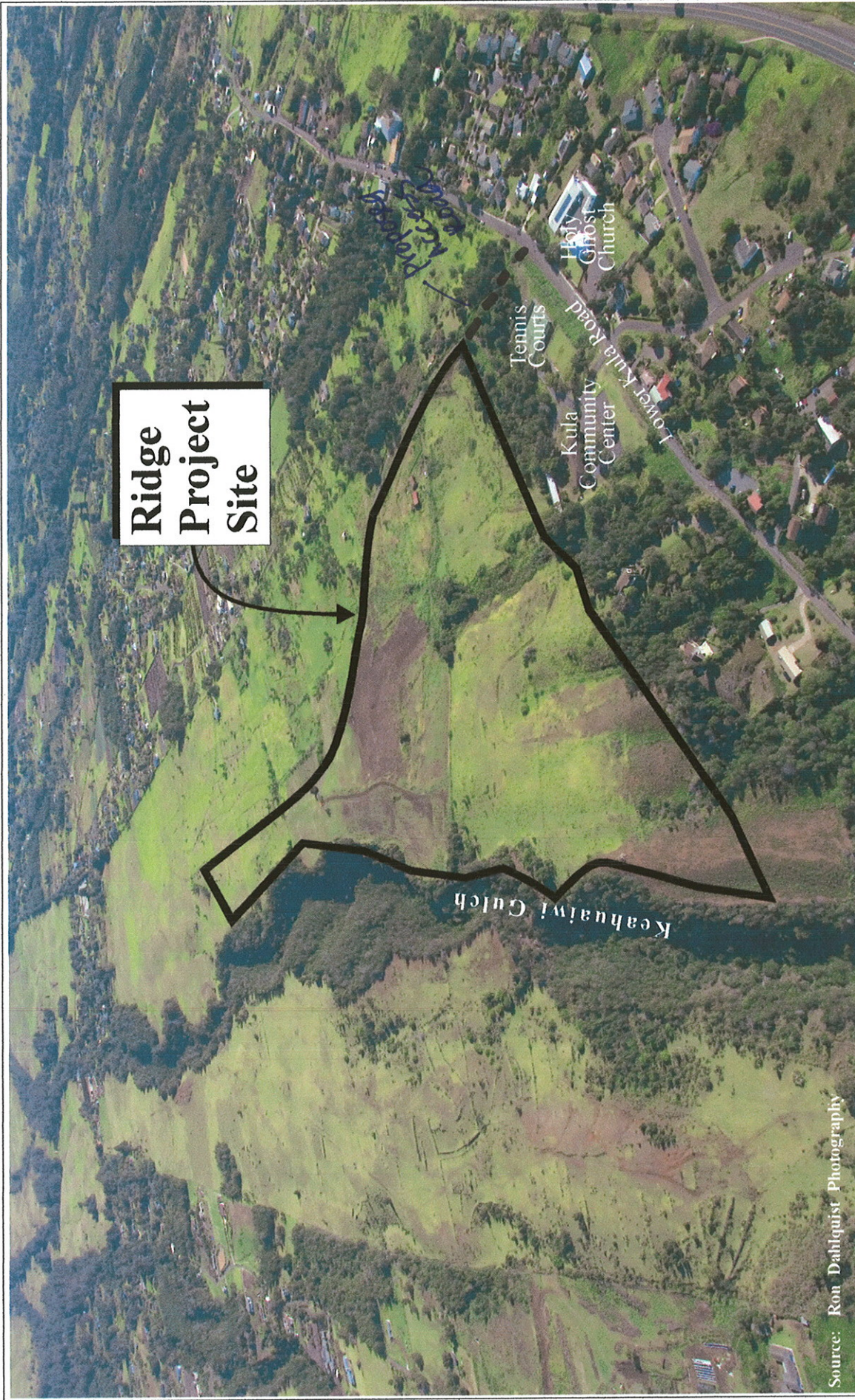


Figure 3



Prepared for: Kula Ridge, LLC

# Proposed Kula Ridge Residential Workforce Housing Subdivision Aerial Photograph of Project Area

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Statutes (HRS) projects. The remaining 11 workforce housing units will meet the requirements of the County of Maui Residential Workforce Housing Policy (RWHP) for the adjacent Mauka Subdivision. The affordable house-lot units are proposed to be integrated with market priced lots. See **Figure 4**.

**1. Workforce Housing Overview**

A summary of the project development for both the Ridge Project and Mauka Subdivision projects are provided in **Table 1**.

**Table 1**

<b>PROJECT DEVELOPMENT SUMMARY</b>				
<b>Project Name</b>	<b>Total Number of Lots in Development</b>	<b>Affordable Housing Requirement</b>	<b>Number of Affordable Units Provided</b>	<b>Number of Market Units</b>
Ridge Project	116	58	59*	46
Mauka Subdivision	21**	11	11***	21**
<b>TOTAL</b>	<b>137</b>	<b>69</b>	<b>70</b>	<b>67</b>
* Meets the affordability criteria for §201-H-38, HRS projects. ** Project development on TMK (2)2-3-001:023. *** Affordable Housing Units to be provided on TMK (2)2-3-001:174.				

The workforce housing lot sizes are proposed to be a minimum of approximately 4,600 square feet (s.f.) with a zero-lot line concept proposed for the homes.

Sales prices, based on 2007 income guidelines, are projected to range from \$234,685.00 to \$490,900.00 for the house-lot packages. House models for the workforce housing units will provide approximately 1,200 s.f. of living area and are depicted in **Figure 5, Figure 6, Figure 7, Figure 8, Figure 9, Figure 10, Figure 11, Figure 12, and Figure 13**. Preliminary construction specifications for these units are included in this document as **Appendix “A”**.

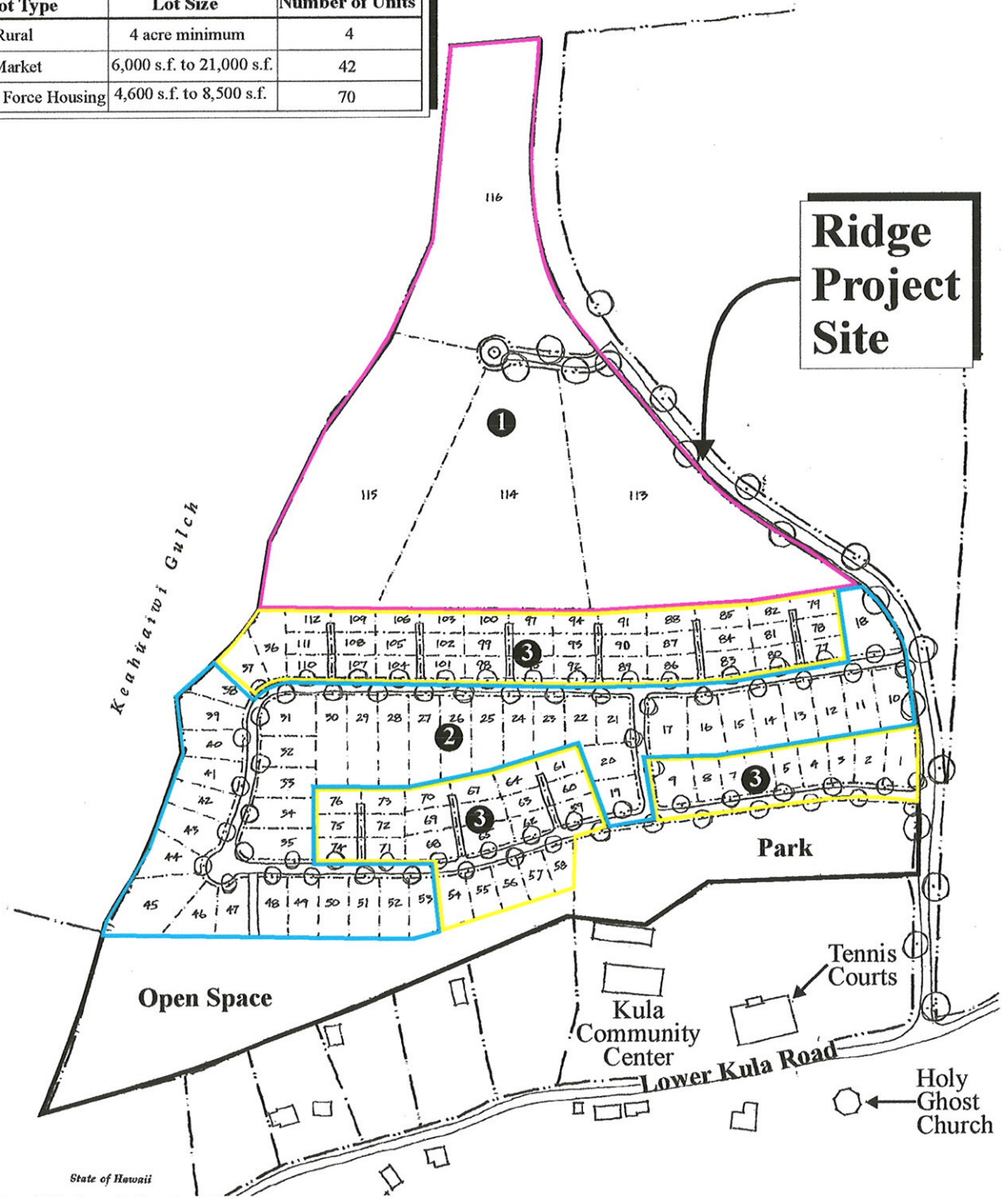
**a. Ridge Project’s Affordable Housing Component**

The Ridge Project will provide 59 workforce housing units and is proposed as a 51 percent affordable housing project. As such, Kula Ridge LLC meets the affordability criteria for Section 201H-38, HRS projects.

**KEY**

**LAND USE SUMMARY**

	Lot Type	Lot Size	Number of Units
①	Rural	4 acre minimum	4
②	Market	6,000 s.f. to 21,000 s.f.	42
③	Work Force Housing	4,600 s.f. to 8,500 s.f.	70



**Ridge Project Site**

Source: Architectural Design & Construction, Inc.

**Figure 4 Proposed Kula Ridge Residential Workforce Housing Subdivision Conceptual Site Plan**

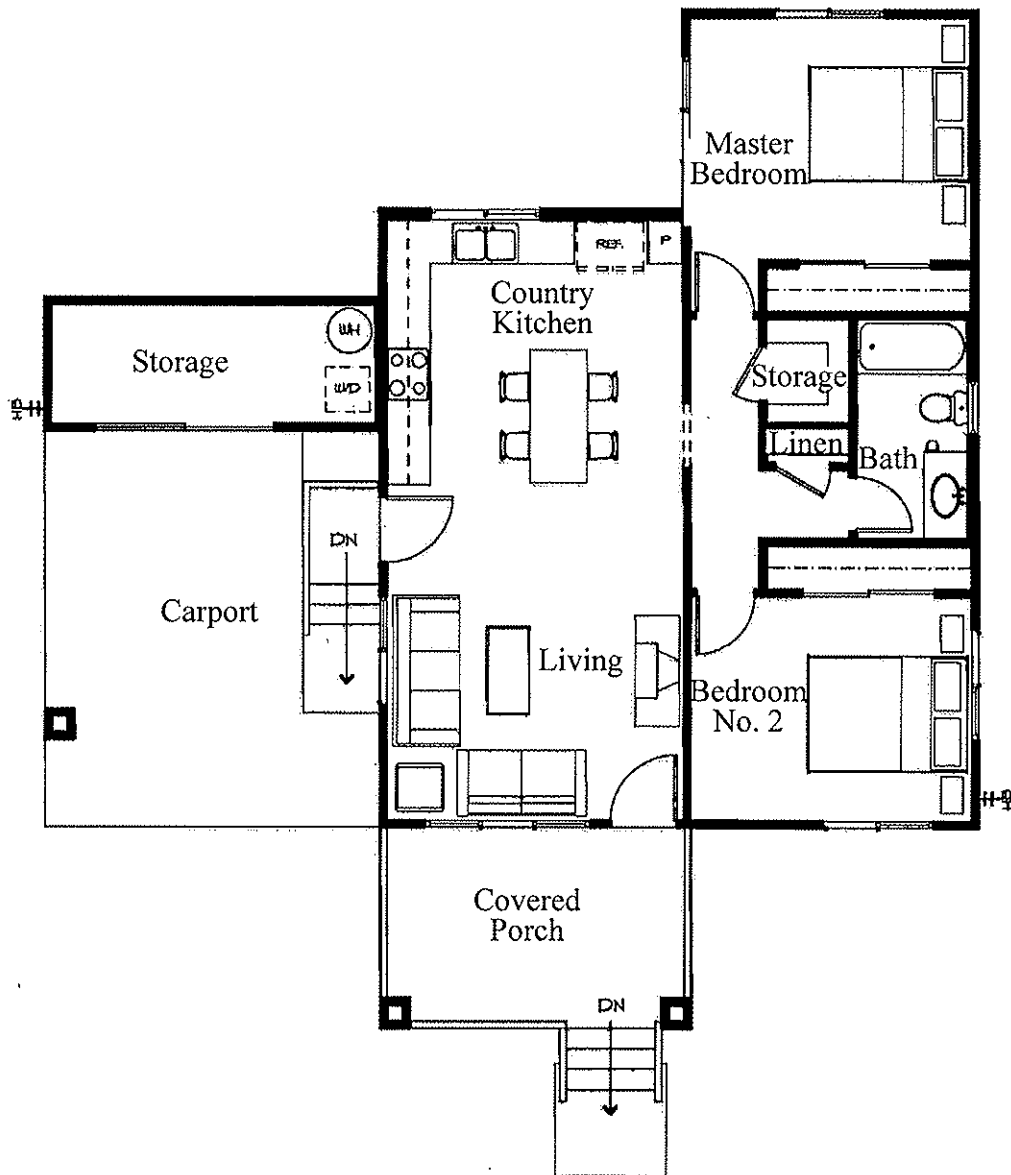
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Prepared for: Kula Ridge, LLC

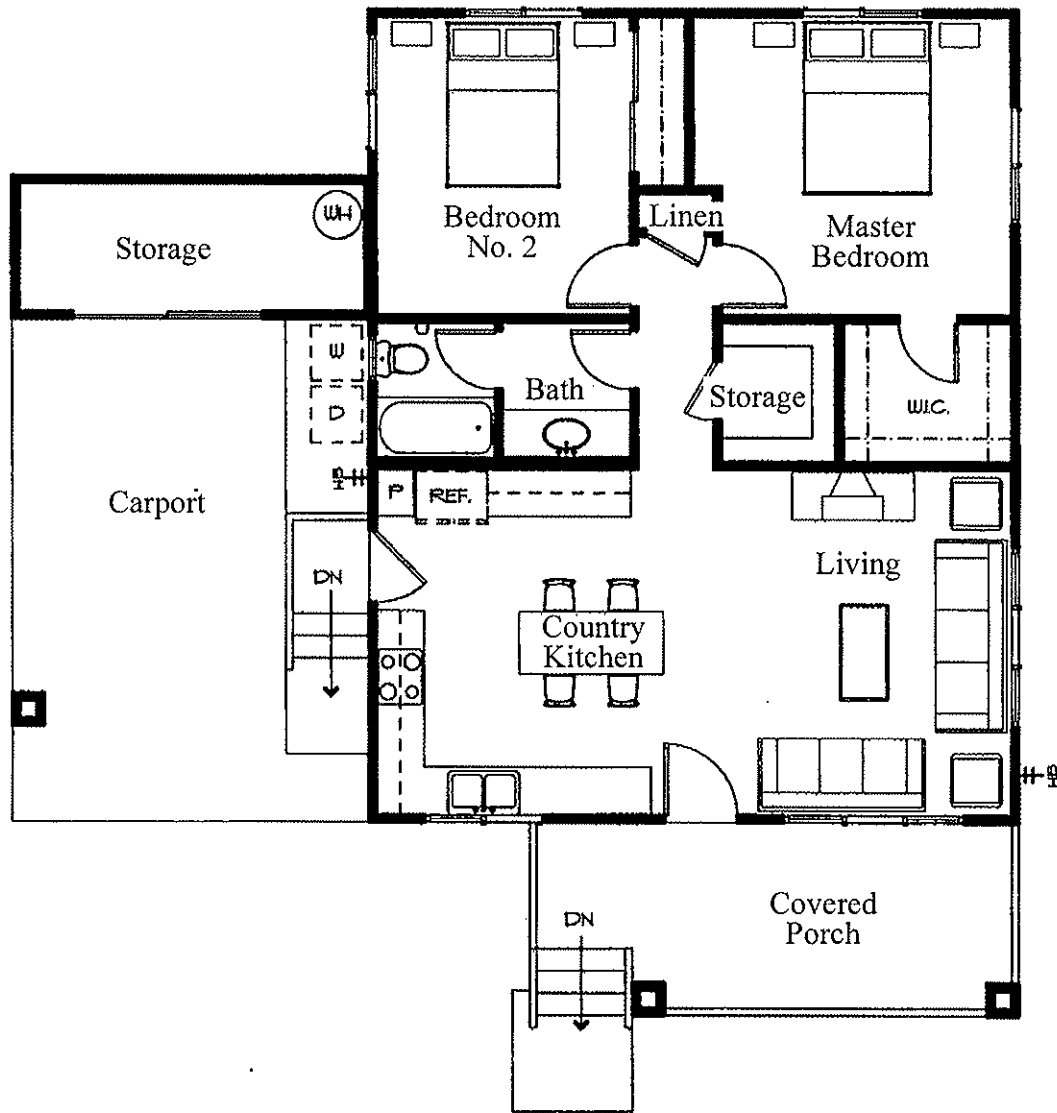
**MUNEKIYO & HIRAGA, INC.**

Nishikawa/Kula/AH/ConceptSite



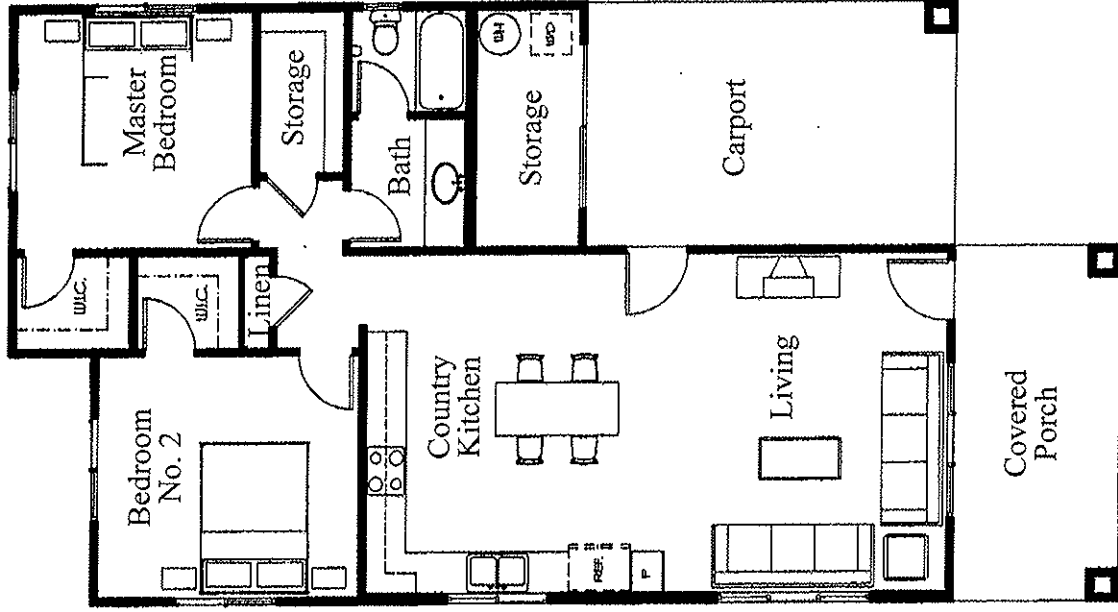
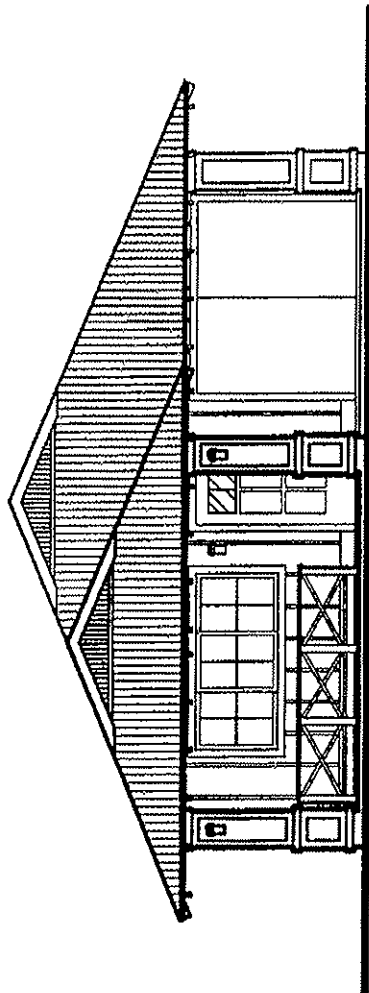
Source: Architectural Design & Construction, Inc.

Figure 5 Proposed Kula Ridge Residential Workforce Housing Subdivision NOT TO SCALE  
House Model A



Source: Architectural Design & Construction, Inc.

Figure 6 Proposed Kula Ridge Residential Workforce Housing Subdivision NOT TO SCALE  
House Model B



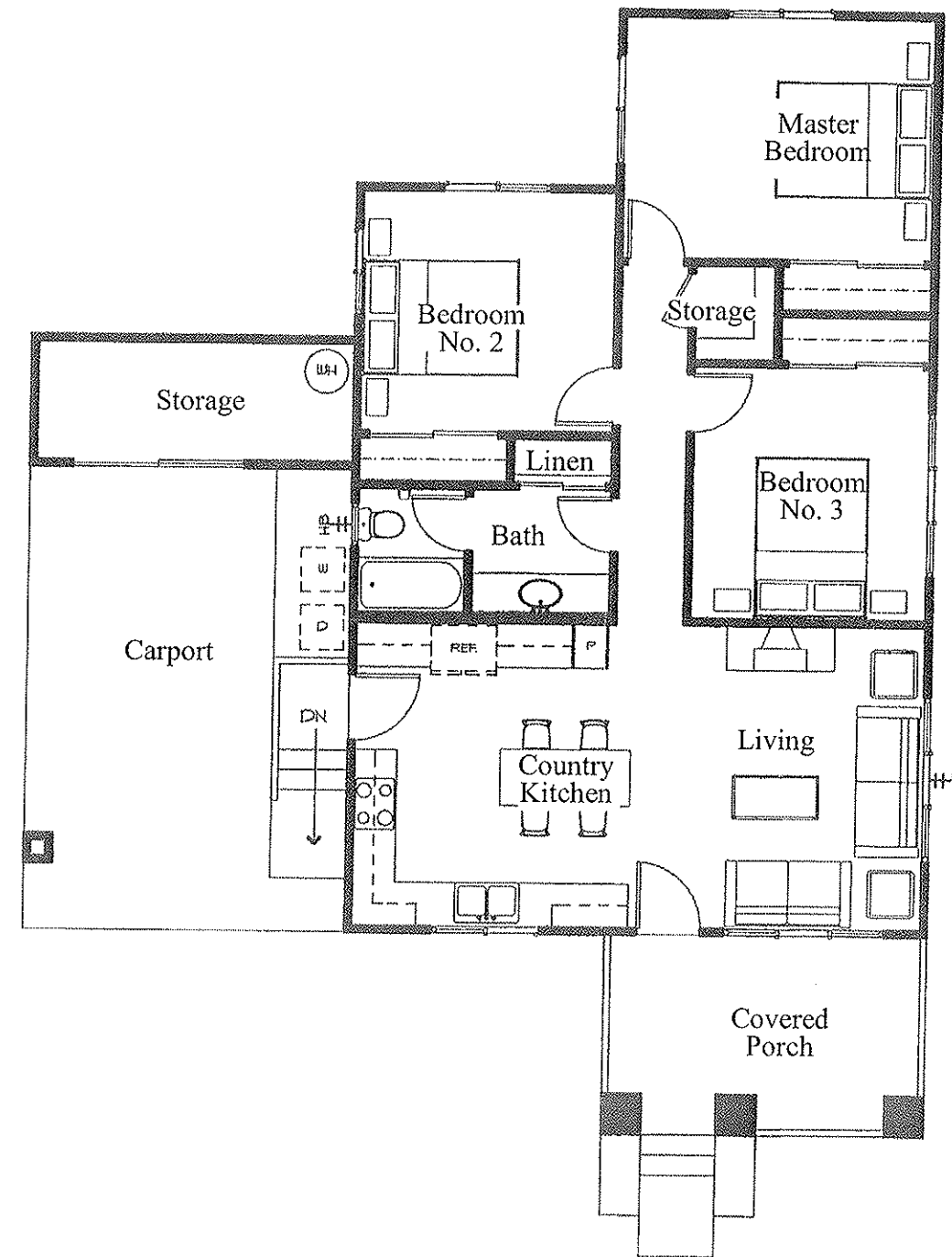
Source: Architectural Design & Construction, Inc.

Figure 7 Proposed Kula Ridge Residential Workforce Housing Subdivision House Model C

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Prepared for: Kula Ridge, LLC



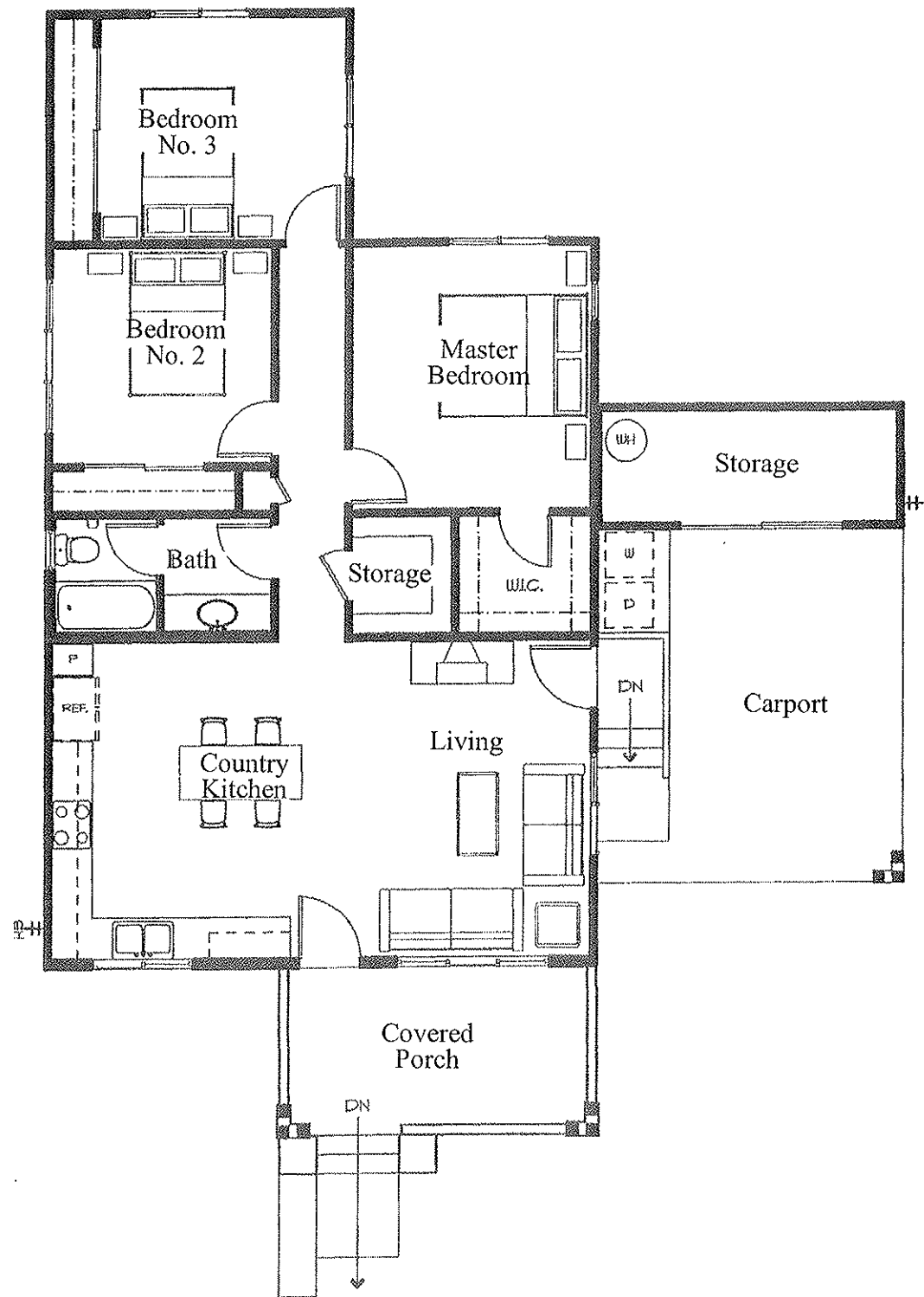


Source: Architectural Design & Construction, Inc.

Figure 8

Proposed Kula Ridge Residential  
Workforce Housing Subdivision  
House Model D

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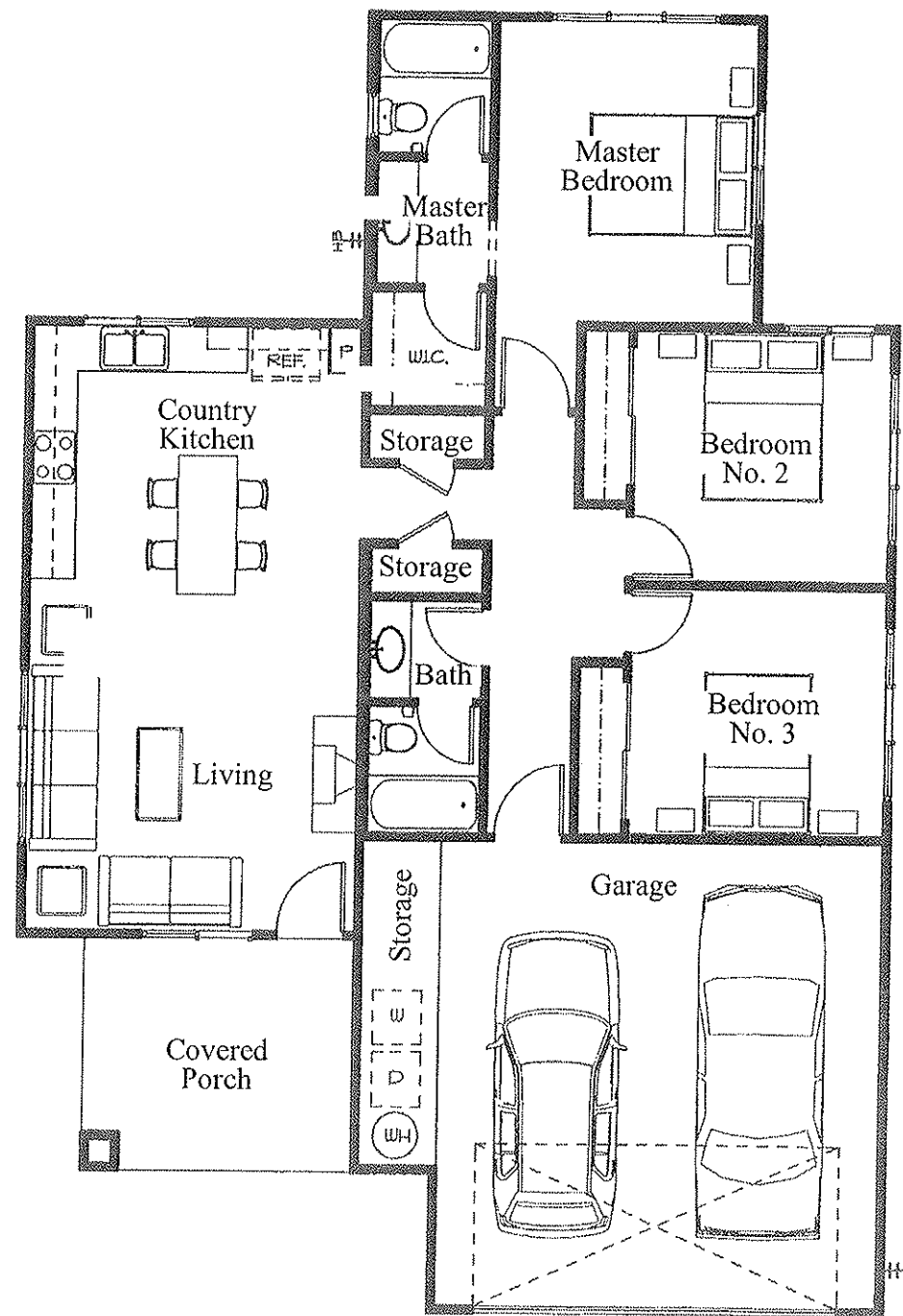
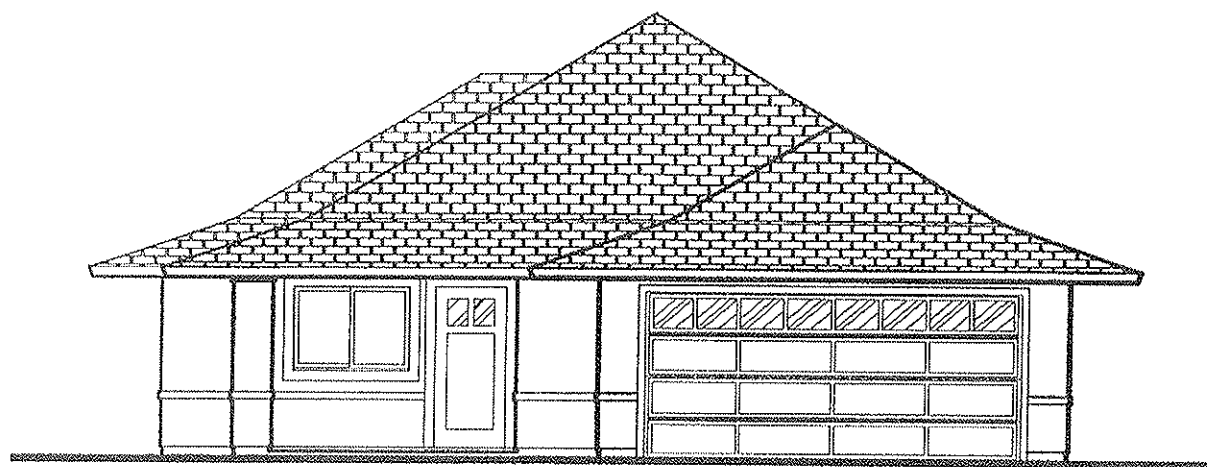


Source: Architectural Design & Construction, Inc.

Figure 9

Proposed Kula Ridge Residential  
Workforce Housing Subdivision  
House Model E

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Source: Architectural Design & Construction, Inc.

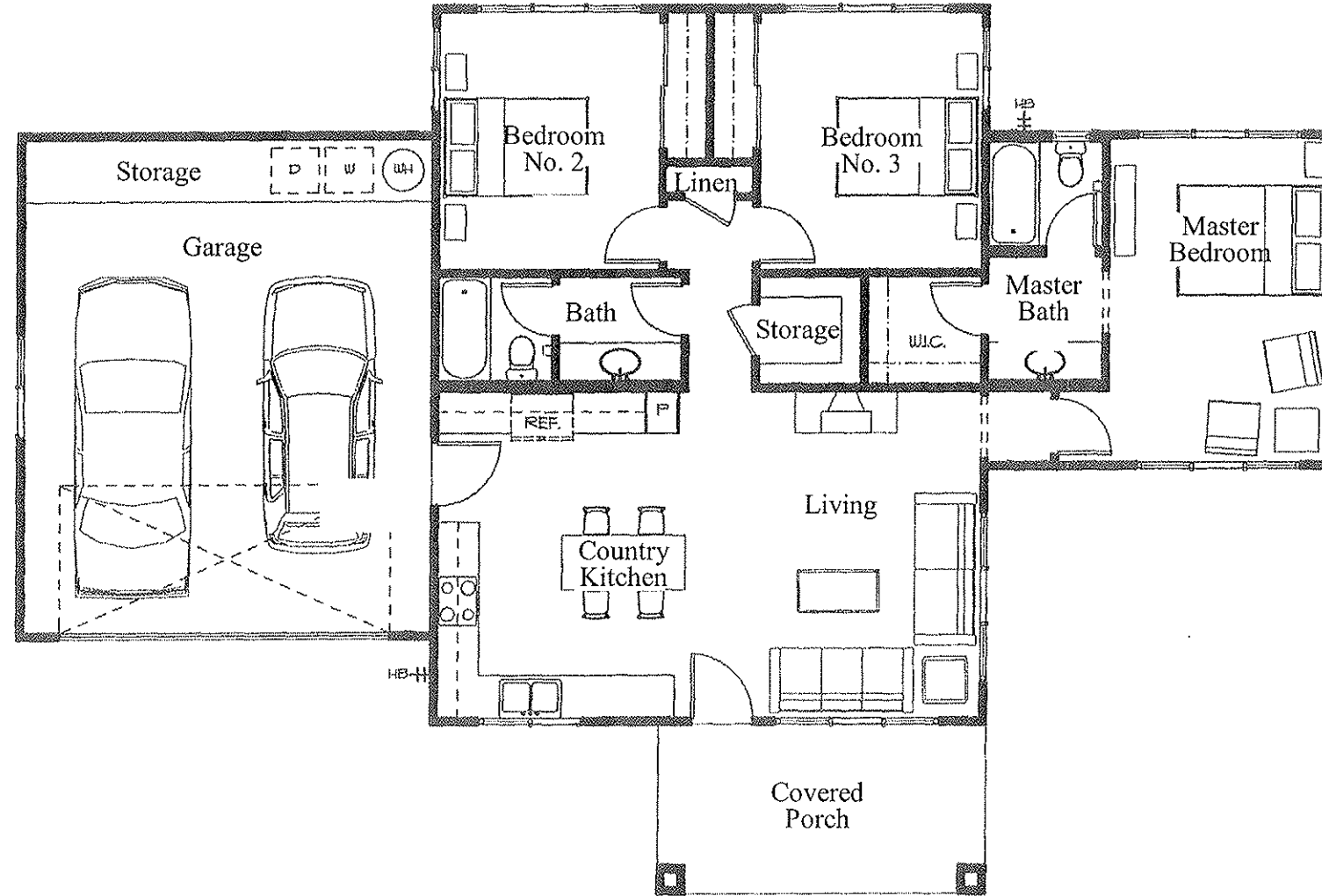
Figure 10

Proposed Kula Ridge Residential  
Workforce Housing Subdivision  
House Model F

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Prepared for: Kula Ridge, LLC



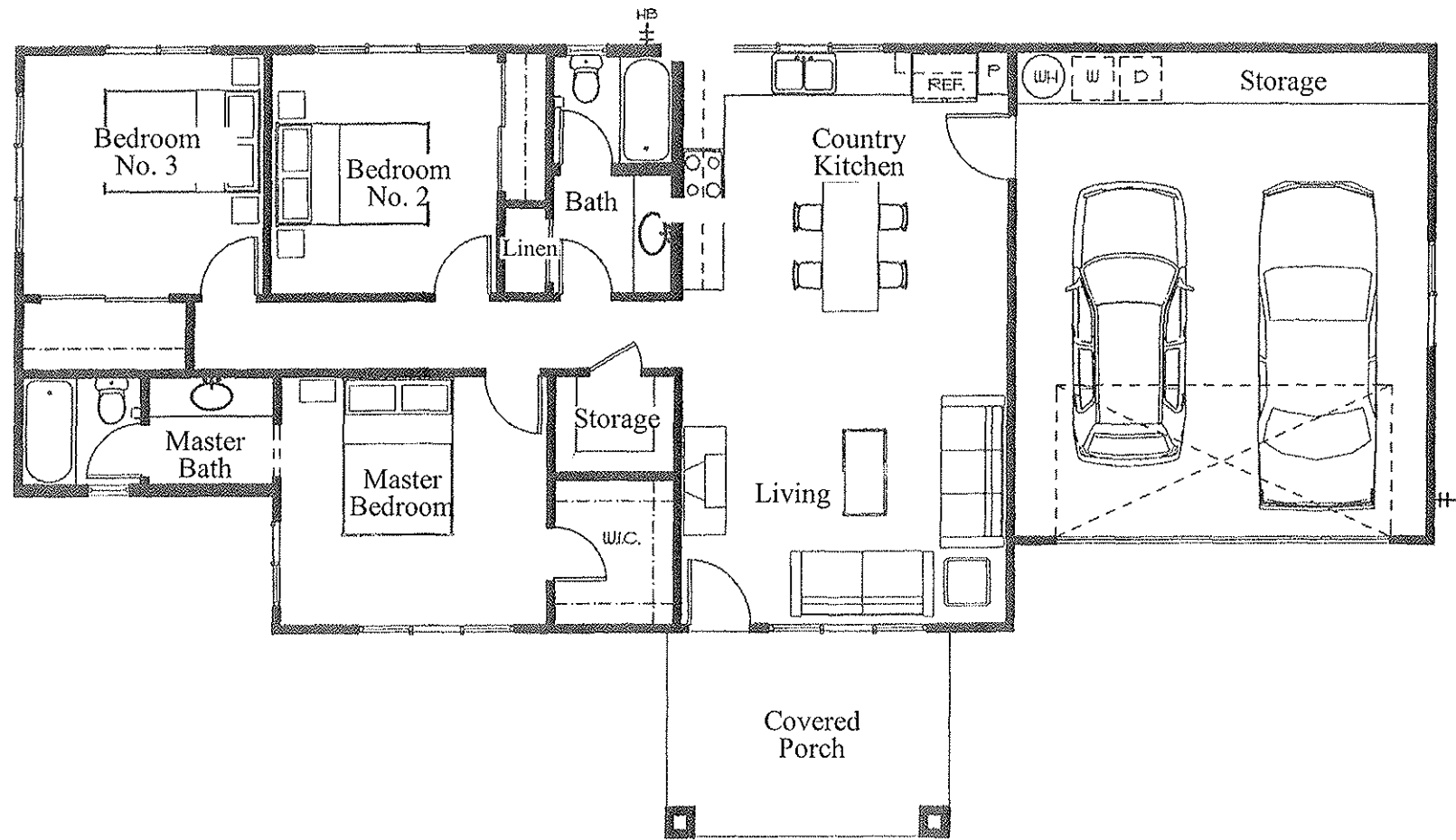
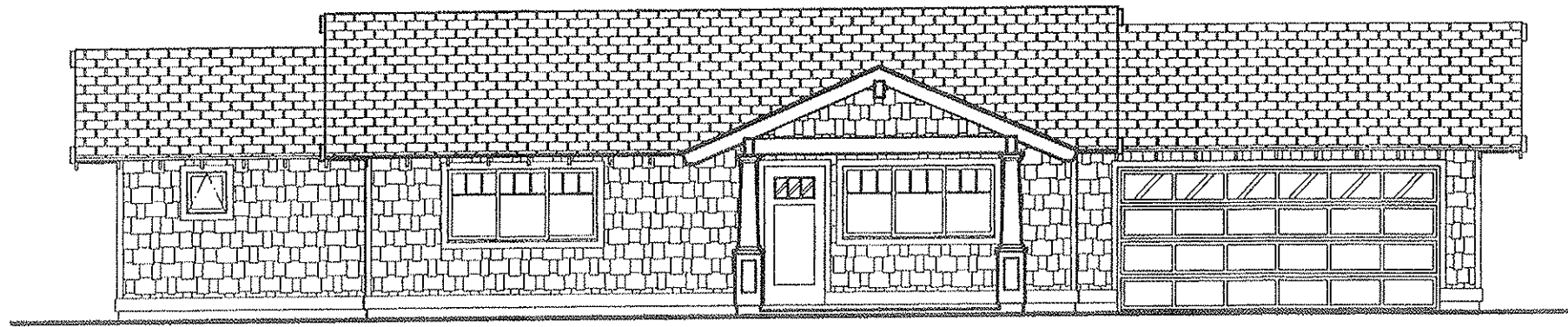


Source: Architectural Design & Construction, Inc.

Figure 11

Proposed Kula Ridge Residential  
Workforce Housing Subdivision  
House Model G

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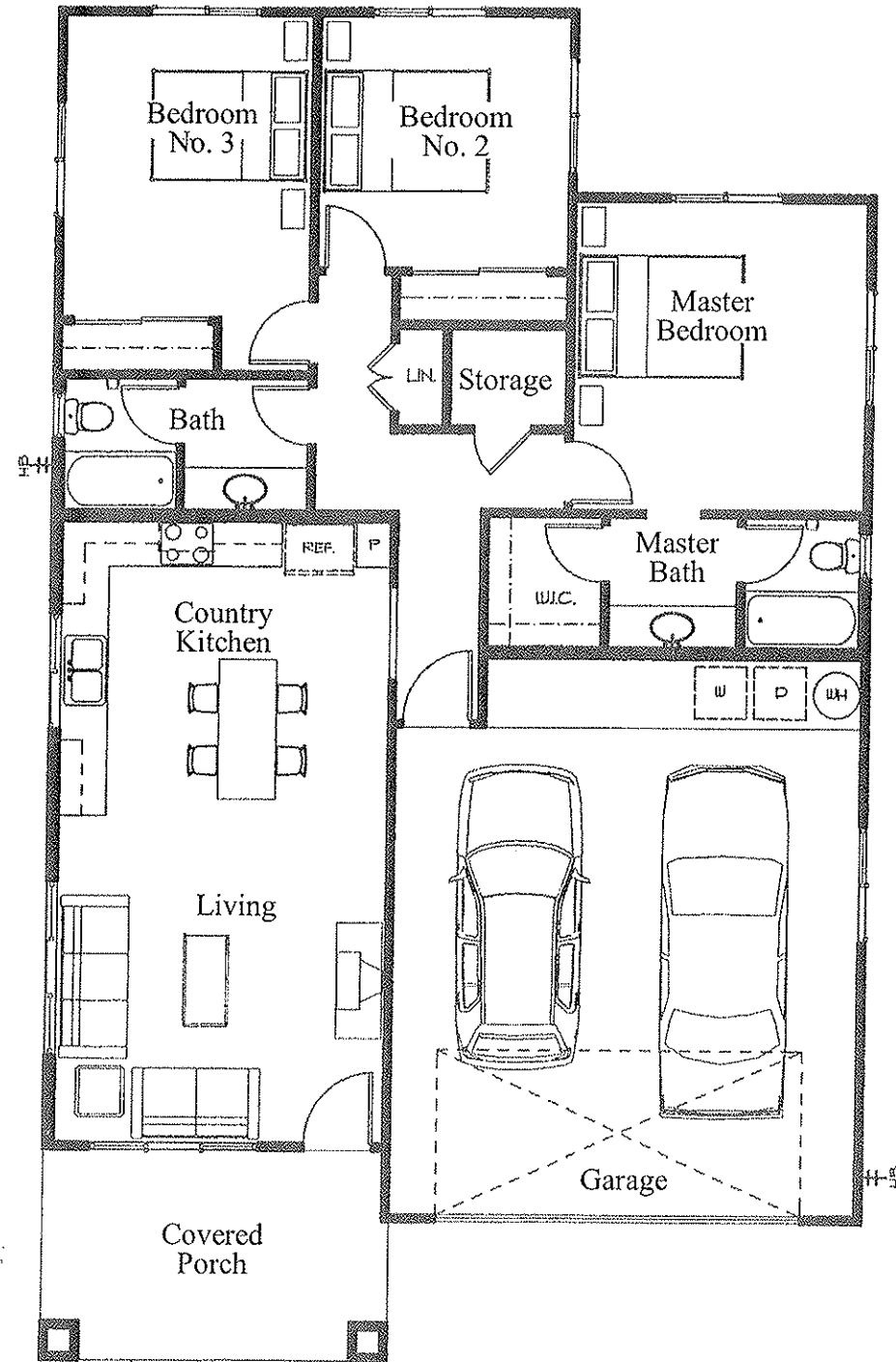
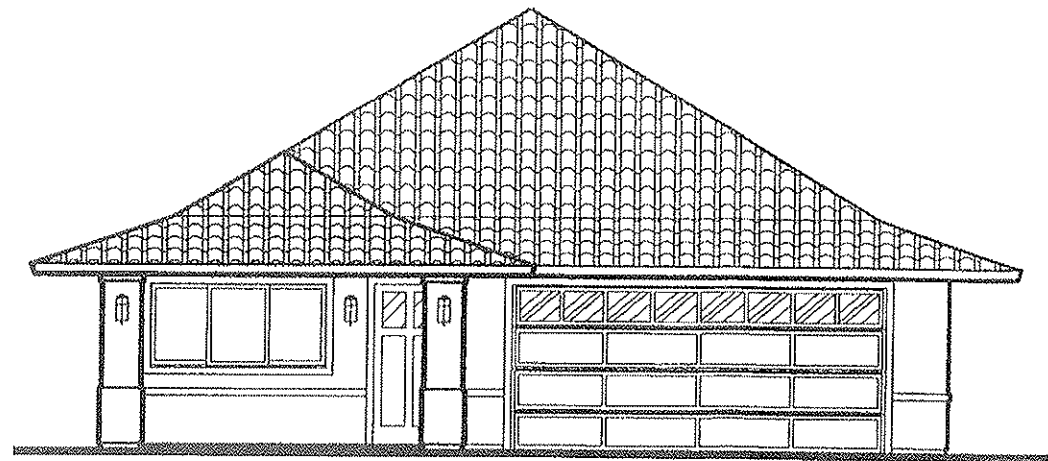


Source: Architectural Design & Construction, Inc.

Figure 12

Proposed Kula Ridge Residential  
Workforce Housing Subdivision  
House Model H

NOT TO SCALE



Source: Architectural Design & Construction, Inc.

Figure 13

Proposed Kula Ridge Residential  
Workforce Housing Subdivision  
House Model J

NOT TO SCALE

The Ridge Project will be initiated upon receipt of State Land Use Commission approvals, the Section 201H-38, HRS and related construction plan approvals, with completion of the project anticipated within 12 months of the start of construction.

**b. Mauka Subdivision Workforce Housing Component**

The Mauka Subdivision's 11 workforce units will meet the County's RWHP requirements for that project's proposed 21 agricultural lots. Kula Ridge Mauka LLC has entered into an agreement with Kula Ridge LLC to provide 11 workforce housing units on the Ridge Project site for this purpose.

**2. Market Housing Component for the Ridge Project**

The remaining lots within the Ridge Project consist of approximately 42 residential lots to be sold at market price on the order of 6,000 s.f. to 21,000 s.f. These lots have an estimated sales price range of \$350,000.00 to \$450,000.00 based on current market conditions and will be sold as lots only with restrictions on further subdividing.

As shown in **Figure 4**, the project also includes four (4) large lots accessed via a separate cul-de-sac (Lot Nos. 113, 114, 115 and 116). These lots have an estimated average sale price of \$1.2 million. Development on these lots will be restricted to one (1) main dwelling unit and one (1) accessory dwelling unit. These restrictions have been developed in coordination with the County Department of Housing and Human Concerns.

**3. Onsite Work and Infrastructure Improvements**

A 3-acre park site is proposed to be dedicated to the County of Maui. The location of the park provides for a park area adjacent to the Kula Community Center.

Acreage distributions for the Ridge Project are summarized in **Table 2**.

**Table 2**

<b>LAND USE ALLOCATIONS</b>	
<b>Land Use</b>	<b>Approximate Acreage</b>
Affordable Housing	9.25
Market Priced Housing	27.37
Parks	3.0
Right-of-way/Common Areas	3.5
Open Space	5.0
<b>Total</b>	<b>48.12</b>

Proposed improvements include site grading and utilities installation covering onsite water and drainage systems. A variance has been granted by the Department of Health to utilize individual wastewater systems. Electrical, telephone and cable utility systems will be placed underground.

**4. Offsite Improvements**

**a. Roadway Improvements**

Access to the proposed subdivision will be provided via a new access road off of Lower Kula Road. Refer to **Figure 3**. Improvements to the westbound approach of Lower Kula Road at the northern intersection with Kula Highway will also be provided.

**b. Offsite Water Improvements**

It is also noted that Kula Ridge LLC, the applicant for the Ridge Project also proposes to install offsite waterline improvements at the adjacent Mauka Subdivision site (TMK (2) 2-3-001:023) to service the proposed residential subdivision. See **Figure 14**.

Kula Ridge LLC is pursuing the development of an offsite well at an elevation of 2,900 feet on the adjacent Mauka Subdivision site. The owner of the Mauka Subdivision property, Kula Ridge Mauka LLC, will enter into a partnership with Kula Ridge LLC for the development of the water source.



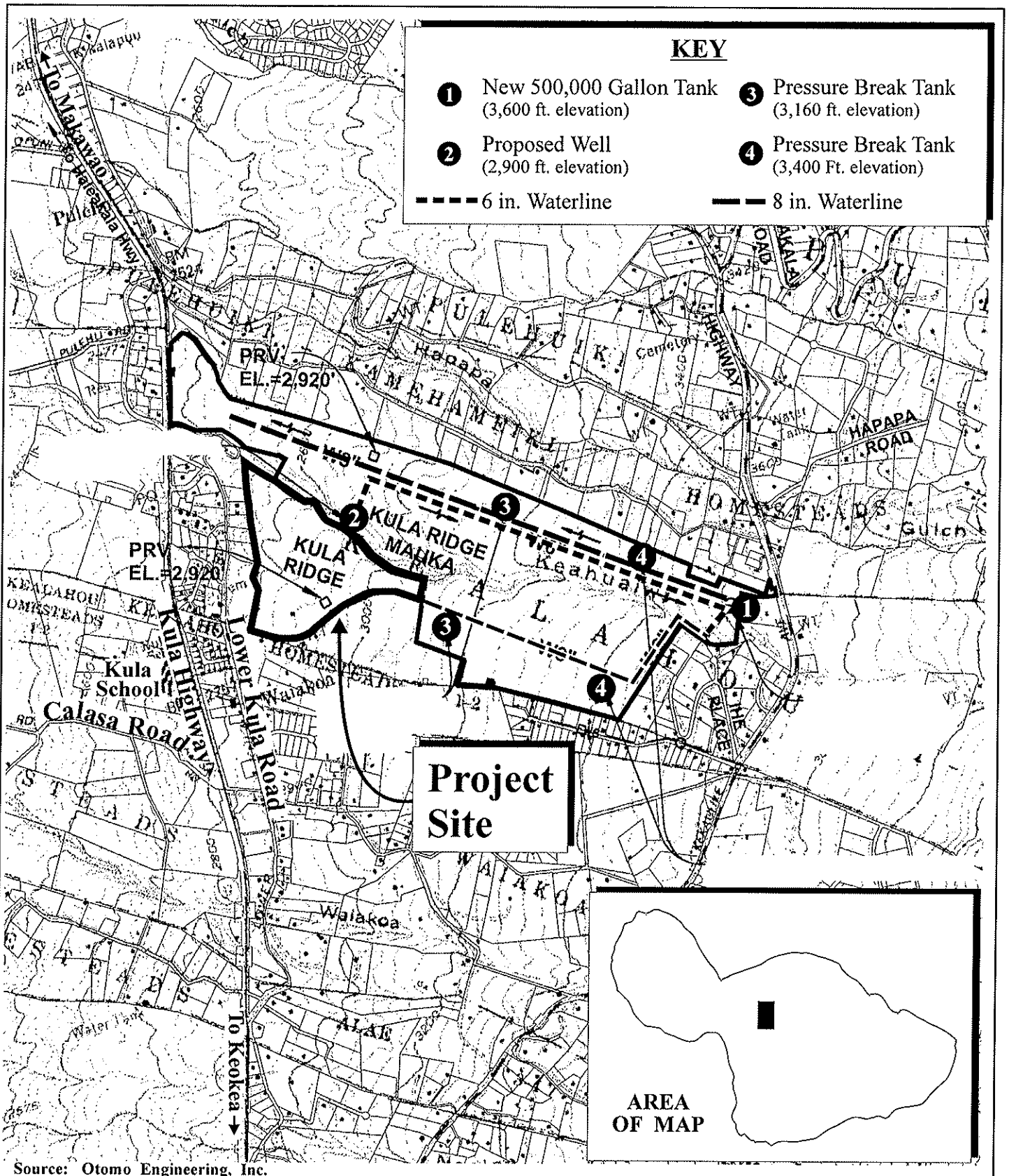


Figure 14 Proposed Kula Ridge Residential Workforce Housing Subdivision Proposed Water System

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Water will be pumped from the well site to a new 500,000 gallon storage tank located near the mauka boundary of the Mauka Project site at an elevation of approximately 3,600 feet.

The 500,000 gallon storage tank will have two (2) distribution lines, one on the north side of Keahuaiwi Gulch, and one along the south. Water from the tank will be transported to the proposed Ridge Project by a new 8-inch transmission line. The water distribution lines will have pressure break tanks, to control the water service pressures, servicing both the Ridge Project and the Mauka Subdivision.

The waterline crossing of Keahuaiwi Gulch will occur in a single location. An 8-inch waterline will be installed approximately 1,500 feet makai of Kekaulike Highway in Keahuaiwi Gulch. The waterline will extend approximately 700 feet in a southwesterly direction to provide service to the Ridge Project.

#### **5. Estimate of Project Costs**

The estimated cost for the Ridge Project improvements, including water source development (excluding house construction on the affordable lots) is approximately \$9 million.

### **C. PROJECT NEED/REASONS JUSTIFYING THE REQUEST**

The Kula area is surrounded by lands used historically for agricultural production. Agricultural operations have been significantly reduced in recent years, and the project site has since been used for pasture land. The Makawao-Pukalani-Kula Community Plan shows "Rural", "Agriculture", "Park", and "Single-Family" residential use designations surrounding the proposed project site.

With continuing stability in local economic conditions, housing demand has exhibited an upward trend. Sales information for single-family subdivisions in Kula/Ulupalakua/Kanaio indicate that demand for single-family homes are strong, with continuing strength in demand anticipated. Recent median sales price information for the Kula/Ulupalakua/Kanaio area shows that single-family units sold for approximately \$764,000.00 in December of 2007 (Realtor Association of Maui, December 2007).

**D. AFFORDABLE HOUSING PROGRAM**

In accordance with the affordable housing conditions adopted by the Workforce Housing Ordinance No. 3418, the range in workforce housing for all projects on Maui is 80 percent to 160 percent of median family income. The present criteria requires that Section 201H-38, HRS projects primarily or exclusively include housing units made affordable to households with incomes at or below 140 percent or less of the County’s median income.

**1. Ridge Project Affordable Housing Program**

The Ridge Project will provide workforce housing in keeping with affordability guidelines for Section 201H-38, HRS projects. In particular, the project will offer a minimum of 51 percent of the total number of lots or 59 workforce housing units to families having an annual income of not more than 140 percent of the Maui County median income. Specifically, thirty (30) Ridge Project units will be provided for above moderate income households. Twenty-nine (29) Ridge Project units will be provided for moderate income and below moderate income households.

**2. Mauka Subdivision Affordable Housing Program**

The Mauka Subdivision is required to provide the following number of workforce housing units within each of the income group categories, as provided for by the RWHP, 30 percent or three (3) workforce housing units for below moderate income households; 30 percent or four (4) workforce housing units for moderate income households; 20 percent or two (2) workforce housing units for above moderate income households; and 20 percent or two (2) workforce housing units for gap income households. A workforce housing distribution for the Mauka Subdivision is summarized in **Table 3**.

**Table 3**

<b>WORKFORCE HOUSING DISTRIBUTION FOR MAUKA SUBDIVISION</b>				
<b>Ownership Income Group</b>	<b>Product Type</b>	<b>Percentage of Units Allocated to Income Group</b>	<b>Number of Affordable Units</b>	<b>*Sales Price Range</b>
Below Moderate Income (80% to 100% of County Median Income)	Two Bedroom	30%	3	\$234,685.00 to \$260,790.00
Moderate Income (101% to 120% of County Median Income)	Two to Three Bedroom	30%	4	\$286,875.00 to \$368,200.00
Above Moderate Income (121% to 140% of County Median Income)	Three Bedroom	20%	2	\$398,900.00 to \$429,500.00
Gap Income (141% to 160% of County Median Income)	Three Bedroom	20%	2	\$460,200.00 to \$490,900.00
		<b>TOTAL</b>	<b>11 Mauka Subdivision Units</b>	

\*Based on 2007 U.S. Department of Housing and Urban Development Income Guidelines at a prevailing interest rate of 6.0 percent.

The proposed sales prices for the house-lot packages have been preliminarily set at \$234,685.00 to \$490,000.00 based on 2007 income guidelines. At interest rates prevailing at the time of the filing of the Section 201H-38, HRS application, and at the preliminary prices noted herein, the house-lot packages would be affordable to families falling between the 80 to 160 percent of median income categories.

Kula Ridge, LLC will enter into an affordable housing agreement with the County of Maui to establish the specific terms and conditions for affordable sales price distribution, applicant selection process, and marketing requirements.

A summary of the proposed affordable housing program is graphically depicted in **Figure 15**.

Preliminary construction specifications for the affordable units are included in this document as **Appendix "A"**. The Ridge Project will be initiated upon receipt of State Land Use Commission approvals, the Section 201H-38, Hawai'i Revised Statutes (HRS) and related construction plan approvals, with completion of the project anticipated within 12 months of the start of construction.

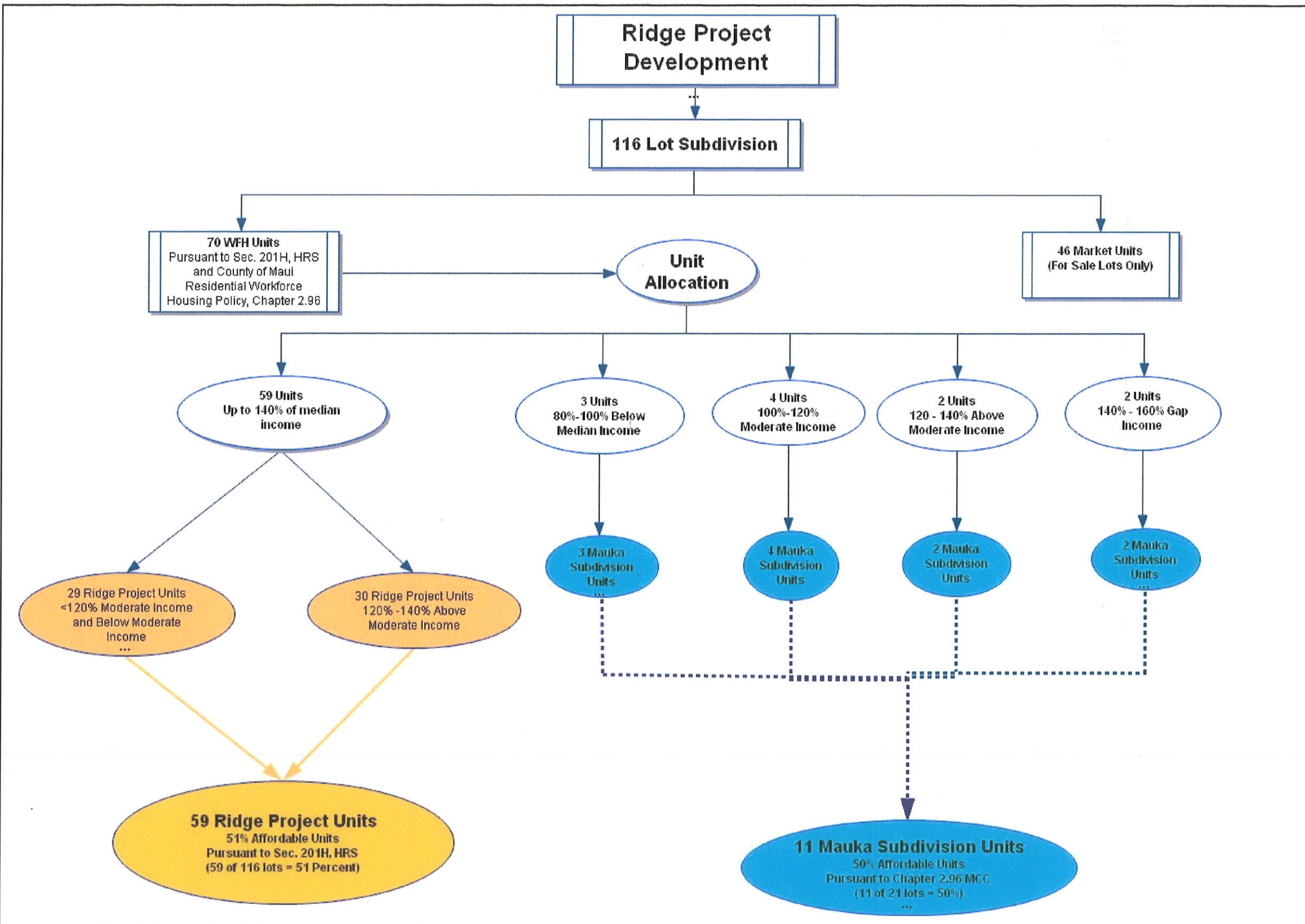


Figure 15



Proposed Kula Ridge Residential  
Workforce Housing Subdivision  
Affordable Housing Program Summary

NOT TO SCALE

**E. ENTITLEMENTS REQUIRED**

The Ridge Project has been developed to meet the criteria for a Section 201H-38, HRS project by County of Maui's, Department of Housing and Human Concerns. Section 201H-38, HRS promotes the delivery of affordable housing by allowing the exemption of endorsed projects from:

*"...all statutes, ordinances, charter provisions, and rules of any governmental agency relating to planning, zoning, construction standards for subdivisions, development and improvement of land, and the construction of units thereon."*

As such, a Section 201H-38, HRS application will be filed with the Maui County Council to seek exemptions from the Community Plan Amendment and Change in Zoning processes, as well as other County requirements to support the timely implementation of the project, without compromising public health, safety or welfare considerations. Proposed exemptions are presented in **Appendix "B"**.

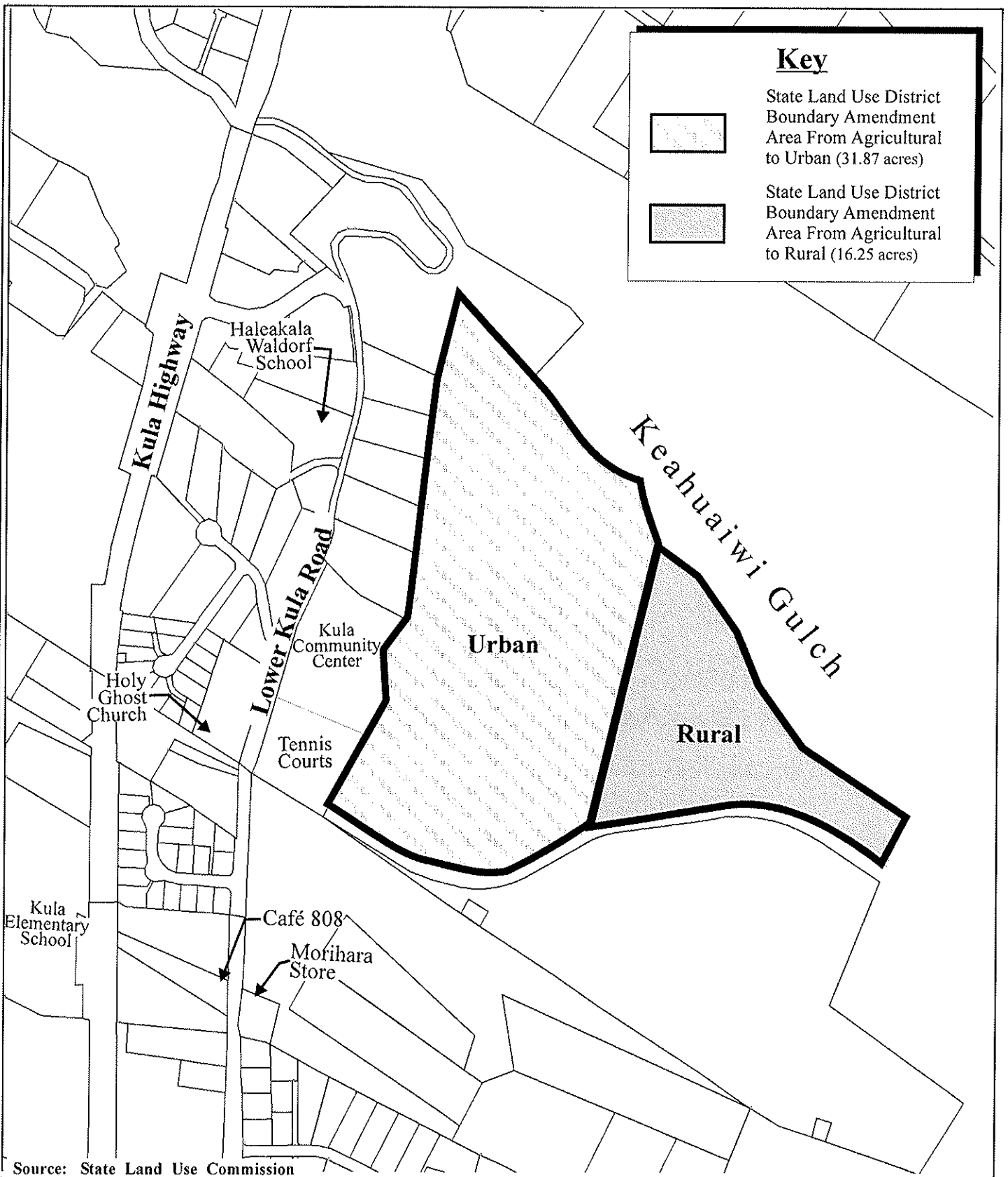
The current State Land Use designation for the plan area is "Agricultural". Concurrent with the County's 201H-38, HRS processing, a petition for a State Land Use Commission (SLUC) District Boundary Amendment (DBA) from the "Agricultural" to "Rural" and "Urban" Districts will be processed. The SLUC petition will encompass the entire 48-acre project area and follow the provisions of Section 15-15-97 of the Land Use Commission Rules, pertaining to Section 201H-38, HRS processing.

The District Boundary Amendment area from Agricultural to Urban is approximately 31.87 acres. The District Boundary Amendment area from Agricultural to Rural is approximately 16.25 acres. The proposed District Boundary Amendment areas are presented in **Figure 16**.

**F. CHAPTER 343, HAWAII REVISED STATUTES (HRS REQUIREMENTS)**

Roadway improvements are anticipated at the intersection of the subdivision access road and Lower Kula Road, a County roadway. Improvements at the intersection of Lower Kula Road and the State of Hawaii's Kula Highway may also be required. In addition, subdivision access road improvements will traverse along the south side of the Kula Community Center, a County-leased recreational facility. The scope of these actions are triggers for an environmental assessment pursuant to Chapter 343, HRS. Accordingly, this environmental





Source: State Land Use Commission

**Figure 16 Proposed Kula Ridge Residential Workforce Housing Subdivision Boundary Amendment Area**

NOT TO SCALE



assessment is being prepared in accordance with Chapter 200 of Title 11, Department of Health Administrative Rules, Environmental Impact Statement Rules.

This document addresses the plan's technical characteristics, environmental impacts and alternatives, and advances findings and conclusions relative to the significance of the proposed single-family residential subdivision and the proposed offsite water system improvements. Based on discussions held with the County of Maui Planning Department, the County of Maui, Department of Housing and Human Concerns and the State Land Use Commission staff, it has been determined that the approving agency for the environmental assessment is the County of Maui, Department of Housing and Human Concerns.



**II. DESCRIPTION OF THE  
EXISTING  
ENVIRONMENT, IMPACTS  
AND MITIGATION  
MEASURES**

## II. DESCRIPTION OF THE EXISTING ENVIRONMENT, IMPACTS AND MITIGATION MEASURES

This chapter has been prepared to describe the existing conditions and potential impacts and proposed mitigation measures at the Ridge Project site. A description of environmental impact considerations associated with the Mauka Subdivision's 11 workforce housing units and water system improvements on the Mauka Subdivision property is provided in Chapter III of this report.

### A. PHYSICAL SETTING

#### 1. Surrounding Land Uses

##### a. Existing Conditions

The Ridge Project site is located in the Waiakoa, Kula region on the southwestern slope of Haleakala. The Kula area is characterized by a combination of rural and agricultural uses. The produce and flowers grown in Kula are exported to domestic, mainland and international markets.

The project site lies in the vicinity of Keahuaiwi Gulch to the north and Waiakoa Gulch to the south. The property is surrounded by pastures to the south and east, and by the Kula Community Center and Holy Ghost Church on the west. Kula Elementary School is located southwest of the property, across Kula Highway. Haleakala Waldorf school is located west of the project site along Lower Kula Road. A restaurant, Café 808, and a grocery store, Morihara Store, are located southwest of the property along Lower Kula Road. Single- family homes are located to the south and west of the project site. Refer to **Figure 16**.

The Kula Fire Station and Kula Park are located southwest of the project area, along Kula Highway. The Kula Hospital lies south of the property, approximately 7.8 miles from the proposed project area.

**b. Impact and Mitigation**

The project site consists of pasture and abandoned farm land and is located in proximity to other single-family residential areas. Kealahou Subdivision is located in close proximity of the project site along with small farms and urban services. The proposed project will include single-family homes and small farms that are reflective of the region's rural character. The development of residential units at the project site is consistent with existing residential uses in the area. The use of the property for the proposed affordable housing subdivision would be functionally compatible with surrounding uses.

**2. Climate**

**a. Existing Conditions**

Kula's climate is typical of most mountainous areas in Hawai'i, with conditions varying by altitude and wind direction. Low land areas are generally typified by arid to semi-tropical climate, while higher elevations are characterized by more temperate conditions.

The Kula region is relatively dry, with rainfall of 20 to 30 inches per year. Generally, temperatures range from low 50 degrees Fahrenheit during the winter, to mid-80 degrees Fahrenheit during the summer. Maui is cooled by northeast tradewinds most of the year. These winds are constant during the spring and summer months. During the winter months, the island is often affected by Kona weather conditions, ranging from strong southerly winds with heavy rains, to calm, humid, or rainy weather.

**b. Impact and Mitigation**

The proposed project is not anticipated to affect climatic conditions in the area.

**3. Topography and Soil Characteristics**

**a. Existing Conditions**

Located on the southwestern flank of Haleakala, the project site slopes away from Lower Kula Road in a northwesterly direction at an average grade of

approximately 14.8 percent. Elevation at the site ranges from 2,780 to 3,085 feet above mean sea level (amsl).












Underlying the site for the proposed subdivision and surrounding lands is soil belonging to the Pu`u Pa-Kula-Pane association. See **Figure 17**. The Pu`u Pa-Kula-Pane soil association is found on the intermediate and high uplands, and consists of deep, gently sloping to steep, well-drained soils that have a medium or moderately textured subsoil. This association is used for orchards, pastures, truck crops, and wildlife habitat. The soil consists of Kula Cobbly Loam with 12 to 20 percent slopes (KxaD). See **Figure 18**. The surface layer of the soil is dark reddish-brown loam and subsoil is dark-reddish brown loam, silt loam and silty clay loam that has subangular, blocky structure. While the surface soil is slightly acid, the subsoil is slightly acid to neutral. Kula Cobbly Loam is characterized as having moderately rapid permeability, medium runoff and moderate hazard of erosion.

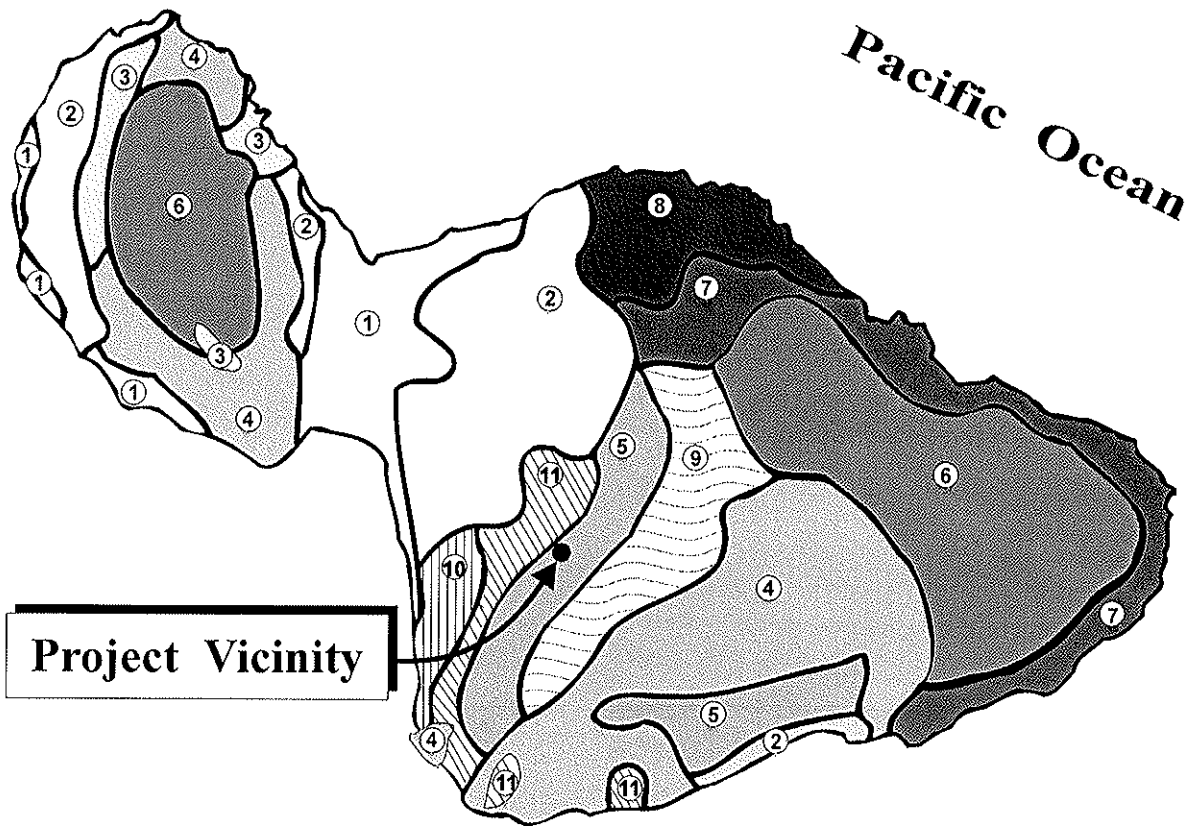
**b. Impact and Mitigation**

To prevent soil erosion during site work, the applicant will implement Best Management Practices, such as construction of drainage basins prior to mass grading for use as temporary sediment catchments; installation of a dust control fence, silt fence, gravel bag berms or other sediment-trapping devices downstream; diversion of storm runoff from graded areas through use of sand bag berms or lined temporary swales; and paving and grassing of exposed areas and permanently landscaping as soon as grading is completed. To minimize soil erosion, the contractor will be required to submit a soil erosion control plan prior to issuance of a grubbing and grading permit. Because the graded area will be larger than 1.0 acre, the applicant will obtain a National Pollutant Discharge Elimination System (NPDES) General Permit Coverage Authorizing Discharges of Storm Water, prior to commencement of construction activity, as required.

Temporary environmental effects due to construction of an off-site water system in the project area will occur. A 2,900-foot groundwater well will be constructed on the Mauka Subdivision site. A storage tank will be provided at the 3,600 ft. elevation. A single trench will be excavated in the Keahuiwi Gulch to facilitate the installation of the waterline. This activity is anticipated to have an insignificant effect on the water quality. This activity

# LEGEND

- |   |  |   |                                   |
|---|--|---|-----------------------------------|
|  | Pulehu-Ewa-Jaucas association                |  | Hana-Makaalac-Kailua association  |
|  | Waiakoa-Keahua-Molokai association           |  | Pauwela-Haiku association         |
|  | Honolua-Olelo association                    |  | Laumaia-Kaipoi-Olinda association |
|  | Rock land-Rough mountainous land association |  | Keawakapu-Makena association      |
|  | Puu Pa-Kula-Panc association                 |  | Kamaole-Oanapuka association      |
|  | Hydrandepts-Tropaquods association           |   |                                   |

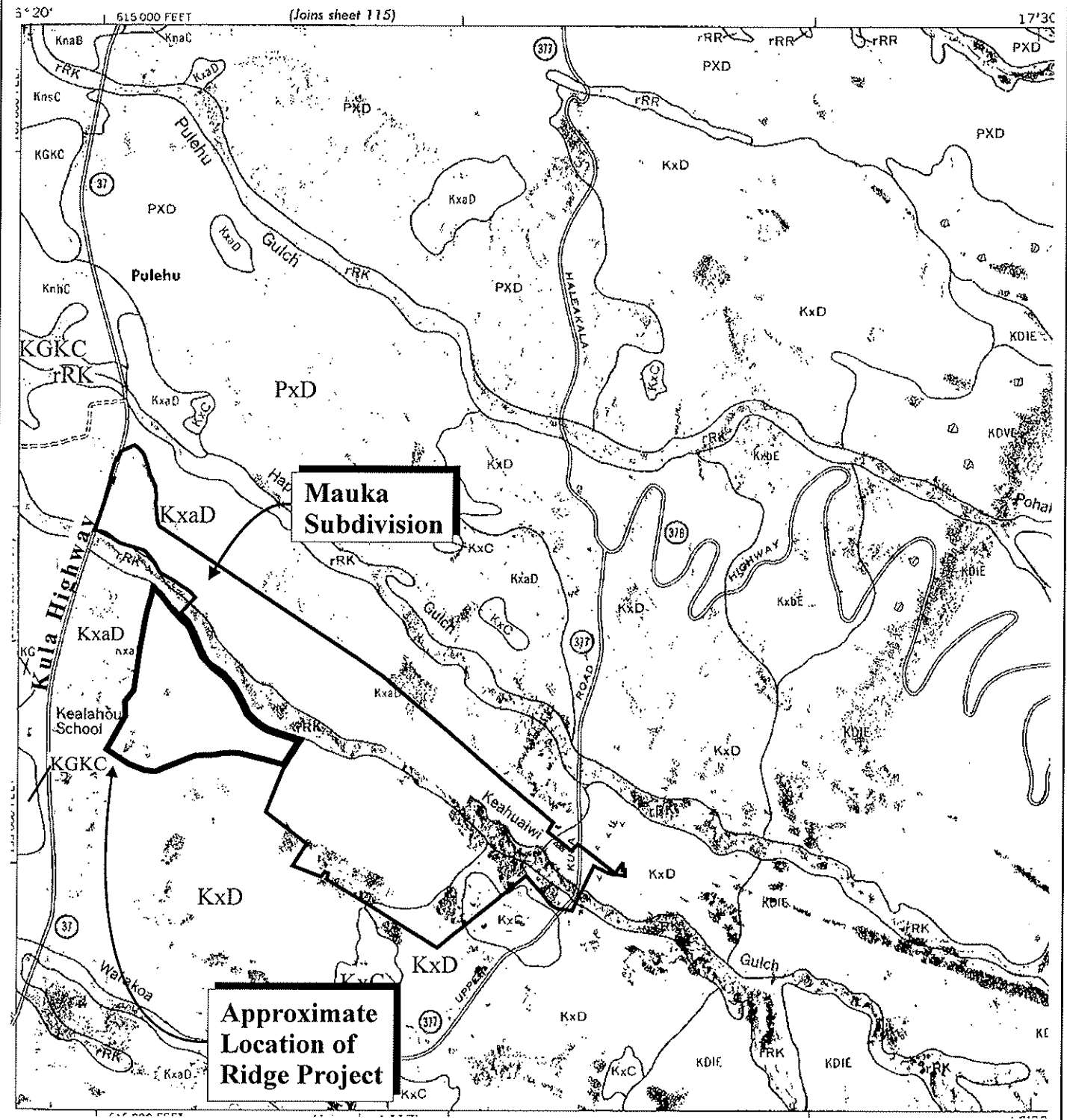


Source: USDA, Soil Conservation Service

**Figure 17** Proposed Kula Ridge Residential Workforce Housing Subdivision  
Soil Association Map

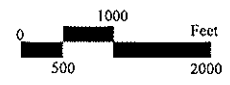
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Source: USDA, Soil Conservation Service

**Figure 18 Proposed Kula Ridge Residential Workforce Housing Subdivision Soil Classifications Map**



Prepared for: Kula Ridge, LLC

**MUNEKIYO & HIRAGA, INC.**  
Nishikawa/Kula/soilclass

will disturb the soils and vegetation in the immediate vicinity, but because construction will be limited to a period when the gulch is dry, the gulch will not have continuous flow to impact the environment downstream. Environmental impacts to the gulch are expected to be minimal and will be monitored on a regular basis. After construction, the preconstruction conditions of the area are expected to recover fully.

#### 4. Agricultural Productivity Considerations

##### a. Existing Conditions

The three classification systems commonly used to rate soils in Hawai`i are: (1) Land Capability Grouping, (2) Agricultural Lands of Importance to the State of Hawai`i, and (3) Overall Productivity Rating.

##### (1) Land Capability Grouping (NRCS Rating)

The 1972 Land Capability Grouping by the U. S. Department of Agriculture NRCS rates soils according to eight levels, ranging from the highest classification level "I" to the lowest "VIII".

The project site soils are rated IVe. Class IV soils have very severe limitations that reduce the choice of plants, or require very careful management, or both. The subclassification "e" indicates that the soils are subject to severe erosion if they are cultivated and not protected.

##### (2) Agricultural Lands of Importance in the State of Hawai`i (ALISH)

In 1977, the State Department of Agriculture developed a classification system to identify Agricultural Lands of Importance to the State of Hawai`i (ALISH), based primarily, though not exclusively, on their soil characteristics. The three (3) classes of ALISH lands are "Prime", "Unique", and "Other", with the remaining non-classified lands termed "Unclassified". When utilized with modern farming methods, "Prime" agricultural lands have a soil quality, growing season, and moisture supply needed to produce sustained crop yields economically; while "Unique" agricultural lands poses a combination of soil quality, growing season, and moisture supply to produce sustained high yields of a specific crop.

“Other” agricultural lands include those that have not been rated as “Prime” or “Unique”.

As reflected by the ALISH map for the Kula region, the proposed project is comprised of lands that have been defined as “Other” agricultural lands. See **Figure 19**.

(3) Overall Productivity Rating

The University of Hawai`i, Land Study Bureau (LSB) developed the Overall Productivity Rating, which classifies soils according to five (5) levels, with “A” representing the class of highest productivity and “E” representing the lowest. The letters are followed by numbers which further classify the soil types by conveying such information as texture, drainage, and stoniness.

The subdivision area is located on lands designated as “C41i” “D41” and “E96”. The western part of the subdivision lies on lands designated “E96” which designates irrigated, well-drained land with non-stony to rocky and moderately fine to medium textured soil. The area in the eastern part of the subdivision lies on lands designated as “C41i” and “D41” which designate irrigated, well-drained land with stony and medium textured soil. See **Appendix "C"**.

**b. Impact and Mitigation**

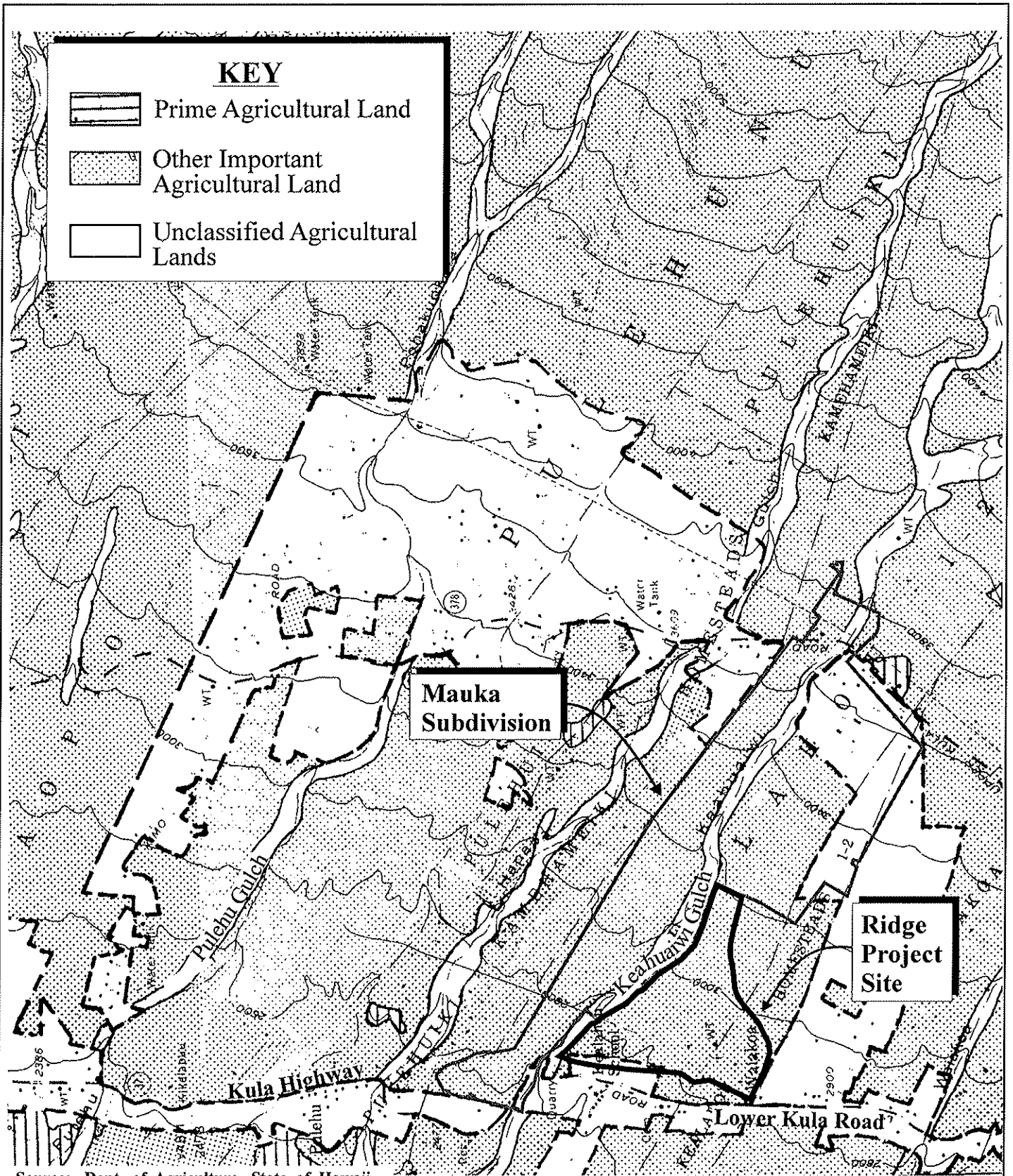
Assessment of the agricultural land use impacts was carried out for the Ridge Project. Refer to **Appendix "C"**.

The project will commit approximately 32 acres of low-quality agricultural land to a non-agricultural use, leaving about 16 acres of the better land available for rural/agriculture uses as part of four 4-acre lots.

The development on this agricultural land, combined with other developments in Hawai`i and the island of Maui, involves a small loss of agricultural land which will not significantly affect (1) the availability of land to farmers in Hawai`i, (2) agricultural land rents, (3) the growth of diversified crops, or (4) potential agricultural employment.

The loss of agricultural land will not limit the Statewide growth of diversified agriculture since an enormous supply of agricultural land will be made





Source: Dept. of Agriculture, State of Hawaii

**Figure 19 Proposed Kula Ridge Residential Workforce Housing Subdivision** NOT TO SCALE  
**Agricultural Lands of Importance to the State of Hawai'i**



available due to the reduction of plantation agriculture. While the market for agricultural land is much tighter in Kula than it is in most other areas of the state, the impact to the loss of agricultural land is minimal since a majority of the land has poor soil.

**5. Flood and Tsunami Hazards**

**a. Existing Conditions**

According to the Federal Emergency Management Agency's Flood Insurance Rate Maps for the area, the proposed subdivision is situated in Zone C, an area of minimal flooding. See **Figure 20**. The property is located upland, away from tsunami inundation areas.

**b. Impact and Mitigation**

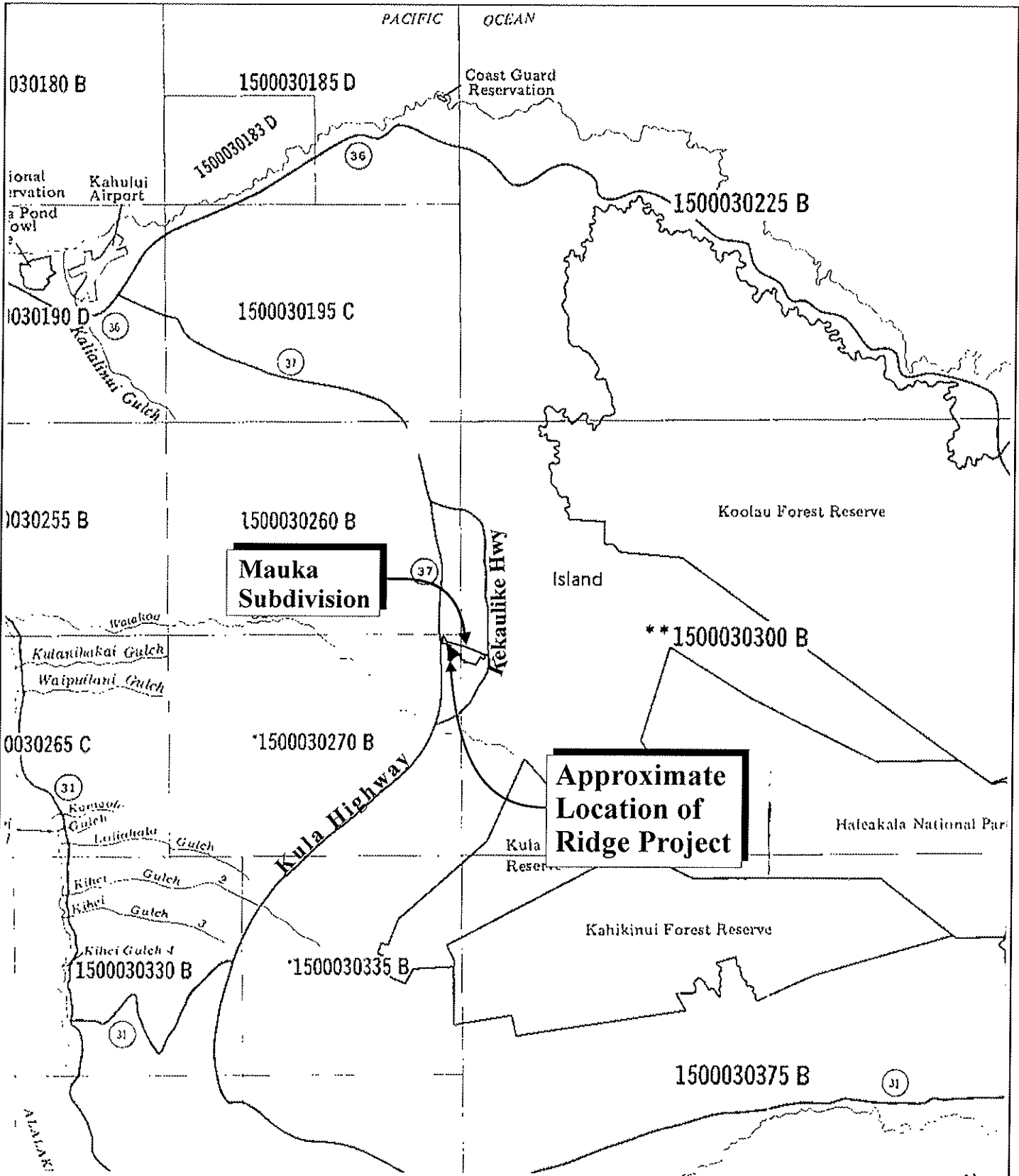
The use of the subject property for a residential workforce housing subdivision is not anticipated to pose a flood or tsunami hazard. As will be discussed in Section "D" of this chapter, post-development drainage mitigation measures will be implemented to ensure that adjacent and downstream properties will not be adversely affected by the proposed action. Because the project site is located upland, there are no threats to the surrounding area from coastal wave action.

**6. Flora and Fauna**

**a. Existing Conditions**

A Biological Resources Survey of the Ridge Project site was conducted by Robert W. Hobdy. See **Appendix "D"**. The inventory survey summarized the findings of flora and fauna in the project site. The property is grassed and has been overrun by scrub vegetation, consisting of pasture grasses and weeds. There are no rare, threatened or endangered species of plants on the property.

Typical of the Upcountry region, animal life in the area include cats, dogs, rats and mongoose. Avifauna include the mynah bird, francolins and the short-eared owl, known as pueo. There are no known rare or endangered species of fauna or avifauna in the vicinity of the project site.



Source: Federal Emergency Management Agency, Flood Insurance Rate Map

# Figure 20 Proposed Kula Ridge Residential Workforce Housing Subdivision Flood Zone Designation Map

NOT TO SCALE



**b. Impact and Mitigation**

There are no rare, Federally threatened or endangered species of plants on the property. Further, there are no known rare or Federally endangered or threatened species of fauna or avifauna in the vicinity of the project site. Accordingly, the proposed development is anticipated to have no significant negative impact on those elements of the natural environment.

**7. Archaeological Resources**

**a. Existing Conditions**

An Archaeological Inventory Survey of the Ridge Project site was carried out by Scientific Consultant Services (SCS). See **Appendix "E"**. The inventory survey included historic background research and settlement pattern analysis prior to fieldwork, a complete pedestrian survey of the project area, subsurface testing, and reporting.

The project site has been heavily altered by habitation since the 1800s, followed by ranching for the past 100 years. A cottage stands on the property, typical of plantation-style homes of the 1930s. Cattle grazing, erosion, and bulldozer grading activities, including construction of a dirt road and presence of horses, have altered much of the project area's original integrity.

Eighteen (18) historic sites were documented during the survey. Nine (9) sites were considered pre-Contact, based on the architecture and type. Six (6) sites were interpreted as historic and three (3) were undetermined.

Pre-Contact sites include settlement patterns of a modified outcrop and small enclosure that may represent temporary habitation (Site 50-50-11-5980), rock mounds (Site 5983), low walls (Site 5972), a habitation platform (Site 5977), and agricultural terraces (Sites 5973, 5975, 5978, 5979, and 5982). All sites fit the model of upcountry occupation reflected in early historic documents, Land Commission Awards (LCAs) and archaeological studies.

Parts of the project area were interpreted as historic and used for habitation (Site 50-50-11-5984), or for pastureland (Sites 5970, 5971, 5981, 5985, and

5987). The sites used for pastureland consisted of walls and an enclosure, and were interpreted as the results of historical ranching activities. It is also noted that a house is featured on Site 5984.

The sites listed as undetermined (Sites 50-50-11-5974, 5976, and 5986) were difficult to define.

Sub-surface testing carried out in areas likely to have been least affected by historic activities resulted in no identified cultural material. The only find of any significance were a sharpening stone (hoana) and a surface lithic scatter on Site 50-40-11-5980.

**b. Impact and Mitigation**

The following significance evaluations are broad criteria established for the State and National register of Historic Places. These criteria are as follows:

**Criterion A:** Site is associated with events that have made a significant contribution to the broad patterns of our history.

**Criterion B:** Site is associated with the lives of persons significant to our past.

**Criterion C:** Site is an excellent site type: embodies distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual construction.

**Criterion D:** Site has yielded or has the potential to yield information important in prehistory or history.

**Criterion E:** Site has cultural significance; probable religious structures or burials present. (State of Hawai'i criterion only).

The eighteen (18) sites identified in the Archaeological Inventory Survey of the proposed subdivision site were considered significant under Criterion D because of their ability to yield information about history or prehistory. Refer to **Appendix "E"**. Excavation at the most important sites yielded information that was recorded by Scientific Consultant Services. Further archaeological monitoring during construction work is recommended due to

the historic properties representing pre-contact agricultural use of the area, and post-contact use for ranching, agriculture, and historic habitation. See **Appendix "F"**.

## **8. Cultural Impact Assessment**

### **a. Historic Context**

During the pre-contact and early contact periods, Kula was primarily an area for farming. Dryland taro patches grew in elevations up to 3,000 feet. Farmers were reliant on growth of sweet potatoes and when crops failed due to caterpillars, blight, frost or sun, people in Makawao and Kula suffered from famine.

The arrival of whalers in the 1840s stimulated great demand for Irish and sweet potatoes. Potatoes were taken to Lahaina and sold aboard ships. The California gold rush also resulted in great demand from prospectors for potatoes, other vegetables, sugar, molasses and coffee. Farmers were doing so well that many Hawaiians were going into business for themselves, shipping their goods to San Francisco. Maui fields were referred to as “Nu Caliponi” or “New California.” When prices dropped, Hawaiians lost interest in growing potatoes.

In the 1840s, many Chinese from Honolulu, Kohala and China moved to the region and acquired land by lease or deed from Caucasian ranchers or Hawaiian homesteaders for farming. The Territorial government leased the land to ranchers who then subleased to the Chinese. In addition to Irish potatoes, they planted corn, beans, onions, Chinese cabbage, round cabbage, sweet potatoes, wheat and other grains, and cotton. Farmers often bartered their farm produce for payment on leases, in lieu of monetary transactions. Bartering was a common practice. In the Kula area, there were three (3) stores that often bartered for goods on other islands.

During the mid-19<sup>th</sup> century, the Chinese population grew. Kula consisted of Chinese and English schools, Christian churches, a Chinese society, gambling houses, opium dens, general stores, farms and cattle ranches. Keokea was often referred to as “Chinatown” and many would travel to the area on

Sundays and holidays from the outlying areas of Kanaio, Ulupalakua and Waiakoa.

In the 1880s, large sections of crown land in lower Kula were leased for grazing for the booming cattle industry. Around the end of World War I, the Territorial government released a large amount of land to the public for purchase. Homestead lands were available to all American citizens at least 21 years old. As a result of the policy, the Chinese population began to decline. In addition to loss of land to parceling, the Chinese population left the area due to severe drought that devastated crops and livestock, soil depletion due to years of harvesting and tilling and a lack of educational opportunities.

Since the late twentieth century, most of the land in the Waiakoa, Kula area served as farm land (Rosendahl, 1989).

**b. Cultural Perspectives**

To assess the cultural impact associated with the proposed project, two (2) interviews were conducted with individuals familiar with the area and long-time residents. A summary of their interviews follow.

**(1) Rogers Ishizu**

The interview with Rogers Ishizu was carried out on September 14, 2006 in Kahului, Maui.

Mr. Ishizu was born in Waiakoa, Kula on January 27, 1944. His mother and father are originally from Wailuku, but were asked to relocate to Kula where Mr. Ishizu was born. Mr. Ishizu is a retired teacher and currently lives in Wailuku with his wife Karen.

Mr. Ishizu's parents operated the Maui Dry Goods store in Wailuku and were subsequently asked by the store owner, Mr. John Dolim, to relocate and manage the Maui Dry Goods store in Kula. At that time, the owner of Maui Dry Goods was opening stores in different places on Maui. The Ishizus relocated and operated Maui Dry Goods for nearly 40 years. The first house that they lived in was owned by Maui Dry

Goods.

After living there for some time, Mr. Ishizu's father had the opportunity to purchase a lot from a private owner. At the time, there were a few lots to choose from. The lots were 2.5 acres in size. In order to select a lot, people drew straws. Mr. Ishizu's father had a good draw and chose the property with the best view. The Ishizu family continues to own the same home located off of Copp Road near the Calasa Service Station.

In later years, Mr. Ishizu's father was given an offer to buy the store but decided against it, thinking that it would be too much work. The Ishizus eventually retired, prompting the closing of the store. The store currently houses the Café 808 restaurant. In addition to Maui Dry Goods, there was also the Ching Store and the Tavares Store.

Mr. Ishizu attended Kealahou School, now occupied by the Haleakala Waldorf School on Lower Kula Road. He stated that there was one classroom for every grade level. Kealahou School taught children from Kindergarten to the 8<sup>th</sup> grade. Mr. Ishizu remembers his Kindergarten teacher, Mrs. Furukawa, because she was his first teacher. He remembers her as being very strict, but fair. He also noted that a Japanese School was in the area across from Kealahou School and that a Japanese minister taught language there. According to Mr. Ishizu, the Japanese school was owned and operated by the Honpa Hongwanji. Mr. Ishizu was enrolled as a student at the Japanese school, and laughed when he stated that he lasted there for just one day.

In recalling the history of the area, Mr. Ishizu remembers the first Morihara store located on the western edge of the subject property near the Holy Ghost Church. Mr. Ishizu said that the Moriharas operated the store for some time and eventually relocated further south across from Maui Dry Goods.

Mr. Ishizu recalls many happy memories of living in Kula. He was very active in sports activities, and played with friends in the neighborhood. He and his friends played in the area south of the subject property, on land owned by Louis Fernandez. Mr. Ishizu had a couple of friends who lived in the area and they would ride horses on the land surrounding the subject property. He stated that most of the land in the



area was used for ranching. During Mr. Ishizu's childhood, transportation was limited, so residents in the area didn't travel much to other parts of Maui. He and his childhood friends would often travel to Ulupalakua and other parts of the countryside for football challenges and other activities.

Mr. Ishizu's family lived close to the store, near Copp Road and Mauna Place. As young boys, the Ishizu brothers worked for the Vincent family in upper Kula. They worked as yard boys and worked for as little as 60 cents an hour to 1.40 cents an hour.

Mr. Ishizu recalls other families in the area who were farmers. There were the Kobayashi, the Nishimoto, and the Umeno Families. He recalls the Koga family owning a farm next to the subject area.

There was a mix of people from different ethnic backgrounds who lived in the Waiakoa area. Residents were of mainly Japanese, Portuguese, and Hawaiian ancestry. Mr. Ishizu added that many Caucasian people owned land. There were a few Chinese or Filipino people who lived in the area, and many of the Chinese people lived in Keokea.

Mr. Ishizu recalls the subject property only being used for pasture land and open space. He is not aware of any cultural practices or gatherings on the subject property. Should the proposed project proceed, Mr. Ishizu said that he was open to seeing development for family homes and thought that there should be more services for people in the area. Mr. Ishizu's mother continues to live in the same home that his family built over 50 years ago in Kula.

(2) **Dorothy Nakata**

The interview with Dorothy Nakata was carried out on May 24, 2007 in Kahului.

Mrs. Nakata was born in Ulupalakua in 1928 and was given the name Dorothy Toyoko Terada by her parents Mitsuji and Hatsume Nishiyama Terada. Her father was originally from Haleiwa, O`ahu. He relocated to Maui when he was 2 years old and was a bookkeeper for Ulupalakua Ranch. Mrs. Nakata's mother is originally from the Waiakoa area and was a homemaker and dressmaker. Mrs. Nakata has one (1)

brother and three (3) sisters. She currently lives in the Waiakoa area with her husband, Ronald and her daughter, Suzanne.

Although Mrs. Nakata grew up in Ulupalakua, she spent all of her childhood summers in Waiakoa helping her grandparents at their farm situated near Copp Road and King Kekaulike Highway. Mrs. Nakata noted that during her childhood, the ethnic mix in Waiakoa mainly included Portuguese and Japanese families, and some Caucasian families. These families operated ranches and farms in the Waiakoa area. There were a few Chinese families in the area and she added that many of them lived in Keokea. Mrs. Nakata stated that a majority of the Hawaiian families in the upcountry area lived in Ulupalakua.

Mrs. Nakata stated that there were two (2) stores that catered to the residents in the area. A third store, Morihara Store was located in close proximity to the project area near the Holy Ghost Catholic Church. The Morihara Store eventually relocated further south near Copp Road during the 1940's. The Morihara Store continues to service the residents of the Waiakoa area today. Mrs. Nakata also noted that residents either went to the Calasa Garage or the Migita Garage for gasoline or to get their cars fixed.

Back then, very few people went to the stores for their goods. Mrs. Nakata stated that many residents prepared their own foods. Women and children stayed home to make jellies, ketchup, and mayonnaise. They churned their own butter and sewed their own clothes. There was no need for a bakery, because the women would also bake their own baked goods. Mrs. Nakata added that many Portuguese parishioners from the Holy Ghost Parish were actively involved in baking Portuguese bread. She remembered the Gregulio and the Moniz families as having an active role in the church. Mrs. Nakata said that residents who knew parishioners from the church were very lucky if they were given Portuguese bread.

Mrs. Nakata added that situated near the Holy Ghost Church was the Kealahou School where Haleakala Waldorf School stands today. She added that Japanese movies would be shown at the school. Mrs. Nakata developed friendships with many of the other children who lived in the area. Some of her childhood friends included Ann Takahashi Masuda, Flora

Umeno and Bernice Takahashi Nagato who lived near the Holy Ghost Church.

Most of Mrs. Nakata's time was spent helping her grandparents on the farm, pulling weeds and harvesting vegetables. They worked from 6:00 in the morning to 7:00 in the evening. She added that back then, children didn't work for money, but worked for love. Farmers with no children depended on relatives with children to help them on the farms. She stated that farmers in those days did not rely on a sophisticated irrigation system to water the crops, so they depended on rain. Mrs. Nakata said that her grandparents grew cabbage, onions, carrots, tomatoes, potatoes, gobo, strawberries, and dried beans on their family farm. She assisted her grandparents with the harvesting of vegetables. Her uncle would travel into town on Mondays to sell their groceries at the market farmer's exchange. She would stay home on these days and do chores such as laundering, housework, etc.

Mrs. Nakata remembers that during her childhood, this part of Kula (Waiakoa) was bustling with agricultural activities. Farmers grew their own food and sold their produce at the markets during the weekdays. Families often picked their own fruit, and made jams and jellies out of peaches and poh berries.

There were many flower farmers in the area following WWII, including Mrs. Nakata's relatives. Her uncle had a large lot that he divided into sections which he used to grow upcountry flowers such as, proteas, carnations, babies breath and lilies. Her Uncle Shigeo Maeda and Aunt Fudeko Maeda, also grew proteas that they marketed in Honolulu.

During World War II, her uncle and aunt, Susumu and Hatsuyo Nishiyama established Wailuku Florist where they sold fresh cut flowers from their farm in Kula. Her cousin Ray Nishiyama eventually took over the family flower farm and continued growing flowers as well.

Mrs. Nakata said that she was aware of cultural practices by Japanese and Portuguese families in the area. Many Japanese families gathered together during the months of June, July, and August to celebrate the O-Bon Festival. Japanese residents from all parts of Maui would travel to Kula to

support their relatives and friends in celebrating the O-Bon festival. Japanese farmers gave O-Bon participants bags of vegetables to show appreciation for coming to Kula to celebrate the occasion. Portuguese families were heavily involved with the Holy Ghost Church and shared their culture with the families of various ethnic backgrounds.

Another cultural activity was the New Year celebration where the Japanese Community Association celebrated with big feasts at the Japanese church.

Mrs. Nakata would like to see more agricultural activity in the Waiakoa region. Throughout the years, she has seen a decline in agricultural activity and felt that many young farmers wanting to continue their family farms need support from the community and county. She also felt that farmers need assistance in obtaining water and providing farmers with opportunities to sell their produce. She felt that local farmers face a tough competition with mainland companies also selling their produce in the stores.

Mrs. Nakata also stated her concern about the reduction of forest land and its effect on the environment. She added that once trees are removed or cut down, they need to be replaced with other trees. She felt that trees were needed to mitigate drainage issues. Mrs. Nakata also stated that stealing, robberies, and fights have become major concerns in the community during recent years. She added that Kula was once a very close-knit community. Residents were cordial and got along well with one another. She hopes that the community will come together and have a sense of closeness that existed many years ago.

Mrs. Nakata stated that she enjoys the open country that Kula has to offer. She thought that the rural characteristic, the friendliness of the residents and the local "*aloha spirit*" were benefits to the community. She stated that she would like to see these benefits continue in the community for the benefit of our children and future generation. She likes the way people help one another. In closing, she stated, "*We need to keep our local aloha spirit in our community.*"

**c. Impact and Mitigation**

Based on the findings and recommendations of the archaeological report and

accounts presented by the interviewees, the proposed action is not anticipated to have an adverse effect on cultural practices.

9. **Air and Noise Quality**

a. **Existing Conditions**

There are no point sources of airborne emission in the immediate vicinity of the project site. The air in the Kula region is of good quality, with existing airborne pollutants attributable to automobile exhaust from the region's roadways. Other sources of airborne pollutants typically include dust and equipment emissions resulting from agricultural activities and smoke generated from sugar cane harvesting operations occurring in the Central Maui plain. These sources are intermittent and the generated particulates are quickly dispersed by the prevailing tradewinds.

Noise generated in the vicinity of the subject property may be attributed to natural (e.g. wind) conditions, traffic along Lower Kula Road, agricultural-related activity involving the intermittent operation of equipment, such as tractors, and trucks, and activity from the Kula Community Center.

b. **Impact and Mitigation**

Airborne particulates, including dust, may be generated during site preparation and construction. To minimize dust generation, dust fences, sprinklers and/or water wagons will be utilized during site preparation and construction. As soon as grading is complete, exposed areas will also be paved, grassed or permanently landscaped.

Ambient noise conditions will be temporarily affected by construction activities. Material-transport vehicles and power tools are anticipated to be the dominant noise-generating source during construction. As with air emissions, construction noise will be minimized through use of applicable BMPs. Construction work will be limited to daylight work hours.

Once operational, the proposed workforce housing project should not have an adverse impact on air or noise quality in the vicinity.

## **10. Scenic and Open Space Resources**

### **a. Existing Conditions**

Situated on the slopes of Haleakala, Kula provides expansive scenic views of the Central Maui isthmus, the off-shore islands of Lanai and Kaho`olawe, and the West Maui Mountains. From clearings throughout the project site, Maui's central isthmus and the northern and southern shorelines of Maui can be seen makai (northwest and southwest, respectively) of the project area. Mauka of the site Haleakala is visible.

### **b. Impact and Mitigation**

The proposed subdivision involves site-related grading and associated improvements. The subdivision configuration maintains density and spatial layout concept which, with the use of existing topographic character of the site will minimize adverse impacts to the visual character of the surrounding area.

Architectural and landscape designs, as well as grade differentials, will help to mitigate views of the sight from Kula Highway and along Kekaulike Highway. The proposed development is anticipated to not have an impact on scenic view, open space resources or adversely affect the visual character of the surrounding area.

## **B. SOCIO-ECONOMIC ENVIRONMENT**

### **1. Community Character**

#### **a. Existing Conditions**

From a regional standpoint, the project site is part of the Makawao-Pukalani-Kula Community Plan region. The region includes a diverse range of physical and socio-economic environments. The region's rural qualities are characterized by vast open space and natural resources, a clean environment, and abundant outdoor recreational opportunities. With its temperate climate, fertile soil, and sweeping views, Kula has grown steadily over the past few years. The area has attracted more residents and there has been a decrease in small farm activity.

b. **Potential Impacts and Benefits**

As noted earlier, the subdivision property is in proximity to other residential areas of similar character with structures, streets, and services of both rural and urban type. The proposed project will include single-family homes and agricultural lots that are reflective of the region's rural character. Included in the proposed project plans are four (4) large lots that will encourage the continuation of farming activities to occur near other farming communities in the area.

2. **Population**

a. **Existing Conditions**

The population of Maui County has exhibited relatively strong growth over the past decade with the 2000 population of 128,241, reflecting a 27.6 percent increase over the 1990 population of 100,504. Growth in the County is expected to continue, with resident population projections for the years 2010 and 2030, estimated to be 151,300 and 199,550, respectively (County of Maui Planning Department, June 2006).

Just as the County's population continues to grow, the resident population of the Kula region has also increased. The 2000 population of the Makawao-Pukalani-Kula region was 21,571. The population is projected to increase to 26,644 by the year 2010 and 30,880 by the year 2030 (County of Maui Planning Department, June 2006).

b. **Potential Impacts and Benefits**

Given the size and scope of the proposed action, impact on population is expected to be minimal. The proposed project is not considered a direct population generator from a long-term perspective. Instead, the project is anticipated to accommodate demands for housing by existing island residents.

While many purchasers are anticipated to be Upcountry residents, some of the prospective homeowners may relocate from other regions of the island, with the potential to incrementally increase population in the Makawao-Pukalani-Kula Community Plan region. Given the size of the project (116 lots), the increase in population is not expected to extend beyond the



projected growth parameters of the region defined by migration and birth/death rates.

### 3. Economy

#### a. Existing Conditions

Maui's economy is heavily dependent upon the visitor industry. The Kula region, with its fertile soil and cool climate conditions, has resulted in successful produce and flower generation for export to domestic and international markets. The vast lands of pasture grass has also enabled cattle ranching and alternative ranching activities, such as sheep and llama herding, which contribute to the economy.

#### b. Potential Impacts and Benefits

On a short-term basis, the proposed action will support construction and construction-related employment. In the long term, residential homeowners will require services related to home maintenance and improvement which is expected to further support local business owners. Real property taxes generated by the project will contribute to the County's revenue base to support any increase in regional public service demands over time.

### 4. Housing

#### a. Existing Conditions

In 2000, Maui County's housing supply totaled 56,377 housing units, representing a 31 percent increase from 1990. The Makawao-Pukalani-Kula area's housing supply in 2000 totaled 4,761 units, representing a 57% increase from 1990.

Countywide, owners lived in 44 percent of the occupied homes. Owner occupancy tended to be slightly higher in the Makawao-Pukalani-Kula region with 59 percent of the units being owner-occupied.

Housing values in Kula-Ulupalakua-Kanaio are noticeably higher than most of the Countywide housing supply. Whereas recent median home valuation for Maui County was \$630,000.00, the price median in the Kula-Ulupalakua-

Kanaio area was \$764,000.00 (Realtor Association of Maui, December 2007).

**b. Potential Impacts and Mitigation Measures**

As noted previously, there is a need for residential workforce housing in Maui County. The proposed action will address this need through the provision of housing intended for families earning up to 160 percent of the median annual income for the island of Maui. A residential workforce housing agreement setting forth the terms and conditions of provision of the workforce units will be executed by Kula Ridge, LLC and the County of Maui.

The proposed action is anticipated to have a positive economic effect during the construction phase of development as expenditures for construction and related support services are made. In the long term, the project is anticipated to accommodate demands for workforce housing by existing island residents.

**C. PUBLIC SERVICES**

**1. Police**

**a. Existing Conditions**

The County of Maui's Police Department is headquartered in Wailuku. The Maui Police Department (MPD) consists of several patrol, investigative and administrative divisions. The Wailuku or Central station, which serves the Haiku, Paia, Makawao, Pukalani and Kula regions is situated approximately 18.0 miles northwest of the project site. A police substation is located in Pukalani, about 5.3 miles northwest of the project site. A new police community service center will be located in the Kulamalu Town Center, approximately 1.0 mile northwest of the project site.

**b. Impact and Mitigation Measures**

The project will not extend the existing service area limits for emergency limits. As previously noted, real property taxes generated by the project will contribute to the County's revenue base to support police manpower requirements in the region.

2. **Fire**

a. **Existing Conditions**

Fire prevention, suppression and protection services are provided by the County Department of Fire Control. The Kula Station, which serves the region, is located off Kula Highway, approximately one-half mile southwest of the subject property. The Makawao and Paia fire stations lend additional firefighting support to the Kula region and are situated approximately 7.0 miles and 7.5 miles away from the project site, respectively.

b. **Impact and Mitigation Measures**

The proposed action is not anticipated to affect the service capabilities of fire operations. The project will not extend the existing service area limits for emergency services.

3. **Medical Services**

a. **Existing Conditions**

Maui Memorial Medical Center, the only major medical facility on the island, is approximately 19.0 miles to the northeast of the project site. Licensed for 231 beds, this facility provides acute, emergency, general, and obstetric care services. Several medical and dental care facilities are located in Makawao and Pukalani to serve Upcountry residents.

Kula Hospital is situated about 3.0 miles southwest of the project site. The hospital serves as a long-term care facility, that provides Alzheimers and dementia care services. An out-patient clinic for the area's residents operates from 8:00 a.m. to 4:30 p.m. on weekdays.

b. **Impact and Mitigation Measure**

The proposed action is not anticipated to affect the service capabilities of emergency medical operations. The project will not extend the existing service area limits for emergency services.

**4. Solid Waste Disposal**

**a. Existing Conditions**

Residential solid waste collection and disposal is provided once weekly by the County's Department of Environmental Management's Solid Waste Division. Solid waste generated in the Upcountry region is transported to the Central Maui Landfill off Pulehu Road, approximately 8.0 miles northwest of the project sites. Other than the Hana Landfill, the Central Maui Landfill is the only disposal site on the island of Maui which accepts County-hauled residential waste, commercially-hauled commercial waste, and self-hauled waste.

Privately owned facilities, such as the Maui Demolition and Construction Landfill and the Pohakulepo Concrete Recycling Facility, accept solid waste and concrete from demolition and construction activities. These facilities are located at Maalaea, northwest of the subject property, near Honoapiilani Highway's junction with North Kihei Road and Kuihelani Highway. A green waste recycling facility is present at the Central Maui Landfill.

**b. Impact and Mitigation Measure**

A solid waste management plan will be developed for the disposal or recycle of materials resulting from the site and construction activities, as appropriate. Once completed, it is anticipated that the project would be served by the County of Maui's solid waste collection operations, and is not expected to affect County services or infrastructure capacities for solid waste. Currently, the County of Maui's Solid Waste Division has recently opened a landfill expansion increment, estimated to provide the island with sufficient capacity for several years, which takes into account future growth of residential and non-residential uses. In addition, lands adjacent to the existing landfill are currently utilized for rock quarrying and will likely be available for County expansion of the landfill, further increasing available capacity.

**5. Education**

**a. Existing Conditions**

The State Department of Education (DOE) operates three (3) public schools

in the Upcountry region. They are: King Kekaulike High School for grades 9 to 12, Kalama Intermediate School for grades 6 to 8, and Kula Elementary School for grades K to 5. The State Department of Education capacity, enrollment and projected enrollment for the schools are as follows in **Table 3**.

**Table 3**

<b>ENROLLMENT ESTIMATES FOR KULA SCHOOLS</b>			
<b>School</b>	<b>Capacity for 2007-2008 School Year</b>	<b>Enrollment School Year 2007-2008</b>	<b>Projected Enrollment 2009-2010</b>
King Kekaulike High School (Grades 9 to 12)	1,339	1,354	919
Kalama Intermediate School (Grades 6 to 8)	1,118	894	650
Kula Elementary School (Grades K to 5)	565	455	375
Source: State of Hawai'i, Department of Education.			

There is an elementary, middle and high school primarily for persons of native Hawaiian ancestry, operated by Kamehameha Schools, located approximately eight (8) miles north of the subject property at Kulamalu. The Kamehameha Schools has an enrollment capacity of 1,100 students.

The region is also served by privately operated facilities, such as St. Joseph School (Grades K to 6), Haleakala Waldorf School (Grades K to 8), and Seabury Hall (Grades 6 to 12).

**b. Impact and Mitigation Measure**

The project involves the development of 116 improved residential lots and construction of single-family residences. The DOE general guidelines for student enrollment projections indicate that the proposed subdivision is anticipated to generate the new student enrollment as follows:

Elementary School .....	33 students
Middle School .....	14 students
High School .....	16 students
<b>Total .....</b>	<b>63 students</b>

Educational assessments are required for the Ridge Project as it meets the criteria of 50 units or more. Coordination between the applicant and the DOE has begun to ensure that the assessment policy provisions are appropriately addressed. Should impact fees be assessed and collected, they are assured to be earmarked for area schools, such as Kula Elementary, Kalama Intermediate, and King Kekaulike High School. Therefore, it is anticipated that these funds will assist in the upgrade and improvement to schools in the Kula-Upcountry area.

Coordination with the DOE and the State Land Use Commission will continue to ensure that assessment policy provisions are appropriately addressed.

**6. Recreational Facilities**

**a. Existing Conditions**

Kula Park is located southwest of the Ridge Project site, across Kula Highway and adjacent to Kula Elementary School. The park consists of the 10.3-acre Kula Ball Field, two (2) soccer fields, playground equipment, two (2) picnic tables, a restroom and two (2) parking areas.

Other neighborhood parks and facilities in close proximity include the Kula Community Center located to the immediate west of the project area. The Kula Community Center is an approximate 2,800 square foot building on seven (7) acres of land. The center has a stage, barbecue grill and restrooms. There is a community police office onsite. Macrame and folk dance classes are offered there. The center hosts weekly bingo games, Alcoholic Anonymous meetings and senior nutrition classes. Behind the community center is the Old Kula Center where Boy Scouts meetings and Dance Society classes are held. The Maui Farm Bureau is also located in this building. Recreational facilities on the property include two (2) tennis courts and a gateball court. The gateball court has a field house and a storage shed.

Harold Rice Park is located approximately 1.3 miles southwest of the project site. The 3.8-acre park contains a paved parking lot with 18 parking stalls, a restroom facility, picnic tables and a barbecue grill. Access to the Rice Park is located off of Lower Kula Road. Located about 4.2 miles southeast of project area is Keokea Park, which encompasses approximately 6.7 acres and includes a picnic pavilion with tables and barbecue grills, a playground area, a softball backstop, a portable backstop, two (2) storage sheds, a restroom facility and two (2) parking areas with a total of twelve (12) spaces.

Situated along the higher elevations of Haleakala, Polipoli State Park, and Haleakala National Park offers camping, hiking, and sight-seeing opportunities.

**b. Impact and Mitigation**

The applicant for the project is working with the Department of Parks and Recreation to ensure compliance with applicable park assessment requirements. In particular, it is the intent of the applicant to utilize the 3-acre park in the subdivision to address parks and playground assessment requirements. The applicant is also working with the Department of Parks and Recreation on roadway access improvements traversing the existing Kula Community Center property.

**D. INFRASTRUCTURE**

**1. Roadways**

**a. Existing Conditions**

Access to the Ridge Project site will be provided via a new access road off Lower Kula Road south of Alanui Place. Lower Kula Road lies southeast of the Kula Highway. Kula Highway is a predominately two-way, two-lane State of Hawai'i roadway, generally oriented in the north-south direction that serves as the primary access road through Upcountry Maui between Pukalani and Ulupalakua.

Also located in the project vicinity are Alanui Place and Copp Road. Alanui Place is a two-way, two-lane roadway that provides access to the residential



properties along its alignment. South of the intersection with Alanui Place, Lower Kula Road intersects Copp Road. Copp Road is a two-way, two-lane roadway oriented in an east-west direction providing access to the residential neighborhoods along its alignment.

A Traffic Impact Assessment Report (TIAR) was prepared by Wilson Okamoto Corporation, dated July 2006. See **Appendix "G"**.

A field investigation was conducted on May 31, 2005, June 1, 2005, and April 25 to 26, 2006 and consisted of manual turning movement count surveys during the morning peak period between 6:00 a.m. and 8:00 a.m., and the afternoon peak period between 3:00 p.m. and 6:00 p.m. at the following intersections:

- Lower Kula Road, Alanui Place, the Kula Community Center driveway;
- Lower Kula Road and Kula Highway (North);
- Lower Kula Road and Copp Road; and
- Lower Kula Road and Kula Highway (South).

In addition, 24-hour mechanical traffic count surveys were collected along Lower Kula Road and Kula Highway to verify the peak traffic periods in the project vicinity.

The highway analysis was consistent with procedures established in the "Highway Capacity Manual", (Transportation Research Board, 2000) and the "Highway Capacity Manual", developed by the Federal Highway Administration. The analysis is based on the concept of Level of Service (LOS), a qualitative and quantitative assessment of traffic operation, with LOS "A" representing ideal traffic operating conditions and LOS "F" representing unacceptable or congested traffic conditions. The existing LOS was recorded as follows:

1. Southbound at the intersection of Lower Kula Road and Kula Community Center driveways on Lower Kula Road, traffic operates at LOS "A" in the morning and afternoon peak hours. Eastbound traffic operates at LOS "A" in the morning and afternoon peak hours.

2. Westbound at the northern intersection of Kula Highway and Lower Kula Road, traffic operates at LOS “C” during the morning and LOS “B” during the afternoon peak hour. Northbound traffic operates at LOS “A” during the morning and afternoon peak periods.
3. Northbound traffic at the intersection of Copp Road and Lower Kula Road, traffic operates at LOS “A” during the morning and afternoon peak hours. Eastbound traffic operates at LOS “A” during both morning and afternoon peak hours.
4. Westbound traffic at the southern intersection of Kula Highway and Lower Kula Road operates at LOS “B” in the morning peak hour and LOS “A” in the afternoon peak hour. Southbound traffic operates at LOS “A” during the morning and afternoon peak periods.

**b. Impact and Mitigation**

Access to the proposed project site will be available off of Lower Kula Road, via an existing 56-foot wide utility and access easement road. The easement road traverses along the southern boundary of the Kula Community Center to the southwest corner of the proposed project site. The driveway pavement section will be 24 feet wide for ingress and egress.

In accordance with County requirements, roadway improvements consisting of concrete curbs, gutters, and sidewalks will be constructed along the frontage of the property to Lower Kula Road.

Access off of Lower Kula Road on the northern boundary of the project has been considered, however, it has been determined to be infeasible, given that the topographic conditions to the north of the Kula Community Center does not provide for a viable second access point.

An analysis of the changes in traffic volumes at the study intersections concluded that during the weekday morning peak hour, traffic volumes at all intersections are expected to remain the same.

The following recommendations have been advanced by the TIAR:

1. Maintain sufficient sight distance to motorists to safely enter and exit

all project roadways.

2. Provide adequate onsite loading and off-loading service areas and prohibit offsite loading operations.
3. Provide adequate turn-around area for service, delivery, and refuse collection vehicles to maneuver on the project site to avoid vehicle-reversing maneuvers onto public roadways.
4. Provide sufficient turning radii at all project roadways to avoid or minimize vehicle encroachments to oncoming traffic lanes.
5. Provide exclusive left-turn and right-turn lanes on the westbound approach of Lower Kula Road at the northern intersection with Kula Highway to minimize the impact of left-turning vehicles on the higher volume of right-turning vehicles on that approach.

## 2. Water

### a. Existing Conditions

Water service to the Makawao-Pukalani-Kula Community Plan region is provided by the County Department of Water Supply (DWS). The Kula system consists of an upper and lower system, with the upper system located at the 4,000 foot elevation, and the lower system originating at the 3,000 foot elevation. The Lower Kula System serves the Omaopio, Olinda, and lower Kula communities, while the Upper Kula System serves the remaining communities. The upper system collects water from Haipuaena, Puohakamoa, and Waiakamoi Streams, while the lower system diverts water from the Haipuaena, Puokakamoa, Waiakamoi, and Honomanu Streams.

The DWS operates a water treatment plant at Olinda with a capacity of 1.7 million gallons per day (MGD). Major storage reservoirs supporting the Upper Kula System include a 10 million gallon (MG) upper Waiakamoi dam/reservoir, a lower Waiakamoi concrete dam, two (2) 15 MG Waiakamoi concrete tanks, and a 3 MG Olinda steel tank. The recently constructed Kahakapao Reservoirs, consisting of two (2) 50 MG reservoirs in the vicinity of the Waiakamoi Reservoirs, also provide additional storage capacity for the upper system. During dry periods, the Kula system is supplemented by water pumped from the Makawao system.

Water storage for the area is currently provided by the Omaopio tank located approximately 1,200 feet to the northeast of the project site. It has a capacity of 2.1 million gallons at an elevation of 3,890 feet. An existing 8-inch waterline along Lower Kula Road in the vicinity of the project site conveys water from the Omaopio tank. There is an existing fire hydrant located near the Kula Community Center.

**b. Impact and Mitigation**

The proposed Ridge Project is estimated to require approximately 83,200 gallons of domestic water per day. See **Appendix "H"**. For this calculation, it is assumed that each 4-acre large lot will develop both a main residence and an accessory dwelling unit. The affordable and smaller market-priced lots will be limited to one (1) dwelling. The subdivision will meet DWS standards for fire flow demand of 1,000 gallons per minute for a two (2) hour duration and 500 gallons per minute for a two (2) hour duration for agriculture. Fire hydrants will be installed with a maximum spacing of 350 feet for residential areas and 500 feet in the agricultural areas.

Kula Ridge, LLC is pursuing the development of an offsite well at an elevation of 2,900 feet on the adjacent Mauka Subdivision parcel identified as TMK (2) 2-3-001:023. The ground water well is anticipated to yield approximately 1,000,000 gallons of water per day. The owner of the Mauka Subdivision, Kula Ridge Mauka LLC, will enter into a partnership with Kula Ridge LLC for the development of this water source, to service both parcels. Water will be pumped from the well site to a new 500,000 gallon storage tank to be located near the mauka boundary of the Mauka Project at an elevation of approximately 3,600 feet. Refer to **Figure 14**.

The 500,000 gallon storage tank will have two (2) distribution lines to service the Ridge Project and the Mauka Subdivision. Distribution lines will be located along the north side of Keahuaiwi Gulch and along the south side of the gulch. Water from the tank will be transported across Keahuaiwi Gulch to the proposed Ridge Project by a new 8-inch transmission line. Refer to **Figure 21**. The north side distribution line will have pressure break tanks to control the water service pressures, servicing the Mauka Project.



**Photo No. 1:** View of Gulch Facing East (Mauka)



**Photo No. 3:** View of Gulch Facing South



**Photo No. 2:** View of Gulch Facing West (Makai)



**Photo No. 4:** View of Gulch Facing North

Source: Kula Ridge, LLC

**Figure 21**



Prepared for: Kula Ridge, LLC

**Proposed Kula Ridge Residential  
Workforce Housing Subdivision**  
Photographs of the Existing  
Conditions at Keahuaui Gulch

NOT TO SCALE



MUNEKIYO & HIRAGA, INC.

The applicant will undertake coordination with the DWS regarding standard requirements pertaining to this water source, and is planning to develop the well, the storage tanks, and the transmission lines according to County standards. In the event that the well produces a sufficient yield with good water quality, the applicant will discuss with the DWS, opportunities for dedicating this well to the County of Maui. The proposed water system is anticipated to improve storage and source in the service area.

In accordance with the rules of the DWS, calculations for domestic and fire protection use will be submitted to DWS in connection with the processing of the project's subdivision approval.

3. **Wastewater**

a. **Existing Conditions**

There are no public sewer facilities in this part of Maui. Wastewater in the Kula region is treated, processed and filtered through cesspools or septic tanks. The County of Maui does not serve the area.

b. **Impact and Mitigation**

The average wastewater flow rates for the project area were estimated using County of Maui standards. It is estimated that the wastewater contributions from the subdivision will be approximately 40,600 gallons per day. See **Appendix "H"**.

The applicant has been granted a variance from the State Department of Health to utilize Individual Wastewater Systems (IWS) and is coordinating with Best Industries USA, Inc., to install and maintain IWS for the 112-lot residential and 4-lot rural subdivision. The approved aerobic Individual Wastewater Systems (IWS) as the means of wastewater treatment disposal for each lot meets the requirements of Hawai'i Administrative Rule (HAR), Title 11-62, Section 33.1. (b) (2). A single IWS will be provided per lot and will consist of an aerobic unit, chlorinators, and horizontal soil absorption system or surface disposal system. Refer to **Appendix "I"**.



Each (IWS) unit will be required have an operation and maintenance (O&M) program to ensure optimal performance. This O&M program will be written into each deed and will require that an annual report of its quality be sent to the Department of Health. The IWS in the Kula Ridge Subdivision will be maintained by Best Industries USA, Inc.

4. **Drainage**

a. **Existing Conditions**

Keahuaiwi Gulch is located on the north side of the subdivision site and extends east to west. Based on the United States Geological Survey Map and the Federal Emergency Management Agency, the estimated flow for a 50-year storm from the project site is 55.66 cubic feet per second (cfs) in a northeast to southwest direction toward adjacent properties. There are no existing drainage improvements located on the project site. A portion of the runoff sheetflows directly into Keahuaiwi Gulch. The runoff eventually discharges into the ocean. Refer to **Appendix "H"**.

b. **Impact and Mitigation**

It is estimated that the 50-year storm runoff will create a net increase of 108.93 cfs of sheetflow from the subdivision site resulting in a post development total of 164.59 cfs. There will be an onsite detention basin located on the northwestern corner of the subdivision. This basin will hold the runoff generated by the development of the proposed project. Runoff from throughout the subdivision will be channeled into the retention basin by grated catch basins located within grassed shoulder areas.

Overflows from the detention basin will be allowed to sheetflow into Keahuaiwi Gulch at a rate less than the existing condition. The detention basin will be sized to accommodate the increase in surface runoff volume from a 50-year, 1-hour storm generated from the proposed project.

The proposed drainage improvements will be designed to ensure that the natural pattern of the existing onsite surface runoff will not be adversely impacted by the proposed action. Drainage design criteria to minimize

alterations will be in accordance with the drainage standards for the County of Maui.

5. **Electrical, Telephone, and Cable Television Services**

a. **Existing Conditions**

Electrical and telephone services for the Kula region are provided by Maui Electric Company, Ltd. and Hawaiian Telcom, respectively. Developed properties within the vicinity of the project site are served by overhead electrical and telephone distribution systems along Lower Kula Road. Refer to **Appendix “H”**.

b. **Impact and Mitigation**

Electrical and telephone distribution systems in the subdivision will be installed underground from Lower Kula Road to reduce visual impacts. Early design coordination will be undertaken with utility companies to ensure that services can be provided in accordance with the project development schedule. Electrical services will be provided by Maui Electric Company, Ltd. (MECO). Coordination with Maui Electric Company will be done to ensure that the project will meet electrical requirements. The proposed project is not anticipated to adversely affect electrical or communication systems. Street lights will be installed along subdivision streets with the design to be determined by the project’s electrical engineer, in coordination with MECO and in conformance with applicable State and County standards. All lighting within the subdivision will be fully shielded.

Telephone service will be provided by Hawaiian Telcom and cable television service by Time Warner Oceanic Cable.



### **III. CUMULATIVE AND SECONDARY IMPACTS**

### III. CUMULATIVE AND SECONDARY IMPACTS

Cumulative impacts are defined as the impact on the environment which results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions.

In this instance, there are two Ridge Project elements which relate to the proposed development of the 272-acre Mauka Subdivision project. First, 11 of the workforce housing units proposed in the Ridge Project will be used to meet the RWFH requirements for the 21-lot Mauka Subdivision. Second, water service for the Ridge Project is being provided via offsite water system improvements located on the Mauka Subdivision project. These improvements include a new water source well, a 500,000 gallon storage tank and water distribution lines.

This chapter addresses impact considerations associated with the Mauka Subdivision project given its relationship to the Ridge Project.

#### A. PHYSICAL SETTING

##### 1. Surrounding Land Uses

Offsite water improvements will occur on the Mauka Subdivision project area. The improvements include the construction of a groundwater well at the 2,900 ft elevation, the installation of a water storage tank at the 3,600 ft. elevation and the installation of waterlines to service both the Mauka Subdivision and the Ridge Subdivision project areas. The proposed groundwater well will be located more than 1,000 ft. from the nearest private water septic system. The proposed groundwater well and water storage tank are not anticipated to have an adverse impact on surrounding uses. The development of these facilities is consistent with existing agricultural and rural uses in the area.

Underground water utility line installation will traverse the Keahuaiwi Gulch. No human activities involving recreation or marine activities occur where the waterline is anticipated to cross Keahuaiwi Gulch. The gulch, where the trenching and backfilling will occur, consists of rocks and boulders and is typically dry, except

when it rains. Scrub vegetation, grasses and trees border the area. The waterline will traverse across existing pastureland to service the proposed subdivision. Coordination with the Department of the Army and the State Commission on Water Resource Management will be undertaken to ensure that applicable permits are secured for the work within the gulch.

A portion of the property is County zoned “Interim” and designated “Single-Family” and “Rural” by the Makawao-Pukalani-Kula Community Plan. The Mauka Subdivision also includes the proposed creation of 21 agricultural lots ranging in size from 3 acres to 41 acres. The proposed agricultural subdivision is consistent with the property’s underlying State “Agricultural” district, Makawao-Pukalani-Kula “Agricultural” land use category, and County “Agricultural” zoning designation. The development of the proposed subdivision will be undertaken in accordance with applicable provisions of the County’s subdivision ordinance as well as other applicable State statutes and County ordinances and rules. The development of the proposed subdivision is not anticipated to be in conflict with surrounding land uses.

## **2. Topography and Soil Characteristics**

The lands underlying the site for the proposed Mauka Subdivision project and offsite water improvements contain soil consisting of Kula Cobbly Loam, 12 to 20 percent slopes (KxaD) and Rock Land (rRK). Refer to **Figure 18**. Kula Cobbly Loam is characterized as having moderately rapid permeability, medium runoff and moderate hazard of erosion. Soil type Rock Land is associated with Keahuaiwi Gulch. Rock Land is characterized as having exposed rock covering 25 to 90 percent of the surface, rock outcrops, and very shallow soils (Decision Analysts Hawai‘i, Inc., December 2007).

Temporary environmental effects due to the construction of an offsite water system in the project area are anticipated to occur. A 2,900-foot groundwater well will be constructed on the Mauka Subdivision site. A storage tank will be provided at the 3,600 ft. elevation. A single trench will be excavated in the Keahuaiwi Gulch to facilitate the installation of the waterline that will cross the gulch and service the Ridge Project. Additionally, grading activities will be needed to construct roadway improvements for the 21-lot Mauka Subdivision.

In all instances where grading work will be required, whether it be for water system

improvements or subdivision improvements, applicable permits and approvals will be secured. In this connection Best Management Practices will be employed to ensure that impacts of site-related grading are minimized. Grading plans for the subdivision will be designed to minimize cut and fill quantities, and are not expected to result in post-grading topographic conditions which are significantly different than existing conditions.

Collectively, grading work on both the Mauka Subdivision and the Ridge Project is not anticipated to create adverse topographic conditions or involve soil conditions which are limiting to the provision housing development.

3. **Agricultural Productivity Considerations**

An assessment of the agricultural feasibility and potential impacts on agriculture at Mauka Subdivision was prepared (Decision Analysts Hawai'i, Inc., December 2007).

The three classification systems commonly used to rate soils in Hawaii are: (a) Land Capability Grouping, (b) Agricultural Lands of Importance to the State of Hawaii, and (c) Overall Productivity Rating. The following identifies the ratings for the soils underlying the Mauka Project site:

a. **Land Capability Grouping**

Approximately 233 acres of the Mauka Subdivision site soils are rated IVe. Class IV soils have very severe limitations that reduce the choice of plants, or require very careful management, or both. The subclassification "E" indicates that the soils are subject to severe erosion if they are cultivated and not protected.

The remaining 40 acres of the site are rated VIIs. Class VII soils have very severe limitations that make them unsuitable for cultivation and restrict their use largely to pasture. The subclassification "S" indicates that the soils are rocky or stony.

b. **Agricultural Lands of Importance in the State of Hawaii (ALISH)**

About 233 acres of the Mauka Subdivision site have soils that are rated

“Other”, while the remaining 40 acres are “Unclassified”. Refer to **Figure 19**. The unclassified soils are associated with Keahuaiwi Gulch.

c. **Overall Productivity Rating**

About 233 acres of the Mauka project site have soils that are rated “D”, while the remaining 40 acres are rated “E”. The E soils are associated with Keahuaiwi Gulch.

Historically, the Mauka Subdivision project site has been and continues to be used for grazing cattle and horses. The site is not and was never part of a sugarcane or pineapple plantation. The proposed subdivision of the property into 21 agricultural lots ranging in size from 3.0 acres to 41 acres will allow for continued agricultural use. For example, based on existing agricultural lots in the surrounding area and in other farm communities, it is anticipated that commercial or casual farming and ranching activities may be carried out at the Mauka Subdivision.

In this regard, the Mauka Subdivision and Ridge Project, when taken together, are not anticipated to adversely affect agricultural productivity parameters in the region.

4. **Flood and Tsunami Hazards**

As reflected in **Figure 20**, both the Mauka Subdivision and the Ridge Project are located in flood Zone “C”, an area of minimal flooding. Cumulative impacts resulting from the development these projects are not anticipated to pose a flood hazard. Post development drainage mitigation measures will be implemented to ensure that adjacent and downstream properties will not be adversely affected by the proposed projects. Because the region is located upland, there are no threats to the surrounding area from coastal wave action. The development of both projects is not anticipated to result in drainage or flooding conditions which are adverse from a cumulative standpoint.

5. **Flora and Fauna**

A Biological Resources Survey of the Mauka Subdivision lands was conducted by Robert W. Hobdy (Hobdy, October 2006). Vegetation on the project site and within Keahuaiwi Gulch includes small weeds and ferns. Eleven (11) native plant species

were recorded on the property. All of these native species are widespread and common throughout Hawaii. In addition, there were no known rare or endangered species of fauna or avifauna identified in the vicinity of the proposed offsite water improvements. Accordingly, the proposed development is anticipated to have no significant negative impact on those elements of the natural environment. Collectively, the development of both the Mauka Subdivision and the Ridge Project is not anticipated to create an adverse effect on flora or fauna resources.

## **6. Archaeological Resources**

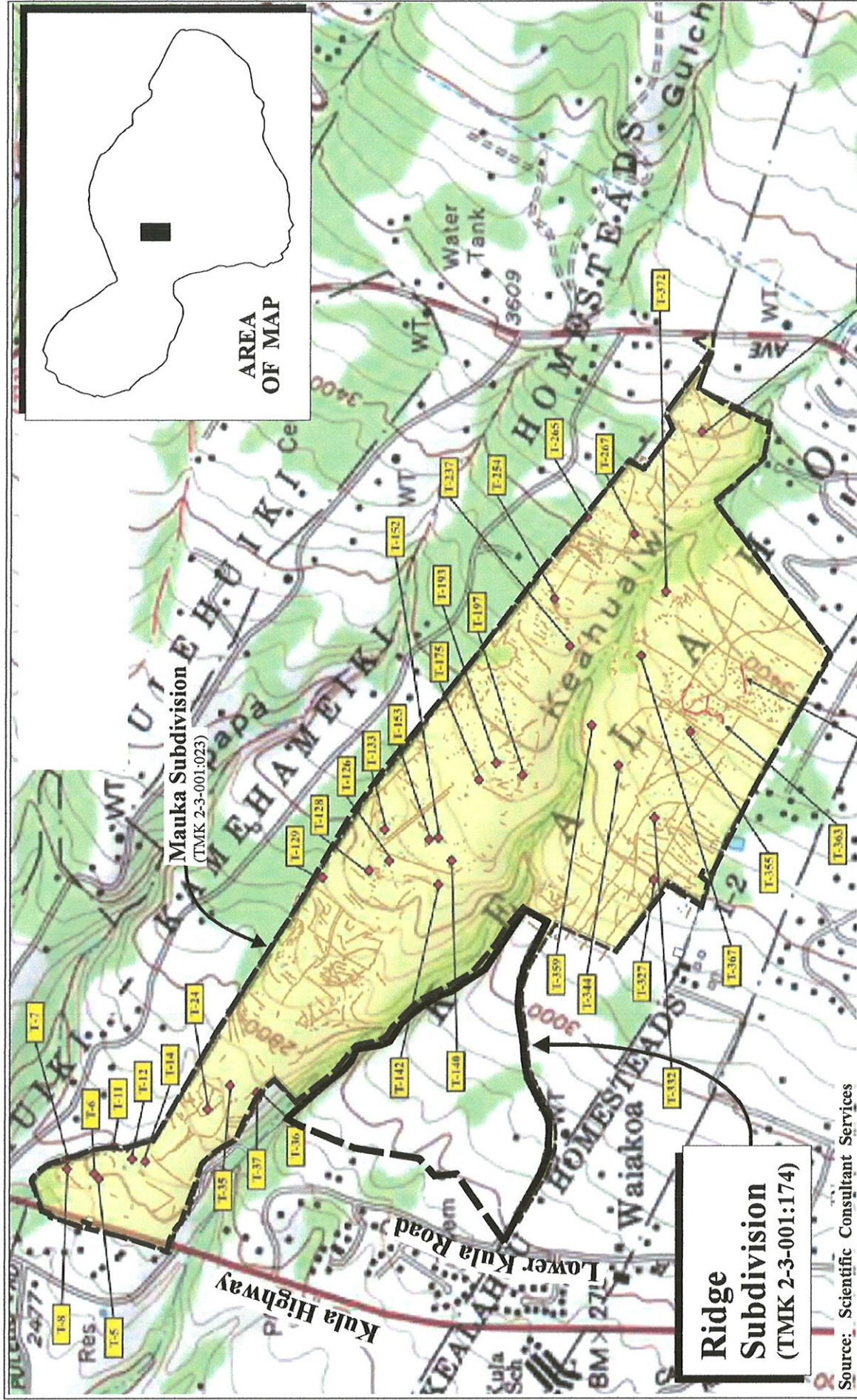
An Archaeological Inventory Survey was conducted on the Mauka Subdivision project site covering approximately 272 acres. See **Appendix “J”**. The survey identified 39 sites and agricultural features to be significant for information content under Criterion D. See **Figure 22**. A petroglyph site was identified and is significant under Criterion D and E. The proposed water storage tank and transmission lines will be designed to avoid the identified sites and agricultural features. Data Recovery or Preservation has been recommended for several sites on the Mauka Subdivision project area.

In the event that archaeological resources are encountered during earth altering activities, work will be halted in the area of the find and appropriate protocols will be followed in coordination with the State Historic Preservation Division and the Maui/Lanai Islands Burial Council. Archaeological features will be treated in accordance with current State preservation law and administrative rules for the treatment of inadvertent discoveries, including required coordination with the Maui/Lanai Islands Burial Council.

## **7. Cultural Impact Assessment**

Based on the findings and recommendations of the archaeological reports prepared for the Ridge Project and the Mauka Subdivision, and accounts presented by interviewees of the Ridge Project, the proposed developments in the region are not anticipated to have an adverse effect on cultural practices.





Source: Scientific Consultant Services

**Figure 22**  
**Proposed Kula Ridge Residential Workforce Housing Subdivision**  
**Archaeological Site Locations and Agricultural Features at Kula Ridge Mauka**

NOT TO SCALE



Prepared for: Kula Ridge, LLC



NishikawaKulaaH 1107archaeologicalsite

**8. Air and Noise Quality**

The construction phase of the Mauka Subdivision project will generate noise generated from construction equipment, similar to the Ridge Project. The construction duration for the Mauka Subdivision project is estimated to be 12 to 18 months. Construction activities will be limited to daylight hours and Best Management Practices will be implemented to ensure compliance with applicable noise standards set forth by the Department of Health. After construction, noise generated from the Mauka Subdivision will be limited to local traffic and agricultural-related activities. These sources however, are not anticipated to create adverse noise conditions given the surrounding land use context.

Air quality will also be temporarily affected during subdivision construction activities and water system improvements installation. Best Management Practices will be used during construction to minimize fugitive dust emissions associated with construction. Post-construction air quality is not expected to differ from existing conditions. Farming activities may result in the generation of dust on a temporary basis. However, the effects of small-scale farming on air quality is not anticipated to be adverse.

Collectively, the Mauka Subdivision and the Ridge Project are not anticipated to create adverse noise and air quality conditions.

**9. Scenic and Open Space Resources**

The Mauka Subdivision will continue the agricultural land use context on the property's 272 acres. The development of the subdivision will enable construction of farm dwelling and related structures. However, such structures will be required to comply with zoning performance standards relating to height, setbacks and lot coverage, as set forth by Chapter 19.30A of the Maui County Code. Open space, park areas and large residential lots at the mauka portion of the Ridge Project will be provided to create a greenbelt and maintain the rural characteristic of the region. The Ridge Project will result in a change in the man-made landscape with the development of 116 house lots. This change however, is not considered out of context when considering the architectural character of the proposed house designs and the need for workforce housing.



## **B. SOCIO-ECONOMIC ENVIRONMENT**

### **1. Community Character**

The Mauka Subdivision and the Ridge Project are located in the Waiakoa region of Kula. The region's rural qualities are characterized by agricultural pursuits, outdoor recreational opportunities, and open space and natural resources. The areas within Waiakoa contain agricultural uses and low-density rural residential uses.

Overall, the Kula region has grown steadily over the past few years with the development of the Kulamalu Town Center located approximately 1.0 mile northeast of the project site and the Department of Hawaiian Homelands Waiohului Homestead Community located south of the project site. The project area is also located in close proximity to urban and rural uses, such as the Kula Community Center, Holy Ghost Catholic Church, several small business establishments, and schools which include Kula Elementary School and Haleakala Waldorf School. Residential workforce housing would be provided in close proximity to these neighborhood services.

Both projects are proposed to be built with the intention of maintaining the character of the region while meeting the need for additional housing in the community.

### **2. Population and Housing**

Resident population in the Makawao-Pukalani-Kula region is projected to increase to 26,644 by the year 2010 and 30,880 by the year 2030 (County of Maui Planning Department, June 2006). A significant increase in housing supply will be needed to accommodate the region's anticipated growth. The project will provide residential workforce housing opportunities in both the near and long term, which in turn is anticipated to result in a more balanced housing market. The proposed projects respond to the demand of a growing need for homes in the region.

### **3. Economy**

The natural and agricultural settings in the region provide opportunities to maintain and enhance the region's economic base. The Waiakoa region includes opportunities that can contribute to the economic well-being of the County of Maui. It is anticipated that commercial or casual farming and ranching activities will be carried

out at the Mauka Subdivision, thereby providing opportunities for agricultural diversification.

Development of both the Ridge Project and Mauka Subdivision are expected to involve construction over a period of approximately 12 to 18 months and support construction related employment. In the long term, real property taxes generated by the project will contribute to the County's revenue base to support any increase in regional public service demands over time.

## C. PUBLIC SERVICES

### 1. Police, Fire, and Medical Services

The combined developments in the region will not extend the existing service area limits for police services, fire protection operations, or medical services.

### 2. Education and Recreational Facilities

The combined development of both projects includes 116 improved residential lots, the construction of single-family residences and 21 agricultural lots. Cumulative impacts of both developments are anticipated to result in a slight increase in student population. This impact is anticipated to be mitigated by educational impact fees as determined by the DOE.

The development of both projects will also result in increased land for park areas and improvements to existing recreational facilities in the vicinity. The Mauka Subdivision project will address the County's parks and playground requirements through the payment of fees. It is noted that Kula Ridge Mauka LLC, the owner of the Mauka Subdivision property also owns the lands underlying the Kula Community Center. An alternative means of addressing the parks and playground requirements for the Mauka Subdivision therefore, includes the dedication of lands underlying the Kula Community Center. Kula Ridge Mauka LLC will coordinate with the Department of Parks and Recreation to address the County's parks and playground requirements.

As previously noted, the Ridge Project will meet the parks and playground assessment requirements through the provision of a three (3)-acre park site adjacent

to the Kula Community Center.

Collectively, both projects will meet their respective obligations for parks and playgrounds.

**3. Solid Waste Disposal**

A solid waste management plan will be developed for the disposal or recycle of materials resulting from construction and site activities. Solid waste generated during the construction of both projects are anticipated to be recycled or disposed in an approved construction landfill site.

The Public Facilities Assessment Update County of Maui prepared by R.M. Towill Corporation (R.M. Towill Corporation 2002) indicates that the Central Maui Landfill will have adequate capacity to accommodate residential and commercial waste through the year 2025. The study took into account future growth of residential and non-residential uses on Maui. In addition, lands adjacent to the existing landfill are currently utilized for rock quarrying and will likely be available for County expansion of the landfill, further increasing available capacity.

**D. INFRASTRUCTURE**

**1. Roadways**

A traffic study that was prepared for the Makua Project shows traffic patterns within the Waiakoa region along Kula Highway and Lower Kula Road and the potential impacts of the proposed Ridge Project and the Kula Senior Housing project (Wilson Okamoto, December 2006).

Each potential development was analyzed separately and then integrated into the study area to account for trips generated by all proposed developments in the region. Total traffic volumes entering the traffic study's subject intersections along Kula Highway are expected to increase by approximately 2 to 3 percent during both peak periods with the proposed developments. These increases in the total traffic volumes are in the range of daily volume fluctuations along the highway and represent a minimal increase in the overall traffic volumes.

The TIAR indicated that cumulative traffic volumes and operating conditions with the proposed projects are generally expected to remain similar to existing conditions in the Waiakoa area.

**2. Water**

Kula Ridge Mauka LLC, in partnership with Kula Ridge LLC is proposing to drill a ground water well at the 2,900 ft. elevation of the Mauka Subdivision site. The groundwater well is anticipated yield approximately 1 million gallons per day (mgd) and serve both the Ridge and Mauka projects. Development of the groundwater well involves the construction of a 500,000 gallon tank at the 3,600 ft. elevation and distribution lines to service both projects.

The project's water system may provide opportunities for water service beyond the project's limits. Should opportunities for joint development of water storage and conveyance systems become available, the project's water system has been formulated with the notion that integration with adjoining properties' water systems can be accomplished.

**3. Wastewater**

The Ridge Project has secured a wastewater variance for the installation of individual wastewater systems for each of the 116 residential lots. Each agricultural lot in the Mauka Subdivision will also have individual wastewater systems. Collectively, the two projects will not place additional burdens on the County for wastewater resources.

**4. Drainage**

The development of both the Ridge Project and the Mauka Subdivision are not expected to have significant adverse effects on downstream properties or coastal marine waters. Post development runoff from both the Ridge Project and the Mauka Subdivision is estimated to be 711.4 cfs, an increase of 211.3 cfs over existing conditions. All additional runoff due to the development of the subdivisions will be retained onsite. Overflows from the detention basins at both the Ridge Project and the Mauka Subdivision will be allowed to sheetflow into Keahuaiwi Gulch at a rate less than the existing conditions. (Otomo Engineering, Inc., February 2008.)

**5. Electrical, Telephone and Cable Television Services**

Electrical, Telephone, and Cable Television Services for the Mauka Subdivision will be provided by Maui Electric, Hawaiian Telcom, and Oceanic Cable respectively. All utility lines servicing the projects will be installed underground. On a cumulative basis, the projects are not anticipated to adversely affect electrical or communication systems.

**E. OTHER PLANNING CONSIDERATIONS**

It is noted that the County of Maui's ongoing General Plan update process will involve the formulation of a Maui Island Plan which would delineate urban and rural growth boundaries. Other landowners in the vicinity may seek to have portions of their respective land holdings placed on the Maui Island Plan for purposes of defining future development potential in the Kula region. Should lands other than the proposed Ridge Project be identified as potential future areas for urban and/or rural growth, planning for such areas would need to consider land planning integration opportunities. Upon completion of the General Plan update, the respective community plans, including the Makawao-Pukalani-Kula Community Plan, will be updated. The timeframe for the overall completion of the updating of the community plans has not yet been established. However, the overall timeframe for the General Plan covers a planning horizon up to the year 2030.

**F. SECONDARY IMPACTS**

A secondary impact associated with the Ridge Project and the Mauka Subdivision relates to the development of the new water source on the Mauka Subdivision property. As previously noted, the well yield is estimated to be 1.0 mgd while the daily average consumption demands for the Ridge Project and the Mauka Subdivision are 83,200 mgd and 300,000 mgd, respectively. These estimates indicate an excess availability of water of approximately 616,800 mgd which may be used by others seeking to build homes or use their properties for a higher use. Alternatively, the source may be dedicated to the County of Maui, DWS should they determine that source acquisition holds public value and benefit. In both instances, the availability of water will allow for additional growth, which up to this point in time has been constrained due to the lack of water.

# **IV. RELATIONSHIP TO GOVERNMENTAL PLANS, POLICIES AND CONTROLS**

## **IV. RELATIONSHIP TO GOVERNMENTAL PLANS, POLICIES AND CONTROLS**

This section discusses the relationship of the proposed Ridge Project to applicable State and County land use plans, policies and controls.

### **A. STATE LAND USE DISTRICTS**

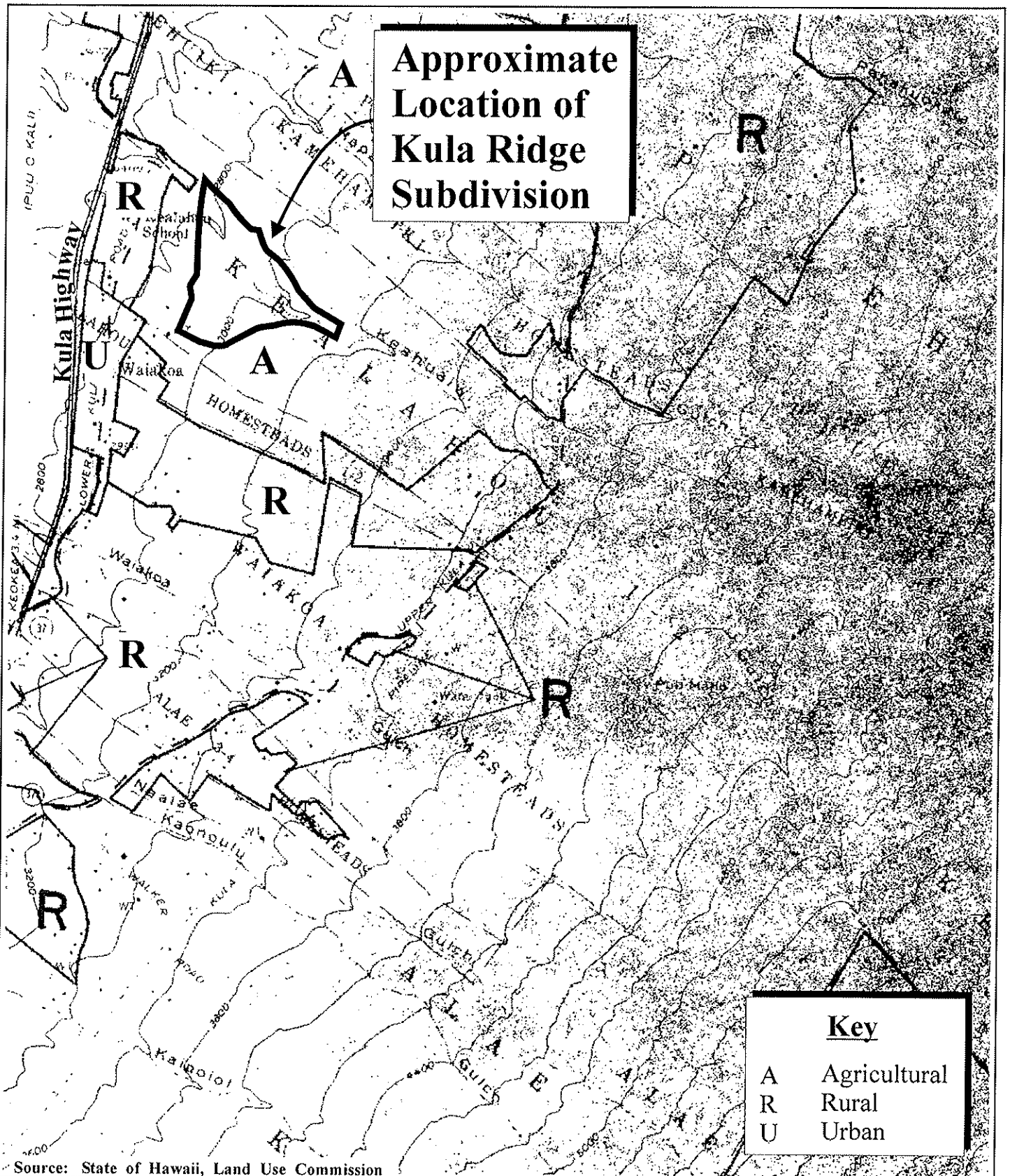
Pursuant to Chapter 205, Hawai'i Revised Statutes, all lands in the State have been placed into one (1) of four (4) major land use districts by the State Land Use Commission. These land use districts are designated "Urban", "Rural", "Agricultural", and "Conservation". The project site is classified "Agricultural". See **Figure 23**.

A State Land Use District Boundary Amendment from the "Agricultural" District to the "Urban" and "Rural" Districts is being requested as part of the entitlement requirements to bring consistency between the State Land Use District boundaries and the Kula Ridge Project. Refer to **Figure 16**. This 48.12-acre area will contain a workforce housing component integrated with market-priced housing (including four (4) large lots), open space, and a 3-acre park. Of the 48.12 acres, 31.87 acres are proposed to be reclassified from the Agricultural District to the Urban District. The remainder of the project area (16.25 acres) is proposed to be reclassified from Agricultural to Rural District.

Criteria considered in the reclassification of lands are set forth in the State Land Use Commission Rules (Chapters 15-15-58 and 15-15-21, Hawai'i Administrative Rules). The proposed reclassification of the 48.12 acres within the Project Area from "Agricultural" to "Urban" and "Rural" has been analyzed with respect to the criteria, as discussed below.

### **B. LAND USE COMMISSION RULES, CHAPTER 15-15, HAWAII ADMINISTRATIVE RULES (HAR)**

The proposed reclassification of the subject property has been analyzed with respect to standards of the Urban District set forth in Chapter 15-15-18, HAR and standards for the Rural District set forth in Chapter 15-15-21, HAR.



Source: State of Hawaii, Land Use Commission

Figure 23 Proposed Kula Ridge Residential Workforce Housing Subdivision  
 State Land Use District Classifications

NOT TO SCALE





## **Urban District Standards (Chapter 15-15-18, HAR)**

Chapter 15-15-18, HAR pertains to standards for determining Urban District Boundaries.

- (1) It shall include lands characterized by “city-like” concentrations of people, structures, streets, urban level of services and other related land uses.

**Comment:** The subdivision property is in proximity to residential subdivisions of a similar character, with structures, streets, and services of an urban type. In this context, the subject property is in immediate proximity to developed residential areas

- (2) It shall take into consideration the following specific factors:

- A. Proximity to centers of trading and employment except where the development would generate new centers of trading and employment.

**Comment:** The area proposed for reclassification is located approximately 8.0 miles to Makawao Town and approximately 6.0 miles to Pukalani Town. The proposed Ridge Project will provide a residential community in proximity to key employment centers in both towns, as well as generate employment opportunities associated with home building and maintenance services.

- B. Availability of basic services such as schools, parks, wastewater systems, solid waste disposal, drainage, water, transportation systems, public utilities, and police and fire protection.

**Comment:** The area proposed for reclassification will be serviced by infrastructure and public services without creating capacity and operational constraints. Appropriate onsite and offsite infrastructure improvements will be provided by the applicant as reported in the Preliminary Engineering Report. Refer to **Appendix "H"**. The area is located in close proximity to major existing roadways, such as Kula Highway, and includes a planned internal transportation system of collector and local roads.

The project area requiring reclassification will be served by neighboring schools and parks. Fire protection services are available nearby and a new police community service center will be located in the Kulamalu Town Center, approximately 1.0 mile northeast of the project site.

- C. Sufficient reserve areas for foreseeable urban growth.

**Comment:** Other planned areas of urban growth are anticipated in the Makawao-Pukalani-Kula Community Plan. The Waiohuli Homestead Community Phase 2 and Phase 3 Developments, for example, will accommodate future urban growth. Incremental development at Keokea and Waiohuli is proceeding with build-out anticipated over the next several years.

- (3) It shall include lands with satisfactory topography, drainage, and reasonably free from the danger of any flood, tsunami, unstable soil conditions, and other adverse environmental effects.

**Comment:** The project site gently slopes in a west to east direction, with elevations ranging between 2,708 to 3,085 feet. Having been formerly used for pasture land, the property can be characterized as generally level, with defined drainage patterns. The land proposed for reclassification is located within Zone C, an area of minimal flooding, on the Federal Emergency Management Agency (FEMA) flood insurance rate maps. This land area is not subject to tsunami inundation or unstable soil conditions.

- (4) Land contiguous with existing urban areas shall be given more consideration than non-contiguous land, and particularly when indicated for future urban use on state or county general plans.

**Comment:** The 31.87-acre parcel proposed to be reclassified is contiguous with existing Urban district lands to the west. This area contains residential lots, a community center, a church, and small business establishments, along with an elementary school and park space.

- (5) It shall include lands in appropriate locations for new urban concentrations and shall give consideration to areas of urban growth as shown on the state and county plans.

**Comment:** This 31.87-acre parcel lies adjacent to areas of single-family residential uses designated in the Makawao-Pukalani-Kula Community Plan. The Makawao-Pukalani-Kula Community Plan designates the project site as both single-family and rural. The proposed area for reclassification is surrounded by other urban uses. It is in close proximity to a grocery store, gas station, restaurant, a school, and a community center.

- (6) It may include lands which do not conform to the standards in paragraphs (1) to (5):
  - A. When surrounded by or adjacent to existing urban development; and
  - B. Only when those lands represent a minor portion of this district.

**Comment:** The area proposed for reclassification is adjacent to existing urban development and activity. The 31.87 acres proposed for reclassification represent a minor portion of the 244,632 acres of Agricultural classified lands on the island of Maui (Maui County Data Book, 2006).

- (7) It shall not include lands, the urbanization of which will contribute toward scattered spot urban development, necessitating unreasonable investment in public infrastructure or support services.

**Comment:** The area proposed for reclassification will be implemented as a small planned development. The property's location adjacent to developed and undeveloped urban lands does not contribute to spot development or burdensome infrastructure investments.

- (8) It may include lands with a general slope of twenty percent or more if the commission finds that those lands are desirable and suitable for urban purposes and that the design and construction controls, as adopted by any federal, state, or county agency, are adequate to protect the public health, welfare and safety, and the public's interest in the aesthetic quality of the landscape.

**Comment:** These single-family residential lots will be developed on lands having slopes of less than 20 percent. County grading regulations will be followed to ensure the protection of public health, safety and welfare.

- (9) The extent to which the proposed reclassification conforms to the applicable goals, objectives, and policies of the Hawai'i state plan and relates to the applicable priority guidelines of the Hawai'i state plan and adopted functional plans.

**Comment:** The proposal to incorporate the land uses as envisioned in the Kula Ridge Subdivision project is in alignment with overall theme, goals, objectives and policies of Chapter 226, Hawai'i Revised Statutes, relating to Hawai'i State Planning Act. The applicable objectives, policies and priority guidelines are set forth in Section C of this Chapter.

- (10) The extent to which the proposed reclassification conforms to the applicable district standards.

**Comment:** The proposed reclassification conforms to Urban District standards as identified in Chapter 205-2 and in keeping with the Maui County General Plan.

- (11) The impact of the proposed reclassification on the following areas of state concern:

A. Preservation or maintenance of important natural systems or habitats.

**Comment:** There are no important systems or habitats within the reclassification area.

B. Maintenance of valued cultural, historical or natural resources.

**Comment:** An archaeological inventory survey was carried out on the subject property. An archaeological monitoring plan for the property will be developed to appropriately cover the recommendations of the SHPD. The property is not being used for cultural practices and adverse impacts to cultural resources are not anticipated as a result of reclassification.

C. Maintenance of other natural resources relevant to Hawai'i's economy, including, but not limited to, agricultural resources.

**Comment:** The use of the subject property for workforce and market housing purposes will not compromise agricultural productivity for the island. The subject property has been used historically for habitation and pasture land. Moreover, other natural resources are not anticipated to be adversely affected by the proposed action. Refer to **Appendix "C"**.

D. Commitment of State funds and resources.

**Comment:** The proposed reclassification will not require commitment of State funds or resources.

E. Provision for employment opportunities and economic development.

**Comment:** The Ridge Project as a whole will provide new employment opportunities for Maui residents. The residential projects will provide construction and service-related employment.

F. Provision for housing opportunities for all income groups, particularly the low, low-moderate, and gap groups.

**Comment:** The Ridge Project as a whole will provide a variety of housing types, including affordable and single-family "starter" homes. The workforce housing

parameters for the project includes the provision of at least 51 percent of the lots to families earning not more than 160 percent of the Maui County median income.

**Rural District Standards (Chapter 15-15-21, HAR)**

The proposed reclassification of a 16.25-acre portion of the subject property is also in conformance with the following standards of the Rural District set forth in Chapter 15-15-21, HAR.

- (1) Areas consisting of small farms; provided that the areas need not be included in this district if their inclusion will alter the general characteristics of the areas.

**Comment:** The area proposed for reclassification is surrounded by other rural areas. The four (4) large lots within the project will encourage farming activities to occur near other farming communities.

- (2) Activities or uses are characterized by low-density residential lots of not less than one-half acre and a density of not more than one single-family dwelling per one-half acre in areas where “city-like” concentration of people, structures, streets, and urban level of services are absent, and where small farms are intermixed with the low-density residential lots.

**Comment:** The area proposed for reclassification is surrounded by single-family homes, small farms, and urban uses that are reflective of the region’s rural character. The four (4) large lots within the proposed project will be sold with restrictions on further subdividing, and development will be restricted to one (1) main and one (1) accessory dwelling unit.

- (3) It may also include parcels of land which are surrounded by, or contiguous to this district, and are not suited to low-density residential uses for small farm or agricultural uses.

**Comment:** As noted above, the proposed area for reclassification is surrounded by other uses that are reflective of the region’s rural character. The rural transition between agricultural and urban areas is considered appropriate, given the proximity of the project site to infrastructure and services.

## C. CHAPTER 226, HRS, HAWAII STATE PLAN

Chapter 226, HRS, also known as the Hawai`i State Plan, is a long-range comprehensive plan which serves as a guide for the future long-term development of the State by identifying goals, objectives, policies and priorities, as well as implementation mechanisms. The proposed Ridge Project is in concert with the following goals of the Hawai`i State Plan:

- A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawai`i's present and future generations.
- A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people.
- Physical, social and economic well-being for individuals and families in Hawai`i that nourishes a sense of community responsibility, of caring and of participation in community life.

### 1. Objectives and Policies of the Hawai`i State Plan

The proposed reclassification is in conformance with the following objectives and policies of the Hawai`i State Plan:

#### Chapter 226-5, HRS, Objectives and Policies for Population

**226-5(b) (1), HRS:** Manage population growth statewide in a manner that provides increased opportunities for Hawai`i's people to pursue their physical, social and economic aspirations while recognizing the unique needs of each county.

**226-5(b)(3), HRS:** Promote increased opportunities for Hawai`i's people to pursue their socio-economic aspirations throughout the islands.

#### 226-6, HRS, Objectives and Policies for the Economy—in General

**226-6 (b)(6), HRS:** Strive to achieve a level of construction activity responsive to, and consistent with, State growth objectives.

#### 226-11, HRS, Objectives and Policies for the Physical Environment—Land-based, Shoreline and Marine Resources

**226-11 (a)(2), HRS:** Effective protection of Hawai`i's unique and fragile

environmental resources.

**226-11 (b)(3), HRS:** Take into account the physical attributes of areas when planning and designing activities and facilities.

**226-11(b)(8), HRS:** Pursue compatible relationships among activities, facilities and natural resources.

**226-12, HRS, Objectives and Policies for the Physical Environment—Scenic, Natural Beauty and Historic Resources**

**226-13(b)(5), HRS:** Encourage the design of developments and activities that complement the natural beauty of the islands.

**226-13, HRS, Objectives and Policies for the Physical Environment—Land, Air and Water Quality**

**226-13(b)(2), HRS:** Promote the proper management of Hawai'i's land and water resources.

**226-13(b)(6), HRS:** Encourage design and construction practices that enhance the physical qualities of Hawai'i's communities.

**226-13(b)(7), HRS:** Encourage urban developments in close proximity to existing services and facilities.

**226-19, HRS, Objectives and Policies for Socio-Cultural Advancement—Housing**

**226-19(a)(2), HRS:** The orderly development of residential areas sensitive to community needs and other land uses.

**226-19(b)(1), HRS:** Effectively accommodate the housing needs of Hawai'i's people.

**226-19(b)(3), HRS:** Increase homeownership, rental opportunities and choices in terms of quality, location, cost, densities, style and size of housing.

**226-19(b)(5), HRS:** Promote design and location of housing developments taking into account the physical setting, accessibility to public facilities and services, and other concerns of existing communities and surrounding areas.

**226-19(b)(7), HRS:** Foster a variety of lifestyles traditional to Hawai'i through the design and maintenance of neighborhoods that reflect the culture and values of the community.

**Chapter 226-23, HRS, Objectives and Policies for Socio-Cultural Advancement—Leisure**

**226-23(b)(4), HRS:** Promote the recreational and educational potential of natural resources having scenic, open space, cultural, historical, geological, or biological values while ensuring that their inherent values are preserved.

**2. Priority Guidelines of the Hawai'i State Plan**

The proposed action is in keeping with the following priority guidelines of the Hawai'i State Plan.

**Chapter 226-103, HRS, Economic Priority Guidelines:**

**226-103(1), HRS:** Seek a variety of means to increase the availability of investment capital for new and expanding enterprises.

A. Encourage investments which:

- (i) Reflect long-term commitments to the State;
- (ii) Rely on economic linkages within the local economy;
- (iii) Diversify the economy;
- (iv) Reinvest in the local economy;
- (v) Are sensitive to community needs and priorities; and
- (vi) Demonstrate a commitment to management opportunities to Hawai'i residents.

**Chapter 226-104, HRS, Population Growth and Land Resources Priority Guidelines**

**226-104(a)(1), HRS:** Encourage planning and resource management to ensure that population growth rates throughout the State are consistent with available and planned resource capacities and reflect the needs and desires of Hawai'i's people.

**226-104(b)(1), HRS:** Encourage urban growth primarily to existing urban areas where adequate public facilities are already available or can be provided with reasonable public expenditures and away from areas where other important benefits are present, such as protection of important agricultural land or preservation of



lifestyles.

**226-104(b)(2), HRS:** Make available marginal or non-essential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district.

**226-104(b)(12), HRS:** Utilize Hawai'i's limited land resources wisely, providing adequate land to accommodate projected population and economic growth needs while ensuring the protection of the environment and the availability of the shoreline conservation lands, and other limited resources for future generations.

**Chapter 226-106, HRS, Affordable Housing Priority Guidelines**

**226-106(1), HRS:** Seek to use marginal or nonessential agricultural land and public land to meet housing needs of low- and moderate-income and gap-group households.

**226-106(8), HRS:** Give higher priority to the provision of quality housing that is affordable for Hawai'i's residents and less priority to development of housing intended primarily for individuals outside of Hawai'i.

**D. STATE FUNCTIONAL PLANS**

The State Functional Plans implement the Hawai'i State Plan by identifying needs, problems and issues, and by recommending policies and priority actions which address the identified areas of concern. The proposed reclassification request is consistent with the following State Functional Plans:

**1. State Agricultural Functional Plan**

The proposed action will reclassify approximately 48.12 acres of land from the State Agricultural district to the State Urban and Rural districts. The four (4) large lots proposed as part of the project encompasses a total of 16.25 acres. Agricultural pursuits relating to pasture land uses can be accommodated on these lands. The proximity of the subject property to existing and planned urban land uses provide a reasonable nexus and an appropriate foundation for the proposed reclassification request, particularly in the context of meeting affordable housing needs of the community.

2. **State Housing Functional Plan**

The growing public demand for affordable housing indicate a current shortage of single-family housing on Maui. The 70 affordable residential houselots and the 46 market lots within the proposed subdivision will help to address a critical community need.

3. **State Recreational Functional Plan**

Outdoor recreation is recognized by the Hawai'i State Plan as an important part of life for Hawai'i's residents. As the population rises and residential land uses increase, creating areas dedicated to outdoor recreation becomes increasingly vital. The State Functional Plan for Recreation urges the improvement and expansion of recreational facilities in urban areas and local communities. The proposed action for the subdivision includes provisions to provide approximately 3.0 acres of park to address this need.

**E. MAUI COUNTY GENERAL PLAN**

The Maui County General Plan (1990 Update) sets forth broad objectives and policies to help guide the long-range development of the County. As indicated by the Maui County Charter, the purpose of the general plan shall be to:

*... indicate desired population and physical development patterns for each island and region within the county; shall address the unique problems and needs of each island and region; shall explain opportunities and the social, economic, and environmental consequences related to potential developments; and shall set forth the desired sequence, patterns and characteristics of future developments. The general plan shall identify objectives to be achieved, and priorities, policies, and implementing actions to be pursued with respect to population density; land use maps, land use regulations, transportation systems, public and community facility locations, water and sewage systems, visitor destinations, urban design, and other matters related to development.*

The Maui County General Plan developed five (5) major themes that focus on the overall goals of the plan. These themes were devised to reflect the general scope and priorities of the Maui County General Plan. The proposed project responds to the following theme:

### **Theme Number 5**

Provide for needed resident housing:

- Amendments to the General Plan address the development of resident housing as a major social need in our community.

The proposed action is in keeping with the following General Plan objectives relating to population, land use, economic activity, housing and urban design.

### **POPULATION**

#### **Objective**

To plan the growth of resident and visitor population through a directed and managed growth plan so as to avoid social, economic and environmental disruptions.

#### **Policies**

- a. Manage population growth so that the County's economic growth will be stable and the development of public and private infrastructures will not expand beyond growth limits specified in the appropriate community plans or negatively impact our natural resources.
- b. Balance population growth by achieving concurrency between the resident employee work force, the job inventory created by new industries, affordable resident/employee housing, constraints on the environment and its natural resources, public and private infrastructure, and essential social services such as schools, hospitals, etc.

### **LAND USE**

#### **Objective**

1. To preserve for present and future generations existing geographic, cultural and traditional community lifestyles by limiting and managing growth through environmentally sensitive and effective use of land in accordance with the individual character of the various communities and regions of the county.

**Policies**

- a. Provide and maintain a range of land uses districts sufficient to meet the social, physical, environmental and economic needs of the community.

**Objective**

- 2. To use the land within the County for the social and economic benefit of all the County's residents.

**Policies**

- a. Encourage land use patterns that foster a pedestrian oriented environment to include such amenities as bike paths, linear parks, landscaped buffer areas and mini-parks.
- b. Encourage land use methods that will provide a continuous balanced inventory of housing types in all price ranges.
- c. Encourage programs to stabilize affordable land and housing prices.

**ECONOMIC ACTIVITY (General)**

**Objective**

Utilize an equitable growth management program which will guide the economic well-being of the community.

**Policies**

- a. Encourage the adoption of a resource allocation program which gives a high priority to affordable residential projects.

**HOUSING**

**Objective**

To provide a choice of attractive, sanitary and affordable homes for all our residents.

**Policies**

- a. Provide or require adequate physical infrastructure to meet the demands of present and planned future affordable housing needs.
- b. Encourage the construction of housing in a variety of price ranges and

geographic locations.

- c. Encourage the use of innovative performance standards and building methods to reduce housing costs to the consumer.
- d. Streamline or “fast-track” the governmental review process for affordable single-family housing projects.
- e. Make full use of State and Federal programs that provide financial assistance to renters and homebuyers.
- f. Ensure that each community plan region contains its fair share of affordable housing.

## **URBAN DESIGN**

### **Objective**

To encourage development that reflects the character and culture of Maui County’s people.

### **Policies**

- a. Encourage community design that establishes a cohesive identity
- b. Encourage the establishment of continuous green areas, bike-paths, active and passive recreation areas and mini-parks in new subdivision development.

## **F. MAKAWAO-PUKALANI-KULA COMMUNITY PLAN**

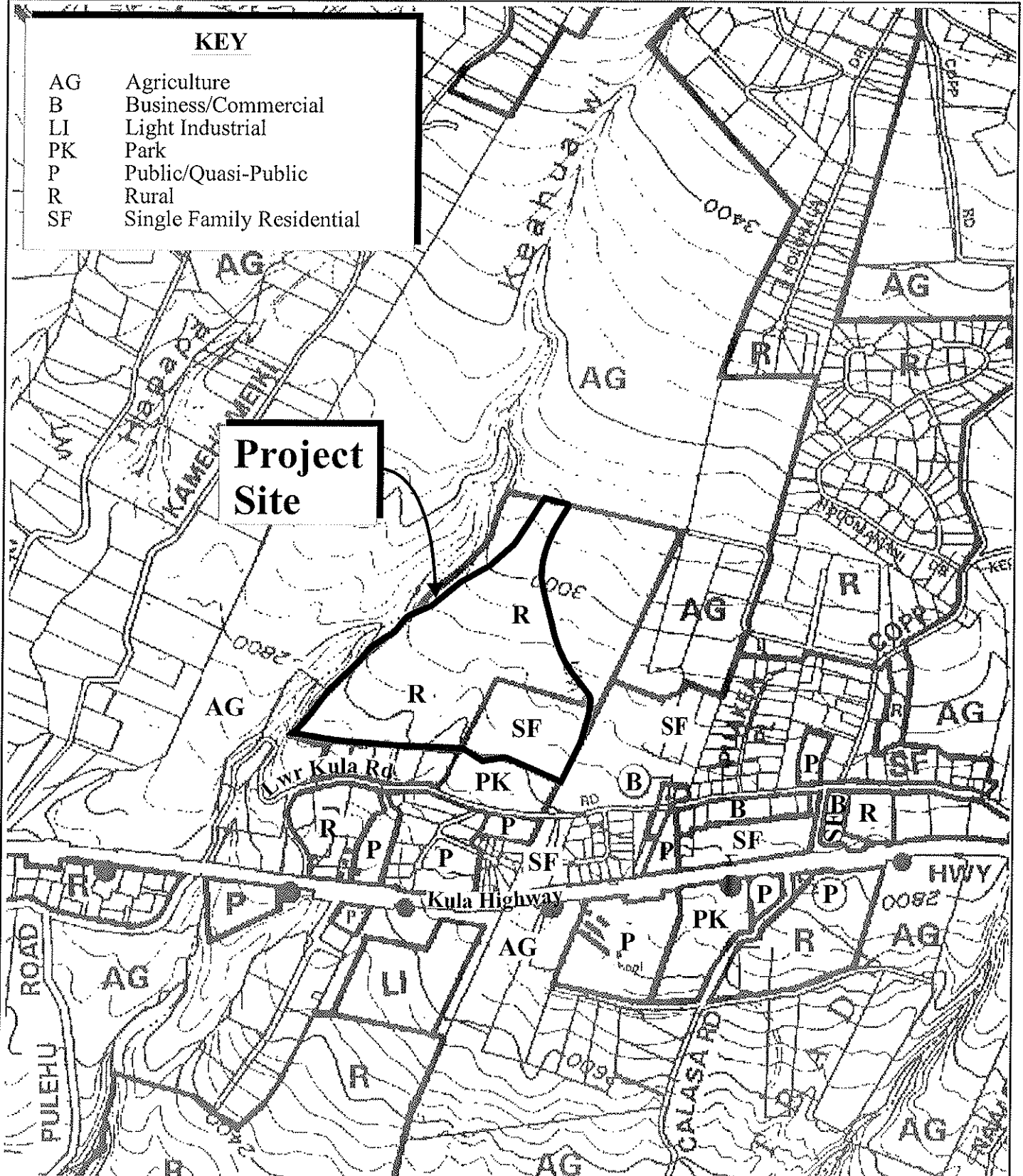
The project site is located within the Makawao-Pukalani-Kula Community Plan region, one (1) of nine (9) community plan regions established in the County of Maui. Planning for each region is guided by the respective community plans, which are designed to implement the Maui County General Plan. Each community plan contains recommendations and standards which guide the sequencing, patterns and characteristics of future development in the region.

The Makawao-Pukalani-Kula Community Plan was adopted by the County of Maui through Ordinance No. 2510 which took effect on July 23, 1996.

Land use guidelines are set forth by the Makawao-Pukalani-Kula Community Plan Land Use Map. See **Figure 24**. Fifteen (15) acres of the subject property are designated for “Single-Family” use with a remainder of 33.12 acres set aside for “Rural” use. The proposed project

**KEY**

- AG Agriculture
- B Business/Commercial
- LI Light Industrial
- PK Park
- P Public/Quasi-Public
- R Rural
- SF Single Family Residential



Source: Pukalani-Makawao-Kula Community Plan Map

Figure 24 Proposed Kula Ridge Residential Workforce Housing Subdivision  
Community Plan Land Use Map

NOT TO SCALE



includes 116 single-family homes, a 3-acre park space, and a 5-acre open space area.

Because the proposed project will provide workforce housing opportunities for residents, it will be processed in accordance with Section 201H-38 of the Hawai'i Revised Statutes. The applicant will be seeking exemptions from certain regulatory and statutory requirements relating to land use, construction, subdivision, public services and infrastructure and administrative procedures. An exemption from Chapter 2.80B of the Maui County Code, relating to the General Plan and Community Plans, will be included in the Section 201H-38 exemption list.

The proposed project is consistent with the following goals, objectives and policies set forth in the Makawao-Pukalani-Kula community plan.

### **ECONOMIC ACTIVITY**

**Goal:** A stable and diverse economic environment which supports a level of community prosperity in order to provide social services and environmental amenities and which respects the region's rural and agricultural lifestyle, open space, and natural resources.

#### **Objectives and Policies:**

- Provide for the preservation and enhancement of agricultural lands and operations, emphasizing the importance of promoting diversified agriculture to the region's economic base and lifestyle.
- Preserve agriculture by actively promoting locally grown agricultural products.

### **LAND USE**

**Goal:** The maintenance and enhancement of Upcountry's unique and diverse rural land use character with sensitivity to existing land use patterns, natural resource values, and economic and social needs of the region's residents.

#### **Objectives and Policies:**

- Recognize the value of open space, including agricultural lands and view planes to preserve the region's rural character.
- Encourage new residential developments in area which are contiguous

extensions of, or infills within the established residential pattern, and which do not adversely affect agricultural uses.

- Ensure that adequate lands are set aside for recreational and open space purposes.
- Preserve and enhance the “country” atmosphere in all communities by maintaining the small-scale, unique and independent character of each of the three sub-regions. “Country” atmosphere is defined by building style, a low density mix of residences, ranches, open spaces, greenways, plantings, and cultivated lands.
- Make available agricultural lands for those who wish to farm.
- Ensure an adequate supply of lands designated for residential use to address the affordable and elderly housing needs of the region’s residents.

### **URBAN DESIGN**

**Goal:** Recognitions and preservation of the unique design characteristics of the Makawao, Pukalani, and Kula communities in order to enhance Upcountry’s man-made environment.

#### **Objectives and Policies:**

- Support the revision of subdivision and roadway design criteria and standards to be more compatible with the rural character of the upcountry region.
- Preserve the unique characteristics of all of the Upcountry towns by recognizing and respecting architectural styles as described in the Country Town Design Guidelines.
- Support the development of pedestrian equestrian and bikeway connections which provide safe and convenient linkages within and between Upcountry communities.

### **HOUSING**

**Goal:** Housing opportunities for the residents of Makawao-Pukalani-Kula, to include all income and age groups, which are affordable, safe, and environmentally and culturally compatible.



**Objectives and Policies:**

- Provide a mixture of housing types, smaller lot sizes, and coordinated assistance programs aimed at lowering housing costs and expanding housing opportunities.
- In keeping with public health and safety principles, and consistent with the Upcountry character, develop zoning, subdivision and design standards which will facilitate the development of affordable housing.

**SOCIAL INFRASTRUCTURE**

**Goal:** An efficient and responsive system of people-oriented public services which enable residents to live in a safe, healthy, and enjoyable lifestyle, and offer the youth and adults of the region opportunities and choices for self and community improvement.

**Objectives and Policies:**

- Pursue the development of equestrian trails, pathways, greenways, and related facilities which will meet the recreational needs of runners, joggers, walkers, horseback riders, and cyclists.

**G. UPCOUNTRY GREENWAY MASTER PLAN**

The project site is located within the Upcountry Greenway Master Plan Region. The Makawao-Pukalani-Kula Community Plan calls for the preparation and implementation of an Upcountry Master Plan for Bikeways, equestrian trails and pedestrianways which connect major origin and destination points. Such facilities include:

1. Pedestrian/equestrian/bikeway routes which link the Makawao Town Center, Eddie Tam Memorial Gym, Kalama Intermediate School, and continuing along Makani Road to Haleakala Highway.
2. Pedestrian/equestrian/bikeway routes which link Pukalani residential areas with the Pukalani Community Center, Pukalani Elementary School, and the Pukalani Terrace Center, along Pukalani Street from Haleakala Highway to the Pukalani Country Club, with a future extension to the Kulamalu project.
3. Pedestrian/bikeway route along the Pukalani Bypass and Kula Highway from Makani Road to Ulupalakua.

### **Greenway Master Plan Goal**

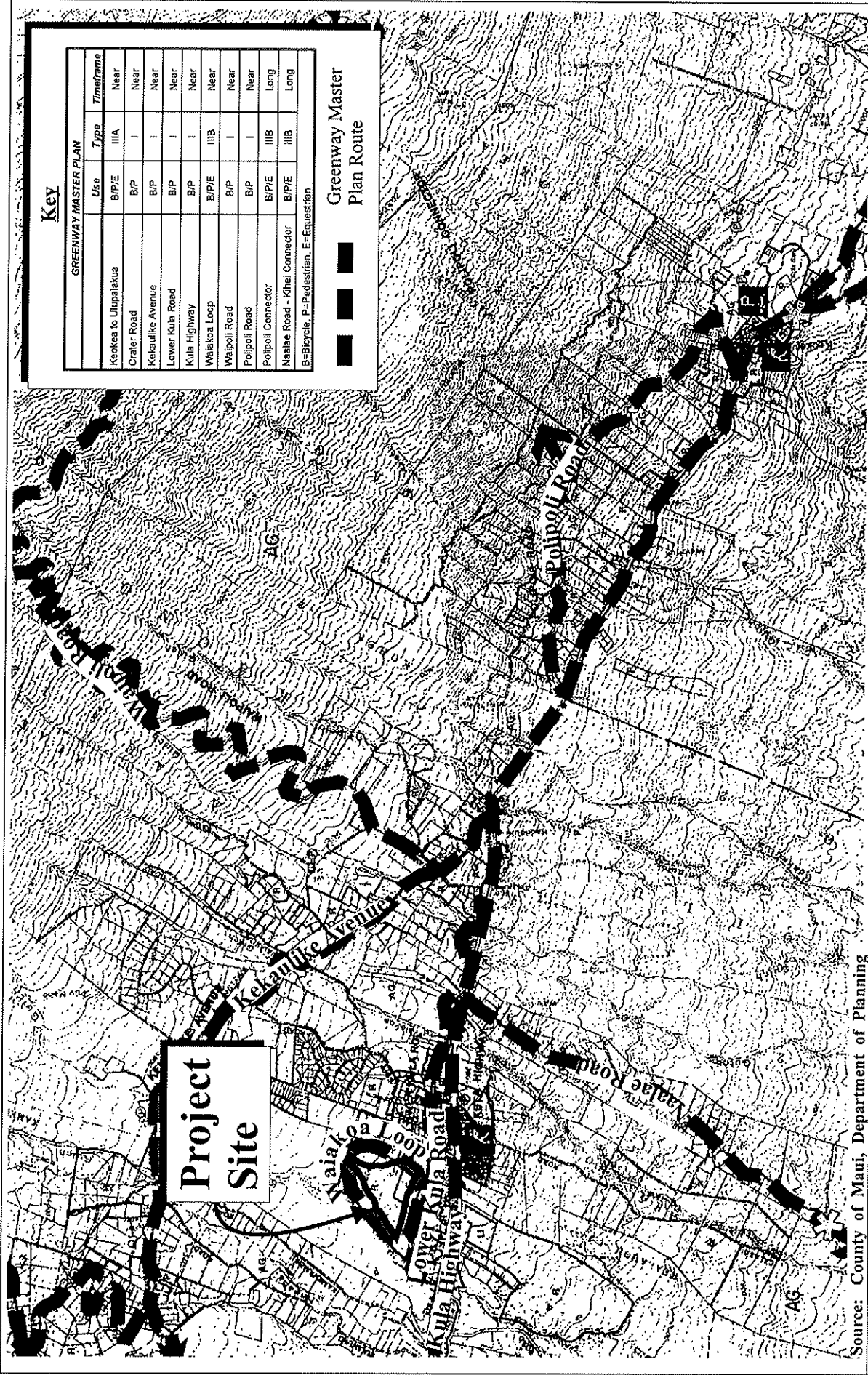
An integrated system of non-motorized transportation and recreation multi-use routes, trails and paths, which respect the rights of private property owners and utility service companies, and which are compatible with existing and future land uses in the region.

### **Greenway Master Plan Objectives**

1. Identify greenway routes which provide linkages between and within communities.
2. Establish greenway design criteria which are suitable to multi-use and multi-function purposes.
3. Develop routing criteria which recognizes physical, operational, and land use needs of private property owners and utility service providers.
4. Establish a regulatory and management framework to ensure the long-term operational success of the Upcountry Greenway.
5. Develop a user education program to promote user safety and welfare and to broaden understanding of private property interests and needs.
6. Develop greenway implementation priorities and timeframes which maximize operational utility within the context of available funding.

### **Greenway Concepts Envisioned In The Project Vicinity**

An opportunity for a recreational loop trail was identified along the perimeter of the project area. Conceptually, a recreational loop trail incorporates a trail or path parallel to, and physically separated from the vehicular travel way. The trail/path may be within an existing right-of-way or may be placed adjacent to the existing roadway on private lands. This type of section would have the flexibility to accommodate pedestrians, bicyclists, and horseback riders. See **Figure 25**. The applicant intends to incorporate recommendations from the Upcountry Greenway Master Plan and will work with the County's Department of Public Works to identify opportunities and constraints in implementing a recreational loop trail along the perimeter of the project area. As project-specific details evolve, physical constraints relating to the topography and land use patterns will be addressed through site planning and a grading plan. Project planning will also involve coordination to determine use regulations and maintenance of the trail.



**Key**

GREENWAY MASTER PLAN		
Use	Type	Timeframe
Koolea to Ulupalekua	B/P/E	III A
Crater Road	B/P	I
Kelaouike Avenue	B/P	I
Lower Kula Road	B/P	I
Kula Highway	B/P	I
Maiake Loop	B/P/E	III B
Waipoli Road	B/P	I
Polipoli Road	B/P	I
Polipoli Connector	B/P/E	III B
Naalee Road - Kihai Connector	B/P/E	III B
B-Bicycle, P-Pedestrian, E-Equestrian		

**Greenway Master Plan Route**

**Figure 25** Proposed Kula Ridge Residential Workforce Housing Subdivision Upcountry Greenway Master Plan

NOT TO SCALE



## H. COUNTY ZONING

The Ridge Project site is zoned “Interim” by Maui County zoning. While the current zoning does not allow for the proposed residential subdivision, the Section 201H-38, HRS application, which will be filed with the Maui County Council, will include an exemption from the County’s Title 19 zoning provisions which would allow for the proposed project.

According to Chapter 19.30A.020 of the Maui County Code, agricultural lands that meet at least two (2) of the following criteria should be given the highest priority for retention in the agricultural district:

1. Agricultural Lands of Importance to the State of Hawai‘i (ALISH);
2. Lands not classified by the ALISH system whose agricultural land suitability, based on soil, topographic, and climatic conditions, supports the production of agricultural commodities, including but not limited to coffee, taro, watercress, ginger, orchard and flower crops, and non-irrigated pineapple. In addition, these lands shall include lands used for intensive husbandry, and lands in agricultural cultivation in five of the ten years immediately preceding the date of approval of this chapter; and
3. Lands which have seventy-five percent or more of their boundaries contiguous to lands within the agricultural district.

While portions of the project site meet Criteria 1 and 3, there are a number of factors which limit the feasibility of the project site for active agricultural use. Although the entire project area is designated as “other” agricultural lands, about 16 acres or 33 percent of the project area have agronomic conditions that are suitable for growing high-elevation crops. Much of this land is located at the mauka portion of the site where the four 4-acre lots are planned. These lands are planned to be available for agricultural uses which include both farming and grazing operations. The remainder of the site contains soils with low productivity ratings. About 25 acres (52 percent) of the project site have soils rated D, and about 7 acres (15 percent) are rated E.

The recent release of land from plantation agriculture has resulted in the supply of agricultural land far exceeding its demand. This current trend indicates that ample land is available in Hawai‘i to accommodate the growth of diversified crops.

The agricultural impact of this project is near negligible when taken in the context of the recent trends occurring on Maui. In the last 30 years, the closures of Wailuku Sugar and

Pioneer Mill on Maui have taken significant acreages out of active sugar cane cultivation. These actions have greatly increased the supply of non-sugar based agricultural lands. In fact, much of the lands of these former plantations are still fallow. The proposed project will ultimately involve the use of approximately 48 acres of land, which represents less than one (1) percent of the roughly 246,000 acres of State Agricultural district lands on the island of Maui.

When evaluated based on the housing shortage that exists on Maui, coupled with the scarcity of entitled, undeveloped residential lands in Upcountry Maui, the conversion of the project's agriculture lands into residential development presents a beneficial opportunity. The expansion of the urban district boundary in Upcountry Maui will allow residential use and supply additional housing units at a site deemed less than optimal for long-term agricultural use.

## **I. HAWAII COASTAL ZONE MANAGEMENT PROGRAM**

The Hawai'i Coastal Zone Management Program (HCZMP), as formalized in Chapter 205A, HRS, establishes objectives and policies for the preservation, protection and restoration of natural resources of Hawai'i's coastal zone. The subject property is not within the County of Maui's Special Management Area.

As set forth in Chapter 205A, HRS, this section addresses the project's relationship to applicable coastal zone management considerations.

### **1. Recreational Resources**

**Objective:** Provide coastal recreational opportunities accessible to the public.

**Policies:**

- a. Improve coordination and funding of coastal recreational planning and management; and
  - (i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;
  - (ii) Requiring replacement of coastal resources having significant recreational value including, but not limited to, surfing sites, fishponds, and sand beaches, when such resources will be

unavoidably damaged by development; or requiring reasonable monetary compensation to the state for recreation when replacement is not feasible or desirable;

- (iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;
- (iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;
- (v) Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;
- (vi) Adopting water quality standards and regulating point and non-point sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;
- (vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and
- (viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of Section 46-6, HRS.

**Response:** The project site is located upland, away from the coastline. As such, the proposed action is not expected to impact coastal recreational opportunities or affect existing public access to the shoreline.

## 2. **Historical/Cultural Resources**

**Objective:** Protect, preserve and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

**Policies:**

- a. Identify and analyze significant archeological resources;
- b. Maximize information retention through preservation of remains and artifacts or salvage operations; and
- c. Support state goals for protection, restoration, interpretation, and display of historic resources.

**Response:** The project site had been previously impacted by many years of cattle grazing and erosion. An archaeological inventory survey, prepared by Scientific Consultant Services, reports that 18 identified sites have been assessed as significant under Criterion B. These sites have been photographed and documented for their significance. Refer to **Appendix "E"**.

No further archaeological work is recommended and the proposed project is not anticipated to have an adverse effect on historical or cultural resources. Refer to **Appendix "F"**.

**3. Scenic and Open Space Resources**

**Objectives:** Protect, preserve and, where desirable, restore or improve the quality of coastal scenic and open space resources.

**Policies:**

- a. Identify valued scenic resources in the coastal zone management area;
- b. Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;
- c. Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and
- d. Encourage those developments that are not coastal dependent to locate in inland areas.

**Response:** The proposed workforce housing project will be designed to ensure visual compatibility with the surrounding land uses. The project will call for the construction of single-story and two-story homes. The project site is located adjacent

to developed areas in the vicinity of Lower Kula Road and does not fall within a coastal scenic or open space view corridor. The project will also involve the construction of a 500,000 gallon tank approximately 1,500 ft. makai of Kekaulike Highway at the 3,600 ft. elevation. The height of the tank is not anticipated to impede on views along Kekaulike Highway. Grade differentials will help to mitigate views of the site long Kekaulike Highway.

#### 4. Coastal Ecosystem

**Objective:** Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

**Policies:**

- a. Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;
- b. Improve the technical basis for natural resource management;
- c. Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;
- d. Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and
- e. Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

**Response:** The proposed action is not expected to adversely impact coastal ecosystems. Runoff will be retained in a retention basin located on the northwestern corner of the subdivision. Drainage system improvements will be designed in accordance with applicable regulatory standards to ensure that there is no adverse effect on downstream properties.

Temporary environmental effects due to construction of offsite water improvements which include the construction of a ground water well, waterlines to service the project area and a water storage tank in the project area will occur. This activity will disturb the soils and vegetation in the immediate vicinity. Waterline



construction will be limited to a period when the gulch is dry. Environmental impacts are expected to be minimal and will be monitored on a regular basis. After construction, the preconstruction conditions of the area are expected to recover fully.

In addition, appropriate erosion control measures and Best Management Practices will be implemented to minimize the effects of stormwater runoff during construction of the project and to ensure that coastal ecosystems are not adversely impacted.

## 5. Economic Use

**Objective:** Provide public or private facilities and improvements important to the State's economy in suitable locations.

**Policies:**

- a. Concentrate coastal dependent development in appropriate areas;
- b. Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and
- c. Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:
  - (i) Use of presently designated locations is not feasible;
  - (ii) Adverse environmental effects are minimized; and
  - (iii) The development is important to the State's economy.

**Response:** The proposed project will be a positive contribution to the local economy through the generation of workforce housing for Maui's residents and the creation of construction-related job opportunities. Surrounding businesses, such as Café 808 and Morihara Store, will benefit from the patronage of the residents. The proposed project is not contradictory to the objective and policies for economic use.

## 6. Coastal Hazards

**Objective:** Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence and pollution.

**Policies:**

- a. Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;
- b. Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint pollution hazards;
- c. Ensure that developments comply with requirements of the Federal Flood Insurance Program; and
- d. Prevent coastal flooding from inland projects.

**Response:** The proposed subdivision and the offsite water improvements fall within Zone C, an area of minimal flooding. Drainage improvements will be designed in accordance with the Drainage Standards of the County of Maui to ensure that the project will not adversely affect downstream properties from the effects of flooding and erosion.

## 7. Managing Development

**Objective:** Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

**Policies:**

- a. Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;
- b. Facilitate timely processing of applications for development permits and resolve overlapping of conflicting permit requirements; and
- c. Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

**Response:** This Environmental Assessment has been prepared for public review in compliance with Chapter 343, HRS, and Chapter 200 of Title 11, Administrative

Rules, Environmental Impact Statement Rules.

The proposed project will be processed as a Section 201H-38, HRS project. Public review will be provided through Council meetings on the proposal.

In February 2006, the applicant presented the project to the members of Kula Community Association (KCA) for their review and comment. Subsequent meetings with the KCA's Planning Committee and Board were also held. The applicant plans on keeping the Board and its general membership informed as the project progresses through the planning process.

**8. Public Participation**

**Objective:** Stimulate public awareness, education, and participation in coastal management.

**Policies:**

- a. Promote public involvement in coastal zone management processes;
- b. Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and
- c. Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.

**Response:** In addition to meetings with the KCA, the applicant also met with neighboring residents on July 13, 2006. Minutes of that meeting are contained in **Appendix "K"**. An opportunity for agency and public review will also be provided as part of the notification review and comment process required for the Environmental Assessment, Chapter 343, HRS, and through the Section 201H-38, HRS review process. As noted above, the applicant is undertaking ongoing coordination with the Kula Community Association. The County's objective of public awareness, education and participation is being addressed through these efforts.

**9. Beach Protection**

**Objective:** Protect beaches for public use and recreation.

**Policies:**

- a. Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;
- b. Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and
- c. Minimize the construction of public erosion-protection structures seaward of the shoreline.

**Response:** The project site is located upland, away from the shoreline and is not anticipated to impact shoreline processes.

**10. Marine Resources**

**Objective:** Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

**Policies:**

- a. Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;
- b. Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;
- c. Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;
- d. Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and
- e. Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

**Response:** As previously stated, the project is located inland, away from the ocean and is, therefore, not anticipated to have an impact on marine or coastal resources.

**J. SECTION 201H-38, HAWAII REVISED STATUTES**

Section 201H-38 of the Hawai`i Revised Statutes (HRS) allows eligible developers/housing projects to be exempt from “all statutes, ordinances, charter provisions, and rules of any governmental agency relating to planning, development improvement to land, and the construction of units thereon...”, in order to facilitate the timely and cost effective implementation of proposed affordable housing projects. In coordination with the County of Maui’s Department of Housing and Human Concerns (DHHC), the Kula Ridge Subdivision has been determined to be an eligible project. Accordingly, a Section 201H-38, HRS application has been prepared and will be submitted to DHHC for review and transmittal to the Maui County Council. Upon receipt of the 201H-38, HRS request, the County Council shall have 45 days to render its decision on the request for exemptions.

The list of exemptions sought for the project is listed in **Appendix "B"** of this document. The proposed exemptions are intended to support the timely implementation of the project without compromising public health, safety, or welfare considerations.

**V. SUMMARY OF  
ADVERSE  
ENVIRONMENTAL  
EFFECTS WHICH  
CANNOT BE AVOIDED**

## **V. SUMMARY OF ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED**

Assessment of construction-related impacts, noise and air quality impacts, and potential impact on physical and socio-economic environment, as well as an archaeological inventory survey and an agricultural impact assessment were carried out as part of the EA. The proposed development will have a limited, unavoidable construction-related impact on the environment, as described in Chapter II.

In the short term, construction associated with the Ridge Project will have a temporary impact on air quality from dust generation and discharge of exhaust from construction equipment during ground altering activities and site grading. Appropriate BMPs will be incorporated to mitigate adverse impacts, including watering of exposed surfaces and regular maintenance of construction equipment to minimize construction-related impacts.

Construction of the Ridge Project will also generate short-term noise impacts which will also be unavoidable. The use of properly maintained construction equipment will mitigate noise impacts caused by equipment. The incorporation of State Department of Health construction noise limits and curfew times is another measure to mitigate noise impacts caused by equipment.

The project will commit approximately 32 acres of the 48-acre property of agricultural land formerly used for pastureland. The remaining 16 acres encompassed by the four (4) large lots will be available for agricultural use. The loss of agricultural land will not adversely affect the growth of diversified agriculture in Kula. Based on the limited market size for crops that can be grown profitably in Hawai'i, there is ample land on the island of Maui to accommodate the growth of diversified agriculture.

Development of the project will alter the existing landscape, but it is not anticipated to have an adverse impact on scenic or open space resources. The proposed residential community will be developed with residential structures with a low-profile. The project will incorporate park and open space areas that will contribute to view corridors within and through the project. The 500,000-gallon water tank located on the adjacent Mauka Subdivision site is also not anticipated to have an adverse impact on scenic or open space resources. Grade differentials will help mitigate views of the water tank from Kekaulike Highway.



**VI. ALTERNATIVES TO  
THE PROPOSED  
ACTION**

## **VI. ALTERNATIVES TO THE PROPOSED ACTION**

### **A. PREFERRED ALTERNATIVE**

The proposed single-family subdivision was deemed an appropriate use for the property given the surrounding single-family residential and urban type land uses. Given this land use parameter, the applicant considered alternate subdivision scenarios in terms of lot sizes and overall project density.

The low density approach to development, incorporating both affordable house lots and market priced lots was deemed appropriate in terms of surrounding uses and conditions. Specific spatial configurations of the lots were generated based on topographic and boundary patterns established by the surrounding properties. This alternative will provide much needed workforce housing in a location that is available and underused, in proximity to similar land uses.

### **B. SITE PLAN ALTERNATIVES**

Various site plans were considered for the subdivision during consultation with the Kula Community Association. The size and number of large lots and the location of the park were also considered, as were the house-lot packages offered for the affordable lots. In the end, the preferred alternative was deemed the most viable implementation of the project.

### **C. DEVELOP PARCEL IN ACCORDANCE WITH MAKAWAO-PUKALANI-KULA COMMUNITY PLAN**

Under the existing Community Plan, the area designated for “Single-Family” use allows for a 3-acre park area and 87 single-family homes, assuming a minimum lot size area of 6,000 square feet. The area designated for “Rural” use allows for a 5-acre open space area, 24 single-family homes on smaller rural lots, and up to 8 homes on the larger 4-acre parcels. The allowed density in the Makawao-Pukalani-Kula Community Plan is approximately 119 homes which is compatible with the proposed density in the Kula Ridge Workforce Housing

project.

In terms of providing the affordable housing allocations set forth by the project, the spatial land use delineations of the Makawao-Pukalani-Kula Community Plan was not considered sufficient.

**D. COUNTY PARTICIPATION IN THE DEVELOPMENT OF WATER SOURCE**

The applicant will continue coordination efforts with the County of Maui Department of Water Supply (DWS) regarding standard requirements pertaining to the development of a private well and related infrastructure. The applicant is planning to develop the well, the storage tanks, and the transmission lines according to County standards.

An opportunity for the DWS to participate in the development of water source and related infrastructure at the project site may be available as well. In this alternative, the DWS will enter into a partnership with the applicant in the development and implementation of a groundwater well and related infrastructure. Should this alternative be considered, an agreement between the DWS and the applicant will be developed to establish terms and joint development efforts.

**E. NO ACTION ALTERNATIVE**

This alternative would see the land remain fallow and under-utilized, while the housing market grows steadily worse. The median single-family home price in the Kula-Ulupalakua-Kanaio area for the month of December 2007 was approximately \$764,000.00 (Realtor Association of Maui, December 2007). The preferred alternative, as set forth in this document, would contribute towards addressing this situation by providing approximately 70 single-family homes for Maui County's workforce population. The No Action alternative is thus not deemed desirable.

**VII. IRREVERSIBLE  
AND IRRETRIEVABLE  
COMMITMENTS OF  
RESOURCES**

## **VII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES**

The proposed action will not call for a substantial commitment of public services or facilities. Development of the proposed project will involve a commitment of energy, labor, fiscal and material resources. The use of these resources, when weighed against the expected benefit to be derived from the project, is not considered an adverse commitment.

**VIII. SIGNIFICANCE  
CRITERIA  
ASSESSMENT**

## VIII. SIGNIFICANCE CRITERIA ASSESSMENT

The "Significance Criteria", Section 12 of the Administrative Rules, Title 11, Chapter 200, "Environmental Impact Statement Rules", were reviewed and analyzed to determine whether the proposed project will have significant impacts to the environment. The following criteria and preliminary analysis are provided.

1. **Involves an irrevocable commitment to loss or destruction of any natural or cultural resource.**

Temporary environmental effects due to construction of subdivision improvements, including the offsite water improvements area will occur. There are no known, rare, threatened or endangered species of flora, fauna, avifauna or important habitats located within the project sites. Should archaeological features, cultural artifacts or human burials be located during construction activities, work in the area of the find shall be promptly halted and the find protected from further disturbance. The SHPD will be immediately contacted to determine the significance of the find and establish appropriate mitigative measures, if necessary.

2. **Curtails the range of beneficial uses of the environment.**

The proposed action and the commitment of land resources will not curtail the range of beneficial uses of the environment. The proposed use for workforce housing is compatible with surrounding residential, public/quasi-public, and pastureland uses. Fallow agricultural lands would be converted to home sites to help meet affordable housing needs of the community.

3. **Conflicts with the state's long-term environmental policies or goals and guidelines as expressed in chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.**

The State's Environmental Policy and Guidelines are set forth in Chapter 344, Hawai'i Revised Statutes. The proposed action is consistent with the policies and guidelines.

4. **Substantially affects the economic welfare, social welfare, and cultural practices of the community or State.**

The proposed action will have a beneficial effect on the local economy during construction. In the long term, the proposed project will support the local economy through the contribution of salaries, wages, and benefits, as well as through the purchases of goods and services from local merchants and service providers. The project will be a social welfare benefit to the Upcountry area.

5. **Substantially affects public health.**

No adverse impact to public health or welfare is anticipated as a result of the proposed action. The proposed 201H-38 exemptions will not compromise public health or welfare.

6. **Involves substantial secondary impacts, such as population changes or effects on public facilities.**

The creation of 116 house-lots for residential use at the project site will result in new residents in this section of the Makawao-Pukalani-Kula region of Upcountry Maui. The increase in residential population is not expected to be significantly different from that which would be generated under the existing Community Plan land use designations. Demands on infrastructure created by the project will be mitigated through the provision of required improvements by the applicant. The applicant is currently pursuing the development of an offsite water source and is coordinating with the Department of Water Supply to develop a well and a storage tank according to County standards. Public service requirements for this sub-region will be addressed with the provision of applicable fees and dedications.

The proposed subdivision is designed to meet affordable workforce housing requirements for the island's residents.

Best Management Practices (BMP's) and appropriate erosion control measures will be utilized during the construction period. Drainage system improvements will be constructed in accordance with applicable regulatory design standards to ensure that surface runoff will not have an adverse effect on adjacent or downstream properties.



7. **Involves a substantial degradation of environmental quality.**

During the construction phase of the project, there will be short-term air quality and noise impact as a result of the project. In the long term, effect on air quality and ambient noise levels should be minimal. The proposed action is not anticipated to significantly affect the open space and scenic character of the area.

No substantial degradation of environmental quality resulting from the action is anticipated.

8. **Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions.**

The proposed action includes the development of 10 workforce housing units for the proposed 21-lot Mauka Subdivision project. The effects of developing this 21-lot agricultural subdivision, together with the Ridge Project is discussed in Chapter III of this report. There are no significant cumulative impacts associated with the combined development of both projects.

9. **Substantially affects a rare, threatened, or endangered species, or its habitat.**

There are no rare, threatened or endangered species of flora, fauna, avifauna or important habitats that will be adversely affected by the project.

10. **Detrimentially affects air or water quality or ambient noise levels.**

Construction activities will have an impact on air quality and noise; however, it will be minimal and temporary. Dust control measures, such as regular watering and sprinkling, will be implemented to minimize wind-blown emissions. Noise impact will be mitigated through limitation on construction to daylight work hours. Utilizing approved BMPs, water quality should not be affected.

In the long term, the proposed action is not anticipated to have a significant impact on air and water quality or ambient noise levels.

11. **Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.**

The project site is situated upland and is not anticipated to have any adverse impact upon coastal waters or resources. An onsite drainage basin in the northwest corner portion of the project site is expected to retain the runoff generated by the project. Runoff from throughout the subdivision will be channeled into the retention basin by grated catch basins located within grassed shoulder areas. Further appropriate mitigation measures will be developed in consultation with the applicable governmental agencies during the design process. During construction, recommended Best Management Practices (BMPs) will be implemented for erosion and sedimentation control.

12. **Substantially affects scenic vistas and viewplanes identified in county or state plans or studies.**

The proposed development will not block scenic vistas or viewplanes. The project will not affect scenic corridors, coastal scenic or open space resources. The project will incorporate park and open space areas that will provide view corridors within and throughout the project. Grade differentials will help mitigate views of the sight from Kula Highway and along Kekaulike Highway.

13. **Requires substantial energy consumption.**

The proposed action will involve the short-term commitment of fuel for equipment, vehicles, and machinery during construction activities. However, this use is not anticipated to result in a substantial consumption of energy resources. In the long term, the project will create an additional demand for electricity. However, this demand will not be substantially or excessively more than the energy consumed throughout the region.

In summary, the site is situated at an attractive and central location in Kula, in close proximity to community services and commercial areas in the Upcountry region. Necessary infrastructure systems and services are within near proximity, or can be reasonably provided to serve the project. Residential development and the development of an offsite water system to service the project area are not anticipated to have a significant adverse impact on the physical environment. The site is suitable for the development of single-family housing to meet the housing needs of the region.

# **IX. LIST OF PERMITS AND APPROVALS**

# IX. LIST OF PERMITS AND APPROVALS

The following permits and approvals will be required prior to the implementation of the project:

## State of Hawai'i

1. State Land Use Commission District Boundary Amendment (Agricultural to Rural and Urban)
2. Requirements of the State of Hawai'i Department of Health:
  - a. As applicable, project activities shall comply with the Administrative Rules of the Department of Health:
    - Chapter 11-39, Air Conditioning and Ventilation;
    - Chapter 11-45, Radiation Control;
    - Chapter 11-46, Community Noise Control;
    - Chapter 11-501, Asbestos Requirements;
    - Chapter 11-502, Asbestos-Containing Materials in Schools;
    - Chapter 11-503, Fees for Asbestos Removal and Certification;
    - Chapter 11-62, Wastewater Systems;
    - Chapter 11-60.1-33, Fugitive Dust;
    - Chapter 11-20, Rules Relating to Potable Water Systems;
    - Chapter 11-21, Cross-Connections and Backflow Control; and
    - Chapter 11-23, Underground Injection Control.
3. National Pollution Discharge Elimination System (NPDES) Permit. (Coordination with the U.S. Department of the Army has been undertaken.)

4. Department of Land and Natural Resources Commission Water Resource Management  
Application for a Well Construction/Pump Installation Permit
5. Work to perform in State Highway Right-of-Way (as applicable)

**County of Maui**

1. Section 201H-38, HRS approval by the Maui County Council
2. Subdivision approval
3. Construction Permits

**X. AGENCIES  
CONSULTED DURING  
THE PREPARATION OF  
THE DRAFT  
ENVIRONMENTAL  
ASSESSMENT; LETTERS  
RECEIVED AND  
RESPONSES TO  
SUBSTANTIVE  
COMMENTS**

# X. AGENCIES CONSULTED DURING THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT; LETTERS RECEIVED AND RESPONSES TO SUBSTANTIVE COMMENTS

The following agencies were consulted during preparation of the Draft Environmental Assessment. Agency comments and responses to substantive comments are also included in this section.

- |  |  |
|--|--|
| <p>1. Ranae Ganske-Cerizo, Soil Conservationist<br/><b>Natural Resources Conservation Service</b><br/><b>U.S. Department of Agriculture</b><br/>210 Imi Kala Street, Suite 209<br/>Wailuku, Hawai'i 96793-2100</p> | <p>919 Ala Moana Blvd., Room 300<br/>Honolulu, Hawai'i 96814</p>   |
| <p>2. George Young<br/>Chief, Regulatory Branch<br/><b>U.S. Department of the Army</b><br/>U.S. Army Engineer District, Honolulu<br/>Regulatory Branch<br/>Building 230<br/>Fort Shafter, Hawai'i 96858-5440</p>   | <p>7. Herbert Matsubayashi<br/>District Environmental Health<br/>Program Chief<br/>State of Hawai'i<br/><b>Department of Health</b><br/>54 High Street<br/>Wailuku, Hawai'i 96793</p>  |
| <p>3. Robert P. Smith<br/>Field Supervisor<br/><b>U. S. Fish and Wildlife Service</b><br/>300 Ala Moana Blvd., Rm. 3-122, Box 50088<br/>Honolulu, Hawai'i 96813</p>  | <p>8. Peter Young, Chairperson<br/>State of Hawai'i<br/><b>Department of Land and Natural<br/>Resources</b><br/>P. O. Box 621<br/>Honolulu, Hawai'i 96809</p>  |
| <p>4. Laura Thielen, Director<br/>State of Hawai'i<br/><b>Office of Planning</b><br/>P.O. Box 2359<br/>Honolulu, Hawai'i 96804</p>   | <p>9. Melanie Chinen, Administrator<br/>State of Hawai'i<br/><b>Department of Land and Natural<br/>Resources</b><br/><b>State Historic Preservation Division</b><br/>601 Kamokila Blvd., Room 555<br/>Kapolei, Hawai'i 96707</p> |
| <p>5. Patricia Hamamoto, Superintendent<br/>State of Hawai'i<br/><b>Department of Education</b><br/>P.O. Box 2360<br/>Honolulu, Hawai'i 96804</p>  | <p>10. Rodney Haraga, Director<br/>State of Hawai'i<br/><b>Department of Transportation</b><br/>869 Punchbowl Street<br/>Honolulu, Hawai'i 96813</p>   |
| <p>6. Denis Lau, Chief<br/><b>Clean Water Branch</b><br/>State of Hawai'i<br/><b>Department of Health</b></p>  | <p>cc: Fred Cajigal</p>  |

- |  |  |
|--|--|
| <p>11. Clyde Namu`o, Administrator<br/><b>Office of Hawaiian Affairs</b><br/>711 Kapiolani Boulevard, Suite 500<br/>Honolulu, Hawai`i 96813</p> <p>12. Carl Kaupololo, Chief<br/>County of Maui<br/><b>Department of Fire<br/>and Public Safety</b><br/>200 Dairy Road<br/>Kahului, Hawai`i 96732</p> <p>13. Alice Lee, Director<br/>County of Maui<br/><b>Department of Housing and<br/>Human Concerns</b><br/>200 S. High Street<br/>Wailuku, Hawai`i 96793</p> <p>14. Michael W. Foley, Director<br/>County of Maui<br/><b>Department of Planning</b><br/>250 South High Street<br/>Wailuku, Hawai`i 96793</p> <p>15. Glenn Correa, Director<br/>County of Maui<br/><b>Department of Parks and Recreation</b><br/>700 Halia Nakoia Street, Unit 2<br/>Wailuku, Hawai`i 96793</p> <p>16. Thomas Phillips, Chief<br/>County of Maui<br/><b>Police Department</b><br/>55 Mahalani Street<br/>Wailuku, Hawai`i 96793</p> <p>17. Milton Arakawa, Director<br/>County of Maui<br/><b>Department of Public Works<br/>and Environmental Management</b><br/>200 South High Street<br/>Wailuku, Hawai`i 96793</p> <p>18. Neal Shinyama, Manager – Engineering<br/><b>Maui Electric Company, Ltd.</b><br/>P.O. Box 398<br/>Kahului, Hawai`i 96733</p> <p>19. Karolyn Mossman, President<br/><b>Kula Community Association</b><br/>P.O. Box 417<br/>Kula, Hawai`i 96790</p> | <p>20. Rene Yamafuji, Principal<br/><b>Kula Elementary School</b><br/>5000 Kula Highway<br/>Kula, Hawai`i 96790</p> <p>21. John Schaumburg, Administrator<br/><b>Kula Hospital and Clinic</b><br/>204 Kula Highway<br/>Kula, Hawai`i 96790</p> <p>22. Elmer Cravalho, President<br/><b>Kula Community Federal Credit Union</b><br/>137 Kalepa Place<br/>Kahului, Hawai`i 96732</p> <p>23. Mike Mayberry, Assistant Director<br/>University of Hawai`i<br/><b>Institute of Astronomy</b><br/>4761 Lower Kula Road<br/>P. O. Box 209<br/>Kula, Hawai`i 96793</p> |
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United States Department of Agriculture



Natural Resources Conservation Service  
210 Iml Kala St. Ste 209  
Wailuku, HI 96793  
808-244-3100

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July 28, 2006

Ms. Rowena M. Dagdag, Planner  
Munekiyo & Hiraga, Inc.  
305 High Street Suite 104  
Wailuku, Hawaii 96793

Dear Ms Dagdag,

SUBJECT: Early Consultation Request for Proposed Affordable Housing Project at  
TMK (2) 2-3-01:174, Kula, Maui, Hawaii

We highly recommend this project be constructed in Phases to reduce the impact of erosion and drainage concerns. As soon as the area grading and construction in each single Phase(s) is complete, the area should be stabilized and vegetated.

Thank you for the opportunity to comment.

Sincerely,

A handwritten signature in black ink, appearing to read "Ranae F. Ganske-Cerizo".

Ranae F. Ganske-Cerizo  
District Conservationist

*Helping People Help the Land*

An Equal Opportunity Provider and Employer



MICHAEL T. MUNEKIYO  
GWEN OHASHI HIRAGA  
MITSURU "MICH" HIRANO  
KARLYNN KAWAHARA

MARK ALEXANDER ROY

October 29, 2007

Ms. Ranae Ganske-Cerizo  
District Conservationist  
**Natural Resources Conservation Service**  
**U. S. Department of Agriculture**  
210 Imi Kala Street, Suite 209  
Wailuku, Hawaii 96793-2100

SUBJECT: Proposed Kula Ridge Affordable Housing Project at  
TMK 2-2-3-001:174

Dear Ms. Ganske-Cerizo:

Thank you for your letter dated July 28, 2006, commenting on the proposed affordable housing project in Kula. In response to your comments, we would like to note the following:

1. Grading will be addressed in the Environmental Assessment. I will forward your letter to the project architect and civil engineer to ensure erosion and drainage controls.
2. The civil engineer has prepared a Preliminary Drainage Report that discusses the expected increase in runoff from the proposed project and includes mitigation. The drainage report will be included in the Environmental Assessment, along with Best Management Practices.
3. The suggestion to construct the homes in phases to reduce the impact of erosion and drainage concerns will be considered and forwarded to the applicant for review and possible incorporation into plans.

Ms. Ranae Ganske-Cerizo  
October 29, 2007  
Page 2

Thank you again for your input. A copy of the Draft Environmental Assessment will be provided to your office for review and comment.

If there are any questions, please do not hesitate to call me at 244-2015.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Rowena Dagdag', written in a cursive style.

Rowena Dagdag, Planner

RD:yp

cc: Clayton Nishikawa, Kula Ridge, LLC

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AUG 09 2006



DEPARTMENT OF THE ARMY  
U. S. ARMY ENGINEER DISTRICT, HONOLULU  
FT. SHAFTER, HAWAII 96858-5440

August 2, 2006

REPLY TO  
ATTENTION OF

Regulatory Branch

**File No. POH-2006-304**

Ms. Rowena Dagdag  
Munekiyo & Hiraga, Inc.  
305 High Street, Suite 104  
Wailuku, Hawaii 96793

Dear Ms. Dagdag:

This responds to your request letter dated October 27, 2005 for early consultation comments for preparation of a Draft Environmental Assessment (DEA) to develop affordable housing units and for improvements to the Kula Highway and Lower Kula Road in Kula, Maui Island, Hawaii TMK(2) 2-3-01:174.

Based on the preliminary information you provided on behalf of Kula Ridge, LLC, we are unable to reach a conclusive determination whether a DA permit would be required. In order to issue a jurisdiction determination, please forward copy of the DEA, site photographs and design drawings for our review.

If you have any questions, please contact Ms. Joy Anamizu by phone at 808-468-7023, by fax at 808-438-0460, or by electronic mail at [joy.n.anamizu@usace.army.mil](mailto:joy.n.anamizu@usace.army.mil) and reference the file number above in future correspondence.

Sincerely,

A handwritten signature in black ink, appearing to read "George P. Young".

George P. Young, P.E.  
Chief, Regulatory Branch



MICHAEL T. MUNEKIYODA  
GWEN OHASHI HIRAGA  
MITSUBU "MICH" HIRANO  
KARLYNN KAWAHARA

MARK ALEXANDER ROY

October 29, 2007

George P. Young, P.E.  
Chief, Regulatory Branch  
**U. S. Department of the Army**  
U. S. Army Engineer District, Honolulu  
Regulatory Branch  
Building 230  
Fort Shafter, Hawaii 96858-5440

SUBJECT: Proposed Kula Ridge Affordable Housing Project  
at TMK (2) 2-3-01:174

Dear Mr. Young:

Thank you for your letter dated August 2, 2006, commenting on the proposed affordable housing project in Kula.

A copy of the Draft EA which include site photographs, the preliminary drainage report and the schematic development plans will be provided to your office for review and comment.

If there are any questions, please do not hesitate to call me at (808)244-2015.

Very truly yours,

A handwritten signature in black ink, appearing to read "Rowena M. Dagdag", written in a cursive style.

Rowena M. Dagdag, Planner

RMD:yp

cc: Clayton Nishikawa, Kula Ridge, LLC

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AUG 08 2006



# United States Department of the Interior



FISH AND WILDLIFE SERVICE  
Pacific Islands Fish and Wildlife Office  
300 Ala Moana Boulevard, Room 3-122, Box 50088  
Honolulu, Hawai'i 96850

In Reply Refer To:  
1-2-2006-TA-638

**AUG 07 2006**

Ms. Rowena M. Dagdag  
Munekyo & Hiraga, Inc.  
305 High Street, Suite 104  
Wailuku, Hawaii 96793


Dear Ms. Dagdag:

Thank you for your letter, received on July 14, 2006, requesting a list of threatened and endangered species that may occur in the vicinity of the proposed project along Kula Highway on the island of Maui (TMK: (2) 2-3-01:174). The 48-acre Kula Ridge Affordable Housing Project proposes to develop 116 improved housing lots with 70 lots set aside for affordable housing. The remaining 46 residential lots will be sold at market price. Included in the project are five acres of green space and a three-acre park that will be dedicated to the County of Maui. Access to the project site will be via a new access road off of Lower Kula Road.

We reviewed the information you provided and pertinent information in our files, including data compiled by the Hawaii Biodiversity and Mapping Program. Two federally endangered species, nene (*Branta sandvicensis*) and Hawaiian hoary bat (*Lasiurus cinereus semotus*), occur near the proposed project site. These species may need special consideration before and during the execution of your project.

We appreciate your efforts to conserve endangered species. If you have questions, please contact Fish and Wildlife Biologist Charmian Dang (phone: 808/792-9400; fax: 808/792-9581).

Sincerely,

 Patrick Leonard  
Field Supervisor



MICHAEL T. MUNEKIYO  
GWEN ORASIO HIRAGA  
MITSURU "MICK" HIRANO  
KARLYNN KAWAHARA

MARK ALEXANDER BOY

October 29, 2007

Patrick Leonard, Field Supervisor  
**U. S. Fish and Wildlife Service**  
300 Ala Moana Boulevard  
Room 3-122, Box 50088  
Honolulu, Hawaii 96813

SUBJECT: Proposed Kula Ridge Affordable Housing Project  
at TMK (2) 2-3-01:174, Kula, Maui

Dear Mr. Leonard:

Thank you for your letter dated August 7, 2006, commenting on the proposed affordable housing project in Kula. In response to your comments, we would like to note that a Biological Resources Survey will be included with the Draft Environmental Assessment (EA), which will determine the presence or likely occurrence of any native flora and fauna, particularly any that are federally listed as threatened or endangered. As applicable, the Draft EA will further recommend measures that would mitigate any significant negative impact on the flora and fauna in the proposed subdivision.

Thank you again for your comments. A copy of the Draft EA will be provided to your office for review and comment.

If there are any questions, please do not hesitate to call me at (808)244-2015.

Very truly yours,

Rowena M. Dagdag, Planner

RMD:yp

cc: Clayton Nishikawa, Kula Ridge, LLC

F:\DATA\Nishikawa\KulaAH 1107\usfishandwildlife.ecres.wpd

JUL 21 2006

LINDA LINGLE  
GOVERNOR OF HAWAII



CHIYOME L. FUKINO, M.D.  
DIRECTOR OF HEALTH

STATE OF HAWAII  
DEPARTMENT OF HEALTH  
P.O. BOX 3378  
HONOLULU, HAWAII 96801-3378

In reply, please refer to:  
EMD / CWB

07065PKP.06

July 19, 2006

Ms. Rowena M. Dagdag  
Plannner  
Munekiyo & Hiraga, Inc.  
305 South High Street, Suite 104  
Wailuku, Hawaii 96793

Dear Ms. Dagdag:

**Subject: Early Consultation Request for Proposed Affordable Housing Project  
Kula, Maui, Hawaii**

The Department of Health (DOH), Clean Water Branch (CWB), acknowledges receipt of your letter, dated July 12, 2006, and associated documents. The CWB has reviewed the limited information contained in the subject document and offers the following comments:

1. The Army Corps of Engineers should be contacted at (808) 438-9258 for this project. Pursuant to Federal Water Pollution Control Act (commonly known as the "Clean Water Act" (CWA) Paragraph 401(a)(1), a Section 401 Water Quality Certification (WQC) is required for "[a]ny applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may **result** in any discharge into the navigable waters..." (emphasis added). The term "discharge" is defined in CWA, Subsections 502(16), 502(12), and 502(6); Title 40, Code of Federal Regulations (CFR), Section 122.2; and Hawaii Administrative Rules (HAR), Chapter 11-54.
2. In accordance with HAR, Sections 11-55-04 and 11-55-34.05, the Director of Health may require the submittal of an individual permit application or a Notice of Intent (NOI) for general permit coverage authorized under the National Pollutant Discharge Elimination System (NPDES).
  - a. An application for an NPDES individual permit is to be submitted at least 180 days before the commencement of the respective activities. The NPDES application forms may also be picked up at our office or downloaded from our website at <http://www.hawaii.gov/health/environmental/water/cleanwater/forms/indiv-index.html>.



- b. An NOI to be covered by an NPDES general permit is to be submitted at least 30 days before the commencement of the respective activity. A separate NOI is needed for coverage under each NPDES general permit. The NOI forms may be picked up at our office or downloaded from our website at:  
<http://www.hawaii.gov/health/environmental/water/cleanwater/forms/genl-index.html>.
- i. Storm water associated with industrial activities, as defined in Title 40, CFR, Sections 122.26(b)(14)(i) through 122.26(b)(14)(ix) and 122.26(b)(14)(xi). [HAR, Chapter 11-55, Appendix B]
  - ii. Construction activities, including clearing, grading, and excavation, that result in the disturbance of equal to or greater than one (1) acre of total land area. The total land area includes a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under a larger common plan of development or sale. **An NPDES permit is required before the commencement of the construction activities.** [HAR, Chapter 11-55, Appendix C]
  - iii. Discharges of treated effluent from leaking underground storage tank remedial activities. [HAR, Chapter 11-55, Appendix D]
  - iv. Discharges of once through cooling water less than one (1) million gallons per day. [HAR, Chapter 11-55, Appendix E]
  - v. Discharges of hydrotesting water. [HAR, Chapter 11-55, Appendix F]
  - vi. Discharges of construction dewatering effluent. [HAR, Chapter 11-55, Appendix G]
  - vii. Discharges of treated effluent from petroleum bulk stations and terminals. [HAR, Chapter 11-55, Appendix H]
  - viii. Discharges of treated effluent from well drilling activities. [HAR, Chapter 11-55, Appendix I]
  - ix. Discharges of treated effluent from recycled water distribution systems. [HAR, Chapter 11-55, Appendix J]
  - x. Discharges of storm water from a small municipal separate storm sewer system. [HAR, Chapter 11-55, Appendix K]
  - xi. Discharges of circulation water from decorative ponds or tanks. [HAR, Chapter 11-55, Appendix L]

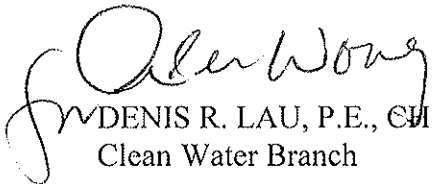
Ms. Rowena M. Dagdag  
July 19, 2006  
Page 3

3. In accordance with HAR, Section 11-55-38, the applicant for an NPDES permit is required to either submit a copy of the new NOI or NPDES permit application to the State Department of Land and Natural Resources, State Historic Preservation Division (SHPD), or demonstrate to the satisfaction of the DOH that the project, activity, or site covered by the NOI or application has been or is being reviewed by SHPD. If applicable, please submit a copy of the request for review by SHPD or SHPD's determination letter for the project.
4. Any discharges related to project construction or operation activities, with or without a Section 401 WQC or NPDES permit coverage, shall comply with the applicable State Water Quality Standards as specified in HAR, Chapter 11-54.

The Hawaii Revised Statutes, Subsection 342D-50(a), requires that "[n]o person, including any public body, shall discharge any water pollutants into state waters, or cause or allow any water pollutant to enter state waters except in compliance with this chapter, rules adopted pursuant to this Chapter, or a permit or variance issued by the director."

If you have any questions, please contact Mr. Alec Wong, Supervisor of the Engineering Section, CWB, at (808) 586-4309.

Sincerely,

  
DENIS R. LAU, P.E., CHIEF  
Clean Water Branch

KP:np



MICHAEL T. MUNEKIYO  
GWEN OHASHI HIRAGA  
MITSURU "MICH" HIRANO  
KARLYNN KAWAHARA

MARK ALEXANDER ROY

October 29, 2007

Dennis R. Lau, P.E., Chief  
**Clean Water Branch**  
State of Hawai'i  
Department of Health  
P. O. Box 3378  
Honolulu, Hawai'i 96801-3378

SUBJECT: Proposed Kula Ridge Affordable Housing Project at  
TMK (2) 2-3-01:174

Dear Mr. Lau:

Thank you for your letter dated July 19, 2006, commenting on the proposed affordable housing subdivision in Kula. In response to your comments, we would like to note the following:

1. The Army Corps of Engineers will be contacted to identify whether a Federal permit will be required for the proposed project. A copy of the Draft Environmental Assessment (EA) will be forwarded to the Department of the Army for review and comment.
2. The applicant will comply with the requirements of Hawai'i Administrative Rules (HAR), Sections 11-55-04 and 11-55-34.05, relating to the National Pollutant Discharge Elimination System, as applicable.
3. An archaeological inventory survey has been prepared and submitted to the State Historic Preservation Division (SHPD) for review. As required by HAR, Section 11-55-38, appropriate coordination and documentation will be secured from SHPD. A copy of the archaeological report will be included in the Draft EA.
4. Project construction and operations will comply with HAR, Chapter 11.54, as applicable.
5. Kula Ridge, LLC acknowledges and understands the requirements of Hawai'i Revised Statutes, Subsection 342D-50(a).

Dennis R. Lau, P.E., Chief  
October 29, 2007  
Page 2

Thank you again for your input. A copy of the Draft EA will be provided to your office for review and comment.

Should you any questions, please do not hesitate to call me at (808)244-2015.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Rowena Dagdag', written in a cursive style.

Rowena Dagdag, Planner

RDL:yp

cc: Clayton Nishikawa, Kula Ridge, LLC

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JUL 25 2006

LINDA LINGLE  
GOVERNOR OF HAWAII



CHIYOME L. FUKINO, M. D.  
DIRECTOR OF HEALTH

LORRIN W. PANG, M. D., M. P. H.  
DISTRICT HEALTH OFFICER

STATE OF HAWAII  
DEPARTMENT OF HEALTH  
MAUI DISTRICT HEALTH OFFICE  
54 HIGH STREET  
WAILUKU, MAUI, HAWAII 96793-2102

July 24, 2006

Ms. Rowena M. Dagdag  
Planner  
Munekiyō & Hiraga, Inc.  
305 High Street, Suite 104  
Wailuku, Hawai'i 96793

Dear Ms. Dagdag:

Subject: **Early Consultation Request for Proposed Affordable Housing Project**  
TMK: (2) 2-3-01: 174

Thank you for the opportunity to participate in the early consultation process for the proposed affordable housing project for Kula Ridge, LLC. The following comments are offered:

One hundred sixteen residential lots will be developed for this project. Hawaii Administrative Rules, Chapter 11-62, "Wastewater Systems" will require that a treatment plant in lieu of individual wastewater disposal systems be installed. Questions regarding this matter should be directed to the Department of Health, Wastewater Branch at 808 586-4294.

Should you have any questions, please call me at 808 984-8230.

Sincerely,

Herbert S. Matsubayashi  
District Environmental Health Program Chief

c: WWB  
Roland Tejano



MICHAEL T. MUNEKIYO  
GWEN OHASHI HIRAGA  
MITSURU "MICH" HIRANO  
KARLYNN KAWAHARA  
MARK ALEXANDER ROY

October 29, 2007

Herbert S. Matsubayashi, Chief  
District Environmental Health Program  
State of Hawaii  
**Department of Health**  
54 High Street  
Wailuku, Hawaii 96793

SUBJECT: Proposed Kula Ridge Affordable Housing Project at  
TMK 2-2-3-001:174

Dear Mr. Matsubayashi:

Thank you for your letter dated July 24, 2006, commenting on the proposed affordable housing project in Kula. In response to your comments, we would like to note that the wastewater issues are being carefully considered for the proposed project.

The applicant has been granted a variance from the State Department of Health to utilize individual wastewater systems (IWS) and is coordinating with a private company to install and maintain individual aerobic wastewater systems for the 116-lot subdivision. Proposed wastewater improvements will be addressed in the Draft Environmental Assessment (EA).

Thank you again for your input. A copy of the Draft EA will be provided to your office for review and comment.

Should you have any questions, please do not hesitate to call me at 244-2015.

Very truly yours,

Rowena M. Dagdag, Planner

RMD:yp

cc: Clayton Nishikawa, Kula Ridge, LLC

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OCT 11 2006

PHONE (808) 594-1888

FAX (808) 594-1865



**STATE OF HAWAII**  
**OFFICE OF HAWAIIAN AFFAIRS**  
711 KAPI'OLANI BOULEVARD, SUITE 500  
HONOLULU, HAWAII 96813

HRD06/2580

October 4, 2006

Rowena M. Dagdag  
Planner  
Munekiyo & Hiraga, Inc.  
305 High Street, Suite 104  
Wailuku, HI 96793

**RE: Early Consultation Request for Proposed Affordable Housing Project, Kula, Maui, TMK: 2-3-001:174.**

Dear Rowena M. Dagdag,

The Office of Hawaiian Affairs (OHA) is in receipt of your request for consultation on the above-referenced project. We apologize for the delayed response and offer the following comments.

OHA staff recommends that the environmental assessment (EA) you are preparing include a professional "due diligence" study of the potential impact of these projects on archaeological, historic, and cultural resources. We also recommend contacting Ed Lindsey to improve the consultation component of your EA.

OHA further requests your assurances that, should iwi or Native Hawaiian cultural or traditional deposits be found during any ground disturbance associated with this project, work will cease, and the appropriate agencies will be contacted pursuant to applicable law.

Thank you for the opportunity to comment. If you have further questions or concerns, please contact Kai Markell, Lead Advocate – Culture, at (808) 594-1945 or [kaim@oha.org](mailto:kaim@oha.org).

Aloha,

A handwritten signature in black ink, appearing to read "Clyde W. Nāmu'o".  
Clyde W. Nāmu'o  
Administrator

Rowena M. Dagdag  
Planner  
October 4, 2006  
Page 2

C: Thelma Shimaoka  
Community Resource Coordinator  
OHA – Maui Office  
140 Hoohana Street, Suite 206  
Kahului, HI 96732



October 29, 2007

Haunani Apoliona  
Board of Trustee Chair  
**Office of Hawaiian Affairs**  
State of Hawai'i  
711 Kapiolani Blvd., Suite 500  
Honolulu, Hawai'i 96813

SUBJECT: Proposed Kula Ridge Affordable Housing Project at  
TMK 2-2-3-001:174

Dear Mr. Apoliona:

Thank you for the Office of Hawaiian Affairs letter dated October 4, 2006, commenting on the proposed affordable housing project in Kula. In response to these comments, we would like to note the following:

1. Coordination will be undertaken with individuals familiar with the project area, as we prepare the cultural component of the Draft Environmental Assessment (EA). Mr. Ed Lindsey has been contacted in this regard and is willing to offer assistance.
2. An archaeological inventory survey has been prepared by the archaeologist and will be included in the Draft EA.

Thank you again for providing input to the proposed action. A copy of the Draft EA will be provided to your office for review and comment.

If there are any questions, please do not hesitate to call me at (808) 244-2015.

Very truly yours,



Rowena M. Dagdag, Planner

RMD:yp

cc: Clayton Nishikawa, Kula Ridge, LLC  
Mike Dega, Scientific Consulting Services

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JUL 28 2006

STATE OF HAWAII  
DEPARTMENT OF EDUCATION  
P.O. BOX 2360  
HONOLULU, HAWAII 96804

OFFICE OF THE SUPERINTENDENT

July 27, 2006

Ms. Rowena M. Dagdag, Planner  
Munekiyo & Hiraga Inc.  
305 High Street, Suite 104  
Wailuku, Hawaii 96793

Dear Ms. Dagdag:

Subject: Early Consultation for Kula Ridge, TMK: 2-3-01: 174

The Department of Education (DOE) has reviewed your request for an early consultation on the proposed Kula Ridge project in Kula, Maui.

The DOE will need to know if accessory residential units will be permitted within the project, either on the affordable or the market price lots. We would also like to know the size of the lots. The DOE would like to get an estimate of the actual cost of the affordable house and lot packages and the cost of the market priced lots. The costs of the homes and property have a bearing on the number of public school students we estimate will eventually reside in the project. Finally, the DOE would appreciate receiving an estimated schedule of construction completions of the affordable homes.

Thank you for an opportunity to comment on your plans. If you have any questions, please call Heidi Meeker of the Facilities Development Branch at (808) 733-4862.

Very truly yours,

Patricia Hamamoto  
Superintendent

PH:jmb

cc: Randolph Moore, Acting Assistant Superintendent, OBS  
Duane Kashiwai, Public Works Manager, FDB  
Ken Nomura, CAS, Baldwin/King Kekaulike/Maui Complex Areas



MICHAEL T. MUNEKIYO  
GWEN DHASHI HIRAGA  
MITSURU "MICH" HIRANO

KARLYNN KAWAHARA

August 22, 2006

Patricia Hamamoto, Supervisor  
State of Hawaii  
Department of Education  
P. O. Box 2360  
Honolulu, Hawaii 96804

**SUBJECT: Proposed Kula Ridge Affordable Housing Project  
at TMK (2)2-3-01:174**

Dear Ms. Hamamoto:

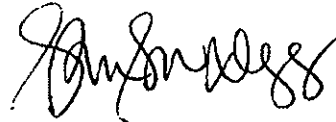
Thank you for your letter dated July 27, 2006, commenting on the proposed affordable housing project in Kula. In response to your comments, we would like to note the following:

1. Accessory residential units will not be permitted on the smaller affordable or market priced lots. Accessory units will be permitted on the four (4) large lots located in the proposed subdivision (Lot Nos. 113, 114, 115 and 116). See Figure 1.
2. The affordable lots are proposed to be a minimum of 5,600 to 8,500 square feet (s.f) with a zero-lot line concept. Market priced lots will be on the order of 6,000 to 21,000 square feet.
3. Sale prices are projected to range from approximately \$210,000.00 to \$325,000.00 for the affordable house-lot packages. The market prices for the residential lots have an estimated sales price range of \$400,000.00 to \$500,000.00, based on current market conditions for "lots only".
4. An estimated schedule of construction completion for the affordable homes will be included in the Draft Environmental Assessment (DEA).

Patricia Hamamoto, Supervisor  
August 22, 2006  
Page 2

Thank you again for your input. A copy of the DEA will be provided to your office for review and comment. If there are any questions, please do not hesitate to call me at (808) 244-2015.

Very truly yours,

A handwritten signature in black ink, appearing to read "Rowena Dagdag". The signature is fluid and cursive, with the first name being more prominent.

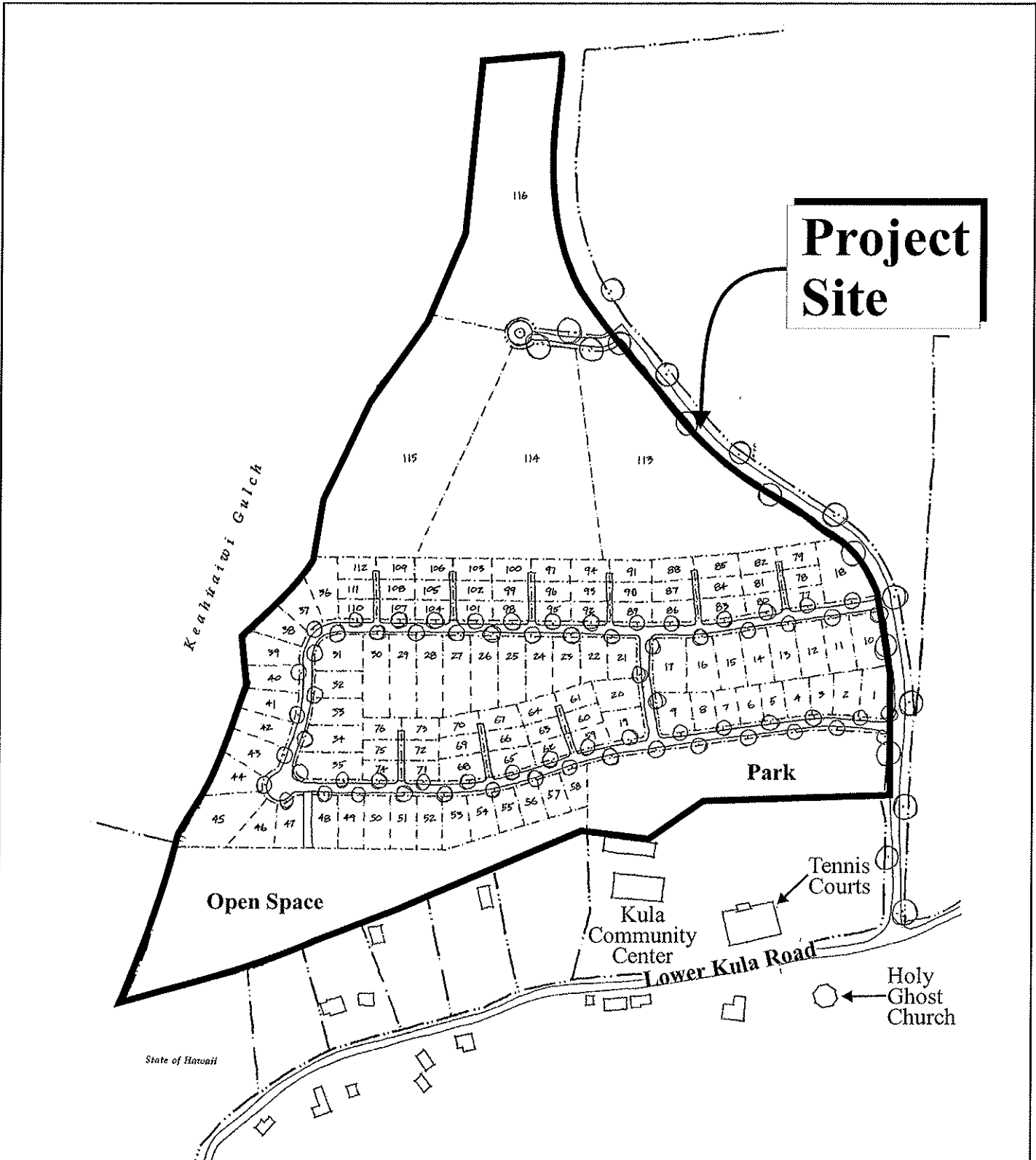
Rowena Dagdag, Planner

RD:yp

Enclosure

cc: Clayton Nishikawa, Kula Ridge, LLC (w/out enclosure)

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Source: Architectural Design & Construction, Inc.

**Figure 1** Proposed Kula Ridge Affordable Housing Subdivision Conceptual Site Plan NOT TO SCALE



Prepared for: Kula Ridge, LLC


  
 MUNEKIYO & HIRAGA, INC.



MICHAEL T. MUNEKIYO  
GWEN OHASHI HIRAGA  
MITSURU "MICK" HIRANO  
KARLYNN KAWAHARA

MARK ALEXANDER ROY

October 29, 2007

Patricia Hamamoto, Supervisor  
State of Hawaii  
**Department of Education**  
P. O. Box 2360  
Honolulu, Hawaii 96804

SUBJECT: Proposed Kula Ridge Affordable Housing Project  
at TMK (2)2-3-01:174

Dear Ms. Hamamoto:

Thank you for your letter dated July 27, 2006, responding to our request for early consultation comments for the proposed affordable housing project in Kula. We responded to your comments in a letter dated August 22, 2006, and met with Heidi Meeker of the Department of Education Planning Section on October 13, 2006 to discuss the education assessment requirements for the project. We wish to provide you with an update to the information that we presented to you in our last letter.

Based on the 2007 income guidelines, the proposed sale prices for the affordable house-lot packages are projected to range from approximately \$234,685.00 to \$490,900.00. The market prices for the residential lots continue to have an estimated sales price range of \$350,000.00 to \$450,000.00 based on current market conditions. The larger four (4) acre lots have an estimated sale price of \$1.2 million. The market lots will be sold as lots only.

A copy of the Draft Environmental Assessment will be provided to your office for review and comment. If there are any questions, please do not hesitate to call me at (808) 244-2015.

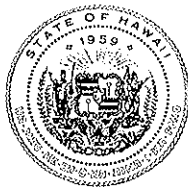
Very truly yours,

Rowena Dagdag, Planner

RD:lh

cc: Clayton Nishikawa, Kula Ridge, LLC

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AUG 04 2006

RODNEY K. HARAGA  
DIRECTOR

Deputy Directors  
FRANCIS PAUL KEENO  
BARRY FUKUNAGA  
BRENNON T. MORIOKA  
BRIAN H. SEKIGUCHI

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
869 PUNCHBOWL STREET  
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:

STP 8.2226

August 2, 2006

Ms. Rowena M. Dagdag  
Munekiyo & Hiraga, Inc.  
305 High Street, Suite 104  
Wailuku, Hawaii 96793

Dear Ms. Dagdag:

Subject: Kula Ridge LLC, Affordable Housing Project  
Early Consultation  
TMK: (2) 2-3-01: 174

Thank you for your notification on the proposed subject project.

The project is anticipated to have an impact on our State highway. We understand that an environmental assessment on the project will be done. A traffic impact analysis report (TIAR) should be conducted and provided as a part of the environmental assessment. We request that four (4) copies of the environmental assessment be provided to us for our review.

We will defer further comments on the project until we have reviewed the environmental assessment.

We appreciate the opportunity to provide our comments.

Very truly yours,

  
RODNEY K. HARAGA  
Director of Transportation



MICHAEL T. MUNEKIYO  
GWEN OHASHI HIRAGA  
MITSURU "MICK" HIRANO  
KARLYNN KAWAHARA  
MARK ALEXANDER BOY

October 29, 2007

Barry Fukunaga, Director  
State of Hawai'i  
**Department of Transportation**  
869 Punchbowl Street  
Honolulu, Hawai'i 96813-5097

SUBJECT: Proposed Affordable Housing Project at TMK (2) 2-3-01:174

Dear Mr. Fukunaga:

Thank you for the Department of Transportation letter of August 2, 2006, responding to our request for early consultation comments for the proposed affordable housing project in Kula. In response to these comments, we would like to note that a traffic impact analysis has been prepared by the traffic engineer and will be included in the Draft Environmental Assessment (EA).

Four (4) copies of the Draft Environmental Assessment will be provided to your office for review and comment.

If there are any questions, please do not hesitate to call me at (808)244-2015.

Very truly yours,

Rowena Dagdag, Planner

RD:yp  
cc: Clayton Nishikawa, Kula Ridge, LLC  
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DEPARTMENT OF  
**HOUSING AND HUMAN CONCERNS**  
COUNTY OF MAUI

JUL 31 2006  
ALAN M. ARAKAWA  
Mayor

ALICE L. LEE  
Director

HERMAN T. ANDAYA  
Deputy Director

---

200 SOUTH HIGH STREET • WAILUKU, HAWAII 96793 • PHONE (808) 270-7805 • FAX (808) 270-7165

July 25, 2006

Ms. Rowena M. Dagdag, Planner  
Munekiyo & Hiraga, Inc.  
305 High Street, Suite 104  
Wailuku, Hawaii 96793

Dear Ms. Dagdag:

**SUBJECT: AFFORDABLE HOUSING PROJECT IN KULA,  
TMK (2)2-3-01:174,  
KULA, MAUI, HAWAII**

We have reviewed your July 12, 2006 letter and enclosures for the proposed affordable housing project in Kula, Maui, and would like to offer the following comments:

1. Since the project is proposed for development under Section 201G-118, HRS, attached for your use is a copy of our department's Section 201G-118, HRS, application process (Revised 3/04/04).
2. It is our understanding that under the provisions of Act 217, SLH 2006, commenting agencies are to be given 45 days to comment on preliminary Section 201G-118, HRS, applications. Therefore, the provision in Section III of our department's Section 201G-118, HRS, application process will be changed to 45 days. In addition, Act 217, SLH 2006, stipulates that if agencies do not comment within the 45 day comment period, that the preliminary application as proposed are deemed acceptable to the agency.
3. Act 180, SLH 2006, has repealed Chapter 201G, HRS, and placed the provisions of Chapter 201G, HRS, into Chapter 201H, HRS. However, at this time, we do not know the new section number for what was Section 201G-118, HRS.

Ms. Rowena M. Dagdag

Page 2

July 25, 2006

4. Please note that under our department's Section 201G-118, HRS, application process, single family units must be affordable to persons/families whose income is 120% or less of Maui County's median annual income.
5. Please advise our department as soon as possible, as to whether the project's EA and preliminary Section 201G-118, HRS, application will be prepared and processed separately or jointly.

Thank you for the opportunity to comment.

Very truly yours,



ALICE L. LEE

Director

ETO:hs

Attachment

c: Housing Administrator

SECTION 201G-118, HRS, APPLICATION PROCESS  
DEPARTMENT OF HOUSING AND HUMAN CONCERNS  
COUNTY OF MAUI

To qualify as a Section 201G-118, HRS, project, a minimum of fifty-one percent (51%) of the proposed units must qualify as affordable housing units.

To qualify as an affordable housing unit, a housing unit must be affordable to persons/families in one or more of the applicable income group(s) shown below, as determined by the Director of Housing and Human Concerns, County of Maui.

Ownership Units

Single-Family Detached (Includes duplexes)	-	120% or less of the County's median income.
Multi-Family Attached	-	110% or less of the County's median income.

Rental Units

Detached/Attached	-	100% or less of the County's median income.
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In addition, the final selling price(s) and/or the final rental rate(s) must be approved by the Director of Housing and Human Concerns.

- I. Applicant prepares preliminary Section 201G-118, HRS, application.
- II. Preliminary Section 201G-118, HRS, application shall include but not be limited to the following:
  - A. INTRODUCTION
    1. PROJECT LOCATION, EXISTING USE, AND LAND OWNERSHIP
    2. BACKGROUND
    3. PROJECT NEED
    4. PROPOSED IMPROVEMENTS
    5. REQUESTED WAIVERS AND EXEMPTIONS

B. DESCRIPTION OF THE EXISTING ENVIRONMENT

1. PHYSICAL ENVIRONMENT

- a. Surrounding Land Use
- b. Climate
- c. Flood and Tsunami Zone
- d. Topography and Soils
- e. Flora and Fauna
- f. Archaeological Resources
- g. Air Quality
- h. Noise Characteristics
- i. Visual Resources

2. COMMUNITY SETTING

- a. Regional Setting
- b. Population
- c. Economy
- d. Police and Fire Protection
- e. Medical Facilities
- f. Recreational Facilities
- g. Schools
- h. Solid Waste Disposal

3. INFRASTRUCTURE

- a. Roadway Systems
- b. Water system
- c. Wastewater System
- d. Drainage

e. Electrical and Telephone Service

C. POTENTIAL IMPACTS AND MITIGATION MEASURES

1. IMPACTS TO PHYSICAL ENVIRONMENT

a. Surrounding Uses

b. Flora and Fauna

c. Archaeological Resources

d. Air Quality

e. Noise

f. Visual Impact

2. IMPACTS TO COMMUNITY SETTING

a. Population and Local Economy

b. Housing

c. Police, Fire and Medical Services

d. Recreational and Social Service

e. Solid Waste

3. IMPACTS TO INFRASTRUCTURE

a. Roadways

b. Water

c. Drainage

d. Wastewater

e. Electrical and Telephone Services

D. RELATIONSHIP TO LAND USE PLANS, POLICIES AND CONTROLS

1. STATE LAND USE DISTRICTS

2. GENERAL PLAN OF THE COUNTY OF MAUI

3. COMMUNITY PLAN

4. ZONING

E. FINDINGS AND CONCLUSIONS

F. AGENCIES CONTACTED IN THE PREPARATION OF THE PRELIMINARY SECTION 201G-118, HRS, APPLICATION AND COMMENTS RECEIVED

G. COMMENTS RECEIVED DURING PUBLIC REVIEW PERIOD AND APPLICABLE RESPONSES

H. COMMENTS RECEIVED AFTER PUBLIC REVIEW PERIOD

I. APPENDICES - Preliminary Grading and Drainage Report  
- Preliminary Building Specifications

J. LIST OF FIGURES

- 1 Regional Location Map
- 2 Site Location Map
- 3 Site Plan
- 4 Exterior Building Elevations
- 5 Unit Floor Plans
- 6 Flood Insurance Rate Map
- 7 Soil Association Map
- 8 Soil Classifications
- 9 State Land Use District Classifications
- 10 Community Plan Land Use Designations

III. Fifteen (15) copies of the preliminary Section 201G-118, HRS, application is submitted to the Director of Housing and Human Concerns, County of Maui.

IV. Director of Housing and Human Concerns transmits preliminary Section 201G-118, HRS, application to the following agencies for review and comment, and requests that comments be submitted within (30) days.

Highways Division (Maui), State Department of  
Transportation  
Environmental Health Division (Maui), State Department  
Of Health  
Historic Preservation Division, State Department of  
Land and Natural Resources  
Department of Public Works and Environmental  
Management, County of Maui (3 copies)  
Department of Planning, County of Maui  
Department of Water Supply, County of Maui (2 copies)  
Department of Fire and Public Safety, County of Maui  
Department of Parks & Recreation, County of Maui  
Department of Police, County of Maui

Department of Transportation, County of Maui  
Department of Housing and Human Concerns, County of  
Maui (2 copies)

- V. Agency comments are forwarded to the applicant by the Director of Housing and Human Concerns with a request that all issues of concern be addressed or resolved prior to the Section 201G-118, HRS, application being finalized.
- VI. Section 201G-118, HRS, application is finalized and twenty-one (21) copies are submitted to the Director of Housing and Human Concerns.
- VII. Director of Housing and Human Concerns transmits nineteen (19) copies of the final Section 201G-118, HRS, application to the County Council via the Mayor with a recommendation for approval. Also transmitted are two resolutions. One resolution is for approval of the project and the second resolution is for disapproval of the project. The County Council has forty-five (45) days to approve or disapprove the project. If the project is not disapproved by the forty-sixth day, the project is deemed approved.
- VIII. If a district boundary amendment by the State Land Use Commission (LUC) is required, a petition shall be submitted to the LUC by the applicant. The LUC has forty-five (45) days to approve or disapprove the petition. If the petition is not disapproved by the forty-sixth day, the petition is deemed approved.

Note: If the proposed project is subject to Chapter 343, Hawaii Revised Statutes (HRS), the preliminary and final Section 201G-118, HRS, applications shall contain all of the information that is specified for an Environmental Assessment.



MICHAEL T. MUNEKIYO  
GWEN OHASHI HIRAGA  
MITSURU "MICK" HIRANO  
KARLYNN KAWAHARA

MARK ALEXANDER ROY

October 29, 2007

Vanessa Medeiros, Director  
County of Maui  
**Department of Housing  
and Human Concerns**  
200 South High Street  
Wailuku, Hawaii 96793

SUBJECT: Proposed Kula Ridge Affordable Housing Project  
at TMK (2) 2-3-01:174

Dear Ms. Medeiros:

A letter from the Department of Housing and Human Concerns (DHHC) was transmitted to our office on July 25, 2006 responding to our request for early consultation comments for the proposed affordable housing project in Kula. Comments were made based on the information provided in the early consultation request. To better organize the presentation of our response, we have labeled each item to correspond with the number and letter designation for each comment provided in the letter.

1. The applicant will abide by the Department of Housing and Human Concerns' Section 201H-38, Hawaii Revised Statutes (HRS) guidelines.
2. The applicant has reviewed and understands the provisions of Act 217, SLH 2006.
3. The new replacement section number Section 201H-38, HRS, will be used to refer to Section 201G, HRS.
4. The estimated selling prices for the affordable-priced lots, as well as the estimated selling prices for the market-priced lots will be included in the Draft Environmental Assessment (EA). In accordance with the affordable housing conditions adopted by the County Council Workforce Housing Ordinance No. 3418, the applicant understands that affordable units must be affordable to those earning 160 percent or less of Maui County's median annual income. The applicant is also prepared to set prices using HUD guidelines.
5. The project's Environmental Assessment and preliminary Section 201H-38, HRS, application will be prepared and processed concurrently.

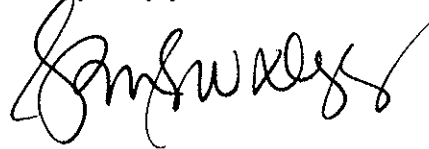


Vanessa Medeiros, Director  
October 29, 2007  
Page 2

A copy of the Draft EA will be provided to your office for review and comment.

If there are any questions, please do not hesitate to call me at 244-2015.

Very truly yours,

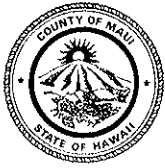
A handwritten signature in black ink, appearing to read "Rowena M. Dagdag". The signature is fluid and cursive, with a long horizontal stroke at the end.

Rowena M. Dagdag, Planner

RMD:yp

cc: JoAnn Ridao, County of Maui Housing Commissioner  
Clayton Nishikawa, Kula Ridge, LLC

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ALAN M. ARAKAWA  
MAYOR

OUR REFERENCE  
ti  
YOUR REFERENCE

# POLICE DEPARTMENT

## COUNTY OF MAUI

55 MAHALANI STREET  
WAILUKU, HAWAII 96793  
(808) 244-6400  
FAX (808) 244-6411

July 26, 2006

JUL 28 2006



THOMAS M. PHILLIPS  
CHIEF OF POLICE

GARY YABUTA  
DEPUTY CHIEF OF POLICE

Ms. Rowena M. Dagdag, Planner  
Munekiyo & Hiraga, Inc.  
305 High Street, Suite 104  
Wailuku, HI 96793


Dear Ms. Dagdag:

SUBJECT: Early Consultation Request for Proposed Affordable Housing Project  
at TMK (2) 2-3-01:174, Kula, Maui, Hawaii

Thank you for your letter of July 12, 2006, requesting comments on the above subject.

We have reviewed the information submitted for this project and have enclosed our comments and recommendations. Thank you for giving us the opportunity to comment on this project.

Very truly yours,

  
Acting Assistant Chief Milton Matsuoka  
for: Thomas M. Phillips  
Chief of Police

c: Michael Foley, Planning Department

Enclosure

COPY

TO : THOMAS M. PHILLIPS, CHIEF OF POLICE, MAUI POLICE DEPARTMENT

VIA : CHANNELS

FROM : SCOTT Y. MIGITA, ADMINISTRATIVE SERGEANT, WAILUKU PATROL

SUBJECT : EARLY CONSULTATION REQUEST FOR PROPOSED AFFORDABLE HOUSING PROJECT, TMK (2) 2-3-01:174, KULA, MAUI, HAWAII

Sir, this To/From is being submitted by Munekiyo & Hiraga, Inc., on behalf of Kula Ridge, LLC seeking early consultation comments to prior to an Environmental Assessment (EA) regarding the construction of an affordable housing project in Kula. The proposed project is on an approximately 48-acre parcel at TMK (2) 2-3-01:174, located along Lower Kula Road, east of the Kula Community Center. This proposal involves the development of 116 improved lots, 70 of which will be affordable house-lot packages. The remaining 46 residential lots will be sold at market price. There will also be 5 acres of green space and a 3 acre park dedicated to the County of Maui. The access to the project site will be via a new access road off of Lower Kula Road and there are also plans to improve Kula Highway.

The issue of traffic and safety is paramount from a police perspective. This roadway off of Lower Kula Road is located in a rural area and is not ordinarily heavily used throughout all hours of the day and evening. However, with any new development, an increase in traffic and parking is anticipated, therefore, comments regarding the impact on traffic is being withheld at this time pending a traffic impact study by planners. Another area which would need to be addressed is adequate security and lighting. This proposed development is located mauka (east) of the Kula Community Center and tennis courts, therefore, the issue of sound resulting from the use of the community center for gatherings which may affect this residential area must also be considered and addressed in the draft EA.

Submitted for your information and perusal.

Notes -  
Prelim Traffic Impact  
Study.  
A/Capt. [Signature]  
[Signature]  
07/26/06

Respectfully submitted,

[Signature]

Scott Y. MIGITA, E-1122  
Administrative Sergeant, Wailuku Patrol  
07/26/06 at 2107 hours



MICHAEL T. MUNEKIYO  
GWEN OHASHI HIRAGA  
MITSURU "MICK" HIRANO  
KARLYNN KAWAHARA

MARK ALEXANDER ROY

October 29, 2007

Thomas M. Phillips  
Chief of Police  
County of Maui  
**Police Department**  
55 Mahalani Street  
Wailuku, Hawaii 96793

SUBJECT: Proposed Kula Ridge Affordable Housing Project at  
TMK 2-2-3-001:174

Dear Chief Phillips:

Thank you for your letter dated July 26, 2006, commenting on the proposed affordable housing project in Kula. In response to your comments, we would like to note the following:

1. A traffic impact analysis has been prepared for the project and will be included in the Environmental Assessment. This report addresses the increase in traffic from the additional homes. The project will be governed by design guidelines and covenants to ensure that neighborhood quality is maintained over time. Smaller homes will be able to accommodate two (2) cars off-street, with the larger homes accommodating up to four (4) cars off-street. Parking on the access driveway will not be allowed for the affordable homes with a private access driveway.
2. Safety issues will be considered and issues of adequate security and lighting will be addressed during the project's design phase. The issue of sound resulting from the use of the community center for gatherings was also considered. The distance between the community center building and the nearest home sites is about 80 feet. It is anticipated that this separation distance will help to minimize noise generated from events held at the community center. A copy of your comment letter is being forwarded to the project architect for further review.

Thomas M. Phillips  
October 29, 2007  
Page 2

Thank you again for your input. A copy of the Draft Environmental Assessment will be provided to your office for review and comment.

If there are any questions, please do not hesitate to call me at 244-2015.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Rowena Dagdag', with a long, sweeping flourish extending from the end of the signature.

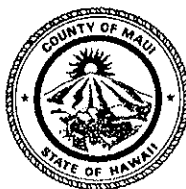
Rowena Dagdag, Planner

RD:yp

cc: Clayton Nishikawa, Kula Ridge, LLC

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ALAN M. ARAKAWA  
Mayor



AUG 11 2006  
GLENN T. CORREA  
Director

JOHN L. BUCK III  
Deputy Director

(808) 270-7230  
Fax (808) 270-7934

## DEPARTMENT OF PARKS & RECREATION

700 Hali'a Nakoa Street, Unit 2, Wailuku, Hawaii 96793

August 4, 2006

Ms. Rowena M. Dagdag  
Munekiyo & Hiraga, Inc.  
305 High Street  
Wailuku, HI 96793

Dear Ms. Dagdag.

SUBJECT: EARLY CONSULTATION REQUEST FOR PROPOSED  
AFFORDABLE HOUSING PROJECT AT TMK (2) 2-3-04:174,  
KULA, MAUI, HAWAII

We will work with the developer in coordinating park improvements for the adjoining Kula tennis court facility.

We reserve further comment at this time.

Thank you for the opportunity to comment. Please contact me or Mr. Patrick Matsui, Chief of Planning and Development, at 270-7387 if there are any questions.

Sincerely

A handwritten signature in black ink, appearing to read "Glenn T. Correa", is written over a white background.

Glenn T. Correa  
Director

GTC:PM:do

c: Patrick Matsui, Chief-Planning and Development



MICHAEL T. MUNEKIYO  
GWEN OHASHI HIRAGA  
MITSURU "MICH" HIRANO  
KARLYNN KAWAHARA  
  
MARK ALEXANDER ROY

October 29, 2007

Tamara Horcajo, Director  
County of Maui  
**Department of Parks and Recreation**  
700 Hali`a Nakoia Street, Unit 2  
Wailuku, Hawai`i 96793

SUBJECT: Proposed Kula Ridge Affordable Housing Project at  
TMK (2) 2-3-01:174

Dear Ms. Horcajo:

A letter from the Department of Parks and Recreation was transmitted to our office on August 11, 2006, responding to our request for early consultation comments for the proposed subdivision at TMK 2-3-001:174, Kula, Maui. We will continue to work with the Department of Parks and Recreation regarding roadway access improvements involving the construction of the adjoining Kula tennis court facility.

A copy of the Draft Environmental Assessment will be provided to your office for review and comment.

Please feel free to contact me with any questions at 244-2015.

Very truly yours,

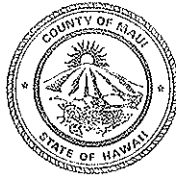
Rowena Dagdag, Planner

RDL:yp

cc: Clayton Nishikawa, Kula Ridge, LLC

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ALAN M. ARAKAWA  
Mayor  
MICHAEL W. FOLEY  
Director  
DONALD G. COUCH  
Deputy Director



AUG 11 2006

COUNTY OF MAUI  
DEPARTMENT OF PLANNING

August 9, 2006

Ms. Rowena M. Dagdag  
Munekiyo & Hiraga, Inc.  
305 High Street, Suite 104  
Wailuku, Hawaii 96793

Dear Ms. Dagdag:

RE: Early Consultation Request for Proposed Kula Ridge Affordable Housing Project at TMK: 2-3-001:174, Kula, Island of Maui, Hawai'i (EAC 2006/0025)

The Maui Planning Department (Department) has reviewed the above-referenced document for the proposed action involving the development of:

A residential subdivision including approximately:

- 116 lots, including 70 affordable lots;
- 5 acre green space; and a
- 3 acre park.

Based on the foregoing, the Department recommends that the Draft Environmental Assessment address the following:

1. Provide a regional map depicting where the site is in relation to other nearby features such as roads, streams, existing developments, prominent buildings, points of interest, etc.
2. Explain details on how the affordable housing will be provided:
  - a. What income levels will be targeted (AMI) and how many units will be provided at those levels;
  - b. How the selection of owners will occur;
  - c. How the affordability will be maintained over time;
  - d. Whether the market units will subsidize the affordable units completely;
  - e. Whether the project will entail the construction of affordable homes or merely the sale of lots; and



- f. If there will be a release rate for the market units based on the construction of the affordable units.
3. Clarify whether ohana units will be allowed throughout the development. If ohana units are allowed, then the analysis should reflect the increase.
4. It appears that mass-grading will be necessary. Provide a grading and drainage plan, including potential Best Management Practices to address erosion from wind and rain, especially in regard to the adjacent Keahuaiwi Gulch.
5. Explain how water service will be provided. We understand that the issuance of new water meters in the Kula area may be difficult to obtain.
6. Discuss how wastewater will be handled. Will each lot have an individual septic system?
7. Even though the 210G process may exempt the community plan amendment and change in zoning, a justification should be made as to why this density of development is appropriate in a rural/agricultural area, considering anticipated impacts to the neighborhood character, adjacent properties and infrastructure.
8. Discuss the cumulative loss of all agricultural lands from projects proposed or approved to date. A list of projects and regional project maps may be obtained from the Department's Long Range Division.
9. The discussion should address Section 19.30.020, Maui County Code, which states that:

*"Agricultural lands that meet at least two (2) of the following criteria should be given the highest priority for retention in the agricultural district:*

- A. *Agricultural Lands of Importance to the State of Hawaii (ALISH);*
- B. *Lands not classified by the ALISH system whose agricultural land suitability, based on soil, topographic and climatic conditions, supports the production of agricultural commodities, including*

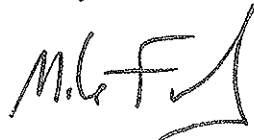
*but not limited to coffee, taro, watercress, ginger, orchard and flower crops and non-irrigated pineapple. In addition, these lands shall include lands used for intensive animal husbandry, and lands in agricultural cultivation in five of the ten years immediately preceding the date of approval of this chapter; and*

C. *Lands which have seventy-five percent or more of the their boundaries contiguous to lands within the agricultural district."*

10. It is suggested that the County Department of Parks & Recreation be consulted regarding the 3 acre park.
11. Please retain the Planning Department on your mailing list regarding this project.

Should you require further clarification, please contact Mr. Jeff Hunt, AICP, Staff Planner at [jeff.hunt@co.maui.hi.us](mailto:jeff.hunt@co.maui.hi.us) or 270-6271.

Sincerely,



MICHAEL W. FOLEY  
Planning Director

MWF:JH:bv

c: Donald G. Couch, Deputy Planning Director  
Jeff Hunt, AICP, Staff Planner  
EAC Project File  
General File  
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MICHAEL T. MUNEKIYO  
GWEN OHASHI HIRAGA  
MITSURU "MICK" HIRANO  
KARLYNN KAWAHARA  
MARK ALEXANDER ROY

October 29, 2007

Jeffrey Hunt, Director  
**Department of Planning**  
County of Maui  
250 South High Street  
Wailuku, Hawai'i 96793

SUBJECT: Proposed Kula Ridge Affordable Housing Project at  
TMK 2-2-3-001:174

Dear Mr. Hunt:

A copy of the Department of Planning's August 9, 2006 letter, commenting on the proposed Kula Ridge affordable housing project at TMK (2)2-3-001:174. Comments were made based on the information provided in the early consultation letter has been received by our office. To better organize the presentation of our response, we have labeled each response to correspond with the number and letter designation for each comment provided in the letter.

1. A regional map for the subdivision depicting its location in relations to nearby features will be included in the Draft Environmental Assessment (EA).
2. Affordable housing parameters for the project will be included in the Draft EA. The applicant will enter into an affordable housing agreement with the County of Maui to establish the specific terms and conditions for affordable sales price distribution, applicant selection process, and marketing requirements.
3. Accessory residential units will not be permitted on the smaller affordable or market priced lots. Accessory units will be permitted on the four (4) large lots located in the proposed subdivision (Lot Nos. 113, 114, 115, and 116).
4. A preliminary drainage report and a preliminary grading plan will be included in the Draft EA. Best Management Practices shall be utilized to ensure erosion and runoff control. A copy of this letter is being sent to the project engineer to ensure compliance.
5. The applicant is currently pursuing the development of an on-site water source and is coordinating with the Department of Water Supply to develop a well according to

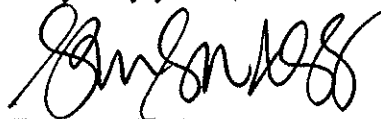
county standards. Water service and mitigation measures will be addressed in the Draft EA.

6. The applicant has been granted a variance from the State Department of Health to utilize individual wastewater systems (IWS) and is coordinating with a private company to install and maintain individual aerobic wastewater systems for the 116-lot subdivision. Proposed wastewater improvements will be addressed in the Draft EA.
7. A discussion on the appropriateness of the density within the Kula Ridge Affordable Housing project will be included in the Draft EA. The proposed project will provide include single-family homes and the opportunity for small farms that will be reflective of the region's rural character.
8. The subject property has not been used for agricultural production and there are no plans by the current owners to resume such activities. The 48 acres comprising the project site represent a small fraction of the approximately 244,726 acres of land classified as agricultural on the island of Maui. An Agricultural Impact Assessment Report has been prepared and will be included in the Draft EA.
9. Criteria cited in Section 19.30.020 of the Maui County Code will be addressed and discussed in the Draft EA.
10. The applicant has begun coordination with the County of Maui, Department of Parks and Recreation with regards to the 3-acre park in the proposed subdivision.

Thank you again for your input. A copy of the Draft EA will be provided to your office for review and comment.

Should you have any questions, please do not to call me at 244-2015.

Very truly yours,



Rowena M. Dagdag, Planner

RMD:yp

cc: Clayton Nishikawa, Kula Ridge, LLC

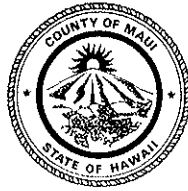
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AUG 30 2006

ALAN M. ARAKAWA  
Mayor

MILTON M. ARAKAWA, A.I.C.P.  
Director

MICHAEL M. MIYAMOTO  
Deputy Director



RALPH M. NAGAMINE, L.S., P.E.  
Development Services Administration

DAVID TAYLOR, P.E.  
Wastewater Reclamation Division

CARY YAMASHITA, P.E.  
Engineering Division

BRIAN HASHIRO, P.E.  
Highways Division

TRACY TAKAMINE, P.E.  
Solid Waste Division

COUNTY OF MAUI  
DEPARTMENT OF PUBLIC WORKS  
AND ENVIRONMENTAL MANAGEMENT  
**DEVELOPMENT SERVICES ADMINISTRATION**  
250 SOUTH HIGH STREET  
WAILUKU, MAUI, HAWAII 96793

August 25, 2006

Mr. Michael Munekiyo, A.I.C.P.  
MUNEKIYO & HIRAGA, INC.  
305 High Street, Suite 104  
Wailuku, Maui, Hawaii 96793

Dear Mr. Munekiyo:

Subject: EARLY CONSULTATION REQUEST FOR PROPOSED  
AFFORDABLE HOUSING PROJECT - KULA RIDGE  
TMK (2) 2-3-001:174


We reviewed the subject application and have the following comments:

1. The proposed subdivision will have major impacts to surrounding roadway infrastructure. A detailed traffic impact assessment report for the entire subdivision shall be developed.
2. A detailed final drainage report shall be developed and should include hydrologic and hydraulic calculations and the schemes for disposal of runoff waters. It must comply with the provisions of the "Rules and Design of Storm Drainage Facilities in the County of Maui" and must provide verification that the grading and runoff water generated by the project will not have an adverse effect on adjacent and downstream properties. The Best Management Practices plan shall show the location and details of structural and non-structural measures to control erosion and sedimentation to the maximum extent practicable.
3. Address solid waste/recycling.

Mr. Michael Munekiyo, A.I.C.P.  
August 25, 2006  
Page 2

Please call Michael Miyamoto at 270-7845 if you have any questions regarding this letter.

Sincerely,



MILTON M. ARAKAWA, A.I.C.P.  
Director

MMA:MMM:da

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11/10



MICHAEL T. MUNEKIYO  
GWEN OHASHI HIRAGA  
MELISSA "MICK" HIRANO  
KAROLYN KAWAHARA

MARK ALEXANDER BOY

October 29, 2007

Milton Arakawa, Director  
County of Maui  
**Department of Public Works**  
200 South High Street, Room 322  
Wailuku, Hawai'i 96793

SUBJECT: Proposed Kula Ridge Affordable Housing Project at  
TMK (2) 2-3-01:174

Dear Mr. Arakawa:

Thank you for your letter dated August 25, 2005, responding to our request for early consultation comments of the proposed subdivision located in Kula, Maui. In response to your comments, we note the following:

1. A detailed Traffic Impact Assessment Report (TIAR) for the subdivision will be incorporated in the Draft Environmental Assessment (EA).
2. A drainage and preliminary engineering report will be included in the Draft EA. Best Management Practices shall be utilized to ensure erosion and runoff control. A copy of this letter is being sent to the project engineer to ensure compliance.
3. Solid waste and recycling issues will be addressed in the Draft EA.

Thank you again for your input on the proposed action. A copy of the Draft EA will be provided to your office for review and comment.

Milton Arakawa, Director  
October 29, 2007  
Page 2

Should you any questions, please do not hesitate to call me at (808)244-2015.

Very truly yours,

A handwritten signature in black ink, appearing to read "Rowena Dagdag". The signature is fluid and cursive, with a large initial "R" and a long, sweeping tail.

Rowena Dagdag, Planner

RDL:yp

cc: Clayton Nishikawa, Kula Ridge, LLC  
Stacy Otomo, Otomo Engineering, Inc.

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ALAN M. ARAKAWA  
Mayor



GEORGE Y. TENGAN  
Director

ERIC H. YAMASHIGE, P.E., L.S.  
Deputy Director

**DEPARTMENT OF WATER SUPPLY**  
**COUNTY OF MAUI**  
200 SOUTH HIGH STREET  
WAILUKU, MAUI, HAWAII 96793-2155  
www.mauiwater.org

September 5, 2006

Ms. Rowena M. Dagdag, Planner  
Munekiyo & Hiraga, Inc.  
305 High Street, Suite 104  
Wailuku, Hawaii 96793

RE: Subject: Early Consultation Request for Proposed Affordable Housing Project  
TMK: 2-3-001:174 (Kula, Maui, Hawaii)

Dear Ms. Dagdag:

Thank you for the opportunity to comment on this Early Consultation Request.

**Source Availability and Consumption**

The project site is served by the Upcountry/Makawao system. Water for the system comes from the Makawao aquifer and streams of the Koolau system.

A project of this sort would have an anticipated consumption of about 83,200 gpd (gallons per day) by system standards.

The project is located in an area affected by the finding of inadequate water supply, issued on March 16, 1993. The area has insufficient water supply developed for fire protection, domestic and irrigation purposes to take on new or additional services without the detriment to those already in the regulated area.

If you submit a subdivision application with our Engineering Division, you will be placed on the Upcountry Water Service Priority List. You may also proceed and develop your own private system.

**System Infrastructure**

The project area is serviced by a 8-inch waterline off Lower Kula Road and a hydrant on Lower Kula Road. Storage is inadequate for new or additional services in the area. Extensive infrastructure improvements would have to be made for a project of this sort.

Should you have any questions, please contact our Water Resources & Planning Division at

*"By Water All Things Find Life"*



Ms. Rowena M. Dagdag  
Page 2  
September 5, 2006

244-8550, or our Engineering Division at 270-7835.

Sincerely,

A handwritten signature in black ink, appearing to read "George Y. Tengan", with a large, stylized flourish at the end.

George Y. Tengan, Director

ayi

c: Engineering Division  
WRPD Reading File



MICHAEL T. MUNEKIYO  
DAVID D. HIRAGA  
MAYUMI T. M. HIRANO  
KAROLU KAWAHARA  
MAHE A. CHANDRI BOY

October 29, 2007

Jeffery Eng, Director  
County of Maui  
**Department of Water Supply**  
200 South High street  
Wailuku, Hawai'i 96793

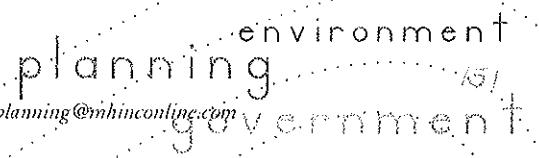
SUBJECT: Proposed Kula Ridge Affordable Housing Project at  
TMK 2-2-3-001:174

Dear Mr. Eng:

A letter from the Department of Water Supply was transmitted to our office on September 5, 2006, responding to our request for early consultation comments for the proposed subdivision at TMK (2) 2-3-01:174. Comments were made based on the information provided in the early consultation letter. In response to these comments provided by the Department of Water Supply, we would like to note the following:

1. The applicant, Kula Ridge, LLC, is pursuing the development of on-site water source. The applicant will continue to coordinate with the Department of Water Supply to ensure that water source is adequately and appropriately addressed for the project.
2. The applicant will also continue to coordinate with your Department regarding infrastructure improvements and storage capacity in the project site area.
3. A copy of your letter has been forwarded to the applicant and the project engineer for further review.

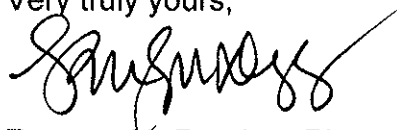
Thank you again for providing input to the proposed action. A copy of the Draft Environmental Assessment will be provided to your office for review and comment.



Jeffery Eng, Director  
October 29, 2007  
Page 2

If there are any questions, please do not hesitate to call me at 244-2015.

Very truly yours,

A handwritten signature in black ink, appearing to read "Rowena M. Dagdag", with a long, sweeping flourish extending to the right.

Rowena M. Dagdag, Planner

RMD:yp

cc: Clayton Nishikawa, Kula Ridge, LLC

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AUG 10 2006



August 8, 2006

Munekiyo & Hiraga, Inc.  
Attn: Rowena M. Dagdag, Planner  
305 High Street, Suite 104  
Wailuku, Hawaii 96793

Dear Ms. Dagdag,

Subject: Proposed Kula Ridge Affordable Housing Project –  
Lower Kula Road  
Kula, Maui, Hawaii  
Tax Map Key: (2) 2-3-001:174

Thank you for allowing us to comment on the Early Consultation Request for Proposed Kula Ridge Affordable Housing Project as described in your letter of July 12, 2006.

In reviewing our records and the information received, Maui Electric Company (MECO) will be requiring access and electrical easements for our facilities to serve the subject project site. We highly encourage the customer's electrical consultant to submit electrical drawings and a project time schedule as soon as practical so that service can be provided on a timely basis.

The existing area is currently served from our Kula Substation. Since this substation is nearly filled to capacity, the addition of this project's anticipated electrical load demand will have a substantial impact to our system. Therefore, in addition to a electrical line extension, other upgrades may be necessary to accommodate a project of this magnitude.

We also suggest that the developer and/or their consultant make contact with Walter Enomoto of our Demand Side Management (DSM) group at 872-3283 to review potential energy conservation and efficiency opportunities for their project.

Should you have any questions or concerns, please call Ray Okazaki at 871-2340.

Sincerely,

A handwritten signature in black ink that reads "Neal Shinyama".

Neal Shinyama  
Manager, Engineering

NS:ro

Cc: Walter Enomoto – MECO DSM



MICHAEL T. MUNEKIYO  
GAVIN ORASHI HIRAGA  
MITSURU "MICH" HIRANO  
KAROLYN KAWAHARA

MAIL ALLEXANDER BOX

October 29, 2007

Neal Shinyama  
Engineering Manager  
**Maui Electric Company, Ltd.**  
P. O. Box 398  
Kahului, Hawai'i 96733

SUBJECT: Proposed Kula Ridge Affordable Housing Project at  
TMK (2) 2-3-01:174

Dear Mr. Shinyama:

Thank you for your letter dated August 8, 2006, commenting on the proposed affordable housing project in Kula. In response to your comments, we would like to note the following:

1. Your letter will be forwarded to the project architect, who will coordinate with your office to verify electrical demand and indicate the desired service location for timely service. Coordination with the Demand Side Management Group will also be undertaken, as recommended.
2. Proposed electrical line improvements and other upgrades will be addressed in the Draft Environmental Assessment (EA).

Thank you again for your input. A copy of the Draft EA will be provided to your office for review and comment.

Should you have any questions, please do not hesitate to call me at 244-2015.

Very truly yours,

Rowena Dagdag, Planner

RDL:yp

cc: Clayton Nishikawa, Kula Ridge, LLC

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*David J. Darling*, EA, FNTPI

Tax Preparation & Consulting

Enrolled to Practice Before the Internal Revenue Service  
Fellow: National Tax Practice Institute

GOOD EVENING,

My name is David Darling and I have lived continuously on the corner below the proposed project for 35 ½ years. I was drawn to the area for its climate, the sun rises, bird life, sunsets, soil quality and convenience and central location. I raised a family here and hope to retire in the general Kula area someday. My child and grandchild are on the mainland furthering his studies at Seattle Children's hospital. I would hope he would be able to return to Hawaii to raise his family.

I harbor no "not in my back yard" feelings and would completely understand why these proposed lots will be a popular and desirable item on the future real estate market. I am willing to share the climate, sun rises and sunsets and overall quality of life the area offers.

Two concerns come to mind however and I hope they can be addressed in the planning process rather than after the fact.

One is double edged so I will address it last.

FIRST is traffic on a very narrow and outdated Lower Kula Road between the community center and the Waldorf School property. It is a 20 mph speed zone and is way too narrow by current county standards to support another 120 to 200 cars per day. It passes by a school that is expanding every year and serves (presently) pre-school to grade eight. The project to widen it would be ambitious but necessary to support increased traffic. SECOND is water. My property has a waterfall that runs during heavy rain. The layout of the lots does not seem to accommodate the natural flow of heavy rain, the increased runoff from rooftops and paving will only increase these flows. What drainage solutions are offered?? The double edge to the water question is where will the domestic water be coming from?? 118 water meters in this day and age on the Upper Kula system seems a stretch.

Once these concerns are addressed this project has my support

Thank you,

David Darling

A handwritten signature in cursive script that reads "David Darling". The signature is written in dark ink and is positioned to the right of the typed name "David Darling".





MICHAEL T. MUNEKIYO  
GWEN OHASHI HIRAGA  
MITSURU "MICH" HIRANO

KARLYNN KAWAHARA

August 3, 2006

David Darling  
4074 Lower Kula Road  
Kula, Hawaii 96790

SUBJECT: Kula Ridge Housing Project

Dear Mr. Darling:

Thank you for your letter of July 13, 2006, commenting on the proposed Kula Ridge Affordable Housing Subdivision (TMK 2-3-01-174) in Kula, Maui. We would also like to thank you for participating in the community meeting on July 13, 2006 at the Kula Elementary School Cafeteria. We note that the project is in its preliminary stages in terms of the environmental assessment and the Land Use Commission processes. These processes help us identify areas that would be impacted and suggest improvements for the project, as well as offsite improvements for the surrounding areas.

Clayton Nishikawa of Kula Ridge, LLC understands your concerns regarding the proposed subdivision and is working toward identifying ways to mitigate or minimize the project's impact on the community. In response to your comments, we note the following:

1. A traffic impact analysis report is being done to identify improvements and mitigation measures that need to be made before approval of the subdivision. We are awaiting completion of the traffic impact analysis report, as well as comments from the State of Hawaii, Department of Transportation regarding mitigation considerations for Lower Kula Road, Kula Highway, and other roadways in the project vicinity.
2. Any increase in runoff generated from the development of the property will be mitigated onsite by a detention basin. The design of the basin will be based on a 50 year-1hour storm, in accordance with the County drainage standards. There will be no increase in runoff flowing to the adjoining properties. Furthermore, the existing drainage pattern will be maintained through the makai properties. The civil engineer has prepared a Preliminary Drainage Report that discusses the expected increase in runoff from the proposed project and includes mitigation. The drainage report will be included in the Environmental Assessment, along with Best Management Practices.

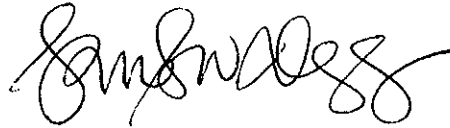


David Darling  
August 3, 2006  
Page 2

3. Residents expressed their concerns over water requirements and asked if the project would receive water before others who have been waiting for a water meter. We would like to note that although the Section 201G, Hawaii Revised Statutes process allows for certain exemptions, it would not permit exemptions relating to the provision of water source and water infrastructure. Kula Ridge, LLC is currently negotiating with Maui Land and Pineapple Company and A&B who are drilling wells in the Upcountry area. The objective of this discussion is to identify opportunities for provision of water to meet project needs.

Thank you once again for your comments. The Draft Environmental Assessment will be made available for residents interested in receiving a copy once it has been completed. Should you have any further questions or require additional information, please call me at 244-2015.

Very truly yours,



Rowena Dagdag, Planner

RD:yp

cc: Clayton Nishikawa, Kula Ridge, LLC

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James R. Davis  
 6708 Austin Way  
 Sacramento, CA 95823  
 7/8/06

Munekiyo & Hiraga, Inc.  
 305 High Street, Suite 104  
 Wailuku, Maui, Hawaii 96793

Re: Informational Meeting for Proposed Affordable Housing Project at Kula, Hawaii,  
 TMK 2-3-01:174

Dear Sirs:

I got your letter about a housing subdivision on 48 Acres by Kula Ridge, LLC, including an 8 acre park.

Unfortunately I live in Sacramento and cannot come to your meeting on 7/13.

Based on the plat map I think this is in an area that is one lot mauka of a stretch of the old lower Kula road between Haleakala School and the Holy Ghost Church. Is this correct?

You say there will be 116 improved lots with 59 affordable and 53 regular residential lots on 40 acres. This raises some questions?

- 1) What is the current zoning on this land? Urban, rural, agricultural?
- 2) Are there any unimproved lots?
- 3) What is the proposed minimum lot size?
- 4) Does "affordable" housing mean it is subsidized and so commercial?
- 5) I don't understand the percentages?  $59/116=50.9\%$  (not 60%) and  $53/116=45.7\%$  (not 40%) Is there a goal you are trying to meet? Why? Oh... maybe you mean percentage of land area. So  $(48-8)*.60/59=.407A/lot$  and  $(48-8)*.40/53=.302A/lot$ . If so, why do the subsidized lots get more acreage?
- 6) Where is the road access? Somewhere to the Lower Kula Road? Is there a road on the southern boundary? Is it a public road already? What is the name of that road?
- 7) Where is the 8 acres for the park located? Is it next to the Kula Community Club shown on plat 2-3-37 lot 27? Was this community center ever developed?

Other questions I have are:

- 8) Eight acres for a park is to be dedicated to the County. Is it to be developed before dedicating it to the county? When will the people of the area get to use it as a park? Will you be putting in the trees?
- 9) With 112 more families in the area what roads are to be upgraded? Lower Kula Road and some other feeder road? And who pays for that? What traffic controls will be enhanced?
- 10) With 112 more families in the area what impact on the water system does this have? Lower water pressure at times of peak use? Harder to get subdivision permission for existing Kula lots? Harder to get permits for water hookups?
- 11) What will the impact be on the people already living in the area that purchased in an agricultural or rural area and hoped to maintain a slower pace with lower traffic and noise? Where will the traffic flow be?

12) What does "affordable" mean? Low income? What does that mean in general terms of life style and upkeep of properties and junk and old cars accumulation? In terms of air pollution from old cars? In terms of more noise due to more cars?

13) Who are the principles in Kula Ridge, Inc.? Robert G. Von Tempsky or someone else?

I look forward to your response.

Yours truly,

A handwritten signature in cursive script that reads "James R. Davis". The signature is written in black ink and is positioned to the right of the typed name "James R. Davis".



MICHAEL T. MUNEKIYO  
GWEN OHASHI HIRAGA  
MITSURU "MICH" HIRANO

KARLYNN KAWAHARA

August 1, 2006

James R. Davis  
6708 Austin Way  
Sacramento, California 95823

SUBJECT: Proposed Kula Ridge Subdivision at TMK (2)2-3-01:174, Kula, Maui

Dear Mr. Davis:

Thank you for your letter of June 8, 2006, commenting on the proposed Kula Ridge Affordable Housing Subdivision (TMK 2-3-01:174) in Kula, Maui. We note that the project is in its preliminary stages in terms of the environmental assessment and the Land Use Commission processes. These processes help us identify areas that would be impacted and suggest improvements for the project, as well as offsite improvements for the surrounding areas.

Kula Ridge, LLC understands your concerns regarding the construction of a 116-lot subdivision, and has recently met with residents and land owners living near the proposed subdivision to answer any questions or address any concerns they had regarding the project. See Attachment. In response to your questions, we note the following:

1. The subject property falls within the State "Agricultural" District and will require reclassification to the "Rural" and Urban" Districts by the State Land Use Commission (LUC).

The property is designated "Rural" and "Single-Family" by the Makawao-Pukalani-Kula Community Plan. It is currently County-Zoned "Interim".

2. The affordable and market units will be sold as house-lot packages. Architectural Design & Construction (ADC) will design and construct the homes.
3. The affordable lot sizes are proposed to be a minimum of 5,600 to 8,500 square feet (s.f.) with a zero-lot line concept proposed for the affordable homes. Market priced lots will be on the order of 6,000 to 21,000 s.f.
4. The term "affordable" as used for this project refers to households whose annual income fall within income thresholds established by the County of Maui. For example, a portion of the affordable units may be set aside for those households

earning not more than 100 percent of the County's annual median income (\$65,700.00 for 2006).

5. There have been changes to the percentage of affordable units to be provided. The proposed project will involve the development of 116 improved lots with approximately 70 lots (60 percent) set aside for affordable house-lot packages. The remaining lots, consisting of approximately 46 residential lots (40 percent), will be sold at market price. The percentages cited above are rounded.
6. Access to the proposed subdivision would be provided via a new access road off of Lower Kula Road. See Figure 1.
7. Eight (8) acres have been designated as park and open space located above Kula Community Center. (Three (3) acres will be set aside for Park use, with the remaining five (5) acres set aside for Open Space use.) The center is located to the immediate west of the proposed subdivision. The Kula Community Center is an approximate 2,800 square foot building on seven (7) acres of land. The center has a stage, outside barbecue grill area and restrooms. There is a community police office onsite. Recreational facilities on the property include two (2) lighted tennis courts and a gateball court. The gateball court has a field house and storage shed.
8. The proposed three (3) acre park will be dedicated to the County of Maui. Five (5) acres will be used as green/open space and a drainage detention basin. Specific improvements to be implemented on the 3-acre park site will be discussed with the County's Department of Parks and Recreation. Residents will be able to use this park after it has been developed and dedicated to the county.
9. A traffic impact analysis report is being done to identify improvements and mitigation measures that need to be made before approval of the subdivision. We are awaiting a final study of the traffic impact analysis, as well as comments from the State of Hawaii, Department of Transportation and County Department of Public Works and Environmental Management regarding potential traffic impacts and mitigative measures.
10. Water supply and infrastructure improvements will need to be addressed as part of the project's ongoing planning efforts. See item no. 8 in the attached meeting minutes.
11. The impacts associated with the proposed action will be addressed as part of the environmental assessment process. Engineering, traffic and architectural design

James R. Davis  
August 1, 2006  
Page 3

issues for example, are being studied to ensure that impacts to the surrounding areas are appropriated addressed.

12. As noted, the above traffic impacts are being studied by a licensed traffic engineer. The project will be governed by design guidelines and covenants to ensure that neighborhood quality is maintained over time.
13. The Kula Ridge Affordable Housing Subdivision is managed under the direction of Mr. Clayton Nishikawa of Kula Ridge, LLC. He is the owner/architect of Nishikawa Architects and a design builder for ADC.

Thank you once again for your comments. Should you have any further questions or require additional information, please call me at (808) 244-2015.

Very truly yours,



Rowena Dagdag, Planner

RD:yp

Enclosures

cc: Clayton Nishikawa, Kula Ridge, LLC (w/out enclosures)

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MICHAEL T. MUNEKIYO  
GWEN OHASHI HIRAGA  
MITSURU "MICH" HIRANO

KARLYNN KAWAHARA

July 21, 2006

## **MEETING MEMORANDUM**

**Date of Meeting:** July 13, 2006

**From:** Rowena Dagdag, Planner

**Subject:** Kula Ridge Affordable Housing Subdivision

**Participants:** Clayton Nishikawa, (*Architectural Design & Construction, Inc.*)  
Stacy Otomo, (*Otomo Engineering, Inc.*)  
Michael Munekiyo, (*Munekiyo & Hiraga, Inc.*)  
Rowena Dagdag, (*Munekiyo & Hiraga, Inc.*)  
Community Participants, (*See Attached*)

The purpose of the meeting was to introduce the proposed Kula Ridge Subdivision project to residents and community members living in proximity to the proposed project site. The project would require a district boundary amendment and seek exemptions from the community plan amendment and change in zoning process through the Section 201G-118, Hawaii Revised Statutes (HRS) application process.

1. C. Nishikawa provided a brief summary of the project's description and displayed the proposed house plan designs. He noted that the project will involve the development of 116 improved lots, with 70 (60 percent) affordable house/lot packages and 46 (40 percent) market lots.
2. A rendering of what the affordable units would look like using a private access easement for 6 of the lots was displayed. C. Nishikawa stated that one of his reasons for developing affordable housing was to provide well designed affordable homes for Maui residents and their children.
3. The project is moving ahead to obtain the proper sequence of approvals. C. Nishikawa has already met with the Kula Community Association, the Maui County Council members, and with the Mayor. All had recommended that he meet with the residents living near the proposed project to answer any questions or address any concerns that they have regarding the project.

4. M. Munekiyo explained that the project was in its preliminary stages in terms of the environmental assessment and Land Use Commission process. He further explained that the environmental assessment process would help identify areas that would be impacted and suggest improvements that need to be made to mitigate or minimize project impacts.
5. M. Munekiyo stated that the project will need to go through the State Land Use Commission for a district boundary amendment to reclassify the land use from Agricultural to Rural and Urban. Exemptions from the community plan amendment and change in zoning process will be requested as part of the Section 201G-118, HRS application process.
6. The project is to be processed as a Section 201G, HRS application, which allows an affordable housing project to be expedited through exemptions. The regular process would take approximately 3 to 4 years. During the application process, there will be formal opportunities for the public to comment and provide feedback.
7. A resident expressed her concern over water rights and asked if the project would receive water before others who have been waiting for a water meter. M. Munekiyo replied that although the Section 201G, HRS process allows for certain exemptions, it would not permit exemptions relating to the provision of water source and water infrastructure.
8. C. Nishikawa stated that he recently met with the Water Director, who suggested that he find his own water. C. Nishikawa is currently negotiating with Maui Land and Pineapple Company and A&B who are drilling wells in the Upcountry area. The water from these wells could service the project site. He further indicated that he would pay for a percentage of the well being drilled by the companies.
9. The well would eventually be connected to the County water system.
10. D. Mayer stated that the Kula Community Association board members met with C. Nishikawa about two (2) months ago and reviewed the project with him. The association has provided C. Nishikawa with comments and concerns regarding the project. D. Mayer indicated that he was not satisfied with the update regarding the water situation, but was willing to be of help to resolve the issues.
11. A septic tank system will be installed in the homes. C. Nishikawa stated the benefits of a septic system and pointed out the disadvantages of a larger single wastewater system. C. Nishikawa is coordinating with the Department of Health to obtain permission to utilize individual wastewater systems as being proposed.
12. A resident asked if the homes could be expanded to accommodate growing families. C. Nishikawa stated that there would be enough room on the individual lots for expansion. He noted that there would be no need for a larger water meter,




but that the homes may need a larger septic system. Homes would have a 5/8-inch meter.

13. A question was raised regarding the community plan designation, and if there was any mention of density to the area. Residents were concerned that the 116 improved lots would result in increased traffic. They were concerned about the safety of the roads and a large number of cars in the subdivision.
14. C. Nishikawa indicated that the smaller homes would be able to accommodate two (2) cars off-street, with the larger homes accommodating up to four (4) cars off-street. Parking on the access driveway would not be allowed for the affordable homes with a private access driveway.
15. The larger density (116 improved lots) is required to keep the affordable housing cost lower.
16. Ohana units will not be allowed on the individual lots.
17. A resident raised concern about the four (4) large lots on the eastern boundary of the property. Residents are concerned about it becoming a "gentlemen" ranch. M. Munekiyo stated that the current state land use designation will be kept as agricultural or rural.
18. A resident raised concern over the sidewalk along Lower Kula Road and suggested improvements to it. Residents also felt that Lower Kula Road was too narrow to accommodate traffic leading up to the 116 lot subdivision. M. Munekiyo stated that a traffic impact analysis was being done to identify improvements and mitigation measures that need to be made before approval of the subdivision.
19. A resident raised a concern over outdoor lights and its negative impact on the Haleakala Observatory. He suggested that we contact the University of Hawaii Institute For Astronomy for their comments.
20. C. Nishikawa noted that the Maui Police Department would like to see adequate lighting in the new neighborhood to address safety concerns. Residents felt that the police officers would be able to continue their work safely with low lighting.
21. A resident commented that some years ago, the Carden Academy proposed to build a school on Lower Kula Road but was denied approval by the Maui Planning Commission due to traffic impact reasons.
22. A resident felt that the project should be located somewhere else where there is less impact to the surrounding neighborhood. An affordable housing project could be done somewhere else.

23. M. Munekiyo stated that there will be several meetings where residents will be able to testify and provide comments over the project. The public will be able to give testimony before the State Land Use Commission during meetings regarding the environmental assessment. After a draft of the environmental assessment has been published, a 30-day comment period will be held for residents to provide feedback. The applicant will review and address the comments received during the draft environmental assessment comment period.
24. M. Munekiyo noted that residents living within 500 feet of the proposed project site were invited to the meeting, but welcomed others in the Kula area to attend. He added that more meetings could be held to update residents on the status of the project and to gather more comments.
25. A resident noted that 6:00 p.m. may be too early in the evening to hold a meeting. A better time would be at 7:00 p.m.
26. Residents asked D. Mayer if the Kula Community Association could act as the spearhead for upcoming meetings. They want to be informed of any meetings or hearings regarding the projects that impact the entire Kula Community. D. Mayer responded that a website is available at [www.kulamaui.org](http://www.kulamaui.org). The website includes information that residents would find useful.
27. C. Nishikawa stated that water and roadway infrastructure are very important issues that need to be addressed and resolved. He is willing to work with residents and the Kula Community Association on these issues.

In closing the meeting, M. Munekiyo stated that the applicant would like to come back to the community to provide updates and receive comments as the project progresses.

  
\_\_\_\_\_  
Rowena M. Dagdag, Planner

RMD:yp

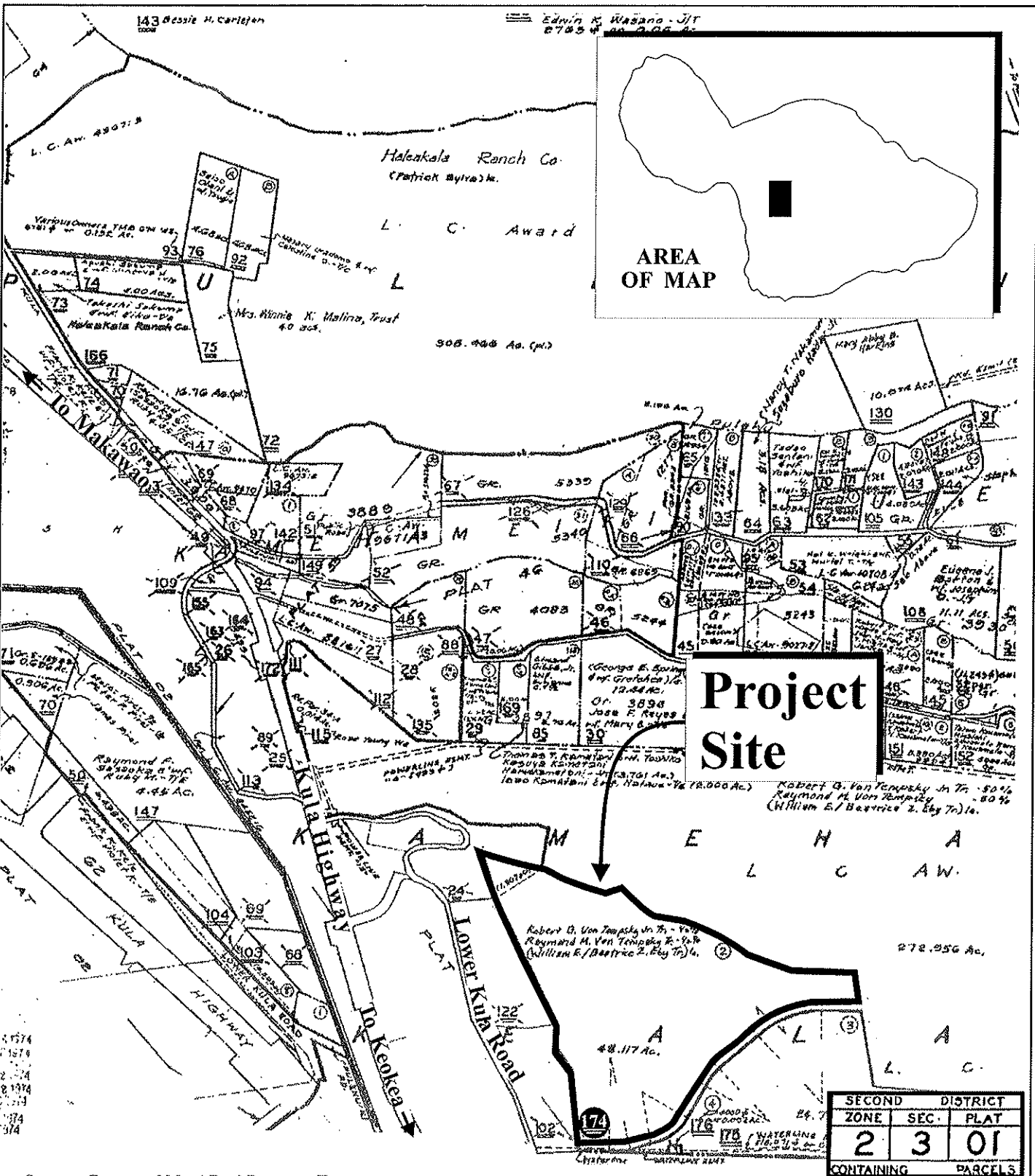
Attachment

cc: Clayton Nishikawa, Architectural Design & Construction, Inc. (w/attachment)

Stacy Otomo, Otomo Engineering, Inc. (w/out attachment)

Dick Mayer, Kula Community Association (w/attachment)

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Source: County of Maui Real Property Tax

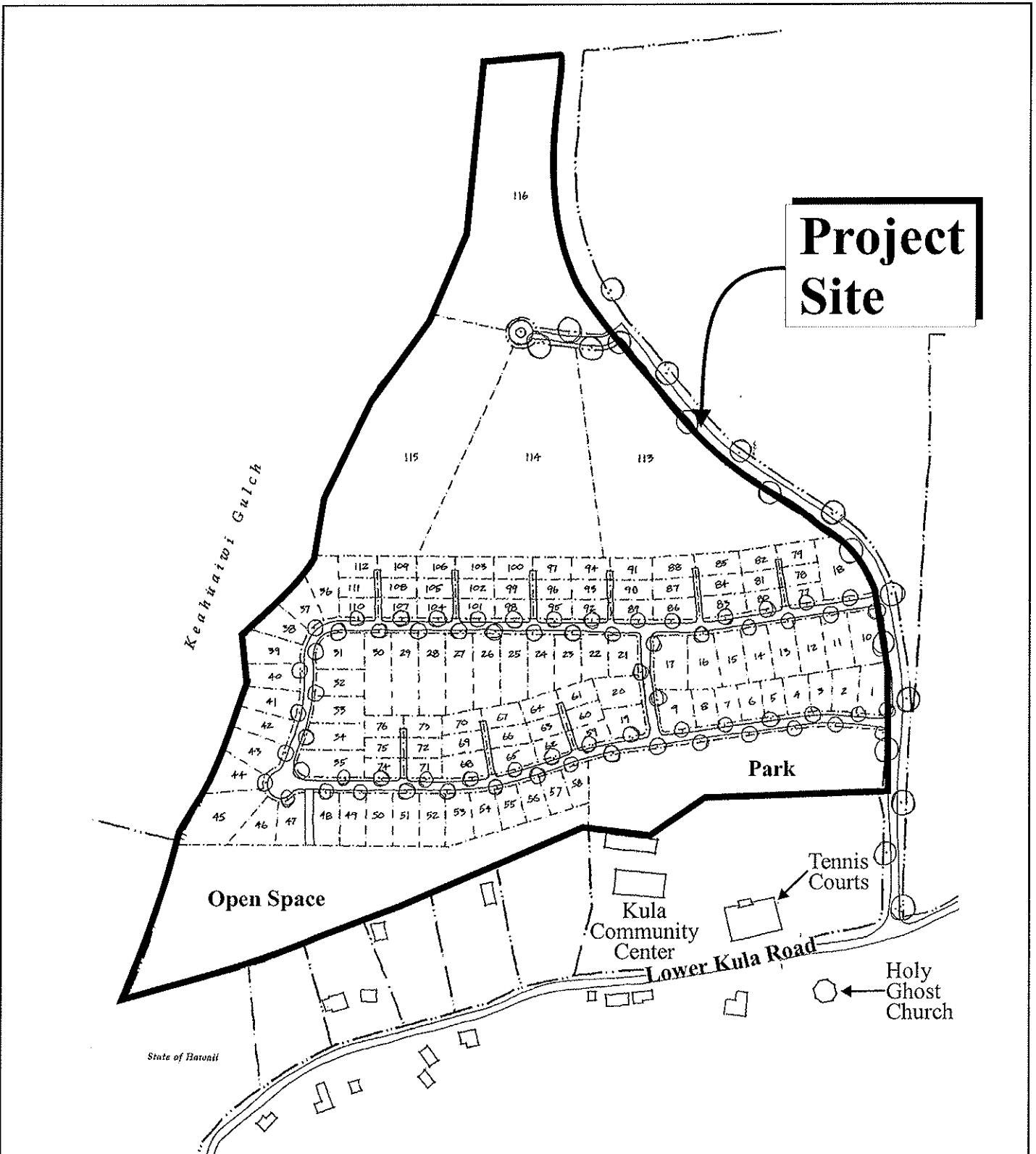
Figure 1 Proposed Kula Ridge Affordable Housing Subdivision Project Site Map

NOT TO SCALE



Prepared for: Kula Ridge, LLC

MUNEKIYO & HIRAGA, INC.



Source: Architectural Design & Construction, Inc.

Figure 2

Proposed Kula Ridge  
Affordable Housing Subdivision  
Conceptual Site Plan

NOT TO SCALE



Prepared for: Kula Ridge, LLC

MUNEKIYO & HIRAGA, INC.

Nishikawa\KulaAH\BimapConceptSite

## **XI. REFERENCES**

## XI. REFERENCES

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# **APPENDICES**



# **APPENDIX A.**

## **Preliminary Construction Specifications for Affordable Units**

Proposed Construction

### DESCRIPTION OF MATERIALS

No. \_\_\_\_\_  
(To be inserted by Agency)

Under Construction

Property address Lower Kula Road City Kula State HI

Mortgagor or Sponsor \_\_\_\_\_  
(Name) (Address)

Contractor or Builder Architectural Design & Construction, Inc. 1849 Wili Pa Loop Wailuku, HI 96793  
(Name) (Address)

#### INSTRUCTIONS

1. For additional information on how this form is to be submitted, number of copies, etc., see the instructions applicable to the FHA Application for Mortgage Insurance, VA Request for Determination of Reasonable Value or other, as the case may be.

2. Describe all materials and equipment to be used, whether or not shown on the drawings, by marking an X in each appropriate check-box and entering the information called for in each space. If space is inadequate enter "See misc." and describe under item 27 or on an attached sheet. THE USE OF PAINT CONTAINING MORE THAN THE PERCENT OF LEAD BY WEIGHT PERMITTED BY LAW IS PROHIBITED.

3. Work not specifically described or shown will not be considered unless

required, then the minimum acceptable will be assumed. Work exceeding minimum requirements cannot be considered unless specifically described.

4. Include no alternates, "or equal" phrases, or contradictory items. (Consideration of a request for acceptance of substitute materials or equipment is not thereby precluded.)

5. Include signatures required at the end of this form.

6. The construction shall be completed in compliance with the related drawings and specifications, as amended during processing. The specifications include this Description of Materials and the applicable building code.

#### 1. EXCAVATION:

Bearing soil, type \_\_\_\_\_

#### 2. FOUNDATIONS:

Footings: concrete mix Type I or II ASTM C-150; strength psi 3000 Reinforcing #4, see structural details

Foundation wall: material Concrete, Type I or II ASTM C-150 Reinforcing #4, see structural details

Interior foundation wall: material Concrete, Type I or II Party foundation wall \_\_\_\_\_

Columns: material and sizes 6x6 Douglas Fir, No. 1 Piers: material and reinforcing 12x12 CMU, Fully Grouted

Girders: material and sizes 4x12 Douglas Fir, No. 1 Sills: material NA

Basement entrance areaway NA Window arcaways NA

Waterproofing NA Footing drains NA

Termite protection Termimesh Stainless Steel Mesh

Basementless space: ground cover NA; insulation NA; foundation vents NA

Special foundations NA

Additional information \_\_\_\_\_

#### 3. CHIMNEYS:

Material \_\_\_\_\_ Prefabricated (make and size) \_\_\_\_\_

Flue lining: material \_\_\_\_\_ Heater flue size \_\_\_\_\_ Fireplace flue size \_\_\_\_\_

Vents (material and size): gas or oil heater \_\_\_\_\_; water heater \_\_\_\_\_

Additional information \_\_\_\_\_

#### 4. FIREPLACES:

Type:  solid fuel;  gas-burning;  circulator (make and size) \_\_\_\_\_ Ash dump and clean-out \_\_\_\_\_

Fireplace: Facing \_\_\_\_\_; lining \_\_\_\_\_; hearth \_\_\_\_\_; mantel \_\_\_\_\_

Additional information \_\_\_\_\_

#### 5. EXTERIOR WALLS:

Wood frame: wood grade, and species 2x Douglas Fir, No. 1  Corner bracing. Building paper or felt Kraft or Bituminous

Sheathing Structural II; thickness 1/2"; width 48"  solid;  space \_\_\_\_\_ o.c.;  diagonal; \_\_\_\_\_

Siding Fiber cement Lap; grade II; type A; size 12'; exposure 6"; fastening HDG nails

Shingles Fiber cement; grade II; type A; size 4'; exposure 7"; fastening HDG nails

Stucco Glass Mat Gyp.; thickness 5/8"; Lath Synthetic plaster finish, weight \_\_\_\_\_ lb.

Masonry veneer \_\_\_\_\_ Sills \_\_\_\_\_ Lintels \_\_\_\_\_ Base flashing \_\_\_\_\_

Masonry:  solid  faced  stuccoed; total wall thickness 0; facing thickness \_\_\_\_\_; facing material \_\_\_\_\_

Backup material \_\_\_\_\_; thickness \_\_\_\_\_; bonding \_\_\_\_\_

Door sills \_\_\_\_\_ Window sills \_\_\_\_\_ Lintels \_\_\_\_\_ Base flashing \_\_\_\_\_

Interior surfaces: dampproofing, \_\_\_\_\_ coats of \_\_\_\_\_; furring \_\_\_\_\_

Additional information \_\_\_\_\_

Exterior painting: material Acrylic latex; number of coats 2

Gable wall construction:  same as main walls;  other construction \_\_\_\_\_

#### 6. FLOOR FRAMING:

Joists: wood, grade, and species Doug. fir No. 1; other \_\_\_\_\_; bridging Solid; anchors HDG Simpson

Concrete slab:  basement floor;  first floor;  ground supported;  self-supporting; mix Type I or II; thickness 4

reinforcing 6x6 10/10 WWM; insulation \_\_\_\_\_; membrane 10 Mil vapor barrier

Fill under slab: material TBD; thickness \_\_\_\_\_; Additional information \_\_\_\_\_

#### 7. SUBFLOORING: (Describe underflooring for special floors under item 21.)

Material: grade and species Structural I plywd with P.I. Index of 48/24, size 3/4", type T&G

Laid:  first floor;  second floor  attic \_\_\_\_\_ sq. ft.;  diagonal;  right angles. Additional information: Glued & Nailed

#### 8. FINISH FLOORING: (Wood only. Describe other finish flooring under item 21.)

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According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0575-0042. The time required to complete this information collection is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

**9. PARTITION FRAMING:**  
 Studs: wood, grade, and species Douglas Fir No. 1 size and spacing 2x4 @ 16" oc Other 2x4 @ 24" oc where occur

Additional information: \_\_\_\_\_

**10. CEILING FRAMING:**  
 Joists: wood, grade, and species Douglas Fir No. 1 Other \_\_\_\_\_ Bridging 2x4

Additional information: Wood truss bottom chord for ceiling framing

**11. ROOF FRAMING:**  
 Rafters: wood, grade, and species \_\_\_\_\_ Roof trusses (see detail): grade and species Douglas Fir No. 1

Additional information: \_\_\_\_\_

**12. ROOFING:**  
 Sheathing: wood, grade, and species 5/8" Structural I P.I. Index 40/20  solid  spaced \_\_\_\_\_ o.c.

Roofing Asphalt Shingle; grade \_\_\_\_\_; size 12" x 36"; type ASTM D 3018, Type I

Underlay Single layer of shingle underlayment; weight or thickness 30 lb; size 3' wide; fastening HDG staples

Built-up roofing \_\_\_\_\_; number of plies \_\_\_\_\_; surface material \_\_\_\_\_

Flashing: material copper; gage or weight 16 oz.  gravel stops;  snow guards

Additional information: drip edge

**13. GUTTERS AND DOWNSPOUTS:**

Gutters: material \_\_\_\_\_; gage or weight \_\_\_\_\_; size \_\_\_\_\_; shape \_\_\_\_\_

Downspouts: material \_\_\_\_\_; gage or weight \_\_\_\_\_; size \_\_\_\_\_; shape \_\_\_\_\_; number \_\_\_\_\_

Downspouts connected to:  Storm sewer;  sanitary sewer;  dry-well.  Splash blocks: material and size \_\_\_\_\_

Additional information: \_\_\_\_\_

**14. LATH AND PLASTER:**

Lath  walls,  ceilings: material \_\_\_\_\_; weight or thickness \_\_\_\_\_ Plaster: coats \_\_\_\_\_; finish \_\_\_\_\_

Dry-wall  walls,  ceilings: material Gyp. bd., thickness 1/2"; finish Light orange peel

Joint treatment Taped and sanded

**15. DECORATING: (Paint, wallpaper, etc.)**

ROOMS	WALL FINISH MATERIAL AND APPLICATION	CEILING FINISH MATERIAL AND APPLICATION
Kitchen	Interior Latex Flat Enamel	Interior Latex Flat Enamel
Bath	Interior Latex Flat Enamel	Interior Latex Flat Enamel
Other	Liv, Bedr Interior Latex Flat	Interior Latex Flat

Additional information: \_\_\_\_\_

**16. INTERIOR DOORS AND TRIM:**

Doors: type Hollow Core; material Hardboard; thickness 1 3/8"

Door trim: type 1x3 S2S; material Poplar; Base: type S2S; material Poplar; size 1/2"x5 1/2"

Finish: doors Alkyd Semi-Gloss; trim Alkyd Semi-Gloss

Other trim (item, Type and location) \_\_\_\_\_

Additional information: \_\_\_\_\_

**17. WINDOWS:**

Windows: type Horiz. Slide; make Alpine or Milgard; material Vinyl; sash thickness 2.75"

Glass: grade Class A  sash weights;  balances, type \_\_\_\_\_; head flashing 25 Mil. Tape

Trim: type Exterior 1x4; material Douglas Fir; Paint Latex Semi-Gloss; number coats 2

Weatherstripping: type Fin Seal; material Rubber Storm sash, number \_\_\_\_\_

Screens:  full;  half, type Metal Frame; number \_\_\_\_\_; screen cloth material Fiberglass

Basement windows: type \_\_\_\_\_; material \_\_\_\_\_; screens, number \_\_\_\_\_; Storm sash, number \_\_\_\_\_

Special windows \_\_\_\_\_

Additional information: \_\_\_\_\_

**18. ENTRANCES AND EXTERIOR DETAIL:**

Main entrance door: material Douglas Fir; width 3'-0"; thickness 1 3/4" Frame: material Douglas Fir; thickness 3/4"

Other entrance doors: material Douglas Fir; width 3'-0"; thickness 1 3/4" Frame: material Douglas Fir; thickness 3/4"

Head flashing \_\_\_\_\_ Weatherstripping: type \_\_\_\_\_; saddles \_\_\_\_\_

Screen doors: thickness \_\_\_\_\_; number \_\_\_\_\_; screen cloth material \_\_\_\_\_ Storm doors: thickness \_\_\_\_\_; number \_\_\_\_\_

Combination storm and screen doors: thickness \_\_\_\_\_; number \_\_\_\_\_; screen cloth material \_\_\_\_\_

Shutters:  hinged;  fixed. Railings wood balusters, 2x2; Attic louvers \_\_\_\_\_

Exterior millwork: grade and species Douglas Fir, Select Merchant Paint Latex Semi-Gloss; number coats 2

Additional information: \_\_\_\_\_

**19. CABINETS AND INTERIOR DETAIL:**

Kitchen cabinets, wall units: material Plywood; lineal feet of shelves TBD; shelf width \_\_\_\_\_

Base units: material Plywood; counter top Laminate; edging Laminate

Back and end splash Laminate Finish of cabinets Factory stain finish; number coats 2

Medicine cabinets: make NA; model \_\_\_\_\_

Other cabinets and built-in furniture \_\_\_\_\_

Additional information: \_\_\_\_\_

**20. STAIRS:**

STAIR	TREADS		RISERS		STRINGS		HANDRAIL		BALUSTERS	
	Material	Thickness	Material	Thickness	Material	Thickness	Material	Thickness	Material	Thickness
Basement										
Main	Doug. Fir	2x12	-	-	Doug. Fir	4x12	Doug. Fir	1 1/2" d	Doug. Fir	2x2
Attic										

Disappearing: make and model number \_\_\_\_\_

Additional information: \_\_\_\_\_

**21. SPECIAL FLOORS AND WAINSCOT: (Describe carpet as listed in Certified Products Directory.)**

Floors	Location	Material, Color, Border, Sizes, Gage, Etc.	Threshold Material	Wall Base Material	Underfloor Material
	Kitchen	Resilient Flooring			Poplar
Bath	Resilient Flooring			Poplar	Plywd.
	Carpet			Poplar	Plywd.
Wainscot	Location	Material, Color, Border, Sizes, Gage, Etc.	Height	Height Over Tub	Height in Showers (From Floor)
	Bath				

Bathroom accessories:  Recessed; material \_\_\_\_\_; number \_\_\_\_\_;  Attached; material Chrome \_\_\_\_\_; number \_\_\_\_\_  
 Additional information: \_\_\_\_\_

**22. PLUMBING**

Fixture	Number	Location	Make	MP's Fixture Identification No.	Size	Color
Sink	1	Kitchen	Kohler Cadence	K-3145-4	33x22	Stainless
Lavatory	2	Baths	Sterling	65020140	19" round	White
Water closet	2	Baths	Sterling Windham	402215	29"x16"x29"	White
Bathtub	2	Baths	Sterling Advantage	61030110	60"x30"x72"	White
Shower over tub	2	Baths	Delta Classic Shower	T13420		Chrome
Stall shower						
Laundry trays						

A  Curtain rod A  Door  Shower pan; material \_\_\_\_\_  
 Water supply:  public;  community system;  individual (private) system.\*  
 Sewage disposal  public;  community system;  individual (private) system.\*  
 \*Show and describe individual system in complete detail in separate drawings and specifications according to requirements.  
 House drain (inside):  cast iron;  tile;  other ABS Plastic House sewer (outside):  cast iron;  tile;  other ABS Plastic  
 Water piping:  galvanized steel;  copper tubing;  other \_\_\_\_\_ Still cocks, number \_\_\_\_\_  
 Domestic water heater: type Solar \_\_\_\_\_; make and model Rheem Solaraide \_\_\_\_\_; heating capacity 80 gal \_\_\_\_\_  
 \_\_\_\_\_ gph. 100' rise. Storage tank: material \_\_\_\_\_; capacity \_\_\_\_\_ gallons.  
 Gas service:  utility company;  liq. pet. gas;  other \_\_\_\_\_ Gas piping:  cooking;  house heating.  
 Footing drains connected to  storm sewer;  sanitary sewer;  dry well. Sump pump; make and model \_\_\_\_\_  
 \_\_\_\_\_; capacity \_\_\_\_\_; discharges into \_\_\_\_\_

**23. HEATING**

Hot water.  Steam.  Vapor.  One-pipe system.  Two-pipe system.  
 Radiators.  Convectors.  Baseboard radiation. Make and model \_\_\_\_\_  
 Radiant panel:  floor;  wall;  ceiling. Panel coil: material \_\_\_\_\_  
 Circulator.  Return pump. Make and model \_\_\_\_\_; capacity \_\_\_\_\_ gpm.  
 Boiler: make and model \_\_\_\_\_ Output \_\_\_\_\_ Btuh.; net rating \_\_\_\_\_ Btuh.  
 Additional information: \_\_\_\_\_  
 Warm air:  Gravity.  Forced. Type of system \_\_\_\_\_  
 Duct material: supply \_\_\_\_\_ return \_\_\_\_\_ Insulation \_\_\_\_\_; thickness \_\_\_\_\_  Outside air intake.  
 Furnance: make and model \_\_\_\_\_ Input \_\_\_\_\_ Btuh.; output \_\_\_\_\_ Btuh.  
 Additional information: \_\_\_\_\_  
 Space heater;  floor furnace;  wall heater. Input \_\_\_\_\_ Btuh.; output \_\_\_\_\_ Btuh.; number units \_\_\_\_\_  
 Make, model \_\_\_\_\_ Additional information: \_\_\_\_\_  
 Controls: make and types \_\_\_\_\_  
 Additional information: \_\_\_\_\_  
 Fuel:  Coal;  oil;  gas;  liq. pet. gas;  electric;  other \_\_\_\_\_; storage capacity \_\_\_\_\_  
 Additional information: \_\_\_\_\_  
 Firing equipment furnished separately:  Gas burner, conversion type.  Stoker: hopper feed  bin feed   
 Oil burner:  pressure atomizing;  vaporizing \_\_\_\_\_  
 Make and model \_\_\_\_\_ Control \_\_\_\_\_  
 Additional information: \_\_\_\_\_  
 Electric heating system: type \_\_\_\_\_ Input \_\_\_\_\_ watts; @ \_\_\_\_\_ volts; output \_\_\_\_\_ Btuh.  
 Additional information: \_\_\_\_\_  
 Ventilating equipment: attic fan, make and model \_\_\_\_\_, capacity \_\_\_\_\_ cfm.  
 Kitchen exhaust fan, make and model GE Standard Range Hood JV338HBB

Other heating, ventilating, or cooling equipment \_\_\_\_\_

**24. ELECTRIC WIRING:**

Service:  overhead;  underground. Panel:  fuse box;  circuit-breaker; make 200 \_\_\_\_\_ AMP's \_\_\_\_\_ No. circuits \_\_\_\_\_  
 Wiring:  conduit;  armored cable;  nonmetallic cable;  knob and tube;  other \_\_\_\_\_  
 Special outlets:  range;  water heater;  other \_\_\_\_\_  
 Doorbell.  Chimes. Push-button locations. \_\_\_\_\_ Additional information: \_\_\_\_\_

**25. LIGHTING FIXTURES:**

Total number of fixtures 9 Total allowance for fixtures, typical installations, \$ 500.00

Nontypical installation \_\_\_\_\_  
 Additional information: \_\_\_\_\_

**26. INSULATION:**

Location	Thickness	Material, Type, and Method of Installation	Vapor Barrier
Roof			
Ceiling	6 1/4"	R-19 Fiberglass Batt Insulation	
Wall			Tyvek
Floor			

**27. MISCELLANEOUS:** (Describe any main dwelling materials, equipment, or construction items not shown elsewhere; or use to provide additional information where the space provided was inadequate. Always reference by item number to correspond to numbering used on this form.)

\_\_\_\_\_

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\_\_\_\_\_

**HARDWARE:** (make, material, and finish.) Schlage Avanti 625 Bright Chrome Door Hardware

**SPECIAL EQUIPMENT:** (State material or make, model and quantity. Include only equipment and appliances which are acceptable by local law, custom and applicable FHA standards. Do not include items which, by established custom, are supplied by occupant and removed when he vacates premises or chattels prohibited by law from becoming realty.)

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**PORCHES:**  
Entry Porch with wood deck or concrete slab

**TERRACES:**

\_\_\_\_\_

\_\_\_\_\_

**GARAGES:**  
5/8" Type "X" Gyp. Bd. @ walls and ceiling  
20 min. rated door with closer from garage to dwelling

**WALKS AND DRIVEWAYS:**  
Driveway: width 16'; base material Subgrade; thickness \_\_\_\_\_; surfacing material Concrete; thickness 4"  
Front walk: width \_\_\_\_\_; material \_\_\_\_\_; thickness \_\_\_\_\_. Service walk: width \_\_\_\_\_; material \_\_\_\_\_; thickness \_\_\_\_\_.  
Steps: material \_\_\_\_\_; trends \_\_\_\_\_; risers \_\_\_\_\_; Check walls \_\_\_\_\_

**OTHER ONSITE IMPROVEMENTS:**  
(Specify all exterior onsite improvements not described elsewhere, including items such as unusual grading, drainage structures, retaining walls, fence, railings, and accessory structures.)

\_\_\_\_\_

\_\_\_\_\_

**LANDSCAPING, PLANTING, AND FINISH GRADING:**  
Topsoil \_\_\_\_\_" thick;  front yard;  side yards;  rear yard to \_\_\_\_\_ feet behind main building.  
Lawns (seeded, sodded, sprigged):  front yard \_\_\_\_\_;  side yards \_\_\_\_\_;  rear yard \_\_\_\_\_  
Planting:  as specified and shown on drawings;  as follows:  
\_\_\_\_\_ Shade trees, deciduous, \_\_\_\_\_" caliper. \_\_\_\_\_ Evergreen trees \_\_\_\_\_, to \_\_\_\_\_', B & B.  
\_\_\_\_\_ Low flowering trees, deciduous, \_\_\_\_\_, to \_\_\_\_\_' \_\_\_\_\_ Evergreen shrubs \_\_\_\_\_ to \_\_\_\_\_', B & B.  
\_\_\_\_\_ High-growing shrubs, deciduous, \_\_\_\_\_, to \_\_\_\_\_' \_\_\_\_\_ Vines, 2-years  
\_\_\_\_\_ Medium-growing shrubs, deciduous, \_\_\_\_\_, to \_\_\_\_\_'  
\_\_\_\_\_ Low-growing shrubs, deciduous, \_\_\_\_\_, to \_\_\_\_\_'

**IDENTIFICATION.** This exhibit shall be identified by the signature of the builder, or sponsor, and/or the proposed mortgagor if the latter is known at the time of application.

Date \_\_\_\_\_ Signature \_\_\_\_\_  
Signature \_\_\_\_\_

## Preliminary Outline Specifications for Kula Ridge Affordable Housing

Kula Ridge will have four Architectural styles within the neighborhood project. The four styles are commonly found within Hawaii's unique cultural and historic heritage:

### Plantation Style

The "Plantation" architectural style takes its historical architectural context from old Plantation villages found throughout Hawaii. Front porches were a common design element. Materials proposed to be used with the plantation style will be corrugated metal roofing and board and batten wood siding. T1-11 siding will also be incorporated in some plans.

### Bungalow Style

The Bungalow style is another architectural style that is commonly found in many parts of Hawaii. It can also be commonly found in Kula. Gable roofs with front porches were a common element associated with the Bungalow style. Exterior materials proposed with the Bungalow style will be Asphalt shingle roofing and a composite exterior lap siding for durability.

### Craftsmen Style

The Craftsmen style is also commonly found architectural style in the Hawaiian Islands as well as in Kula. Gable roofs with detailed porches were common with this style as well as cedar shingle siding. Asphalt shingle roofing is proposed with this style of architecture as well as a composite exterior siding that will have the appearance of real cedar shingle exterior siding.

### Contemporary Hawaiian

One of the more popular styles of architecture in Hawaii today can be described as "Contemporary Hawaiian" architecture. Incorporating the front porch or covered lanai, the Contemporary Hawaiian style integrates a double pitched roof as its distinctive characteristic. Exterior plaster for its exterior wall material will be used and concrete tiled roofs will be used on some of the plans to facilitate blending with market priced homes on adjacent lots.

Foundation All of the homes foundations will be either post and pier construction or poured in place concrete slab foundation on grade.

Framing Wall and roof construction will be wood framed construction. A wood framed, panelized system is proposed to be integrated to facilitate faster wall erection. Integration of pre-fabricated wood trusses will facilitate faster roof construction.

Roofing Roofing material will vary according to Architectural character. Roofing materials proposed are corrugated metal roofing, asphalt shingle roofing and concrete tile roofing.

Doors and Windows Exterior windows will be low maintenance, vinyl windows. Door to be solid wood doors at entry door and hollow core at interior doors.

Interior walls Gypsum board over wood framing, taped, sanded, textured and painted.

Flooring Carpet with pad in Bedrooms and sheet vinyl in baths and Kitchen. Upgrades may include wood laminate flooring.

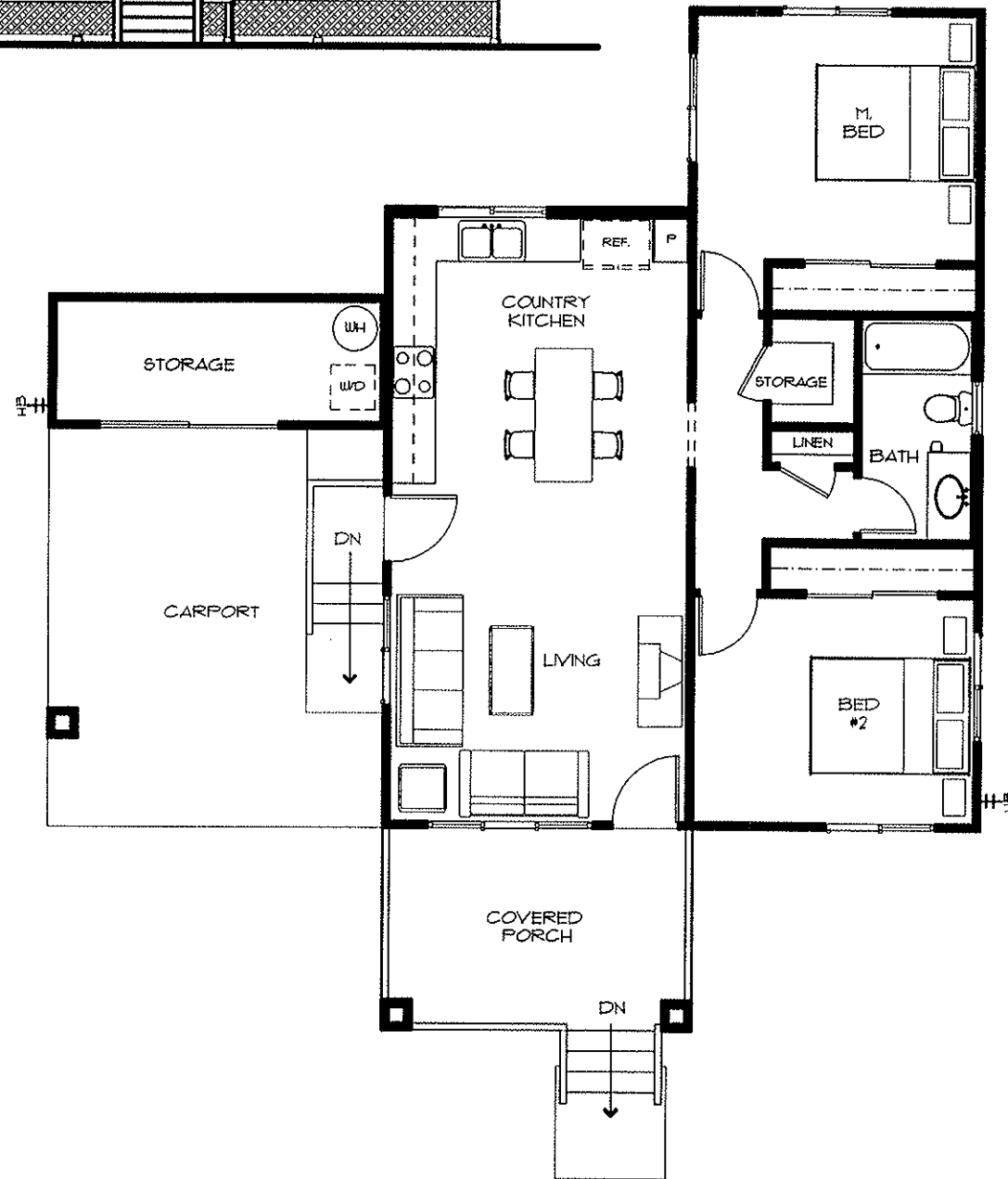
Countertops Plastic laminate. Upgrades may include granite countertops.

Appliances To be selected.

Plumbing fixtures To be selected.

Cabinets To be selected.

*Kula Ridge  
Plan A*



*Living Area: 875 sf  
Covered Lanai: 126 sf  
Carport: 360 sf*

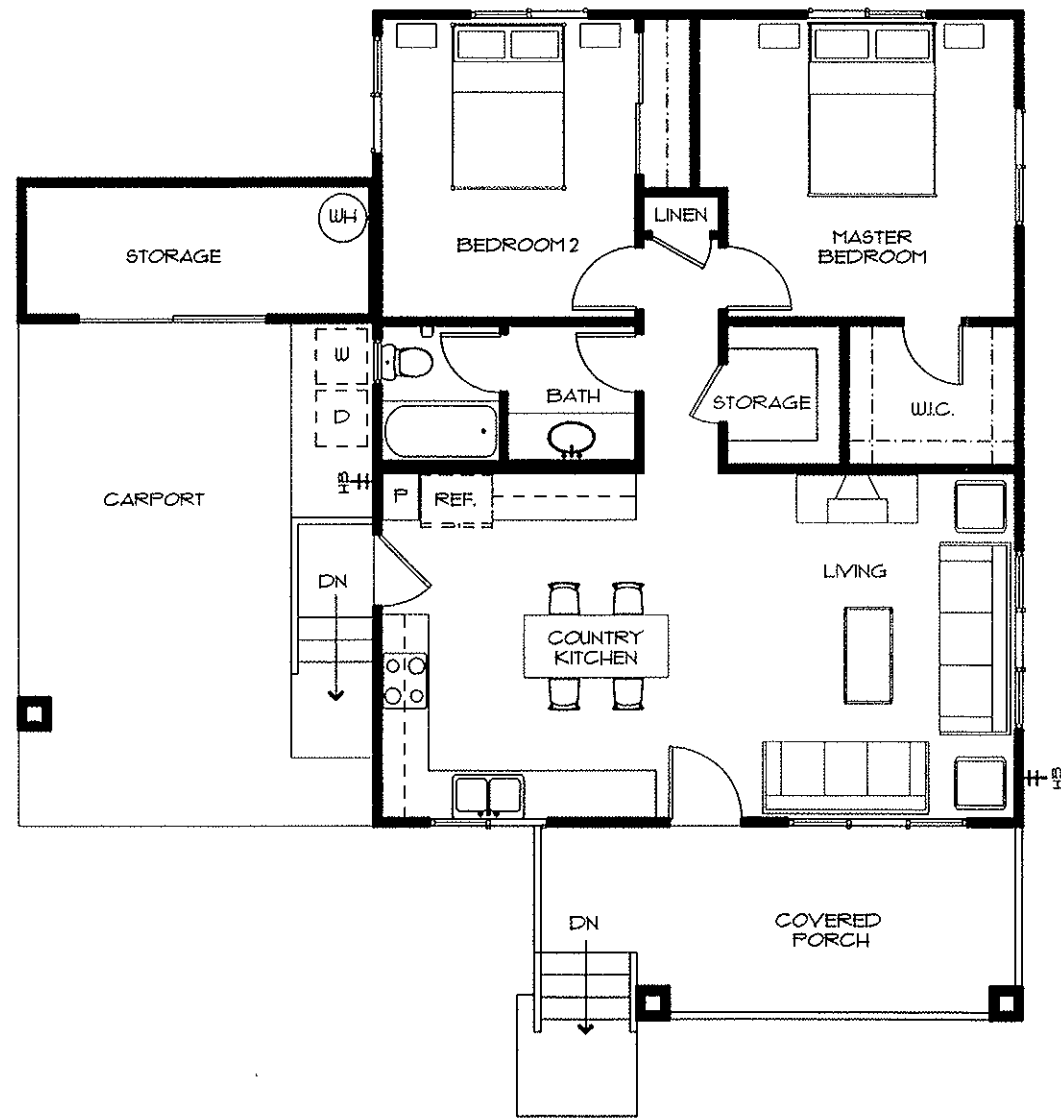


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*Kula Ridge Affordable Homes  
Plan B Post & Pier*



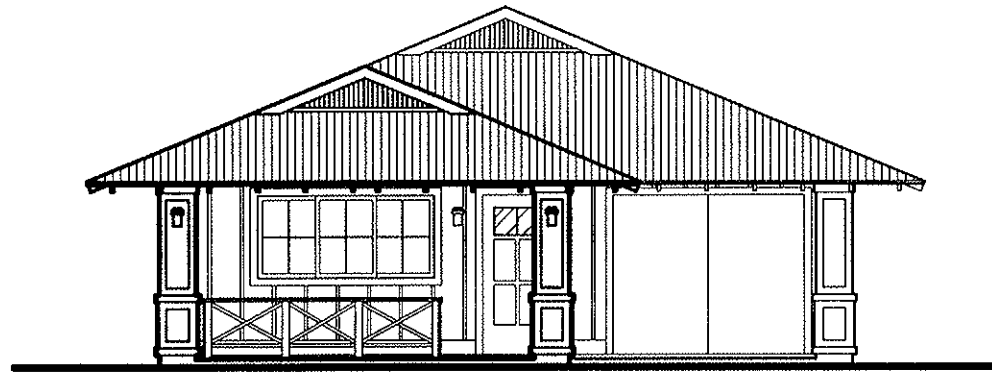
*Living Area: 918 sf  
Covered Lanai: 162 sf  
Carport: 343 sf*



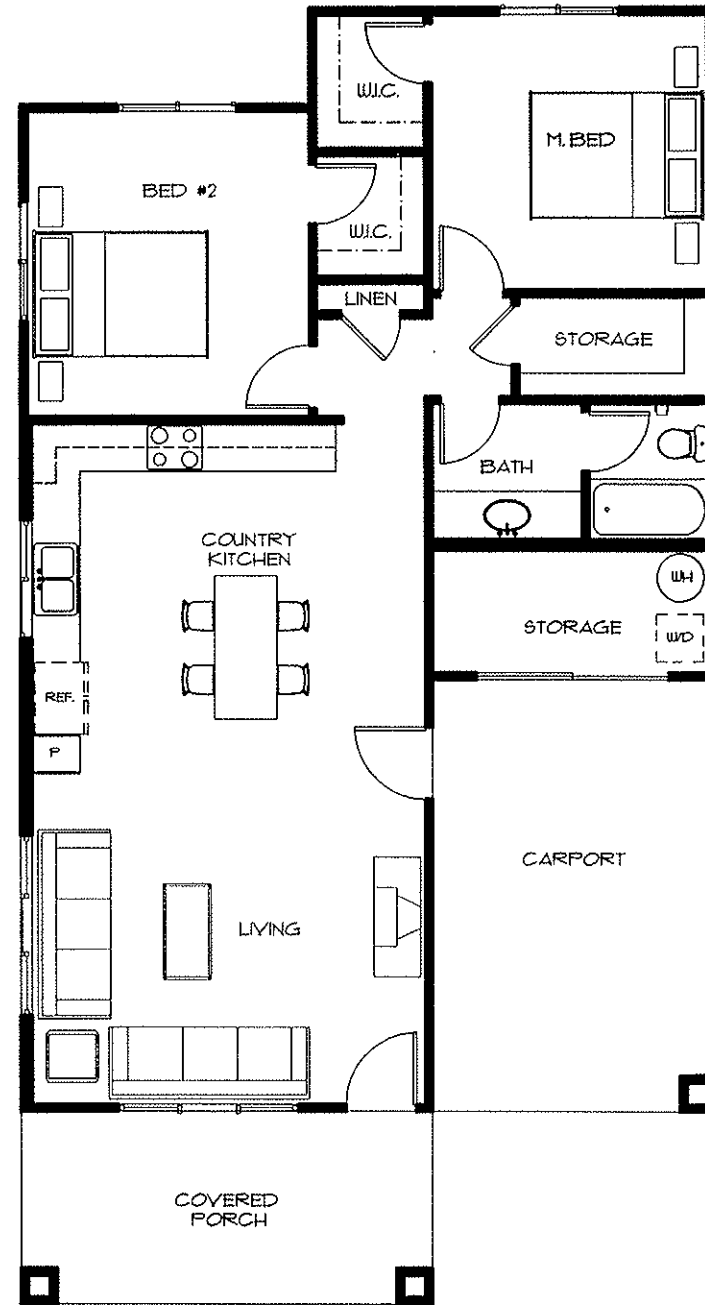
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*Kula Ridge Affordable Homes-  
Plan C*



*Living Area: 1,010 sf  
Covered Lanai: 137 sf  
Carport: 277 sf*



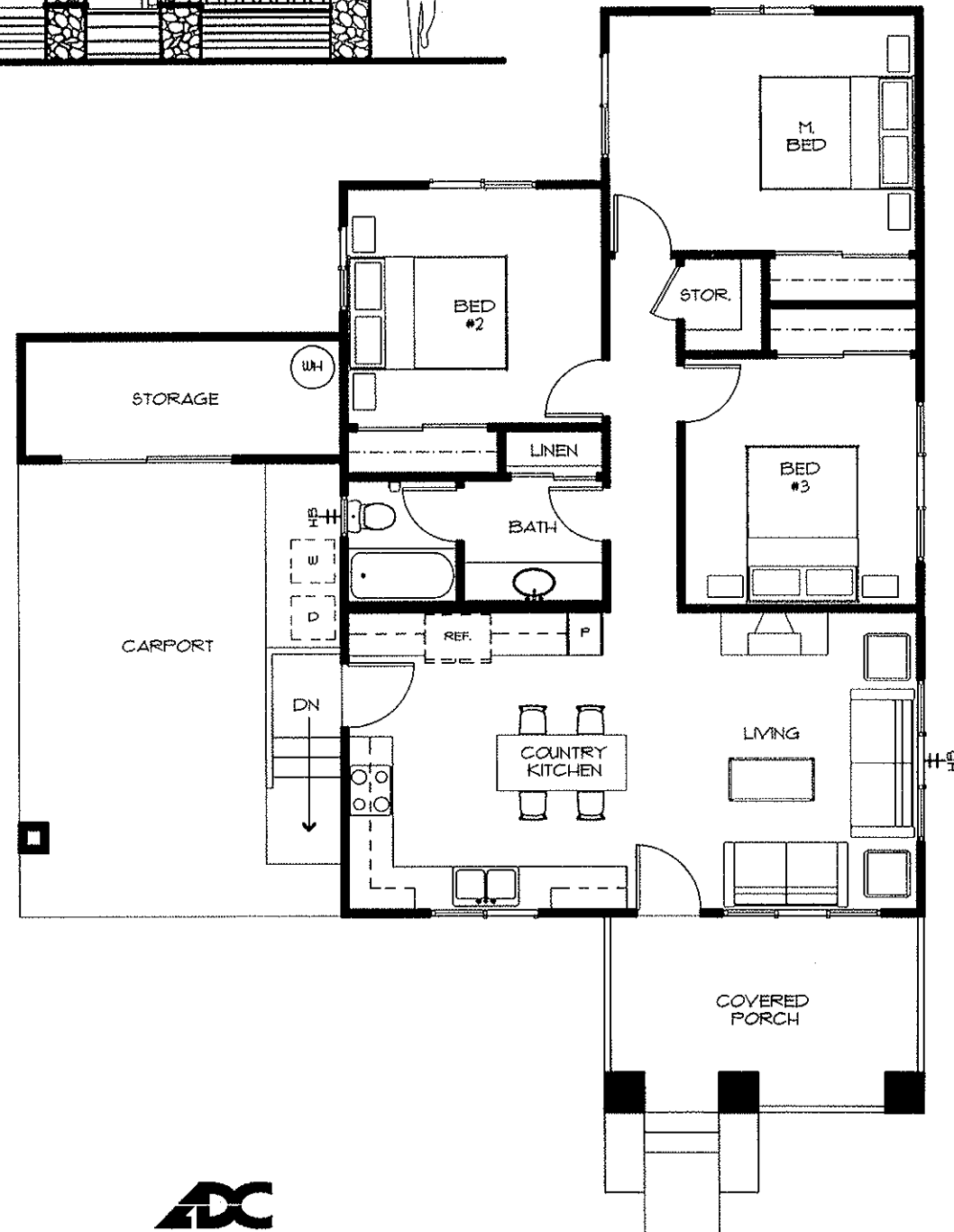
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*Kula Ridge Affordable Homes-  
Plan D*

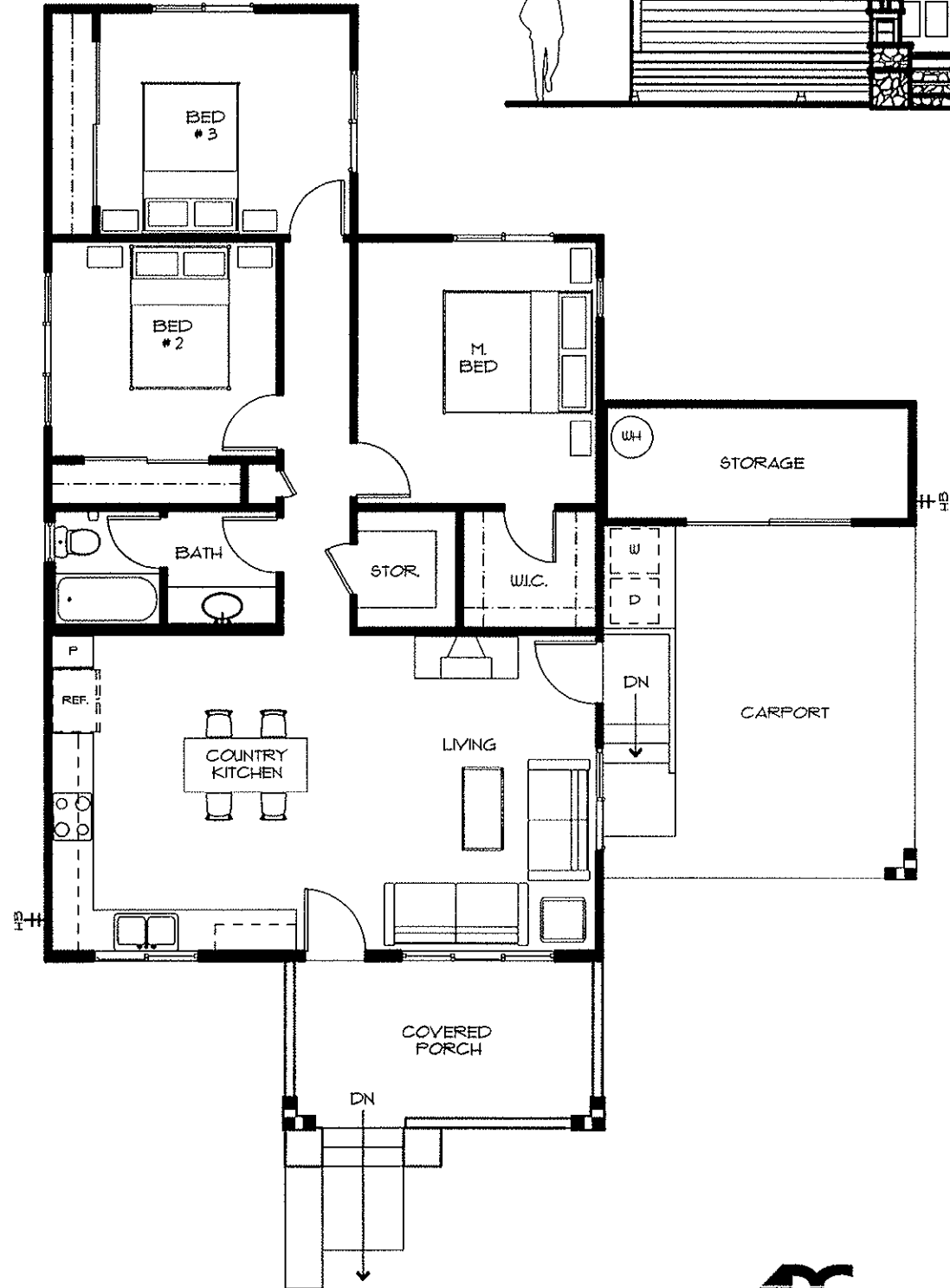


*Living Area: 1,038sf  
Covered Lanai: 135 sf  
Carport: 360 sf*



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*Kula Ridge  
Plan E*

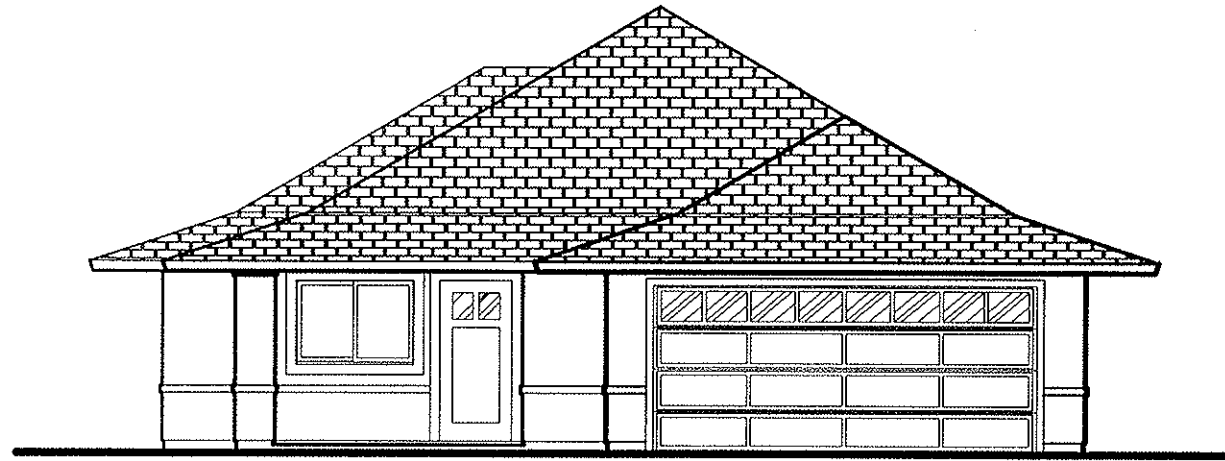


*Living Area: 1,110 sf  
Covered Lanai: 124 sf  
Carport: 345 sf*

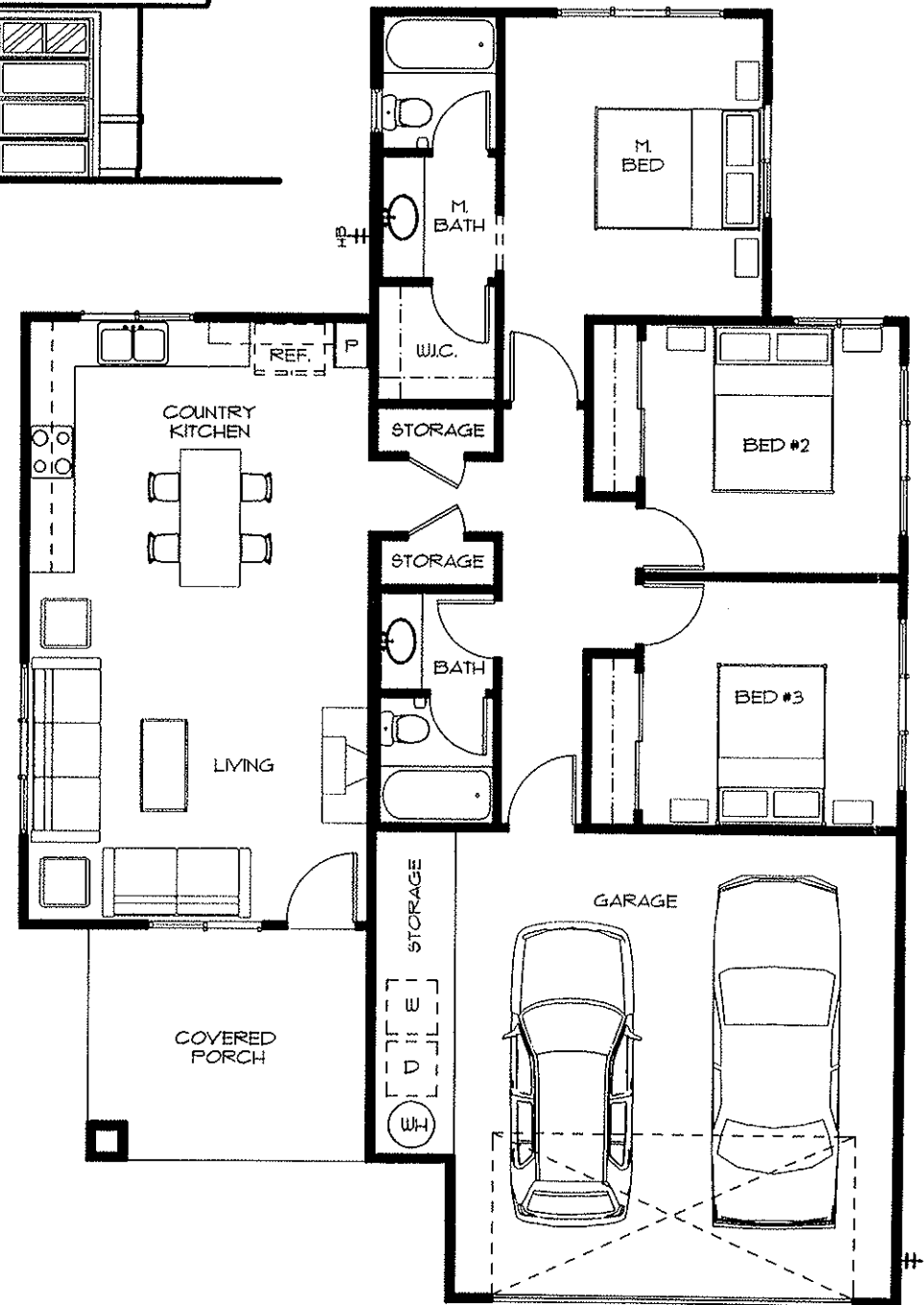


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*Kula Ridge Affordable Homes-  
Plan F*



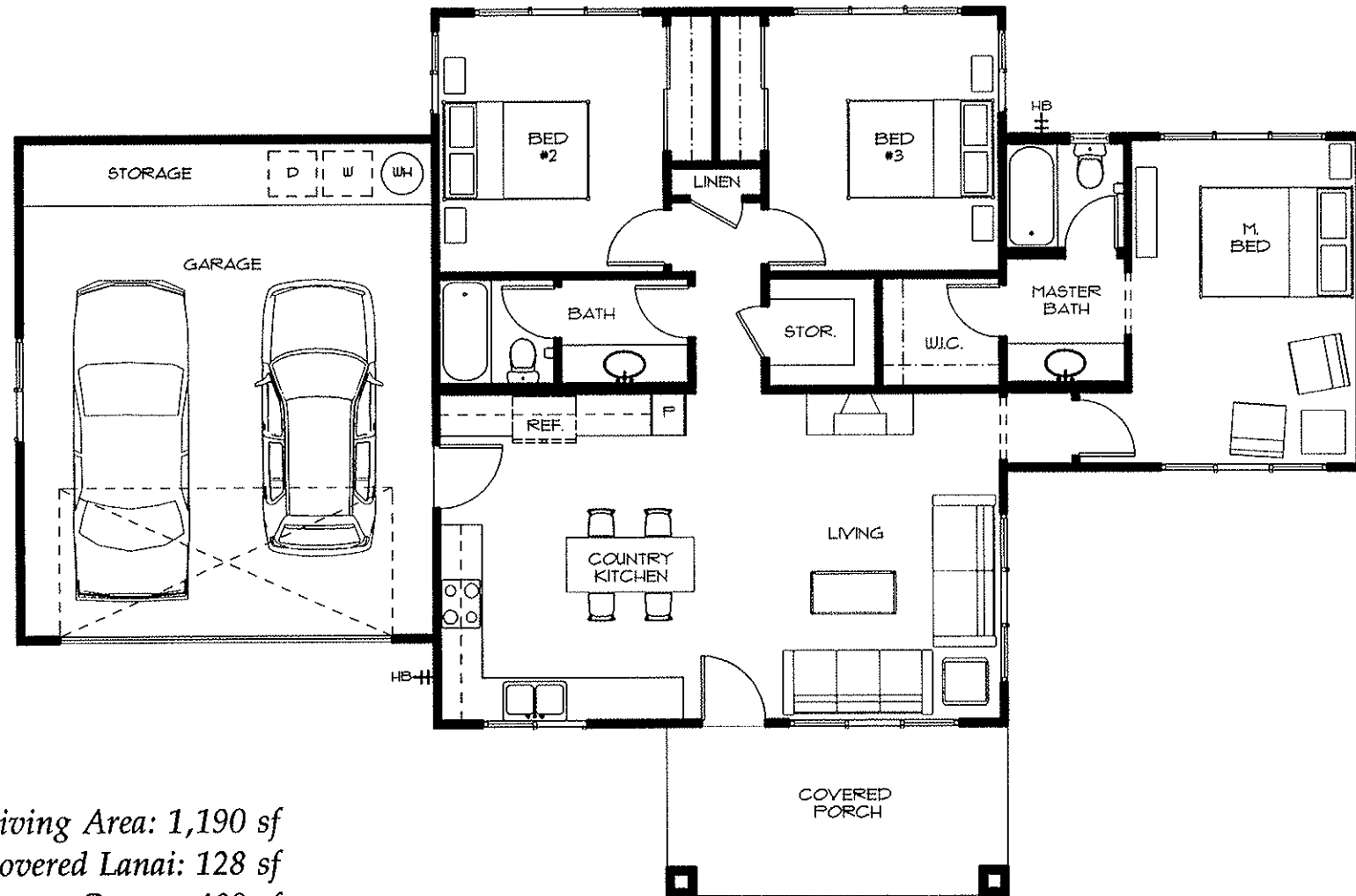
*Living Area: 1157 sf  
Covered Lanai: 120 sf  
Garage: 457 sf*



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*Kula Ridge Affordable Homes-  
Plan G*



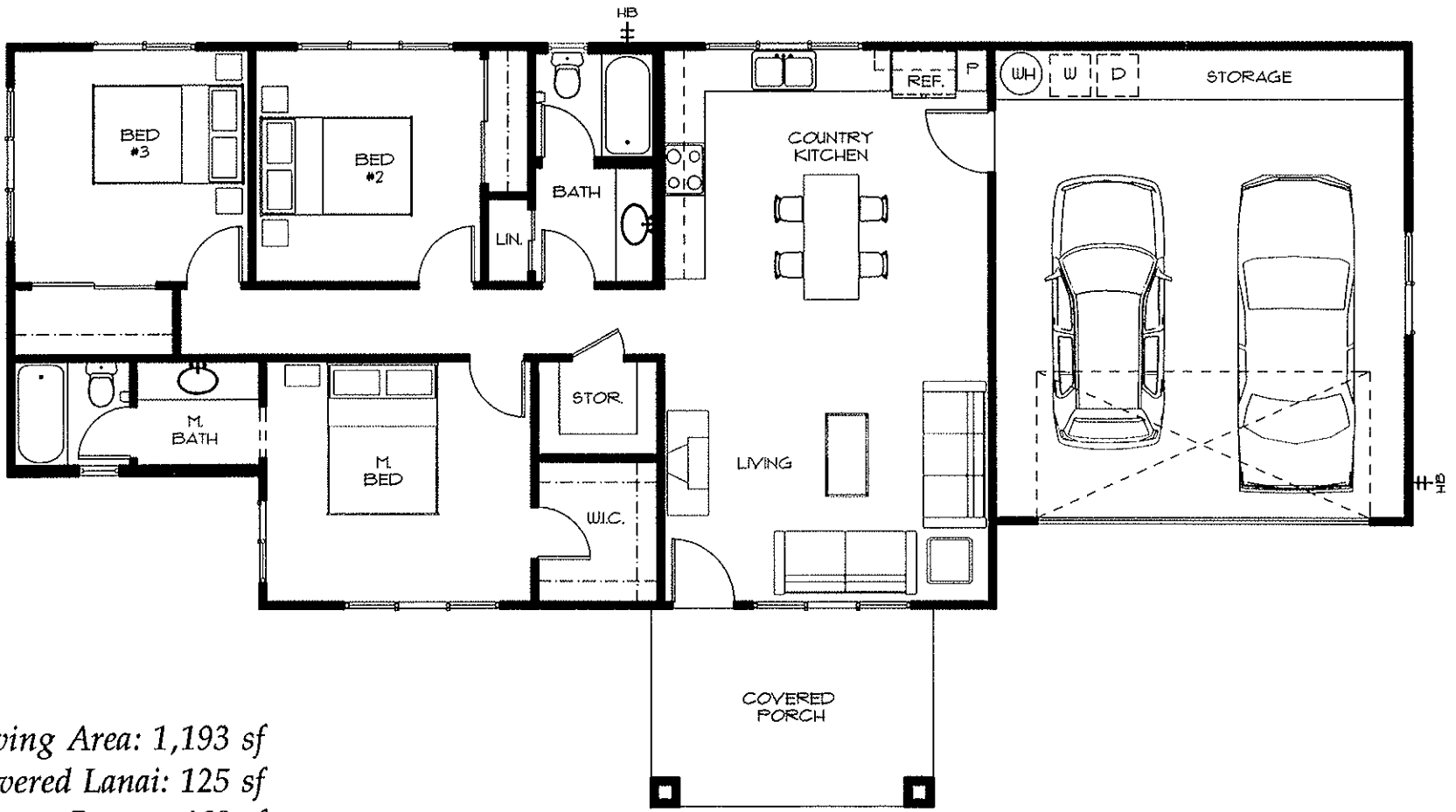
*Living Area: 1,190 sf  
Covered Lanai: 128 sf  
Garage: 480 sf*



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*Kula Ridge Affordable Homes-  
Plan H*



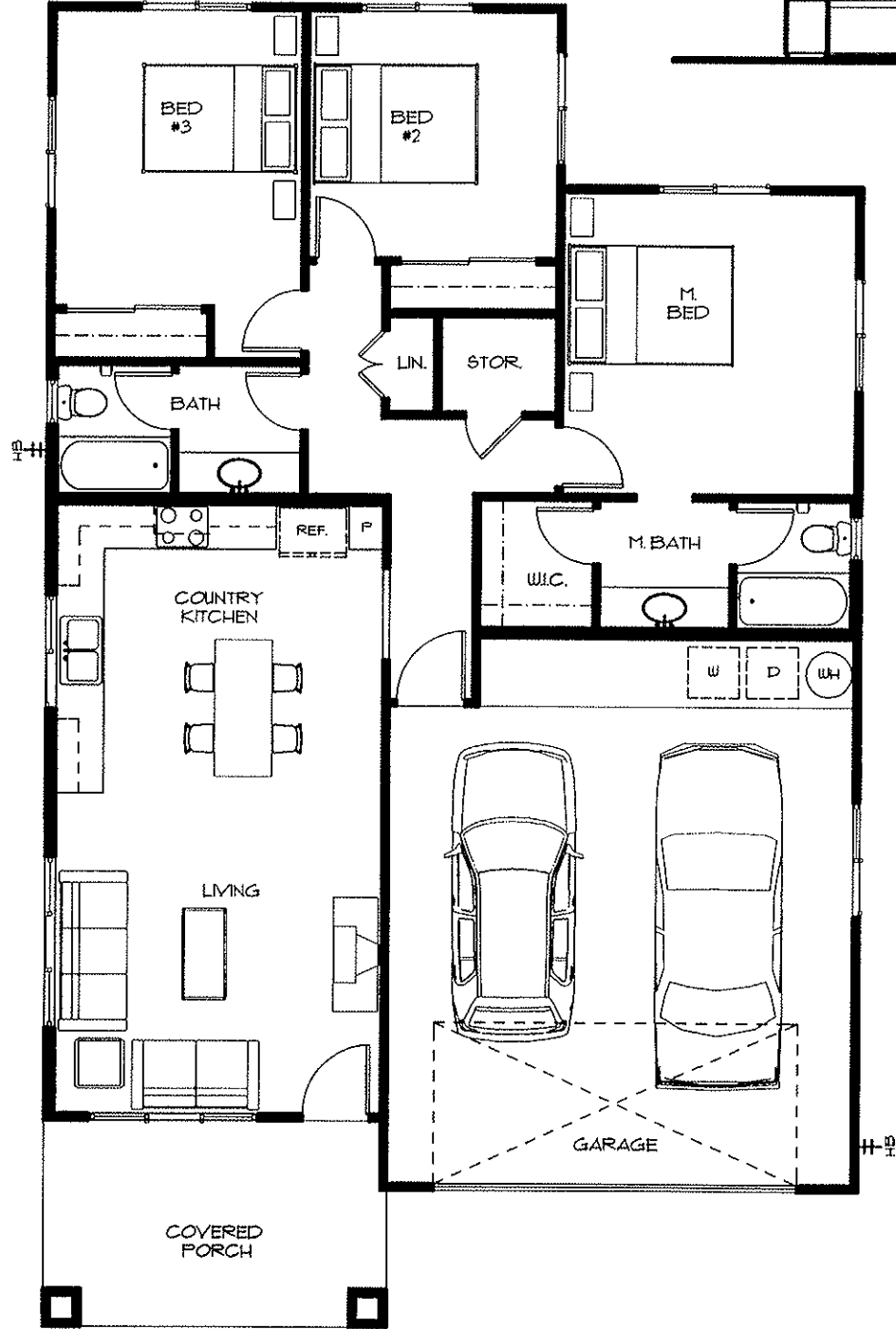
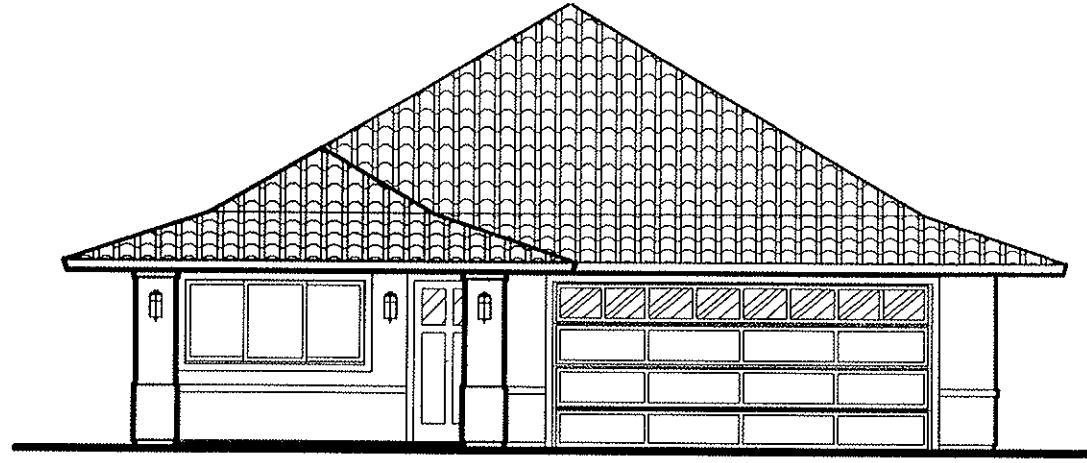
*Living Area: 1,193 sf  
Covered Lanai: 125 sf  
Garage: 460 sf*



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*Kula Ridge Affordable Homes  
Plan J*



*Living Area: 1,227 sf  
Covered Lanai: 137 sf  
Garage: 490 sf*



*Architectural Design & Construction, Inc.*

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# **APPENDIX B.**

## **Proposed Section 201H-38, HRS Exemptions**

**PROPOSED EXEMPTIONS FOR AFFORDABLE HOUSING SUBDIVISION  
PROPOSED SECTION 201H, HRS, EXEMPTIONS  
FROM THE MAUI COUNTY CODE ("MCC")**

**A. EXEMPTION FROM TITLE 2, MCC, ADMINISTRATION AND PERSONNEL**

1. An exemption from Chapter 2.80B, MCC, General Plan and Community Plans, shall be granted to permit the project without obtaining a community plan amendment.

**B. EXEMPTIONS FROM TITLE 16, MCC, Buildings and Construction**

1. Exemptions from MCC Chapters 16.04A, Fire Code, 16.18A, Electrical Code, 16.20A, Plumbing Code, and 16.26, Building Code, shall be granted to exempt the project from fire, electrical, plumbing, building permit fees and demolition permit fees, as well as inspection fees.

**C. EXEMPTIONS FROM TITLE 18, MCC, SUBDIVISIONS**

1. Exemptions from Section 18.04.030, MCC, Administration, and Section 18.16.020, MCC, Compliance, shall be granted to exempt the project from obtaining a change in zoning and community plan amendment to enable subdivision approval.
2. An exemption from Section 18.16.320, MCC, Parks and Playgrounds, shall be granted to allow the 3.0 acres of parks within the project to satisfy the park dedication and assessment requirements.
3. An exemption from Section 18.16.050 MCC, Minimum Right-of-way and Pavement Withs, shall be granted to allow 24 ft. right-of-way and 20 ft. pavement withs for private streets serving not more than four (4) lots in the R-0 zero lot line residential district.
4. An exemption from Section 18.20.070, MCC, Sidewalks, relating to frontage improvements shall be granted.
5. An exemption from Section 18.20.80, MCC, Curbs and Gutters, relating to frontage improvements shall be granted.

**D. EXEMPTIONS FROM TITLE 19, MCC, ZONING**

1. An exemption from Chapter 19.02, MCC, Interim District, shall be granted to permit the development and use of the parcel for single-family and rural residential purposes, including supporting infrastructure requirements. Further, this exemption shall allow the subdivision of the property in the plat configuration shown in Attachment "A". The following zoning standards shall apply to the proposed lots:

**Affordable Lots**

Minimum Lot Size . . . . . 4,600 square feet  
Minimum Lot Width . . . . . 52 feet  
Front Yard Setback . . . . . 10 feet  
Zero Lot Line . . . . In conformance with R-0 Standards  
Access Yard Setback Line . . . . . 15 feet

Other Setback  
Lines . . . . . 6 feet at 1-story, 10 feet at 2-story

**Market Lots**

Minimum Lot Size . . . . . 6,000 square feet  
Minimum Lot Width . . . . . 60 feet  
Front Yard Setback . . . . . 15 feet  
Other Setback  
Lines . . . . . 6 feet at 1-story, 10 feet at 2-story

Height: No building shall exceed 2-story or 30 feet in height from finished grade of the subdivision.

**E. EXEMPTIONS FROM TITLE 20, MCC, ENVIRONMENTAL PROTECTION**

1. An exemption from Section 20.08.090, MCC, Grubbing and Grading Permit Fees, shall be granted to exempt the project from payment of grading, grubbing and excavation permit fees, as well as inspection fees.

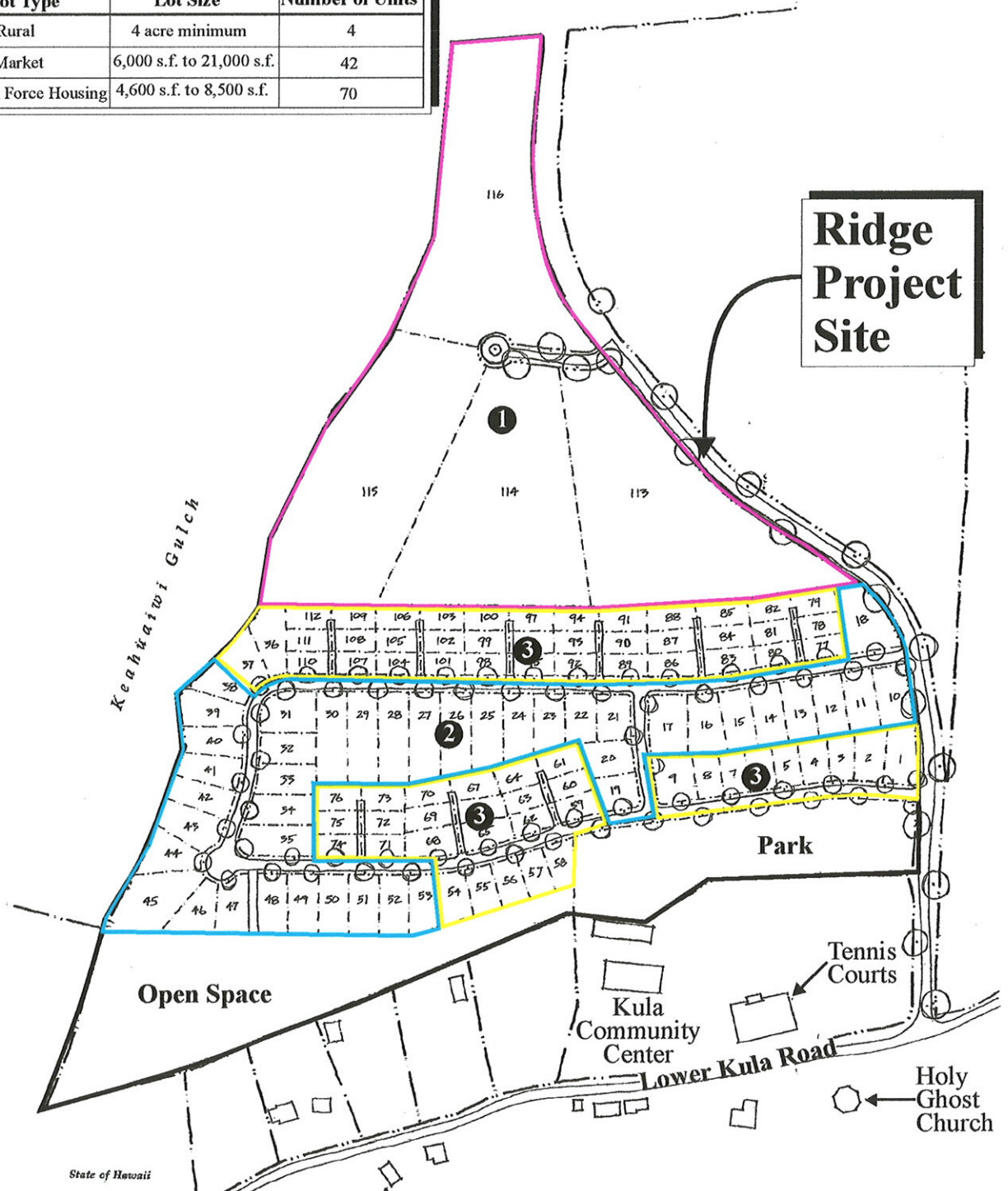
**F. EXEMPTIONS FROM HAWAII ADMINISTRATIVE RULES (HAR), TITLE 11, CHAPTER 62, WASTEWATER SYSTEMS**

1. An exemption from Section 11-62-32 HAR, Spacing of Individual Wastewater Systems, shall be granted to permit the development of individual wastewater systems for 116 single-family homes.

# KEY

## LAND USE SUMMARY

	Lot Type	Lot Size	Number of Units
①	Rural	4 acre minimum	4
②	Market	6,000 s.f. to 21,000 s.f.	42
③	Work Force Housing	4,600 s.f. to 8,500 s.f.	70



**Ridge  
Project  
Site**

*Keahāhāwi Gulch*

Open Space

Park

Tennis Courts

Kula Community Center

Lower Kula Road

Holy Ghost Church

State of Hawaii

Source: Architectural Design & Construction, Inc.

# Attachment A Proposed Kula Ridge Residential Workforce Housing Subdivision Conceptual Site Plan

NOT TO SCALE



Prepared for: Kula Ridge, LLC

MUNEKIYO & HIRAGA, INC.

Nishikawa/Kula/AH/ConceptSite

# **APPENDIX C.**

**Agricultural Impact Study,  
November 2006**

*KULA RIDGE AFFORDABLE HOUSING SUBDIVISION:  
IMPACT ON AGRICULTURE*

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*KULA RIDGE AFFORDABLE HOUSING SUBDIVISION:  
IMPACT ON AGRICULTURE*

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PREPARED FOR:  
Kula Ridge LLC

PREPARED BY:  
Decision Analysts Hawaii, Inc.

November 2006

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## EXECUTIVE SUMMARY

### 1. PROPOSED DEVELOPMENT

Kula Ridge, LLC proposes to develop the Kula Ridge Affordable Housing Subdivision, a planned affordable housing subdivision to be located in Kula, Maui. The Project will contain 116 single-family residential units including 70 affordable homes and four 4-acre agricultural lots.

### 2. AGRICULTURAL CONDITIONS

None of the Project site has high quality soils. However, about 16 acres (35%) of the Project site have agronomic conditions that are suitable for "high-elevation" crops that are grown commercially in Kula. Most of the better agricultural land is located at the mauka portion of the site where the four 4-acre agricultural lots are planned.

### 3. LOCATIONAL ADVANTAGES AND DISADVANTAGES FOR CROP PRODUCTION

In terms of location, farmers in Kula are well-situated to supply the small Maui Island market. And compared to other farmers in Hawaii, they can also compete reasonably well in supplying mainland markets, as long as their products have long shelf-lives and so can be shipped by surface vessel.

However, compared to farmers on O'ahu, they are at a disadvantage in supplying the Honolulu market. Furthermore, they are at a disadvantage in supplying mainland markets if their products have short shelf-lives and so must be shipped by air. Also, farmers in Kula are at a disadvantage in competing against the low-cost producers who supply mainland markets.

### 4. SURROUNDING LAND USES

The Project site is bordered on the north by Keahuaiwi Gulch, to the south and east are abandoned pasture lands, and to the west along Lower Kula Road are the Kula Community Center, Gateball Field and Tennis Courts. Single-family homes are also located along the western boundary of the Project site. None of these properties appear to support commercial agricultural activities.

### 5. RECENT CROP FARMING

From the mid-1990s through November 2005, a full-time commercial farmer leased approximately 15 acres of the upper portion of the Project site, of which about 10 acres had "good" soils. Although profitability was marginal, the operation supported the farmer plus one employee.

This former tenant quit commercial farming due to the planned development of the Project and the difficulties associated with earning a livelihood from farming. He now has permanent employment with the State of Hawaii as an agriculture inspector.

### 6. IMPACT ON EXISTING AGRICULTURAL OPERATIONS

Two people jointly lease about 20 to 25 acres in the lower portion of the Project site to graze eight horses and mules. This is a non-commercial operation that generates no revenues and provides no employment. Both of the tenants have full-time jobs unrelated to their grazing operation.

Development of the Project and the related loss of grazing land will not require these tenants to reduce the size of their herd because they lease a sufficient amount of grazing land elsewhere in Kula. It is also possible that one or more of the four owners of the 4-acre parcels will lease some of their land to these tenants for grazing their animals.

In view of the negligible impact of the Project on this grazing operation, mitigation measures for the loss of grazing lands are not recommended.

### 7. POTENTIAL AGRICULTURAL USE OF LARGE LOTS

The Project will include four agricultural lots of at least 4 acres each. These lots are located in the upper portion of the Project site where most of the better soils are found.

Even though homes will be built on these agricultural lots, one or more of the future lot owners might farm a portion of their land or graze animals on them, or might lease a portion of their property to others who might farm the land or graze animals. Correspondingly, the Project might result in a slight increase in agricultural activity, even though it is a residential development.

### 8. GROWTH OF DIVERSIFIED CROPS (CUMULATIVE IMPACT)

The Project will commit about 36 acres of low-quality agricultural land to a non-agricultural use, leaving about 12 acres of the better land available for agriculture as part of four 4-acre lots. For each agricultural lot, this leaves about 1 acre for a home and possibly an *ohana* home.



If the 36 acres had good soils, and if this land were used to grow a typical vegetable or fruit crop, then it could support about 4.5 farm jobs. More realistically, development on this agricultural land—combined with other developments in Hawai'i and on Maui Island—involves the loss of too little agricultural land to significantly affect (1) the availability of land to farmers in Hawai'i, (2) agricultural land rents, (3) the growth of diversified crops, or (4) potential agricultural employment. This conclusion is based on the finding that, as a result of the contraction of plantation agriculture, ample land is available for diversified crops, with the available supply far exceeding likely or potential demand.

The Project might adversely affect the growth of diversified agriculture in Kula since the market for agricultural land is tighter there than it is in most other areas of the state. However, the impact would be slight since nearly all of the 36 acres that will be lost to agriculture have poor soils.

In view of the negligible impact of the Project on the growth of diversified agriculture, mitigation measures for the loss of agricultural land are not recommended.

## 9. OFFSETTING BENEFITS

The loss of about 36 acres of low-quality agricultural land will be offset by the benefit of 116 homes, including 70 affordable homes, that are needed to house Maui residents.

## 10. CONSISTENCY WITH STATE AND CITY POLICIES

### a. Availability of Lands for Agriculture

The *Hawai'i State Constitution*, the *Hawai'i State Plan*, the *State Agriculture Functional Plan*, the *County of Maui General Plan 1990*, and the *County's Makawao-Pukalani-Kula Community Plan* call directly or implicitly for preserving the economic viability of plantation agriculture and promoting the growth of diversified agriculture. To accomplish this, an adequate supply of agriculturally suitable lands and water must be assured.

With regard to plantation agriculture, the Project site is not and never was part of a sugarcane or pineapple plantation.

With regard to diversified agriculture, the Project will reduce the availability of agricultural land by about 36 acres, most of which has poor soils. About 12 acres of the better land will remain available for agriculture as part of four 4-acre lots. This small loss of agricultural land will not limit the Statewide growth of diversified agriculture since an enormous supply of agricultural land is now available due to the contraction of plantation agriculture.

### b. Conservation of Agricultural Lands

In addition to the above, State policies call for conserving and protecting prime agricultural lands, including protecting agricultural lands from urban development.

However, these policies—which were written before the major contraction of plantation agriculture in the 1990s—assume implicitly that profitable agricultural activities eventually will be available to utilize all available agricultural lands. This has proven to be a questionable assumption in view of the enormity of the contraction of plantation agriculture, the abundant supply of land that came available for diversified agriculture, and the slow growth in the amount of land being utilized for diversified agriculture.

Furthermore, discussions in the Agriculture portion of the *State Functional Plan* recognize that redesignation of lands from Agricultural to Urban should be allowed "... upon a demonstrated change in economic or social conditions, and where the requested redesignation will provide greater benefits to the general public than its retention in ... agriculture;" that is, when an "overriding public interest exists." The enormous contraction in plantation agriculture, resulting in the supply of agricultural land far exceeding demand, constitutes a major change in economic conditions. Moreover, development in the Project site will provide community benefits (i.e., needed homes for Maui residents, including 70 affordable homes). Furthermore, the Project is expected to have no significant impact on existing or potential agricultural employment.

### c. Community Plan

In terms of agriculture, the Project is consistent with the *Makawao-Pukalani-Kula Community Plan* in that none of the site is designated Agriculture. Instead, the Project site is designated for Single-Family Residential and Rural use.

## KULA RIDGE AFFORDABLE HOUSING SUBDIVISION: IMPACT ON AGRICULTURE

### 1. INTRODUCTION<sup>[1]</sup>

Kula Ridge, LLC proposes to develop the Kula Ridge Affordable Housing Subdivision ("the Project"), a planned affordable housing subdivision to be located in Kula, Maui. Figure 1 shows the location of the Project; Figure 2 shows the site location and the Tax Map Key; and Figure 3 shows the conceptual site plan for the Project. All figures are located at the end of this report.

The Project site is within the State Agricultural District (Figure 4). The County of Maui ("County") *Makawao-Pukalani-Kula Community Plan* designates the site for "Rural" and "Single-Family Residential" uses (Figure 5). County zoning for the Project site is "Interim." The Project will require a State Land Use District Boundary Amendment, changes in the *Makawao-Pukalani-Kula Community Plan*, and changes in zoning.

This report addresses the impacts of the Project on agriculture. The material below gives the following information: its location; a description of the Project; the agricultural conditions at the site, along with supporting Figures 6 to 9; potential crops; locational advantages and disadvantages for crop production; surrounding land uses; details on recent crop farming; the impact of the Project on an existing grazing operation; potential agricultural use on some proposed agricultural lots; the impact of the Project on the growth of diversified crops, along with supporting Figure 10 which shows the release of land from plantation agriculture and the increase in acreage in diversified crops; benefits of the Project that will offset adverse agricultural impacts; and consistency of the Project with State and County agricultural policies.

Two appendices are at the end of the report. Appendix A provides a listing of planned and proposed projects on Maui and the amount of agricultural land that would be affected. Appendix B provides a summary of State and County goals, objectives, policies and guidelines related to agricultural lands.

### 2. LOCATION OF THE PROJECT<sup>[1]</sup>

The Project site is located on the western flank of Mt. Haleakala, *mauka* of Kula Highway and adjacent to the town of Waiahoa (Figure 1). As shown in Figure 2 the Project site is also identified by Tax Map Key (2) 2-3-01: 174.

### 3. PROJECT DESCRIPTION<sup>[1]</sup>

The Kula Ridge Affordable Housing Subdivision will provide 116 single-family homes located on 48.117 acres. As shown in Figure 3, the Project will include the following components:

Item	Number	Lot Size	Acres
Affordable homes	70	5,600 to 8,500 sf	9.25
Market-priced homes	42	6,000 to 21,000 sf	11.12
Homes (+ a potential <i>otiana</i> home on each lot)	4	4 acres minimum	16.25
Park and green space		n.a.	8.00
Right of way, common areas	—	n.a.	<u>3.50</u>
Total	116		48.12

Most of the land for the four 4-acre lots would remain available for agricultural uses.

### 4. AGRICULTURAL CONDITIONS

#### a. Soil Type<sup>[2]</sup>

Underlying the property is a soil type belonging to the Pu'u Pa-Kula-Pane association (Figure 6).

As shown in Figure 7, the Project site contains only one soil type as rated by the Soil Conservation Service, now known as the Natural Resources Conservation Service (NRCS). The soil type is KxaD: Kula cobbly loam with 12 to 20 % slopes.

#### b. Soil Characteristics<sup>[2]</sup>

Soil type KxaD has the following characteristics:

- surface layer: about 8 inches thick consisting of loam soils
- subsoil: about 46 inches thick consisting of loam, silty loam, and silty clay loam soils
- subangular blocky structure in the subsoil
- slightly acid in the surface layer, and slightly acid to neutral in the subsoil
- moderate permeability
- medium runoff
- moderate erosion hazard
- water capacity of about 1.8 inches per foot

#### c. Soil Ratings

Three classification systems are commonly used to rate soils in Hawaii: (1) Land Capability Grouping, (2) Agricultural Lands of Importance to the State of Hawaii, and (3) Overall Productivity Rating.

#### Land Capability Grouping (NRCS Rating)<sup>[2]</sup>

The 1972 Land Capability Grouping by the NRCS rates soils according to eight levels, ranging from the highest classification level "I" to the lowest "VIII."

The one soil type at the Project site is rated IVe. Class IV soils have very severe limitations that reduce the choice of plants, or require very careful management, or both. The subclassification "e" indicates that the soils are subject to severe erosion if they are cultivated and not protected.

#### Agricultural Lands of Importance in the State of Hawaii (ALISH)<sup>[3]</sup>

ALISH ratings were developed in 1977 by the NRCS, the UH College of Tropical Agriculture and Human Resources, and the State Department of Agriculture. This system classifies land into three broad categories: (a) Prime agricultural land which is land that is best suited for the production of crops because of its ability to sustain high yields with relatively little input and with the least damage to the environment; (b) Unique agricultural land which is non-Prime agricultural land used for the production of specific high-value crops; and (c) Other agricultural land which is non-Prime and non-Unique agricultural land that is important to the production of crops.

All the soils at the Project site are rated Other (see Figure 8).

#### Overall Productivity Rating (LSB Rating)<sup>[4]</sup>

In 1972, the University of Hawaii (UH) Land Study Bureau (LSB) developed the Overall Productivity Rating, which classifies soils according to five levels, with "A" representing the class of highest productivity and "E" the lowest.

About 16 acres (34%) of the Project site have soils rated C, about 25 acres (52%) are rated D, and about 7 acres (14%) are rated E (see Figure 9). Most of the better agricultural land is located at the *mauka* portion of the Project site.

#### Summary Evaluation of Soil Quality

These soil-rating systems suggest that none of the Project site has high quality soils. However, the LSB rating suggests that about 16 acres (35%) has soils that are suitable for farming (C rating).

#### d. Elevation<sup>[1]</sup>

The elevation of the Project site ranges from about 2,769 feet at the western end to about 3,085 feet at the eastern end.

#### e. Slopes<sup>[1,2]</sup>

The average slope of the Project site is about 20%, which is relatively steep for most farming.

#### f. Climatic Conditions

Like other areas in Hawaii, Central Maui has a mild semitropical climate which is due primarily to three factors: (1) Hawaii's mid-Pacific location near the Tropic of Cancer, (2) the surrounding warm ocean waters that vary little in temperature between the winter and summer seasons, and (3) the prevailing northeasterly tradewinds that bring air having temperatures that are close to those of the surrounding waters.

#### Solar Radiation<sup>[5]</sup>

This area of Maui where the Project site is located receives considerable sunshine, with average daily insolation of over 400 calories per square centimeter.

#### Rainfall<sup>[6]</sup>

Rainfall in the area averages about 30 inches per year. Most of this rainfall occurs during the winter rainy season (October through April), while the summer months (May through September) are hot and dry.

#### Temperatures<sup>[6]</sup>

Average temperatures range from the low 50s Fahrenheit in the winter to the mid-80s during the summer.

#### Winds and Storms<sup>[6,7]</sup>

The prevailing northeast tradewinds average about 20 miles per hour. In the winter, the island is often affected by Kona weather conditions, ranging from strong southerly winds with heavy rains, to calm and humid, or rainy weather.

#### g. Irrigation Water<sup>[8]</sup>

Irrigation water in Kula is provided by the County.

#### h. Road Access

Access to the Project site is along its western border via Lower Kula Road which connects to Kula Highway.

#### i. Summary

None of the Project site has high quality soils. However, about 16 acres (35%) of the Project site have agronomic conditions that are suitable for growing high-elevation crops. Most of the better agricultural land is located at the *mauka* portion of the site where the four 4-acre agricultural lots are planned.

#### 5. POTENTIAL CROPS<sup>[9,10]</sup>

Based on the above agronomic conditions, portions of the Project site are suitable for "high-elevation" crops that are grown commercially in Kula, including various fruits (avocados, bananas, papayas, pineapples, tropical specialty fruits), flowers, herbs, and various vegetables (artichokes, beets, cabbage, corn, lettuce, onions, parsley, and zucchini).

#### 6. LOCATIONAL ADVANTAGES AND DISADVANTAGES FOR CROP PRODUCTION

##### a. Maui Island Market

Farmers in Kula are well-situated to supply the Maui Island market because of the short trucking distance (about 15.5 miles) to Kahului, which is the island's commercial, industrial, distribution and transportation center. While the Maui Island market is significant, it is comparatively small: in 2000, Maui had a *de facto* population of about 156,170 residents and visitors.<sup>[11]</sup>

##### b. Honolulu Market

All farmers on Maui are at a disadvantage in competing against farmers on O'ahu for supplying the Honolulu market due to the interisland shipping costs, delays and extra handling. In comparing barge and air-cargo services, shipping by barge is less expensive and larger loads can be shipped, but the shipments are slow and infrequent. Air service is faster and frequent, but it is far more expensive and capacities are limited. A planned new ferry system, if successful, will increase the speed and frequency of surface shipments, and costs will be lower than air freight. In turn, this will allow Maui farmers to be more competitive in O'ahu produce markets, and vice versa.

In 2000, O'ahu had a *de facto* population of about 927,170 residents and visitors.<sup>[11]</sup> Thus, the Honolulu market is nearly six-times larger than the Maui market.

#### c. Mainland Market

Compared to Hawaii, the mainland market is enormous: in 2000, the United States had a total population of 281.4 million.<sup>[12]</sup> In supplying this market with products that can be carried by container ship because they have long shelf-lives (e.g., canned fruit), farmers on Maui are competitive with farmers on O'ahu and other islands. Even though freight from Maui must first be barged to Honolulu then transferred onto a container ship, Matson's overseas shipping service includes interisland barge service at no additional fee, except for some minor port charges; Matson charges a common fare for all islands.<sup>[13]</sup>

In the case of fresh products that must be shipped by air to the mainland because of their short shelf-lives, farmers on Maui are at a disadvantage compared to farmers on O'ahu because most mainland air cargo is shipped via the Honolulu International Airport. Compared to farmers on O'ahu, Maui farmers encounter additional costs, delays and handling for interisland air-cargo service and for transferring the fresh products from small interisland aircraft to large overseas aircraft.

However, overseas air-cargo service from Maui has improved somewhat because the current generation of aircraft can depart from the short runway at Kahului with a full load of passengers and a full load of cargo in the hold. This direct service allows farmers on Maui to be more competitive in mainland markets. However, the lift capacity from Maui is limited by the number of direct flights.

In the U.S. mainland market, farmers in Hawaii must also compete against farmers on the mainland and in Mexico, Central and South America, the Caribbean, Australia, New Zealand, Southeast Asia, etc. Most of the competing farm areas have lower production and delivery costs than Hawaii does. Competing against Mexico is particularly difficult given the North America Free Trade Agreement (NAFTA) and Mexico's proximity to major U.S. markets.

#### d. Summary

In terms of location, farmers in Kula are well-situated to supply the small Maui Island market. And compared to other farmers in Hawaii, they can also compete reasonably well in supplying mainland markets, as long as their products have long shelf-lives and so can be shipped by surface vessel.

However, compared to farmers on O'ahu, they are at a disadvantage in supplying the Honolulu market. Furthermore, they are at a disadvantage in supplying mainland markets if their products have short shelf-lives and so must be shipped by air. Also, farmers in Kula are at a disadvantage in competing against the low-cost producers who supply mainland markets.

## 7. SURROUNDING LAND USES<sup>(1,4)</sup>

The Project site is bordered on the north by Keahuaiwi Gulch, to the south and east are abandoned pasture lands, and to the west along Lower Kula Road are the Kula Community Center, Gateball Field and Tennis Courts (see Figures 1, 2 and 3). Single-family homes are also located along the western boundary of the Project site.

Based on the absence of an agricultural property-tax assessment by the County, none of the 1-acre lots along Lower Kula Road appear to support commercial agricultural activities.

## 8. RECENT CROP FARMING<sup>(5,16)</sup>

From the mid-1990s through November 2005, approximately 15 acres of the upper portion of the Project site were leased by a full-time commercial farmer. Lease rent was about \$50 per acre for the 10 acres or so that had "good" soils. Over the years, the farmer grew cabbage, round onions, Chinese parsley and Italian parsley. Although profitability was marginal, the operation supported the farmer plus one employee who was paid less than \$10 per hour.

This former tenant quit commercial farming due to the planned development of the Project and the difficulties associated with earning a livelihood from farming. He now has permanent employment with the State of Hawai'i as an agriculture inspector at Kahului Airport.

## 9. EXISTING GRAZING OPERATION

### a. Grazing Operation

Two people jointly lease about 20 to 25 acres in the lower portion of the Project site to graze eight horses and mules. In lieu of lease rent, the pair provide land stewardship, including fencing the property, keeping the land clear of weeds and trash, paying liability insurance, etc. This is a non-commercial operation that generates no revenues and provides no employment. Their horses and mules are pets and are used for recreation. Both of the tenants have full-time jobs unrelated to their grazing operation.

In order to allow the pasture to regenerate, the tenants rotate some of their herd to other lands they lease in Kula. In all, they lease 40 to 45 additional acres for their animals.

For the future, their plans are to maintain the herd at about the same size.

### b. Impact on Grazing Operation

The tenants indicate that development of the Project and the related loss of grazing land will not require them to reduce the size of their herd because they lease a sufficient amount of grazing land elsewhere in Kula. It is also possible

that one or more of the four owners of the 4-acre parcels will lease some of their land to these tenants for grazing their animals (see Section 10).

### c. Mitigating Measures

In view of the negligible impact of the Project on this grazing operation, mitigation measures for the loss of grazing lands are not recommended.

## 10. POTENTIAL AGRICULTURAL USE OF LARGE LOTS

As indicated in Section 3 and shown in Figure 3, the Project will include four lots of at least 4 acres each, and totalling 16.25 acres for the four lots. Most of the better soils are located in the area designated for these large lots.

Even though homes will be built on these agricultural lots, one or more of the future lot owners might farm a portion of their land or graze animals on them, or might lease a portion of their property to others who might farm the land or graze animals. Assuming about one acre is used on each lot for a primary home and possibly an *ohana* home, as much as 12 acres might remain available for agriculture.

Correspondingly, the Project might result in a slight increase in agricultural activity, even though it is a residential development.

## 11. GROWTH OF DIVERSIFIED CROPS

The Project will commit agricultural land to a non-agricultural use. The impact of this commitment on the growth of diversified crops is addressed below. The material covers the (1) amount of land required for the future growth of diversified crops, (2) availability of land for diversified crops, (3) impact of the Project on the growth of diversified crops, and (4) mitigating measures.

### a. Potential Acreage Requirements for Diversified Crops to Replace Imports of Fruits and Vegetables<sup>(17)</sup>

For low-elevation fruits and vegetables that have a history of profitable production in Hawai'i, potential land requirements in 2010 for 100% import substitution for the Hawai'i and O'ahu markets are estimated at 12,700 acres and 8,600 acres, respectively, plus additional acreage for fallowing land between crop plantings. When allowing for competition from imports, these estimates drop to about half. These estimates take into account estimated consumption, production trends, seasonal and annual market shares, yields, and the number of crops per year. Also, these figures are for acreage in crop—not harvested acreage as is typically reported in government publications.

Market shares for Hawaii growers are limited by the following factors: (1) local varieties are not perfect substitutes for all imports (e.g., premium-priced sweet Maui onions versus inexpensive storage onions); (2) some crops cannot be produced profitably in the summer due to competition from low-cost imports of fruits and vegetables from California, other states, and Mexico; and (3) over-production must be avoided in order to maintain profitable price levels.

Since Hawaii farmers already supply a portion of the Hawaii market, land requirements for increased import substitution are a fraction of the above estimates.

#### Export Crops<sup>[9,11,12]</sup>

The potential market for export crops is far larger than the Hawaii market. In 2005, the U.S. population was 296.41 million, compared to Hawaii's resident-plus-visitor population of 1.45 million. To take advantage of this large potential, Hawaii farmers are exploring various export crops on lands released from plantation agriculture. Over the next 20+ years, one or more of these crops may prove to be successful and may grow into a major export crop.

However, the history of agricultural efforts in Hawaii reveals that the successful development of major new export crops requiring large amounts of land is infrequent. For example, over the past 50 years in Hawaii, farmers have explored numerous possibilities for export crops, but they have developed overseas markets for just one diversified crop that requires more than 10,000 acres (macadamia nuts at 18,000 acres in 2004); one additional crop that requires more than 5,000 acres (coffee at 7,700 acres); and only five additional crops or crop categories that require more than 1,000 acres each (papaya at 2,105 acres, bananas at 1,360 acres, tropical specialty fruits at 1,260 acres, flowers/nursery products at 3,874 acres, and seed crops at 3,870 acres). Tropical specialty fruits include longan, lychee, mango, rambutan, star-fruit, etc.

#### Feed Crops<sup>[18]</sup>

If feed crops could be grown in Hawaii and priced competitively against mainland imports, they could replace some of the grains and hay that is now being imported to the State. Unfortunately, a number of commercial attempts in Hawaii to grow grains and alfalfa have been unsuccessful. The major problems have been (1) pests, particularly birds that eat the grains before they are harvested; (2) humidity that is too high for drying alfalfa properly; and (3) high production costs compared to those of mainland farms.

#### Biofuel Crops<sup>[19,25]</sup>

Crops can be grown to produce biomass to fuel a boiler, or as feedstock to produce fuels. Examples of the latter include sugarcane, corn or sorghum used

to produce ethanol. In turn, the ethanol is used to produce E-10 gasohol (90% gasoline and 10% ethanol).

In Hawaii, the common practice is to produce biomass as a by-product of some principal crop. For example, at HC&S on Maui and at Gay & Robinson on Kauai, the sugarcane by-product bagasse is burned to help fuel their respective power plants. In addition, the biofuel company Maui Ethanol plans to use the sugarcane by-product, molasses, from the two sugarcane plantations as a feedstock to produce ethanol. Using conventional technology, the sugar in the molasses will be fermented to produce ethanol, followed by distillation to extract the alcohol.

However, Oahu Ethanol Corporation plans to build an ethanol plant at Campbell Industrial Park using conventional technology but, at least initially, using imported molasses as the feedstock. The rated capacity will be 15 million gallons of ethanol per year. For the longer term, this company is exploring the economics of growing sweet sorghum to supply feedstock to its ethanol plant. The sorghum would have to be grown on Oahu because it would be too expensive to ship the sorghum juice from a Neighbor Island to Oahu. Sorghum juice is mostly water having a low concentration of sugar compared to molasses.

Acreage requirements for a new sorghum biofuel plantation on Oahu would range from about 6,000 acres for viability to 15,000 if it were to replace all imported molasses. This acreage comprises a substantial share or all of the estimated 14,700 acres of crop land that is available on Oahu at year end 2006. But it is a small share of the 160,000+ acres of crop land that will be available State-wide (see Section 11.b).

A number of substantial difficulties must be overcome in order to develop a biofuel plantation for supplying feedstock for ethanol production, including:

#### — Long-term leases

In many areas of the State, it will be difficult to lease the large amount of land required for a biofuel plantation at low lease rents for the 30 or so years required to capitalize the investment in a new plantation. Over time, other farmers and other users of land are likely to make higher offers for lease rents or land purchases. In view of this potential, the current market value of available agricultural lands is likely to be higher if the lands are not committed long-term at rents that would be low enough to be affordable for a biofuel plantation.

#### — Capital

Substantial investment capital will be required to cover the cost of a mill to extract the juice from a biofuel crop, a generating plant to provide power, improvements and upgrades to irrigation systems that are in disrepair, trucks and equipment to harvest

and haul the sorghum to the mill and haul the sorghum juice to the ethanol plant, etc.

— Short-term Profitability

Annual revenues from selling the ethanol plus direct subsidies are estimated by the consultant at about \$2,700 per acre (based on an estimated 900 gallons per acre per year of ethanol at about \$3 per gallon). Even with subsidies, this is low compared to revenues from other crops in Hawaii.

Furthermore, the cost of importing molasses for feedstock or importing ethanol may prove less expensive than growing a biofuel crop in Hawaii. For similar crops (e.g., feed crops), importing has proven to be less expensive than growing and processing crops locally. Also, the U.S. Department of Agriculture has found sorghum to be an expensive feedstock for producing ethanol—about 3.7 times as expensive as corn and 63% more expensive than molasses.

As ethanol production increases on the mainland and in Hawaii, there is a risk that the combined Federal and State subsidies for ethanol (nearly \$1 per gallon) could be reduced, thereby compromising the profitability of a biofuel crop.

— Long-term Profitability

In the long-term, emerging technology promises a cheaper source of feedstock for ethanol than growing a biofuel crop on a plantation. Instead of producing ethanol using sugars from conventional sources (e.g., molasses, sugarcane, grains, fruits, etc.), the sugar would come from "cellulosic" sources. Using new technology that is in the early stages of commercialization, sugar that is locked in complex carbohydrates of plants is separated into fermentable sugars. Feedstock would include agricultural wastes, yard clippings, discarded paper, wood waste, etc.—i.e., the green waste that is now used for composting. This new technology promises (1) much higher ethanol yields per ton of biomass because the entire plant can be used as feedstock, and (2) lower costs, particularly if there are no growing costs when waste product is used, and if the operator is paid a fee to dispose of municipal and agricultural waste.

O'ahu's municipal waste could produce an estimated 160 million gallons of ethanol compared to annual consumption of about 400 million gallons of gasoline. This would allow for higher use of ethanol in gasohol than is needed in E-10. In Hawaii, this new technology is being explored by ClearFuels Technology Inc. Eventually, this less expensive source of feedstock could result in unprofitable biofuel plantations.

The above difficulties and risks suggest that the probability of successfully developing and sustaining a biofuel plantation in Hawaii is low. The more likely scenario is ethanol produced as a by-product from sugar operations and, in the long-term, ethanol produced from green waste.

Recent Crop-acreage Trends<sup>91</sup>

For all diversified crops—i.e., all crops other than sugarcane and pineapple, including crops to replace imports and crops for export—Statewide land requirements grew by an average of 240 acres per year from 1984 through 2004, or about 2,400 acres per decade (see Figure 10).<sup>92</sup>

From 1999 to 2004, acreage increased for just three of the major export crop categories: tropical specialty fruits up 350 acres, flowers/nursery products up 1,162 acres, and seed crops up 1,420 acres. During this same period, acreage declined for three of the major export crops: macadamia nuts down 1,900 acres, papaya down 1,395 acres, and bananas down 400 acres. Coffee remained unchanged. The net change was a decrease of 763 acres.

Factors Limiting the Growth of Diversified Crops<sup>93</sup>

A great many crops can be grown in Hawaii's year-round subtropical climate, and a number of them can be grown profitably in volumes that require a few hundred acres. However, the modest growth in land requirements for diversified crops reflects the fact that few crops can be grown profitably on a large scale. The primary factors that have limited the growth of diversified agriculture in Hawaii are given below.

- Hawaii's subtropical climate is not well-suited to the commercial production of major crops that grow better in the temperate mainland climates.
- For certain crops, special hybrids adapted to Hawaii's subtropical climate are yet to be developed.
- Crop pests are more prevalent and more expensive to control in Hawaii than they are on the mainland where the cold winters kill many pests.
- Fruit-fly infestations prevent exports of many crops, or require expensive treatment.
- Most soils in Hawaii have low nutrient levels and therefore require high expenditures for fertilizer.

1. In Figure 10, the temporary bump in diversified-crop acreage that occurred in the late 1990s reflects the fact that some former sugarcane fields were newly planted with grasses for future cattle grazing. After cattle grazing began in 2000, much of this acreage was recategorized from crop land to grazing land.

- Hawaii suffers from high farm-labor costs, largely because the agriculture industry must compete against the visitor industry and related industries for its labor.
- Compared to many other farm areas that supply U.S. markets, the cost of shipping agricultural supplies and equipment to Hawaii is high, as is the cost of exporting produce from Hawaii to mainland markets. High shipping costs are due to Hawaii's remote location and to Federal regulations that require use of American-built ships and U.S. crews between U.S. ports.
- For a number of crops, consumption volumes in Hawaii are too small to support large, efficient farms (i.e., the volumes are too small to realize economies of scale).
- Trends towards crops that are certified as safe and towards a single supplier of many food items favor large farms.
- Hawaii farmers must compete against highly efficient mainland and foreign farms which, in a number of cases, can deliver produce to Hawaii more cheaply than it can be produced locally. This is due to economies of scale and, in comparison to Hawaii, low costs for land, labor, supplies, fertilizer, pest control, equipment, etc.

#### b. Statewide Availability of Land for Diversified Crops

Statewide, a vast amount of land has been released from plantation agriculture: about 249,900 acres between 1968 and 2004—an average decrease of over 6,940 acres per year over a 36-year period (see Figure 10).<sup>[9,26]</sup> The 2006 closure of Del Monte's pineapple plantation in Kunia, O'ahu increased this acreage by an additional 5,100 acres, resulting in a total release of at least 255,000 acres from plantation agriculture between 1968 and 2007.<sup>[27]</sup>

Over this same period, the demand for land for diversified crops increased by about 26,500 acres, or an average of about 740 acres per year. Since 1984, the growth has slowed to an average of 240 acres per year, as previously mentioned.

As the above indicates, the release of land from plantation agriculture has far outpaced the demand for land for diversified crops. The net decrease in crop land amounted to 223,400 acres, and will amount to 228,500 acres after adding the land followed by Del Monte. While some of the released land has been converted or is scheduled to be converted to urban uses and tree plantations, an estimated 160,000+ acres remain available for diversified crops.<sup>[28]</sup> Because of the increased availability of agricultural land, a number of landowners report lower per-acre land rents on O'ahu and the Neighbor Islands compared to rents that were charged before the major contraction of plantation agriculture.<sup>[24]</sup>

Once the Superferry begins operations in 2007, cultivating crops on the Neighbor Islands for the Honolulu market, and vice versa, will become more economically feasible. For a full load carried in a large pick-up truck, the one-way fare will be about 2¢ per pound.<sup>[25]</sup> This will increase the importance of the Statewide availability of agricultural land vis-a-vis the island-wide availability.

The above indicates that ample land is available in Hawaii to accommodate the growth of diversified crops, whether demand is based on potential or recent trends. In other words, the limiting factor to the growth of diversified crops is not the *land supply*, but rather the *size of the market* for crops that can be grown profitably in Hawaii.

#### c. Maui Island Availability of Land for Diversified Crops

The above findings also apply to Maui. Since 1977, the contraction and eventual closure of Wailuku Sugar Co. and Pioneer Mill released about 11,200 acres from sugarcane production. In addition, the contraction of pineapple operations released about 5,000 acres since 1993.

During the 1980s, about 4,700 acres of sugarcane land in Central Maui were made available for other uses. Some of this land was developed; some was planted in macadamia nuts which continued until 1999; some was planted in pineapple; some was transferred to Hawaiian Commercial & Sugar Co. (HC&S); and some remains fallow.

During the 1990s, the reduction in sugarcane acreage occurred in West Maui, including about 6,000+ acres released in 2000. Similarly, most of the recent reduction in pineapple acreage occurred in West Maui, including about 3,200 acres that were released in 2003. Some of this former plantation land in West Maui was developed and some was converted to other crops, but most of it remains fallow or is used for grazing cattle.

In summary, considerable land remains available on Maui for diversified agriculture, although most of it is in West Maui.

#### d. Potential Loss of Agricultural Land on Maui to Development<sup>[11,29,31]</sup>

Based on information provided by the Maui County Planning Department, Appendix A provides a summary of 202 major residential, resort, commercial, and industrial development projects on Maui Island that will (1) increase the number of residential and visitor units, or (2) involve agricultural land. The listing, which reflects known projects as of April 2006, excludes projects having fewer than six dwelling units, and subdivisions having fewer than four lots.

The projects are organized by District, entitlements, then alphabetically. Entitlements are defined as follows:

- Committed projects include (1) those having 201G approval, (2) those having Project District zoning, (3) Department of Hawaiian



Home Lands (DHFL) projects, (4) approved agricultural subdivisions, and (5) other projects for which the land is zoned for development.

- Designated projects include those having (1) urban Community Plan designation, and (2) Project District zoning but no Phase 2 approval.
- Proposed projects include those lacking urban Community Plan designations.

To the extent that information was provided and is relevant, the information on each project listed in Appendix A includes:

- its entitlements;
- the number of homes (single-family and multi-family homes), the number of visitor units (hotel rooms and time-share units), and the total number of units;
- its total area (if provided and needed only for projects that involve agricultural land), along with the average acreage per unit (i.e., the reciprocal of the density, which applies only to projects that have residential or visitor units); and
- the acreage that is within the State Agricultural District, along with an acreage adjustment (explained below).

If all of the committed, designated and proposed residential and resort projects on Maui Island were approved, built and sold, they would supply about 45,900 homes, including about 31,000 single-family homes and 14,900 multi-family homes (see the last page of Appendix A).

Economic projections prepared by the Maui County Planning Department (June 2006) for the Maui County General Plan 2030 forecast that the number of homes on Maui Island will increase from about 49,870 in 2005 to about 84,350 in 2030, resulting in an increase of about 34,480 homes over this 25-year period. Over time, the pace of development is expected to follow a linear trend, fluctuating above and below the average of about 1,380 new homes per year (34,480 homes ÷ 25 years). At the projected demand of about 1,380 new homes per year, the potential supply of homes listed in Appendix A could be absorbed in about 33 years (a total of 45,900 homes ÷ 1,380 homes per year).

Altogether, the projects listed in Appendix A would affect about 19,900 acres on Maui Island that are now in the State Agricultural District (see the last page of Appendix A). Although this accounting includes some agricultural subdivisions where most of the land will be lost to homes, it also includes other agricultural subdivisions where most of the land will remain available for agriculture. In practice, an estimated 11,800 acres in the Agricultural District would be lost to agriculture if all of these projects were approved and built (see the last

page of Appendix A). This estimate is based on the assumption that agricultural subdivisions having at least 2.5 acres per home will remain available for agriculture.

The estimated 11,800 acres of agricultural land includes prime agricultural land, low-quality land that is suitable for grazing but not farming, and gulch land. It represents less than 5% of the 244,600 acres on Maui Island that are in the State Agricultural District.

In summary, the eventual development over a period of about 33 years of all the committed, designated and proposed projects listed in Appendix A, including the loss of about 36 acres for the Kula Ridge Affordable Housing Subdivision, would leave about 232,800 acres on Maui Island available for agricultural use (244,600 acres – 11,800 acres).

#### e. Impact on the Growth of Diversified Crops (Cumulative Impact)

The Project will commit about 36 acres of low-quality agricultural land to a non-agricultural use, leaving about 12 acres of the better land available for agriculture as part of four 4-acre lots. If the 36 acres had good soils, and if this land were used to grow a typical vegetable or fruit crop, then it could support about 4.5 farm jobs (based on 100 acres and about 12.5 jobs per 100 acres).

More realistically, development on this agricultural land—combined with other developments in Hawaii and on Maui Island—involves the loss of too little agricultural land to significantly affect (1) the availability of land to farmers in Hawaii, (2) agricultural land rents, (3) the growth of diversified crops, or (4) potential agricultural employment. This conclusion is based on the above finding that ample land is available for diversified crops, with the available supply far exceeding likely or potential demand.

The Project might adversely affect the growth of diversified agriculture in Kula since the market for agricultural land is tighter there than it is in most other areas of the state. However, the impact would be slight since nearly all of the 36 acres that will be lost to agriculture have poor soils.

#### f. Mitigating Measures

In view of the negligible impact of the Project on the growth of diversified agriculture, mitigation measures for the loss of agricultural land are not recommended.

## 12. OFFSETTING BENEFITS

The loss of about 36 acres of low-quality agricultural land will be offset by the benefit of 116 homes, including 70 affordable homes, that are needed to house Maui residents.

### 13. CONSISTENCY WITH STATE AND COUNTY POLICIES<sup>[92]</sup>

#### a. Availability of Lands for Agriculture

The *Hawaii's State Constitution*, the *Hawaii's State Plan*, the *State Agriculture Functional Plan*, the *County of Maui General Plan 1990*, and the *County's Makawao-Pukalani-Kula Community Plan* call directly or implicitly for preserving the economic viability of plantation agriculture and promoting the growth of diversified agriculture. To accomplish this, an adequate supply of agriculturally suitable lands and water must be assured.

With regard to plantation agriculture, the Project site is not and never was part of a sugarcane or pineapple plantation.

With regard to diversified agriculture, the Project will reduce the availability of agricultural land by about 36 acres, most of which has poor soils. About 12 acres of the better land will remain available for agriculture as part of four 4-acre lots. This small loss of agricultural land will not limit the Statewide growth of diversified agriculture since an enormous supply of agricultural land is now available due to the contraction of plantation agriculture (see Figure 10).

However, the Project might adversely affect the growth of diversified agriculture in Kula since the market for agricultural land is tighter there than it is in most other areas of the state. However, the impact would be slight since nearly all of the 36 acres that will be lost to agriculture have poor soils.

#### b. Conservation of Agricultural Lands

In addition to the above, State policies call for conserving and protecting prime agricultural lands, including protecting agricultural lands from urban development.

However, these policies—which were written before the major contraction of plantation agriculture in the 1990s—assume implicitly that profitable agricultural activities eventually will be available to utilize all available agricultural lands. This has proven to be a questionable assumption in view of the enormity of the contraction of plantation agriculture, the abundant supply of land that came available for diversified agriculture, and the slow growth in the amount of land being utilized for diversified agriculture (see Section 11 and Figure 10).

Furthermore, discussions in the Agriculture portion of the *State Functional Plan* recognize that redesignation of lands from Agricultural to Urban should be allowed "... upon a demonstrated change in economic or social conditions, and where the requested redesignation will provide greater benefits to the general public than its retention in ...agriculture," that is, when an "overriding public interest exists." The enormous contraction in plantation agriculture, resulting in the supply of agricultural land far exceeding demand, constitutes a major

change in economic conditions. Moreover, development on the Project site will provide community benefits (i.e., needed homes for Maui residents, including 70 affordable homes). Furthermore, the Project is expected to have no significant impact on existing or potential agricultural employment.

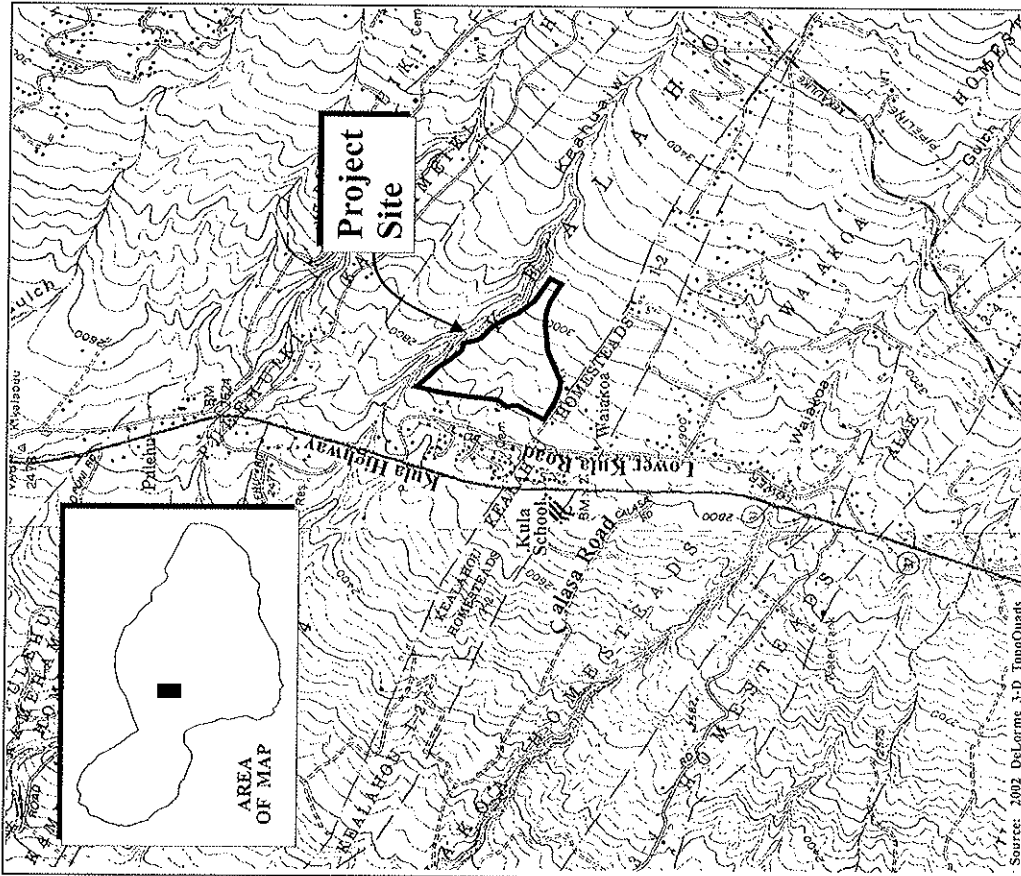
#### c. Community Plan

In terms of agriculture, the Project is consistent with the *Makawao-Pukalani-Kula Community Plan* in that none of the site is designated Agriculture (Figure 5). Instead, the Project site is designated for Single-Family Residential and Rural use.

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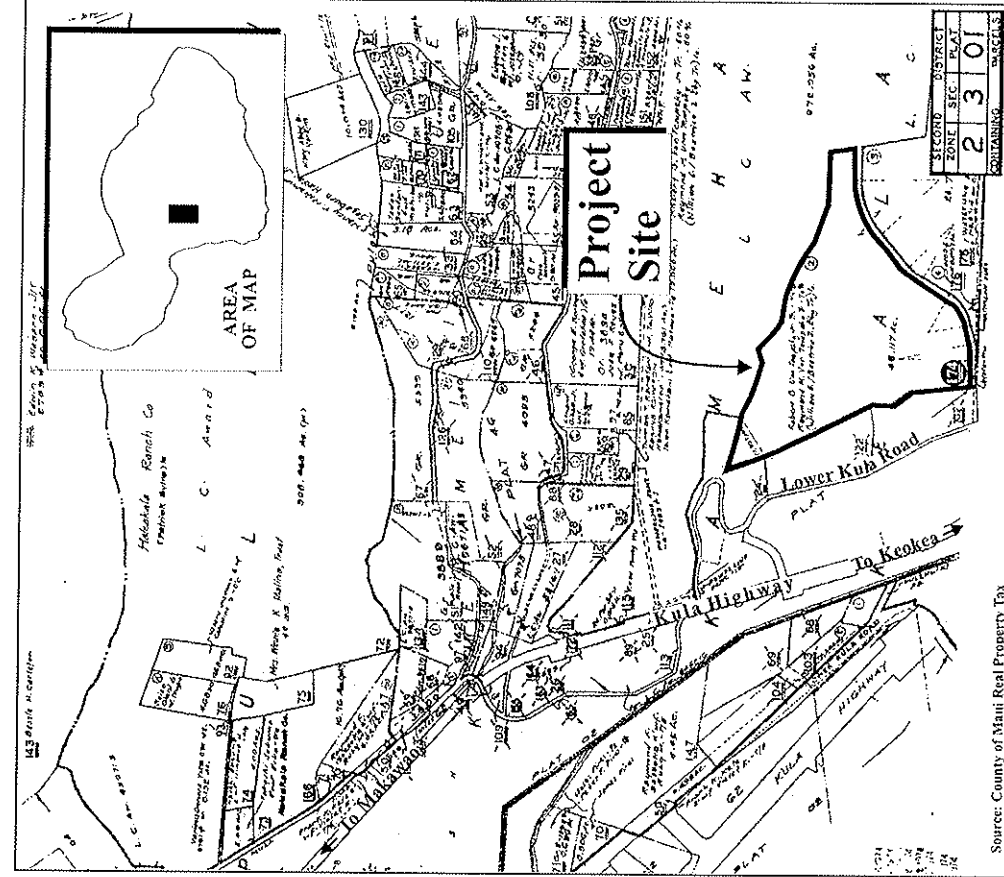


**Figure 1** Proposed Kula Ridge Affordable Housing Subdivision Regional Location Map



NOT TO SCALE

Prepared for: Kula Ridge, LLC  
 MUNEKIYO & HIRAGA, INC.  
 KulaRidgeKULRidge.com

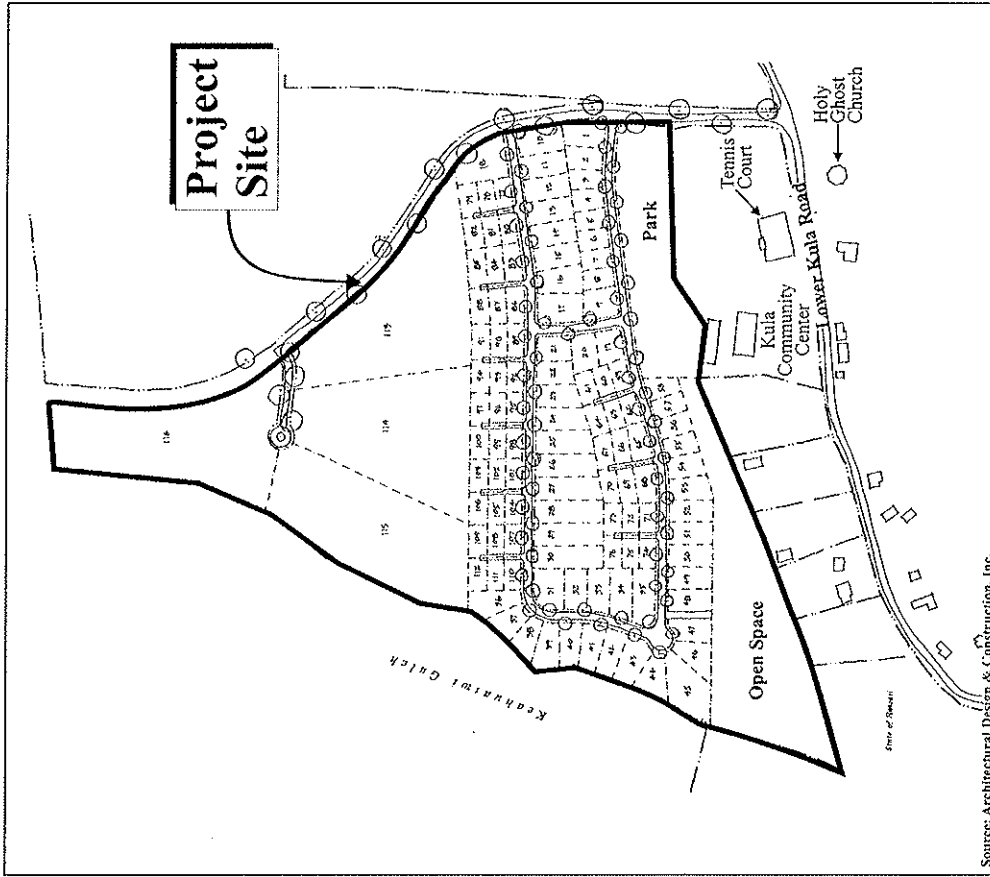


**Figure 2** Proposed Kula Ridge Affordable Housing Subdivision Project Site Map



NOT TO SCALE

Prepared for: Kula Ridge, LLC  
 MUNEKIYO & HIRAGA, INC.  
 KulaRidgeKULRidge.com



Source: Architectural Design & Construction, Inc.

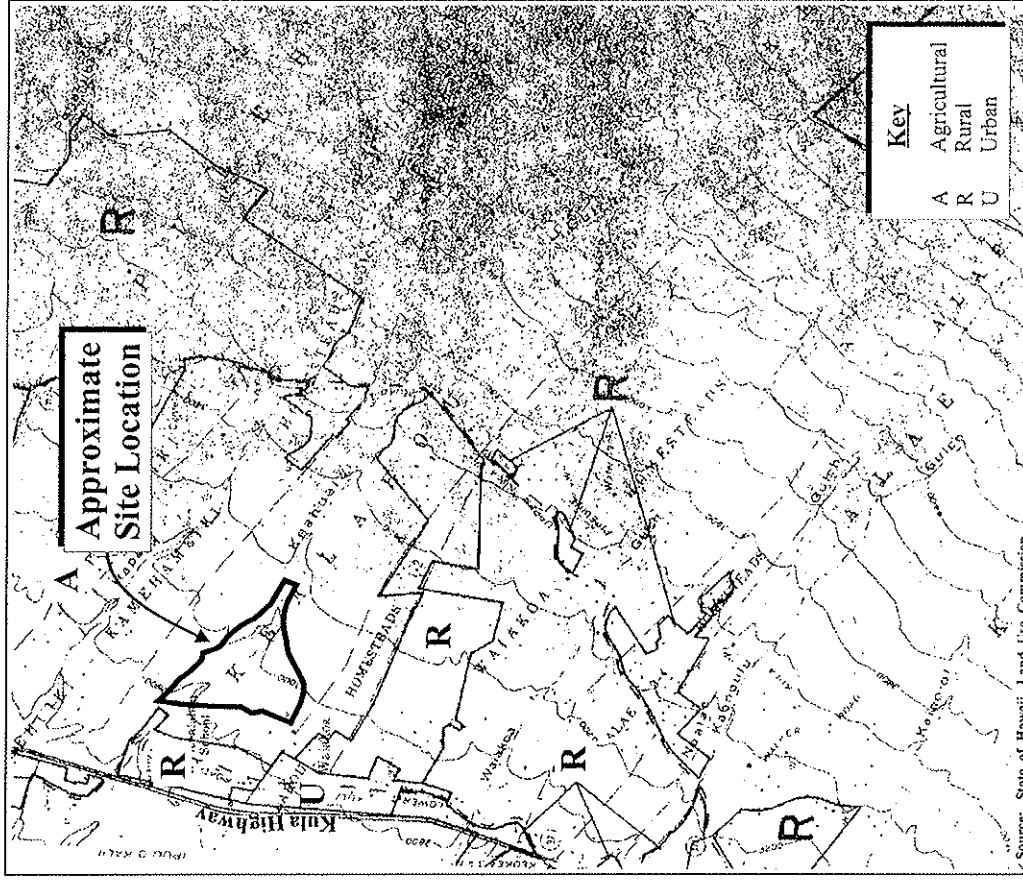
**Figure 3** Proposed Kula Ridge Affordable Housing Subdivision Conceptual Site Plan

NOT TO SCALE



Prepared for: Kula Ridge, LLC

MUNEKIYO & HIRAGA, I.N.C.  
 5085 Kula Ridge, Kula, HI 96753



Source: State of Hawaii, Land Use Commission

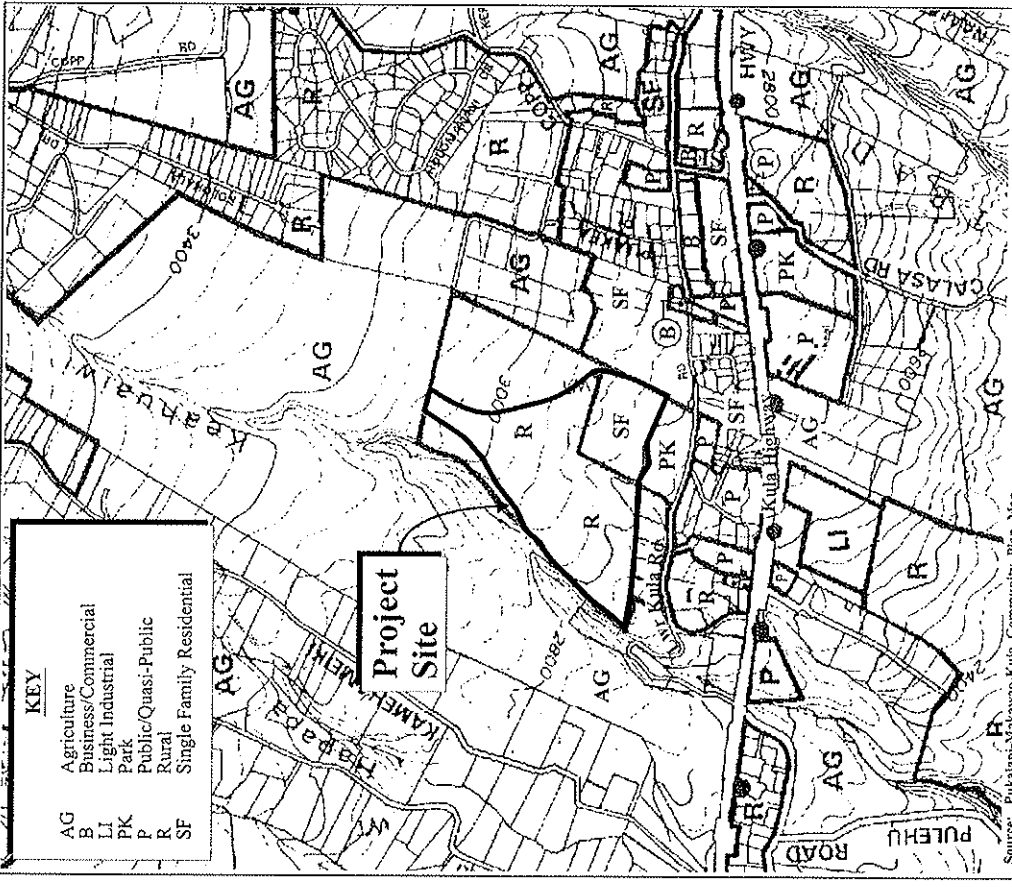
**Figure 4** Proposed Kula Ridge Affordable Housing Subdivision State Land Use District Classifications



NOT TO SCALE

Prepared for: Kula Ridge, LLC

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 5085 Kula Ridge, Kula, HI 96753



**KEY**

AG	Agriculture
B	Business/Commercial
LI	Light Industrial
PK	Park
P	Public/Quasi-Public
R	Rural
SF	Single Family Residential

Figure 5 Proposed Kula Ridge Affordable Housing Subdivision Community Plan Land Use Map



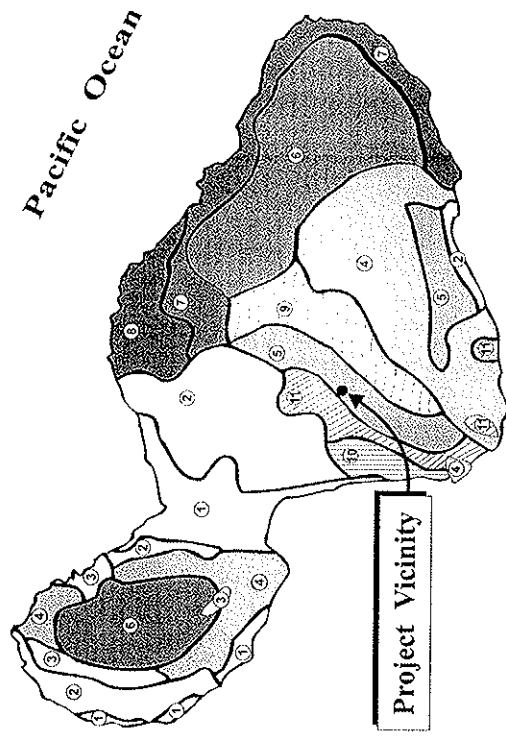
Prepared for: Kula Ridge, LLC

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SHAWNEEKI@ATTOLCD

**LEGEND**

①	Pulehu-Ewa-Janea association	⑦	Huna-Makaalae-Kalian association
②	Waiakoa-Kehun-Molekai association	⑧	Pauwela-Iaika association
③	Honouli-Ololo association	⑨	Lauana-Kaipoi-Olinda association
④	Rock land-Rough mountainous land association	⑩	Keawakapu-Makana association
⑤	Puu Pa-Kula-Pane association	⑪	Kamalo-Olapuka association
⑥	Hydrandrops-Tropozoids association		



Project Vicinity

Source: USDA, Soil Conservation Service

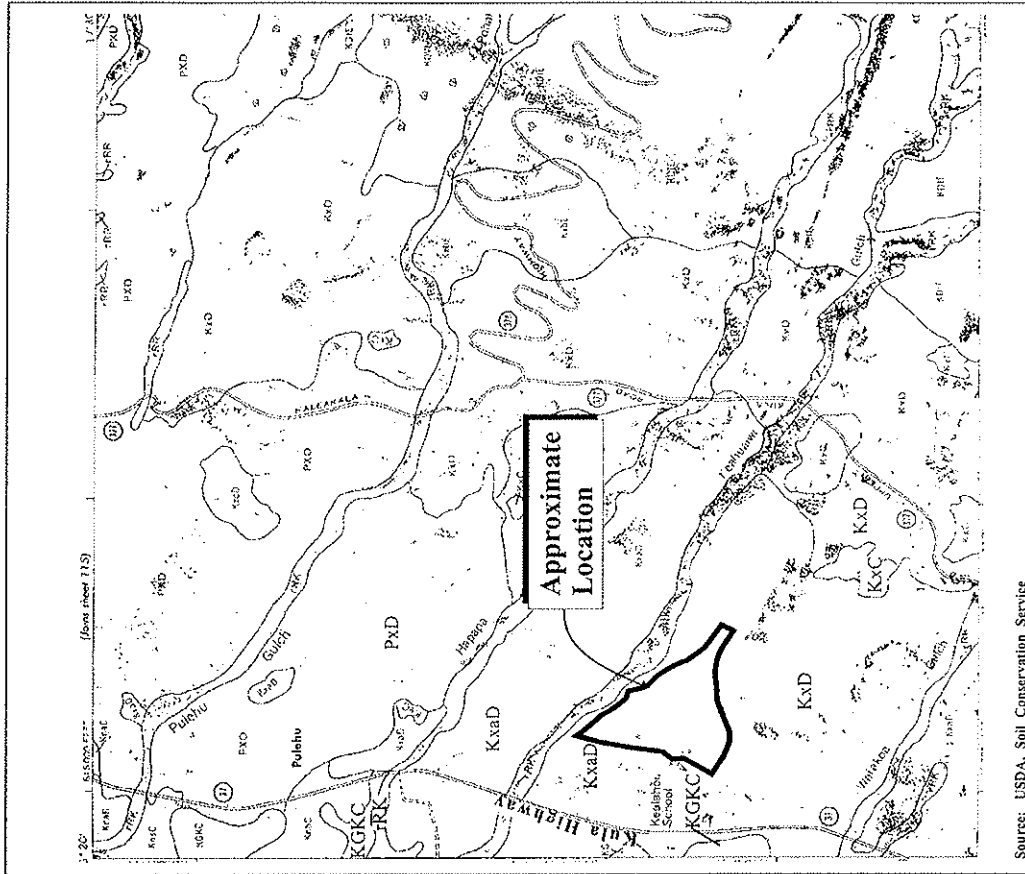
Figure 6 Proposed Kula Ridge Affordable Housing Subdivision Soil Association Map



Prepared for: Kula Ridge, LLC

MUNEKIYO & HIRAGA, INC.

SHAWNEEKI@ATTOLCD



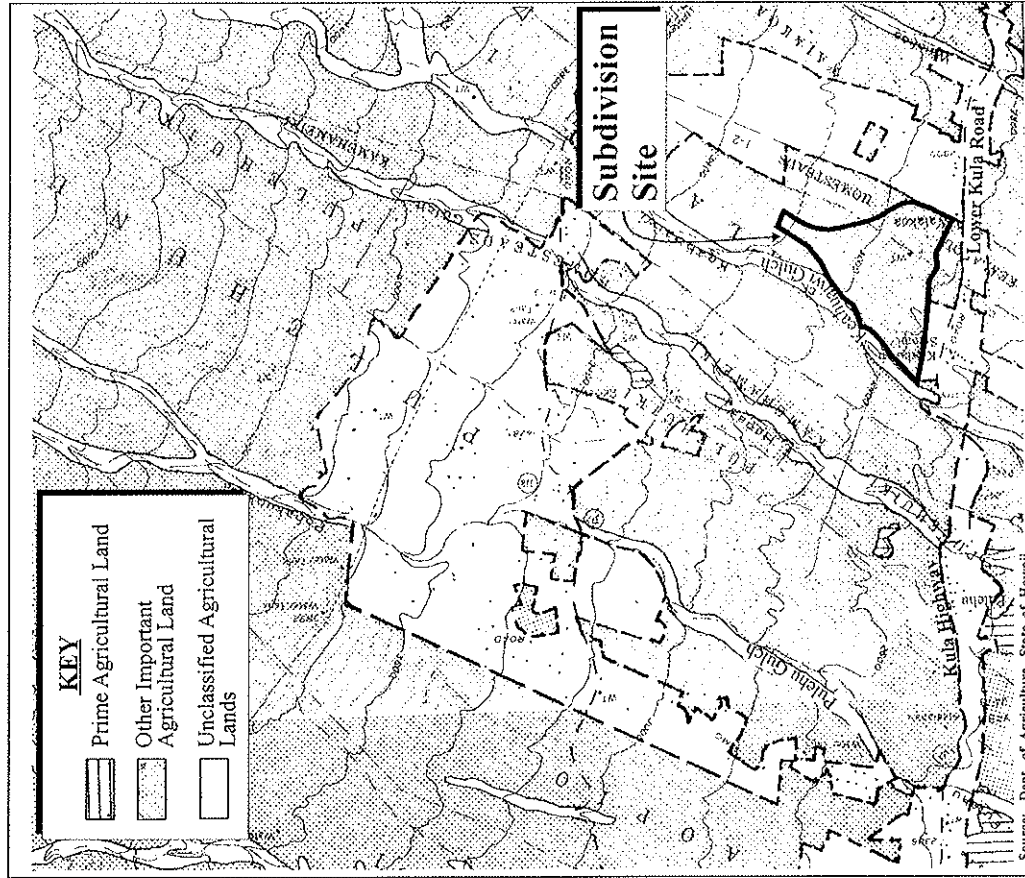
Source: USDA, Soil Conservation Service

**Figure 7 Proposed Kula Ridge Affordable Housing Subdivision Soil Classifications Map**



Prepared for: Kula Ridge, LLC

MUREKIYO & HIRAGA, INC.  
Nakawa@KMHawaii.com



Source: Dept. of Agriculture, State of Hawaii

**Figure 8 Proposed Kula Ridge Affordable Housing Subdivision Agricultural Lands of Importance to the State of Hawaii**



NOT TO SCALE

Prepared for: Kula Ridge, LLC

MUREKIYO & HIRAGA, INC.  
Nakawa@KMHawaii.com

Figure 10 - Statewide Acreage in Crop: 1960 to 2004

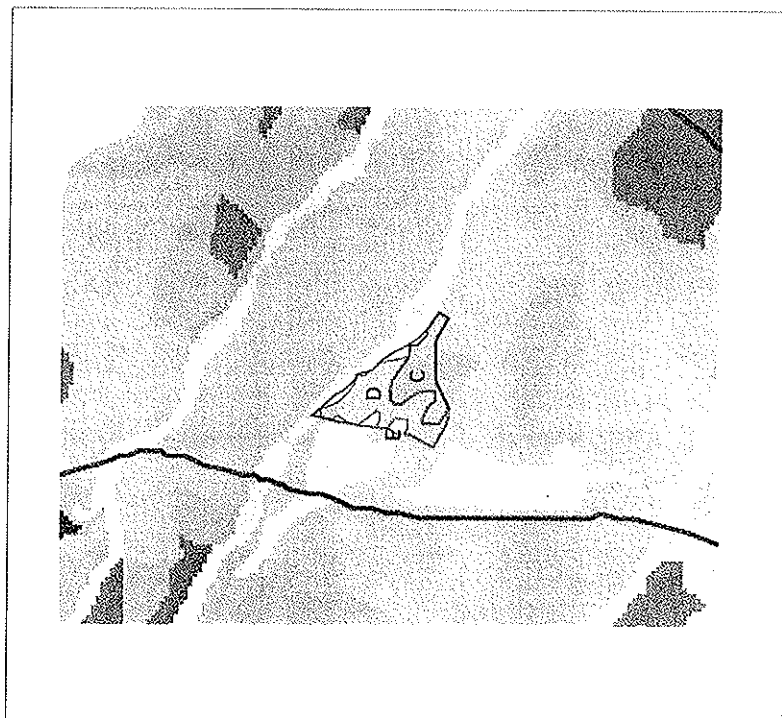
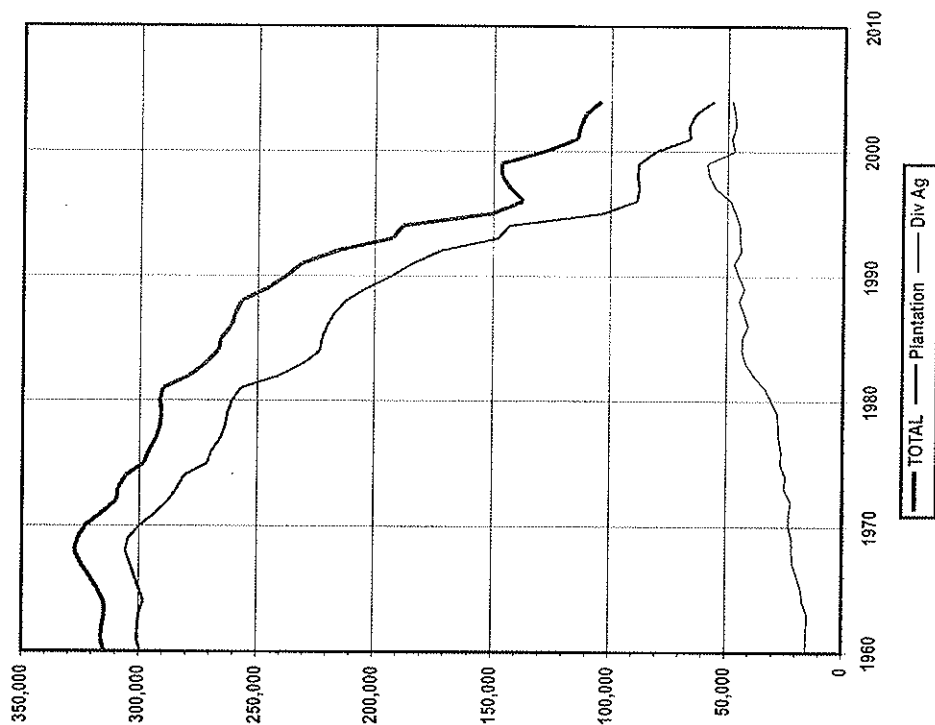


Figure 9 Proposed Kula Ridge Affordable Housing Subdivision Land Study Bureau Soil Ratings



Appendix A. Maui Island Development Projects: April 2006

Project Location and Name	Entitlements	Homes or Units			Project Area			State Ag District	
		Single family Homes	Multi-family Homes	Hotel & Time share Units	Total Project (acres)	Total Acres per Unit	Total (acres)	Adjusted (acres)	
<b>West Maui</b>									
Honoikiwi DHHL	Committed	1,250			1,250	780	0.62	780	780
Honouliuli Ridge, Ph. 1&2	Committed	50			50	441	8.82	439	
Intrawest Honua Kai (North Beach Lot 4)	Committed		700		700	n.e.	n.e.		
Ka'anapali Coffee Farms	Committed	58			58	336	5.79	336	
Ka'anapali Residences - Landloch; Parcel 10-H	Committed	18			18	n.e.	n.e.		
Kahana Ridge Villas	Committed		117		117	n.e.	n.e.		
Kapapa Bay	Committed			155	155	n.e.	n.e.		
Kapapa Maui; Master Plan; PD 2	Committed	890			890	1,085	1.57	1,085	1,085
Kapapa; Master Plan; PD 1	Committed	900			900	249	6.13		
Kapapa; Maui Residential	Committed	690		1,050	1,050	n.e.	n.e.		
Kapua Village; MLP employees	Committed	45			45	n.e.	n.e.		
Leipoa Point Homesites	Committed	40			40	n.e.	n.e.		
Lanipoko; Mahanaluia Nui; 1	Committed	131			131	436	3.34	438	
Lokahi Kuhua	Committed	12			12	n.e.	n.e.		
Mahanaulu Nui; Ph. 5	Committed	9			9	n.e.	n.e.		
Makiki Pinnation; Ph. 1 & 2	Committed	52			52	485	8.94	465	
Makua Ridge; Large Lots	Committed	11			11	458	41.64	438	
Marrist Maui Ocean Club; Sequoi Towers	Committed			148	148	n.e.	n.e.		
Na Hale O Waialeale; Ph. 2	Committed			26	26	5	0.19	5	5
Napali Kahuna (Kali Nee Subdiv)	Committed	10			10	n.e.	n.e.		
North Beach; Starwood (Lot 2)	Committed			516	516	n.e.	n.e.		
North Beach; Weston (Lot 1)	Committed			399	399	n.e.	n.e.		
Panaloa Inn	Committed			14	14	n.e.	n.e.		
Puunoa; Ph. 1 & 2	Committed	24			24	169	7.00	168	
Royal Lahaina Resort rehabilitation	Committed			455	455	n.e.	n.e.		
Sunshine	Committed	5			5	n.e.	n.e.		
Ukumehame Homes; Ph. 1,2+Chenax	Committed	46			46	280	6.09	280	
Ukumehame Park	Committed					111	n.a.	111	111
Villages of Lelehi; Ph. 1A	Committed	104			104	n.e.	n.e.		
Villages of Lelehi; Ph. 1B	Committed	250			250	99	0.39		
West Maui Breakers 1	Committed		90		90	n.e.	n.e.		
Hyatt Regency Maui; Timeshare Project	Proposed	1,257	1,553	806	2,810	2,594	0.71	1,695	1,695
Ka'anapali 2020; Residences	Proposed	60	12		72	17	0.24	17	17
Kahana Employee Housing	Proposed	53			53	876	16.53	874	
Kahama; Lots	Proposed	900			900	211	0.23	211	211
Kamehameha Schools Kula Residential Infill	Proposed	25			25	247	9.88	244	
Lipoa Point; Homes	Proposed	38			38	1,292	34.00	1,291	
Makia Farms; Large Lots	Proposed	10			10	n.e.	n.e.		
Napali Maui Residences	Proposed	1,500			1,500	631	0.42	609	609
Olowalu Maui & Makai Plan; Master	Proposed	24			24	9	0.38		
Pineapple Ridge	Proposed	533	349		882	309	0.35	309	309
Pulehewa; Master; Proposed PD	Proposed	2,035	2,840		4,875	n.e.	n.e.		
Villages of Lelehi; Master	Proposed	491			491	193	0.22	184	184
Waialeale Villages	Proposed								
<b>Total West Maui</b>		<b>11,205</b>	<b>6,151</b>	<b>3,543</b>	<b>20,899</b>	<b>10,704</b>		<b>9,999</b>	<b>6,006</b>

APPENDICES

Appendix A. Maui Island Development Projects: April 2006

Project Location and Name	Entitlements	Homes or Units			Project Area		State Ag District	
		Single-family Homes	Multi-family Homes	Hotel & Time-share Units	Total Project (acres)	Acres per Unit	Total (acres)	Adjusted (acres)
<b>North Maui</b>								
Kahui Pono Subdivision III	Committed	3			4	1.33	4	4
Krauss Subdivision	Committed	4			9	2.25	9	9
Makiko Bay Homes	Committed	8			45	5.63	45	
Makiko Ranch - Lots	Committed	3			3	3.33	10	
Masaaki Dai Subdivision	Committed	3			35	12.00	33	
Peahi Farms at Opaea Point	Committed	16			270	16.88	270	
Peahi Hill Lands	Committed	3			1	0.33	1	1
Puu o Mailei Rural Subdivision	Committed	3				n.e.		
Ross Subdivision	Committed	5			11	2.20	11	11
Waipuu Subdivision	Committed	3			5	1.67	5	5
Pala School Community Project District 1	Designated	330			330	n.e.		
Maui Residential ASB	Proposed	140			140	0.48		
<b>Total North Maui</b>		<b>521</b>			<b>458</b>		<b>388</b>	<b>39</b>
<b>Central Maui</b>								
Central Maui Landfill, Phase IV	Committed				29	n.a.	29	29
Consolidated Backyards	Committed				21	n.a.	21	21
E Paepae Ka Puaka, Spreckelsville	Committed	16			45	2.81		
Hale Kapaui Project	Committed	7	4			n.e.		
Iao Valley Large Lot Subdivision	Committed	302				n.e.		
Kahului Town Center Redevelopment	Committed	90				n.e.		
Kane Street Condos and Shops	Committed	1,403	829		2,232	n.e.		
Kohalaui Master Plan Project District 3	Committed	62			10	7.20	69	
Lowerani Hale, Sr. Affordable Housing	Committed	2				n.e.		
Malaha Ag Subdivision	Committed	2				n.e.		
Mahele Wailea Ag Subdivision	Committed	2				n.e.		
Manor Courtyard Hotel, Kahalaue Airport	Committed	502		140		n.e.		
Maui Lani, Master Plan PD 1	Committed	3,163	502		3,665	1.085	0.36	76
Maui Student Housing	Committed	400				n.e.		
Pihana, Project District 2	Committed	535	440		73	0.14	5	5
Waiehu Aha	Committed	17			279	16.41	261	
Waiehu Kou, Phase 3	Committed	115			42	0.37	20	20
Waiehu Maieka Ag Subdivision	Committed	16			113	7.06	113	
Waiehu Valley Large Lot Subdivision	Committed	24			373	15.54	373	
Waipuu Gardens	Committed	410			95	0.23	95	95
Waioa Maieka Ag Subdivision	Committed	2			22	11.00	22	
Waioa Country Estates	Committed	184			452	2.45	449	449
Waioaai, Elva	Committed	37			37	n.e.		
Waioaai, Makiia	Committed	104				n.e.		
Waimanalo	Committed	4			152	38.00	152	
Waimanalo, Phase 4	Committed	95				n.e.		
Wailuku, Pihaki	Committed	38				n.e.		
Hale Hoanani, Maui Health Kokuu	Designated	456	6		234	0.50	227	227

Appendix A. Maui Island Development Projects: April 2006

Project Location and Name	Entitlements	Homes or Units			Project Area		State Ag District	
		Single-family Homes	Multi-family Homes	Hotel & Time-share Units	Total Project (acres)	Acres per Unit	Total (acres)	Adjusted (acres)
<b>South Maui</b>								
All Village Subdiv.	Committed	27			27	n.e.		
Aloha Village	Committed	78			76	n.e.		
Ameron Hawaii	Committed					2	n.a.	2
Central Maui Baseyard	Committed	16			16	n.e.		
Chambers Apartments	Committed	32		200	200	n.e.		
Club World Mark, Kihoe	Committed	54			54	n.e.		
Cove Beach Villas	Committed	58			58	n.e.		
Hale Mahalo, Etika 1, Phase 1	Committed	55			240	n.e.		
Hale Mahalo, Etika 2, Phase 2	Committed	62			62	n.e.		
Hokulani Golf Villas	Committed	28			28	n.e.		
Honu Ala Hale	Committed	120			120	n.e.		
Hoohani Subdivision	Committed	4			4	n.e.		
Hoolani Waiala Mr-9	Committed	99			99	n.e.		
Iliia Condos	Committed	112			112	n.e.		
Kai An Village MF Residential Project	Committed	150			150	n.e.		
Kai Makani	Committed	80			80	n.e.		
Kai Maui Waieka Master	Committed	12			12	n.e.		
Kailana Hills	Committed	82			82	n.e.		
Kailana Heights, Phase 2	Committed	39			38	n.e.		
Kamali Always Estates (Waipuhani Estates)	Committed	34			58	n.e.		
Kanani Waieka	Committed	7			7	n.e.		
Ke Ahi Homes	Committed	12			12	n.e.		
Ke Ahi Ocean Villas	Committed	4			4	n.e.		
Keneloa Lelaui Sub	Committed	26			26	n.e.		
Keneloa Place	Committed	31			31	n.e.		
Kihoe Hanalei Condominiums	Committed	18			18	n.e.		
Kihoe Kapaule	Committed	65			65	n.e.		
Kiokona Home	Committed					n.e.		
Landry Apts.	Committed					n.e.		
Loaia Village Subdivision	Committed					n.e.		
<b>Total Central Maui</b>		<b>8,778</b>	<b>5,692</b>	<b>140</b>	<b>14,610</b>	<b>4.851</b>	<b>3,667</b>	<b>2,572</b>

Appendix A. Maui Island Development Projects: April 2006

Project Location and Name	Entitlements	Homes or Units			Project Area		State Ag District	
		Single family Homes	Multi-family Homes	Hotel & Time-share Units	Total Project (acres)	Acres per Unit	Total (acres)	Adjusted (acres)
Makaha at Wailea, Condos	Committed	15	15	15	n.e.	n.e.	-	-
Mape Lu TimeShare	Committed	388	789	420	n.e.	n.e.	-	-
Maui Reservoir & Tech Park...Project District 6	Committed	7	387	7	3.14	3.14	234	234
MF21 Subdivision...PD 8	Committed	90	17	90	n.e.	n.e.	22	22
Moana Estates	Committed	17	17	17	n.e.	n.e.	-	-
One Palaua Bay, PD 8	Committed	20	20	20	n.e.	n.e.	-	-
One Wailea Dev	Committed	7	7	7	n.e.	n.e.	-	-
Oakstock Subdivision, 7 lot	Committed	16	16	16	0.31	0.31	3	3
Papaanui Lots	Committed	8	8	8	n.e.	n.e.	-	-
Papaanui Subdivision	Committed	32	32	32	n.e.	n.e.	-	-
Paradise Ridge Estates	Committed	105	105	105	n.e.	n.e.	-	-
Wailea Beach Villas	Committed	144	144	144	n.e.	n.e.	-	-
Wailea MF-10	Committed	9	9	9	n.e.	n.e.	-	-
Wailea MF-10 Subdivision	Committed	12	12	12	n.e.	n.e.	-	-
Wailea MF-11	Committed	25	25	25	0.50	0.50	5	5
Wailea Villas (MF-4) (Papaui)	Committed	10	10	10	5	5	-	-
Garcia Makena Residences	Designated	6	6	6	n.e.	n.e.	-	-
Hale Pama Condos	Designated	73	73	73	n.e.	n.e.	-	-
Kiuhana, Wailea	Designated	31	31	31	n.e.	n.e.	-	-
Ma'alaea Wailea Residential...Project District 12	Designated	1,150	1,150	1,150	2.27	2.27	257	257
Ma'alaea Village A&B...Project District 11	Designated	2,030	2,030	2,030	6.88	6.88	765	765
Pu'uene Arisip...Project District 10	Designated	1,400	1,400	1,400	5.58	5.58	558	558
Wailea 670 (Honua'ula)...Project District 9	Designated	4	4	4	0.42	0.42	584	584
Ka Ono Ulu...Industrial Park	Proposed	95	95	95	n.a.	n.a.	96	96
Kalani Condos Makena	Proposed	4	4	4	1	1	1	1
Kamaole Heights	Proposed	98	24	122	0.25	0.25	1	1
Kobei Kaivehine Res. A&B	Proposed	600	650	650	1.14	1.14	114	114
Makena Resort, Hotel & Condos	Proposed	1,105	1,650	1,650	7.13	7.13	31	31
<b>Total South Maui</b>		<b>6,158</b>	<b>2,935</b>	<b>1,169</b>	<b>10,262</b>	<b>4,006</b>	<b>2,672</b>	<b>2,650</b>
<b>Upcountry Maui</b>								
A.L. & P. Phillips Subdivision	Committed	3	3	3	11	3.67	11	11
Abner Dellaia Subdivision	Committed	3	3	3	6	2.00	6	6
Sayong Subdivision	Committed	3	3	3	8	2.67	8	8
Blackburn Subdivision	Committed	5	5	5	n.a.	n.a.	-	-
Cameron Kilauea Subdivision	Committed	7	7	7	n.a.	n.a.	-	-
DeRego Subdivision	Committed	3	3	3	59	8.43	59	59
Ehrenwan Estates Subdivision	Committed	7	7	7	40	5.71	40	40
Freitas Subdivision	Committed	4	4	4	3	0.75	-	-
Haleakala Homesites 1 & 2	Committed	15	15	15	81	5.40	87	87
Hali'imaui...Residential	Committed	149	146	146	69	0.47	8	8
Jacaranda Hill	Committed	3	3	3	2	0.67	2	2
Joan Ferreira Subdivision	Committed	3	3	3	24	8.00	24	24
Kaalahou 1 & 2 Homesites	Committed	7	7	7	16	2.28	7	7

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Appendix A. Maui Island Development Projects: April 2006

Project Location and Name	Entitlements	Homes or Units			Project Area		State Ag District	
		Single family Homes	Multi-family Homes	Hotel & Time-share Units	Total Project (acres)	Acres per Unit	Total (acres)	Adjusted (acres)
Keokey/Waihiuli Subdivision DHHL	Committed	426	406	406	445	1.10	445	445
Kulae Maui Res	Committed	14	14	14	n.e.	n.e.	-	-
Kulae Maui Estates: Phase 1	Committed	40	40	40	n.e.	n.e.	-	-
Kulae Maui Estates: Phase 2, Jacaranda Grove	Committed	13	13	13	n.e.	n.e.	-	-
Kuluanu Ridge: Ridge at Kuluanu	Committed	57	57	57	n.e.	n.e.	-	-
Maka Village Subdivision	Committed	24	24	24	n.e.	n.e.	-	-
Mary Deamtra Subdivision	Committed	3	3	3	7	2.33	7	7
Meriwort Subdivision	Committed	10	10	10	23	2.30	23	23
Pihilo Farms Subd.	Committed	3	3	3	n.e.	n.e.	-	-
Size Subdivision	Committed	36	36	36	251	7.25	281	281
Waiohiki Subdivision (Kula Res 1,2) DHHL	Committed	4	4	4	200	50.00	200	200
Waiohiki Lot 134 (Kula Res 1,2) DHHL	Committed	56	56	56	182	3.43	182	182
Waiohiki Uka Subdivision (Kula Res 1,2) DHHL	Committed	3	3	3	2	0.67	2	2
Wilfred "Hoop" Phillips Subd	Committed	64	64	64	n.e.	n.e.	-	-
Baro Project Cook Estate: Project District 3	Designated	155	155	155	81	6.52	81	81
Kaohala Lani...Pukalani Makai	Designated	15	15	15	n.e.	n.e.	-	-
Kula Lodge: Project District 1	Designated	12	12	12	n.e.	n.e.	-	-
Silversword Inn: Project District 2	Designated	1,220	1,220	1,220	353	0.29	351	351
Hali'imaui Expansion...A&B400	Proposed	1,520	1,520	1,520	441	0.29	421	421
Hali'imaui Expansion...ML&P348	Proposed	2	2	2	3	1.50	-	-
Ka Ono Ulu Lots	Proposed	49	49	49	14	0.29	14	14
Kulae Maui by Hanohano	Proposed	116	116	116	48	0.41	48	48
Kula Ridge Affordable Housing Subdivision	Proposed	36	36	36	n.e.	n.e.	-	-
Kula Senior Housing	Proposed	3,905	100	27	4,032	2.388	2,297	1,403
<b>Total Upcountry Maui</b>		<b>421</b>	<b>20</b>	<b>441</b>	<b>906</b>	<b>2.316</b>	<b>864</b>	<b>48</b>
<b>East Maui</b>								
Hana Beach Subdivision	Committed	3	3	3	2	0.67	1	1
Hana Com. Health Ctr. Exp.	Committed	20	20	20	n.a.	n.a.	-	-
Hana Ranch Affordable Housing	Committed	286	286	286	38	0.13	38	38
Hana Ranch Store	Committed	3	3	3	25	8.33	3	3
Hana Substation Subdivision	Committed	8	8	8	6	4.25	42	42
Honomeale Subdivision	Committed	102	102	102	724	7.10	724	724
Waiuku Hana Homes DHHL	Committed	3	3	3	30	10.00	30	30
Garden of Eden Aforestation	Proposed	14	14	14	6	9.43	6	6
Hilani Gardens 2 Self Help Housing Corp	Proposed	421	20	441	906	2.316	864	48
<b>Total East Maui</b>		<b>39,998</b>	<b>14,888</b>	<b>4,879</b>	<b>50,765</b>	<b>23.316</b>	<b>19,882</b>	<b>11,939</b>
<b>TOTAL MAUI ISLAND</b>								

n.e.: not estimated (i.e., acreages were not estimated for projects that do not involve agricultural land)  
n.a.: not applicable (i.e., units per acre were not calculated for industrial and commercial projects)  
Source: Maui County Planning Department, 2005.

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(d) Priority guidelines to promote the growth and development of diversified agriculture and aquaculture:

- (1) Identify, conserve, and protect agricultural and aquacultural lands of importance and initiate affirmative and comprehensive programs to promote economically productive agricultural and aquacultural uses of such lands.
- (10) Support the continuation of land currently in use for diversified agriculture.

**Section 226-104 Population growth and land resources priority guidelines.**

- (b) Priority guidelines for regional growth distribution and land resource utilization:
  - (2) Make available marginal or non-essential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district.

**Section 226-106 Affordable Housing**

Priority guidelines for the provision of affordable housing:

- (1) Seek to use marginal or nonessential agricultural land and public land to meet housing needs of low- and moderate-income and gap-group households.

**3. AGRICULTURAL STATE FUNCTIONAL PLAN (1991)<sup>(3)</sup>**

(Functional plans are guidelines for implementing the State Plan. They are approved by the Governor, but not adopted by the State Legislature.)

**Objective H:** Achievement of Productive Agricultural Use of Lands Most Suitable and Needed for Agriculture.

**Policy H(2):** Conserve and protect important agricultural lands in accordance with the Hawaii State Constitution.

**Action H(2)(a):** Propose enactment of standards and criteria to identify, conserve, and protect important agricultural lands and lands in agricultural use.

**Action H(2)(c):** Administer land use district boundary amendments, permitted land uses, infrastructure standards, and other planning and regulatory functions on important agricultural lands and lands in agricultural use, so as to ensure the availability of agriculturally suitable lands and promote diversified agriculture.

**APPENDIX B  
SELECTED STATE AND COUNTY GOALS,  
OBJECTIVES, POLICIES AND GUIDELINES  
RELATED TO AGRICULTURAL LANDS**

**1. HAWAII STATE CONSTITUTION (Article XI, Section 3):**

...to conserve and protect agricultural lands, promote diversified agriculture, increase agricultural self-sufficiency and assure the availability of agriculturally suitable lands...

**2. HAWAII STATE PLAN (Chapter 226, Hawaii Revised Statutes, as amended):<sup>(1),(2)</sup>**

**Section 226-7 Objectives and policies for the economy--agriculture.**

(a) Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives:

- (1) Viability in Hawaii's sugar and pineapple industries.
- (2) Growth and development of diversified agriculture throughout the State.
- (3) An agriculture industry that continues to constitute a dynamic and essential component of Hawaii's strategic, economic, and social well-being.
- (b) To achieve the agricultural objectives, it shall be the policy of the State to:
  - (2) Encourage agriculture by making best use of natural resources.
  - (10) Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs.
  - (16) Facilitate the transition of agricultural lands in economically nonfeasible agricultural production to economically viable agricultural uses.

**Section 226-103 Economic priority guidelines.**

(c) Priority guidelines to promote the continued viability of the sugar and pineapple industries:

- (1) Provide adequate agricultural lands to support the economic viability of the sugar and pineapple industries.

**4. COUNTY OF MAUI GENERAL PLAN 1990<sup>(4)</sup>**

**Theme No. 1: PROTECT MAUI COUNTY'S AGRICULTURAL LAND AND RURAL IDENTITY**

Amendments to the General Plan will preserve agricultural lands for the continuing pursuits of both land intensive and labor intensive agricultural pursuits. This action will also achieve preservation of an open space resource.

**I. POPULATION, LAND USE, THE ENVIRONMENT AND CULTURAL**

**B. LAND USE**

**Objective**

3. To preserve lands that are well suited for agricultural pursuits.

**Policies**

- a. Protect prime agricultural lands from competing nonagricultural land uses.
- b. Promote the use of agricultural lands for diversified agricultural pursuits by providing public incentives and encouraging private initiative.
- c. Support the right to farm consistent with the identification of productive agricultural lands.
- d. Discourage the conversion, through zoning or other means, of productive or potentially productive agricultural lands to nonagricultural uses, including but not limited to golf courses and residential subdivisions.
- e. Provide adequate irrigation water and access to agricultural lands.

**II. ECONOMIC ACTIVITY**

**C. AGRICULTURE**  
**Objective**

1. To foster growth and diversification of agriculture and aquaculture throughout Maui County.

**Policies**

- a. Support programs to maintain the viability of the sugar and pineapple industry.
- b. Support and promote programs to maintain the viability of diversified agriculture, specialty crops, forestry and aquaculture.

**Objective**

2. To maximize the use and yield of productive agricultural land throughout the County.

**Policies**

- a. Ensure the availability of land that is well suited for agricultural production.
- b. Encourage the development of agricultural parks throughout Maui County.
- f. Support "right-to-farm" provisions in the event potential conflicts arise from adjacent residential uses.
- g. Discourage establishment of pseudo-agricultural subdivisions.

**5. COUNTY OF MAUI, MAKAWAO-PUKALANI-KULA COMMUNITY PLAN<sup>(5)</sup>**

**B. Goals, Objectives and Policies**

**ECONOMIC ACTIVITY**

**Objectives and Policies**

1. Provide for the preservation and enhancement of agricultural lands and operations, emphasizing the importance of promoting diversified agriculture to the region's economic base and lifestyle.
3. Protect existing agricultural operations from urban encroachment.
9. Encourage the continuation of sugar, pineapple, cattle ranching, and diversified agriculture as major agricultural activities in the region and at the same time encourage the pursuit of alternative agricultural industries.

**Implementing Actions**

9. Encourage the continuation of sugar, pineapple, cattle ranching, and diversified agriculture as major agricultural activities in the region and at the same time encourage the pursuit of alternative agricultural industries.

**LAND USE**

**Objectives and Policies**

1. Recognize the value of open space, including agricultural lands and view planes to preserve the region's rural character.
2. Establish land use patterns which recognize the "Right to Farm," in order to minimize conflicts between existing agricultural operations and urban-related activities.
3. Discourage speculation in agricultural lands.

4. Encourage land use patterns which will support the long-term viability of agriculture.
5. Encourage and support the development of land use performance and subdivision standards such as cluster development which will encourage viable farm operations and discourage estate subdivisions on agricultural lands such as Kula 200 or Kula Glen.
6. Encourage new residential developments in areas which are contiguous extensions of, or infills within the established residential pattern, and which do not adversely affect agricultural uses.
9. Encourage the use of mechanisms such as land trusts and farm trusts to preserve open space and agricultural activity.
11. Make available agricultural lands for those who wish to farm.
16. Recognize the four (4) semi-urban centers of Makawao Town, Pukalani, Hali'imaile and Waikoa Village. Within them, support the following land use and circulation patterns:
  - c. Within Hali'imaile: Existing agricultural operations and baseyard.
  - d. Within and surrounding Waikoa: Agricultural uses and open space.

ENVIRONMENT

1. Preserve environmental resources by maintaining important agricultural lands as an integral part of the open space setting in each community.
2. Recognize agricultural lands as an essential ingredient to the Upcountry atmosphere. Criteria for determining such lands may include:
  - Land Study Bureau productivity ratings for agricultural lands.
  - Lands presently in cultivation.
  - Agricultural Lands of Importance to the State of Hawaii (ALISH).

**6. REFERENCES**

- [1] State of Hawaii, Office of State Planning, Office of the Governor. *The Hawaii State Plan, 1991*. Honolulu, Hawaii. 1991.
- [2] Act 25, S.B. No. 1158, April 15, 1993.
- [3] Hawaii Department of Agriculture. *The Hawaii State Plan: Agriculture, State Functional Plan*. Honolulu, Hawaii. 1991.
- [4] County of Maui. *The General Plan of the County of Maui, 1990 Update*. Adopted by Ordinance No. 2039, as amended by Ordinance No. 2234. April 23, 1993
- [5] County of Maui. *Makawao-Pukalani-Kula Community Plan*. Maui County Council. July 1996.

# **APPENDIX D.**

## **Biological Resources Survey, April 2006**

**BIOLOGICAL RESOURCES SURVEY  
KULA RIDGE PROJECT  
KULA, MAUI**

**INTRODUCTION**

The Kula Ridge project lies on approximately 48 acres of land (TMK 2-3-001:174) in Kealahou, Kula, Maui. It is bounded on the north by Keahuaui Gulch, on the east and south by pastures, and on the west by the Kula Community Center and single family residences.

**SITE DESCRIPTION**

The property consists of pasture and former agricultural land that is mostly covered with grasses, agricultural weeds and a few scattered trees. The property lies on the Kula slope between 2,750 feet and 3,100 feet elevation. Soils are all of the Kula Cobbly Loam (KxalD) which is a well drained, dark reddish brown loam which is neutral to slightly acid (Foote et al, 1972). Annual rainfall averages 25 to 30 inches (Armstrong, 1983). One old farm dwelling remains on the property.

**BIOLOGICAL HISTORY**

Kula once had a dense native forest stretching across its slopes between the 2,000 feet and 6,000 feet elevations. This would have been a mixed mesic forest dominated by koa (*Acacia koa*) and 'ohi'a (*Metrosideros polymorpha*), with a mixture of 'ohe (*Tetraplasandra kavaiensis*), kolea launui (*Myrsine lessertiana*) and kawa'u (*Ilex anomala*), and a great variety of understory of shrubs, vines and ferns. This forest was gradually destroyed during the 1800's by herds of wild goats and grazing cattle, and by the cutting of trees for fence posts and fire wood by early settlers in the region.

During the 1900's the gentler slopes were farmed extensively and cattle grazing was widespread, turning the steeper slopes into grasslands. Since 1960 introduced tree species, principally black wattle (*Acacia mearnsii*) and Tasmanian bluegum (*Eucalyptus globulus*), have spread across Kula turning former grasslands into dense forested thickets.

Today the last vestiges of native vegetation cling to the steep sides of rocky gulches, and the area is dominated by non-natives.

**BIOLOGICAL RESOURCES SURVEY**

for the

**KULA RIDGE PROJECT**

**KULA, MAUI**

by

**ROBERT W. HOB DY  
ENVIRONMENTAL CONSULTANT  
Kokomo, Maui  
April 2006**

Prepared for: Kula Ridge LLC.



## SURVEY OBJECTIVES

This report summarizes the findings of a flora and fauna survey of the proposed Kula Ridge Project which was conducted in April, 2006. The objectives of the survey were to:

1. Document what plant, bird and mammal species occur on the property or may likely occur in the existing habitat.
2. Document the status and abundance of each species.
3. Determine the presence or likely occurrence of any native flora and fauna, particularly any that are Federally listed as Threatened or Endangered. If such occur, identify what features of the habitat may be essential for these species.
4. Determine if the project area contains any special habitats which if lost or altered might result in a significant negative impact on the flora and fauna in this part of the island.
5. Note which aspects of the proposed development pose significant concerns for plants or for wildlife and recommend measures that would mitigate or avoid these problems.

## BOTANICAL SURVEY REPORT

### SURVEY METHODS

A walk-through botanical survey method was used following routes to ensure maximum coverage of the many areas of this large property. Areas most likely to harbor native or rare plants such as gulches or rocky outcroppings were more intensively examined. Notes were made on plant species, distribution and abundance as well as terrain and substrate.

### DESCRIPTION OF THE VEGETATION

The vegetation on the property can be placed into two general categories: pasture and abandoned farm. The pasture consists of open grassland. There are a wide variety of grasses but the predominant one is kikuyu grass (*Pennisetum clandestinum*). Also present are a few scattered shrubs such as 'iniko (*Indigofera suffruticosa*) and hairy abutilon (*Abutilon grandifolium*), and the weedy tree, black wattle.

The abandoned farm land is occupied by a host of agricultural weeds. Predominant are green amaranth (*Amaranthus hybridus*), golden crown-beard (*Verbesina encelioides*), swine cress (*Coronopus didymus*), tineroo (*Neomotonia wrightii*), Castor bean (*Ricinus communis*) and apple of Peru (*Nicanfra physalodes*). A few fruit trees occupy the field margins: avocado (*Persea americana*), Peach (*Prunus persica*) and pomegranate (*Punica granatum*).

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The total number of plant species recorded on the property was ninety-two. Of these seven were native species, most occurring along the edge of the gulch, on rock outcrops or field margins. These include Kilau (*Pteridium aquilinum* var. *decompositum*) kalamoho lauli'i (*Pellaea ternstrofia*), kalamalo (*Eragrostis atropioides*), kapala (*Sicyos pacificarpus*), koali awahia (*Ipomoea indica*), popolo (*Solanum americanum*) and 'uhaloa (*Waltheria indica*). All of these species are rare or uncommon on the property, but are otherwise widespread and common throughout Hawaii. The gulch adjacent to the property, while harboring a few species of common native plants, is essentially a dense forest of black wattle and a few other weed species.

### DISCUSSION AND RECOMMENDATIONS

The vegetation throughout the project is dominated by a wide array of non-native plant species, mostly pasture grasses and agricultural weeds. The seven species of common native plants occur mainly along the edge of the gulch on the margin of the property.

No Federally listed Endangered or Threatened native plants (USFWS, 1999) were encountered during the course of the survey nor were any species that are candidate for such status seen. No habitats or rare plant communities were seen on the property.

Because the vegetation is dominated by non-native plants and no rare or protected species occur on or adjacent to the property, there is little of botanical concern and the proposed land uses are not expected to have a significant negative impact on the botanical resources in this part of Maui.

Because of the steepness of the land, erosion is a potential concern. It is recommended that during any land clearing work special care be taken to use accepted contouring and terracing techniques to avoid significant soil runoff.

It is also recommended that native plants species known to have occurred in Kula be incorporated into the landscaping design of the completed project. The Maui Country Planting Plan can be consulted for ideas.

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PLANT SPECIES LIST

Following is a checklist of all those vascular plant species inventoried during the field studies. Plant families are arranged alphabetically within each of three groups: Ferns, Monocots and Dicots. Taxonomy and nomenclature of the ferns, are in accordance with Palmer (2005) while the flowering plants (Monocots and Dicots) are in accordance with Wagner et al. (1999).

For each species, the following information is provided:

1. Scientific name with author citation
2. Common English or Hawaiian name.
3. Bio-geographical status. The following symbols are used:  
 endemic = native only to the Hawaiian Islands; not naturally occurring anywhere else in the world.  
 indigenous = native to the Hawaiian Islands and also to one or more other geographic area(s).  
 non-native = all those plants brought to the islands intentionally or accidentally after western contact.  
 polynesian = all those plants brought to the islands by the Hawaiians during the course of their migrations.
4. Abundance of each species within the project area:  
 abundant = forming a major part of the vegetation within the project area.  
 common = widely scattered throughout the area or locally abundant within a portion of it.  
 uncommon = scattered sparsely throughout the area or occurring in a few small patches.  
 rare = only a few isolated individuals within the project area.

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDA
<b>FERNS</b>			
DENNSTAEDTIACEAE (Braeken Fern Family)			
<i>Pteridium aquilinum</i> (L.) Kuhn var.	Kilau	endemic	rare
<i>decompositum</i> (Gaud.) R.M. Tyron			
<b>PTERIDACEAE (Brake Fern Family)</b>			
<i>Pellaea ternstrofia</i> (Cav.) Link	kalamoho laulii	indigenous	rare
<b>MONOCOTS</b>			
<b>AGAVACEAE (Agave Family)</b>			
<i>Furcraea foetida</i> (L.) Haworth	Mauritius hemp	non-native	rare
<b>COMMELNACEAE (Dayflower Family)</b>			
<i>Commelina diffusa</i> N.L. Burm.	honohono	non-native	rare
<b>POACEAE (Grass Family)</b>			
<i>Axonopus fissifolius</i> (Raddi) Kuhlrm.	narrow-leaved carpet grass	non-native	rare
<i>Bromus catharticus</i> Vahl	rescue grass	non-native	rare
<i>Bromus hordeaceus</i> L.	soft chess	non-native	rare
<i>Cenchrus ciliaris</i> Kunth	buffelgrass	non-native	rare
<i>Chloris gayana</i> Kunth	Rhodes grass	non-native	rare
<i>Cynodon dactylon</i> (L.) Pers.	manienie	non-native	uncommon
<i>Digitaria violascens</i> Link	kukaepua'a	non-native	rare
<i>Ehrharta erecta</i> Lam.	-----	non-native	uncommon
<i>Eleusine indica</i> (L.) Gaertn.	wiregrass	non-native	rare
<i>Eragrostis atropioides</i> Hillebr.	kalamalo	endemic	rare
<i>Eragrostis pectinacea</i> (Michx.) Nees	Carolina lovegrass	non-native	rare
<i>Melinis minutiflora</i> P. Beauv.	molasses grass	non-native	rare
<i>Melinis repens</i> (Willd.) Zizka	Natal redtop	non-native	uncommon
<i>Panicum maximum</i> Jacq.	Guinea grass	non-native	rare

<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>STATUS</u>	<u>ABUNDANC</u>	<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>STATUS</u>	<u>ABUNDAN</u>
<i>Paspalum dilatatum</i> Poir.	Dallis grass	non-native	uncommon	<i>Lactuca sativa</i> L.	prickly lettuce	non-native	rare
<i>Pennisetum clandestinum</i> Chiov.	Kikuyu grass	non-native	common	<i>Senecio madagascariensis</i> Poir.	fire weed	non-native	uncommo
<i>Setaria verticillata</i> (L.) P. Beauv.	bristly foxtail	non-native	rare	<i>Senecio oleraceus</i> L.	<i>pualele</i>	non-native	rare
<i>Sporobolus africanus</i> (Poir.) Robyns & Tourney	African dropseed	non-native	rare	<i>Verbena enceloides</i> (Cav.) Benth. & Hook.	golden crown-beard	non-native	common
<i>Vulpia myuros</i> (L.) C.C. Gmelin	rat tail fescue	non-native	rare	<b>BIGNONIACEAE</b> (Bignonia Family)			
<b>DICOTS</b>				<i>Jacaranda minosifolia</i> D. Don	jacaranda	non-native	rare
<b>ACANTHACEAE</b> (Acanth Family)				<i>Podranea ricasoliana</i> (Tanfani) Sprague	pink trumpet vine	non-native	rare
<i>Thunbergia alata</i> Bojer ex Sims	black-eyed susan vine	non-native	rare	<b>BRASSICACEAE</b> (Mustard Family)			
<b>AMARANTHACEAE</b> (Amaranth Family)				<i>Capsella bursa-pastoris</i> (L.) Medick	shepherd's purse	non-native	uncommo
<i>Amaranthus hybridus</i> L.	green amaranth	non-native	uncommon	<i>Coronopus didymus</i> (L.) Sm.	swine cress	non-native	uncommo
<i>Amaranthus viridis</i> L.	spleen amaranth	non-native	rare	<i>Lepidium virginicum</i> L.	-----	non-native	rare
<b>ANACARDIACEAE</b> (Mango Family)				<i>Sisymbrium officinale</i> (L.) Scop.	hedge mustard	non-native	rare
<i>Schinus molle</i> Raddi.	Christmas berry	non-native	rare	<b>CACTACEAE</b> (Cactus Family)			
<b>APIACEAE</b> (Parsley Family)				<i>Opuntia ficus-indica</i> (L.) Mill.	panini	non-native	rare
<i>Coriandrum sativum</i> L.	coriander	non-native	uncommon	<b>CARYOPHYLLACEAE</b> (Pink Family)			
<b>ASCLEPIADACEAE</b> (Milkweed Family)				<i>Pterorhagia velutina</i> (Guss.) P. Ball & Heyw.	childing pink	non-native	rare
<i>Asclepias curassavica</i> L.	butterfly bush	non-native	rare	<i>Polycarpon tetragyllum</i> (L.) L.	-----	non-native	rare
<i>Asclepias physocarpa</i> (E.Meyer) Schlechter	balloon plant	non-native	rare	<i>Silene gallica</i> L.	small-flowered catchfly	non-native	rare
<b>ASTERACEAE</b> (Sunflower Family)				<b>CHENOPODIACEAE</b> (Goosefoot Family)			
<i>Bidens pilosa</i> L.	Spanish needle	non-native	common	<i>Chenopodium album</i> L.	goosefoot	non-native	uncommo
<i>Conyza bonariensis</i> (L.) Cronq.	hairy horseweed	non-native	uncommon	<i>Chenopodium ambrosioides</i> L.	Mexican tea	non-native	rare
<i>Cotula australis</i> (Sieber ex Spreng.) J.D. Hooker	Australian brass buttons	non-native	uncommon	<i>Chenopodium murale</i> L.	'aheaha	non-native	rare
<i>Galinsoga parryiflora</i> Cav.	-----	non-native	uncommon	<b>CONVOLVULACEAE</b> (Morning Glory Family)			
<i>Gnaphalium purpurea</i> (L.) Cabrera	purple cudweed	non-native	rare	<i>Ipomoea indica</i> (J.Burm.) Merr.	koali awahia	indigenous	uncommo
<i>Thyphochloa glabra</i> L.	smooth cats ear	non-native	rare	<b>CUCURBITACEAE</b> (Gourd Family)			

<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>STATUS</u>	<u>ABUNDANCE</u>	<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>STATUS</u>	<u>ABUNDANCE</u>
<i>Sicyos pachycarpus</i> Hook. & Arnott	kupala	endemic	uncommon	<i>Psidium guajava</i> L.	guava	non-native	ABUNDA rare
EUPHORBIACEAE (Spurge Family)				ONAGRACEAE (Evening Primrose Family)			
<i>Ricinus communis</i> L.	Castor bean	non-native	uncommon	<i>Oenothera lacinata</i> J. Hill	cut-leaved evening primrose	non-native	rare
FABACEAE (Pea Family)				OXALIDACEAE (Wood Sorrel Family)			
<i>Acacia nearnsii</i> De Wildman	black wattle	non-native	uncommon	<i>Oxalis corniculata</i> L.	'ih'i'ai	non-native	rare
<i>Chamaecrista nictitans</i> (L.) Moench	partridge pea	non-native	rare	PASSIFLORACEAE (Passion Flower Family)			
<i>Desmodium intortum</i> (Mill.) Urb.	-----	non-native	rare	<i>Passiflora subpeltata</i> Ort.	white passion flower	non-native	rare
<i>Desmodium sanuivicense</i> E. Meyer	Spanish clover	non-native	uncommon	PLANTAGINACEAE (Plantain Family)			
<i>Indigofera suffruticosa</i> Mill.	'in'ieo	non-native	uncommon	<i>Plantago lanceolata</i> L.	narrow-leaved plantain	non-native	rare
<i>Macroptilium latyroides</i> (L.) Urb.	wild bean	non-native	rare	PORTULACACEAE (Purslane Family)			
<i>Medicago lupulina</i> L.	black medick	non-native	rare	<i>Portulaca oleracea</i> L.	pigweed	non-native	rare
<i>Medicago polymorpha</i> L.	bur clover	non-native	uncommon	PRIMULACEAE (Primrose Family)			
<i>Melilotus indica</i> (L.) All.	yellow sweet clover	non-native	uncommon	<i>Anagallis arvensis</i> L.	scarlet pimpernel	non-native	rare
<i>Neonotonia wightii</i> (Wight & Arnott) Lackey	tineroo	non-native	uncommon	PROTEACEAE (Protea Family)			
<i>Trifolium repens</i> L.	white clover	non-native	uncommon	<i>Grevillea robusta</i> A. Cunn. ex R. Br.	silk oak	non-native	rare
<i>Vicia sativa</i> L.	common vetch	non-native	rare	PUNICACEAE (Pomegranate Family)			
LAMIACEAE (Mint Family)				<i>Punica granatum</i> L.	pomegranate	non-native	rare
<i>Sabia cocctinea</i> B. Juss. ex Murray	scarlet sage	non-native	rare	ROSACEAE (Rose Family)			
LAIURACEAE (Laurel Family)				<i>Cotoneaster pannosus</i> Franch.	cotoneaster	non-native	rare
<i>Persea americana</i> Mill.	avocado	non-native	rare	<i>Prunus persica</i> (L.) Batsch	peach	non-native	rare
MALVACEAE (Mallow Family)				SOLANACEAE (Nightshade Family)			
<i>Abutilon grandifolium</i> (Willd.) Sweet	hairy abutilon	non-native	uncommon	<i>Nicanandra physalodes</i> (L.) Gaertn.	apple of Peru	non-native	uncommon
<i>Machya neglecta</i> Waltr.	cheeseweed	non-native	rare	<i>Solanum americanum</i> Mill.	popolo	indigenous	rare
<i>Sida rhombifolia</i> L.	Cuban jute	non-native	uncommon	STERCULIACEAE (Cacao Family)			
MYRTACEAE (Myrtle Family)				<i>Walfheria indica</i> L.	'u'faloa	indigenous	rare
<i>Eucalyptus robusta</i> J.E. Smith	swamp-mahogany	non-native	rare	TILIACEAE (Linden Family)			

<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>STATUS</u>	<u>ABUNDANCE</u>
<i>Tritumfetta semitriloba</i> Jacq.	Sacramento bur	non-native	uncommon
TROPAEOLACEAE (Nasturtium Family)			
<i>Tropaeolum majus</i> L.	garden nasturtium	non-native	rare
VERBENACEAE (Verbena Family)			
<i>Lantana camara</i> L.	lantana	non-native	uncommon
<i>Verbena littoralis</i> Kunth	halu owi	non-native	uncommon

## FAUNA SURVEY REPORT

### SURVEY METHODS

A walk-through survey method was conducted in conjunction with the botanical survey. All parts of the project area were covered. Field observations were made with the aid of binoculars and by listening to vocalizations. Notes were made on species abundance, activities and location as well as observations of trails, tracks scat and signs of feeding. In addition an evening visit was made to the area to record crepuscular activities and vocalizations and to see if there was any evidence of occurrence of the Endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) in the area.

### RESULTS

#### MAMMALS

Three mammal species were observed on the property during two site visits. Taxonomy and nomenclature follow Tomich (1986).

Axis deer (*Axis axis*) – Sign of axis deer was everywhere on the north site of the property along Keahuaui Gulch. The deer apparently bed down in the gulch during the day, then emerge in the evenings to browse in the pastures, agricultural lands and even peoples yards through the night. Deer populations are increasing in this part of Maui.

Domestic horse (*Equus caballus*) – Four horses were being pastured in the lower part of the property and are attended to by their owners daily.

Domestic cat (*Felis catus*) – One cat was observed in the agricultural field and tracks were seen elsewhere. Domestic cats make forays into the property, mostly in the evenings, to hunt for rats and mice.

Other mammals seen on adjacent properties that may at times find their way on to the project area include domestic dogs (*Canis familiaris*), chicken (*Gallus gallus*), goats (*Capra hircus*) and cattle (*Bos Taurus*). Not seen but likely occur on the property are mongoose (*Herpestes auropunctatus*), rats (*Rattus rattus*) and mice (*Mus musculus*).

A special effort was made to look for the native Hawaiian hoary bat by making an evening surveys of the property. These bats are known to occur sporadically at mid elevations across Kula. When present in an area they can be easily identified as they forage for insects, their distinctive flight patterns clearly visible in the glow of twilight.

No evidence of such activity was observed though visibility was excellent and plenty of flying insects were seen.

#### **BIRDS**

There was moderate birdlife in both diversity and numbers on this property. An ample supply of herbaceous plants, seeds and insects were observed, following a good winter wet season. Seventeen species of birds were seen including one endemic owl, one migratory bird and fifteen non-native species. Taxonomy and nomenclature follow American Ornithologists' Union (2005).

House Finch (*Carpodacus mexicanus*) – Many small flocks of these finches were seen and their calls were heard throughout the property.

Common myna (*Acridotheres tristis*) – Many mynas, mostly in pairs, were seen feeding in the fields and in flight.

Zebra dove (*Geopelia striata*) – Small flocks of these doves were seen feeding in the fields and calling from shrubs and trees.

Ring-necked pheasant (*Phasianus colchicus*) – Pheasants were scattered throughout the pastures and fields. Their calls could be heard in all parts of the property.

Northern cardinal (*Cardinalis carolinensis*) – Several cardinals were seen and heard calling from trees throughout the property.

Spotted dove (*Streptopelia chinensis*) – A few of these large doves were seen in the fields and heard calling.

Black francolin (*Francolinus francolinus*) – A few gray francolins were seen and heard in the fields and field margins.

Gray francolin (*Francolinus pondicerianus*) – A few individuals were flushed from cover in the lower part of the property. Their distinctive buzzing calls were heard widely.

Japanese white-eye (*Zosterops japonica*) – A few white-eyes were seen in trees and shrubs and their high-pitched calls could be heard throughout the property.

House sparrow (*Passer domesticus*) – A few sparrows were seen and heard in the lower part of the property close to structures where they prefer to nest.

Skylark (*Alauda arvensis*) – Skylarks were seen individually and in pairs in the pasture and flying and calling overhead.

Nutmeg manikin (*Lonchura punctulata*) – One flock of these small birds was seen in a tree near the top of the property.

Hawaiian short-eared owl, Pueo (*Asio flammeus sandwicensis*) – Four pueo were seen flying over the fields during the evening survey. These endemic owls are Endangered on O'ahu, but still are fairly common on several islands including Maui. Their preferred habitat is upcountry pastures.

Northern mockingbird (*Mimus polyglottos*) – Two individuals were heard and seen in flight along forested margins.

Cattle egret (*Bubulcus ibis*) – Two egrets were seen feeding near grazing animals in the pasture.

Japanese bush-warbler (*Cettia diphione*) – One bush warbler was heard calling from dense brush near the bottom of the property.

Pacific golden plover, Kolea (*Pluvialis fulva*) – One kolea was seen flying across the property during the evening.

#### **INSECTS**

While insects in general were not tallied, they were abundant throughout the area and fueled the bird life observed. One native Sphingid moth, Blackburn's sphinx moth (*Manduca blackburni*) has been put on the Federal Endangered species list and this designation requires special focus (USFWS 2000). Blackburn's sphinx moth is known to occur in parts of East Maui and Central Maui but is not presently known from central Kula. Its native host plants are species of 'Aiea (*Notiocestrum spp.*) and non-native alternative host plants are tobacco (*Nicotiana tabacum*) and tree tobacco (*Nicotiana glauca*). None of these plants were found on the property, and no Blackburn's sphinx moth or their larvae were observed.

#### **CONCLUSIONS AND RECOMMENDATIONS**

Fauna surveys are seldom comprehensive due to the short window of observation, the seasonal nature of animal activities and the usually unpredictable nature of their daily movements. This survey, however, should be considered fairly representative due

to the abundance of food resources present throughout the area and the resulting level of animal use. While ideal for many types of non-native animals the habitat is not suitable for many native species, most notably our native forest birds. None of these forest birds occur anywhere in the vicinity of this property. One native owl was found to use the property. The development of the property would likely result in a small loss of feeding habitat for this species. The area, however, is not significant and the owl is still rather common. All of the other bird species are widespread and common and of no particular environmental concern.

No Federally Endangered or Threatened species were encountered during the course of the survey and no special habitats were identified. The proposed changes in land use should have no significant negative impact on the fauna resources in this part of Maui.

#### ANIMAL SPECIES LIST

Following is a checklist of the animal species inventoried during the field work.

Animal species are arranged in descending abundance within two groups: Mammals and Birds. For each species the following information is provided:

1. Common name
2. Scientific name
3. Bio-geographical status. The following symbols are used:  
 endemic = native only to Hawaii; not naturally occurring anywhere else in the world.  
 indigenous = native to the Hawaiian Islands and also to one or more other geographic area(s).  
 migratory = all species that spend part of their annual life cycle in Hawaii and part of it elsewhere. Migrant birds typically spend their spring and summer months breeding in the arctic and their fall and winter months in Hawaii.  
 non-native = all those animals brought to Hawaii intentionally or accidentally after western contact.
4. Abundance of each species within the project area:  
 abundant = many flocks or individuals seen throughout the area at all times of day.  
 common = a few flocks or well scattered individuals throughout the area.  
 uncommon = only one flock or several individuals seen within the project area.  
 rare = only one or two seen within the project area.

COMMON NAME	SCIENTIFIC NAME	STATUS	ABUNDANCE
<b>MAMMALS</b>			
Axis deer	<i>Axis axis</i>	non-native	common
Domestic horse	<i>Equus caballus</i>	non-native	uncommon
Domestic cat	<i>Felis catus</i>	non-native	rare
<b>BIRDS</b>			
House finch	<i>Carpodacus mexicanus</i>	non-native	common
Common myna	<i>Acridotheres tristis</i>	non-native	common
Zebra dove	<i>Geopelia striata</i>	non-native	common
Ring-necked pheasant	<i>Phasianus colchicus</i>	non-native	common
Northern cardinal	<i>Cardinalis cardinalis</i>	non-native	uncommon
Spotted dove	<i>Streptopelia chinensis</i>	non-native	uncommon
Black francolin	<i>Francolinus francolinus</i>	non-native	uncommon
Gray francolin	<i>Francolinus pondicerianus</i>	non-native	uncommon
Japanese white-eye	<i>Zosterops japonica</i>	non-native	uncommon
House sparrow	<i>Passer domesticus</i>	non-native	uncommon
Skylark	<i>Alauda arvensis</i>	non-native	uncommon
Nutmeg mannikin	<i>Lonchura punctulata</i>	non-native	rare
Short-eared owl / Pueo	<i>Asio flammeus sandwichensis</i>	endemic	rare
Northern mockingbird	<i>Mimus polyglottos</i>	non-native	rare
Cattle egret	<i>Bubulcus ibis</i>	non-native	rare
Japanese bush-warbler	<i>Cettia diphone</i>	non-native	rare
Kolea, Pacific golden plover	<i>Pāvwialis fulva</i>	migratory	rare

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# **APPENDIX E.**

## **Archaeological Inventory Survey, April 2006**

SCS Project Number 681-1

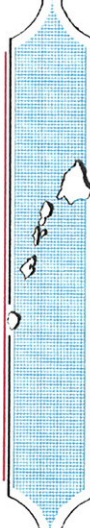
**AN ARCHAEOLOGICAL INVENTORY SURVEY REPORT  
ON 48.117 ACRES LOCATED IN,  
KEALAHOU AHUPUA`A, KULA, MAKAWAO DISTRICT,  
MAUI ISLAND, HAWAII  
[TMK: 2-3-001:174]**

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**ABSTRACT**

Scientific Consultant Services, Inc. (SCS) conducted Archaeological Inventory Survey on 48.117 acres of land in Kealahou Ahupua`a, Makawao District, Maui Island (TMK: 2-3-001:174). A total of 18 archaeological sites consisting of 32 individual features were documented during the Inventory Survey. Identified sites included agricultural and habitation features represented by terraces, alignments, walls, modified outcrops, a rock mound, and an enclosure. Eighteen archaeological sites (50-50-11-5970 to 50-50-11-5987) were assessed as significant under Criterion D of Hawaii's State Historic Preservation criteria. All 18 sites have yielded sufficient information and no additional archaeological work is recommended.

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**INTRODUCTION**

Scientific Consultant Services, Inc. (SCS) conducted an Archaeological Inventory Survey on 48.117 acres of land in Kealahou Ahupua`a, Makawao District, Maui Island (TMK: 2-3-001:174) (Figure 1). Archaeological Inventory Survey of the project area was conducted to determine the presence/absence of archaeological features/deposits within the project area and to provide recommendations to the State Historic Preservation Division (SHPD) concerning site mitigation during planned development within the project area.

**ENVIRONMENTAL SETTING**

**LOCATION**

The project area is parcel 174 of TMK 2-3-001. It consists of 48.117 acres of undeveloped land, owned by Clayton Nishikawa, AIA. The project area is located in the town of Kula, located in leeward east Maui, on the southwestern slopes of Haleakala (Figure 2). Kula exists between the elevations of 2,792 and 3,017 ft. amsl (above mean sea level), in Kealahou Ahupua`a. It lies between Keāhuaiwi Gulch to the north, and Waiahoa Gulch to the south. The property is bounded by an easement to the south and southeast, which separates it from mostly undeveloped land. On its east and northeast perimeter, it is bounded by Keāhuaiwi Gulch. To the north, is a former quarry site. To the west is Kealahou Subdivision, and Kula Community Center (Randal and Dora Von Tempisky Memorial Park). A portion of the property has been used historically for habitation, and a currently occupied historic house exists on the property. At present, the property is also being utilized as a horse pasture. Extensive machine (bulldozer) alterations are evident in many areas of the project area. A four-wheel drive access road traverses through the project area.

The project area is located on an extensively altered piece of land. Ranching activity has most likely taken place on the project area for a minimum of one hundred years. Kula native Darlene Tavares (whose family previously owned the building that now houses Morihara Store, less than 0.25 miles from the project area), confirmed that the project area was most likely occupied by a Japanese farming family, which was commonplace in Kula in the mid to late 1800s. A historic house still stands on the property, typical of plantation-style homes of the 1930s. Bulldozer grading activity, including construction of a dirt road and the presence of horses, has altered much of the project area's original integrity.



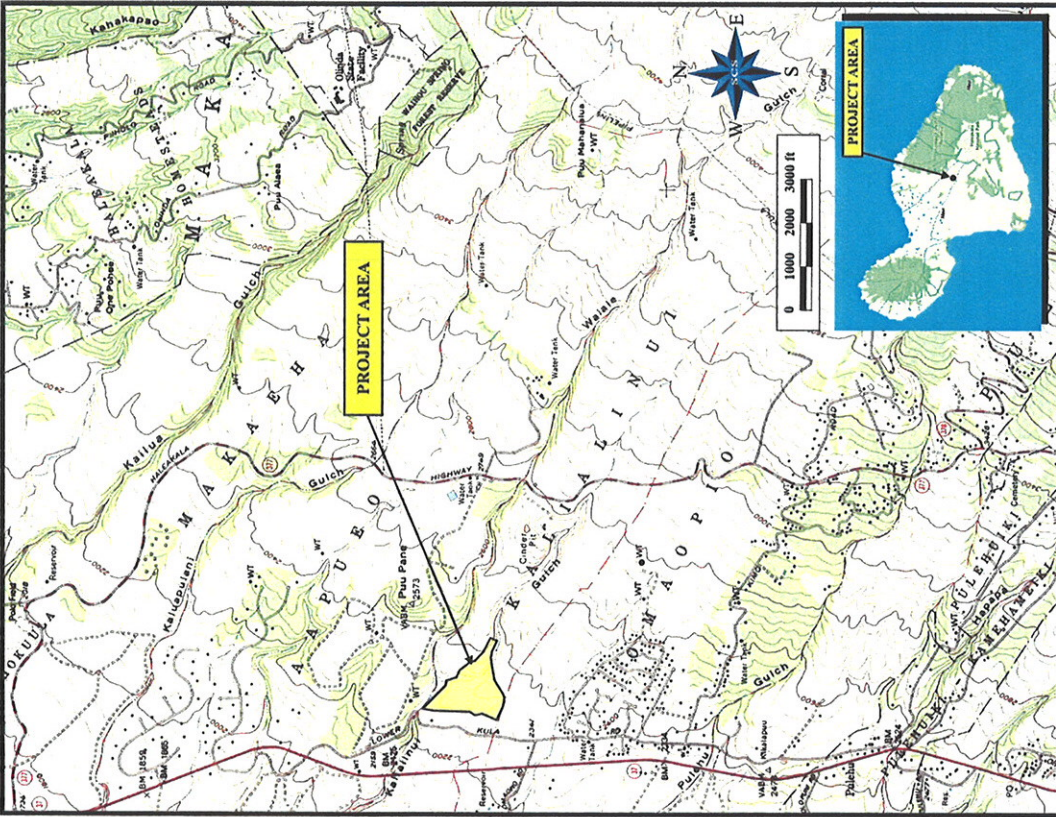


Figure 1: USGS Pu u O Kali Quad Showing Project Area.

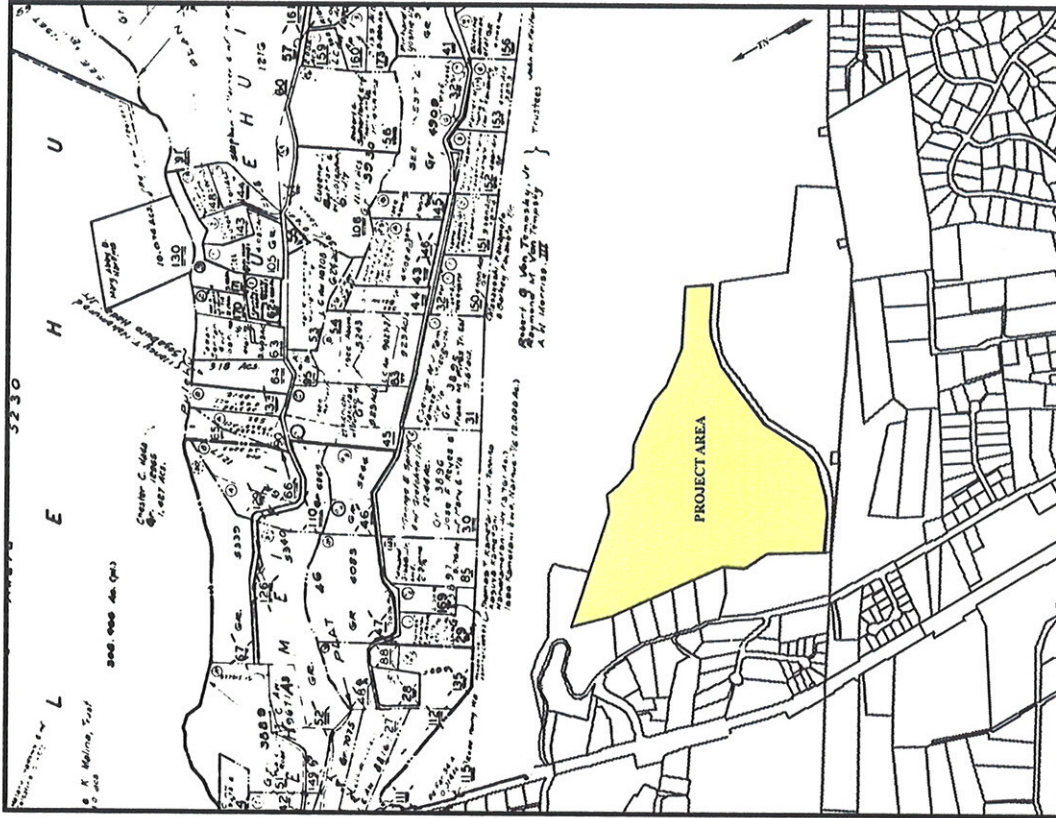


Figure 2: Tax Map Key [TMK] Showing Project Area.

## CLIMATE

*Kula* can be translated as "open country," "field," or "plain." These descriptions are all fitting to Kula, where the land is spread out for many miles, along two parallel highways. Kula exists between the elevations of approximately 2,000 and 3,500 feet amsl. Kula is known for its temperate conditions, with an average annual temperature of 66° F. The region is relatively dry, with an average annual rainfall of 25-40" per year (Juvik and Juvik 1998).

## SOILS

Kula lies on the southwestern slopes of Haleakalā. As this volcano reached maturity, cinder cones formed along rifts that extended to the east, southwest, and north of the summit. Volcanic flows from this development are classified as the Kula Volcanic Series. After a long period of erosion, huge canyons were cut and later filled by the volcanic flows of the Hana Volcanic Series (Kyselka and Lanterman 1980:22). Cones of this series can still be seen today, stretching from Hāna up to Haleakalā, and down to La Perouse Bay.

Kula is the physiographic region of Maui classified as "Kula Slightly Dissected Upland" (Juvik and Juvik 1998). The abundance of vegetation here is a reflection of the richness of the soils that exist in this region. Kula lies in the convergence zone of the Kula Volcanic Series and the Hana Volcanic Series. Soils found here developed in material weathered by volcanic ash and overlying fragmented *ā* lava.

The soils found in Kula are classified as having Puu Pa-Kula-Pane association. It is well-drained, medium textured, and exists on the medium to high uplands of Maui. These soils are gently sloping to steep, and make up about nine percent of the island. The Puu Pa-Kula-Pane association is utilized for truck crops, orchards, pasture, and wildlife habitat (Foote *et al.*, 1973).

## VEGETATION

The volcanic flows from the cinder cones are classified as the Kula Volcanic Series (Kyselka and Lanterman 1980:22). The Hana Volcanic Series can still be seen today, stretching from Hāna up to Haleakalā and down to La Perouse Bay.

Kula is the physiographic region of Maui classified as "Kula Slightly Dissected Upland" (Juvik and Juvik 1998). The abundance of vegetation here is a reflection of the richness of the soils that exist in this region. Kula lies in the convergence zone of the Kula Volcanic Series and the Hana Volcanic Series. Soils found here developed in material weathered by volcanic ash, and overlying fragmented *ā* lava.

## CULTURAL AND HISTORICAL CONTEXT

### TRADITIONAL SETTLEMENT PATTERNS

The district of Kula was known for dry land agriculture, and later, pig husbandry. Dryland field systems were characterized by extensive stone and earthen embankments, reliance on rainfall, and regular rotation of crops (Kolb *et al.* 1997:6). These systems were also noted for their arid conditions and lack of perennial streams (Chun *et al.* 2005). In fact, the word *kula* is also used to describe lands which were dry and inaccessible to water, except from rainfall (Malo, 1951). According to Kolb *et al.* (1997), the key component of Kula's economy was the dryland agriculture in and near the upland forests. '*Uala*, or sweet potato, is a tuber that will not grow in very wet areas. Handy & Handy (1972) noted that the primary staple of Kula was the '*uala*: sweet potato:

Kula was always an arid region, throughout its long, low seashore, vast stony *kula* lands, and broad uplands. Both on the coast, where fishing was good, and on the lower westward slopes of Haleakala a considerable population existed.....fishing and raising occasional crops of potatoes along the coast, and cultivating large crops of potatoes inland, especially in the central and northeastern section including Keokea, Waiohuli, Koheo, Kaunouli, and Waikoa...Kula was widely famous for its sweet-potato plantations. '*Uala* was the staple of life here.

Malo also noted the farming of '*uala* in the early Hawaiian agricultural practices of upland areas:

If a field of potatoes was desired, the soil was raised into hills, in which the stems were planted; or the stems might merely be thrust into the ground any how, and the hilling done after the plants were grown; the vines were also thrown back upon the hill. In six months the potatoes were ripe. Such was the cultivation of *kula* land [1951:205].

The upland forest was an important resource to early Hawaiians, and before the deforestation that occurred as a result of clearing that made way for pasture-land, there was a sizable amount of moisture and water available to the area. The large upland forest provided wood for fire, tools, weapons, houses, and canoes. It also provided a source of medicinal plants, a habitat for native birds that were hunted for food and feathers, and wood for temple images.

The upland forest also played a sacred role in pre-Contact times. As noted in "Maoli Nō" (Nature Conservancy, 2005):

The ancient Hawaiians recognized gods everywhere in nature and honored a pantheon of natural deities. The upland forest was *wao akua*, the realm of the gods, and trees were physical manifestations of various gods in this spiritual realm. Entry into the forest was

limited to a few consecrated individuals and involved a strict protocol, including a statement of identity and purpose and appropriate offerings. If the purpose was to collect trees, only a single tree or species could be collected at a time. The upland forest was sacred to Ku, the god of war, governance, and leadership.

Pigs played an important political and ceremonial role in the history of Hawai'i. Ruling chiefs collected pigs as taxes. They were used in extensive ritual ceremonies to solidify social relationships between the commoners and those who ruled them (Kolb *et al.* 1997). In order to raise a substantial amount of pigs, the success of crops, such as 'uala and taro, was important, as it provided the primary source of feed. The dry upland of Kula was an ideal place for raising pigs, as well as the crops of 'uala and dry land taro to feed them.

Agricultural products from Kula are among the earliest documented commodities to have been sold or traded with foreigners (Donham, 1992). La Pérouse, an explorer who visited Maui in 1786, recorded in his ship's log that three hundred pigs had been traded to restore his food supplies (La Pérouse 1969).

The many identified *heiau*, building platforms, rock walls, terraces, and petroglyphs located throughout Kula suggests a landscape of extensive agriculture across the open plains and pastures, with a dispersed population, not unlike Kula today (Tulehin *et al.*, 2003).

#### **WAHI PANI (SIGNIFICANT PLACES)**

Kula was important in legend and as a sacred place. In legend, A'apuco the owl, who is known to have instigated a well-known battle between the owls and the chiefs of Wailuku, was from Kula. As Uaua (1871) noted in Handy and Handy, "A certain ahupua'a there bears the name of Aapueo to this day." It has been determined that the sacred volcano Haleakala served as a final resting place for the dead of Kula and Honua'ula (1972).

Numerous accounts in oral history and legend concerning Kula have been documented by Sterling (1998) and Wong Smith (Brown and Haun 1989). Wong Smith has a well-documented summary of references to Kula, a part of an archaeological study of Waiohuli and Keōkea. However, there has been little mention of Kealahou Ahupua'a in legend or history. Keāhuaiwi Gulch, which borders Kealahou, contains a few deposits of 'ālaea and pictographs on its walls (Sterling, 1962). Sterling has also noted that further down the Gulch, a collection of petroglyphs was found high up on the walls. Fredericksen & Fredericksen (1992) noted that petroglyphs were recorded in Waiakoa Gulch, which is adjacent to the Kealahou Ahupua'a. Walker (1931) describes a *heiau* and a platform in the Waiakoa Ahupua'a.

#### **PAST POLITICAL BOUNDARIES AND LAND TENURE**

In ancient Hawaii, it was the role of the people to *malama 'āina*, or care for the land. It was a reciprocal relationship. If the people took care of the land, as a primary responsibility, the land would in turn care for the people, by providing food, clothing, and shelter. The harmony and balance of this relationship was called *pono*.

The *ali'i*, or chiefs, belonged to the ruling class and were considered the protectors of the *maka'āinana* (common people). They were believed to be the human representations of the *akua*, or gods. Their duty was to maintain a balance between appeasing the gods by caring for the land, and in return, the common people provided for the *ali'i* (Kame'eleihewa, 1992).

Land was considered the property of the king or *ali'i 'ai moku* (the *ali'i* who eats the island/district), which he held in trust for the gods. The title of *ali'i 'ai moku* ensured rights and responsibilities to the land, but did not confer absolute ownership. The king kept the parcels he wanted, his higher chiefs received large parcels from him, and, in turn, distributed smaller parcels to lesser chiefs. The *maka'āinana* (commoners) worked the individual plots of land.

In general, several terms, such as *moku*, *ahupua'a*, *'i'i* or *'ili'āina* were used to delineate different land sections. A district (*moku*) contained smaller land divisions (*ahupua'a*) that customarily continued inland from the ocean and upland into the mountains. Extended household groups living within the *ahupua'a* were able to harvest from both the land and the sea. Ideally, this situation allowed each *ahupua'a* to be self-sufficient by supplying needed resources from different environmental zones (Lyons 1875:11). The *'i'i 'āina* or *'ili* were smaller land divisions next to importance to the *ahupua'a* and were administered by the chief who controlled the *ahupua'a* in which it was located (Lyons 1875:33; Lucas 1995:40). The *lele* or *'ili lele* were two *'ili* parcels within an *ahupua'a* that were separated from each other. The *mo'o 'āina* were narrow strips of land within an *'ili*. The land holding of a tenant, or *hoa 'āina*, residing in an *ahupua'a* was called a *kuleana* (Lucas 1995:61).

#### **HISTORIC PERIOD**

By the mid-1800s, large-scale sugar production had begun with the partnership of two men, S.T. Alexander and H.P. Baldwin, and their sugar plantation, Hawaii Commercial & Sugar (HC&S). With the growth of the sugar industry and the establishment of numerous plantations, workers from all over the world were recruited, including Portugal, Germany, Russian, Puerto Rico, Philippines, China, and Japan. This diverse group of people joined together, under

government contract, to labor in the sugarcane fields. When their contracts were expired, many immigrants settled in the upcountry area. The predominant groups which settled in Kula were the Portuguese, Chinese, and Japanese.

In the 1840s, many Hawaiian and Chinese were growing Irish potatoes in the Kula area. Some Chinese working as contract laborers in Kohala on the Big Island heard about the demand for labor on Maui. Many left the Big Island and settled in the Keōkeha area on Maui. Potatoes were initially cultivated to provision whaling ships, and then in 1849, to supply mining areas in California during the gold rush.

Extensive clearing of the upland forest, for sugarcane fields and potato farming, contributed to the rise of aridity in the Kula. The cool, relatively dry climate, and rich soil was perfect for growing crops, as was evident from the traditional Hawaiian cultivation of *ʻāwā* in the area. Potatoes became such a dominant crop on Maui, that the area became known as “the potato district.” According to Kuykendall (1938), the fields covered an area as large as 12 miles, and by 1847, the annual production of potatoes was 20,000 barrels. With the expansion of ranching in the upcountry area, considerable amounts of land were cleared for pasture and ranch land, contributing to the deforestation of the upland forest, but creating the rich *paniolo* (cowboy) tradition for which the upcountry area is so famous.

#### THE GREAT MĀHELE

In the 1840s, traditional land tenure shifted drastically with the introduction of private land ownership based on Western law. While it is a complex issue, many scholars believe that in order to protect Hawaiian sovereignty from foreign powers, Kamehameha III) was forced to establish laws changing the traditional Hawaiian economy to that of a market economy (Kame'eleihewa 1992:169-70, 176; Kelly 1983:45, 1998:4; Daws 1962:111; Kuykendall 1938 Vol. I:145). The Great *Māhele* of 1848 divided Hawaiian lands between the king, the chiefs, and the government, and began the process of private ownership of lands. The subsequently awarded parcels were called Land Commission Awards (LCAs). Once lands were thus made available and private ownership was instituted, the *maka ʻāina*, if they had been made aware of the procedures, were able to claim the plots on which they had been cultivating and living. These claims did not include any previously cultivated but presently fallow land, *okipā* (on O'ahu), stream fisheries, or many other resources necessary for traditional survival (Kelly 1983; Kame'eleihewa 1992:295; Kirch and Sahlins 1992). If occupation could be established through the testimony of two witnesses, the petitioners were awarded the claimed LCA and issued a Royal Patent after which they could take possession of the property (Chinen 1961:16).

In 1848 the Hawaiian population was around 88,000, of which 29,220 were males over the age of 18. There were only 14,195 applications for LCA awards submitted by *maka ʻāina*. Of these claims, only 8,421 were awarded to less than 30% of the eligible males. The land received by the *maka ʻāina* was less than 1% of all the total land in Hawai'i (Kame'eleihewa 1992).

The entire *ahupua ʻa* of Kealahou was awarded to Kohokālole (LCA8452\*M), mother of future king, Kalākaua and queen, Lili'uokalani. The majority of LCAs awarded in Kula during the *Māhele*, were located between the 2,000 to 4,000 foot elevation in each *ahupua ʻa* (Tulchin *et al.* 2003). According to Chun *et al.* (2005), citing Haun and Henry (2001):

The distribution of LCAs in Kula describes a narrow horizontal band within specific elevation ranges and vegetation zones, in contrast to a typical valley system layout in which awardes often claimed agricultural lands along alluvial valley terraces and house lots and *kula* land along the coast.

The Waihona ʻAina database (2006) lists a total of 21 land claims made for Kealahou Ahupua ʻa out of which 14 were awarded. Several were located within the project area and included, LCA9010 to Helehua, LCA 10144 to Makahiki, and LCA 9673 to Lonoaea. Claims were noted for *kula*, *koʻākou* trees, and stream use.

The tradition of family farms in Kula began with the availability of homesteads at the end of the 19<sup>th</sup> century. Many sugar plantations had been leasing government land, and as the leases expired, pressure for homestead land grew. The government land was leased or sold in one to ten acre lots, in an effort to encourage farming (Brown and Haun 1989). Many lots were bought by former plantation workers, including the Chinese and Japanese. To this day, the Japanese have a rich history of farming in the Kula area. Goldman (2003) describes one account of a Japanese farming family, in a conversation with John Hashimoto, of Kula:

“My grandfather started the farm,” said John Hashimoto, resting reluctantly on the back steps of the old Kula farmhouse. “His name was Shinichi Hashimoto, an *issei* who came here from Japan. My grandfather bought ten acres; I think that was before 1910. Those days, nobody bought land. They'd save money and go back to Japan. But he came and stayed. He bought this land when this road was impassible. Everybody said, ‘fool, what will you do with the land?’”

Goldman goes on to say:



The answer would take generations—long enough for Shimichi's son Isami to become a leader in Kula's farming community, Isami's son John to follow in his footsteps, and John's son Howard to become the fourth generation to run what was by then a twenty-five acre farm.

### PREVIOUS ARCHAEOLOGY

The earliest archaeological studies in Hawai'i were conducted in the early 20<sup>th</sup> century by John Stokes, Thomas Thrum and, for Maui, Winslow Walker. At that time, there was a heavy emphasis in recording religious sites and features. Winslow Walker conducted an island-wide survey for the Bishop Museum in 1930. According to Kolb *et al.* (1997), Walker documented 23 *heiau* in the Kula area, all situated in a band existing between 1,800-3,000 feet in elevation. Other site types in the district were of significantly lower in number: 3 fishponds, 11 abandoned villages, and 5 ancient villages (replaced with modern communities). Winslow Walker, in his 1930 island-wide survey, noted the presence of one *heiau* in the land of Waiahoa, which is adjacent to the land of Kealahou. Another platform *heiau* in Waiahoa measuring 36 by 45 feet, was identified by Poepoe (in Sterling 1998).

Two large-scale archaeological studies of Keōkeā and Waiohuli to the west and south of the project area have produced an abundance of information on the archaeological patterns and cultural history of upcountry Maui. In 1986, the Bishop Museum was contracted to conduct a reconnaissance survey of both Keōkeā and Waiohuli. An inventory survey was conducted by Brown *et al.* (1989) that identified 159 archaeological sites consisting of 274 features. One hundred and eighty-seven of the features were associated with permanent habitation. According to Brown *et al.* (1989), radiocarbon dates from this study revealed dates ranging from A.D. 1680 to 1890.

In 1992, the State Historic Preservation Division (SHPD) conducted research in both Keōkeā and Waiohuli. During this survey, 217 sites were identified, consisting of 1,093 features. More than half of the features were associated with agriculture. Two hundred and twelve features were associated with permanent habitation, and 121 were associated with temporary habitation. Six *heiau* were also identified. According to Kolb *et al.* (1997), radiocarbon dates from this study revealed dates ranging from A.D. 1399 to 1955.

Over 200 radiocarbon dates presented in Kolb's study (*ibid.* 1997) provides an extensive chronology and a detailed account of settlement and subsistence for Kula. Kolb's analysis of upland residential sites suggested that the area was inhabited primarily by commoners and low-

ranking chiefs. The primary subsistence was based on sweet potato, dry land taro, and banana. Between the years A.D. 1660 and 1700, settlements in the uplands began to grow along with growth of pig husbandry. It is thought that these settlements supported the political structure of the *alii* (Haun and Henry 2001).

Department of Hawaiian Homelands (DHHL) landholdings in the *ahupua'a* of Keōkeā, are located approximately 5.5 miles to the southwest of Kealahou. Landholdings in Waiohuli, are located approximately 3.4 miles from Kealahou. The extensive archaeological testing that has been conducted in these areas has greatly contributed to the overall understanding of the archaeological patterns of upcountry Maui, as well as the cultural traditions of the past in both ancient and historic times.

In 2001, Haun & Associates conducted an inventory survey in the land of Kamehamehū, which is adjacent to Kealahou. In this survey, three historic sites were identified, including an agricultural clearing mound and two cattle walls.

Within the Kealahou Ahupua'a and the project area, archaeological field studies are very few and are limited in scope. The majority of archaeological studies in the region have focused on neighboring *ahupua'a*. Ethnographic information for Kealahou *ahupua'a* is also extremely limited.

Petroglyphs and pictographs were identified in Keāhuaiwi Gulch by Sterling (1962). She stated:

.....we went first to Keahuaiwi Gulch in Kealahou about 1/4 of a mile up the gulch from the old quarry. Here there is a natural crossing and on the Utupalakua side is a bluff shelter. There were traces of alaea rubbings on the walls but it could not be determined whether they were actual pictographs...Further up the gulch on the Makawao side is a deposit of alaea and a series of pictographs fairly high up on the walls. In the streambed we found porous cooking stone and opihī shell.... We then went below the Lower Kula Road to about .6 of a mile down the same gulch from the old quarry. Here are a collection of petroglyphs fairly high up on the Makawao side of the gulch.

In 2003, Scientific Consultant Services conducted an inventory survey in Kealahou. This survey was of a 0.7 acre parcel of land, and two sites were identified, including two features, a historic cattle wall/boundary wall, and a pre-historic agricultural terrace.

### ANTICIPATED SURVEY FINDINGS

Based on archival research of the area and adjacent *ahupua'a*, and the relatively large-scale archaeological studies of the nearby areas of Kōōkea and Waiohuli, it was thought that archaeological features associated with agricultural practices and habitation could be present within the confines of the project area and might include, stone and earth embankments, terraces, mounds, modified outcrops, petroglyphs, garden enclosures, animal enclosures, boundary walls, platforms, surface artifacts, and midden scatters. There is also the possibility of the presence of human burials.

### METHODOLOGY

The Inventory Survey was conducted between April 17 and May 5, 2006 by Donna Shefcheck, Jennifer Frey, Ian Bassford, James Powell, Angela Susak, and Randy Ogg, Field Director Guerin Tome, under Principle Investigator, Michael Dega, Ph.D. The inventory survey incorporated 48.117 acres in Kealahou Ahupua'a. Fieldwork consisted of a systematic pedestrian survey of the project area with the crew spaced a variable 10 m, depending on ground visibility. Consultation was undertaken with the Department of Land and Natural Resources (DLNR) SHPD Maui archaeologist Dr. Melissa Kirkendall. All suggestions were implemented accordingly.

### ARCHIVAL METHODS

In addition to referencing available SCS resources, archival research was conducted at the SHPD library facility (Wailuku and Kapolei, HI) and on the SHPD website. Archival work consisted of general research on the history and archaeology of the project area, as well as specific searches of previous archaeological studies in and around the subject parcel. Historic land use data were obtained from various sources including the Waihona Aima Database 2006 website.

### FIELD METHODS

All of the identified archaeological sites were marked with flagging tape and notes describing their location, construction characteristics, and excavation potential were recorded. During the Inventory Survey all identified features were mapped to scale using a tape and compass and were photographed. Sites were recorded in sufficient detail to reflect their overall integrity, size, and location in the project area. All sites were located with a hand-held GPS unit. Sites deemed appropriate were subjected to limited sub-surface excavations in the form of test units (TU), shovel probes (SP), and stratigraphic trenches (ST). Test Units were excavated using

a trowel, by natural stratigraphic layers divided in 10 cm levels as necessary. Shovel Probes and Stratigraphic Trenches were excavated by natural layers, rather than arbitrary levels. Where noted, excavation fill was screened through 6 mm and 3 mm mesh nested in series. Profiles and standard planview maps were generated for each excavated unit. Soil layer color was recorded using Munsell color charts and soil composition was recorded on standard SCS stratigraphy forms.

### LABORATORY METHODS

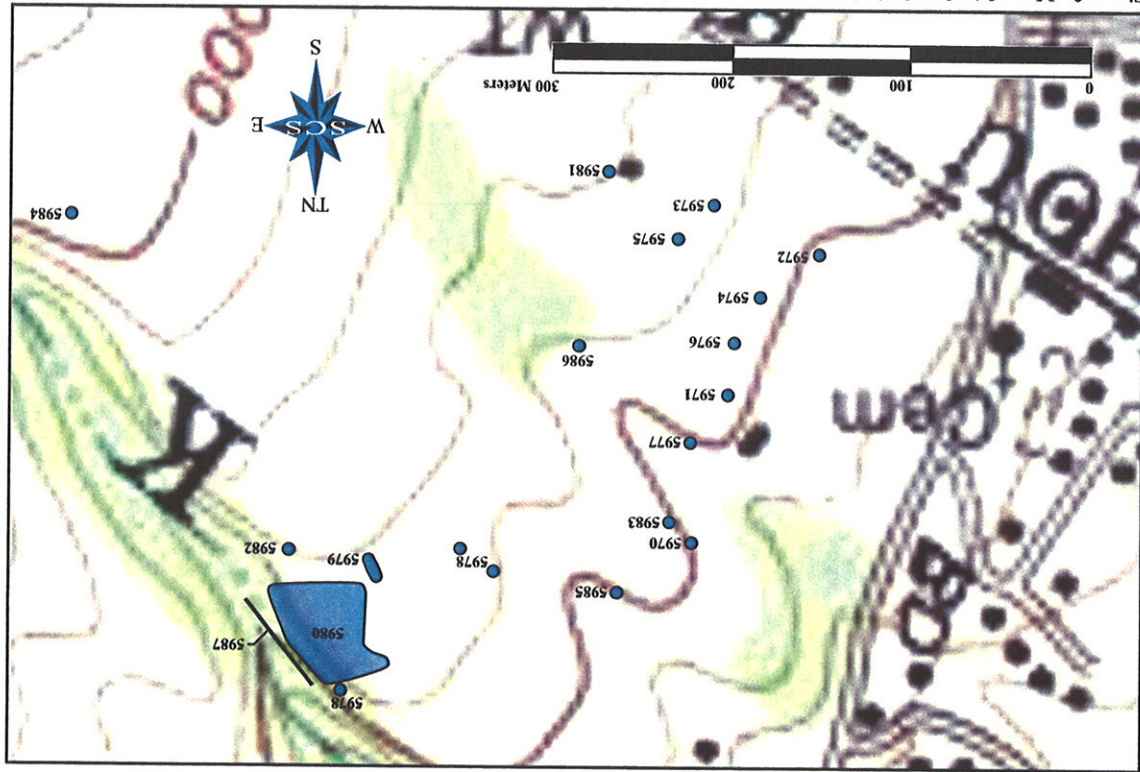
Artifacts were sorted, analyzed, and catalogued at the SCS laboratory in Honolulu and are presently curated at the SCS laboratory in Honolulu along with all field notes, illustrations, and photographs. Portable artifacts were transported to the SCS laboratory in Honolulu. These materials were catalogued, described and quantified, and analyzed and interpreted in the laboratory. Appendix A contains the results of the artifact analysis. Laboratory work also included digital drafting of site locations and plan views for reporting purposes and the digitizing of all photographs and maps for archival purposes.

### ARCHAEOLOGICAL INVENTORY SURVEY RESULTS

A pedestrian survey of 48.117 acres revealed the presence of 18 archaeological sites including 33 features (Table 1). Figure 3 shows the location of the 18 archaeological sites. Two SP and six TU were excavated in Sites 50-50-11-5979, 5980, 5982, and 5983.

**Table 1: Sites Identified During Inventory Survey**

Site #	# of Fe.'s	Type	Function	Age
50-50-11-5970	1	Wall	Ranching	Historic
5971	1	Wall	Ranching	Historic
5972	1	Alignment/wall	Agriculture	Pre-Historic
5973	3	Ag Complex	Agricultural	Early-Historic
5974	1	Modified Outcrop	Agricultural	Undetermined
5975	1	Terrace	Agricultural	Pre-Historic
5976	1	Modified Outcrop	Undetermined	Undetermined
5977	4	Platform	Habitation	Pre-Historic
5978	4	Terraces	Agricultural	Pre-Historic
5979	2	Terraces	Agricultural	Pre-Historic
5980	8	Modified Outcrop/Terrace/enclousure	Agriculture/Habitation	Pre-Historic
5981	1	Wall	Ranching	Historic
5982	1	Terraces	Agriculture	Pre-Historic
5983	1	Mound	Activity Area	Pre-Historic
5984	1	House	Habitation	Historic
5985	2	Enclosure/Wall	Activity Area/Ranching	Historic
5986	1	Modified Outcrop, Rock Mound	Undetermined	Undetermined
5987	1	Wall	Ranching	Historic



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Figure 3: Map of Archaeological Sites Within the Project Area.

**SITE 50-50-11-5970** was located in the bottom of a drainage gully.

Feature 1 was a low-lying core-filled rock wall extending *mauka/makai*, incorporating *in situ* boulders and standing three courses high. It measured approximately 22.00 by 2.20 by 0.15/0.90 m high (Figure 4). The feature was in poor condition and had been severely altered by at least one bulldozed road that bisected the feature, as well as damage from cattle. The function of Feature 1 was interpreted as a ranching wall.

**SITE 50-50-11-5971** was located south of Site 50-50-11-5970 and was oriented *mauka/makai*.

Feature 1 was a double-faced, core-filled wall that had been reduced to one course high. It was constructed with large boulders and a sub-angular cobble fill. The wall measured 30 m by 1.50 m by 0.30/0.67 m high (Figure 5). A horseshoe was identified on the surface near the feature. Although the wall had been impacted by cattle and bulldozer activities, it was in relatively good condition. Feature 1 is interpreted as the remains of a historic cattle/boundary wall.

**SITE 50-50-11-5972** was located adjacent to a shallow swale and intersects the western boundary of the project area.

Feature 1 was one to two course high, stacked alignment/wall lying perpendicular to the slope contour. It measured 7.00 by 0.25/0.55 by 0.40/0.80 m high (Figure 6). Based on its location and style, Feature 1 is interpreted as the remnants of a partially stacked agricultural feature of prehistoric origin.

**SITE 50-5-11-5973** consisted of three features and was located on top of moderately steep hill in the southwest portion of the project area. Visibility was hampered by thick vegetation and there had been recent bulldozer activity to the north and west. To the southeast was a barbed-wire fence, a driveway and an occupied house (Figure 7).

Feature 1 was a roughly stacked rock-faced terrace constructed with medium to large boulders and standing from one to three courses high. It measured 23.70 by 0.70 by 0.83 m high. The surface of terrace was level. The terrace was interpreted to be an early historic agricultural feature.

Feature 2 was a rock-faced, soil-surfaced terrace. The facing construction was informal and rough suggesting it was a later addition containing the soil surface. It measured 16.50 by 6.30 by 0.70 m high. The terrace was interpreted to be an early historic agricultural feature.

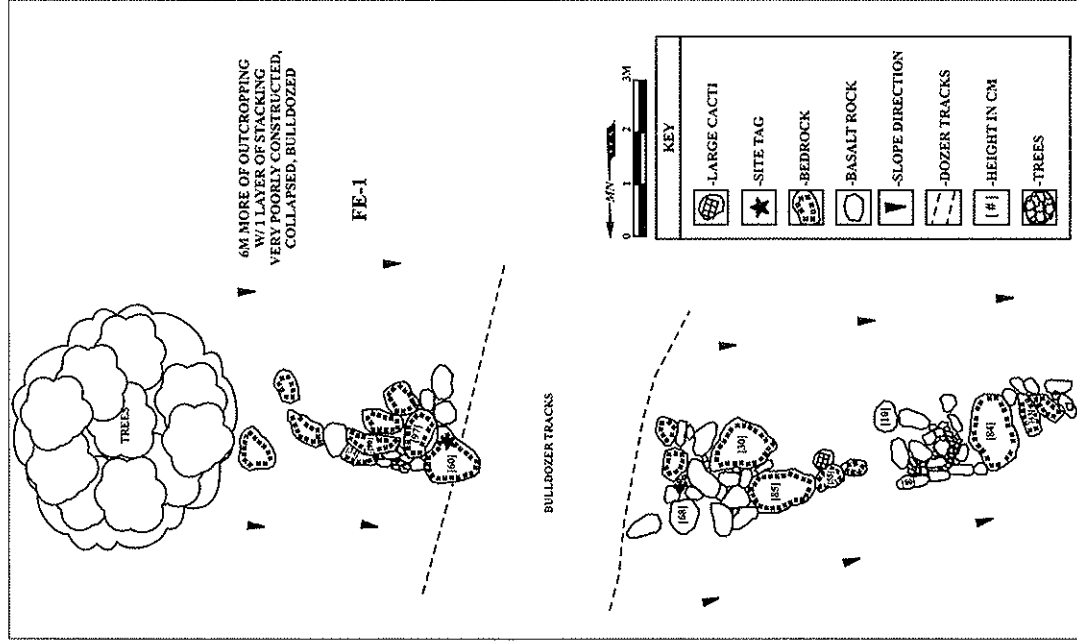


Figure 4: Site 5970, Feature 1 Plan View.

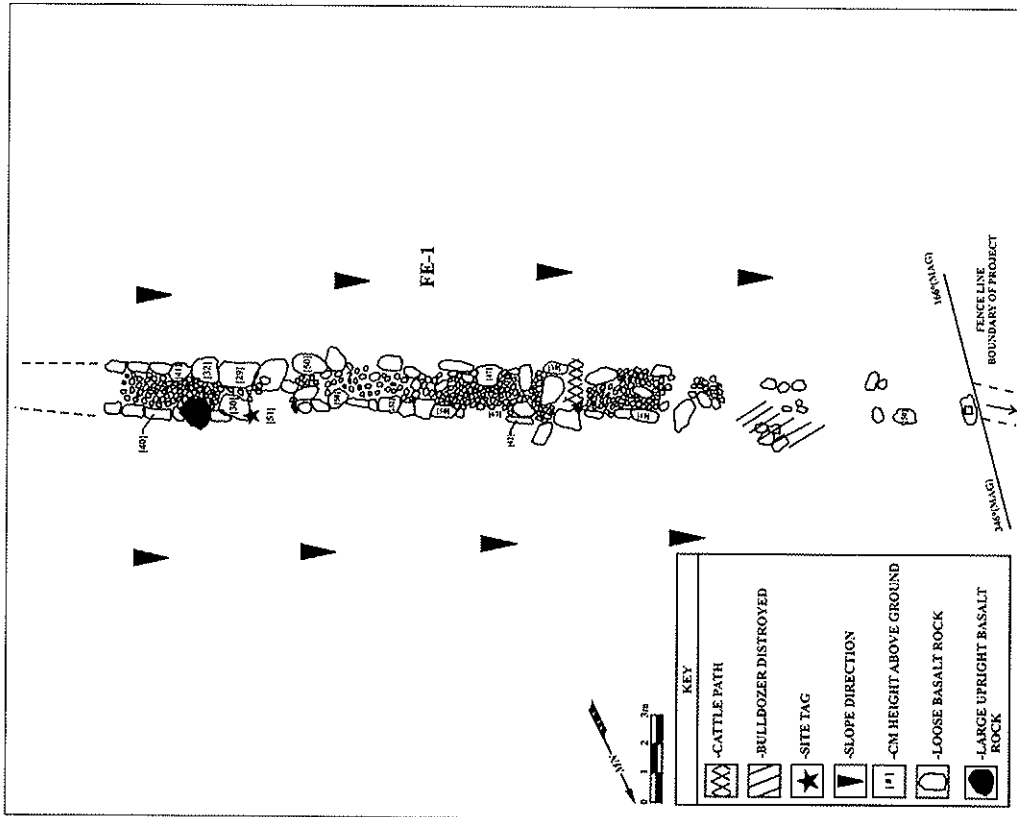


Figure 5: Site 5971, Feature 1 Plan View.

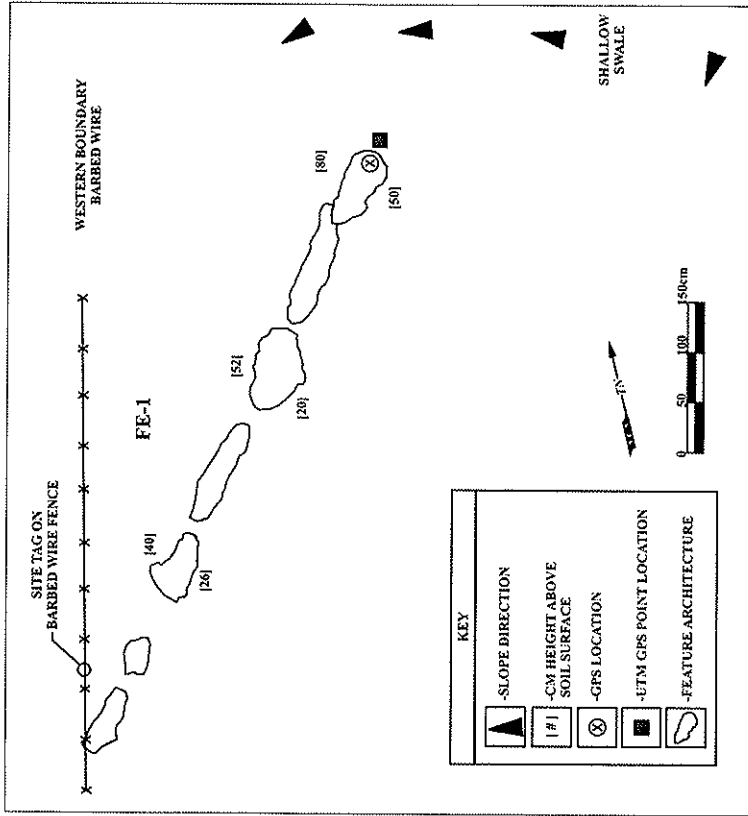


Figure 6: Site 5972, Feature 1 Plan View.

Feature 3 was a roughly faced terrace constructed with piled pebbles, medium sized cobbles, large boulders, and incorporated some sections of bedrock. It measured 5.00 by 1.70 by 0.43 m high. It was interpreted as an early historic agricultural feature. A very eroded, rudimentary hook-shaped terrace was observed to the immediate southwest of Feature 3.

**SITE 50-50-11-5974** was located on a hillside *mauka* of a dirt road that extended through the project area south of the southern gully and near the northwest boundary of the project area.

Feature 1 was a modified outcrop constructed with sub-angular cobbles arranged around *in situ* boulders. It measured 3.00 by 2.00 by 0.70 m high (Figure 8). A china teacup shard, a piece of wire and the flat portion of a tin can were lying on the surface of Feature 1 and are not considered associated with its function. The feature was interpreted as an agricultural feature from an undetermined time period.

**SITE 50-50-11-5975** was located slightly northeast of Site 50-50-11-5973.

Feature 1 was a rock-faced soil-surfaced terrace constructed with medium cobbles and large boulders and standing one to two courses high (Figure 9). It measured 5.20 by 0.80 by 0.06/0.96 m high. The terrace was interpreted as a pre-Contact agricultural terrace.

**SITE 50-50-11-5976** was located on the side of a gulch with many basalt outcrops.

Feature 1 was a modified outcrop consisting of large *in situ* boulders and bedrock with cobble fill in between. It measured 5.00 by 2.60 by 0.75 m high (Figure 10). The function of this feature is undetermined.

**SITE 50-50-11-5977** was located on a slope near a shallow gully. A glass bottle was found on the surface.

Feature 1 was a platform constructed with small cobbles and boulders (Figure 11). The basalt rocks are stacked three courses high in the northwest corner. It measured 4.50 by 4.20 by 0.70 m high in the interior and 0.30 m on the exterior. This feature was interpreted as a habitation platform.

**SITE 50-50-11-5978** was located roughly at the center of the project area. It consisted of four terraces spanning the width of a gully/wash (Figure 12).

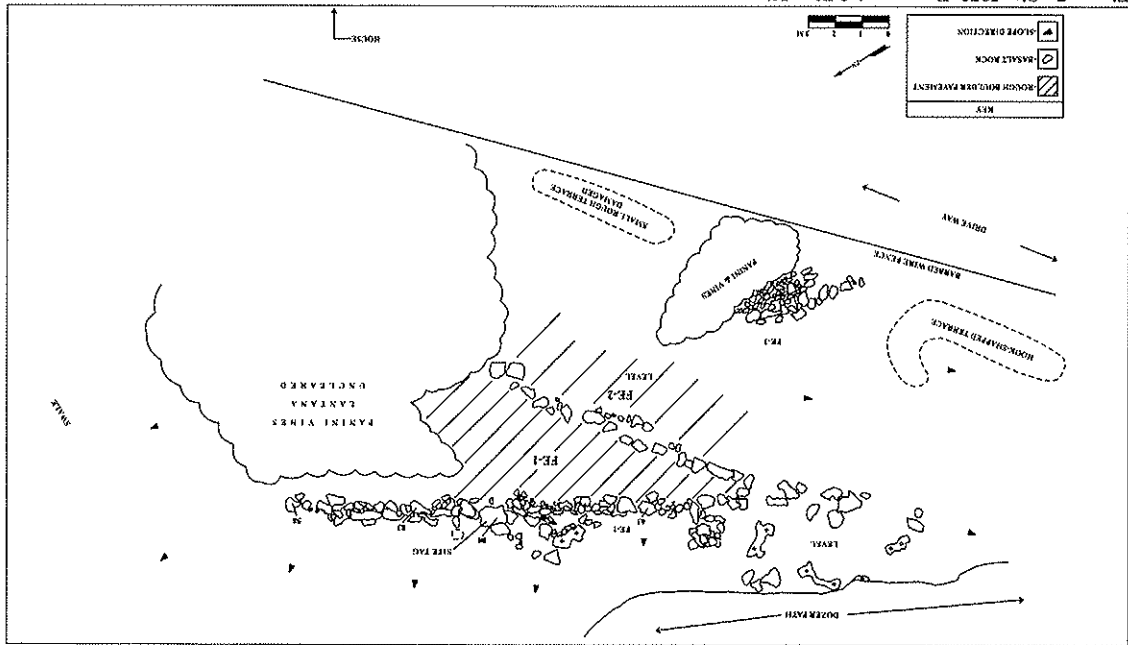


Figure 7: Site 5973, Features 1-3 Plan View.

Figure 9: Site S975, Feature 1 Plan View.

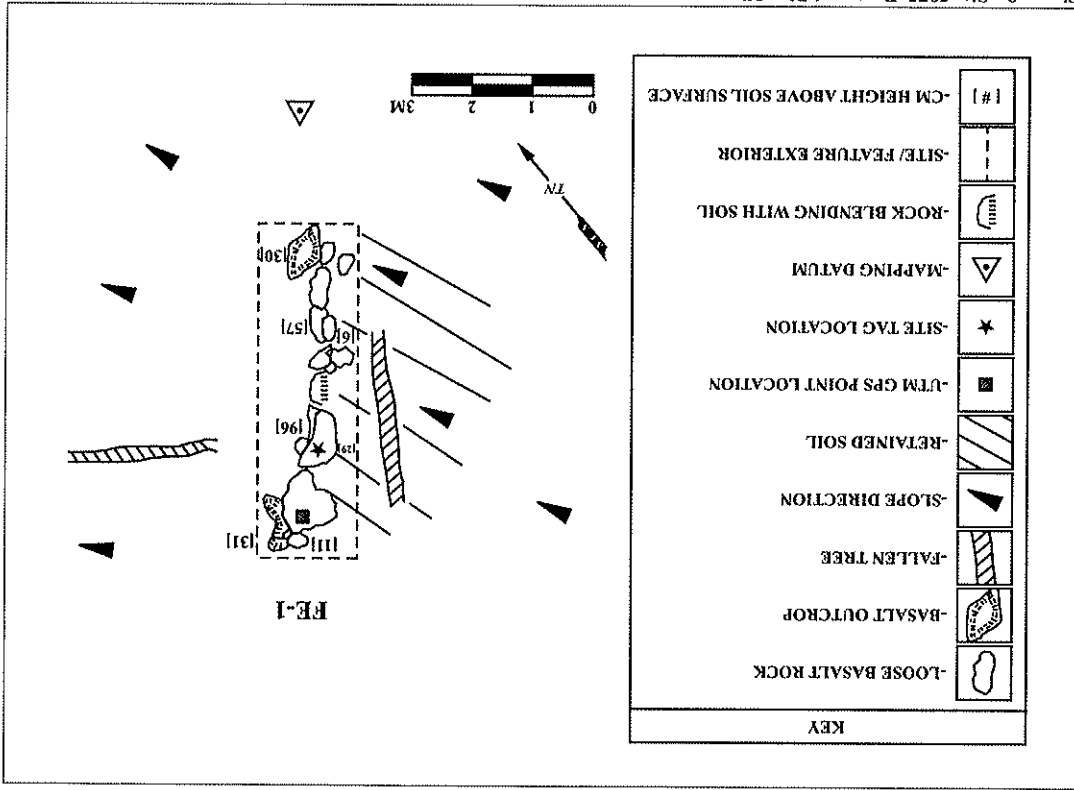
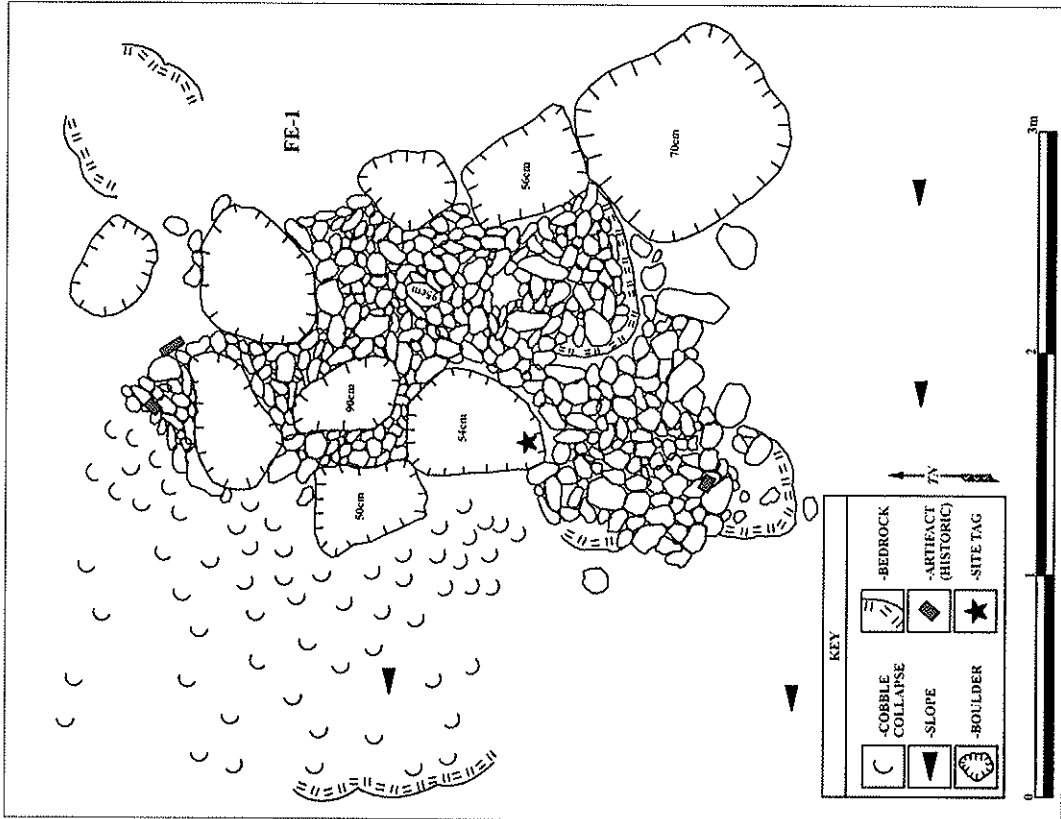


Figure 8: Site S974, Feature 1 Plan View.



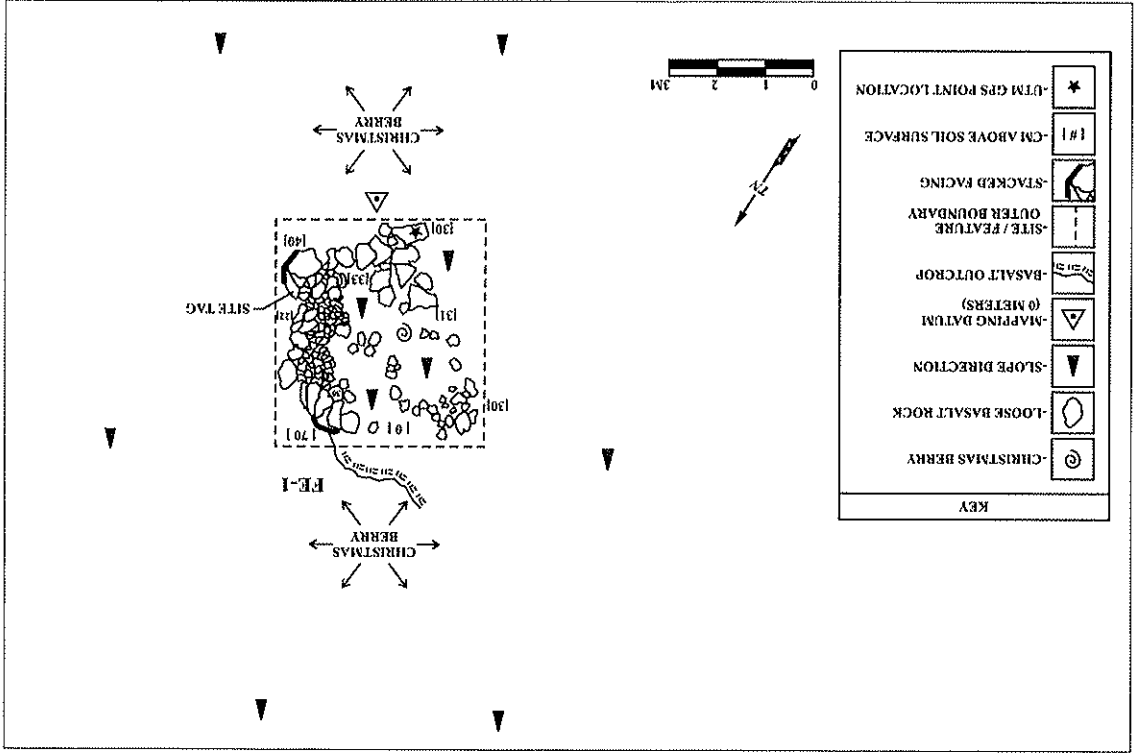


Figure 11: Site 5977, Feature I Plan View.

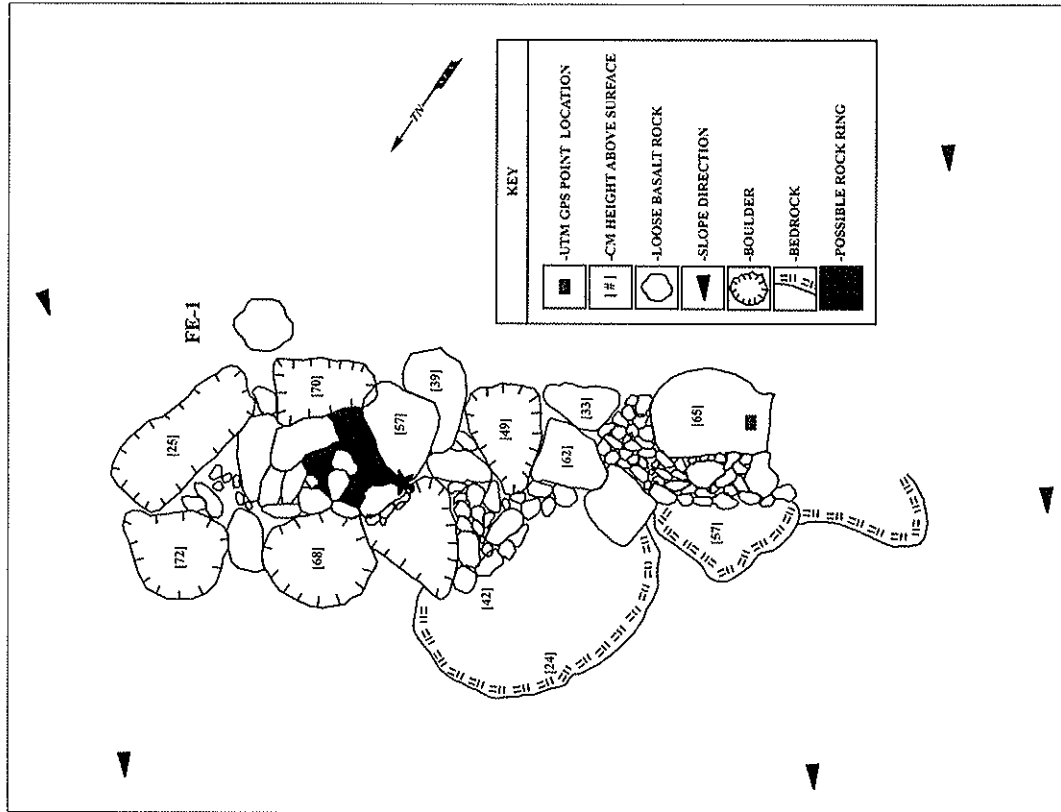


Figure 10: Site 5976, Feature I Plan View.



Feature 1 was a soil-surfaced, rock-faced terrace constructed with medium to large cobbles and small boulders situated at the head of the gully/wash. It measured 31.20 by 2.32 by 0.86 m high. The terrace facing was approximately 1.50 to 2.00 m thick.

Feature 2 was a soil-surfaced, rock-faced terrace constructed with medium to large cobbles and small boulders and was standing three to seven courses high. It measured 23.20 by 2.10 by 0.72 m high. The terrace facing was approximately 1.50 m thick.

Feature 3 was a soil-surfaced, rock-faced terrace constructed with medium to large cobbles and small boulders. It measured 21.60 by 2.10 by 0.63 m high.

Feature 4 was a soil-surfaced, rock-faced terrace constructed with medium to large cobbles and small boulders and was standing three to seven courses high. A glass bottle was found on the surface. The terrace measured 62.00 by 0.32 m high on the interior and 2.52 m high on the exterior. The terrace facing was 1/1.5 m thick. This terrace extended out of the gully/wash and onto the flat surface to the north. All of these features were interpreted as pre-Contact agricultural terraces.

SITE 50-50-11-5979 consisted of two features located to the northeast of Site 50-50-11-5978 on a slight slope.

Feature 1 was a partially soil-surfaced and partially paved, rock-faced terrace (Figure 13). Cobble fill was situated in the southwest corner of the feature and the facing was three to six courses high. It measured 8.50 by 5.50 by 0.94/1.52 m high and the thickness of the facing was approximately 0.60 m.

SP-1 (0.50 by 0.50 m) was placed against the exterior of the *mauka* portion of Feature 1 on a slight southeast to northwest slope. The excavated fill was screened through 6-mm and 3-mm mesh nested in series. Three stratigraphic layers were identified in the exposed section (Figure 14).

Layer I (0-4 cmbs) consisted of a dark brown (10YR 3/3) fine silt containing no cultural material.

Layer II (4-13 cmbs) consisted of a very dark brown (7.5YR 2.5/2) with dark reddish brown (2.5YR 2.5/3) semi-compact, crumbly clay-silt containing no cultural material.

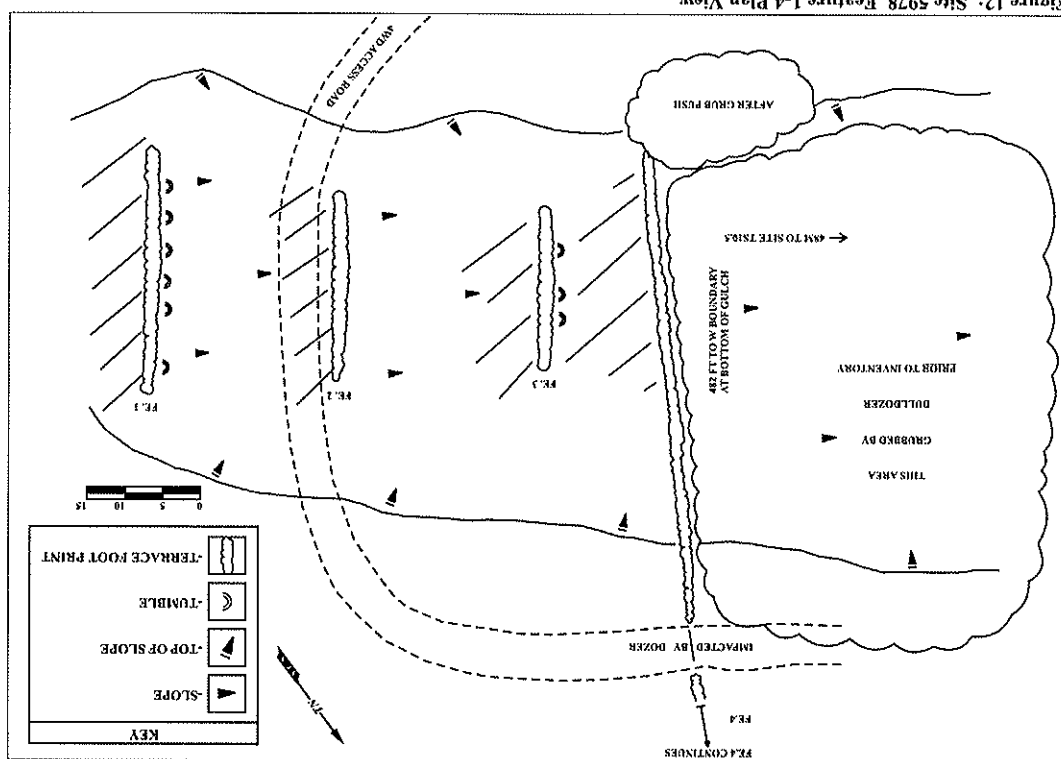
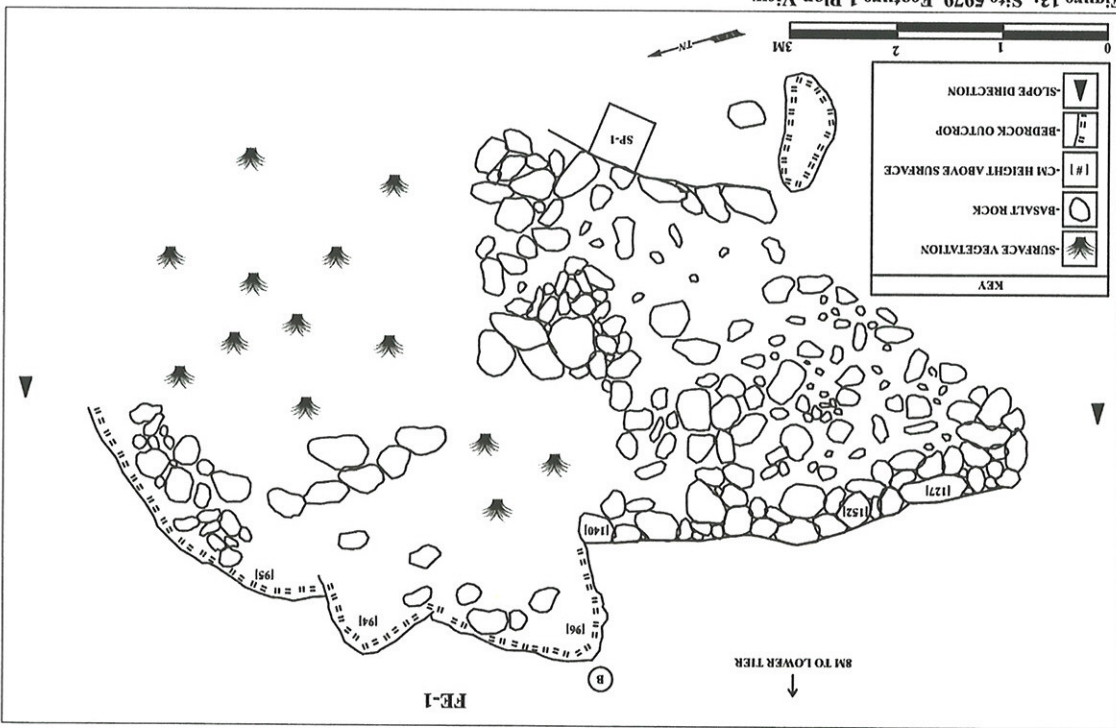


Figure 12: Site 5978, Feature I-4 Plan View.



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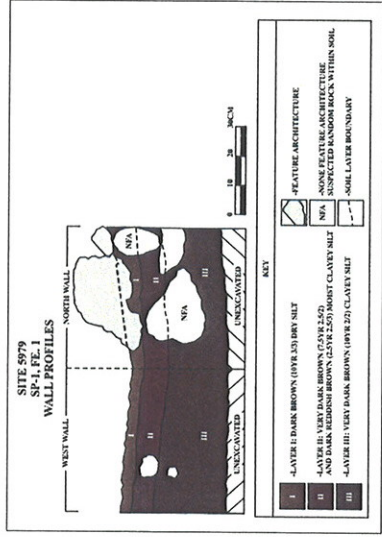


Figure 14: Site 5979, SP-1 Profile West And North Walls.

Layer III (13-25 cmbs) consisted of a very dark brown (10YR 2/2) semi-compact crumbly clay-silt containing one porcelain shard. Excavation was terminated on bedrock.

Feature 2 was a partially soil-surfaced and partially paved, rock-faced terrace constructed with medium to large cobbles and large boulders (Figures 15 and 16). It measured 14.40 m long by 1.08 m high with a terrace facing thickness of 0.60 m wide. The terrace was three to six courses high.



Figure 15: Site 5979, Feature 2 To East.

TU-1 (1.00 by 0.50 m) was placed in the center of the terrace interior. The excavated fill was screened through 3 mm mesh screen. Two stratigraphic layers were identified in the exposed section (Figure 17).

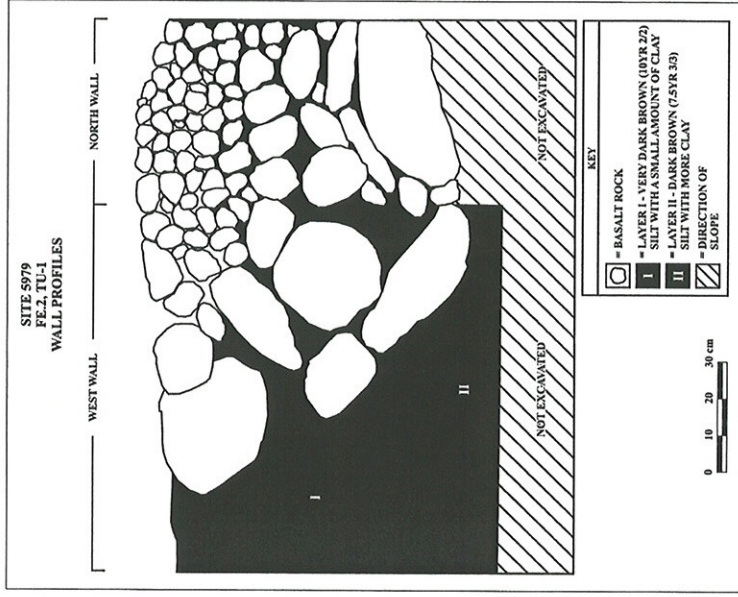


Figure 17: Site 5979, Feature 2, TU-1 North And West Wall Profiles.

Layer I (0-80 cmbs) consisted of a very dark brown (10YR 2/2) silty-clay containing no cultural material.

Layer II (80-100 cmbs) consisted of a dark brown (7.5YR 3/3) clay-silt containing no cultural material.

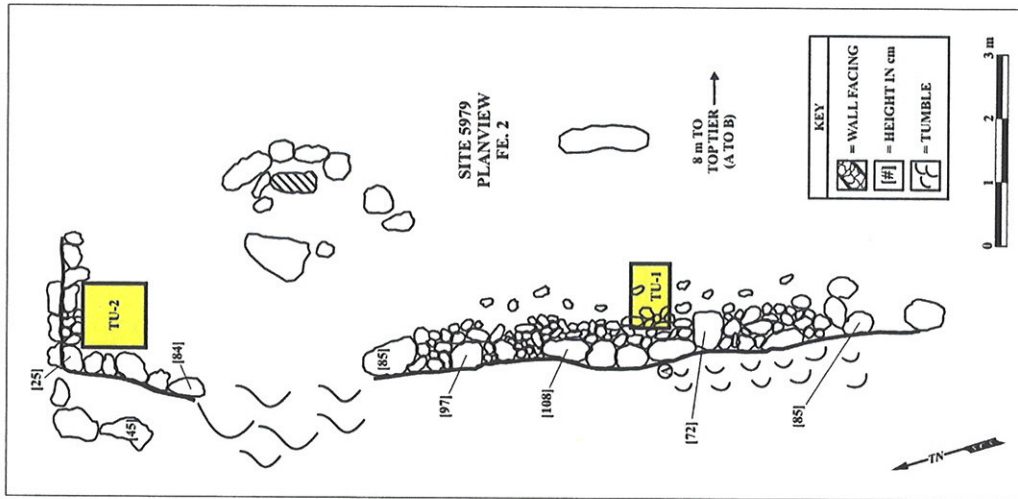


Figure 16: Site 5979, Feature 2 Plan View.

TU-2 (1.00 by 1.00 m) was placed in the northeast corner of the terrace. The excavated fill was screened through 3-mm mesh screen. Two stratigraphic layers were identified in the exposed section (Figure 18).

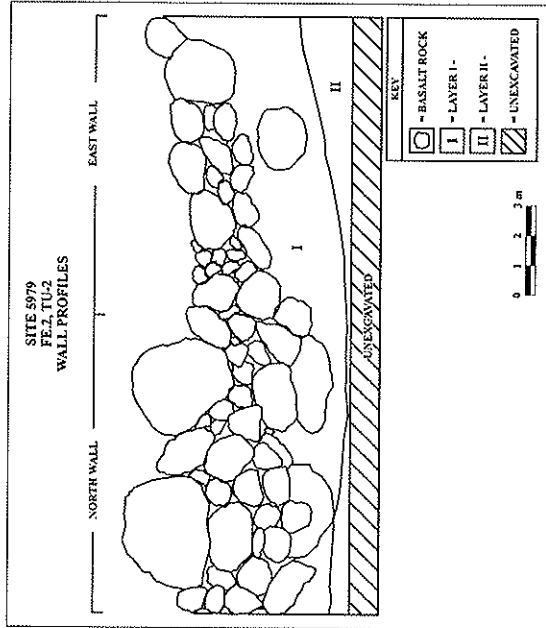


Figure 18: Site 5979, Feature 2, TU-2 North And East Wall Profiles.

Layer I (0-60 cmbs) consisted of a very dark brown (10YR 2/2) silty-clay containing charcoal flecks and the base of the facing.

Layer II (60-70 cmbs) consisted of a dark brown (7.5YR 3/3) clay-silt containing no cultural material.

Both Features 1 and 2 were interpreted as pre-Contact agricultural terraces.

**SITE 50-50-11-5980** consisted of eight features located on the slightly raised edge of Keāhūaiwi Gulch that terminates in a steep *pu'u* at its north end. A shallow swale extended to the southwest. Basalt flakes, a basalt core, edge-altered basalt flakes, a basalt awl, an adze blank, two adzes and a possible awl were identified on the surface near Features 6 and 7.

Feature 1 was a modified outcrop forming an enclosure that became a soil-surfaced terrace with a stacked and piled rock facing (Figures 19 and 20). It measured 5.60 by 5.60 by 1.30 m high.

SP-1 (0.50 by 0.50 m) was placed within the enclosure of Feature 1. The excavated fill was screened through 6 mm and 3 mm mesh nested in series. Three stratigraphic layers were identified in the exposed section (Figure 21).

Layer I (0-16 cmbs) consisted of a dark brown (10YR 3/3) fine silty loam containing 70% cobbles and no cultural material.

Layer II (16-44 cmbs) consisted of a very dark brown (10YR 2/2) fine, semi-compact silt containing 70% cobbles and no cultural material.

Layer III (44-76 cmbs) consisted of a dark yellowish brown (10YR 3/6) fine, semi-loose silt containing 5% rock fill and no cultural material.

The function of Feature 1 was interpreted as agricultural.

Feature 2 was a rock-faced terrace constructed with stacked cobbles and boulders (Figure 22). There was a small level pebble pavement in the eastern portion of the terrace which measured 4.40 by 2.70 by 0.80 m high with a wall thickness of 0.60 m. The stacked facing was one to two courses high. This feature was interpreted as a temporary habitation/shelter.

Feature 3 was located on the edge of a gulch and consisted of a mound of piled boulders with piled cobbles on its west side (see Figure 22). It measured 3.50 by 2.40 by 0.90 m high. This feature was interpreted as a planting/clearing mound.

Feature 4 was located on the west slope of a *pu'u* and consisted of a modified outcrop constructed with cobbles and boulders stacked on bedrock (Figure 23). It measured 13.00 by 2.40 by 1.30 m high. Its function was undetermined.

Feature 5 was located on a south spur of a *pu'u* and consisted of cobbles and boulders stacked along a bedrock outcrop (Figure 24). It measured 13.00 by 0.50/2.00 by 0.75 m high and stood two to three courses high at its north end.



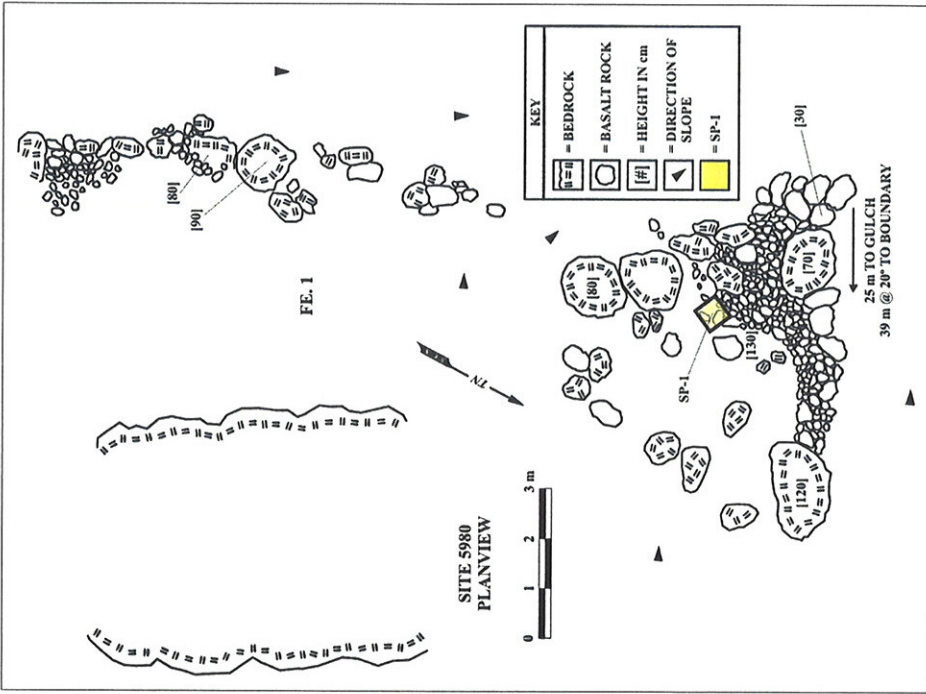


Figure 19: Site 5980, Feature 1 Plan View.



Figure 20: Site 5980, Feature 1 To Northeast.

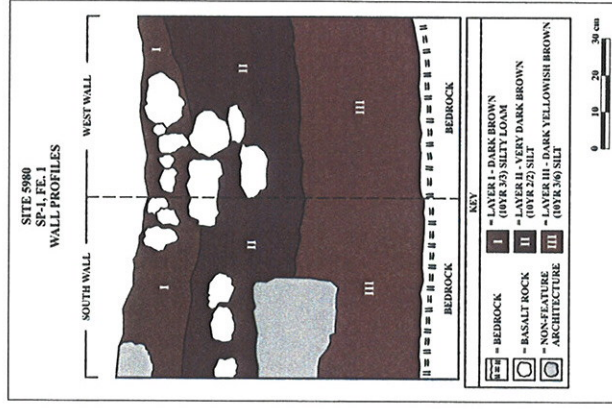


Figure 21: Site 5980, Feature 1, SP-1 South And West Wall Profiles.

Figure 23: Site 5980, Feature 4 Plan View.

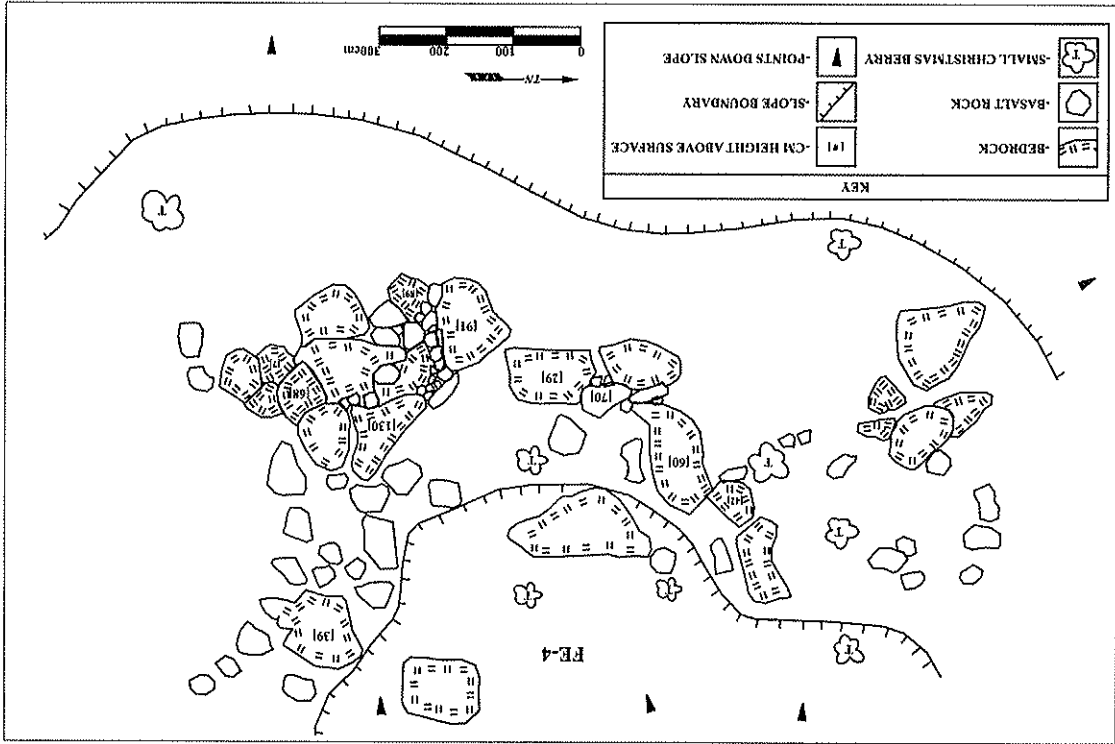
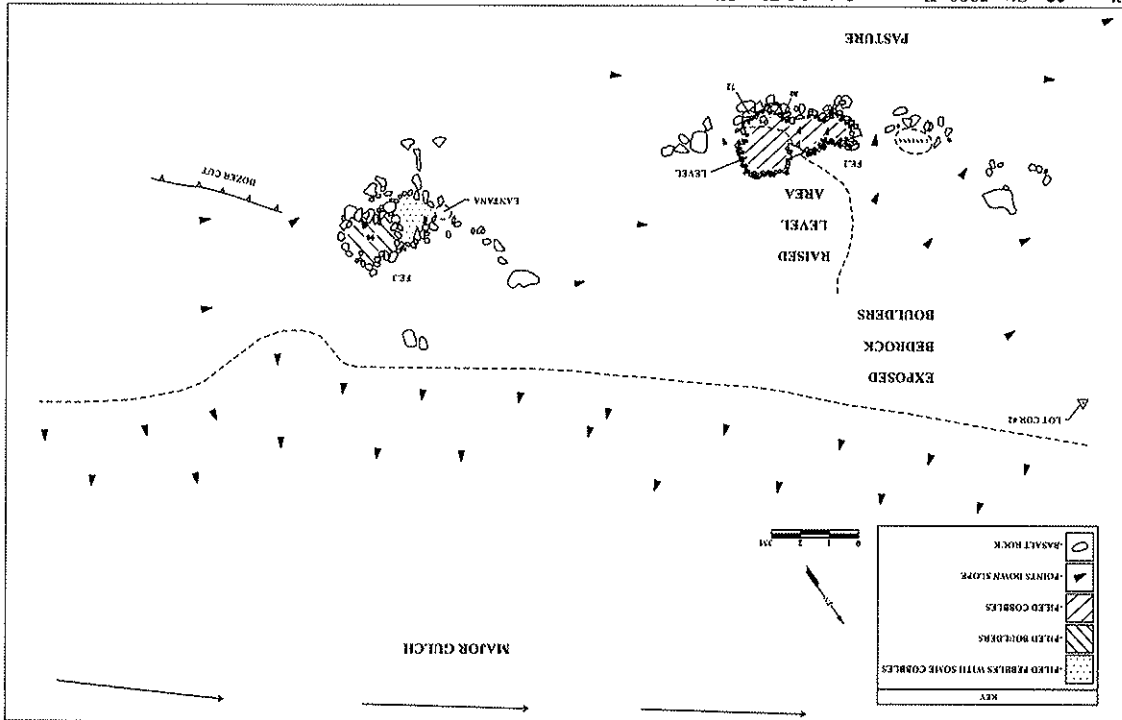


Figure 22: Site 5980, Features 2 And 3 Plan View.



Feature 6 was located on a west spur of a *pu ū* and consisted of a soil-surfaced, rock-faced terrace constructed with cobbles and boulders stacked three courses high (Figures 25 and 26). It measured 14.00 by 2.40 by 1.00 m high. A possible re-worked large basalt flake was identified on the surface.

TU-1 (1.00 by 1.00 m) was placed in the southeast corner of the terrace. The excavated fill was screened through 6-mm and 3-mm mesh nested in series. Three stratigraphic layers were identified in the exposed section (Figure 27).

Layer I (0-30 cmbs) consisted of a very dark brown (7.5YR 2.5/2) very fine silt loam containing 80% gravel in the first 10 cm of matrix. A basalt core was recovered between 20 and 30 cmbs.

Layer II (30-64 cmbs) consisted of a very dark brown (10YR 2/2) very fine silt loam containing less than 10% gravel. At 36 cmbs and 48 cmbs two incised rocks were identified.

Layer III (64-70 cmbs) consisted of a dark reddish brown (5YR 3/4) silt loam containing no cultural material. Excavation was terminated on bedrock.

The incised rock may represent the results of what was traditionally known as a *hoana* stone which was often used for sharpening pointed tools, such as bone picks and needles, rather than a polishing or whetstone used most frequently on flat surfaces of larger tools (Figure 28).

Feature 7 was a modified outcrop constructed with stacked cobbles and boulders and incorporating some large, flat basalt slabs either standing on end or lying flat on two courses of stacked cobbles (Figure 29). It measured 6.00 by 2.00 by 0.65 m high. A lithic scatter was found on and around the feature and extended to the edge of a gully to the south.

Feature 8 was an enclosure constructed with basalt boulders stacked two to three courses high (Figures 30 and 31). It measured 2.40 by 2.25 by 0.47 m high. Both features had been impacted by animal activity. This site was interpreted as an agricultural/habitation complex.

**SITE 50-50-11-5981** extended east-west and was located in the southern portion of the project area.

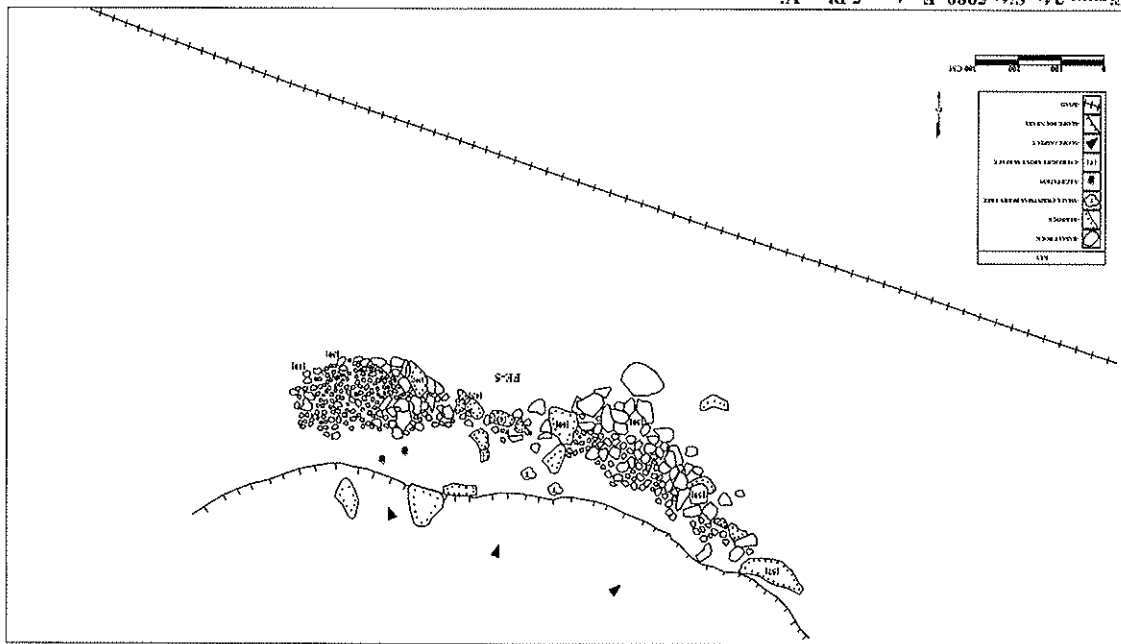


Figure 24: Site 5980, Feature 5 Plan View.

Figure 26: Site 5980, Feature 6, View to Northwest.

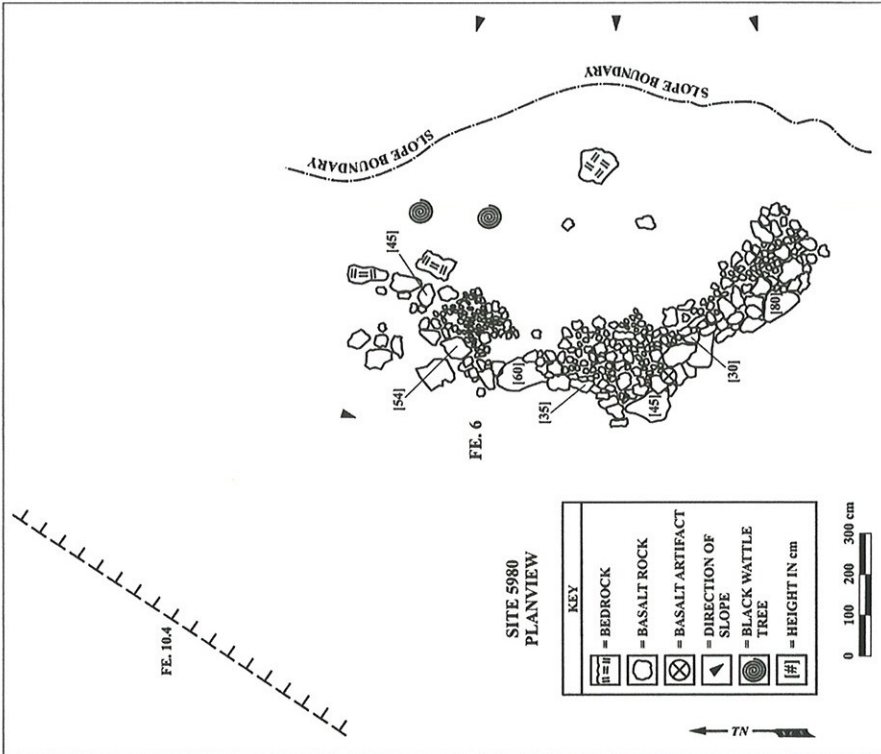
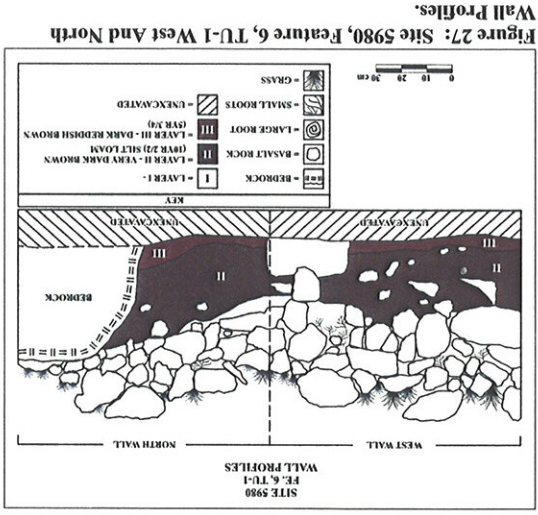


Figure 25: Site 5980, Feature 6 Plan View.



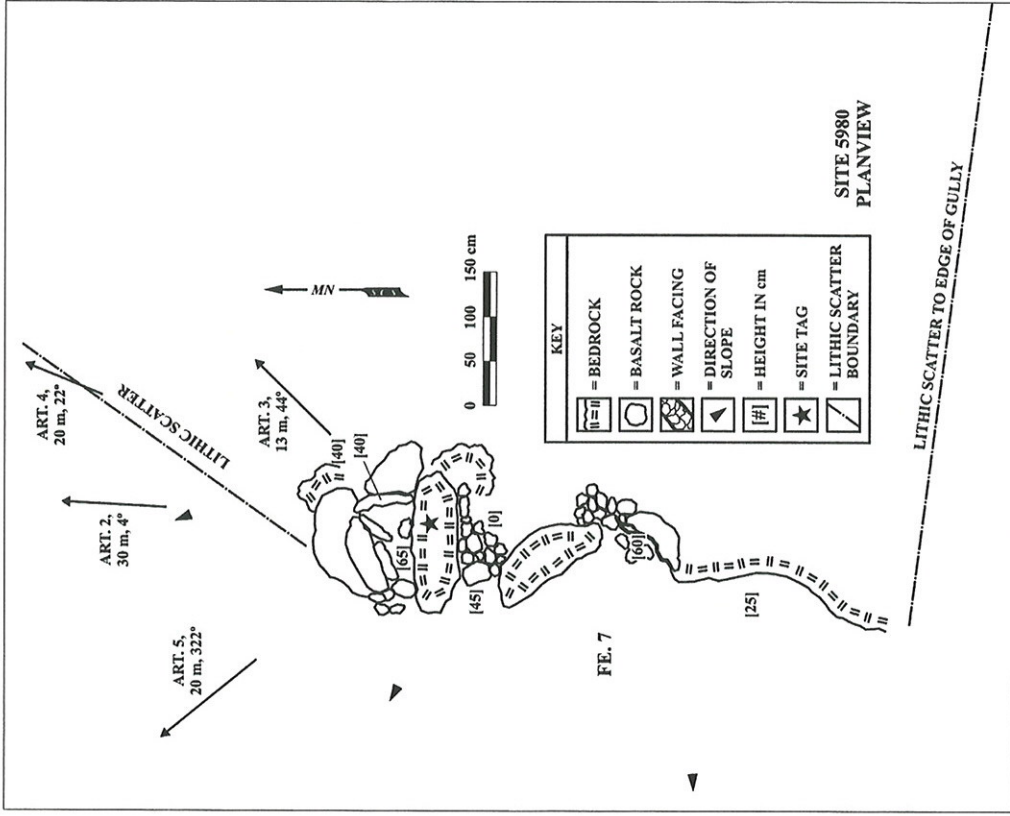


Figure 29: Site 5980, Feature 7 Plan View.



Figure 28: Site 5980 Incised Boulder From Feature 6, TU-1.

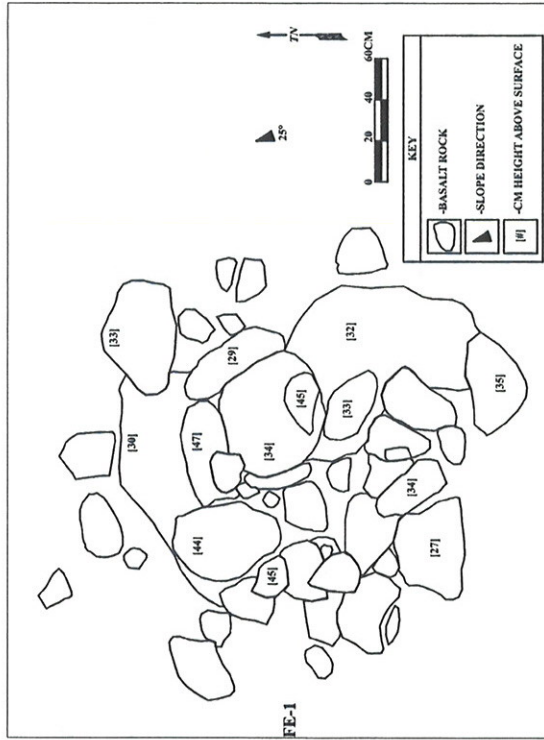


Figure 30: Site 5980, Feature 8 Plan View.



Figure 31: Site 5980, To North.

Feature 1 was a double-faced, cobble-filled, roughly L-shaped wall constructed with boulders and cobbles, and stacked three to six courses high (Figure 32). It measured 26.20 by 0.80 by 0.90 high to the north-south and 7.50 by 0.80 by 0.90 m high in the east-west jog. This feature was interpreted as an historic ranching wall.

**SITE 50-50-11-5982** was located south of Site 50-50-11-5980.

Feature 1 consisted of a three-tiered, rock-faced terrace, three to five courses high in the middle and one to two courses high at the bottom terrace (Figures 33 and 34). The top terrace measured 9.00 by 1.40 by 1.30 m high and has been impacted by bulldozer activity. The lower terrace measured 11.00 by 0.75 by 0.62 m high.

TU-1 (0.50 by 0.50 m) was placed in the middle terrace and incorporated part of the facing. The excavated fill was screened through 6-mm and 3-mm mesh nested in series. Two stratigraphic layers were identified in the exposed section (Figure 35).

Layer I (0-57 cmbs) consisted of a very dark brown (10YR 2/2) fine, clay-silt consisting of some charcoal at the bottom of the facing construction.

Layer II (57-70 cmbs) consisted of very dark brown (10YR 2/2) mottled clay-silt containing no cultural material.

This site was interpreted as prehistoric agricultural terraces.

**SITE 50-50-11-5983** was located to the southeast of Site 50-50-11-5978 on the slope of a gully.

Feature 1 is a rock mound constructed from piled pebbles, small to medium cobbles, and small boulders on top of bedrock (Figure 36). It measured 8.00 by 4.00 by 1.65 m high. A piece of plastic and a basalt core were identified on the surface of the feature.

TU-1 (1.00 by 0.50 m) was placed in the rock mound. The excavated fill was screened through 6 mm and 3 mm mesh nested in series. Three distinct layers of architecture were identified in the exposed section (Figure 37).

Layer I (0-25 cmbs) consisted of a basalt pebbles and cobbles 5 to 10 cm in length, roots, colluvial and aeolian silt.

Layer II (25-65 cmbs) consisted of medium sized rocks 8 to 15 cm in length and contained no cultural material.





Figure 32: Site 5981, Feature 1. View to Southeast.

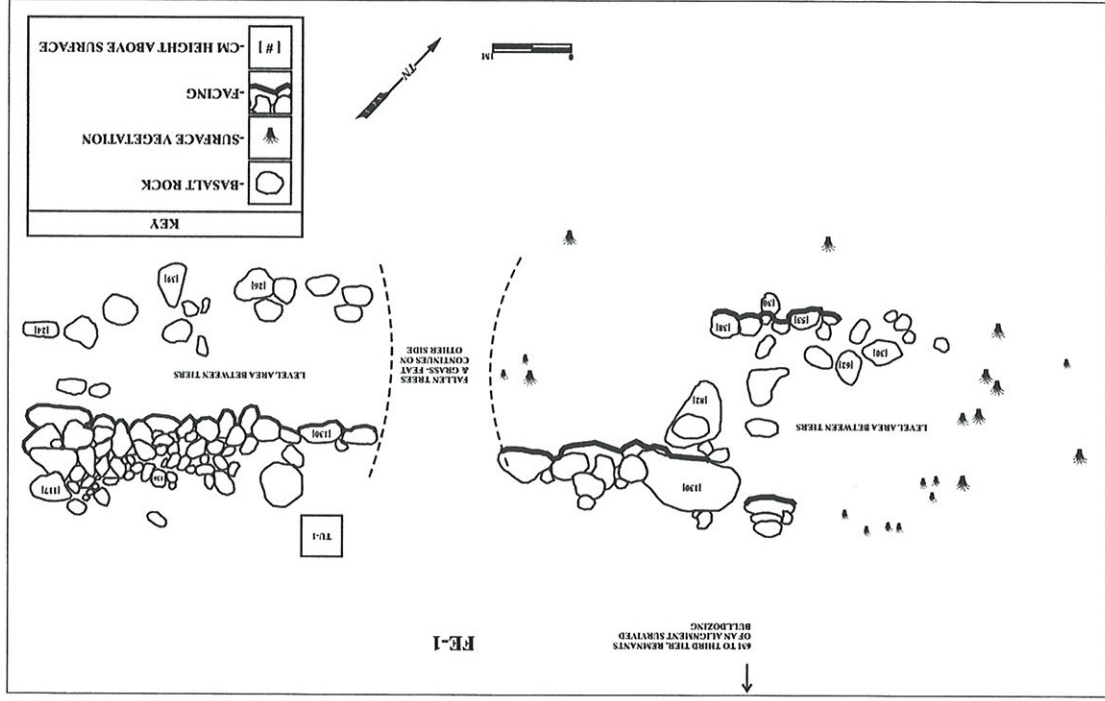


Figure 33: Site 5982, Feature 1 Plan View.





Figure 34: Site 5982, Feature 1. View to South.

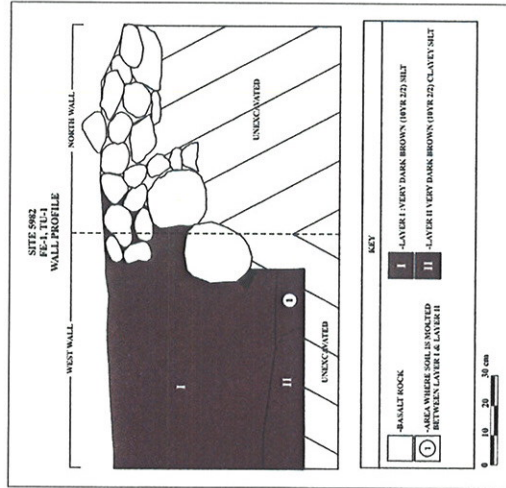


Figure 35: Site 5982, Feature 1, TU-1 West And North Wall Profiles.

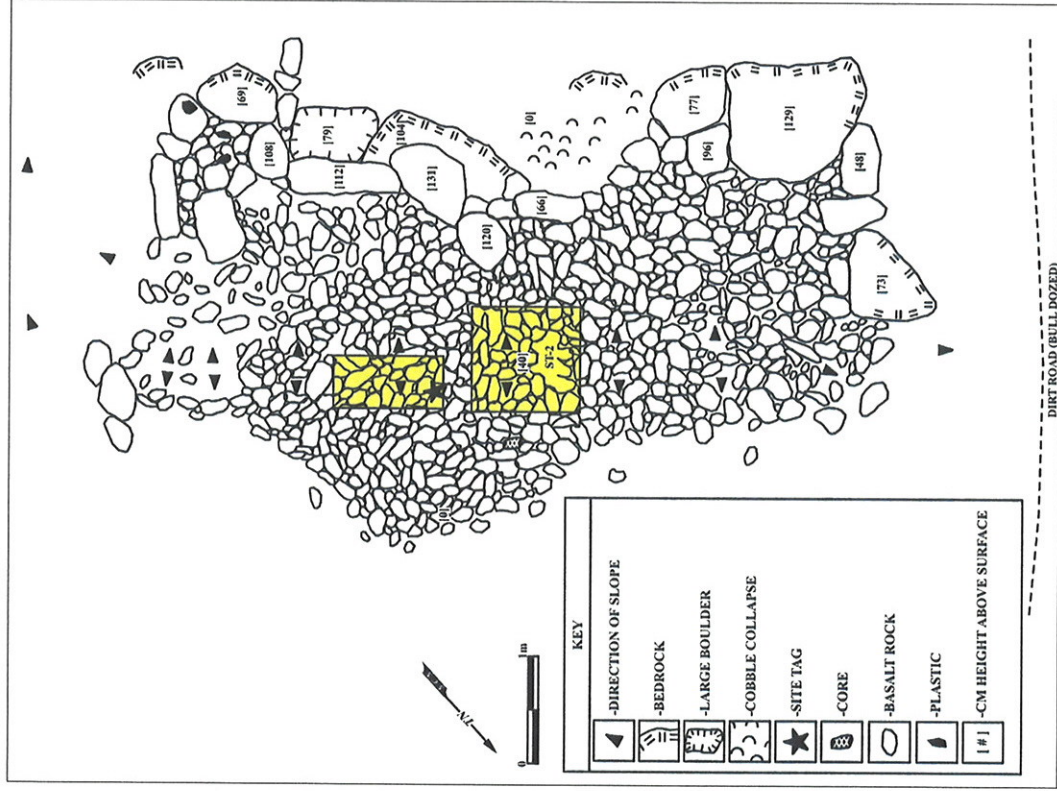


Figure 36: Site 5983, Feature 1 Plan View.

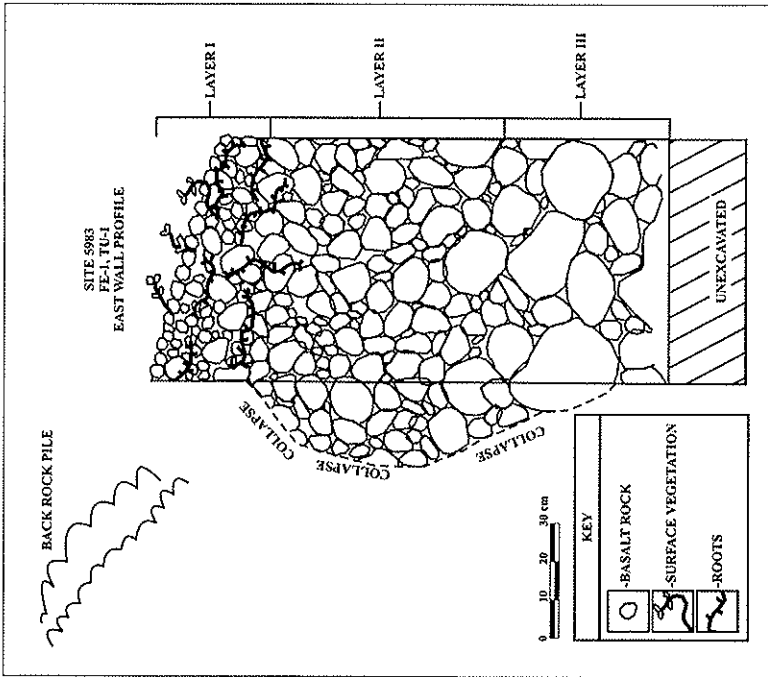


Figure 37: Site 5983, Feature 1, TU-1 East Wall Profile.

Layer III (65-95 cmbs) consisted of small boulders 25 to 30 cm in length and contained no cultural material.

TU-2 (1.00 by 1.00 m) was located to the west of TU-1 on top of Feature 1. Two distinct layers of architecture were identified in the exposed section (Figure 38).

Layer I (0-47 cmbs) consisted of dark brown (10YR 3/3) colluvial and aeolian silt, pebbles and cobbles measuring less than 10 cm in diameter, and no cultural material.

Layer II (47 to 100 cmbs) consisted of a dark brown (10YR 3/3) colluvial and aeolian silt, cobbles measuring 10 to 40 cm in diameter, and no cultural material.

Feature 1 was interpreted as a possible activity area.

**SITE 50-50-11-5984** was located on a flat portion of rolling hills in the eastern section of the project area.

Feature 1 was an historic house site that had been bulldozed. Historic debris, including tin cans, doorknobs, sake bottles, sections of metal roofing, pipes, and plastic were identified in the area (Figure 39). The site measured 30.00 by 50.00 m (1,500<sup>2</sup> m) and is adjacent to a well-established apricot tree. The structure is shown on TMK 2-3-01.

**SITE 50-50-11-5985** consisted of two features and was located on the south side of a gulch in the northwestern portion of the project area.

Feature 1 was a basalt rock enclosure constructed of small cobbles and large boulders stacked six courses high on the exterior (Figures 40 and 41). It was built on top of bedrock and measured 5.20 by 4.40 by 2.00 m high. The wall thickness was 1.10 m. Historic midden was found on the surface of this feature, including glass and pottery shards, a leather shoe, aluminum cans and an aluminum pot handle (see Appendix A).

Feature 2 was located at the bottom of the nearby gulch and consisted of a core-filled, wall, with a stacked basalt rock facing four to six courses high (Figure 42). It measured 49.00 by 1.00 by 0.69 m high. This site was interpreted as agriculture and ranching.

**SITE 50-50-11-5986** was located on the south side of the southern gulch in the center of the project area.

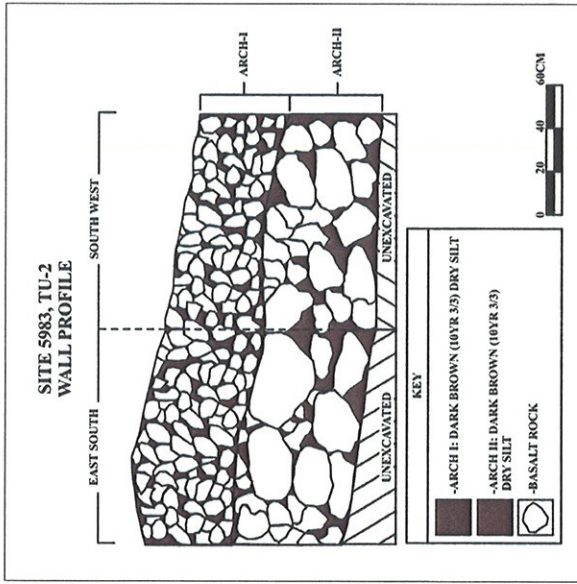


Figure 38: Site 5983, Feature 1, TU-2 East And Southwest Wall Profiles.



Figure 39: Site 5984, Feature 1, Historic Domestic Remnants.

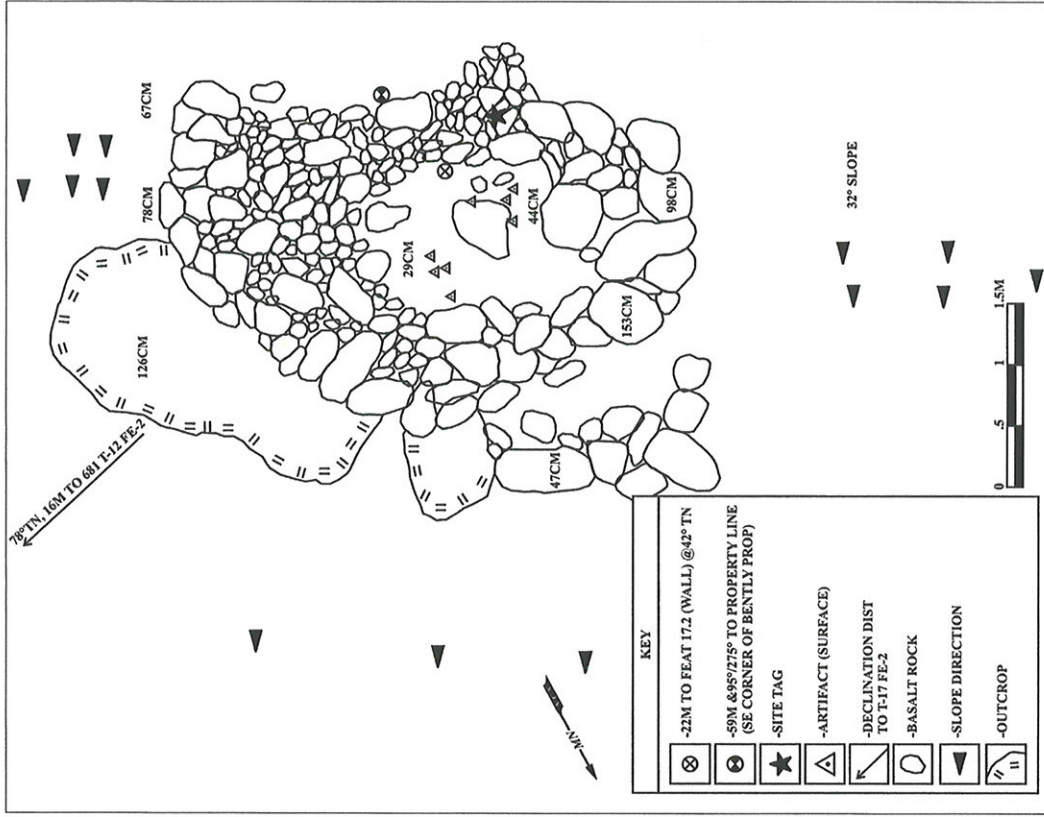


Figure 40: Site 5985, Feature 1 Plan View.





Figure 41: Site 5985, Feature 1. View to North.

Feature 1 was a modified outcrop extending *manuka/makai* along the gully (Figure 43). It measured 30.00 by 1.00 by 0.60 m high and was constructed with large boulders stacked three courses high.

**SITE 50-50-11-5987** was located on the southern top edge of Keāhūiwi Gulch to the east of Site 50-50-11-5980.

Feature 1 was a double-faced, core-filled wall constructed with sub-angular basalt cobbles and boulders (Figure 44). It measured 43.00 by 1.00 by 1.30 m high and stood six courses on its northern side. There was a sudden drop into the gulch directly to the north of the wall. The feature was interpreted as a ranch wall.

### DISCUSSION

The project area had been previously impacted by many years of cattle grazing and erosion and, as would be expected, the integrity of the identified sites was greatly altered by these activities. Extensive machine (bulldozer) alterations were evident in many areas of the project and a four-wheel drive access road traversed the land. The 18 identified sites were spread throughout the project area with the majority located at the 1,000-foot contour elevation. Eight sites were considered pre-Contact based on the architecture and type. Seven sites were interpreted as historic and three were undetermined. LCA claims in Kealahou Ahupua'a during the *Māhele* mainly clustered between 2,000 to 4,000 feet amsl and in the fourteen awarded, were claims for forest trees, stream use and *kūla* for agriculture. The results of the survey confirmed the anticipated remains suggested by the historical and archaeological research.

Pre-Contact settlement patterns of modified outcrops (50-50-11-5976, 5980), rock mounds (5983), low walls (5972), a small enclosure that may represent temporary habitation (5980), agricultural terraces (5975, 5978, 5979, 5982), fit the model for upcountry occupation reflected in early historic documents (LCA) and archaeological studies and are appropriate for dry land cultivation. Also the forest, which extended to a lower elevation, would have provided many valued resources necessary for a subsistence economy.

Historical information indicated that during the 1840s, large-scale cultivation of potatoes included vast areas of *kūla* land. The introduction of cattle combined with the agricultural



Figure 42: Site 5985, Feature 2. View to North.

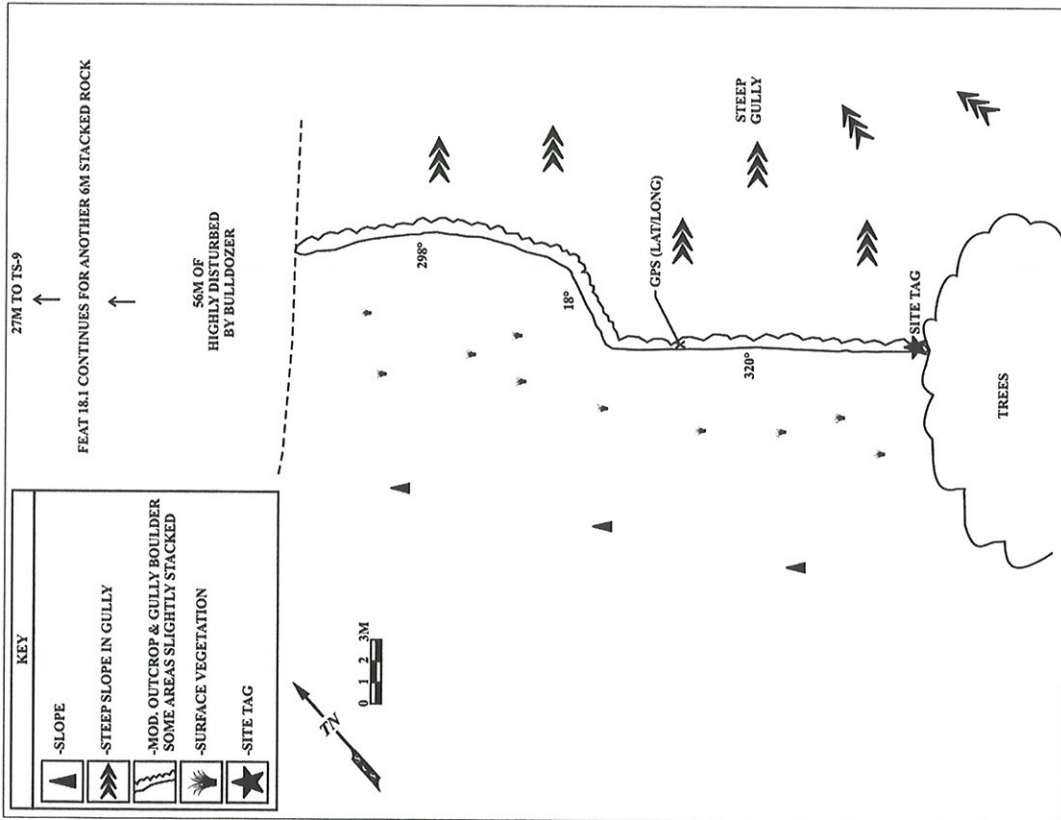


Figure 43: Site 5986, Feature 1 Plan View.



Figure 44: Site 5987, Feature 1. View to West.

pursuits meant land had to be cleared for pasture and planting. Ultimately, deforestation impacted the rainfall in the district and periods of drought became more common. Deforestation also allowed soil to be carried to the coast where it filled the fishponds with mud (*Honolulu Advertiser* 1962, A:15).

Part of the project area was used for habitation as Site 50-50-11-5984 confirm. Other sections were still being used as pasture. Sites 50-50-11-5970, 5971, 5981, 5985, and 5987 consisted of walls and an enclosure, and were interpreted as the results of historical ranching activities. House site 50-50-11-5984 was probably in use during this time. It is very probable that pre-Contact terraces were modified and re-used for potato cultivation in the 1800s.

The sites listed as undetermined (Sites 50-50-11-5974, 5976 and 5986), were difficult to define as traditional methods were still practiced during the early historic period.

Sub-surface testing by two shovel probes and six test units resulted in no identified cultural material. Sites 50-40-11-5980, Features six and seven included a sharpening stone



(*hoana*) and a surface lithic scatter, confirming traditional activities were present. Surface artifacts from Site 50-50-11-5985 reflected domestic 19<sup>th</sup> century historic activities.

#### SIGNIFICANCE ASSESSMENT AND RECOMMENDATIONS

Eight traditional, seven historic, and three undetermined archaeological sites were documented in approximately 48 acres of land in Kealahou Ahupua'a. All traditional sites are likely remnants of pre-Contact agricultural and temporary habitation sites. The seven historic sites are the remnants of historic agriculture and ranching and associated activities. The three undetermined sites represent traditional architecture that may have continued into the historic period.

These sites have been evaluated for significance according to the criteria established for the Hawai'i State Register of Historic Places. The five criteria are classified below:

- Criterion A: Site is associated with events that have made a significant contribution to the broad patterns of our history
  - Criterion B: Site is associated with the lives of persons significant to our past
  - Criterion C: Site is an excellent site type; embodies distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual construction
  - Criterion D: Site has yielded or has the potential to yield information important in prehistory or history
  - Criterion E: Site has cultural significance to an ethnic group; examples include religious structures, burials, major traditional trails, and traditional cultural places
- All 18 of the sites have been assessed as significant under Criterion D. Sufficient information in the form of photographs and maps have been recovered from the 18 sites and no further archaeological work is recommended as further archaeological procedures would not contribute a significant volume of additional data to the interpretation of the history of the region.

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**APPENDIX A : CULTURAL MATERIAL INVENTORY**

SCS PROJECT 681 KULA RIDGE MIDDEN INVENTORY									
Field Bag	Site	Feature	Unit	Layer	Depth	Collected Material Identification	Measurements	Count	Remarks
1	5977	-	-	Surface	-	Glass Bottle	Overall Height: 20.1 cm Body Height: 10.5 cm Mouth Diameter (inner): 1.7 cm Base Diameter: 5.2 cm	1	See below.
<p>Complete, light green glass bottle, automatic machine made (base and two sides), crown top finish, sloped and embossed collar, steeply sloped shoulders, cylindrical and embossed body, flat and embossed base. Collar embossment (raised): 9. Bottle body front embossment: 1st line (arched), PROPERTY OF, 2nd line (arched), MAUI, 3rd line (arched), SODA WORKS, 4th line (horizontal, near base) illegible, appears to be an isosceles triangle. Bottle back embossment: 1st line (horizontal), NET CONTENTS, 2nd line (horizontal), 9 FLUID OUNCES. Base embossment: M or W. Bottle manufacturer unknown due to illegible embossment; suspect Illinois Pacific Glass Co. (1902-25), Illinois Pacific Glass Corp. (1925-30), or Illinois Pacific Coast Co. (1930-32) due to presence of isosceles triangle.</p>									
2	5978	5	-	Surface	-	Glass Bottle	Overall Height: 21.9 cm Body Height: 13.9 cm Mouth Diameter (inner): 1.7 cm Base Diameter: 4.2 cm	1	See below.
<p>Complete, clear glass bottle, automatic machine made (base and two sides), crown top finish, sloped collar, steeply sloped shoulders, raised ring around shoulder, cylindrical and embossed body, body also displays several raised rings around bottle, flat and embossed base. Bottle body front embossment (all horizontal): 1st line: PROPERTY OF, 2nd line: HINGODE, 3rd line: 1/2 of a rising sun motif, 4th line: NET CONTENTS 6 1/2 FL. OZ. Bottle body back embossment (horizontal): CITRIC ACID ADDED 2. Base embossment: 1st line (horizontal): 84, 2nd line (arched): 4911 G 21 manufacturer's stamp 7. The manufacturer's stamp is a horizontal diamond bisected by a vertical oval and a capital I in the intersection of the two shapes. Bottle manufacturer is Owens-Illinois Pacific Coast Co. (1932-43).</p>									
3	5979	-	TU-2	I/6	32 embs	Charcoal	0.1 g	-	Recovered from TU-2 southwest quadrant.
4	5979	2	TU-2	I/6	58 embs	Charcoal with Matrix	1.0 g	-	Recovered from TU-2 southwest quadrant.
5	5979	2	TU-2	II	60 embs	Charcoal	0.1 g	-	Recovered from TU-2 southwest quadrant.
6	5979	2	TU-2	I	64 embs	Charcoal with Matrix	0.9 g	-	Recovered from TU-2 southwest quadrant.
7	5979	2	TU-2	III	60-70 embs	Charcoal with Matrix	5.4 g	-	Recovered from TU-2 southwest quadrant.
8	5979	-	-	Surface	-	Basalt: Adz	11.2 cm Length 3.5 cm Width 3.0 cm Thickness (max)	1	Polished (steep bevel); sides polished, rectangular cross-section.
9	5980	-	-	Surface	-	Possible Basalt: Adz: Blank	-	1	Based on secondary flakes; one altered convex edge; artifact found 4497224 @ 13 m from site.
10	5980	7	-	Surface	-	Edge Altered Basalt: Flake	-	1	From site ring.
11	5980	7	-	Surface	-	Possible Basalt: Awl	-	1	From site ring.
12	5980	6	-	Surface	-	Basalt: Core	-	1	1st-polar striking platform.

SCS PROJECT 681 KULA RIDGE MIDDEN INVENTORY						
Field Site Bag	Feature	Unit	Layer	Depth	Collected Material Identification	Count/Remarks
13	5980	TU-2	I/3	20-30 cmbs	Edge Altered Basalt Flake	1 Based on interior flake; one altered, convex edge
14	5980	TU-2	II/1	36 cmbs	Inclined Basalt Stone	1 Inclining extends from one side of stone to the other; stone underside displays crossed inclining
15	5980	TU-2	II/2	40-50 cmbs	Inclined Basalt Stone Fragments	3 Associated with inclined stone
16	5984	-	Surface	-	Ferrous Metal Door Knob with Vertical Boltlock	1 Artisan design suggest post 1860 manufacture
17	5985	1	Surface	-	Ferrous Metal Can Fragments	2 Can is rectangular, lip side seam, hand soldered; design post 1840
17	5985	1	Surface	-	Non-Diagnostic Ferrous Metal Fragments	50+
17	5985	1	Surface	-	Bottle Glass Body Sherds	2 Amethyst colored
17	5985	1	Surface	-	Bottle Glass Body Sherds	1 Clear, flat
17	5985	1	Surface	-	Bottle Glass Body Sherds	1 Olive green colored
17	5985	1	Surface	-	WhiteWare Rim Sherd	1 Exterior and interior glazed, exterior decorated underglaze with horizontal green, pink/red, and blue stripes
17	5985	1	Surface	-	Rubber Shoe Sole Fragments	11 Shoe nails present
18	5985	1	Surface	-	Bottle Glass Base Sherd	1 Olive green colored, push-up style
18	5985	1	Surface	-	WhiteWare Base Sherd	1
19	5985	1	Surface	-	Bottle Glass Body Sherds	1 Amethyst colored
19	5985	1	Surface	-	Ferrous Metal Can Fragment	1 Can is round cornered, hand soldered tapered can; design post. 1875
19	5985	1	Surface	-	Ferrous Metal Can Fragments	2 Can is cylindrical, double seamed; design post 1895

SCS PROJECT 681 KULA RIDGE MIDDEN INVENTORY						
Field Site Bag	Feature	Unit	Layer	Depth	Collected Material Identification	Count/Remarks
19	5985	1	Surface	-	Non-Diagnostic Ferrous Metal Can Fragments	5
20	5985	1	Surface	-	WhiteWare Rim Sherds	2 Exterior and interior glazed, exterior decorated underglaze with horizontal green, pink/red, and blue stripes
20	5985	1	Surface	-	WhiteWare Body Sherds	5 Exterior and interior glazed, exterior decorated underglaze with horizontal green, pink/red, and blue stripes
20	5985	1	Surface	-	Non-Bottle Glass Vessel Rim Sherd	1 Green colored, rim is undulated and exterior decorated with molded floral pattern
20	5985	1	Surface	-	Non-Bottle Glass Vessel Body Sherd	2 Green colored, exterior decorated with molded floral pattern
20	5985	1	Surface	-	Bottle Glass Finish Sherd	1 Amber colored brandy/wine finish
20	5985	1	Surface	-	Bottle Glass Finish Sherd	1 Crown top finish, post 1904
20	5985	1	Surface	-	Bottle Glass Finish Sherd	1 Crown top finish, post 1904
20	5985	1	Surface	-	Bottle Glass Body Sherd	1 Embossed with words and symbols; DISTILLERIES and a crown design
20	5985	1	Surface	-	Bottle Glass Body Sherds	3 Light green colored
20	5985	1	Surface	-	Bottle Glass Base Sherd	1 Light green colored
20	5985	1	Surface	-	Bottle Glass Body Sherds	4 Clear
20	5985	1	Surface	-	Bottle Glass Body Sherds	6 Olive green colored
20	5985	1	Surface	-	Bottle Glass Body/ Base Sherd	1 Body embossed: 1st line (horizontal): NET CONTENTS, 2nd line (horizontal): 9 FLUID CONTENTS

SCS PROJECT 681 KULA RIDGE MIDDEN INVENTORY									
Field Reg	Site	Feature	Unit	Layer	Depth	Collected Material Identification	Measurements	Count	Remarks
20	5985	1	-	Surface	-	Bottle Glass Body/Shoulders	-	4	One shard embossed: 1st line (horizontal): - AM'S No. 2nd line (horizontal): STANDARD. Amethyst tinted
20	5985	1	-	Surface	-	Bottle Glass Body/Should.	-	1	Amethyst tinted, body is multi-layered
20	5985	1	-	Surface	-	Bottle Glass Body/Base	-	1	Iron for pressing Clothing
21	5985	2	-	Surface	-	Salt Iron Fragment	-	1	Artifact found 50 m from Site 5987 @ 205°
22A	ISO	-	-	Surface	-	Yellowware Body/Should.	-	1	Artifact found 20 m from Site 5987 @ 205°
22B	ISO	-	-	Surface	-	Whiteware Rim Shard	-	1	Exterior and interior glazed, exterior decorated underglaze with blue and green floral transfer print.
23	5974	1	-	Surface	-	Porechha Tea Cup Rim/Body/Base Shard	Overall Height: 6.8 cm	1	

# **APPENDIX F.**

**State Historic Preservation  
Division Letter Dated  
February 27, 2007**

LINDA LINGJI  
GOVERNOR OF HAWAII



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION  
601 KAMOKILA BOULEVARD, ROOM 555  
KAPOLEI, HAWAII 96707

PETER T. YOUNG  
CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES  
GOVERNMENT WATER RESOURCES MANAGEMENT  
  
TIMOTHY K. MAX (DA)  
DEPUTY DIRECTOR  
  
AGRICULTURE  
HAWAIIAN RECREATION  
HAWAIIAN CONSERVATION  
HAWAIIAN WATER RESOURCE MANAGEMENT  
CONSERVATION AND CONTROL LAWS  
CONSERVATION AND RESOURCES ENFORCEMENT  
ENGINEERING  
FORESTRY AND WILDLIFE  
HISTORIC PRESERVATION  
LAND  
WATER RESOURCES

February 27, 2007

Dr. Michael Dega  
Scientific Consultant Services, Inc.  
711 Kapiolani Boulevard, Suite 975  
Honolulu, Hawaii 96813

LOG NO: 2007.0636  
DOC NO: 0702MK21  
Archaeology

Dear Dr. Dega:

**SUBJECT: Chapter 6E-42 Historic Preservation Review --  
Archaeological Inventory Survey on 48.117 Acres for Clayton Nishikawa  
Kealahou Ahupuaa, Makawao District, Island of Maui  
TMK (2) 2-3-001:174**

Thank you for the opportunity to review this revised report which was received by our staff on November 13, 2006 (McGerty *et al.* 2006, *An Archaeological Inventory Survey Report on 48.117 Acres Located in Kealahou Ahupuaa, Kula, Makawao District, Maui Island, Hawaii [TMK: 2-3-001:174]*)...Scientific Consultant Services, Inc., ms. We have previously provided comments on the draft archaeological inventory survey report (DOC NO: 0610MK35) and recommended the following revisions.

13-276-5 (1) a summary of findings

- (2) Map or maps locating all historic properties, with boundaries and one site location map being a relevant portion of the USGS survey topo map
- (3) Table presenting sites with SHIP number, formal type and possible function
- (4) If multiple sites within a major functional type (religious, burial, perm hab and temp hab) include a summary of each type
- (5) Re-evaluation of ideas on historic land use
- (6) If more than five sites within a major functional type, include:
  - (A) A table itemizing each site and relevant constituent structures
  - (B) Map showing distribution of sites within that functional type

The above revisions have been acceptably addressed in the revised report and accompanying correspondence.

We agree that all of the sites are significant under Criterion "D" for information content. As indicated in the review of the draft report, the historic properties represent pre-Contact agricultural use of the area, and post-Contact use for ranching, agriculture and historic habitation.

Dr. Michael Dega

Page 2

We also believe that archaeological monitoring is warranted. We will await submittal of an archaeological monitoring plan for review and acceptance concurrent with applications for proposed development.

The report is acceptable. If you have any questions, please contact Dr. Melissa Kirkendall at (808) 243-5169.

Aloha,



Melanie Chinen, Administrator  
State Historic Preservation Division

MK:kf

c: Bert Rattle, DPWEM, County of Maui  
Jeff Hunt, Director, Dept. of Planning, 250 S. High Street, Wailuku, HI 96793  
Maui Cultural Resources Commission, Dept. of Planning, 250 S. High Street, Wailuku, HI 96793



# **APPENDIX G.**

## **Traffic Impact Assessment Report, July 2006**

**TRAFFIC IMPACT REPORT  
FOR THE**

**KULA RIDGE DEVELOPMENT**

*Prepared for:*

Kula Ridge, LLC  
1849 Wili Pa Loop  
Wailuku, Hawaii 96793

*Prepared by:*

Wilson Okamoto Corporation  
1907 S. Beretania Street, Suite 400  
Honolulu, Hawaii 96826  
WOC Ref #7551-01

July 2006

**Traffic Impact Report**

**Kula Ridge**



Submitted to:  
Kula Ridge, LLC



Submitted by:  
Wilson Okamoto Corporation

July 2006

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## I. INTRODUCTION

### A. Purpose of Study

The purpose of this study is to identify and assess the traffic impacts resulting from the proposed Kula Ridge development in Kula on the island of Maui. The project site for the proposed residential development is located east of Lower Kula Road near the Kula Community Center.

### B. Scope of Study

This report presents the findings and conclusions of the traffic study, the scope of which includes:

1. Description of the proposed project.
2. Evaluation of existing roadway and traffic operations in the vicinity.
3. Analysis of future roadway and traffic conditions without the proposed project.
4. Analysis and development of trip generation characteristics for the proposed project.
5. Superimposing site-generated traffic over future traffic conditions.
6. The identification and analysis of traffic impacts resulting from the proposed project.
7. Recommendations of improvements, if appropriate, that would mitigate the traffic impacts resulting from the proposed project.

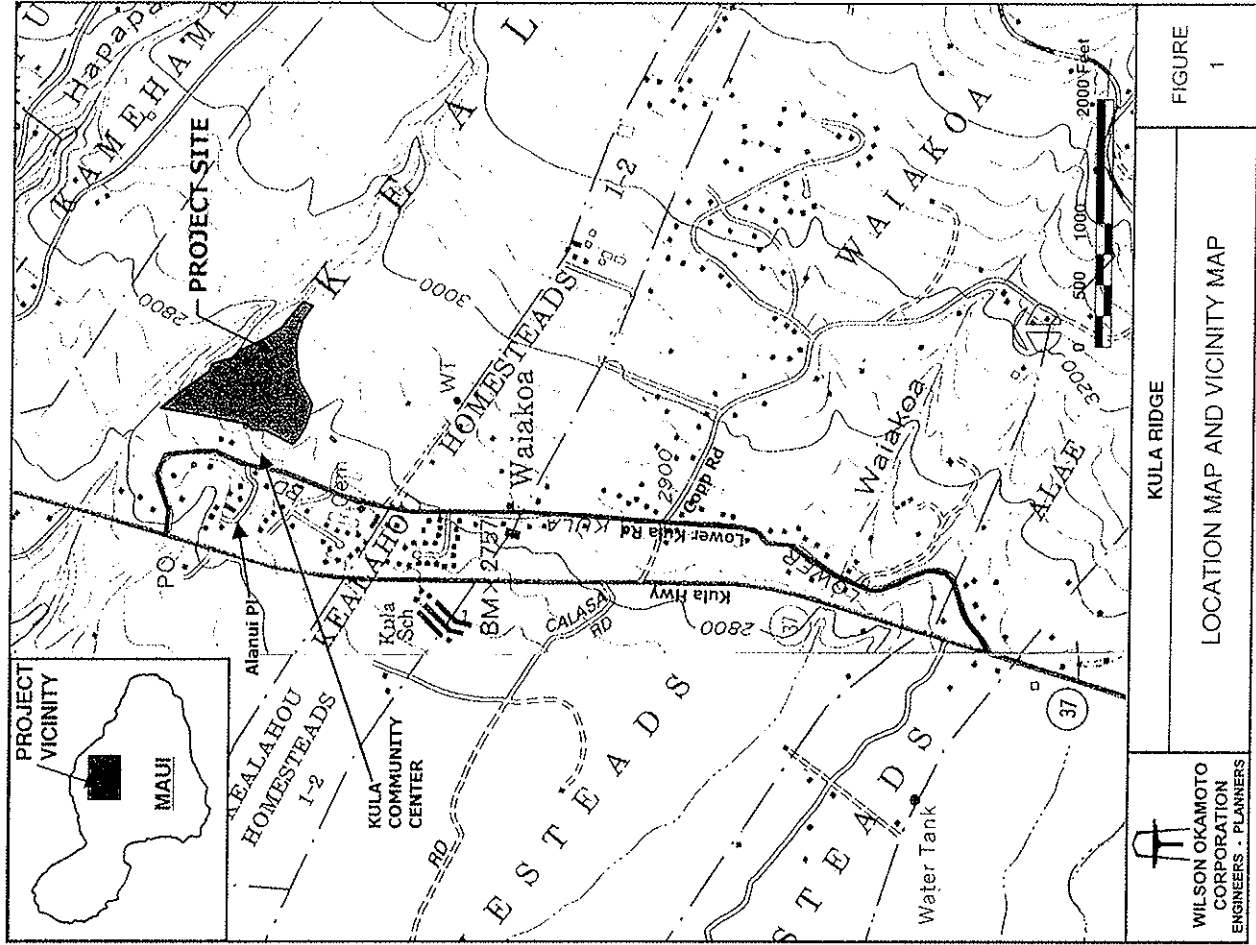
## II. PROJECT DESCRIPTION

### A. Location

The project site is located along Lower Kula Road east of the Kula Community Center in Kula on the island of Maui (see Figure 1) and is further identified as Tax Map Key: 2-3-001: 174. Access to the project site will be provided via a new access road off Lower Kula Road south of Alanui Place.

### B. Project Characteristics

The proposed Kula Ridge development will be located on an approximately 48.117-acre site located east of Lower Kula Road. The project site will be divided into 42 residential lots, 70 affordable housing residential lots, 4 agricultural lots, and



approximately 3-acre park that will be dedicated to the County of Maui. Each residential and agricultural lot is expected to house a residential dwelling that is anticipated to be completed and occupied by the Year 2009. Access to the project site will be provided via a new access road off Lower Kula Road. Figure 2 shows the proposed project site plan.

**III. EXISTING TRAFFIC CONDITIONS**

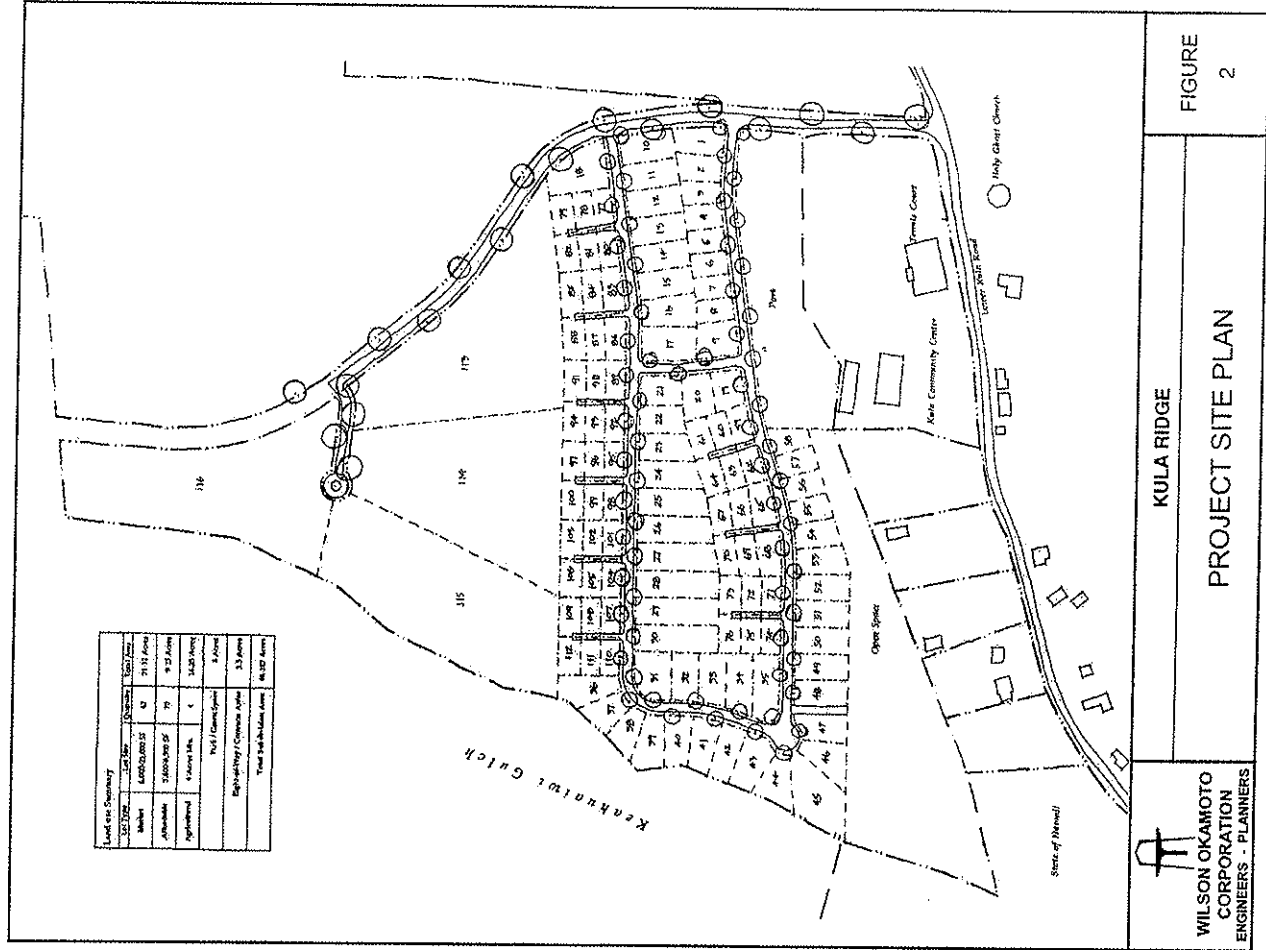
**A. General**

The proposed development will be located east of Lower Kula Road southeast of the intersection with Kula Highway. Kula Highway is a predominately two-way, two-lane State of Hawaii roadway generally oriented in the north-south direction that serves as the primary access road through central Maui between Haleakala Highway in Pukalani and Ulupalakua.

**B. Area Roadway System**

In the vicinity of the project site, Lower Kula Road is a predominantly two-way, two-lane roadway generally oriented in the north-south direction that intersects Kula Highway several times along its alignment. Northwest of proposed project site, Lower Kula Road intersects Alanui Place and the driveway for the Kula Community Center. At this unsignalized intersection, both approaches of Lower Kula Road have one lane that serves all traffic movements. Alanui Place is a two-way, two-lane roadway that provides access to the residential properties along its alignment. At the intersection with Lower Kula Road, the Alanui Place approach has one lane that serves all traffic movements. The westbound approach of the intersection is comprised of the driveway for the Kula Community Center which has one lane that serve all traffic movements at this intersection.

Northwest of intersection with Alanui Place, Lower Kula Road intersects Kula Highway. At this unsignalized T-intersection, the Lower Kula Road approach has one lane that serves left-turn and right-turn traffic movements. The northbound approach of the highway has one lane at this intersection that serves through and right-turn



**WILSON OKAMOTO CORPORATION ENGINEERS - PLANNERS**  
**KULA RIDGE PROJECT SITE PLAN**  
**FIGURE 2**

traffic movements while the southbound approach has one lane that serves left-turn and through traffic movements.

South of the intersection with Alanui Place, Lower Kula Road intersects Copp Road. At this unsignalized intersection, both approaches of Lower Kula Road have one lane that serves all traffic movements. Copp Road is a two-way, two-lane roadway generally oriented in the east-west direction that provides access to the residential neighborhoods along its alignment. At the intersection with Lower Kula Road, both approaches of Copp Road have one lane that serves all traffic movements.

Further southwest, Lower Kula Road intersects Kula Highway again. At this unsignalized t-intersection, the Lower Kula Road approach has one lane that serves left-turn and right-turn traffic movements. The northbound approach of the highway has one lane at this intersection that serves through and right-turn traffic movements while the southbound approach has one lane that serves left-turn and through traffic movements.

#### C. Traffic Volumes and Conditions

##### I. General

###### a. Field Investigation

A field investigation was conducted on May 31 and June 1, 2005, and April 25-26, 2006 and consisted of manual turning movement count surveys during the morning peak period between 6:00 AM and 8:00 AM, and the afternoon peak period between 3:00 PM and 6:00 PM at the following intersections:

- Lower Kula Road, Alanui Place, the Kula Community Center driveway
- Lower Kula Road and Kula Highway (North)
- Lower Kula Road and Copp Road
- Lower Kula Road and Kula Highway (South)

In addition, 24-hour mechanical traffic count surveys were collected along Lower Kula Road and Kula Highway to verify the peak

traffic periods in the project vicinity. Appendix A includes the existing traffic count data.

###### b. Capacity Analysis Methodology

The highway capacity analysis performed in this study is based upon procedures presented in the "Highway Capacity Manual", Transportation Research Board, 2000, and the "Highway Capacity Software", developed by the Federal Highway Administration. The analysis is based on the concept of Level of Service (LOS) to identify the traffic impacts associated with traffic demands during the peak periods of traffic.

LOS is a quantitative and qualitative assessment of traffic operations. Levels of Service are defined by LOS "A" through "F", LOS "A" representing ideal or free-flow traffic operating conditions and LOS "F" unacceptable or potentially congested traffic operating conditions.

"Volume-to-Capacity" (v/c) ratio is another measure indicating the relative traffic demand to the road carrying capacity. A v/c ratio of one (1.00) indicates that the roadway is operating at or near capacity. A v/c ratio of greater than 1.00 indicates that the traffic demand exceeds the road's carrying capacity. The LOS definitions are included in Appendix B.

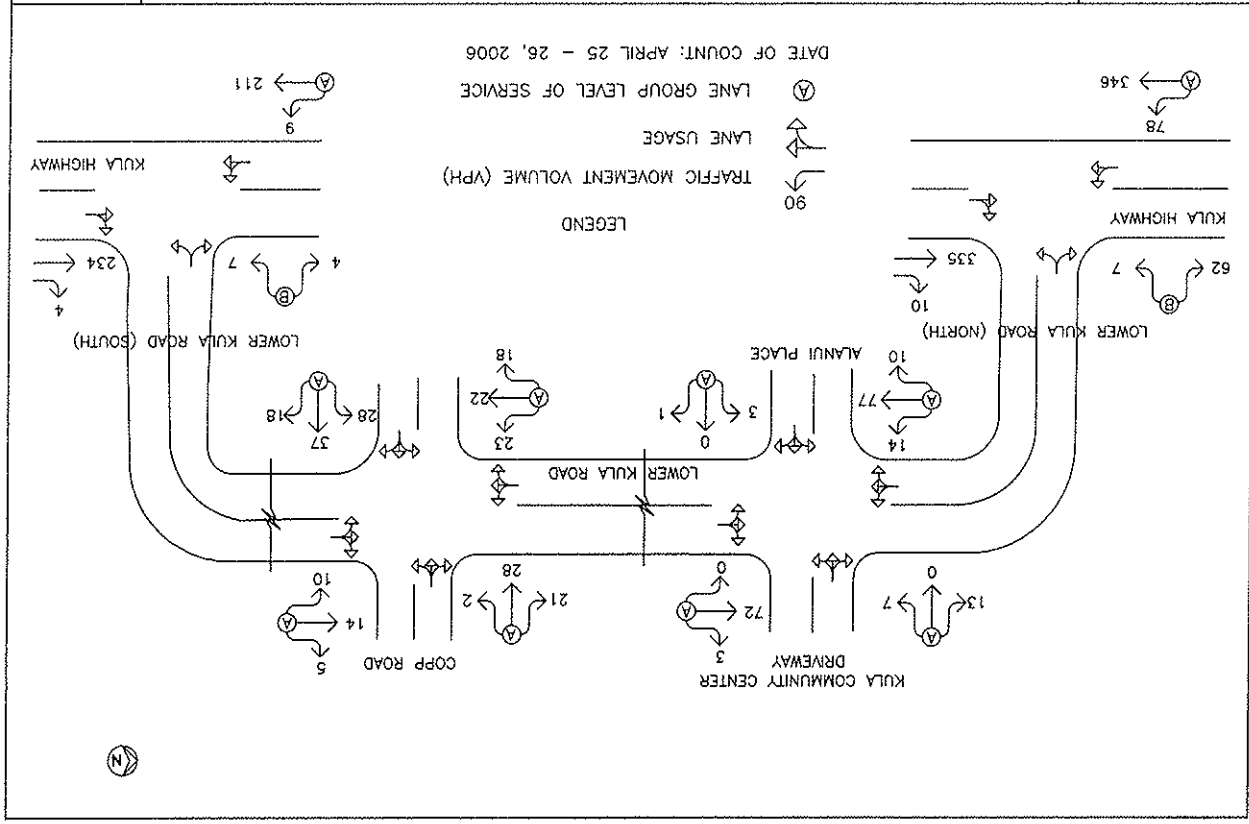
#### 2. Existing Peak period Traffic

##### a. General

Figures 3 and 4 illustrate the existing AM and PM peak period traffic volumes and operating conditions. The morning peak hour of traffic generally occurs between 7:00 AM and 8:00 AM in the project vicinity. In the afternoon, the peak hour of traffic generally occurs between the hours of 3:45 PM and 4:45 PM. Although the peak hours of traffic generally occur around the same time periods at each of the study intersections, the absolute commuter peak hour time periods for

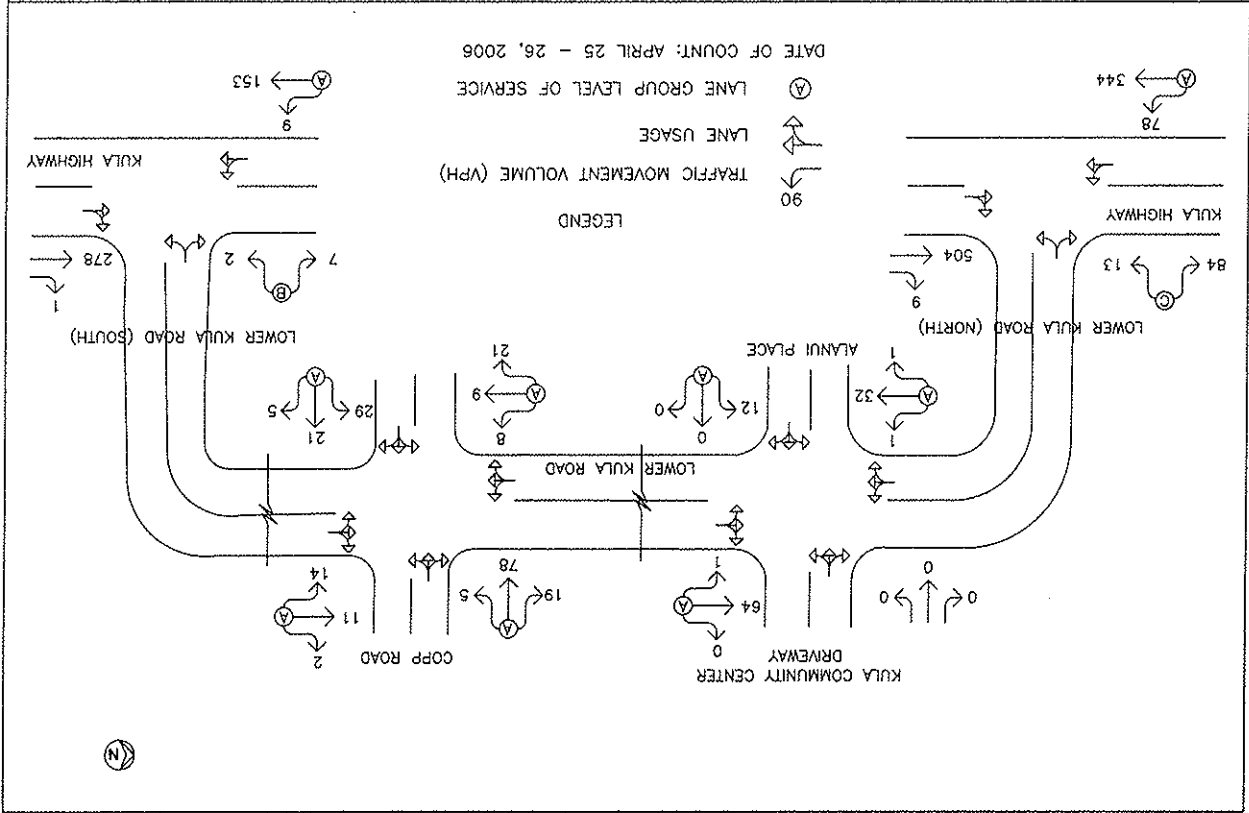
EXISTING PM PEAK HOUR OF TRAFFIC

FIGURE 4



EXISTING AM PEAK HOUR OF TRAFFIC

FIGURE 3



each intersection may differ slightly as shown in Table 1.

Table 1: Peak Periods of Traffic

Intersection	AM Peak	PM Peak
Lower Kula Road/Alanui Place/Kula Community Center Driveway	7:00 AM to 8:00 AM	3:45 PM to 4:45 PM
Lower Kula Road/Kula Highway (North)	7:00 AM to 8:00 AM	3:30 PM to 4:30 PM
Lower Kula Road/Copp Road	7:00 AM to 8:00 AM	3:45 PM to 4:45 PM
Lower Kula Road/Kula Highway (South)	7:00 AM to 8:00 AM	4:00 PM to 5:00 PM

The analysis is based on the above absolute commuter peak hour time periods for each intersection to identify the traffic impacts resulting from the proposed project. LOS calculations are included in Appendix C.

b. **Lower Kula Road, Alanui Place, the Kula Community Center Driveway**  
 At the intersection with Alanui Place and the Kula Community Center driveway, Lower Kula Road carries 65 vehicles northbound and 34 vehicles southbound during the AM peak period. During the PM peak period, traffic volumes are higher with 75 vehicles traveling northbound and 101 vehicles traveling southbound. Both approaches of Lower Kula Road operate at LOS "A" during both peak periods.

The Alanui Place approach of the intersection carries 12 vehicles and 4 vehicles eastbound during the AM and PM peak periods, respectively, while the Kula Community Center driveway carries no vehicles during the AM peak period and 20 vehicles during the PM peak period. Both approaches of the intersection operate at LOS "A" during both peak periods.

c. **Lower Kula Road and Kula Highway (North)**  
 At the northern intersection with Kula Highway, Lower Kula Road carries 97 vehicles westbound during the AM peak period.

During the PM peak period, the traffic volume is less with 69 vehicles traveling westbound. The Lower Kula Road approach of the intersection operates at LOS "C" and LOS "B" during the AM and PM peak periods, respectively.

The Kula Highway approaches of the intersection carry 513 vehicles northbound and 422 vehicles southbound during the AM peak period. During the PM peak period, the overall traffic volume is less with 345 vehicles traveling northbound and 424 vehicles traveling southbound. The critical traffic movement on the highway approaches at this intersection is the southbound left-turn and through traffic movement which operates at LOS "A" during both peak periods.

d. **Lower Kula Road and Copp Road**  
 At the intersection with Copp Road, Lower Kula Road carries 27 vehicles northbound and 38 vehicles southbound during the AM peak period. During the PM peak period, traffic volumes are slightly higher with 29 vehicles traveling northbound and 63 vehicles traveling southbound. Both approaches of Lower Kula Road operate at LOS "A" during both peak periods.

The Copp Road approaches of the intersection carry 55 vehicles eastbound and 102 vehicles westbound during the AM peak period. During the PM peak period, the overall traffic volume is less with 83 vehicles traveling eastbound and 51 vehicles traveling westbound. Both approaches of Copp Road operate at LOS "A" during both peak periods.

e. **Lower Kula Road and Kula Highway (South)**  
 At the southern unsignalized intersection with Kula Highway, Lower Kula Road carries 9 vehicles westbound during the AM peak period. During the PM peak period, the traffic volume is slightly higher with 11 vehicles traveling westbound. The Lower Kula Road



approach of this intersection operates at LOS "B" and LOS "A" during the AM and PM peak periods, respectively.

The Kula Highway approaches of the intersection carry 279 vehicles northbound and 162 vehicles southbound during the AM peak period. During the PM peak period, the overall traffic volume is approximately the same with 238 vehicles traveling northbound and 220 vehicles traveling southbound. The critical traffic movement on the highway approaches at this intersection is the southbound left-turn and through traffic movement which operates at LOS "A" during both peak periods.

**IV. PROJECTED TRAFFIC CONDITIONS**

**A. Site-Generated Traffic**

**1. Trip Generation Methodology**

The trip generation methodology used in this study is based upon generally accepted techniques developed by the Institute of Transportation Engineers (ITE) and published in "Trip Generation, 7<sup>th</sup> Edition," 2003. The ITE trip generation rates are developed empirically by correlating the vehicle trip generation data with various land use characteristics such as the number of vehicle trips generated per dwelling unit. Table 2 summarizes the project site trip generation characteristics applied to the AM and PM peak periods of traffic.

**Table 2: Peak Hour Trip Generation**

SINGLE-FAMILY DETACHED HOUSING		Dwelling Units = 210	
INDEPENDENT VARIABLE		PROJECTED TRIP ENDS	
AM PEAK	ENTER	23	
	EXIT	68	
	TOTAL	91	
PM PEAK	ENTER	77	
	EXIT	45	
	TOTAL	123	

**Table 2: Peak Hour Trip Generation (Cont'd)**

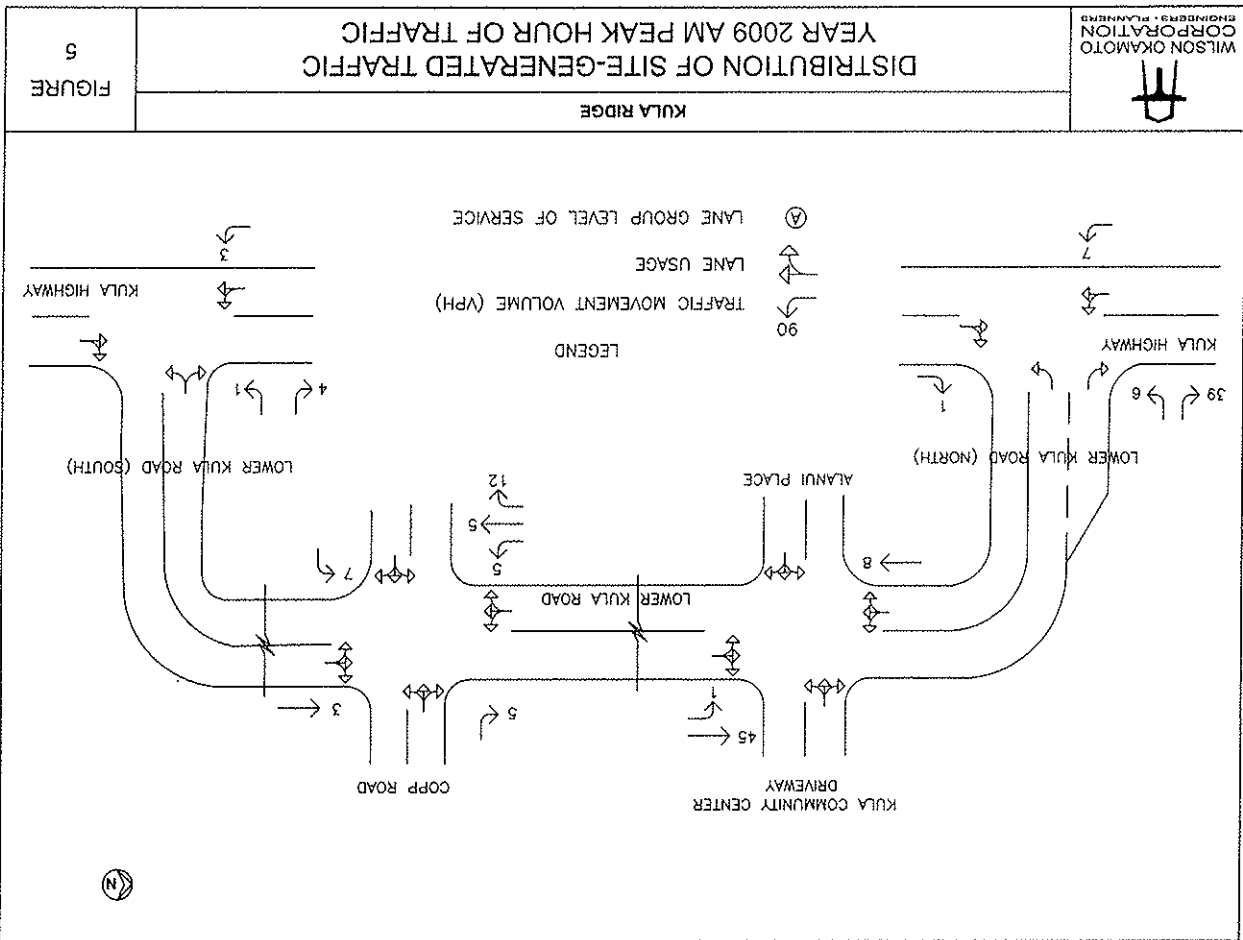
COUNTY PARK		Acres of Development = 5	
INDEPENDENT VARIABLE		PROJECTED TRIP ENDS	
AM PEAK	ENTER	0	
	EXIT	0	
	TOTAL	0	
PM PEAK	ENTER	0	
	EXIT	0	
	TOTAL	0	
<b>TOTALS</b>			
AM PEAK	ENTER	23	
	EXIT	68	
	TOTAL	91	
PM PEAK	ENTER	77	
	EXIT	45	
	TOTAL	123	

**2. Trip Distribution**

Figures 5 and 6 show the distribution of site-generated traffic during the AM and PM peak periods. Access to the proposed Kula Ridge development will be provided via a new access road off Lower Kula Road. The directional distribution of site-generated traffic was based on the prevalent distribution of traffic along Lower Kula Road. As such, 46.9% of the vehicles were assumed to be traveling northbound while 53.1% were assumed to be traveling southbound during the AM peak period. Similarly, during the PM peak period, 67.0% were assumed to be traveling northbound while 33.0% were assumed to be traveling southbound. The directional distribution of traffic at the study intersections was assumed to remain similar to existing conditions.

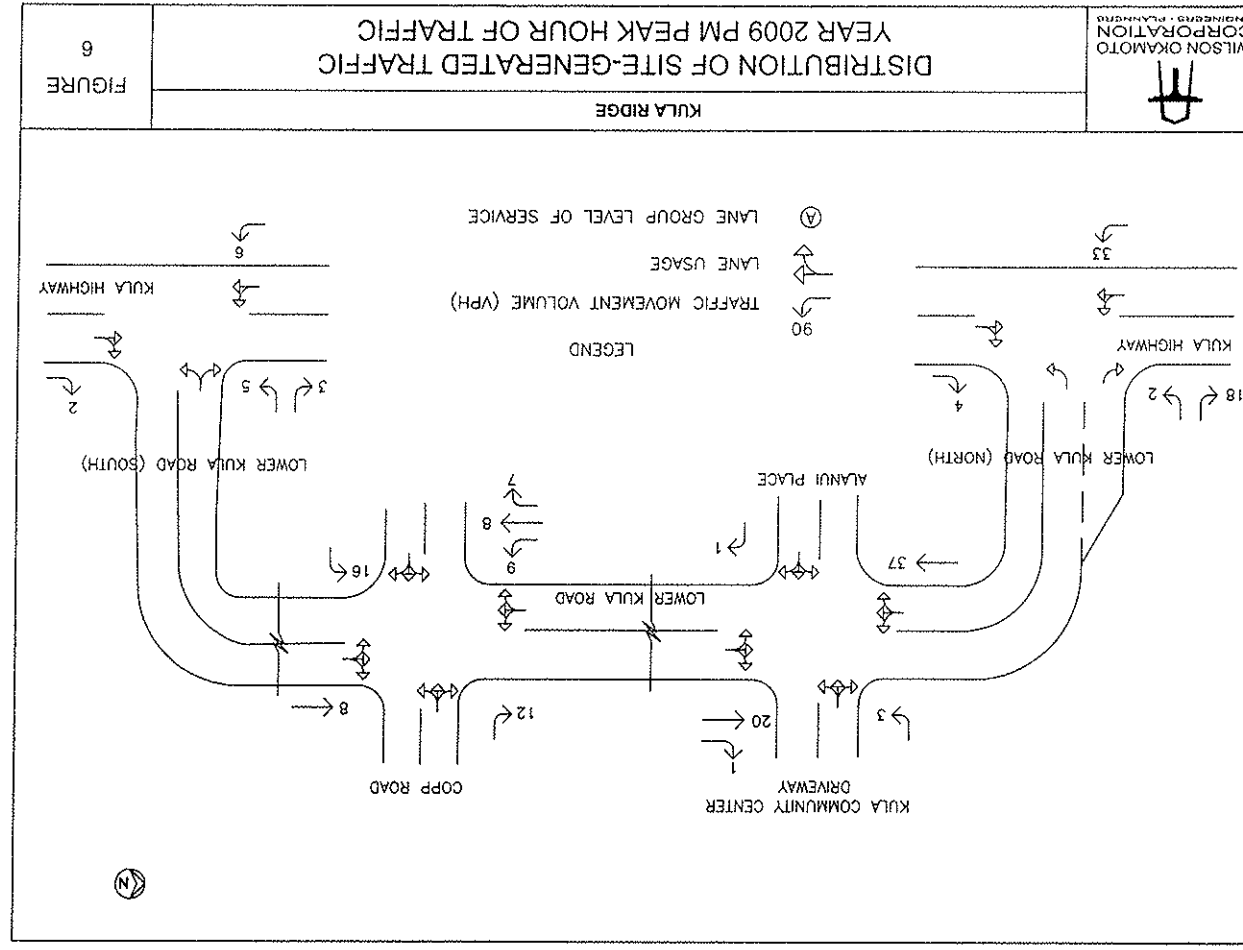
DISTRIBUTION OF SITE-GENERATED TRAFFIC  
YEAR 2009 AM PEAK HOUR OF TRAFFIC

FIGURE 5



DISTRIBUTION OF SITE-GENERATED TRAFFIC  
YEAR 2009 PM PEAK HOUR OF TRAFFIC

FIGURE 6



**B. Through Traffic Forecasting Methodology**

An analysis of both historical traffic data and traffic projections contained within the Maui Long-Range Land Transportation Plan (MLRLTP) was made to determine an appropriate ambient growth of traffic demands in the project vicinity. Using linear regression analysis, historical data indicates an average annual traffic growth rate in the vicinity of approximately 2.7%, while the MLRLTP indicates an average annual traffic growth rate of less than 0.5%. Therefore, for conservative analysis purposes, the travel forecast used in this study is based upon the historical traffic count data obtained from the State Department of Transportation (DOT). Using Year 2006 as the base year, a growth factor of 1.11 was applied to the existing traffic demands on the highways to achieve the projected ambient traffic demands for Year 2009.

**C. Other Considerations**

The Kula Senior Community Housing project is located southwest of the project site adjacent to Kula Highway across from Kula Elementary School. The proposed residential project is expected to be completed by Year 2006 and is expected to provide approximately 36 one-bedroom units for senior citizens with limited annual incomes. As detailed in the "Traffic Impact Report for the Kula Senior Community Housing" dated December 2005, the proposed development is anticipated to generate 2 trips and 4 trips during the AM and PM peak periods, respectively. These trips were assigned to the street network in the study area to account for trips generated by the proposed senior housing project.

**D. Total Traffic Volumes Without Project**

The projected Year 2009 AM and PM peak period traffic volumes and operating conditions without the proposed Kula Ridge development are shown in Figures 7 and 8, and summarized in Table 3. The existing levels of service are provided for comparison purposes. LOS calculations are included in Appendix D.

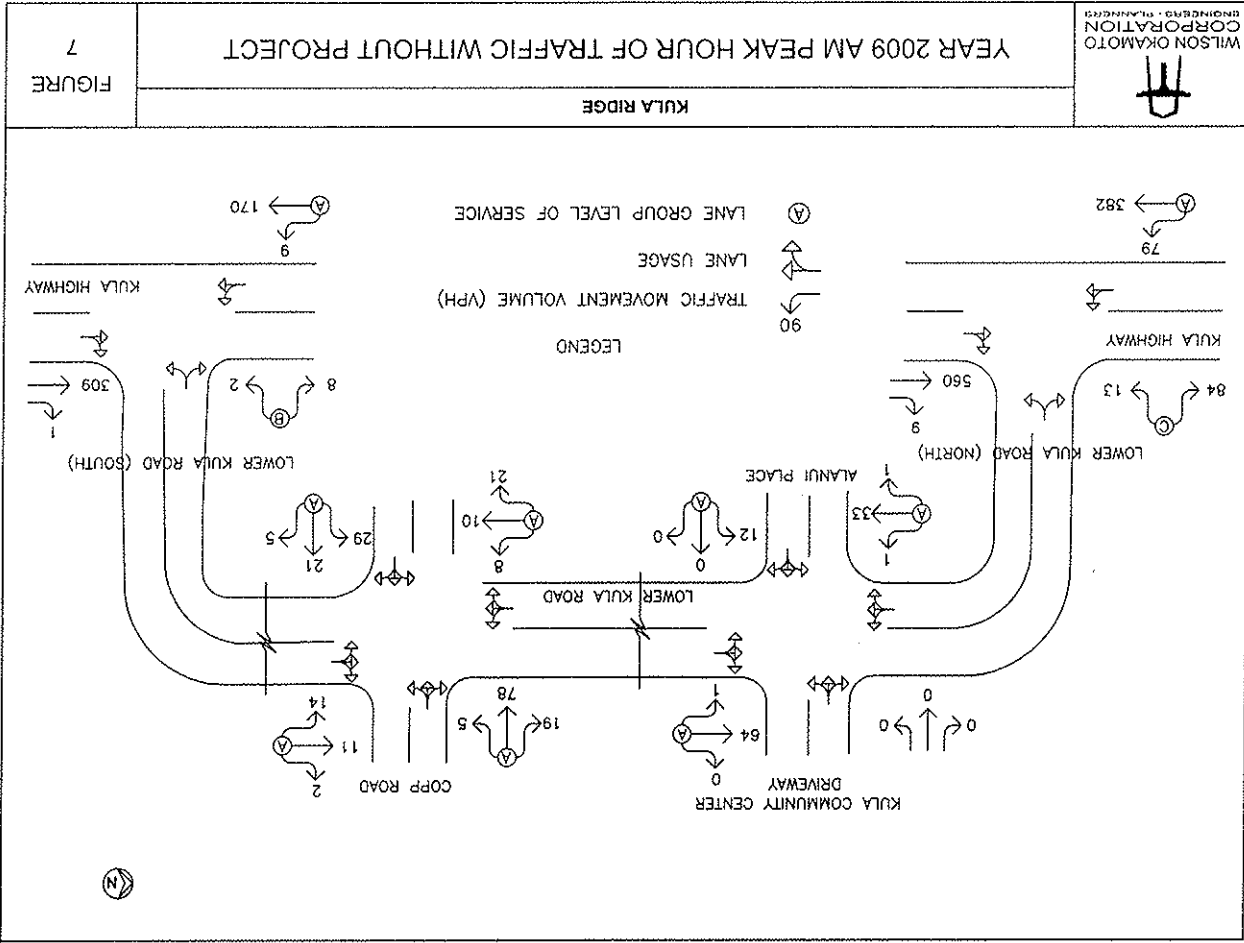


FIGURE 7

YEAR 2009 AM PEAK HOUR OF TRAFFIC WITHOUT PROJECT

KULA RIDGE



Table 3: Existing and Projected (Without Project) LOS Traffic Operating Conditions

Intersection	Critical Approach/Movement	AM		PM	
		Year 2009 w/out Proj	Year 2009 w/out Proj	Year 2009 w/out Proj	Year 2009 w/out Proj
Lower Kula Road/ Alanui Place/ Kula Community Center Driveway	Eastbound	A	A	A	A
	Westbound	-	-	A	A
	Northbound	A	A	A	A
	Southbound	A	A	A	A
Lower Kula Road/ Kula Highway (North)	Westbound	C	C	B	B
	Southbound	A	A	A	A
Lower Kula Road/ Copp Road	Eastbound	A	A	A	A
	Westbound	A	A	A	A
	Northbound	A	A	A	A
	Southbound	A	A	A	A
Lower Kula Road/ Kula Highway (South)	Westbound	B	B	B	B
	Southbound	A	A	A	A

Traffic operations under Year 2009 without project conditions are expected to remain similar to existing conditions. The approaches of the intersections of Lower Kula Road with Alanui Place/Kula Community Center Driveway and Copp Road are expected to continue operating at LOS "A" while the westbound and southbound approaches of the southern intersection with Kula Highway are anticipated to continue operating at LOS "B" and LOS "A," respectively, during the AM and PM peak periods. Similarly, at the northern intersection of Lower Kula Road with Kula Highway, the westbound approach is anticipated to continue operating at LOS "C" and LOS "B" during the AM and PM peak periods, respectively, while the southbound approach is anticipated to continue operating at LOS "A" during both peak periods.

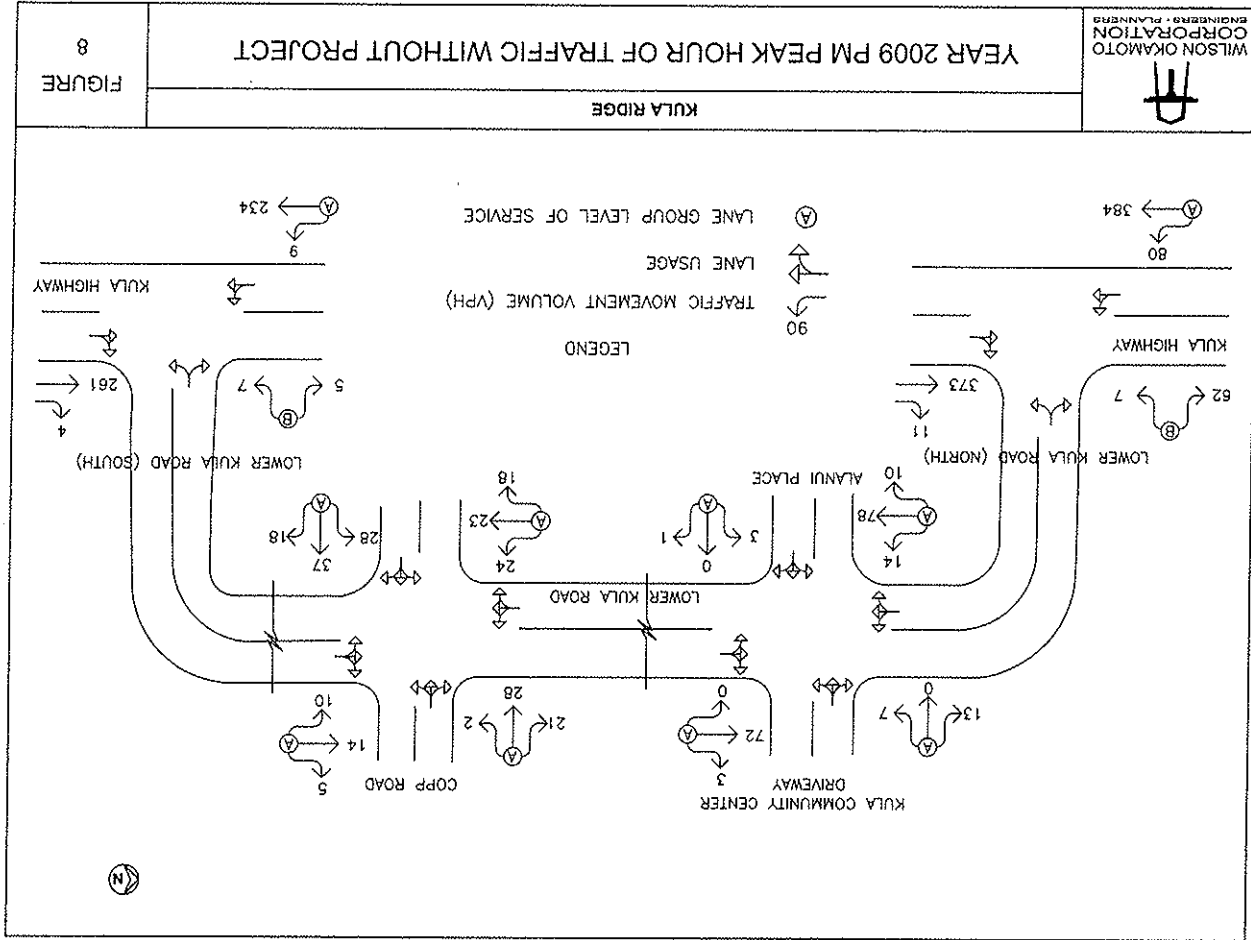


FIGURE 8

*Traffic Impact Report for the Kula Ridge Development*

**E. Total Traffic Volumes With Project**

The projected Year 2009 AM and PM peak period traffic volumes and operating conditions with the development of the proposed Kula Ridge development are shown in Figures 9 and 10. The cumulative volumes consist of site-generated traffic superimposed over Year 2009 projected traffic demands. The traffic impacts resulting from the proposed project are addressed in the following section.

**V. TRAFFIC IMPACT ANALYSIS**

The Year 2009 cumulative AM and PM peak hour traffic conditions with the development of the Kula Ridge development are summarized in Table 4. The westbound approach of the northern intersection of Lower Kula Road with Kula Highway is assumed to have been modified to provide dedicated turning lanes. The existing and projected Year 2009 (Without Project) operating conditions are provided for comparison purposes. LOS calculations are included in Appendix E.

**Table 4: Existing and Projected Year 2009 (With and Without Project) Traffic Operating Conditions**

Intersection	Critical Approach/ Movement	AM				PM			
		Exist	Year 2009		Exist	Year 2009			
			w/out	Proj		w/out	Proj		
Lower Kula Road/ Alanui Place/ Kula Community Center Driveway	Eastbound	A	A	A	A	A	A		
	Westbound	-	-	A	A	A	A		
	Northbound	A	A	A	A	A	A		
		Southbound	A	A	A	A	A	A	
Lower Kula Road/ Kula Highway (North)	Westbound	LT	C	C	C	B	C		
		RT	C	C	C	B	C		
	Southbound	A	A	A	A	A	B		
		A	A	A	A	A	A		
Lower Kula Road/ Copp Road	Eastbound	A	A	A	A	A	A		
	Westbound	A	A	A	A	A	A		
	Northbound	A	A	A	A	A	A		
Lower Kula Road/ Kula Highway (South)	Southbound	A	A	A	A	A	A		
	Westbound	B	B	B	B	B	B		
	Southbound	A	A	A	A	A	A		

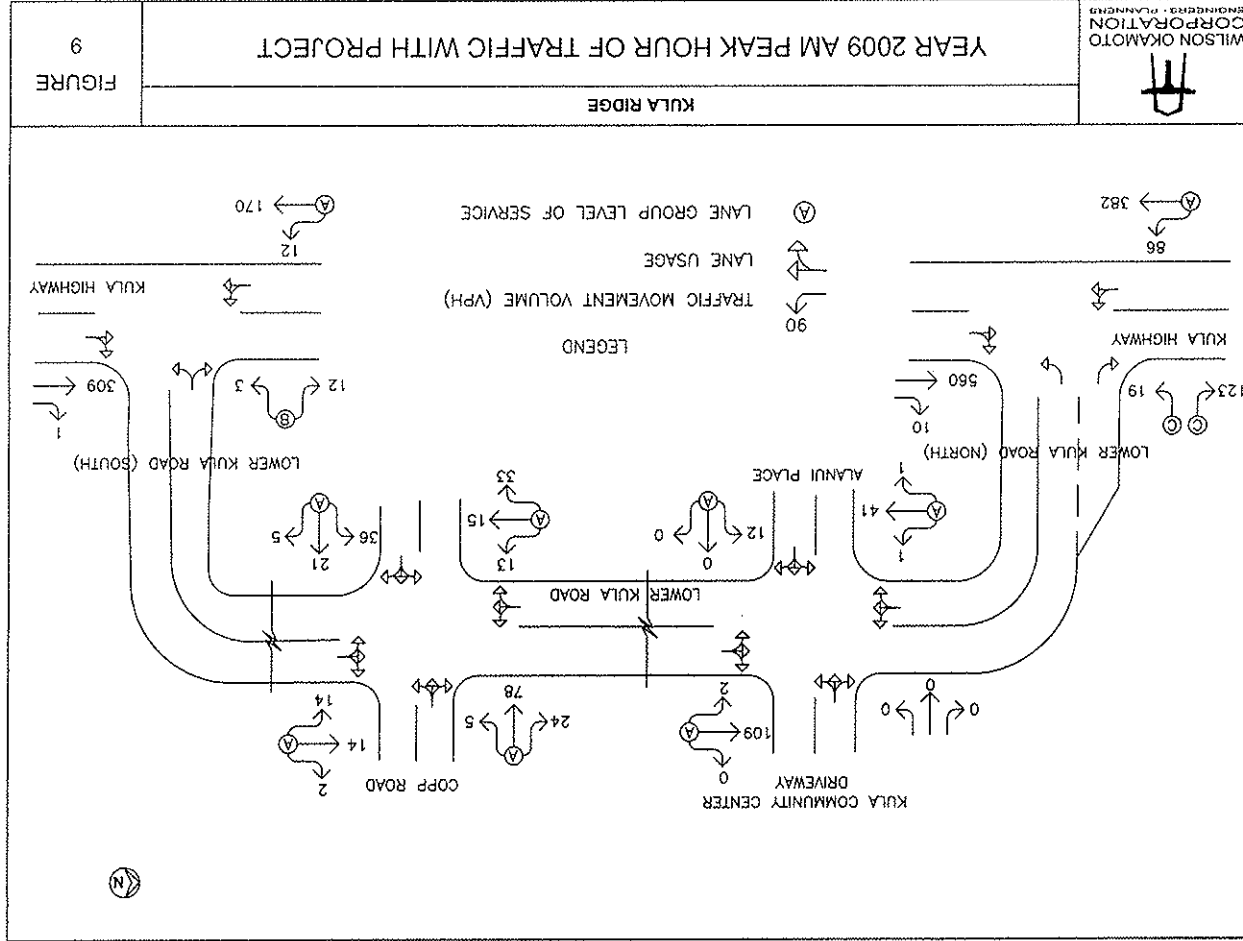


FIGURE 9

YEAR 2009 AM PEAK HOUR OF TRAFFIC WITH PROJECT

KULA RIDGE

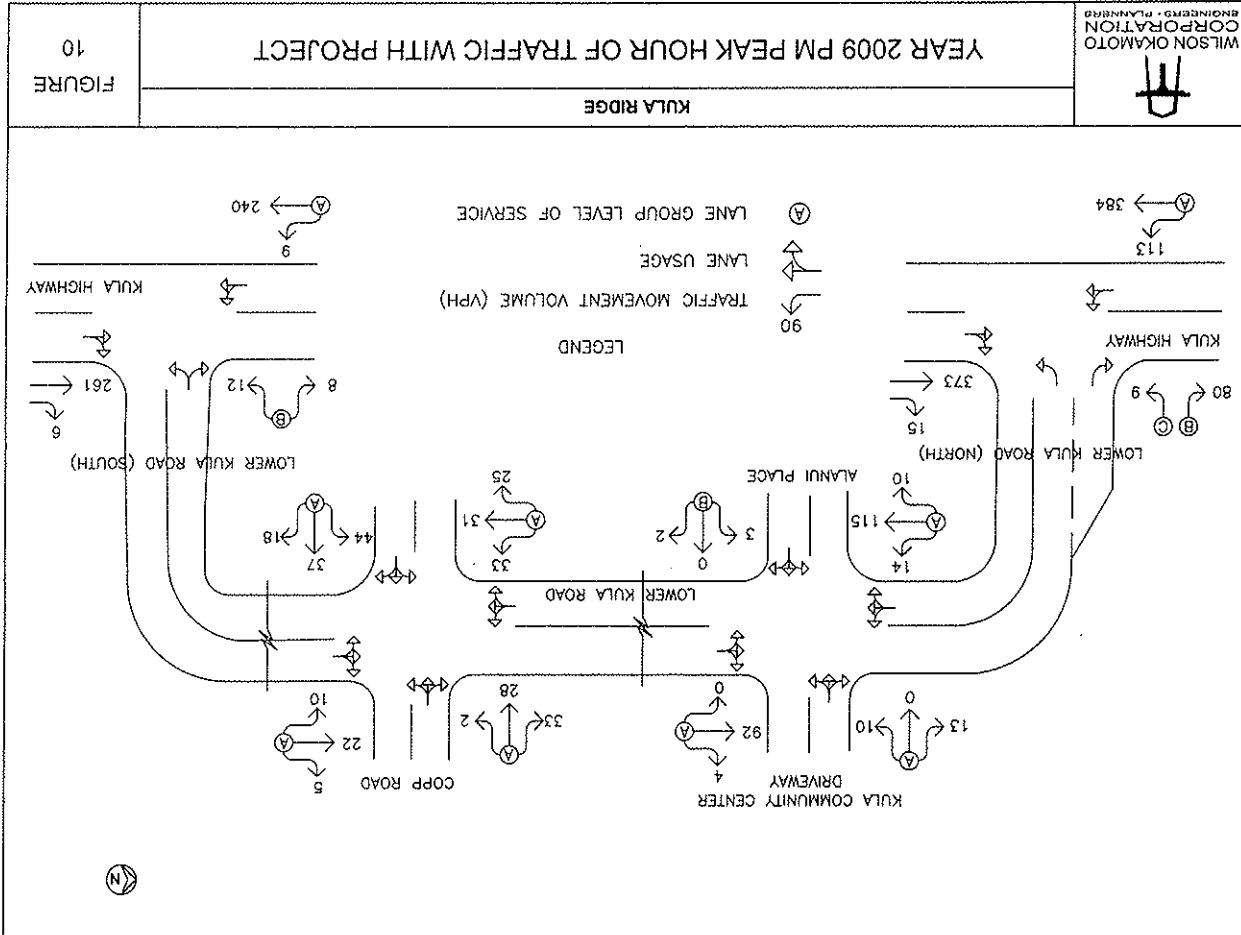


Traffic operations in the vicinity of the proposed Kula Ridge development are expected, in general, to remain similar to existing and Year 2009 without project conditions despite the anticipated increases in traffic along the surrounding roadways due to the project. The critical movements at the intersection of Lower Kula Road with Alanui Place/Kula Community Center Driveway, Copp Road, and Kula Highway (South) are expected to operate at levels of service similar to Year 2009 without project conditions during both peak hours of traffic with the exception of the southbound approach of the intersection with Alanui Place/Kula Community Center driveway which is expected to deteriorate from LOS "A" to LOS "B" during the PM peak period. At the northern intersection of Lower Kula Road with Kula Highway, the westbound left-turn traffic movement is anticipated to operate at LOS "C" during both peak periods while the right-turn traffic movement is anticipated to operate at LOS "C" and LOS "B" during the AM and PM peak periods, respectively.

**VI. RECOMMENDATIONS**

Based on the analysis of the traffic data, the following are the recommendations of this study to be incorporated in the project design.

1. Maintain sufficient sight distance for motorists to safely enter and exit all project roadways.
2. Provide adequate on-site loading and off-loading service areas and prohibit off-site loading operations.
3. Provide adequate turn-around area for service, delivery, and refuse collection vehicles to maneuver on the project site to avoid vehicle-reversing maneuvers onto public roadways.
4. Provide sufficient turning radii at all project roadways to avoid or minimize vehicle encroachments to oncoming traffic lanes.
5. Provide exclusive left-turn and right-turn lanes on the westbound approach of Lower Kula Road at the northern intersection with Kula Highway to minimize the impact of left-turning vehicles on the higher volume of right-turning vehicles on that approach.



#### VII. CONCLUSION

The proposed Kula Ridge development is expected to include 42 residential lots, 70 affordable housing residential lots, 4 agricultural lots, and an approximately 3-acre park that will be dedicated to the County of Maui. With the implementation of the aforementioned recommendations, the proposed Kula Ridge development is not expected to have a significant impact on traffic operations in the vicinity of the project site. The critical movements at the study intersection along Lower Kula Road are expected continue operating at acceptable levels of service despite the addition of site-generated vehicles to the surrounding roadway network due to the provision of exclusive turning lanes at the northern intersection of Lower Kula Road with Kula Highway.

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#### APPENDIX A

#### EXISTING TRAFFIC COUNT DATA

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Start Time	Kula Highway			Lower Kula Hwy (North)			Kula Highway			Lower Kula Hwy (North)			Grand Total	Approch %	Total %
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right			
06:00 AM	2	17	10	0	10	10	0	10	10	0	10	10	59	0	0
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
06:15 AM	3	50	31	0	68	7	0	8	9	0	63	64	88	0	0
06:30 AM	2	29	31	0	68	7	0	8	9	0	63	64	88	0	0
06:45 AM	11	56	45	0	10	13	0	10	13	0	99	93	126	0	0
Total	18	141	141	0	159	159	0	159	159	0	141	290	488	0	0
07:00 AM	11	63	74	3	17	20	0	17	20	0	103	105	199	0	0
07:15 AM	13	94	107	1	22	23	0	22	23	0	139	139	269	0	0
07:30 AM	15	122	137	3	22	25	0	22	25	0	140	142	304	0	0
07:45 AM	39	65	104	6	29	35	0	29	35	0	122	127	280	0	0
Total	78	344	422	13	84	97	0	84	97	0	504	513	1032	0	0
07:00 AM to 07:45 AM - Peak 1 of 1	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	App. Total	Int. Total	
Intersection 07:00 AM	78	344	422	13	84	97	0	84	97	0	504	513	1032	0	0
Volume	18.5	81.5	94.0	0.0	86.6	84.0	0.0	86.6	84.0	0.0	98.2	103.9	202.1	0	0
Percent	18.5	81.5	94.0	0.0	86.6	84.0	0.0	86.6	84.0	0.0	98.2	103.9	202.1	0	0
Peak Factor	15	122	137	3	22	25	0	22	25	0	140	142	304	0	0
High Int.	15	122	137	3	22	25	0	22	25	0	140	142	304	0	0
Volume	15	122	137	3	22	25	0	22	25	0	140	142	304	0	0
High Int.	15	122	137	3	22	25	0	22	25	0	140	142	304	0	0
Volume	15	122	137	3	22	25	0	22	25	0	140	142	304	0	0
Peak Factor	0.770	0	0	0	0	0	0	0	0	0	0	0	0.849	0	0
High Int.	137	0	0	6	0	0	0	0	0	0	0	0	0.849	0	0
Volume	137	0	0	6	0	0	0	0	0	0	0	0	0.849	0	0
High Int.	137	0	0	6	0	0	0	0	0	0	0	0	0.849	0	0
Volume	137	0	0	6	0	0	0	0	0	0	0	0	0.849	0	0
Peak Factor	0.836	0	0	0	0	0	0	0	0	0	0	0	0.836	0	0
High Int.	29	0	0	23	0	0	0	23	0	0	0	0	0.836	0	0
Volume	29	0	0	23	0	0	0	23	0	0	0	0	0.836	0	0
High Int.	29	0	0	23	0	0	0	23	0	0	0	0	0.836	0	0
Volume	29	0	0	23	0	0	0	23	0	0	0	0	0.836	0	0

Start Time	Kula Highway			Lower Kula Highway (North)			Kula Highway			Lower Kula Highway (North)			Grand Total	Approch %	Total %
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right			
03:00 PM	16	54	70	1	23	24	0	23	24	0	59	59	163	0	0
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
03:15 PM	13	22	22	3	13	16	0	13	16	0	77	81	169	0	0
03:30 PM	27	91	118	2	0	15	0	0	15	0	71	81	189	0	0
03:45 PM	15	58	73	3	0	20	0	0	20	0	71	71	222	0	0
Total	71	287	358	9	36	75	0	36	75	0	300	300	733	0	0
04:00 PM	20	86	106	1	0	10	0	0	10	0	97	100	227	0	0
04:15 PM	17	86	103	1	0	12	0	0	12	0	97	97	227	0	0
04:30 PM	16	75	93	1	0	12	0	0	12	0	85	85	201	0	0
04:45 PM	23	90	113	1	0	13	0	0	13	0	74	87	187	0	0
Total	78	337	415	4	0	67	0	0	67	0	14	346	828	0	0
05:00 PM	21	82	103	0	0	17	0	0	17	0	56	57	183	0	0
05:15 PM	34	72	106	1	0	16	0	0	16	0	76	78	201	0	0
05:30 PM	31	68	99	0	0	21	0	0	21	0	74	75	196	0	0
05:45 PM	29	77	106	0	0	6	0	0	6	0	63	64	178	0	0
Total	115	299	414	3	0	65	0	0	65	0	5	274	756	0	0
06:00 PM	264	923	1187	16	0	210	0	0	210	0	0	920	2317	0	0
Approch %	22.2	77.8	84.0	0.0	0.0	97.4	0.0	0.0	97.4	0.0	2.6	24	39.7	0.0	0.0
Total %	11.4	39.8	51.2	0.7	0.0	8.4	0.0	0.0	8.4	0.0	1.0	38.7	51.2	0.0	0.0
03:00 PM to 05:45 PM - Peak 1 of 1	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	App. Total	Int. Total	
Intersection 03:00 PM	79	346	425	10.1	7	118	0	7	118	0	97.1	100	345	839	0
Volume	18.6	81.4	94.0	0.0	0.0	89.9	0.0	0.0	89.9	0.0	2.9	10	34.5	83.9	0
Percent	18.6	81.4	94.0	0.0	0.0	89.9	0.0	0.0	89.9	0.0	2.9	10	34.5	83.9	0
Peak Factor	20	86	106	1	0	20	0	0	20	0	0	3	34.5	83.9	0
High Int.	20	86	106	1	0	20	0	0	20	0	0	3	34.5	83.9	0
Volume	20	86	106	1	0	20	0	0	20	0	0	3	34.5	83.9	0
High Int.	20	86	106	1	0	20	0	0	20	0	0	3	34.5	83.9	0
Volume	20	86	106	1	0	20	0	0	20	0	0	3	34.5	83.9	0
Peak Factor	0.900	0	0	0	0	0	0	0	0	0	0	0	0.924	0	0
High Int.	118	0	0	1	0	180	0	0	180	0	0	0	0.924	0	0
Volume	118	0	0	1	0	180	0	0	180	0	0	0	0.924	0	0
High Int.	118	0	0	1	0	180	0	0	180	0	0	0	0.924	0	0
Volume	118	0	0	1	0	180	0	0	180	0	0	0	0.924	0	0



WILSON OKAMOTO CORPORATION  
1907 S. Beretania Street, Suite 400  
Honolulu, Hawaii 96826

Counter: D4-3891

Counted: TO

Weather: Clear

File Name : LowAlaA  
Site Code : 0000002  
Start Date : 4/26/2006  
Page No : 1

Start Time	Lower Kula Road			Dwy. To Kula Comm. Center			Lower Kula Road			Alanui Place		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	1	1	0	0	0	0	0	0	0	0	0	0
Total	1	24	0	0	0	0	0	0	0	0	0	0
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	1	1	0	0	0	0	0	0	0	0	0	0
Total	1	32	0	0	0	0	0	0	0	0	0	0
Grand Total	2	56	1	0	0	0	0	0	0	0	0	0
Approach %	1.1	30.8	0.5	0	0	0	0	0	0	0	0	0
Total %	1.1	32.4	0.5	0	0	0	0	0	0	0	0	0
PHF	0.250	0.250	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
% App. Total	2.9	94.1	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Volume	32	34	0	0	0	0	0	0	0	0	0	0

Peak Hour for Entire Intersection Begins at 07:45 AM - Peak 1 of 1

Start Time	Lower Kula Road			Dwy. To Kula Comm. Center			Lower Kula Road			Alanui Place		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
03:00 PM	3	13	1	1	0	0	1	18	1	0	0	0
03:15 PM	3	17	1	0	0	0	1	15	1	0	0	0
03:30 PM	3	20	0	0	0	0	1	7	1	0	0	0
03:45 PM	5	22	3	1	0	0	2	18	2	0	0	0
Total	14	69	5	2	0	0	5	56	4	0	0	0
04:00 PM	3	17	4	0	0	0	0	11	0	0	0	0
04:15 PM	4	23	2	0	0	0	0	27	2	0	0	0
04:30 PM	2	15	1	0	0	0	0	27	0	0	0	0
04:45 PM	3	23	1	0	0	0	0	9	0	0	0	0
Total	12	74	8	0	0	0	0	63	2	0	0	0
05:00 PM	0	13	1	0	0	0	0	17	3	0	0	0
05:15 PM	1	11	1	0	0	0	0	13	0	0	0	0
05:30 PM	1	17	2	0	0	0	0	12	2	0	0	0
05:45 PM	0	15	2	0	0	0	0	16	1	0	0	0
Total	2	56	6	0	0	0	0	56	5	0	0	0
Grand Total	28	199	19	10	1	0	10	177	4	192	9	0
Approach %	11.4	80.9	7.7	2.1	0.2	0.0	2.1	92.2	5.7	2.3	1.8	0.0
Total %	5.7	40.9	3.9	50.5	2.1	0.0	7.4	36.3	2.3	39.4	0.2	0.0
PHF	0.700	0.837	0.625	0.842	0.583	0.000	0.650	0.667	0.375	0.694	0.000	0.250
% App. Total	13.9	76.2	9.9	35	0	0	0	98	4	69.4	0	0
Total Volume	14	77	10	101	2	0	20	72	3	75	0	0

Peak Hour for Entire Intersection Begins at 03:45 PM - Peak 1 of 1

File Name : LowAlaA  
Site Code : 0000000  
Start Date : 4/25/2001  
Page No : 1

WILSON OKAMOTO CORPORATION  
1907 S. Beretania Street, Suite 400  
Honolulu, Hawaii 96826

File Name : LowCOPA  
Site Code : 00000001  
Start Date : 4/26/2006  
Page No : 1

Counter: T-1839  
Counted: KT  
Weather: Clear

Start Time	Southbound			Westbound			Copp Road			Lower Kula Road			Northbound			Eastbound			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
06:00 AM	3	0	2	1	6	2	1	1	1	2	2	2	1	1	1	1	0	0	1
06:15 AM	4	0	1	1	4	0	1	1	1	2	2	2	1	1	1	1	0	0	1
06:30 AM	5	0	4	1	18	2	1	1	1	4	4	4	1	1	1	1	0	0	1
06:45 AM	9	0	7	1	7	6	1	1	1	2	2	2	1	1	1	1	0	0	1
07:00 AM	2	1	4	1	18	6	3	3	3	5	5	5	0	0	0	3	3	2	2
07:15 AM	2	2	4	3	24	5	3	3	3	5	5	5	0	0	0	3	3	3	3
07:30 AM	3	3	6	0	25	4	0	0	0	5	5	5	0	0	0	3	3	3	3
07:45 AM	1	1	1	1	16	4	1	1	1	3	3	3	0	0	0	3	3	3	3
Total	27	9	21	38	102	19	14	11	11	22	22	22	27	27	29	21	21	21	21
Grand Total	17	15	29	61	180	29	24	16	16	44	44	44	56	56	33	33	33	33	33
Approch %	27.9	24.6	47.5	3.8	78.1	18.1	8.6	47.5	47.5	7.1	7.1	7.1	9.1	9.1	11.9	11.9	11.9	11.9	11.9
Total %	8	8	21	38	102	19	14	11	11	22	22	22	27	27	29	21	21	21	21
Total Volume	8	9	21	38	102	19	14	11	11	22	22	22	27	27	29	21	21	21	21
% App. Total	21.1	23.7	55.3	4.9	76.5	18.6	7.9	51.9	51.9	40.7	40.7	40.7	7.4	7.4	52.7	36.2	36.2	36.2	36.2
PHF	0.67	0.58	0.79	0.47	0.78	0.79	0.58	0.58	0.58	0.61	0.61	0.61	0.80	0.80	0.83	0.71	0.71	0.71	0.71

Peak Hour for Entire Intersection Begins at 07:00 AM

Peak Hour Analysis From 06:00 AM to 07:45 AM - Peak 1 of 1

Counter: T-1839  
Counted: KT  
Weather: Clear  
File Name : LowCopp  
Site Code : 00000001  
Start Date : 4/25/2006  
Page No : 1

Start Time	Southbound			Westbound			Copp Road			Lower Kula Road			Northbound			Eastbound			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
03:00 PM	5	5	5	10	11	11	3	3	3	3	3	3	3	3	3	3	3	3	3
03:15 PM	7	3	3	15	15	15	4	4	4	4	4	4	4	4	4	4	4	4	4
03:30 PM	4	3	3	10	10	10	3	3	3	3	3	3	3	3	3	3	3	3	3
04:00 PM	9	7	5	21	21	21	1	1	1	1	1	1	1	1	1	1	1	1	1
04:15 PM	5	3	3	14	14	14	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	4	5	2	11	11	11	1	1	1	1	1	1	1	1	1	1	1	1	1
04:45 PM	8	6	1	15	15	15	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	26	16	19	61	61	61	2	2	2	2	2	2	2	2	2	2	2	2	2
Grand Total	58	57	47	162	162	162	12	12	12	12	12	12	12	12	12	12	12	12	12
Approch %	35.8	35.2	29	7.8	55.6	36.6	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8
Total %	9.1	9	7.4	25.5	25.5	25.5	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Total Volume	23	22	18	63	63	63	7	7	7	7	7	7	7	7	7	7	7	7	7
% App. Total	36.5	34.9	28.6	3.9	54.9	41.2	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7
PHF	0.39	0.39	0.26	0.50	0.50	0.50	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

Peak Hour for Entire Intersection Begins at 03:45 PM

Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1

Wilson Okamoto Corporation  
1907 S. Beretania Street, Suite 400  
Honolulu, HI 96826

File Name : Kulikui-SA  
Site Code : 0000004  
Start Date : 6/1/2005  
Page No : 1

Counter: D1-0528  
Counted By: TO  
Weather: CLEAR

Peak Hour From 06:00 AM to 07:45 AM - Peak 1 of 1											
Start Time	Kua Highway			Lower Kua Highway (South)			Kua Highway			Factor	Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		
06:00 AM	0	15	0	0	0	0	0	0	0	15	0
06:15 AM	0	23	0	0	0	0	0	0	0	23	0
06:30 AM	0	28	0	0	0	0	0	0	0	28	0
07:00 AM	1	28	0	0	0	0	0	0	0	29	0
07:15 AM	2	17	0	0	0	0	0	0	0	17	0
07:30 AM	3	52	0	0	0	0	0	0	0	55	0
07:45 AM	3	58	0	0	0	0	0	0	0	61	0
Total	9	153	0	0	0	0	0	0	0	162	0
Approch %	3.6	96.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.7	0.0
Grand Total	10	265	0	0	0	0	0	0	0	275	0
Total %	1.3	35.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.9	0.0
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	App. Total	Int. Total
Lower Kua Highway (South)											
07:00 AM	0	9	0	0	0	0	0	0	0	9	0
07:15 AM	0	27.8	0	0	0	0	0	0	0	27.8	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0
Total	0	27.8	0	0	0	0	0	0	0	27.8	0
Approch %	0.0	99.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	60.7	0.0
Grand Total	4	457	0	0	0	0	0	0	0	457	0
Total %	0.5	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	61.3	0.0
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	App. Total	Int. Total
Kua Highway											
06:00 AM	0	0	0	0	0	0	0	0	0	0	0
06:15 AM	0	0	0	0	0	0	0	0	0	0	0
06:30 AM	0	0	0	0	0	0	0	0	0	0	0
07:00 AM	1	0	0	0	0	0	0	0	0	1	0
07:15 AM	2	0	0	0	0	0	0	0	0	2	0
07:30 AM	3	0	0	0	0	0	0	0	0	3	0
07:45 AM	3	0	0	0	0	0	0	0	0	3	0
Total	9	0	0	0	0	0	0	0	0	9	0
Approch %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grand Total	10	0	0	0	0	0	0	0	0	10	0
Total %	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	App. Total	Int. Total
Kua Highway											
06:00 AM	0	0	0	0	0	0	0	0	0	0	0
06:15 AM	0	0	0	0	0	0	0	0	0	0	0
06:30 AM	0	0	0	0	0	0	0	0	0	0	0
07:00 AM	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0
Approch %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grand Total	0	0	0	0	0	0	0	0	0	0	0
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

File Name : Kulikui-SA  
Site Code : 0000004  
Start Date : 6/1/2005  
Page No : 1

Counter: D1-0528  
Counted By: TO  
Weather: CLEAR

Peak Hour From 03:00 PM to 05:45 PM - Peak 1 of 1											
Start Time	Kua Highway			Lower Kua Highway (South)			Kua Highway			Factor	Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		
03:00 PM	0	39	0	0	0	0	0	0	0	39	0
03:15 PM	1	40	0	0	0	0	0	0	0	41	0
03:30 PM	2	52	0	0	0	0	0	0	0	54	0
03:45 PM	3	52	0	0	0	0	0	0	0	54	0
Total	6	180	0	0	0	0	0	0	0	186	0
Approch %	1.3	97.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.2	0.0
Grand Total	18	603	0	0	0	0	0	0	0	621	0
Total %	1.3	45.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.4	0.0
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	App. Total	Int. Total
Kua Highway											
04:00 PM	1	60	0	0	0	0	0	0	0	61	0
04:15 PM	3	50	0	0	0	0	0	0	0	53	0
04:30 PM	2	51	0	0	0	0	0	0	0	53	0
04:45 PM	1	58	0	0	0	0	0	0	0	59	0
Total	7	219	0	0	0	0	0	0	0	226	0
Approch %	0.0	97.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	52.8	0.0
Grand Total	18	603	0	0	0	0	0	0	0	621	0
Total %	1.3	45.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.4	0.0
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	App. Total	Int. Total
Lower Kua Highway (South)											
04:00 PM	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0
Approch %	0.0	97.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62	0.0
Grand Total	0	0	0	0	0	0	0	0	0	0	0
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7	0.0
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	App. Total	Int. Total
Kua Highway											
04:00 PM	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0
Approch %	0.0	97.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62	0.0
Grand Total	0	0	0	0	0	0	0	0	0	0	0
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7	0.0

File Name : Kulikui-SP  
Site Code : 0000004  
Start Date : 5/31/2005  
Page No : 1

Counter: D1-0528  
Counted By: TO  
Weather: CLEAR

Peak Hour From 03:00 PM to 05:45 PM - Peak 1 of 1											
Start Time	Kua Highway			Lower Kua Highway (South)			Kua Highway			Factor	Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		
03:00 PM	0	39	0	0	0	0	0	0	0	39	0
03:15 PM	1	40	0	0	0	0	0	0	0	41	0
03:30 PM	2	52	0	0	0	0	0	0	0	54	0
03:45 PM	3	52	0	0	0	0	0	0	0	54	0
Total	6	180	0	0	0	0	0	0	0	186	0
Approch %	1.3	97.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.2	0.0
Grand Total	18	603	0	0	0	0	0	0	0	621	0
Total %	1.3	45.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.4	0.0
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	App. Total	Int. Total
Kua Highway											
04:00 PM	1	60	0	0	0	0	0	0	0	61	0
04:15 PM	3	50	0	0	0	0	0	0	0	53	0
04:30 PM	2	51	0	0	0	0	0	0	0	53	0
04:45 PM	1	58	0	0	0	0	0	0	0	59	0
Total	7	219	0	0	0	0	0	0	0	226	0
Approch %	0.0	97.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	52.8	0.0
Grand Total	18	603	0	0	0	0	0	0	0	621	0
Total %	1.3	45.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.4	0.0
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	App. Total	Int. Total
Lower Kua Highway (South)											
04:00 PM	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0
Approch %	0.0	97.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62	0.0
Grand Total	0	0	0	0	0	0	0	0	0	0	0
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7	0.0

File Name : Kulikui-SP  
Site Code : 0000004  
Start Date : 5/31/2005  
Page No : 1

Counter: D1-0528  
Counted By: TO  
Weather: CLEAR

Wilson Okamoto Coporation  
1907 S. Beretana Street #400  
Honolulu, HI 96826

Site: Lower Kula Road  
Date: 04/25/06  
Day: Tuesday

Interval	NB		SB		Combined		Day
	AM	PM	AM	PM	AM	PM	
2:00							
2:15							
2:30							
2:45							
3:00							
3:15							
3:30							
3:45							
4:00							
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8:30							
8:45							
9:00							
9:15							
9:30							
9:45							
10:00							
10:15							
10:30							
10:45							
11:00							
11:15							
11:30							
11:45							
Totals	0	336	0	409	0	745	
10%		45.1		54.9			
Day Totals	336		409		745		
Spills	45.1		54.9				
Peak Hour	03:45		03:45		03:45		
Volume	73		86		159		
tor	0.59		0.90		0.75		

Wilson Okamoto Coporation  
1907 S. Beretana Street #400  
Honolulu, HI 96826

Site: Lower Kula Road  
Date: 04/26/06  
Day: Wednesday

Interval	NB		SB		Combined		Day
	AM	PM	AM	PM	AM	PM	
2:00							
2:15							
2:30							
2:45							
3:00							
3:15							
3:30							
3:45							
4:00							
4:15							
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9:15							
9:30							
9:45							
10:00							
10:15							
10:30							
10:45							
11:00							
11:15							
11:30							
11:45							
Totals	103	59.9	0	0	69	172	
10%		59.9			40.1		
Day Totals	103		0		69	172	
Spills	59.9				40.1		
Peak Hour	06:45				07:00		
Volume	66				31		
tor	0.75				0.55		

1907 S. Beretania Street #400  
Honolulu, HI 96826

1 : Kula Highway : 7410-01 : 01 : 05/1/05

1907 S. Beretania Street #400  
Honolulu, HI 96826

3 : Kula Highway : 7410-01 : 01 : 06/01/05

Time	AM	SB	PM	NB	AM	PM	Combined	Day
12:00								Tuesday
12:15								
12:30								
12:45								
01:00								
1:15								
1:30								
1:45								
2:00	8	180	26	391				
2:15	58	60	112	128				
2:30	67	58	125	128				
2:45	66	66	128	133				
03:00	43	272	56	549				
3:15	65		68	154				
3:30	73		81	154				
3:45	91		72	163				
04:00	86	316	75	609				
4:15	72	76	76	148				
4:30	83	64	83	147				
4:45	75	75	78	153				
05:00	80	301	50	544				
5:15	80	66	66	146				
5:30	63	70	63	133				
5:45	78	78	57	135				
06:00	66	234	62	429				
06:15	64	64	47	128				
6:30	63	54	41	111				
6:45	41	187	32	117				
07:00	53	30	30	73				
07:15	44	44	40	84				
7:45	39	52	39	91				
08:00	26	128	26	64				
08:15	40	40	20	60				
8:30	32	32	14	46				
8:45	21	21	6	27				
09:00	44	122	16	49				
09:15	21	21	10	31				
9:30	26	26	12	38				
9:45	31	31	31	42				
10:00	29	81	10	100				
10:15	18	18	3	23				
10:30	15	15	4	19				
10:45	19	19	2	21				
11:00	16	48	2	21				
11:15	13	13	4	17				
11:30	16	16	7	23				
11:45	3	3	4	7				
Totals	1,900	56.2	1,478	43.8	0	3,378		
Hourly								
Hourly	03:45		03:30			03:30		
Hourly	3:32		3:04			6:26		
Hourly	0.91		0.94			0.96		
Totals	1,900	56.2	1,478	43.8	0	3,378		
Hourly								

Site File: Kula Hwy Printed: 6/2/2005 Page: 1

Time	AM	SB	PM	NB	AM	PM	Combined	Day
12:00								Wednesday
12:15	10	24		6	3		8	
12:30	4				0		4	
12:45	5				2		7	
01:00	3	12		3	0		3	
1:15	1				1		2	
1:30	3				0		3	
1:45	5				2		7	
02:00	3	5		11	0		7	
2:15	0				4		4	
2:30	1				3		4	
2:45	1				0		1	
03:00	0	3		11	0		4	
3:15	1				2		3	
3:30	2				2		4	
3:45	0				3		3	
04:00	4	12		21	2		6	
4:15	4				4		8	
4:30	1				4		5	
4:45	3				11		14	
05:00	6	29		100	26		26	
5:15	5				19		24	
5:30	7				30		37	
5:45	11	122			31		42	
06:00	18	18			58		76	
06:15	25				63		88	
6:30	38				62		100	
6:45	41				92		133	
07:00	30	234			96		128	
07:15	49				124		173	
7:30	80				124		204	
7:45	73				92		165	
08:00					0		0	
08:15								
8:30								
8:45								
09:00								
09:15								
9:30								
9:45								
10:00								
10:15								
10:30								
10:45								
11:00								
11:15								
11:30								
11:45								
Totals	401	33.8	863	66.2	1,304		1,304	
Hourly								
Hourly	07:00		06:45		07:00			
Hourly	2:34		4:36		6:70			
Hourly	0.73		0.88		0.82			
Totals	1,900	56.2	1,478	43.8	0	3,378		
Hourly								

Site File: Kula Hwy Printed: 6/2/2005 Page: 2

## LEVEL OF SERVICE DEFINITIONS

### LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

Level of Service (LOS) criteria are given in Table 1. As used here, control delay is defined as the total elapsed time from the time a vehicle stops at the end of the queue to the time required for the vehicle to travel from the last-in-queue position to the first-in-queue position, including deceleration of vehicles from free-flow speed to the speed of vehicles in the queue.

The average total delay for any particular minor movement is a function of the service rate or capacity of the approach and the degree of saturation. If the degree of saturation is greater than about 0.9, average control delay is significantly affected by the length of the analysis period.

## APPENDIX B

### LEVEL OF SERVICE DEFINITIONS

Table 1: Level-of-Service Criteria for  
Unsignalized Intersections

Level of Service	Average Control Delay (Sec/Veh)
A	$\leq 10.0$
B	$>10.0$ and $\leq 15.0$
C	$>15.0$ and $\leq 25.0$
D	$>25.0$ and $\leq 35.0$
E	$>35.0$ and $\leq 50.0$
F	$>50.0$

TWO-WAY STOP CONTROL SUMMARY

Analyst: IW  
 Agency/Co.: Wilson Okamoto Corporation  
 Date Performed: 6/9/2006  
 Analysis Time Period: AM Peak Period  
 Intersection: Alanui Dr/Lower Kula Rd  
 Jurisdiction: City  
 Units: U. S. Customary  
 Analysis Year: Existing  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Alanui Dr  
 North/South Street: Lower Kula Rd  
 Intersection Orientation: NS  
 Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street:	Approach			Northbound			Southbound		
	Movement	1	2	3	R	L	4	5	6
Volume		64	0	0	1	1	32	1	
Peak-Hour Factor, PHF		0.74	0.74	0.74	0.74	0.50	0.50	0.50	0.50
Hourly Flow Rate, HFR		1	86	0	2	64	2		
Percent Heavy Vehicles		2	--	--	2	--	--	--	--
Median Type/Storage		Undivided /							
Rt Channelized?									
Lanes		0	1	0	0	1	0	1	0
Configuration		LTR No LTR No							
Upstream Signal?		No							

Minor Street: Approach

Movement	Westbound			Eastbound		
	7	8	9	10	11	12
Volume	0	0	0	12	0	0
Peak Hour Factor, PHF	1.00	1.00	1.00	0.60	0.60	0.60
Hourly Flow Rate, HFR	0	0	0	19	0	0
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)	0	0	0	0	0	0
Flared Approach: Exists?/Storage	No /					
Lanes	0	1	0	0	1	0
Configuration	LTR LTR					

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
			4	7	8	9	10	11
Movement	LTR	LTR	LTR	LTR	LTR	LTR	LTR	LTR
v (vph)	1	2	0	0	0	0	0	19
C(m) (vph)	1536	1510						808
v/c	0.00	0.00						0.02
95% queue length	0.00	0.00						0.07
Control Delay	7.3	7.4						9.6
LOS	A	A						A
Approach Delay								9.6
Approach LOS								A

APPENDIX C

CAPACITY ANALYSIS CALCULATIONS  
 EXISTING PEAK PERIOD TRAFFIC ANALYSIS

TWO-WAY STOP CONTROL SUMMARY

Analyst: Wilson Okamoto Corporation  
 Agency/Co.: 6/9/2006  
 Date Performed: PM Peak Period  
 Analysis Time Period: Alanui Dr/Lower Kula Rd  
 Intersection: Alanui Dr  
 Jurisdiction: City  
 Units: U. S. Customary  
 Analysis Year: Existing  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Alanui Dr  
 North/South Street: Lower Kula Rd  
 Intersection Orientation: NS study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street:	Approach			Northbound			Southbound		
	Movement	1	2	3	R	L	4	5	6
Volume	0	72	3	14	77	10			
Peak-Hour Factor, PHF	0.69	0.69	0.69	0.84	0.84	0.84			
Hourly Flow Rate, HFR	0	103	4	16	91	11			
Percent Heavy Vehicles	2	--	--	2	--	--			
Median Type/Storage	Undivided /								
RT Channelized?									
Lanes	0	1	0	0	1	0			
Configuration	LTR								
Upstream Signal?	No								

Minor Street:	Approach			Westbound			Eastbound		
	Movement	7	8	9	R	L	10	11	12
Volume	7	0	13	3	0	1			
Peak Hour Factor, PHF	0.71	0.71	0.71	0.33	0.33	0.33			
Hourly Flow Rate, HFR	9	0	18	9	0	3			
Percent Heavy Vehicles	2	2	2	2	2	2			
Percent Grade (%)	0	0	0	0	0	0			
Flared Approach: Exists?/Storage	No /								
Lanes	0	1	0	0	1	0			
Configuration	LTR								

Delay, Queue Length, and Level of Service

Approach	Movement	Westbound			Eastbound		
		LTR	LTR	LTR	LTR	LTR	LTR
1	4	7	8	9	10	11	12
Lane Config	LTR	LTR	LTR	LTR	LTR	LTR	LTR
v (vph)	0	16	27	27	12	12	
C(m) (vph)	1490	1484	854	744	744		
v/c	0.00	0.01	0.03	0.02	0.02		
95% queue length	0.00	0.03	0.10	0.05	0.05		
Control Delay	7.4	7.5	9.4	9.9	9.9		
LOS	A	A	A	A	A		
Approach Delay		9.4	9.4	9.9	9.9		
Approach LOS		A	A	A	A		

TWO-WAY STOP CONTROL SUMMARY

Analyst: IW  
 Agency/Co.: Wilson Okamoto Corporation  
 Date Performed: 6/9/2006  
 Analysis Time Period: AM Peak Period  
 Intersection: Kula Hwy/Lower Kula Rd (North)  
 Jurisdiction: State  
 Units: U. S. Customary  
 Analysis Year: Existing  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Lower Kula Rd (North)  
 North/South Street: Kula Hwy  
 Intersection Orientation: NS Study period (hrs):

Vehicle Volumes and Adjustments

Major Street:	Approach			Northbound			Southbound		
	Movement	1	2	3	R	L	4	5	6
Volume	504	9	78	344					
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.77	0.77	0.77			
Hourly Flow Rate, HFR	560	10	101	446					
Percent Heavy Vehicles	--	--	--	2	--	--			
Median Type/Storage	Undivided /								
RT Channelized?									
Lanes	1	0	0	0	1				
Configuration	TR								
Upstream Signal?	No								

Minor Street:	Approach			Westbound			Eastbound		
	Movement	7	8	9	R	L	10	11	12
Volume	13	84	84						
Peak Hour Factor, PHF	0.84	0.84	0.84						
Hourly Flow Rate, HFR	15	100	100						
Percent Heavy Vehicles	2	2	2						
Percent Grade (%)	0	0	0						
Flared Approach: Exists?/Storage	No /								
Lanes	0	0	0						
Configuration	LR								

Delay, Queue Length, and Level of Service

Approach	Movement	Westbound			Eastbound		
		LT	LT	LT	LR	LR	LR
1	4	7	8	9	10	11	12
Lane Config	LTR	LTR	LTR	LTR	LTR	LTR	LTR
v (vph)	101	115	115				
C(m) (vph)	1002	420	420				
v/c	0.10	0.27	0.27				
95% queue length	0.34	1.10	1.10				
Control Delay	9.0	16.8	16.8				
LOS	A	C	C				
Approach Delay		16.8	16.8				
Approach LOS		C	C				



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TWO-WAY STOP CONTROL SUMMARY

Analyst: IW  
 Agency/Co.: Wilson Okamoto Corporation  
 Date Performed: 6/9/2006  
 Analysis Time Period: PM Peak Period  
 Intersection: Kula Hwy/Lower Kula Rd (North)  
 Jurisdiction: State  
 Units: U. S. Customary  
 Analysis Year: Existing  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Lower Kula Rd (North)  
 North/South Street: Kula Hwy  
 Intersection Orientation: NS  
 Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street:	Northbound				Southbound				
	L	T	R	L	T	R	L	T	R
Volume	335	10	79	346					
Peak-Hour Factor, PHF	0.86	0.86	0.90	0.90					
Hourly Flow Rate, HFR	389	11	87	384					
Percent Heavy Vehicles	--	--	2	--					
Median Type/Storage	Undivided /								
RT Channelized?	No								
Lanes	1	0	0	1	LT	No			
Configuration	TR								
Upstream Signal?	No								

Minor Street: Approach Movement

Approach Movement	Westbound			Eastbound		
	L	T	R	L	T	R
Volume	7	62		10	11	12
Peak Hour Factor, PHF	0.82	0.82				
Hourly Flow Rate, HFR	8	75				
Percent Heavy Vehicles	2	2				
Percent Grade (%)	0	No	/	0	/	/
Flared Approach: Exists?/Storage	0	0				
Lanes	LR					
Configuration	LR					

Delay, Queue Length, and Level of Service

Approach Movement	Lane Config	Westbound			Eastbound		
		L	T	R	L	T	R
v (vph)	87	83		10	11	12	
C (m) (vph)	1159	574					
v/c	0.08	0.14					
95% queue length	0.24	0.51					
Control Delay	8.4	12.3					
LOS	A	B					
Approach Delay		12.3					
Approach LOS		B					

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Wilson Okamoto Corporation  
 1907 S. Beretania St., Suite 400  
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ALL-WAY STOP CONTROL (AWSC) ANALYSIS

Analyst: IW  
 Agency/Co.: Wilson Okamoto Corporation  
 Date Performed: 6/9/2006  
 Analysis Time Period: AM Peak Period  
 Intersection: Copp Rd/Lower Kula Rd  
 Jurisdiction: City  
 Units: U. S. Customary  
 Analysis Year: Existing  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Copp Rd  
 North/South Street: Lower Kula Rd  
 Worksheet 2 - Volume Adjustments and Site Characteristics

Volume	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	29	21	5	5	78	19	14	11	2	8	9	21
* Thrus Left Lane												

Configuration	Eastbound			Westbound			Northbound			Southbound		
	L1	L2	LTR	L1	L2	LTR	L1	L2	L1	L2	L1	L2
PHF	0.69	0.80	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
Flow Rate	79	126	42	42	42	42	42	42	42	42	42	42
* Heavy Veh	2	2	2	2	2	2	2	2	2	2	2	2
No. Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Opposing-Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Conflicting-Lanes	1	1	1	1	1	1	1	1	1	1	1	1
Geometry group	1	1	1	1	1	1	1	1	1	1	1	1
Duration, T	1.00 hrs.											

Worksheet 3 - Saturation Headway Adjustment Worksheet

Flow Rates:	Eastbound			Westbound			Northbound			Southbound		
	L1	L2	LTR	L1	L2	LTR	L1	L2	L1	L2	L1	L2
Total in Lane	79	126	42	42	42	42	42	42	42	42	42	42
Left-Turn	42	6	10	22	22	10	22	22	10	22	10	22
Right-Turn	7	23	3	23	23	3	23	23	3	23	3	23
Prop. Left-Turns	0.5	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Prop. Right-Turns	0.1	0.2	0.1	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.1	0.2
Prop. Heavy Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Geometry Group	1	1	1	1	1	1	1	1	1	1	1	1
Adjustments Exhibit 17-33:												
hLT-adj	0.2			0.2			0.2			0.2		
hRT-adj	-0.6			-0.6			-0.6			-0.6		
hV-adj	1.7			1.7			1.7			1.7		
hadJ, computed	0.1			-0.1			0.1			-0.1		

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	79		126		42		47	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.07		0.11		0.04		0.04	
hd, final value	4.32		4.12		4.50		4.15	
x, final value	0.09		0.14		0.05		0.05	
Move-up time, m	2.3	2.0	2.1	2.0	2.5	2.0	2.1	2.0
Service Time								

Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	79		126		42		47	
Service Time	2.3		2.1		2.5		2.1	
Utilization, x	0.09		0.14		0.05		0.05	
Dep. headway, hd	4.32		4.12		4.50		4.15	
Capacity	329		376		292		297	
Delay	7.77		7.81		7.75		7.38	
LOS	A		A		A		A	
Approach:								
Delay	7.77		7.81		7.75		7.38	
LOS	A		A		A		A	
Intersection Delay	7.72							
Intersection LOS	A				A		A	

Worksheet 3 - Saturation Headway Adjustment Worksheet

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.94		0.85		0.91		0.75	
Flow Rate	87		58		31		83	
% Heavy Veh	2		2		2		2	
No. Lanes	1		1		1		1	
Opposing-Lanes	1		1		1		1	
Conflicting-lanes	1		1		1		1	
Geometry group	1		1		1		1	
Duration, T	1.00	hrs.						
Volume	28	37	18	2	28	21	10	14
% Thrus Left Lane								

Worksheet 2 - Volume Adjustments and Site Characteristics

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane	87		58		31		83	
Left-Turn	29		2		11		30	
Right-Turn	19		24		5		24	
Prop. Left-Turns	0.3		0.0		0.4		0.4	
Prop. Right-Turns	0.2		0.4		0.2		0.3	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
Geometry Group	1		1		1		1	
Adjustments Exhibit 17-33:								
hRT-adj			0.2		0.2		0.2	
hRT-adj			-0.6		-0.6		-0.6	
hHV-adj			1.7		1.7		1.7	
hadj, computed			-0.0		0.0		-0.1	

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Wilson Okamoto Corporation  
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 Phone: (808) 946-2277 Fax: (808) 946-2253  
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ALL-WAY STOP CONTROL (AWSC) ANALYSIS

Analyst: IW  
 Agency/Co.: Wilson Okamoto Corporation  
 Date Performed: 6/9/2006  
 Analysis Time Period: PM Peak Period  
 Intersection: Copp Rd/Lower Kula Rd  
 Jurisdiction: City  
 Units: U. S. Customary  
 Analysis Year: Existing  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Copp Rd  
 North/South Street: Lower Kula Rd  
 Worksheet 2 - Volume Adjustments and Site Characteristics

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	87		58		31		83	
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.08		0.05		0.03		0.07	
hd, final value	4.18		4.04		4.31		4.18	
x, final value	0.10		0.07		0.04		0.10	
Move-up time, m	2.2	2.0	2.0	2.0	2.3	2.0	2.2	2.0

Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	87		58		31		83	
Service Time	2.2		2.0		2.3		2.2	
Utilization, x	0.10		0.07		0.04		0.10	
Dep. headway, hd	4.18		4.04		4.31		4.18	
Capacity	337		308		281		333	
Delay	7.65		7.32		7.48		7.63	
LOS	A		A		A		A	
Approach:								
Delay	7.65		7.32		7.48		7.63	
LOS	A		A		A		A	
Intersection Delay	7.55		Intersection LOS A					

HCS: Unsignalized Intersections Release 5.1

TWO-WAY STOP CONTROL SUMMARY

Analyst: IW  
 Agency/Co.: Wilson Okamoto Corporation  
 Date Performed: 6/9/2006  
 Analysis Time Period: AM Peak Period  
 Intersection: Kula Hwy/Lower Kula Rd (South)  
 Jurisdiction: State  
 Units: U. S. Customary  
 Analysis Year: Existing  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Lower Kula Rd (South)  
 North/South Street: Kula Hwy  
 Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street:	Northbound				Southbound				
	L	T	R	L	T	R	L	T	R
Approach Movement	1	2	3	4	5	6			

Volume: 278 1 9 153  
 Peak-Hour Factor, PHF: 0.83 0.83 0.66 0.66  
 Hourly Flow Rate, HFR: 334 1 13 231  
 Percent Heavy Vehicles: -- -- 2 --  
 Median Type/Storage: Undivided /  
 RT Channelized?  
 Lanes: 1 0 0 1  
 Configuration: TR LT  
 Upstream Signal? No No

Minor Street: Approach Movement Westbound Eastbound  
 L T R L T R L T R L T R

Volume: 2 7  
 Peak Hour Factor, PHF: 0.75 0.75  
 Hourly Flow Rate, HFR: 2 9  
 Percent Heavy Vehicles: 2 2  
 Percent Grade (%): 0 0 No / 0  
 Flared Approach: Exists?/Storage: 0 0 /  
 Lanes: 0 LR  
 Configuration: LR

Delay, Queue Length, and Level of Service

Approach Movement	NB		SE		Westbound		Eastbound	
	L	T	L	T	L	T	L	T
Approach Movement	1	4	7	8	9	10	11	12
Lane Config	LT	LT	LR	LR				
v (vph)	13				11			
C(m) (vph)	1224				647			
v/c	0.01				0.02			
95% queue length	0.03				0.05			
Control Delay	8.0				10.7			
LOS	A				B			
Approach Delay					10.7			
Approach LOS					B			

HCS+: Unsignalized Intersections Release 5.1

TWO-WAY STOP CONTROL SUMMARY

Analyst: IW  
 Agency/Co.: Wilson Okamoto Corporation  
 Date Performed: 6/9/2006  
 Analysis Time Period: PM Peak Period  
 Intersection: Kula Hwy/Lower Kula Rd (South)  
 Jurisdiction: State  
 Units: U. S. Customary  
 Analysis Year: Existing  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Lower Kula Rd (South)  
 North/South Street: Kula Hwy  
 Intersection Orientation: NS

Study period (hrs): 1.00

APPENDIX D  
 CAPACITY ANALYSIS CALCULATIONS  
 PROJECTED YEAR 2009 PEAK PERIOD TRAFFIC  
 ANALYSIS WITHOUT PROJECT

Vehicle Volumes and Adjustments

Major Street:	Approach	Northbound				Southbound				
		1	2	3	4	5	6	7	8	
	Movement	L	T	R	L	T	R	L	T	R

Volume	234	4	9	211
Peak-Hour Factor, PHF	0.92	0.92	0.93	0.93
Hourly Flow Rate, HFR	234	4	9	226
Percent Heavy Vehicles	--	--	2	--
Median Type/Storage	Undivided	/		
Rt Channelized?				
Lanes	1	0	0	1
Configuration	TR		LT	No
Upstream Signal?	No			No

Minor Street:	Approach	Westbound				Eastbound				
		7	8	9	10	11	12	13	14	
	Movement	L	T	R	L	T	R	L	T	R

Volume	7	4
Peak Hour Factor, PHF	0.61	0.61
Hourly Flow Rate, HFR	11	6
Percent Heavy Vehicles	2	2
Percent Grade (%)	0	No /
Flared Approach: Exists?/Storage	0	No /
Lanes	0	0
Configuration	LR	LR

Delay, Queue Length, and Level of Service

Approach	NE	SB	Westbound				Eastbound			
			4	7	8	9	10	11	12	
Movement	1		LT	LR						
Lane Config										
v (vph)		9		17						
C(m) (vph)		1307		595						
v/c		0.01		0.03						
95% queue length		0.02		0.09						
Control Delay		7.8		11.2						
LOS		A		B						
Approach Delay		11.2		11.2						
Approach LOS		B		B						

TWO-WAY STOP CONTROL SUMMARY

Analyst: Wilson Okamoto Corporation  
 Agency/Co.: 6/9/2006  
 Date Performed: AM Peak Period  
 Analysis Time Period: Alanui Dr/Lower Kula Rd  
 Intersection: Alanui Dr  
 Jurisdiction: City  
 Units: U. S. Customary  
 Analysis Year: 2009 Without Project  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Alanui Dr  
 North/South Street: Lower Kula Rd  
 Intersection Orientation: NS  
 Study period (hrs): 1.00

Major Street:	Vehicle Volumes and Adjustments					
	Approach			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	64	0	1	33	1
Peak-Hour Factor, PHF	0.74	0.74	0.74	0.50	0.50	0.50
Hourly Flow Rate, HFR	1	86	0	2	66	2
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided /					
Rt Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR					
Upstream Signal?	No					

Minor Street:	Vehicle Volumes and Adjustments					
	Approach			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	0	12	0	0
Peak Hour Factor, PHF	1.00	1.00	1.00	0.60	0.60	0.60
Hourly Flow Rate, HFR	0	0	0	19	0	0
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)	0					
Flared Approach: Exists?/Storage	0 / No / 0					
Lanes	0	1	0	0	1	0
Configuration	LTR					

Approach	Delay, Queue Length, and Level of Service					
	Westbound			Eastbound		
Movement	1	4	7	8	9	10
Lane Config	LTR	LTR	LTR	LTR	LTR	LTR
V (vph)	1	2	0	0	0	19
C(m) (vph)	1533	1510	0	0	0	806
v/c	0.00	0.00	0.00	0.00	0.00	0.02
95% queue length	0.00	0.00	0.00	0.00	0.00	0.07
Control Delay	7.3	7.4	7.4	7.4	7.4	9.6
LOS	A					
Approach Delay	9.6					
Approach LOS	A					

TWO-WAY STOP CONTROL SUMMARY

Analyst: IW  
 Agency/Co.: Wilson Okamoto Corporation  
 Date Performed: 6/9/2006  
 Analysis Time Period: PM Peak Period  
 Intersection: Alanui Dr/Lower Kula Rd  
 Jurisdiction: City  
 Units: U. S. Customary  
 Analysis Year: 2009 Without Project  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Alanui Dr  
 North/South Street: Lower Kula Rd  
 Intersection Orientation: NS  
 Study period (hrs): 1.00

Major Street:	Vehicle Volumes and Adjustments					
	Approach			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	72	3	14	78	10
Peak-Hour Factor, PHF	0.69	0.69	0.69	0.84	0.84	0.84
Hourly Flow Rate, HFR	0	104	4	16	92	11
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided /					
Rt Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR					
Upstream Signal?	No					

Minor Street:	Vehicle Volumes and Adjustments					
	Approach			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	7	0	13	3	0	1
Peak Hour Factor, PHF	0.71	0.71	0.71	0.33	0.33	0.33
Hourly Flow Rate, HFR	9	0	18	9	0	3
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)	0					
Flared Approach: Exists?/Storage	0 / No / 0					
Lanes	0	1	0	0	1	0
Configuration	LTR					

Approach	Delay, Queue Length, and Level of Service					
	Westbound			Eastbound		
Movement	1	4	7	8	9	10
Lane Config	LTR	LTR	LTR	LTR	LTR	LTR
V (vph)	0	16	27	27	12	12
C(m) (vph)	1489	1483	852	852	741	741
v/c	0.00	0.01	0.03	0.03	0.02	0.02
95% queue length	0.00	0.03	0.10	0.10	0.05	0.05
Control Delay	7.4	7.5	9.4	9.4	9.9	9.9
LOS	A					
Approach Delay	9.4					
Approach LOS	A					

TWO-WAY STOP CONTROL SUMMARY

Analyst: IW  
 Agency/Co.: Wilson Okamoto Corporation  
 Date Performed: 6/9/2006  
 Analysis Time Period: AM Peak Period  
 Intersection: Kula Hwy/Lower Kula Rd (North)  
 Jurisdiction: State  
 Units: U. S. Customary  
 Analysis Year: 2009 Without Project  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Lower Kula Rd (North)  
 North/South Street: Kula Hwy  
 Intersection Orientation: NS  
 Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:	Northbound				Southbound			
	1	2	3	4	5	6	7	8
Approach Movement	L	T	R	L	T	R	L	T
Volume	560	9	79	382				
Peak-Hour Factor, PHF	0.90	0.90	0.77	0.77				
Hourly Flow Rate, HFR	622	10	102	496				
Percent Heavy Vehicles	--	--	2	--				
Median Type/Storage	Undivided /							
RT Channelized?								
Lanes	1	0	0	1				
Configuration	TR							
Upstream Signal?	No							

Minor Street: Approach Movement

Westbound	Eastbound		
	7	8	9
L	T	R	L
Volume	13	84	
Peak Hour Factor, PHF	0.84	0.84	
Hourly Flow Rate, HFR	15	100	
Percent Heavy Vehicles	2	2	
Percent Grade (%)	0	No	0
Flared Approach: Exists?/Storage	0	No	/
Lanes	0	0	
Configuration	LR		

Delay, Queue Length, and Level of Service

Approach Movement	Westbound			Eastbound		
	4	7	8	9	10	11
Lane Config	LT	L	LR	L	T	R
v (vph)	102		115			
C(m) (vph)	951		377			
v/c	0.11		0.31			
95% queue length	0.36		1.27			
Control Delay	9.2		18.7			
LOS	A		C			
Approach Delay	18.7		18.7			
Approach LOS	C		C			

TWO-WAY STOP CONTROL SUMMARY

Analyst: IW  
 Agency/Co.: Wilson Okamoto Corporation  
 Date Performed: 6/9/06  
 Analysis Time Period: PM Peak Period  
 Intersection: Kula Hwy/Lower Kula Rd (North)  
 Jurisdiction: State  
 Units: U. S. Customary  
 Analysis Year: 2009 Without Project  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Lower Kula Rd (North)  
 North/South Street: Kula Hwy  
 Intersection Orientation: NS  
 Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street:	Northbound				Southbound			
	1	2	3	4	5	6	7	8
Approach Movement	L	T	R	L	T	R	L	T
Volume	373	11	80	384				
Peak-Hour Factor, PHF	0.86	0.86	0.90	0.90				
Hourly Flow Rate, HFR	433	12	88	426				
Percent Heavy Vehicles	--	--	2	--				
Median Type/Storage	Undivided /							
RT Channelized?								
Lanes	1	0	0	1				
Configuration	TR							
Upstream Signal?	No							

Minor Street: Approach Movement

Westbound	Eastbound		
	7	8	9
L	T	R	L
Volume	7	62	
Peak Hour Factor, PHF	0.82	0.82	
Hourly Flow Rate, HFR	8	75	
Percent Heavy Vehicles	2	2	
Percent Grade (%)	0	No	0
Flared Approach: Exists?/Storage	0	No	/
Lanes	0	0	
Configuration	LR		

Delay, Queue Length, and Level of Service

Approach Movement	Westbound			Eastbound		
	4	7	8	9	10	11
Lane Config	LT	L	LR	L	T	R
v (vph)	88		83			
C(m) (vph)	1115		534			
v/c	0.08		0.16			
95% queue length	0.26		0.55			
Control Delay	8.5		13.0			
LOS	A		B			
Approach Delay	13.0		13.0			
Approach LOS	B		B			

HCS+: Unsignalized Intersections Release 5.2

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ALL-WAY STOP CONTROL (AMSC) ANALYSIS

Analyst: IM  
Agency/Co.: Wilson Okamoto Corporation  
Date Performed: 6/9/2006  
Analysis Time Period: AM Peak Period  
Intersection: Copp Rd/Lower Kula Rd  
Jurisdiction: City  
Units: U. S. Customary  
Analysis Year: 2009 Without Project  
Project ID: 7551-01 Kula Ridge  
East/West Street: Copp Rd  
North/South Street: Lower Kula Rd

Worksheet 2 - Volume Adjustments and Site Characteristics

Volume & Thrus Left Lane	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
29	21	5	5	78	19	14	11	2	8	10	21	

Configuration	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
PHF	0.69		0.80		0.61		0.79	
Flow Rate	79		126		43		48	
% Heavy Veh	2		2		2		2	
No. Lanes	1		1		1		1	
Opposing-Lanes	1		1		1		1	
Conflicting-Lanes	1		1		1		1	
Geometry group	1		1		1		1	
Duration, T	1.00 hrs.							

Worksheet 3 - Saturation Headway Adjustment Worksheet

Flow Rates:	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Total in Lane	79		126		43		48	
Left-Turn	42		6		22		10	
Right-Turn	7		23		3		26	
Prop. Left-Turns	0.5		0.0		0.5		0.2	
Prop. Right-Turns	0.1		0.2		0.1		0.5	

Prop. Heavy Vehicle Geometry Group Adjustments Exhibit 17-33:	0.0		1		0.0		1		0.0	
	L1	L2	L1	L2	L1	L2	L1	L2	L1	L2
hlf-adj	0.2		0.2		0.2		0.2		0.2	
hrr-adj	-0.6		-0.6		-0.6		-0.6		-0.6	
hfv-adj	1.7		1.7		1.7		1.7		1.7	
hadj, computed	0.1		-0.1		0.1		-0.1		0.1	

Worksheet 4 - Departure Headway and Service Time

Flow rate	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.07		0.11		0.04		0.04	
hd, final value	4.32		4.13		4.50		4.15	
x, final value	0.09		0.14		0.05		0.06	
Move-up time, m	2.3	2.0	2.1	2.0	2.5	2.0	2.2	2.0
Service Time								

Worksheet 5 - Capacity and Level of Service

Flow Rate	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Service Time	2.3		2.1		2.5		2.2	
Utilization, x	0.09		0.14		0.05		0.06	
Dep. headway, hd	4.32		4.13		4.50		4.15	
Capacity	329		376		293		298	
Delay	7.78		7.82		7.76		7.40	
LOS	A		A		A		A	
Approach:								
Delay	7.78		7.82		7.76		7.40	
LOS	A		A		A		A	
Intersection Delay	7.73		Intersection	LOS	A			

HCS+: Unsignalized Intersections Release 5.2

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ALL-WAY STOP CONTROL (AMSC) ANALYSIS

Analyst: IW  
Agency/Co.: Wilson Okamoto Corporation  
Date Performed: 6/9/2006  
Analysis Time Period: PM Peak Period  
Intersection: Copp Rd/Lower Kula Rd  
Jurisdiction: City  
Units: U. S. Customary  
Analysis Year: 2009 Without Project  
Project ID: 7551-01 Kula Ridge  
East/West Street: Copp Rd  
North/South Street: Lower Kula Rd

Worksheet 2 - Volume Adjustments and Site Characteristics

Volume	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
8 Thrus Left Lane	28	37	18	2	28	21	10	14	5	24	23	18

Configuration	Eastbound			Westbound			Northbound			Southbound		
	L1	L2	LTR	L1	L2	LTR	L1	L2	LTR	L1	L2	LTR
PHF	0.94		0.85			0.91			0.75			
Flow Rate	87		58			30			86			
& Heavy Veh	2		2			2			2			
No. Lanes	1		1			1			1			
Opposing-Lanes	1		1			1			1			
Conflicting-Lanes	1		1			1			1			
Geometry group	1		1			1			1			
Duration, T	1.00	hrs.										

Worksheet 3 - Saturation Headway Adjustment Worksheet

Flow Rates:	Eastbound			Westbound			Northbound			Southbound		
	L1	L2	LTR	L1	L2	LTR	L1	L2	LTR	L1	L2	LTR
Total in Lane	87		58			30			86			
Left-Turn	29		2			10			32			
Right-Turn	19		24			5			24			
Prop. Left-Turns	0.3		0.0			0.3			0.4			
Prop. Right-Turns	0.2		0.4			0.2			0.3			

Prop. Heavy Vehicle 0.0  
Geometry Group 1  
Adjustments Exhibit 17-33: 1  
hRT-adj 0.2  
hRT-adj -0.6  
hRV-adj 1.7  
hadj, computed -0.0

Worksheet 4 - Departure Headway and Service Time

Flow rate	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
hd, initial value	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
x, initial	0.08		0.05		0.03		0.08	
hd, final value	4.19		4.04		4.31		4.19	
x, final value	0.10		0.07		0.04		0.10	
Move-up time, m	2.0		2.0		2.0		2.0	
Service Time	2.2		2.0		2.3		2.2	

Worksheet 5 - Capacity and Level of Service

Flow Rate	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Service Time	2.2		2.0		2.3		2.2	
Utilization, x	0.10		0.07		0.04		0.10	
Dep. headway, hd	4.19		4.04		4.31		4.19	
Capacity	337		308		280		336	
Delay	7.66		7.32		7.47		7.66	
LOS	A		A		A		A	
Approach:								
Delay	7.66		7.32		7.47		7.66	
LOS	A		A		A		A	
Intersection Delay	7.56				Intersection LOS		A	



TWO-WAY STOP CONTROL SUMMARY

Analyst: IW  
 Agency/Co.: Wilson Okamoto Corporation  
 Date Performed: 6/9/2006  
 Analysis Time Period: AM Peak Period  
 Intersection: Kula Hwy/Lower Kula Rd (South)  
 Jurisdiction: State  
 Units: U. S. Customary  
 Analysis Year: 2009 Without Project  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Lower Kula Rd (South)  
 North/South Street: Kula Hwy  
 Intersection Orientation: NS  
 Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street:	Approach			Northbound			Southbound			
	Movement	1	2	3	R	T	4	L	5	6

Volume 309 1 9 170  
 Peak-Hour Factor, PHF 0.83 0.83 0.66 0.66  
 Hourly Flow Rate, HFR 372 1 13 257  
 Percent Heavy Vehicles -- -- 2 --  
 Median Type/Storage Undivided /  
 RT Channelized?  
 Lanes 1 0 0 1  
 Configuration TR LT  
 Upstream Signal? No No

Minor Street: Approach

Movement	Westbound			Eastbound		
	7	8	9	10	11	12

Volume 2 8  
 Peak Hour Factor, PHF 0.75 0.75  
 Hourly Flow Rate, HFR 2 10  
 Percent Heavy Vehicles 2 2  
 Percent Grade (%) 0 0  
 Flared Approach: Exists?/Storage No /  
 Lanes 0 0  
 Configuration LR

Delay, Queue Length, and Level of Service

Approach	Movement	Lane Config	Westbound			Eastbound		
			4	7	8	9	10	11

v (vph) 13 12  
 C(m) (vph) 1185 614  
 v/c 0.01 0.02  
 95% queue length 0.03 0.06  
 Control Delay 8.1 11.0  
 LOS A B  
 Approach Delay 11.0  
 Approach LOS B

TWO-WAY STOP CONTROL SUMMARY

Analyst: IW  
 Agency/Co.: Wilson Okamoto Corporation  
 Date Performed: 6/9/2006  
 Analysis Time Period: PM Peak Period  
 Intersection: Kula Hwy/Lower Kula Rd (South)  
 Jurisdiction: State  
 Units: U. S. Customary  
 Analysis Year: 2009 Without Project  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Lower Kula Rd (South)  
 North/South Street: Kula Hwy  
 Intersection Orientation: NS  
 Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street:	Approach			Northbound			Southbound			
	Movement	1	2	3	R	T	4	L	5	6

Volume 261 4 9 234  
 Peak-Hour Factor, PHF 0.92 0.92 0.93 0.93  
 Hourly Flow Rate, HFR 283 4 9 251  
 Percent Heavy Vehicles -- -- 2 --  
 Median Type/Storage Undivided /  
 RT Channelized?  
 Lanes 1 0 0 1  
 Configuration TR LT  
 Upstream Signal? No No

Minor Street: Approach

Movement	Westbound			Eastbound		
	7	8	9	10	11	12

Volume 7 5  
 Peak Hour Factor, PHF 0.61 0.61  
 Hourly Flow Rate, HFR 11 8  
 Percent Heavy Vehicles 2 2  
 Percent Grade (%) 0 0  
 Flared Approach: Exists?/Storage No /  
 Lanes 0 0  
 Configuration LR

Delay, Queue Length, and Level of Service

Approach	Movement	Lane Config	Westbound			Eastbound		
			4	7	8	9	10	11

v (vph) 9 19  
 C(m) (vph) 1275 575  
 v/c 0.01 0.03  
 95% queue length 0.02 0.10  
 Control Delay 7.8 11.5  
 LOS A B  
 Approach Delay 11.5  
 Approach LOS B

TWO-WAY STOP CONTROL SUMMARY

Analyst: IW  
 Agency/Co.: Wilson Okamoto Corporation  
 Date Performed: 6/9/2006  
 Analysis Time Period: AM Peak Period  
 Intersection: Alanui Dr/Lower Kula Rd  
 Jurisdiction: City  
 Units: U. S. Customary  
 Analysis Year: 2009 With Project  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Alanui Dr  
 North/South Street: Lower Kula Rd  
 Intersection Orientation: NS  
 Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street:	Northbound					Southbound				
	1	2	3	4	5	6	7	8	9	10
Approach Movement	L	T	R	L	T	R	L	T	R	L
Volume	2	64	109	1	41	1	41	1	41	1
Peak-Hour Factor, PHF	0.74	0.74	0.74	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Hourly Flow Rate, HFR	2	86	147	2	82	2	82	2	82	2
Percent Heavy Vehicles	2	--	--	2	--	2	--	--	--	--
Median Type/Storage	Undivided /									
RT Channelized?										
Lanes	0	1	0	0	1	0	0	1	0	0
Configuration	LTR									
Upstream Signal?	No									

Minor Street: Approach

Minor Street:	Westbound			Eastbound		
	7	8	9	10	11	12
Approach Movement	L	T	R	L	T	R
Volume	0	0	0	12	0	33
Peak Hour Factor, PHF	1.00	1.00	1.00	0.60	0.60	0.60
Hourly Flow Rate, HFR	0	0	0	19	0	54
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)	0					
Flared Approach: Exists?/Storage	0 No /					
Lanes	0	1	0	0	1	0
Configuration	LTR					

Delay, Queue Length, and Level of Service

Approach	Westbound			Eastbound		
	1	4	7	8	9	10
Movement	LTR	LTR	LTR	LTR	LTR	LTR
Lane Config	LTR	LTR	LTR	LTR	LTR	LTR
v (vph)	2	2	0	0	0	73
C(m) (vph)	1513	1335				885
v/c	0.00	0.00				0.08
95% queue length	0.00	0.00				0.27
Control Delay	7.4	7.7				9.4
LOS	A	A				A
Approach Delay						9.4
Approach LOS						A

APPENDIX E  
 CAPACITY ANALYSIS CALCULATIONS  
 PROJECTED YEAR 2009 PEAK PERIOD TRAFFIC  
 ANALYSIS WITH PROJECT

TWO-WAY STOP CONTROL SUMMARY

Analyst: IW  
 Agency/Co.: Wilson Okamoto Corporation  
 Date Performed: 6/9/2006  
 Analysis Time Period: PM Peak Period  
 Intersection: Alanui Dr/Lower Kula Rd  
 Jurisdiction: City  
 Units: U. S. Customary  
 Analysis Year: 2009 With Project  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Alanui Dr  
 North/South Street: Lower Kula Rd  
 Intersection Orientation: NS

Study period (hrs): 1.00

Major Street: Approach Movement Northbound Southbound

	Northbound			Southbound		
	L	T	R	L	T	R
Volume	0	92	4	14	115	10
Peak-Hour Factor, PHF	0.69	0.69	0.69	0.84	0.84	0.84
Hourly Flow Rate, HFR	0	133	5	16	136	11
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR					
Upstream Signal?	No					

Minor Street: Approach Movement Westbound Eastbound

	Westbound			Eastbound		
	L	T	R	L	T	R
Volume	10	0	13	3	0	2
Peak Hour Factor, PHF	0.71	0.71	0.71	0.33	0.33	0.33
Hourly Flow Rate, HFR	14	0	18	9	0	6
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)	0					
Flared Approach: Exists?/Storage	0 No / 0					
Lanes	0	1	0	0	1	0
Configuration	LTR					

Delay, Queue Length, and Level of Service

Approach Movement	Westbound			Eastbound		
	LTR	LTR	LTR	LTR	LTR	LTR
1	4	7	8	9	10	11
Lane Config	LTR	LTR	LTR	LTR	LTR	LTR
v (vph)	0	16	32	32	15	15
C(m) (vph)	1435	1446	754	754	707	707
v/c	0.00	0.01	0.04	0.04	0.02	0.02
95% queue length	0.00	0.03	0.13	0.13	0.07	0.07
Control Delay	7.5	7.5	9.9	9.9	10.2	10.2
LOS	A	A	A	A	B	B
Approach Delay	9.9					
Approach LOS	A					

TWO-WAY STOP CONTROL SUMMARY

Analyst: IW  
 Agency/Co.: Wilson Okamoto Corporation  
 Date Performed: 6/9/2006  
 Analysis Time Period: AM Peak Period  
 Intersection: Kula Hwy/Lower Kula Rd (North)  
 Jurisdiction: State  
 Units: U. S. Customary  
 Analysis Year: 2009 With Project  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Lower Kula Rd (North)  
 North/South Street: Kula Hwy  
 Intersection Orientation: NS

Study period (hrs): 1.00

Major Street: Approach Movement Northbound Southbound

	Northbound			Southbound		
	L	T	R	L	T	R
Volume	560	10	86	382		
Peak-Hour Factor, PHF	0.90	0.90	0.77	0.77		
Hourly Flow Rate, HFR	622	11	111	496		
Percent Heavy Vehicles	--	--	2	--	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	1	0	0	0	1	
Configuration	TR					
Upstream Signal?	No					

Minor Street: Approach Movement Westbound Eastbound

	Westbound			Eastbound		
	L	T	R	L	T	R
Volume	19	123		10	11	12
Peak Hour Factor, PHF	0.84	0.84		0.84		
Hourly Flow Rate, HFR	22	146		146		
Percent Heavy Vehicles	2	2		2		
Percent Grade (%)	0					
Flared Approach: Exists?/Storage	0 / 0					
Lanes	1	1		1		
Configuration	L R					

Delay, Queue Length, and Level of Service

Approach Movement	Westbound			Eastbound		
	LTR	LTR	LTR	LTR	LTR	LTR
1	4	7	8	9	10	11
Lane Config	LTR	LTR	LTR	LTR	LTR	LTR
v (vph)	111	22	146	146		
C(m) (vph)	950	214	483	483		
v/c	0.12	0.10	0.30	0.30		
95% queue length	0.40	0.34	1.29	1.29		
Control Delay	9.3	23.7	15.7	15.7		
LOS	A	C	C	C		
Approach Delay	16.7					
Approach LOS	C					

TWO-WAY STOP CONTROL SUMMARY

Analyst: IW  
 Agency/Co.: Wilson Okamoto Corporation  
 Date Performed: 6/9/06  
 Analysis Time Period: PM Peak Period  
 Intersection: Kula Hwy/Lower Kula Rd (North)  
 Jurisdiction: State  
 Units: U. S. Customary  
 Analysis Year: 2009 With Project  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Lower Kula Rd (North)  
 North/South Street: Kula Hwy  
 Intersection Orientation: NS  
 Study period (hrs): 1.00

Major Street:	Vehicle Volumes and Adjustments					
	Northbound			Southbound		
Approach Movement	L	T	R	L	T	R
Volume	373	15	113	384		
Peak-Hour Factor, PHF	0.86	0.86	0.90	0.90		
Hourly Flow Rate, HFR	433	17	125	426		
Percent Heavy Vehicles	--	--	2	--	--	--
Median Type/Storage	Undivided /					
Rt Channelized?						
Lanes	1	0	0	1	LT	NO
Configuration	No TR					
Upstream Signal?	No					

Minor Street:	Vehicle Volumes and Adjustments					
	Westbound			Eastbound		
Approach Movement	L	T	R	L	T	R
Volume	9	80				
Peak Hour Factor, PHF	0.82	0.82				
Hourly Flow Rate, HFR	10	97				
Percent Heavy Vehicles	2	2				
Percent Grade (%)	0	0				
Flared Approach: Exists?/Storage	/					
Lanes	1	1				
Configuration	L	R				

Approach Movement	Delay, Queue Length, and Level of Service					
	NB		SB		Westbound	
Lane Config	L	R	L	R	L	R
v (vph)	125	10	97			
C(m)	110	277	615			
v/c	0.11	0.04	0.16			
95% queue length	0.38	0.11	0.56			
Control Delay	8.7	18.5	11.9			
LOS	A	C	B			
Approach Delay			12.6			
Approach LOS			B			

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ALL-WAY STOP CONTROL (AMSC) ANALYSIS

Analyst: IW  
 Agency/Co.: Wilson Okamoto Corporation  
 Date Performed: 6/9/2006  
 Analysis Time Period: AM Peak Period  
 Intersection: Copp Rd/Lower Kula Rd  
 Jurisdiction: City  
 Units: U. S. Customary  
 Analysis Year: 2009 With Project  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Copp Rd  
 North/South Street: Lower Kula Rd  
 Worksheet 2 - Volume Adjustments and Site Characteristics

Volume	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
36	21	5		5	78	24	14	14	2	13	15	33
% Thrus Left Lane												

Configuration	Eastbound			Westbound			Northbound			Southbound		
	L1	L2	LTR	L1	L2	LTR	L1	L2	LTR	L1	L2	LTR
PHF	0.69		0.61			0.61			0.61			0.61
Flow Rate	89		132			47			75			75
% Heavy Veh	2		2			2			2			2
No. Lanes	1		1			1			1			1
Opposing-Lanes	1		1			1			1			1
Conflicting-Lanes	1		1			1			1			1
Geometry group	1		1			1			1			1
Duration, T	1.00 hrs.											

Worksheet 3 - Saturation Headway Adjustment Worksheet

Flow Rates:	Eastbound			Westbound			Northbound			Southbound		
	L1	L2	LTR	L1	L2	LTR	L1	L2	LTR	L1	L2	LTR
Total in Lane	89		132			47			75			75
Left-Turn	52		6			22			16			16
Right-Turn	7		29			3			41			41
Prop. Left-Turns	0.6		0.0			0.5			0.2			0.2
Prop. Right-Turns	0.1		0.2			0.1			0.5			0.5



TWO-WAY STOP CONTROL SUPARAY

Analyst: IW  
 Agency/Co.: Wilson Okamoto Corporation  
 Date Performed: 6/9/2006  
 Analysis Time Period: AM Peak Period  
 Intersection: Kula Hwy/Lower Kula Rd (South)  
 Jurisdiction: State  
 Units: U. S. Customary  
 Analysis Year: 2009 With Project  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Lower Kula Rd (South)  
 North/South Street: Kula Hwy  
 Intersection Orientation: NS  
 Study period (hrs): 1.00

Major Street: Approach

Northbound		Southbound	
L	T	L	T
1	2	3	4
L	T	R	L
			T
			R

Vehicle Volumes and Adjustments

Volume	309	1	12	170
Peak-Hour Factor, PHF	0.83	0.83	0.66	0.66
Hourly Flow Rate, HFR	372	1	18	257
Percent Heavy Vehicles	--	--	2	--
Median Type/Storage	Undivided /			
RT Channelized?				
Lanes	1	0	0	1
Configuration	TR LT No			
Upstream Signal?	No			

Minor Street: Approach

Westbound		Eastbound	
L	T	L	T
7	8	9	10
L	T	R	L
			T
			R

Volume

Peak Hour Factor, PHF	0.75	12
Hourly Flow Rate, HFR	4	16
Percent Heavy Vehicles	2	2
Percent Grade (%)	0	0
Flared Approach: Exists?/Storage	No	/
Lanes	0	LR
Configuration		

Delay, Queue Length, and Level of Service

Approach	NB		SE		Westbound		Eastbound	
	L	T	L	T	L	T	L	T
Movement	4	7	8	9	10	11	12	
Lane Config	LT	LT	LR	LR	LR	LR	LR	
V (vph)	18	20						
C(m) (vph)	1185	601						
V/C	0.02	0.03						
95% queue length	0.05	0.10						
Control Delay	8.1	11.2						
LOS	A	B						
Approach Delay		11.2						
Approach LOS		B						

Prop. Heavy Vehicle 0.0

Geometry Group	I		1		0.0		1	
	L1	L2	L1	L2	L1	L2	L1	L2
Adjustments Exhibit 17-33:	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hLT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hRT-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hRV-adj	0.0	-0.3	0.0	-0.1	-0.1	-0.1	-0.1	-0.1
hadJ, computed								

Worksheet 4 - Departure Headway and Service Time

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow rate	104	72	39	39	3.20	3.20	3.20	3.20
hd, initial value	3.20	3.20	0.06	0.03	4.43	4.28	0.10	0.14
x, initial	0.09	0.06	0.08	0.05	2.0	2.0	2.0	2.0
hd, final value	4.35	4.10	2.1	2.4	2.4	2.4	2.3	2.3
x, final value	0.13	0.08						
Move-up time, m	2.3	2.0						
Service time								

Worksheet 5 - Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rate	104	72	39	39	118	118	118	118
Service Time	2.3	2.1	2.4	2.4	2.3	2.3	2.3	2.3
Utilization, x	0.13	0.08	0.05	0.05	0.14	0.14	0.14	0.14
Dep. headway, hd	4.35	4.10	4.43	4.28	4.28	4.28	4.28	4.28
Capacity	354	322	289	289	368	368	368	368
Delay	7.97	7.46	7.66	7.66	7.98	7.98	7.98	7.98
LOS	A	A	A	A	A	A	A	A

Approach: Delay 7.97 7.46 7.66 7.66 7.98  
 LOS A A A A A  
 Intersection Delay 7.83 Intersection LOS A

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: IW  
 Agency/Co.: Wilson Okamoto Corporation  
 Date Performed: 6/9/2006  
 Analysis Time Period: PM Peak Period  
 Intersection: Kula Hwy/Lower Kula Rd (South)  
 Jurisdiction: State  
 Units: U. S. Customary  
 Analysis Year: 2009 With Project  
 Project ID: 7551-01 Kula Ridge  
 East/West Street: Lower Kula Rd (South)  
 North/South Street: Kula Hwy  
 Intersection Orientation: NS  
 Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street:	Approach	Northbound			Southbound		
		1	2	3	4	5	6
Movement	L	T	R	L	T	R	
Volume		261	6	9	240		
Peak-Hour Factor, PHF		0.92	0.92	0.93	0.93		
Hourly Flow Rate, HFR		283	6	9	258		
Percent Heavy Vehicles		--	--	2	--	--	--
Median Type/Storage		Undivided /					
RT Channelized?							
Lanes		1	0	0	1		
Configuration		TR LT No					
Upstream Signal?		No					

Minor Street: Approach

Movement	Westbound			Eastbound		
	7	8	9	10	11	12
Lane Config	L	T	R	L	T	R
Volume	12	8	8			
Peak Hour Factor, PHF	0.61	0.61	0.61			
Hourly Flow Rate, HFR	19	13	2			
Percent Heavy Vehicles	2	2	2			
Percent Grade (%)	0	0	0			
Flared Approach: Exists?/Storage	No	No	No			
Lanes	0	0	0			
Configuration	LR					

Delay, Queue Length, and Level of Service

Approach	Movement	Lane Config	Westbound			Eastbound			
			4	7	8	9	10	11	12
			LT	LR	LR	LR	LR	LR	LR
v (vph)			9	32	32				
C(m) (vph)			1273	567	567				
V/C			0.01	0.06	0.06				
95% queue length			0.02	0.18	0.18				
Control Delay			7.8	11.7	11.7				
LOS			A	B	B				
Approach Delay				11.7	11.7				
Approach LOS				B	B				

# **APPENDIX H.**

## **Preliminary Engineering and Drainage Reports, September 2006**



**PRELIMINARY DRAINAGE REPORT**

**FOR**

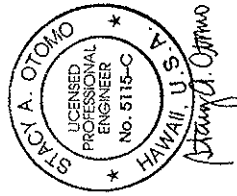
**KULA RIDGE SUBDIVISION**

Kula, Maui, Hawaii

T.M.K.: (2) 2-3-001: 174

Prepared for:

Kula Ridge, LLC  
1849 Wili Pa Loop  
Wailuku, Maui, Hawaii 96793



Prepared by:



CONSULTING CIVIL ENGINEERS  
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WAILUKU, MAUI, HAWAII 96793  
PHONE: (808) 242-0032  
FAX: (808) 242-5779

September 2006

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- I. INTRODUCTION
- II. SITE LOCATION AND PROJECT DESCRIPTION
- III. EXISTING TOPOGRAPHY AND SOIL CONDITIONS
- IV. EXISTING DRAINAGE CONDITIONS
- V. FLOOD AND TSUNAMI ZONE
- VI. PROPOSED DRAINAGE PLAN
- VII. HYDROLOGIC CALCULATIONS
- VIII. CONCLUSION
- IX. REFERENCES

EXHIBITS

- 1 Location Map
- 2 Vicinity Map
- 3 Soil Survey Map

APPENDICES

- A Hydrologic and Hydraulic Calculations

PRELIMINARY DRAINAGE REPORT  
FOR

KULA RIDGE SUBDIVISION  
Kula, Maui, Hawaii

I. INTRODUCTION

The purpose of this report is to examine both the existing and proposed drainage conditions for the proposed project.

II. SITE LOCATION AND PROJECT DESCRIPTION

The subject property is identified as T.M.K.: (2) 2-3-001: 174, which encompasses an area of 48.117 acres. It is also Lot 2 of the G and R Von Tempisky Trust Subdivision. The project site is bordered by Keahuaui Gulch and Lot 1 of the G and R Von Tempisky Trust Subdivision to the north, Lot 1 of the G and R Von Tempisky Trust Subdivision to the east, and Lot 3 of the G and R Von Tempisky Trust Subdivision to the south.

The development plan includes approximately 112 residential lots, 4 agricultural lots, and a 5-acre park site which will be dedicated to the County. Associated improvements include grading, paved roadways, underground utilities and landscaping.

III. EXISTING TOPOGRAPHY AND SOIL CONDITIONS

The project site is presently undeveloped and used as an open pasture. The majority of the site is overgrown with weeds and various grasses.

The elevation on the site ranges from elevation 3,085 feet above sea level at the northeastern corner of the property to 2,700 feet above mean sea level at the northwesterly corner, averaging approximately 14.8%.

According to the "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii (August, 1972)," prepared by the United States Department of Agriculture Soil Conservation Service, the soil within the project site is classified as Kula cobbly loam, (KxAd). Kula cobbly loam is characterized as having moderately rapid permeability, medium runoff, and a moderate erosion hazard.

IV. EXISTING DRAINAGE CONDITIONS

Presently, the majority of the onsite runoff sheet flows across the project site in a northeast to southwest direction toward the adjacent properties. A portion of the runoff sheet flows directly into Keahuaui Gulch. The runoff eventually discharges into the ocean.

It is estimated that the existing 50-year storm runoff from the undeveloped project site is 55.66 cfs.

V. FLOOD AND TSUNAMI ZONE

According to Panel Number 150003 0001-0400 of the Flood Insurance Rate Map, dated March 16, 1995, prepared by the United States Federal Emergency Management Agency, it appears that the project site is situated in Flood Zone C. Flood Zone C represents areas of minimal flooding.

VI. PROPOSED DRAINAGE PLAN

After the development of the proposed project, it is estimated that the 50-year storm runoff will be 164.59 cfs, a net increase of 108.93 cfs. Onsite runoff will be intercepted by grated catch basins located within the grassed shoulder areas. The runoff will be conveyed to an onsite detention basin, which will be located in the northwestern corner of the project site.

Overflows from the detention basin will be allowed to sheet flow into Keahuaui Gulch at a rate less than the present condition. The detention basin will be designed and sized to accommodate the increase in surface runoff volume from a 50-year 1-hour storm generated from the proposed project.

The drainage design criteria will be to minimize any alterations to the natural pattern of the existing onsite surface runoff. This is in accordance with the drainage standards for the County of Maui.

VII. HYDROLOGIC CALCULATIONS

The hydrologic calculations are based on the "Rules for the Design of Storm Drainage Facilities in the County of Maui," and the "Rainfall Frequency Atlas of the Hawaiian Islands," Technical Paper No. 43, U. S. Department of Commerce, Weather Bureau.

Rational Formula Used:  $Q = CIA$

Where  $Q$  = rate of flow (cfs)

$C$  = rainfall coefficient

$I$  = rainfall intensity for a duration equal to the time of concentration (inches/hour)

$A$  = drainage area (Acres)

See Appendix A for Hydrologic Calculations

#### VIII. CONCLUSION

Onsite runoff will be intercepted by grated catch basins located within the grassed shoulder areas. The runoff will be conveyed to an onsite detention basin, which will be located in the northwestern corner of the project site. Overflows from the detention basin will be allowed to sheet flow into Keahuaiwi Gulch at a rate less than the existing condition. The detention basin will be designed and sized to accommodate the increase in surface runoff volume from a 50-year 1-hour storm generated from the proposed project.

There will be no increase in runoff sheet flowing from the project site onto the adjoining or downstream properties. This is in accordance with Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui.

Therefore, it is our professional opinion that the proposed development will not have an adverse effect on the adjoining or downstream properties.

#### IX. REFERENCES

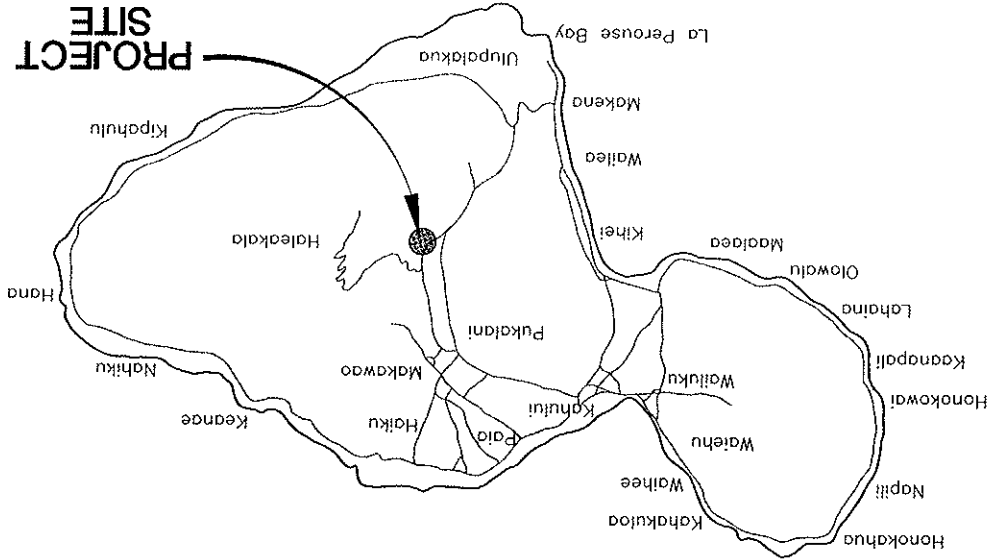
A. Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii, prepared by U.S. Department of Agriculture, Soil Conservation Service, August, 1972.

B. Rainfall-Frequency Atlas of the Hawaiian Islands, Technical Paper No. 43, U.S. Department of Commerce, Weather Bureau, 1962.

C. Flood Insurance Rate Maps of the County of Maui, March, 1995.

D. Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui, prepared by the Department of Public Works and Waste Management, County of Maui, 1995.

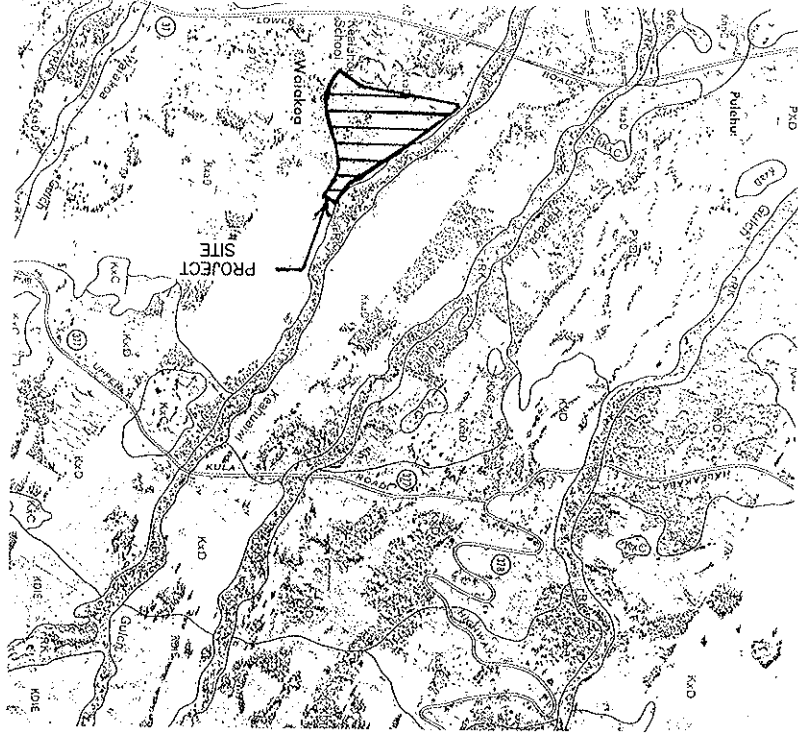
ISLAND OF MAUI  
NOT TO SCALE



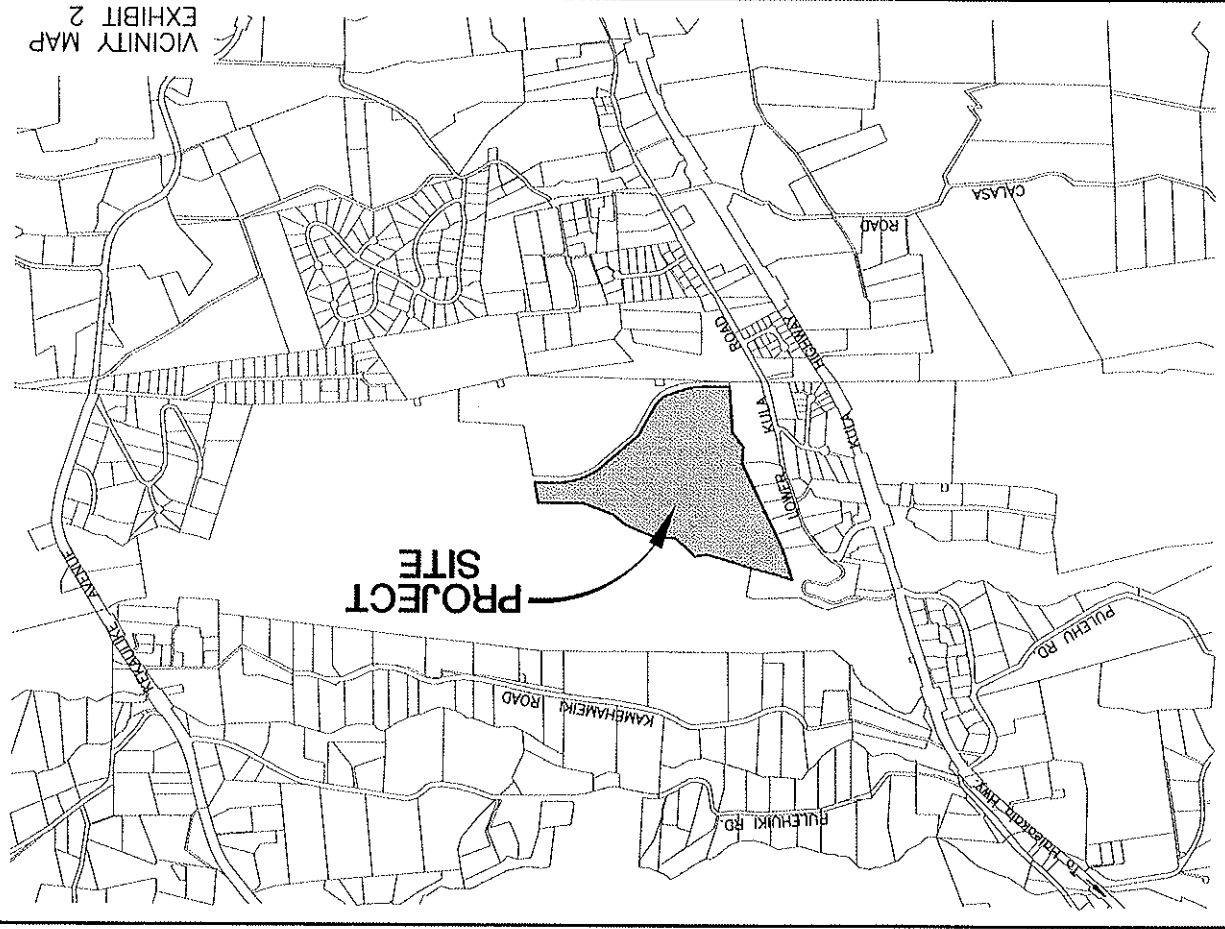
EXHIBITS

- 1 Location Map
- 2 Vicinity Map
- 3 Soil Survey Map

SOIL SURVEY MAP  
EXHIBIT 3



VICINITY MAP  
EXHIBIT 2



## Hydrologic Calculations

Purpose: Determine the increase in surface runoff from the development of the proposed project based on a 50-year storm.

A. Determine the Runoff Coefficient (C):

EXISTING CONDITION:  
Infiltration (Medium) = 0.07  
Relief (Rolling) = 0.06  
Vegetal Cover (Good) = 0.03  
Development Type (Ag) = 0.15  
C = 0.31

ROADWAY AREAS:  
Infiltration (Negligible) = 0.20  
Relief (Rolling) = 0.03  
Vegetal Cover (None) = 0.07  
Development Type (Pavement) = 0.55  
C = 0.85

RESIDENTIAL AREAS:  
Infiltration (Slow) = 0.14  
Relief (Rolling) = 0.03  
Vegetal Cover (Good) = 0.03  
Development Type (Residential) = 0.40  
C = 0.60

EXISTING CONDITION:

Area = 48.117 Acres  
C = 0.31

DEVELOPED CONDITIONS:

Roadway Area = 1.20 Acres  
Residential Area = 46.917 Acres  
WEIGHTED C = 0.61

## APPENDIX A

### HYDROLOGIC CALCULATIONS

B. Determine the 50-year 1-hour rainfall:

$$i_{50} = 3.0 \text{ inches}$$

Adjust for time of concentration to compute Rainfall Intensity (I):

Existing Condition:

$$T_c = 40 \text{ minutes}$$

$$I = 3.73 \text{ inches/hour}$$

Developed Condition:

$$T_c = 16 \text{ minutes}$$

$$I = 5.61 \text{ inches/hour}$$

C. Drainage Area (A) = 48.117 Acres

D. Compute the 50-year storm runoff volume (Q):

$$Q = C/A$$

Existing Conditions:

$$Q = (0.31)(3.73)(48.117) \\ = 55.66 \text{ cfs}$$

Developed Conditions:

$$Q = (0.61)(5.61)(48.117) \\ = 164.59 \text{ cfs}$$

The increase in runoff due to the proposed development is  $164.59 - 55.66 = 108.93 \text{ cfs}$ .

## Hydrograph Plot

English

### Hyd. No. 1

Kula Ridge - Existing Condition

Hydrograph type = Rational

Storm frequency = 50 yrs

Drainage area = 48.1 ac

Intensity = 3.73 in

I-D-F Curve = 3-0.IDF

Peak discharge = 55.66 cfs

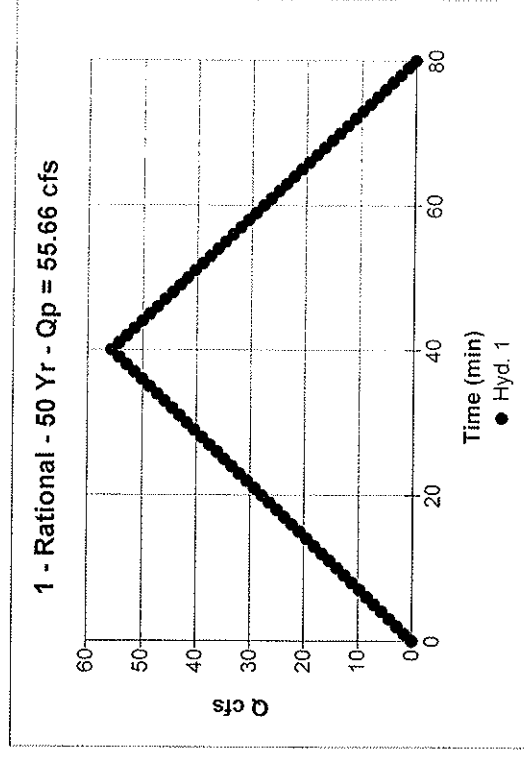
Time interval = 1 min

Runoff coeff. = 0.31

Time of conc. ( $T_c$ ) = 40 min

Reced. limb factor = 1

Total Volume = 133,577 cuft



# Hydrograph Plot

English

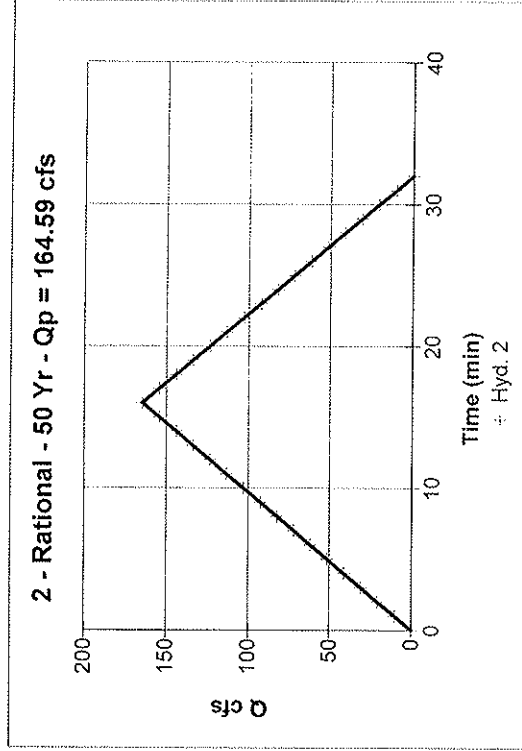
## Hyd. No. 2

Kula Ridge - Developed Conditions

Hydrograph type = Rational  
Storm frequency = 50 yrs  
Drainage area = 48.1 ac  
Intensity = 5.61 in  
I-D-F Curve = 3-0.IDF

Peak discharge = 164.59 cfs  
Time interval = 1 min  
Runoff coeff. = 0.61  
Time of conc. (Tc) = 16 min  
Reced. limb factor = 1

Total Volume = 158,003 cuft



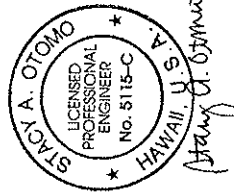


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**PRELIMINARY ENGINEERING REPORT  
FOR  
KULA RIDGE SUBDIVISION**

Kula, Maui, Hawaii  
T.M.K.: (2) 2-3-001: 174

Prepared for:  
Kula Ridge, LLC  
1849 Wili Pa Loop  
Waituku, Maui, Hawaii 96793



Prepared by:



CONSULTING CIVIL ENGINEERS  
305 SCOURI HIGH STREET, SUITE 102  
HAOLE, MAUI, HAWAII 96793  
PHONE: (808) 242-6779  
FAX: (808) 242-6779

September 2006

1.0 INTRODUCTION

2.0 EXISTING INFRASTRUCTURE

- 2.1 ROADWAYS
- 2.2 DRAINAGE
- 2.3 SEWER
- 2.4 WATER
- 2.5 ELECTRIC, TELEPHONE AND CABLE TV

3.0 ANTICIPATED INFRASTRUCTURE IMPROVEMENTS

- 3.1 ROADWAYS
- 3.2 DRAINAGE
- 3.3 SEWER
- 3.4 WATER
- 3.5 ELECTRIC, TELEPHONE AND CABLE TV

**PRELIMINARY ENGINEERING REPORT  
FOR  
KULA RIDGE SUBDIVISION  
T.M.K.: (2) 2-3-001: 174**

**1.0 INTRODUCTION**

The purpose of this report is to provide information on the existing infrastructure which will be servicing the proposed project. It will also evaluate the adequacy of the existing infrastructure and anticipated improvements which may be required for the proposed project.

The subject property is identified as T.M.K.: (2) 2-3-001: 174, which encompasses an area of 48.117 acres. It is also Lot 2 of the G and R Von Tempusky Trust Subdivision. The project site is bordered by Keahuaiwi Gulch and Lot 1 of the G and R Von Tempusky Trust Subdivision to the north, Lot 1 of the G and R Von Tempusky Trust Subdivision to the east, and Lot 3 of the G and R Von Tempusky Trust Subdivision to the south.

The development plan includes approximately 112 residential lots, 4 agricultural lots, and a 5-acre park site which will be dedicated to the County. Associated improvements include grading, paved roadways, underground utilities and landscaping.

**2.0 EXISTING INFRASTRUCTURE**

**2.1 ROADWAYS**

Lower Kula Road in the vicinity of the project site is a two-way, two-lane roadway oriented in the north-south direction. It intersects with Kula Highway several times along its alignment. Lower Kula Road intersects with Alanui Place and the Kula Community Center driveway. Alanui Place is a two-way, two-lane roadway that provides access to the adjacent residential area. The driveway for the Kula Community Center has one lane that serves all traffic movements at the westbound approach of this intersection.

Northwest of the Lower Kula Road-Alanui Place intersection, Lower Kula Road intersects with Kula Highway. At this unsignalized intersection, Lower Kula Road has one lane that serves left and right turn movements. The northbound approach of the highway has one lane that serves left and right turn traffic movements and the southbound approach has one lane that serves left-turn and through traffic movements.

South of its intersection with Alanui Place, Lower Kula Road intersects Copp Road. Copp Road is a two-way, two-lane roadway oriented in the east-west direction that provides access to the residential neighborhoods. Further southwest, Lower Kula Road intersects with Kula Highway.

**2.2 DRAINAGE**

The elevation on the site ranges from elevation 3,085 feet above sea level at the northeastern corner of the property to 2,700 feet above mean sea level at the northwesterly corner, averaging approximately 14.8%.

According to Panel Number 150003 0001-0400 of the Flood Insurance Rate Map, dated March 16, 1995, prepared by the United States Federal Emergency Management Agency, it appears that the project site is situated in Flood Zone C. Flood Zone C represents areas of minimal flooding.

It is estimated that the existing 50-year storm runoff from the project site is 55.66 cfs. Presently, the majority of the onsite runoff sheet flows across the project site in a northeast to southwest direction toward the adjacent properties. A portion of the runoff sheet flows directly into Keahuaiwi Gulch. The runoff eventually discharges into the ocean.

**2.3 SEWER**

There are no public sewer facilities in this part of Maui. Sewerage from residential and commercial developments is handled by individual wastewater systems.

**2.4 WATER**

Domestic water and fire flow will be provided by the County's water system. There is an existing 8-inch waterline along Lower Kula Road, in the vicinity of the Kula Community Center. There is an existing fire hydrant located near the Community Center.

Storage for the project area is provided by a 2.1 million-gallon steel tank, known as the Omaopio tank (elevation 3,890.0 feet). It is located above Haleakala Highway, approximately a 1,200 feet to the northeast of the project site.

## 2.5 ELECTRIC, TELEPHONE AND CABLE TV

The existing electrical and telephone distribution systems on Lower Kula Road are located overhead. These overhead facilities serve the developed properties in the area.

## 3.0 ANTICIPATED INFRASTRUCTURE IMPROVEMENTS

### 3.1 ROADWAYS

Access for the proposed project will be from Lower Kula Road via an existing utility and access Easement "B-1." Easement "B-1" is 56 feet wide and traverses along the southern boundary of the Kula Community Center to the southwestern corner of the subject parcel. The driveway pavement section will be 24-feet wide for ingress and egress.

In accordance with the requirements for a building permit, roadway improvements consisting of concrete curb, gutters and sidewalks will be constructed along the frontage of the property to Lower Kula Road.

The Traffic Impact Report prepared by Wilson Okamoto Corporation, dated June 2006, recommended and concluded the following:

- Maintain sufficient sight distance for motorists to safely enter and exit all project roadways.
- Provide adequate on-site loading and off-loading service areas and prohibit off-site loading operations.
- Provide adequate turn-around area for service, delivery and refuse collection vehicles to maneuver on the project site to avoid vehicle-reversing maneuvers onto public roadways.
- Provide sufficient turning radii at all project roadways to avoid or minimize vehicle encroachments to oncoming traffic lanes.
- Provide exclusive left-turn and right-turn lanes on the westbound approaches of Lower Kula Road at the northern intersection with Kula Highway to minimize the impact of left-turning vehicles on the higher volume of right-turning vehicles on that approach.

"The proposed Kula Ridge development is expected to include 53 residential lots, 59 affordable housing residential lots, 4 agricultural lots, and an approximately 5-acre park that will be dedicated to the County of Maui. With the implementation of the aforementioned recommendations, the proposed Kula Ridge development is not expected to have a significant impact on

traffic operations in the vicinity of the project site. The critical movements at the study intersection along Lower Kula Road are expected to continue operating at acceptable levels of service despite the addition of site-generated vehicles to the surrounding roadway network due to the provision of exclusive turning lanes at the northern intersection of Lower Kula Road with Kula Highway."

### 3.2 DRAINAGE

After the development of the proposed project, it is estimated that the 50-year storm runoff will be 164.59 cfs, a net increase of 108.93 cfs. Onsite runoff will be intercepted by grated catch basins located within the grassed shoulder areas. The runoff will be conveyed to an onsite detention basin, which will be located in the northwestern corner of the project site. Overflows from the detention basin will be allowed to sheet flow into Keahuaui Gulch at a rate less than the existing condition. The system will be designed and sized to accommodate the increase in surface runoff volume from a 50-year 1-hour storm generated from the proposed project.

The drainage design criteria will be to minimize any alterations to the natural pattern of the existing onsite surface runoff.

### 3.3 SEWER

The proposed 112-lot residential subdivision and 4-lot agricultural subdivision will generate approximately 40,600 gallons of wastewater daily. Each residence will connect to an aerobic individual wastewater system. The developer is working closely with a company to install and maintain these systems. This company is also working with the State Department of Health to allow the use of the aerobic systems for a development that has more than 50 homes.

### 3.4 WATER

In accordance with the Department of Water Supply's Domestic Consumption Guidelines for residential and agricultural development is approximately 175,709 gallons per day. Fire flow demand for residential development is 1,000 gallons per minute for a 2-hour duration and 500 gallons

per minute for a 2-hour duration for agriculture. Fire hydrants will be installed with a maximum spacing of 350 feet for residential areas and 500 feet in agriculture areas.

The developer is presently working with the Department of Water Supply and private landowners who are planning to develop wells in the Upcountry area. When completed, the wells will be dedicated to the County of Maui. The developer will pay a prorata share in the development of these wells for an allocation of the water source for the Kula Ridge Subdivision.

As part of the subdivision approval process, domestic water and fire flow calculations will be provided to determine the adequacy of the existing water system, in accordance with the rules of the Department of Water Supply.

### 3.5 ELECTRIC, TELEPHONE AND CABLE TV

The proposed electrical and telephone distribution systems in the subject development will be installed underground from Lower Kula Road. Interior project lighting will be provided as approved by the Department of Planning. All project lighting will be fully shielded.

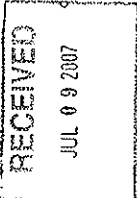
# **APPENDIX I.**

## **Department of Health, Wastewater Branch Individual Wastewater Systems Approval Letter and IWS Project Plan**

LINDA LINGLE  
GOVERNOR OF HAWAII



STATE OF HAWAII  
DEPARTMENT OF HEALTH  
PO BOX 3378  
HONOLULU HAWAII 96801-3378



SHIONE LEINAALA FUKINO, M.D.  
DIRECTOR OF HEALTH

In reply, please refer to:  
File #

WW 242 FINAL DEC CL

June 29, 2007

CERTIFIED MAIL 7005 1160 0001 8381 4502  
RETURN RECEIPT REQUESTED

Mr. Clayton Nishikawa  
Managing Member  
Kula Ridge, LLC  
1849 Wili Pa Loop  
Wailuku, Hawaii 96793

Dear Mr. Nishikawa:

Subject: Variance Application No. WW 242 Docket No. 06-VWW-31  
Proposed Development of 116 Units consisting of 59 Affordable Lots,  
sizes 5,600 - 6,000 square feet, 53 Market Lots - sizes 6,000 - 21,000  
square feet, and 4 agricultural lots - sizes 4 acres minimum  
Lower Kula Road, Lot 2, Wailuku, Maui, TMK: (2) 2-3-001: 174

Please find enclosed the Department of Health's Decision and Order regarding the  
above mentioned application for variance request which was GRANTED on  
June 20, 2007 for five (5) years. We are enclosing for your information the Findings of  
Fact and Conclusions of Law.

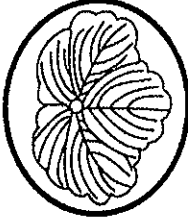
Please note the variance conditions and if there are any questions relative to the  
variance, please do not hesitate to contact Mr. Harold Yee, Chief of the Wastewater  
Branch at our direct toll free phone number 984-2400 ext 64294, fax (808) 586-4300.

Sincerely,

*Thomas E. Arizumi*  
THOMAS E. ARIZUMI, P.E., CHIEF  
Environmental Management Division

Enclosures: Final Decision and Order  
Findings of Fact and Conclusions of Law

C: Clean Water Branch  
Environmental Planning Office  
Safe Drinking Water Branch  
Wastewater Branch - Maui Staff Engineer  
Department of Water Supply - County of Maui  
District Health Office - Maui  
Mr. Harold Nagato, Best Industries USA



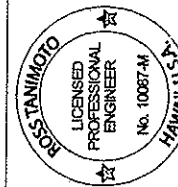
**BEST INDUSTRIES USA, INC.**  
535 Ward Avenue, Suite 210  
Honolulu, Hawaii 96814  
Phone: 808-596-2378  
Fax: 808-596-2063  
bestindus001@hawaii.rr.com

**INDIVIDUAL WASTEWATER SYSTEM  
FOR**

**Kula Ridge  
Lower Kula Road, Lot 2**

**IN**

**Kula, Maui, Hawaii  
TMK: (2) 2-3-01: 174**



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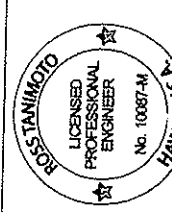
ROSS TAMMO  
LICENSED PROFESSIONAL ENGINEER  
No. 10087-M  
HAWAII, U.S.A.

**KULA RIDGE**

SIZE	1/8" = 1'	DWG NO.		REV	
SCALE					
DATE: 23 OCT 2006			SHEET	C	

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**KULA RIDGE**

DATE: 23 OCT 2006

REVISIONS

NO.	DESCRIPTION	DATE

DATE: 23 OCT 2006

SCALE: \_\_\_\_\_

SHEET: **D**



OSWALD L. PERCIVAL, D.D.S.  
CHIEF OF HEALTH

in public health service  
SINCE 1962

## STATE OF HAWAII DEPARTMENT OF HEALTH

P.O. BOX 3279  
HONOLULU, HAWAII 96811

### DEPARTMENT OF HEALTH - WASTEWATER BRANCH INDIVIDUAL WASTEWATER SYSTEM (IWS) - SITE EVALUATION / PERCOLATION TEST

Date/Time: 9/30/06 Test Performed by: Harold Nagato  
 Owner: Kula Ridge LLC TME: ( 2 ) 2 3 01 : 174

Elevation: N/A feet  
 Depth to Groundwater Table: N/A feet below grade  
 Depth to Bedrock (if observed): Not Observed feet below grade  
 Diameter of Hole: 6 inches  
 Depth to Hole Bottom: 2 feet below grade  
 Depth, inches below grade: 24  
 Soil Profile (color, texture, other): Brown, fine-grained

#### PERCOLATION READINGS:

Time 12 inches of water to seep away: 11 minutes  
 Time 18 inches of water to seep away: 15 minutes

Check one:  
 Percolation tests in sandy soils, recorded time intervals and water drops at least every 10 minutes for at least 1 hour.

Percolation tests in no-sandy soils, pre-soaked the test hole for at least 4 hours. Recorded time intervals and water drops at least every 10 minutes for 1 hour of time for the first 6 inches to seep away in greater than 30 minutes record time intervals and water drops at least every 30 minutes for 4 hours or until 2 successive drops do not vary by more than 1/16 inch.



Time Interval	Drop in Inches	Time Interval	Drop in Inches
10 min	5.00 in.		
10 min	2.75 in.		
10 min	2.50 in.		
10 min	2.75 in.		
10 min	2.25 in.		
10 min	2.25 in.		

Percolation Rate (time/final water level drop): 4.5 minutes/inches

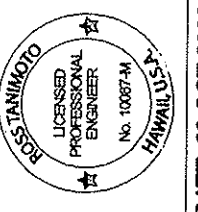
As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable. I also attest that three feet of suitable soil exist between the bottom of the soil absorption system and the groundwater table or any other limiting layer.

Signature: *Ross Tanimoto* Date: 12/14/06  
 Engineer's Signature/Stamp

IWS Site Evaluation & Percolation Test, WPD BCI at January 8, 2003


### GENERAL NOTES

1. All work shall conform to the Building Codes, Standards of Industry, Department of Health, Uniform Plumbing Codes, and other related items.
2. The installation indicates the overall Scope of Work and Intent, Contractor to provide verification at the job site for adjustment and to inform the engineer of change.
3. Gravel shall be #3 Coarse, no bigger than 3/4" in size with no fines or washed rock.
4. Engineer's drawing herewith does not indicate underground lines, and as such, Contractor shall inspect or tone the area for said underground lines.
5. All work shall be guaranteed for 1 year after completion by Contractor.
6. No trees or shrubs shall be planted within 5 feet of the Sewage Treatment Unit or Disposal System.
7. Sewage Treatment Unit and Disposal System shall be located in a Non-vehicular Traffic Area.
8. Depths of pipe inverts of the Sewage Treatment Unit and Disposal System are controlled by Topographic Features. The existing pipe invert may impact the depths shown on the drawings.
9. The Sewage Treatment Unit shall be at least 5 feet from the Disposal System.
10. The Sewage Treatment Unit or Disposal System shall be at least 5 feet from any wall line of any structure or building.
11. Disposal System shall be at least 5 feet from property line.
12. Sewage Treatment Unit shall be at least 5 feet from property line.
13. Seepage Pits shall be at least 12 feet from another Seepage Pit.

	DATE: 23 OCT 2006	
	SCALE	SHEET 2
KULA RIDGE		
DATE: 23 OCT 2006	SCALE	SHEET 2
DATE: 23 OCT 2006	SCALE	SHEET 2

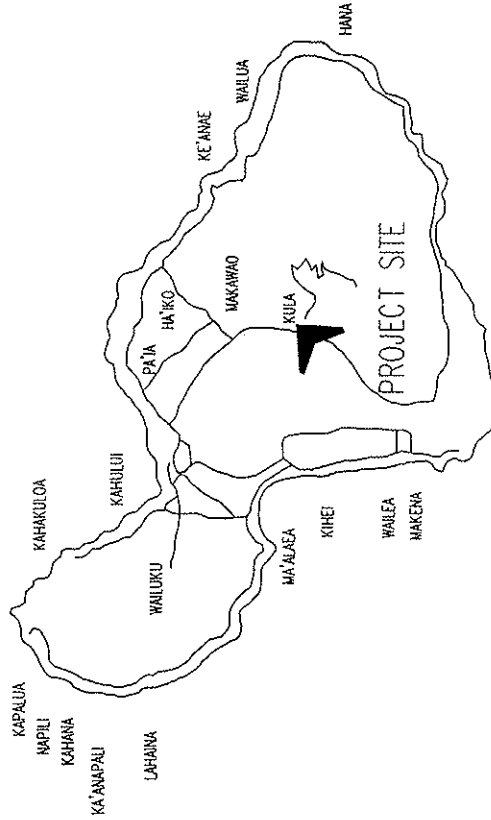
### DESIGN CRITERIA

1. Owner Name: Clayton Nishikawa  
Residential Zoning  
TMK: (2) 2 - 3 - 01 : 174  
Description: 48.117 Acres divided into  
(116) Lots consisting of a  
(1) 3-Bedroom Dwelling each
2. Flow: 600 gallons per day (gpd) per dwelling
3. IWS Selection: (1) ESIS 1700 per dwelling  
Max Flow: 1000 gpd  
Max Volume: 1700 gallons
4. Disposal System Design  
Disposal System Selection: (1) Absorption Bed per IWS  
Percolation Rate = 4.5 min/in.  
Required Absorption Area (Assume 5 min/in.)  
(600 gpd) x (125 sq. ft./200 gpd) = 375 sq. ft.  
Absorption Bed Dimensions: 16 ft. x 24 ft.  
Absorption Bed Area = 384 sq. ft.

	DATE: 23 OCT 2006	
	SCALE	SHEET 3
KULA RIDGE		
DATE: 23 OCT 2006	SCALE	SHEET 3
DATE: 23 OCT 2006	SCALE	SHEET 3



MAP OF MAUI



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*Reos S. Tanimoto*

LICENSE EXPIRES ON: 24 APR 2008

**KULA RIDGE**

DATE: 23 OCT 2006

SIZE: FSCM NO. DWG NO. SHEET 4

SCALE: NONE

REV: NONE



REVISIONS		DATE	APPROVED
ZONE	REV	DESCRIPTION	

Subdivision Area

Kula Community Center

Tennis Courts

Holy Ghost Church

Lower Kula Road

Street Map

NO WORK IS PERMITTED BY ME OR UNDER MY CLOSE PERSONAL SUPERVISION AND CONTROL OF THIS PROJECT WILL BE MADE BY ANY OTHER PERSON OR ENTITY WITHOUT MY WRITTEN CONSENT. I AM NOT PROVIDING ANY GUARANTEE OR WARRANTY FOR THE ACCURACY OF THE INFORMATION PROVIDED HEREON. I AM NOT PROVIDING ANY GUARANTEE OR WARRANTY FOR THE ACCURACY OF THE INFORMATION PROVIDED HEREON.

*Reos S. Tanimoto*

LICENSE EXPIRES ON: 24 APR 2008

**KULA RIDGE**

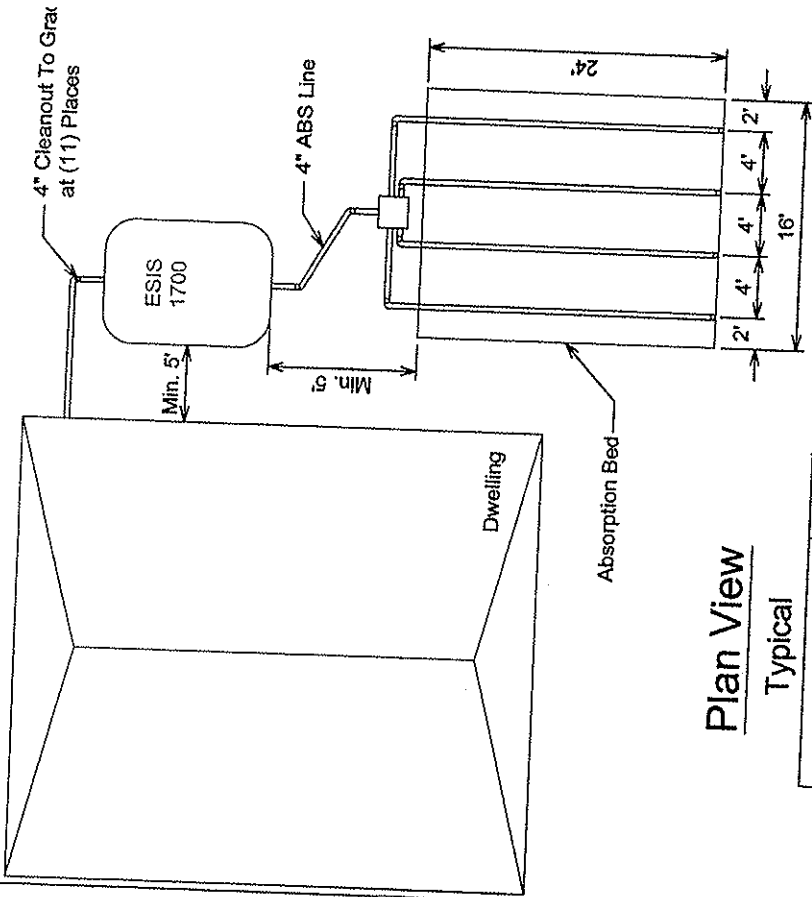
DATE: 23 OCT 2006

SCALE: NONE

SHEET 5



REVISIONS		DATE	APPROVE
ZONE	REV	DESCRIPTION	



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LESLIE JAMES DR. 30 APR 2006  
*Leslie S. James*

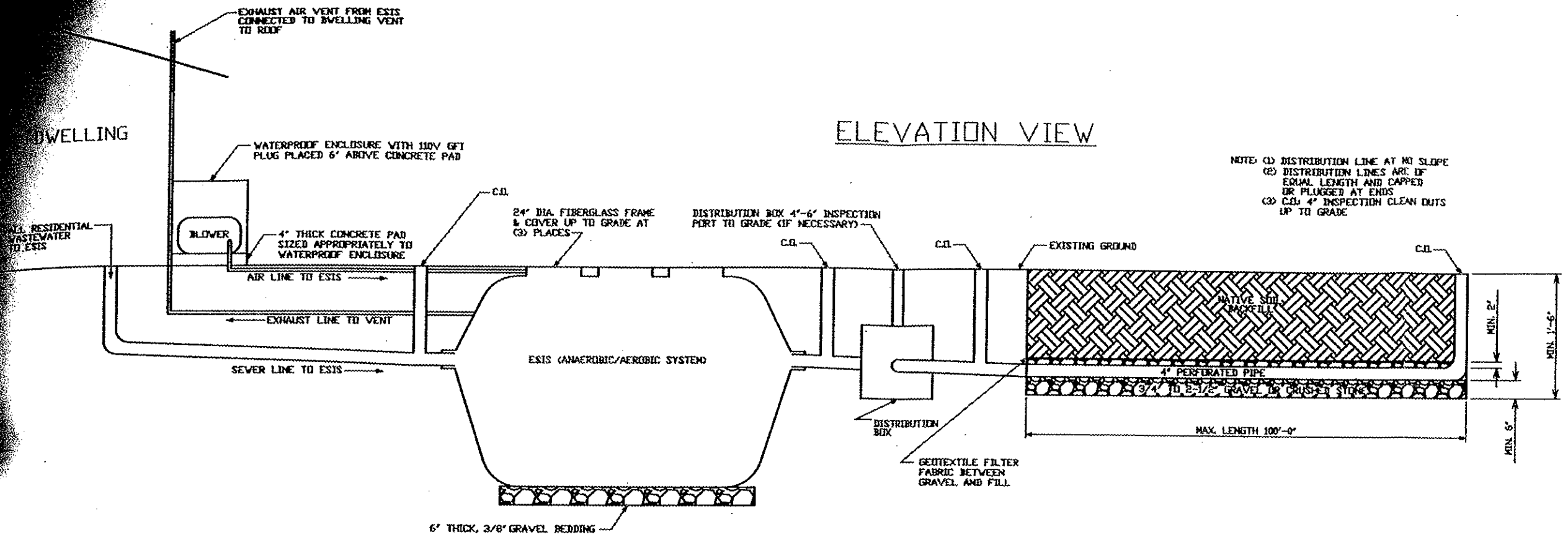
**KULA RIDGE**



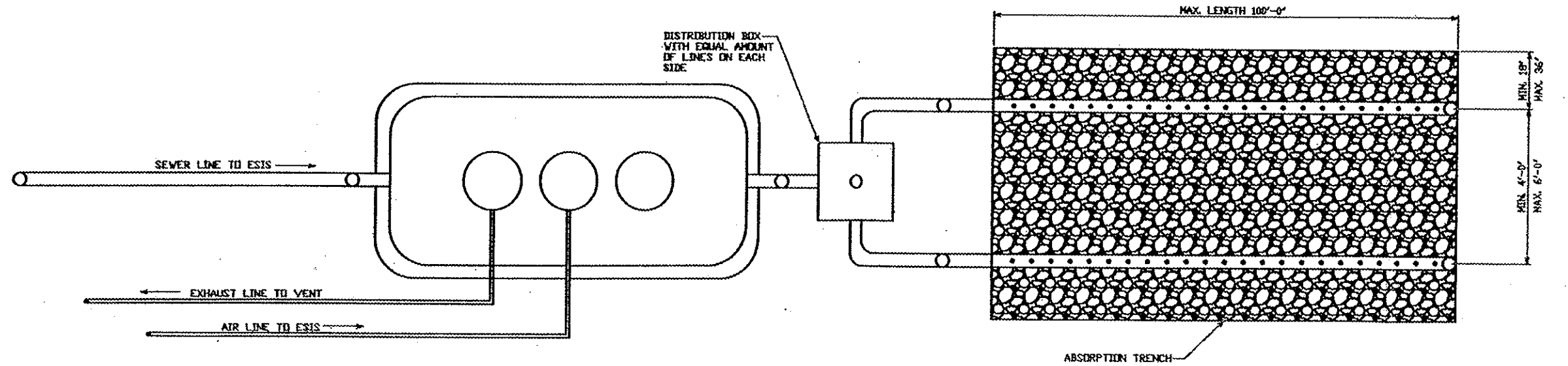
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SIZE: ARCH NO.	DWG NO.	REV



# ELEVATION VIEW

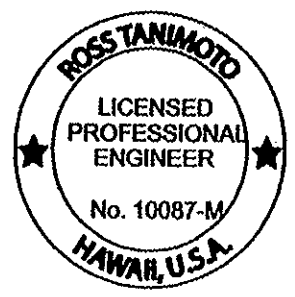


NOTE (1) DISTRIBUTION LINE AT NO SLOPE  
 (2) DISTRIBUTION LINES ARE OF EQUAL LENGTH AND CAPPED OR PLUGGED AT ENDS  
 (3) C.O. 4" INSPECTION CLEAN OUTS UP TO GRADE



# PLAN VIEW

# ABSORPTION BED



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 THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY SUPERVISION (EXCEPTION OF CONSTRUCTION AS DEFINED IN SECTION 1.010) OF THE RULES AND REGULATIONS OF THE BOARD OF PROFESSIONAL ENGINEERS, ARCHITECTS AND SURVEYORS OF THE STATE OF HAWAII.

B	UPDATE DESIGN INFO	MM/YY/YY
A	UPDATE DESIGN INFO	MM/YY/YY
No.	Revision/Issue	Date

Firm Name and Address  
 \_\_\_\_\_  
 \_\_\_\_\_

Project Name and Address  
 \_\_\_\_\_  
 \_\_\_\_\_

Project	Sheet
Date	7
Scale	NONE

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED

ESIS Model	External Dimensions		Dry Weight lb	Manhole Diameter
	Length	Width		
1000	10'-1"	5'-3"	750 lb	24"
1300	11'-1"	5'-9"	800 lb	24"
1700	11'-3"	7'-11"	925 lb	24"

ESIS Model	User Capacity	
	GPD	Bed Rm Gallons
1000	600	3
1300	800	4
1700	1000	5

ESIS Model	Excavation Dimensions		Excavated Soil Volumes
	Length	Depth	
1000	12'-0"	7'-6"	25.0 cu. yds.
1300	13'-0"	8'-0"	31.0 cu. yds.
1700	13'-6"	10'-0"	52.5 cu. yds.

Air Pump Model	Pump Dimensions		Watts	Outlet	Max PSI
	Length	Width			
SL 56	8"	5"	50	3/4"	5.9

115V/60Hz with 6' Power Cord using GFI Outlet, UL-Listed & CE-Approved.

## IWS SPECIFICATIONS

THE WORK HAS BEEN PREPARED BY ME OR UNDER MY CLOSE PERSONAL SUPERVISION AND I AM A LICENSED PROFESSIONAL ENGINEER IN THE STATE OF HAWAII. I AM NOT PROVIDING ANY GUARANTEE OF FITNESS FOR ANY PARTICULAR PURPOSE, DESIGN, SPECIFICATION OR PROJECT.

DATE: 23 OCT 2006

*Feo S. Jarama*



# KULA RIDGE

DATE: 23 OCT 2006	SCALE: NONE	SHEET: 8
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# **APPENDIX J.**

**Archaeological Inventory  
Survey, Kula Ridge Mauka,  
May 2007**

**ABSTRACT**

Scientific Consultant Services, Inc. (SCS) conducted an Archaeological Inventory Survey on 272 acres of land in Kealahou Ahupua'a, Kula District, Maui Island [TMK: (2) 2-3-001:023]. The project involved a 100 percent systematic survey of the entire parcel, including the mapping and recording of identified features, and representative manual and mechanical testing (through backhoe trenching) of representative sites.

During the survey, which was conducted in intervals between October 2006 and March 2007, 40 archaeological sites, State Site 50-50-XX-XXXX through 50-50-XX-XXXX, were documented. Of the 40 sites, 39 were newly recorded; one site containing a rock shelter and numerous petroglyphs and pictographs (State Site 50-50-11-1050) was re-identified. Of the 39 newly recorded sites, one site number was assigned to the vast array of agricultural features found across the project area (State Site 50-50-XX-XXXX). Excluding all of the features included with the agricultural site (Site -XXXX), a total of 74 features were documented. Twenty features were determined to be pre-Contact, 22 were Historic, and 13 were undetermined. Eighteen features were interpreted as demonstrating characteristics from both the pre-Contact and Historic periods. Based on similar construction methods and materials of other known sites, all of the features identified during the Inventory Survey were interpreted as related to habitation, refuse sites/privies, agricultural functions, animal husbandry and ranching activities, and/or storage or water control. A variety of features were identified including terraces, enclosures, C-shaped structures, L-shaped structures, linear mounds, rock piles, ditches, and cisterns and refuse sites (privies) possibly associated with historic house sites also located on the property. Thirty-three excavations were dug at 21 sites; eight subsurface features were discovered. All were associated with habitation, agriculture, and water storage. Thirty-nine sites have been assessed as significant under Criterion D of Hawaii's State Historic Preservation criteria. State Site 50-50-11-1050, the petroglyph and rock shelter site, has been assessed as significant under Criteria D and E, emphasizing the cultural significance of the features; preservation is recommended. Although most sites have yielded sufficient information, Data Recovery is recommended for some sites, including Sites TS-8, -128, -141, -193, -254, -265, -355, -362, and -1050, in order to obtain additional significant information which can be used to address research questions that will be proposed in a future Data Recovery Plan.

**AN ARCHAEOLOGICAL INVENTORY SURVEY  
OF 272 ACRES IN  
KEALAHOU AHUPUA'A, KULA DISTRICT,  
MAUI ISLAND, HAWAII  
[TMK: (2) 2-3-001:023]**

Prepared by:  
Jon Wilson, B.A.  
Sara Q. Bassford, B.A.  
and  
Michael Dega, Ph.D.  
May 2007

Prepared for:  
Clayton Nishikawa  
1849 Wili Pa Loop  
Wailuku, HI 96793

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## INTRODUCTION

At the request of Clayton Nishikawa (landowner), Scientific Consultant Services, Inc. (SCS) conducted an Archaeological Inventory Survey on 272 acres of land in Kealahou Ahupua'a, Kula District, Maui Island [TMK: (2) 2-3-001:023] (Figures 1 and 2). A portion of the property has been used historically for habitation, and a currently occupied historic house exists on the property. At present, the property is also being utilized as a horse pasture. A four-wheel drive access road traverses through the project area.

Inventory Survey work included historic background research and settlement pattern analysis prior to fieldwork, a systematic pedestrian survey of the entire project area, and the mapping and recording of identified features. Representative manual and mechanical testing (through backhoe trenching) of representative sites was conducted in order to assess the presence or absence of subsurface cultural deposits in representative portions of the project area. Fieldwork was conducted in intervals between October 2006 and March 2007 by SCS personnel including Allison Chun, Ph.D. (Field Director), Brian Armstrong, B.A., Ian Bassford, B.A., Ryan Calma, B.A., David Dillon, B.A., Leigh Anne Ellison, M.A., Suzanne Humphrey, B.A., Jenna Matthews, B.A., Randy Ogg, B.A., and Guerin Tome, B.A. The survey was conducted under the direct supervision of Michael Dega, Ph.D., Principle Investigator.

The ultimate goals of the project were to identify historic properties on the parcels, effectively record and document the sites and to provide recommendations to the State Historic Preservation Division (SHPD) regarding site significance and mitigation in regards to future land use in the project area.

## ENVIRONMENTAL SETTING

### **LOCATION**

The project area is parcel 23 of TMK (2) 2-3-001. It consists of 272 acres of undeveloped land, owned by Clayton Nishikawa, AIA. The project area is located in Kula, which is in leeward east Maui, on the southwestern slopes of Haleakala (Figure 3). Kula exists between the elevations of 2,792 and 3,017 ft. amsl (above mean sea level), in Kealahou Ahupua'a. It lies between Keāhuaiwi Gulch to the north, and Waiakoa Gulch to the south. The property is bounded by an easement to the south and southeast, which separates it from mostly undeveloped land. On its east and northeast perimeters, it is bounded by Keāhuaiwi Gulch. To the north lies a former quarry site. To the west is Kealahou Subdivision and Kula Community Center (Randal and Dora Von Tempsky Memorial Park). A portion of the property has been used historically

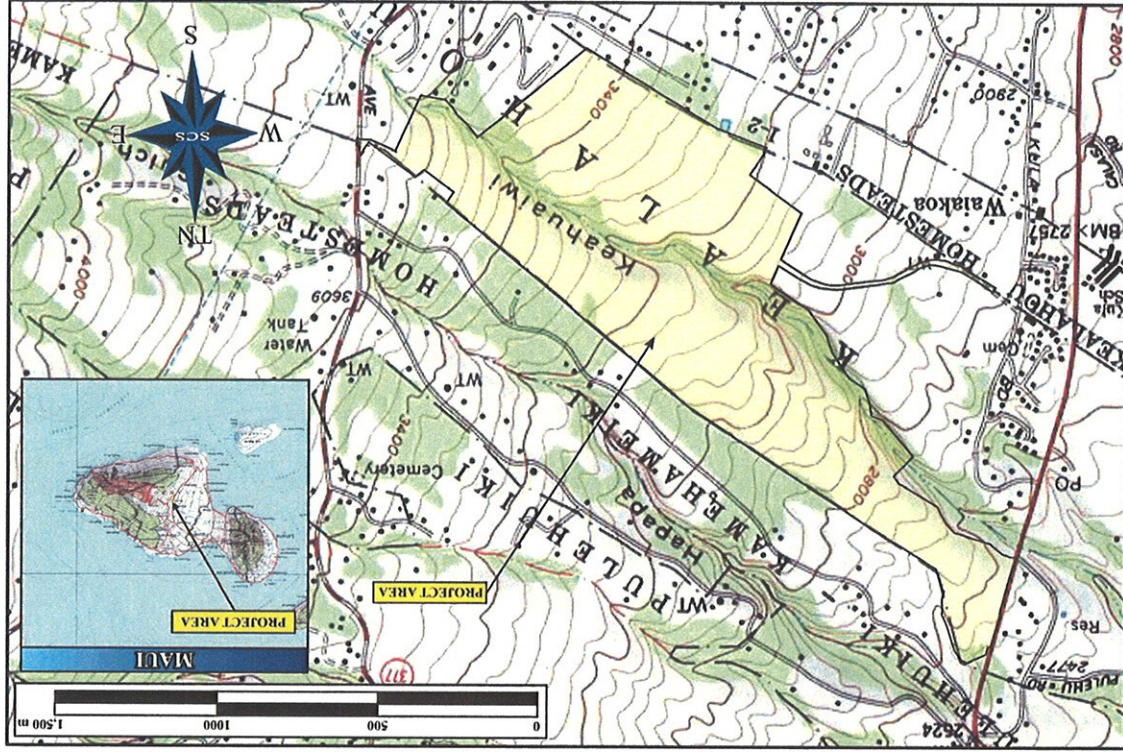


Figure 1: USGS Quadrangle (Ha'iki) Showing Project Area Location.



Figure 3: USGS Quadrangle Plan View Map Showing Site Locations.

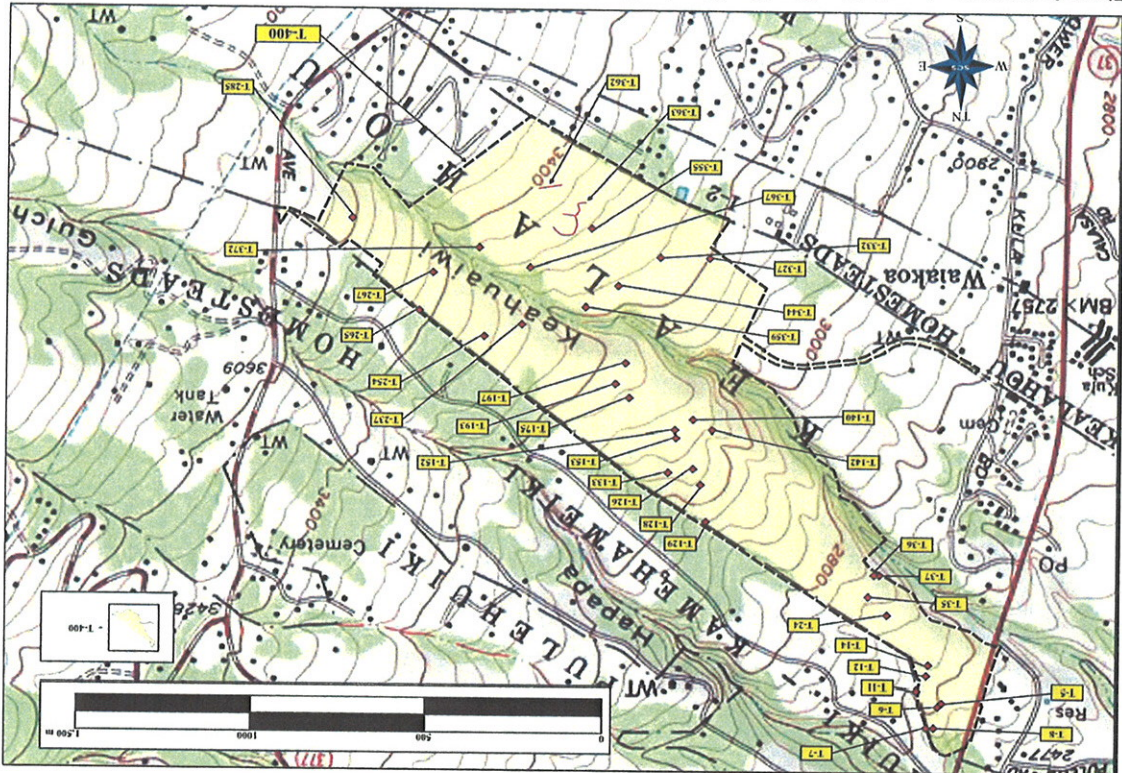
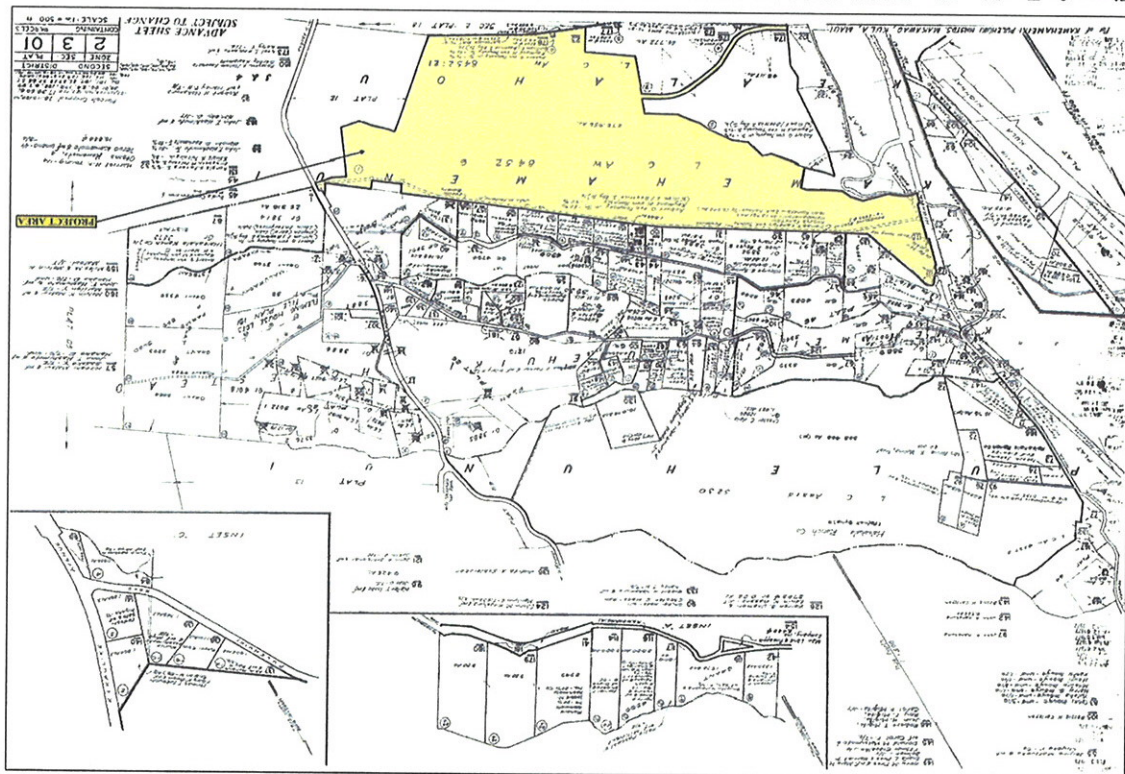


Figure 2: Tax Map Key [TMK] (2) 2-3-001: 023 Showing Project Area Location.



for habitation, and a currently occupied historic house exists on the property. At present, the property is also being utilized as a horse pasture. Extensive machine (bulldozer) alterations are evident in many areas of the project area. A four-wheel drive access road included within the project area.

The project area is located on an extensively altered piece of land. Ranching and agricultural activities have most likely taken place on the project area for a minimum of one hundred years. Kula native Darlene Favares, whose family previously owned the building that now houses Morihara Store, less than 0.25 miles from the project area, confirmed that the project area was most likely occupied by a Japanese farming family, which was commonplace in Kula in the mid- to late 1800s. A historic house still stands on the property, typical of plantation-style homes of the 1930s. Bulldozer grading activity, including construction of a dirt road and the presence of horses, has altered much of the project area's original integrity.

#### CLIMATE

Kula can be translated as "open country," "field," or "plain" (Pukui and Elbert 1986: 178). These descriptions are all fitting to Kula, where the land is spread out for many miles, along two parallel highways. Kula, which exists between the elevations of approximately 2,000 and 3,500 feet amsl, is known for its temperate conditions; the average annual temperature for the area is 66° F. The region is relatively dry, with an average annual rainfall of 25 to 40 inches per year (Juvik and Juvik 1998).

#### SOILS

Kula lies on the southwestern slopes of Haleakalā. As this volcano reached maturity, cinder cones formed along rifts that extended to the east, southwest, and north of the summit. Volcanic flows from this development are classified as the Kula Volcanic Series. After a long period of erosion, huge canyons were cut and later filled by the volcanic flows of the Hana Volcanic Series (Kyselka and Lanterman 1980:22). Cones of this series can still be seen today, stretching from Hana up to Haleakalā, and down to La Pérouse Bay.

Kula is the physiographic region of Maui classified as "Kula Slightly Dissected Upland" (Juvik and Juvik 1998). The abundance of vegetation here is a reflection of the richness of the soils that exist in this region. Kula lies in the convergence zone of the Kula Volcanic Series and the Hana Volcanic Series. Soils found here developed in material weathered by volcanic ash and overlying fragmented 'a'ā lava.

The soils found in Kula are classified as having Pau Pa-Kula-Pane association. These soils are well-drained, medium textured, and exist on the medium to high uplands of Maui. These soils are gently sloping to steep, and make up about nine percent of the island. The Pau Pa-Kula-Pane association is utilized for truck crops, orchards, pasture, and wildlife habitat (Foote *et al.*, 1973: 9). Kula cobbly loam (KxaD), a reddish brown, sub-angular and blocky, loam is found in areas with slopes between 12 and 20 percent. The erosion hazard of such soils is moderate, as medium run-off occurs and there is rapid permeability (*ibid.*: 76). KxaD soils have been used for pasturelands and truck and orchard crops. Rock land (rRK) soils are also found within the project area. Such soils are generally shallow and contain many outcrops; they are found on steep slopes. Rock land soils have been used for pasturelands, as habitation for wildlife, and as lands for urban development (*ibid.*: 119).

#### VEGETATION

Vegetation in the project area, which is currently used as pastureland, is a typical representation of the low-shrub-like pastures of Kula gulches. The property consists of a mixed woodland of eucalyptus (*Eucalyptus* spp.), jacaranda (*Jacaranda mimosifolia*), black wattle (*Acacia mearnsii*), kukui (*Alseodaphne moluccana*), and some Christmas berry (*Schinus terebinthifolius*). Fig (*Ficus carica*), tree tobacco (*Nicotiana glauca*), and kiawe (*Prosopis pallida*) are also present on the property. Smaller shrubs include Sacramento bur (*Triumfetta semitriloba*), hairy abutilon (*Abutilon grandifolium*), castor bean (*Ricinus communis*), balloon plant (*Asclepias physocarpa*), pānini (*Opuntia ficus-indica*), *Lantana* (*Lantana camara*), indigo (*Indigofera suffruticosa*), glycine vine (*Glycine wightii*), century plants (*Agave* spp.), and black raspberry (*Rubus* spp.). Typical pasture grasses and weeds, including fireweed (*Senecio madagascariense*), red top natal grass (*Melinis repens*), dandelion (*Taraxacum officinale*), and clover (*Trifolium* spp.) grow, in addition to other, unidentified, alien pasture grasses. The native 'iima (*Sida fallax*), 'ama'u fern (*Sadleria* spp.), and 'uhaloa ferns (*Waltheria indica*) are present.

#### CULTURAL AND HISTORICAL CONTEXT

##### TRADITIONAL SETTLEMENT PATTERNS

The district of Kula was known for dry land agriculture, and later, pig husbandry. Dryland agricultural field systems were characterized by extensive stone and earthen embankments, reliance on rainfall, and regular rotation of crops (Kolb *et al.* 1997:6). These systems were also noted for their arid conditions and lack of perennial streams (Chun *et al.* 2005). In fact, the word *kula* is also used to describe lands which were dry and inaccessible to water, except from rainfall (Maio, 1951). According to Kolb *et al.* (1997), the key component of

Kula's economy was the dryland agriculture in and near the upland forests. 'Uala (*Ipomoea batatas*), or sweet potato, is a tuber that will not grow in very wet areas. In discussing the environs of the region, Handy (1940) noted that the primary staple of Kula was the 'uala:

Kula was always an arid region, throughout its long, low seashore, vast stony *kula* lands, and broad uplands. Both on the coast, where fishing was good, and on the lower westward slopes of Haleakala a considerable population existed.....[Activities included] fishing and raising occasional crops of potatoes along the coast, and cultivating large crops of potatoes inland, especially in the central and northeastern section including Kookea, Waiohuli, Koho, Kaunoulu, and Waiakoa....Kula was widely famous for its sweet-potato plantations. 'Uala was the staple of life here. [1940: 161]

Malo also noted the farming of 'uala in the early Hawaiian agricultural practices of upland areas:

If a field of potatoes was desired, the soil was raised into hills, in which the stems were planted; or the stems might merely be thrust into the ground any how, and the hilling done after the plants were grown; the vines were also thrown back upon the hill. In six months the potatoes were ripe. Such was the cultivation of *kula* land. [1951: 205]

The upland forest was an important resource to early Hawaiians. Before the deforestation that occurred as a result of clearing that made way for pastureland, there was a sizable amount of moisture and water available to the area. The large upland forest provided wood for fire, tools, weapons, houses, and canoes. It also provided a source of medicinal plants, a habitat for native birds that were hunted for food and feathers, and wood for temple images.

The upland forest also played a sacred role in pre-Contact times. As noted in "Maoli Ng" (Nature Conservancy 2005):

The ancient Hawaiians recognized gods everywhere in nature and honored a pantheon of natural deities. The upland forest was *wao akua*, the realm of the gods, and trees were physical manifestations of various gods in this spiritual realm. Entry into the forest was limited to a few consecrated individuals and involved a strict protocol, including a statement of identity and purpose and appropriate offerings. If the purpose was to collect trees, only a single tree or species could be collected at a time. The upland forest was sacred to Ku, the god of war, governance, and leadership.

Pigs also played an important political and ceremonial role in the history of Hawaii. Ruling chiefs collected pigs as taxes. They were used in extensive ritual ceremonies to solidify social relationships between the commoners and those who ruled them (Kolb *et al.* 1997). In order to raise a substantial amount of pigs, the success of crops, such as 'uala and taro (*Colocasia esculenta*), was important, as it provided the primary source of feed. The dry upland

of Kula was an ideal place for raising pigs, as well as the crops of 'uala and dry land taro to feed them.

Agricultural products from Kula are among the earliest documented commodities to have been sold or traded with foreigners (Donham, 1992). La Pérouse, an explorer who visited Maui in 1786, recorded in his ship's log that three hundred pigs had been traded to restore his food supplies (La Pérouse 1969).

The many identified *heiau* (temple, shrine, place of worship), building platforms, rock walls, terraces, and petroglyphs located throughout Kula suggests a landscape of extensive agriculture across the open plains and pastures, with a dispersed population, not unlike Kula today (Tulchin *et al.*, 2003).

#### WĀHI PĀNI (SIGNIFICANT PLACES)

Kula was important in legend and as a sacred place. In legend, A'apueo the owl, who is known to have instigated a well-known battle between the owls and the chiefs of Waiohuku, was from Kula. As Uaua (1871) noted in Handy and Handy (1972), "A certain ahupua'a there bears the name of A'apueo to this day." It has been determined that the sacred volcano Haleakalā served as a final resting place for the dead of Kula and Honua'ula.

Numerous accounts in oral history and legend concerning Kula have been documented by Sterling (1998) and Wong Smith (in Brown and Haun 1989). Wong Smith has a well-documented summary of references to Kula, a part of an archaeological study of Waiohuli and Kōōkea. However, there has been little mention of Kealahou Ahupua'a in legend or history. Keāhuae'iwi Gulch, which borders Kealahou, contains a few deposits of 'ālaea (red dirt) and

pictographs on its walls (Sterling, 1962). Sterling has also noted that further down the Gulch, a collection of petroglyphs was found high up on the walls. Fredericksen and Fredericksen (1992) noted that petroglyphs were recorded in Waiakoa Gulch, which is adjacent to the Kealahou Ahupua'a. Waiker (1931) describes a *heiau* and a platform in the Waiakoa Ahupua'a.

#### PAST POLITICAL BOUNDARIES AND LAND TENURE

In ancient Hawaii, it was the role of the people to *malama 'āina*, or care for the land. This was a reciprocal relationship. If the people took care of the land, as a primary responsibility, the land would in turn care for the people, by providing food, clothing, and shelter. The harmony and balance of this relationship was called *pono*.



As part of the ruling class, one responsibility of the *ali i* (chief) was to act as the protectors of the *maka ainana* (common people). They were believed to be the human representations of the *akua* (gods). Their duty was to maintain a balance between appeasing the gods by caring for the land, and in return, the common people provided for the *ali i* (Kame'ele'iwa 1992).

Land was considered the property of the king or *ali i ai moku* (the *ali i* who eats the island/district), which he held in trust for the gods. The title of *ali i ai moku* ensured rights and responsibilities to the land, but did not confer absolute ownership. The king kept the parcels he wanted; his higher chiefs received large parcels from him, and, in turn, distributed smaller parcels to lesser chiefs. The *maka ainana* (commoners) worked the individual plots of land.

In general, several terms were used to delineate different land sections. A district (*moku*) contained smaller land divisions (*ahupua'a*) that customarily continued inland from the ocean and upland into the mountains. Extended household groups living within the *ahupua'a* were able to harvest from both the land and the sea. Ideally, this situation allowed each *ahupua'a* to be self-sufficient by supplying needed resources from different environmental zones (Lyons 1875:111). The *'ili aina* or *'ili* were smaller land divisions next to importance to the *ahupua'a* and were administered by the chief who controlled the *ahupua'a* in which it was located (Lyons 1875:33; Lucas 1995:40). The *lele* or *'ili lele* were two *'ili* parcels within an *ahupua'a* that were separated from each other. The *mo o aina* were narrow strips of land within an *'ili*. The land holding of a tenant (*hoa aina*), residing in an *ahupua'a* was called a *kuleana* (Lucas 1995:61).

#### HISTORIC PERIOD

By the mid-1800s, large-scale sugar production had begun with the partnership of two men, S. T. Alexander and H. P. Baldwin, and their sugar plantation, Hawaii Commercial & Sugar (HC&S). With the growth of the sugar industry and the establishment of numerous plantations, workers from all over the world were recruited, including Portugal, Germany, Russian, Puerto Rico, Philippines, China, and Japan. These diverse groups of people were joined under government contract to labor in the sugarcane fields. When their contracts expired, many immigrants settled in the upcountry area. The predominant groups which settled in Kula were the Chinese, Portuguese, and Japanese.

In the 1840s, many Hawaiian and Chinese were growing Irish potatoes in the Kula area. Some Chinese working as contract laborers in Kohala on the Big Island heard about the demand for labor on Maui. Many left the Big Island and settled in the Keokea area on Maui. Potatoes

were initially cultivated to provision whaling ships, and then in 1849, to supply mining areas in California during the gold rush.

Extensive clearing of the upland forest, for sugarcane fields and potato farming, contributed to the rise of aridity in the Kula. The cool, relatively dry climate and rich soil was perfect for growing crops, as was evident from the traditional Hawaiian cultivation of *'iata* in the area. Potatoes became such a dominant crop on Maui, that the area became known as "the potato district." According to Kuykendall (1938), the fields covered an area as large as 12 miles, and by 1847, the annual production of potatoes was 20,000 barrels. With the expansion of ranching in the upcountry area, considerable amounts of land were cleared for pasture and ranch land, contributing to the deforestation of the upland forest, but creating the rich *puniolo* (cowboy) tradition for which the upcountry area is so famous.

#### THE GREAT MAHELE

In the 1840s, traditional land tenure drastically shifted with the introduction of private land ownership based on Western law. While it is a complex issue, many scholars believe that in order to protect Hawaiian sovereignty from foreign powers, Kame'eolui (Kamehameha II) was forced to establish laws changing the traditional Hawaiian economy to that of a market economy (Kame'ele'iwa 1992:169-70, 176; Kelly 1983:45 and 1998:4; Daws 1962:111; Kuykendall 1938 Vol. I: 145). The Great *Mahele* of 1848 divided Hawaiian lands between the king, the chiefs, and the government, and began the process of private ownership of lands. The subsequently awarded parcels were called Land Commission Awards (LCAs). Once lands were made available and private ownership was instituted, the *maka ainana*, if they had been made aware of the procedures, were able to claim the plots on which they had been cultivating and living. These claims did not include any previously cultivated but presently fallow land, *okipi'i* (on O'ahu), stream fisheries, or many other resources necessary for traditional survival (Kelly 1983; Kame'ele'iwa 1992:295; Kirch and Sahlins 1992). If occupation could be established through the testimony of two witnesses, the petitioners were awarded the claimed LCA and issued a Royal Patent (RP) number after which they could take possession of the property (Chinen 1961:16).

In 1848, the Hawaiian population was around 88,000, of which 29,220 were males over the age of 18. There were only 14,195 applications for LCA awards submitted by *maka ainana*. Of these claims, only 8,421 were awarded to less than 30 percent of the eligible males. The land received by the *maka ainana* was less than one percent of all the total land in Hawaii (Kame'ele'iwa 1992).

## PREVIOUS ARCHAEOLOGY

The entire *ahupua'a* of Kealahou was awarded to Kohokāole (LCA8452\*M), mother of future king, Kalākaua and queen, Lili'uokalani. The majority of LCAs awarded in Kula during the *Māhela*, were located between the 2,000 to 4,000 foot elevation in each *ahupua'a* (Tulchin *et al.* 2003). According to Chun *et al.* (2005), citing Haun and Henry (2001):

The distribution of LCAs in Kula describes a narrow horizontal band with specific elevation ranges and vegetation zones, in contrast to a typical valley system layout in which awardees often claimed agricultural lands along alluvial valley terraces and house lots and *kūia* land along the coast.

The Waihona 'Aina database (2006) lists a total of 21 land claims made for Kealahou *ahupua'a* out of which 14 were awarded. Several were located within the project area and included, LCA9010 to Helehua, LCA 10144 to Makahiki, and LCA 9673 to Lonoaea. Claims were noted for *kūia*, *koa* and *kor* trees, and stream use.

The tradition of family farms in Kula began with the availability of homesteads at the end of the nineteenth century. Many sugar plantations had been leasing government land, and as the leases expired, pressure for homestead land grew. The government land was leased or sold in one to ten acre lots, in an effort to encourage farming (Brown and Haun 1989). Many lots were bought by former plantation workers, including the Chinese and Japanese. To this day, the Japanese have a rich history of farming in the Kula area. Goldman (2003) describes one account of a Japanese farming family, in a conversation with John Hashimoto, of Kula:

“My grandfather started the farm,” said John Hashimoto, resting reluctantly on the back steps of the old Kula farmhouse. “His name was Shinichi Hashimoto, an *issei* who came here from Japan. My grandfather bought ten acres; I think that was before 1910. Those days, nobody bought land. They’d save money and go back to Japan. But he came and stayed. He bought this land when this road was impassible. Everybody said, ‘fool, what will you do with the land?’”

Goldman goes on to say:

The answer would take generations—long enough for Shinichi’s son Isami to become a leader in Kula’s farming community, Isami’s son John to follow in his footsteps, and John’s son Howard to become the fourth generation to run what was by then a twenty-five acre farm.

The earliest archaeological studies on Maui were conducted in the early twentieth century by Winslow Walker. At that time, there was a heavy emphasis in recording religious sites and features. Winslow Walker conducted an island-wide survey for the Bishop Museum in 1930. According to Kolb *et al.* (1997), Walker documented 23 *heiau* in the Kula area, all situated in a band existing between 1,800 to 3,000 feet in elevation. Other site types in the district were of significantly lower in number: 3 fishponds, 11 abandoned villages, and 5 ancient villages (replaced with modern communities). In his 1930 island-wide survey, Winslow Walker noted the presence of one *heiau* in the land of Waiakoa, which is adjacent to the land of Kealahou. Another platform *heiau* in Waiakoa measuring 36 by 45 feet was identified by Posepos (in Sterling, 1998).

Two large-scale archaeological studies of Kēōkeā and Waiohuli to the west and south of the project area have produced an abundance of information on the archaeological patterns and cultural history of upcountry Maui. In 1986, the Bishop Museum conducted a Reconnaissance Survey of both Kēōkeā and Waiohuli. An Inventory Survey by Brown *et al.* (1989) identified 159 archaeological sites consisting of 274 features. One hundred and eighty-seven of the features were associated with permanent habitation. According to Brown *et al.* (1989), radiocarbon dates from this study revealed dates ranging from A.D. 1680 to 1890.

In 1992, the State Historic Preservation Division (SHPD) conducted research in both Kēōkeā and Waiohuli. During this survey, 217 sites were identified, consisting of 1,093 features. More than half of the features were associated with agriculture. Two hundred and twelve features were associated with permanent habitation, and 121 were associated with temporary habitation. Six *heiau* were also identified. According to Kolb *et al.* (1997), radiocarbon dates from this study revealed dates ranging from A.D. 1399 to 1955.

Over 200 radiocarbon dates presented in Kolb’s study (*ibid*) provides an extensive chronology and a detailed account of settlement and subsistence for Kula. Kolb’s analysis of upland residential sites suggested that the area was inhabited primarily by commoners and low-ranking chiefs. The primary subsistence was based on sweet potato, dry land taro, and banana. Between the years A.D. 1660 and 1700, settlements in the uplands began to grow along with growth of pig husbandry. It is thought that these settlements supported the political structure of the *alii* (Haun and Henry 2001).

Department of Hawaiian Homelands (DHHL) landholdings in the *ahupua'a* of Kōkeā, are located approximately 5.5 miles to the southwest of Kealahou. Landholdings in Waiohuli are located approximately 3.4 miles from Kealahou. The extensive archaeological testing that has been conducted in these areas has greatly contributed to the overall understanding of the archaeological patterns of upcountry Maui, as well as the cultural traditions of the past in both ancient and historic times.

In 2001, Haun & Associates conducted an inventory survey in the land of Kamehamehū, which is adjacent to Kealahou. In this survey, three historic sites were identified, including an agricultural clearing mound and two cattle walls.

Within the Kealahou Ahupua'a and the project area, archaeological field studies are very few and are limited in scope. The majority of archaeological studies in the region have focused on neighboring *ahupua'a*. Ethnographic information for Kealahou *ahupua'a* is also extremely limited.

Petroglyphs and pictographs were identified in Keāhuaiwi Gulch by Sterling (1962). She stated:

.....we went first to Keāhuaiwi Gulch in Kealahou about 1/4 of a mile up the gulch from the old quarry. Here there is a natural crossing and on the Ulupalakua side is a bluff shelter. There were traces of alaea rubbings on the walls but it could not be determined whether they were actual pictographs....Further up the gulch on the Makawao side is a deposit of alaea and a series of pictographs fairly high up on the walls. In the streambed we found porous cooking stone and opihī shell.... We then went below the Lower Kula Road to about .6 of a mile down the same gulch from the old quarry. Here are a collection of petroglyphs fairly high up on the Makawao side of the gulch.

This site, State Site 50-50-11-1050, was re-identified during the current survey.

In 2003, Scientific Consultant Services conducted an Inventory Survey in Kealahou. This survey was of a 0.7 acre parcel of land, and two sites were identified, including two features, a historic cattle wall/boundary wall, and a pre-Contact agricultural terrace.

In 2006, SCS conducted an Inventory Survey in Pulehu Nui Ahupua'a and in Waiahoā and Aiae 3 & 4 Ahupua'a (Dega *et. al*). The Survey led to the identification and documentation of 117 sites comprised of 358+ features. These sites are assigned as State Site Number 50-50-10-6089 through 50-50-10-6205. Variability in site type and site function was fairly high. Fifteen different feature types were documented (in order of ubiquity): terrace, enclosure,

mound, modified outcrop, planting area, wall, C-shape, petroglyph/pictograph panel, overhang, rock shelter, alignment, garden enclosure, platform, foundation, road section. A majority of these features were related to habitation or agricultural activities and were estimated to have been constructed and occupied during traditional times. Six site classes/functions were documented: habitation (both permanent and temporary), agriculture, ceremonial, symbolic, ranching, and transportation. A total of 98 sites (84% of the total identified) were interpreted as traditional period sites, 14 sites (12%) were assessed as historic in origin, and 5 sites (4%) were interpreted as either traditional or historic sites or having components of both time periods. Prehistoric sites included those related to habitation (both permanent and temporary), agriculture (complexes, garden enclosures, clearing mounds, and such), ceremonial (possible *heiau*), and symbolic (petroglyphs) pursuits. Historic Era sites include ranching walls, push piles (mostly modern), animal husbandry, and historic road sections.

Also in 2006, SCS conducted an Inventory Survey on a 478.117 acre parcel near the current project area (McGerty *et al*). A total of 18 archaeological sites (50-50-11-5970 through 50-50-11-5987) consisting of 32 individual features were documented. Identified sites included agricultural and habitation features represented by terraces, alignments, walls, modified outcrops, a rock mound, and an enclosure.

#### ANTICIPATED SURVEY FINDINGS

Based on archival research of the area and adjacent *ahupua'a*, and the relatively large-scale archaeological studies of the nearby areas of Kōkeā and Waiohuli, it was thought that archaeological features associated with agricultural practices and habitation could be present within the confines of the project area and might include, stone and earth embankments, terraces, mounds, modified outcrops, petroglyphs, garden enclosures, animal enclosures, boundary walls, platforms, surface artifacts, and midden scatters. There is also the possibility of the presence of human burials.

#### METHODOLOGY

The Inventory Survey was conducted in intervals between November 2006 and March 2007 by several SCS field staff working under the direction of Field Director Allison Chiu, Ph.D. SCS staff included Brian Armstrong, B.A., Ian Bassford, B.A., Ryan Calma, B.A., David Dillon, B.A., Leigh Anne Ellison, M.A., Suzanne Humphrey, B.A., Jenna Matthews, B.A., Randy Ogg, B.A., and Guerin Tome, B.A. Principle Investigator for this project was Michael Dega, Ph.D. Fieldwork consisted of a systematic pedestrian survey of the project area with the



crew spaced a variable 10 m apart, depending on ground visibility. Consultation was undertaken with the Department of Land and Natural Resources (DLNR) SHPD-Maui archaeologist Dr. Melissa Kirkendall. All suggestions were implemented accordingly.

#### **ARCHIVAL METHODS**

In addition to referencing available SCS resources, archival research was conducted at the SHPD library facility (Wailuku and Kapolei, HI) and on the SHPD website. Archival work consisted of general research on the history and archaeology of the project area, as well as specific searches of previous archaeological studies in and around the subject parcel. Historic land use data were obtained from various sources including the Waihona Aima Database 2007 website.

#### **FIELD METHODS**

All of the identified archaeological sites were marked with flagging tape and notes describing their location, construction characteristics, and excavation potential were recorded. During the Inventory Survey, all identified features were mapped to scale using a tape and compass and were photographed. Sites were recorded in sufficient detail to reflect their overall integrity, size, and location in the project area. All sites were located with a hand-held GPS unit. Sites deemed appropriate were subjected to limited subsurface excavations in the form of Test Units (TU), Shovel Probes (SP), and Stratigraphic Trenches (ST). Test Units were excavated by natural stratigraphic layers divided in 10 cm levels as necessary using a trowel. Shovel Probes and Stratigraphic Trenches were excavated by natural layers, rather than arbitrary levels. Where noted, excavation fill was screened through 6 mm and 3 mm mesh nested in series. Profiles and standard plan view maps were generated for each excavated unit. Soil layer color was recorded using Munsell Soil Color Charts (2000) and soil composition was recorded on standard SCS stratigraphy forms.

#### **LABORATORY METHODS**

Artifacts were sorted, analyzed, and catalogued at the SCS laboratory in Honolulu and are presently curated at the SCS laboratory in Honolulu along with all field notes, illustrations, and photographs. Portable artifacts were transported to the SCS laboratory in Honolulu. These materials were catalogued, described and quantified, and analyzed and interpreted in the laboratory. Laboratory work also included digital drafting of site locations and plan views for reporting purposes and the digitizing of all photographs and maps for archival purposes. Appendix A contains the results of the midden analysis. Appendix B contains the results of the radiocarbon dating samples.

### **ARCHAEOLOGICAL INVENTORY SURVEY RESULTS**

A pedestrian survey of approximately 272 acres revealed the presence of 40 archaeological sites, State Site 50-50-XX-XXXX through 50-50-XX-XXXX. Of the 40 sites, 39 were newly recorded and one site containing a rock shelter and numerous petroglyphs and pictographs (State Site 50-50-11-1050) was re-identified. Of the 39 newly recorded sites, one site number was assigned to the vast array of agricultural features found across the project area (State Site 50-50-XX-XXXX). Excluding all of the features included with the agricultural site (Site -XXXX), a total of 74 features were documented. Twenty features were determined to be pre-Contact, 22 were Historic, and 13 were undetermined. Eighteen features were interpreted as demonstrating characteristics from both the pre-Contact and Historic periods. Based on similar construction methods and materials of other known sites, the features identified during the Inventory Survey were interpreted as related to habitation, refuse sites/prives, agricultural functions, animal husbandry and ranching activities or storage or water control. A variety of features were identified, including terraces, enclosures, C-shaped structures, L-shaped structures, linear mounds, rock piles, ditches, and cisterns and refuse sites (prives) possibly associated with historic house sites also located on the property. Thirty-three excavations were dug at 21 sites; eight subsurface features were discovered. All were associated with habitation, agriculture, and water storage. Table 1 summarizes the sites and features identified during the Inventory Survey.

### **SITE DESCRIPTIONS**

#### **Site TS-5:**

FORM: Enclosure  
FUNCTION: Habitation  
AGE: Pre-Contact  
DIMENSIONS: Exterior: 5.5 x 4.3 m; 0.5–0.8 m high  
Interior: 5.0 x 4.0 m; 0.06–0.13 m high  
CONDITION: Fair-Poor  
SURFACE ARTIFACTS: None  
EXCAVATION: TU-1

DESCRIPTION: Site TS-5 measured 41.0 x 2.5 m, ran discontinuously along the north edge of a low ridge, roughly east-west. The ridge sloped gently east-west, approximately 10–15°. Site TS-5 contained one feature – an enclosure remnant constructed of medium- to large-sized basalt cobbles and a few small boulders, built into bedrock on the top of a ridge. The north wall of the feature is stacked two to three courses high while the west and east walls

Table 1: Inventory of Sites in Project Area.

Temporary Site #	State Site Number 50-50-	Form	L x W x H (to nearest meter)	Age	Function
5		Enclosure	5.5 x 4.3 x 0.5	Pre-Contact	Habitat
6		Wall/Terrace	41.0 x 1.0	Undetermined	Animal Husbandry
7		C-Shaped Structure	5.0 x 3.5 x 0.55	Pre-Contact?	Habitat
8		Terrace/Alignment	8.0 x 6.0 x 0.4	Pre-Contact	Habitat/Agricultural/Undetermined
		Terrace	6.5 x 2.5	Pre-Contact	Habitat/Agricultural/Undetermined
11		Enclosure	9.0 x 7.5 x 0.4	Pre-Contact	Habitat
12		C-Shaped Structure	8.0 x 8.0 x 0.6	Pre-Contact	Habitat
14		C-Shaped Structure	7.0 x 6.5 x 1.0	Pre-Contact?	Habitat
24		Enclosure	5.5 x 4.0 x 0.68	Undetermined	Habitat
35		House Site	14.7 x 12.1	Historic	Habitat
36		Terrace	5.3 x 4.55 x 0.91	Historic	Habitat/Animal Husbandry
37		Refuse Deposit	14.5 x 20.0	Historic	Habitat/Animal Husbandry
126		Linear Mound/Garden Enclosure	5.0 x 3.0 x 0.75	Undetermined	Agricultural/Storage
128		Enclosure	14.0 x 8.5 x 0.7	Pre-Contact?	Habitat
129		Lithic Scatter	15.0 x 15.0	Pre-Contact	Undetermined
133		Cistern (8 sub-features, including piles of rocks, mounds, and C-shaped structures)	4.0 m diameter	Historic	Water Storage
140		Cistern	2.4 m diameter	Undetermined	Undetermined
		Terrace	6.0 x 0.7 x 0.18	Historic	Agricultural/Animal Husbandry
		Enclosure	3.0 x 2.5 x 0.18	Historic	Undetermined
141		Enclosure	8.0 x 8.0 x 0.4	Pre-Contact	Habitat
142		Enclosure	3.0 x 3.4 x 0.45	Pre-Contact?/Historic	Habitat
152		Double Enclosure	8.5 x 5.5 x 0.97	Historic?	Habitat
153		Enclosure	5.9 x 5.5 x 1.30	Historic	Habitat/Animal Husbandry
175		Terrace/Enclosure	6.5 x 6.0 x 0.6	Pre-Contact	Habitat
193		Enclosure/Terrace	12.0 x 3.5 x 1.3	Pre-Contact?	Habitat
		Terrace	4.0 x 3.5 x 1.8	Pre-Contact	Habitat
		Terrace	12.0 x 4.5 x 0.6	Pre-Contact	Habitat
197		Modified Outcrop	40.0+ m long x 1.28 m high	Undetermined	Boundary
		Terrace	8.0 x 4.0 x 1.07	Pre-Contact	Habitat?
		Enclosure	12.0 x 4.0	Pre-Contact	Habitat?

237		Cistern	5.0 m diameter	Historic	Water Storage
		Ditch	30.0 x 1.0 x 0.25 m deep	Undetermined	Agricultural/Habitat/Water Control
254		House Site/Foundation	12.5 x 10.0 x 0.93	Historic	Habitat
		C-Shaped Structure	5.0 x 3.5 x 0.43	Historic	Privy
265		Enclosure	9.5 x 9.0 x 1.55	Pre-Contact	Habitat
		Cistern	2.5 m diameter	Historic	Water Storage
267		Excavated Hole	5.0 x 4.0 x 1.20	Historic?	Privy/Refuse Area
		Terrace	15.0 x 1.0 x 0.75	Undetermined	Agricultural
		Terrace	23.0 x 8.0 x 1.60	Pre-Contact/Historic	Habitat
285		Cistern	1.9 m diameter	Historic	Water Storage
		Terrace	14.0 x 3.0 x 0.48	Pre-Contact/Historic	Undetermined
		L-shaped Structure	7.0 x 5.0 and 5.0 x 5.0	Pre-Contact/Historic	Habitat?
		Terrace	20.5 x 1.5 x 0.95	Pre-Contact/Historic	Agricultural
		Terrace	24.0 m long	Pre-Contact/Historic	Agricultural
		Terrace	0.5 m long	Pre-Contact/Historic	Agricultural
		Terrace	36.5 m long	Pre-Contact/Historic	Agricultural
		L-Shape Alignment	9.0 x 4.0 x 0.85	Pre-Contact/Historic	Agricultural
298		Linear Mound Alignment	7.0 x 2.0 x 0.75	Pre-Contact/Historic	Undetermined
327		Cistern	3.5 m diameter	Historic	Water Storage
332		Enclosure	3.75 x 4.5 x 0.43	Pre-Contact/Historic	Habitat
		Double Enclosure (with 4 terrace sub-features) and Trash Dump (Privy?)	4.0 m diameter, 8.0 x 8.0	Pre-Contact/Historic	Water Storage
344		Terrace	7.8 x 4.3 x 0.75	Pre-Contact/Historic	Habitat
355		Enclosure	5.0 x 3.5	Undetermined	Habitat
359		Lithic Scatter	15.0 x 15.0	Pre-Contact	Work Shop?
362		Enclosure	4.5 x 3.5 x 0.93	Undetermined	Habitat
363		Enclosure	4.5 x 3.0 x 1.15	Undetermined	Habitat/Agricultural
367		Terrace	4.5 x 4.0 x 1.3	Historic?	Agricultural
372		Cistern	2.6 m diameter	Historic	Habitat/Water Storage
		Terrace	2.4 x 3.7 x 0.35	Historic	Habitat
374	-11-1050	Rock Shelter	5.0 x 1.0 x 0.55	Historic	Habitat
		Petroglyphs	----	Pre-Contact/Historic	Rock Art
400		Agricultural Complex	----	Pre-Contact/Historic	Agricultural

consist of foundation stones. The long axis of the feature was oriented northwest-southeast at 122°/302°. The foundation of a partition wall is present within the southeast interior corner; however, the entire southern portion of the feature is obscured by *palmi* cactus. The feature has been interpreted as a pre-Contact habitation (Figure 4).

**EXCAVATION:** A 0.5 x 0.5 m test unit (TU-1) was excavated at in the northeastern corner of Feature 1 in hopes to examine existing architecture as well as to recover any cultural remains deposited during the initial building episode. Surface vegetation (duff) was removed prior to excavation. One culturally sterile layer was revealed between 10 and 43 cmbd – a dark brown (7.5YR 3/3) compact silt with a few small- to medium-sized cobbles and rootlets was observed. Bedrock was revealed at 41 cmbd (centimeters below datum) (Figure 5).

**Site TS-6:**

**FORM:** Wall/Terrace  
**FUNCTION:** Animal Husbandry/Possibly Ranch-related boundary wall  
**AGE:** Undetermined  
**DIMENSIONS:** 41.0 x 1.0 m  
**CONDITION:** Fair-Poor  
**SURFACE ARTIFACTS:** None  
**EXCAVATION:** None

**DESCRIPTION:** Site TS-6 consisted of one feature, a stacked, rock wall constructed of stacked and partially faced sub-angular and sub-rounded basalt cobbles and boulders ranging in size from medium to large. The feature ran from the base of a low ridge, which runs east-west, to the base of a bedrock outcrop at the upper edge of the gully, along the northwestern corner of the project area. Portions of the wall have been damaged by a cattle path and appeared almost completely destroyed; the section remaining resembled an alignment. Other portions have been altered by erosion, gravity, and overgrown vegetation. The area most intact ranged from 80 to 100 cm on the down slope side and 20 to 30 cm on the upslope side. The north end of TS-6, where it abutted the gully edge, was 11.5 m at 160°/340° from the datum at TS-7. The south end of the wall, where it abutted the ridge, was 13.5 m at 10°/190° from the datum of TS-5.

**Site TS-7:**

**FORM:** C-Shape Structure  
**FUNCTION:** Habitation  
**AGE:** Pre-Contact?  
**DIMENSIONS:** 5.0 x 3.5 m; 0–55 cm high  
**CONDITION:** Poor  
**SURFACE ARTIFACTS:** One basalt core  
**EXCAVATION:** TU-1 revealed SSF 1

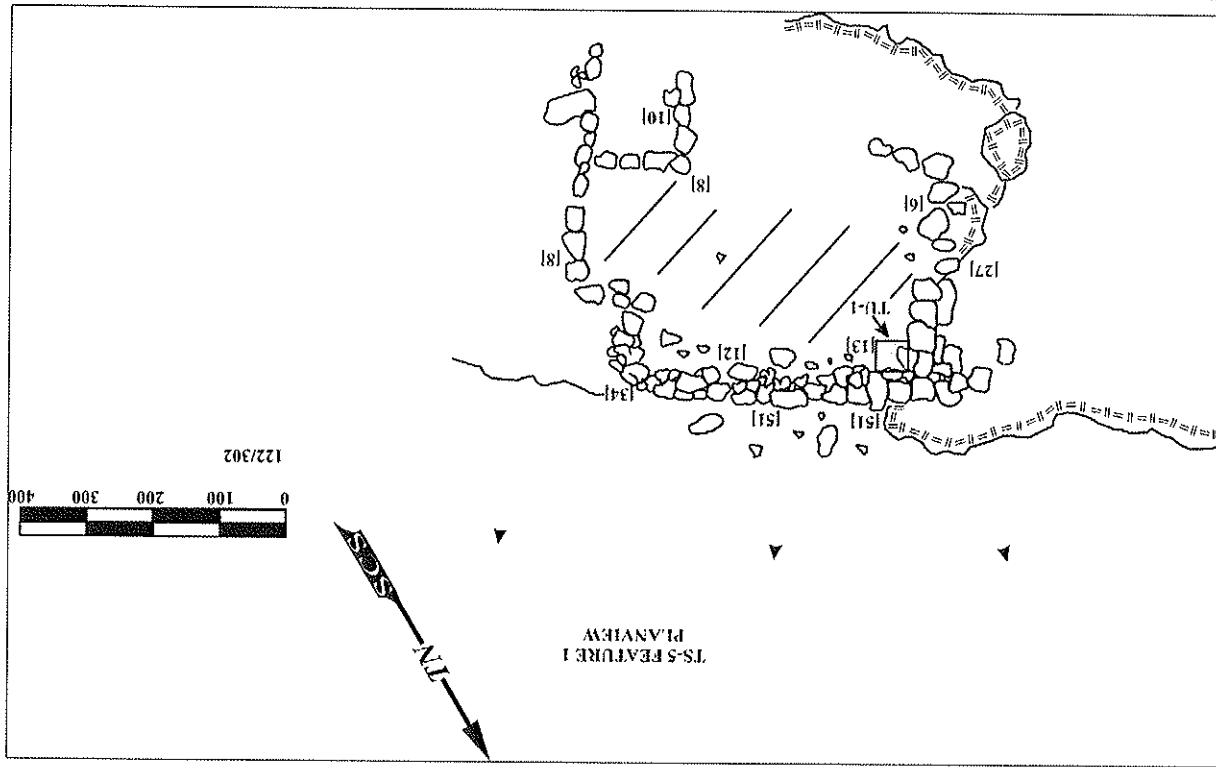


Figure 4: TS-5, Feature 1, Plan View.

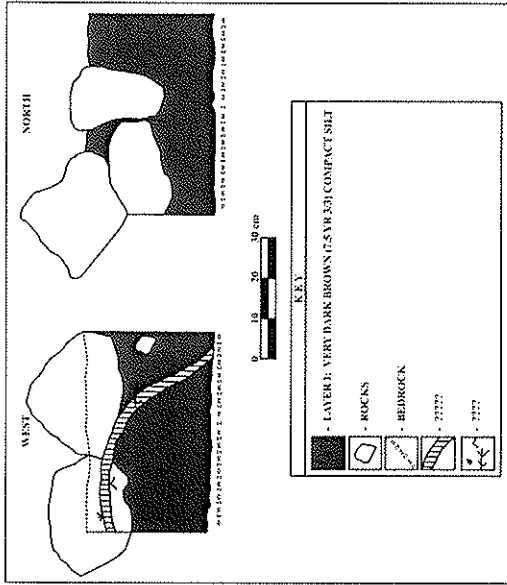


Figure 5: Site TS-5, Feature 1, Test Unit 1, West and North Wall Profiles.

**DESCRIPTION:** TS-7 consisted of one feature located on a hillside which sloped southeast-northwest at 10-30°. There was a gulch approximately 5.0 m east of the feature, running southeast to northwest. The feature was a roughly stacked C-shaped structure formed from medium- to large-sized sub-rounded to sub-angular basalt boulders. The feature had been altered by gravity, erosion, and animal activity. Dense vegetation surrounds the feature, possibly obstructing other features in the area. A basalt core artifact (9 cm L x 7 cm W x 4 cm thick) was observed about 3 m to the SW of the feature. The TS-6 wall was approximately 10.5 m southeast of TS-7. The datum of TS-8 was located 26.5 m from the datum of TS-7 at 60°/240° (Figure 6).

**EXCAVATION:** One 0.5 x 0.5 m test unit, TU-1, was excavated in the center of the feature in order to determine the feature function. Layer I (9-37 cmbd), a very dark brown (7.5YR 2.5/3) soil, contained charcoal, some of which was collected. A series of medium-sized cobbles, which were placed at right angles to each other to form a corner, was revealed within the northeastern corner at a depth of 20 cmbd. This was interpreted as a lined firepit or hearth (*imu*) (Subsurface Feature 1) and its contents were screened and bagged separately. SSF 1, which contained very dark brown (7.5YR 2.5/2) silty loam with patches of brown (7.5YR 4/3) silty loam, terminated at 37 cmbd, directly above Layer II. Layer II contained a dark brown (7.5YR 3/4) soil. Excavation terminated at 37 cmbd (Figure 7).

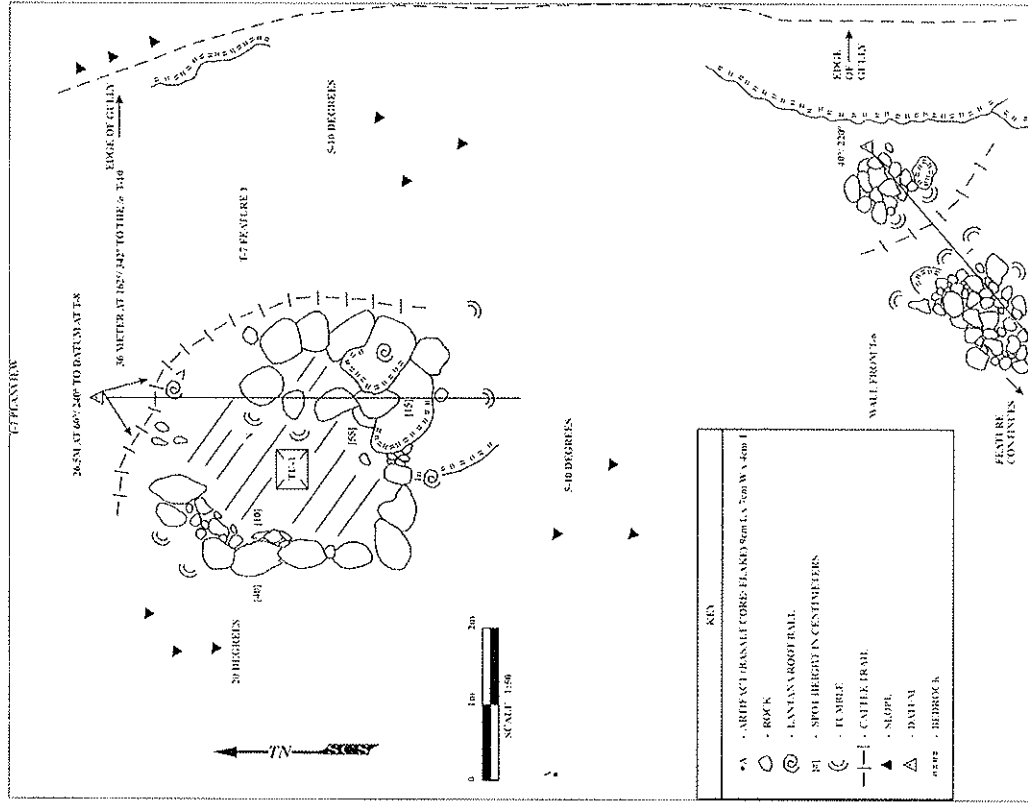


Figure 6: Site TS-7, Feature 1, Plan View.

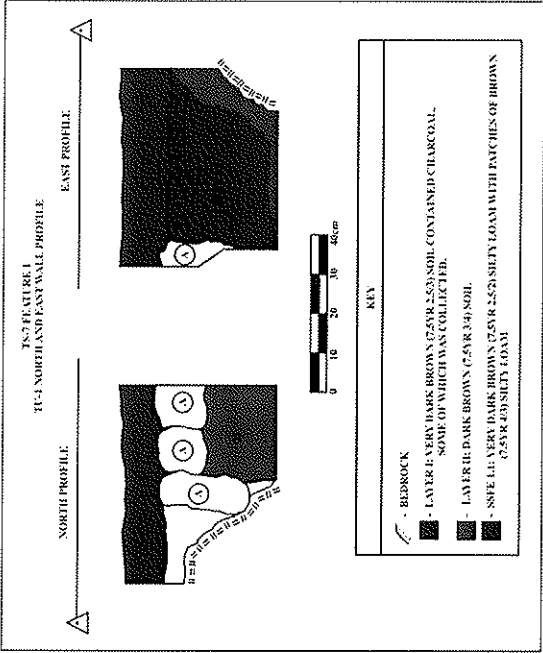


Figure 7: Site TS-7, Feature 1, Test Unit 1. North and East Wall Profiles.

#### Site TS-8

Site TS-8, which measured 15.0 x 9.0 m, consisted of three features: an alignment/wall (Feature 1) and two terraces (Features 2 and 3). The features were constructed of sub-angular to sub-rounded large-sized cobbles and medium-sized boulders stacked on bedrock. All rocks were basalt. On the flat area to the east of Feature 3 was a rectangular basalt stone, which appeared to be anthropogenically modified. To the south of the site was a telephone pole, a cable, and a wire; the site was probably disturbed when these were installed. Livestock have also disturbed the area; two blowouts in the feature appeared to have been caused by cattle. Based on similar construction styles to known sites, TS-8 was deemed pre-Contact in age and related to habitation and agricultural activities. One test unit was excavated at Feature 2; two subsurface features were revealed. Data Recovery was recommended to confirm site function and age (Figure 8).

FORM: Terrace/Alignment  
 FUNCTION: Agricultural/Habitation/Undetermined  
 AGE: Pre-Contact  
 DIMENSIONS: Exterior: 8.0 x 0.6 m  
 Height: 0.1-0.2 m (exterior); 0-0.4 m (interior)  
 CONDITION: Fair  
 SURFACE ARTIFACTS: None  
 EXCAVATION: None

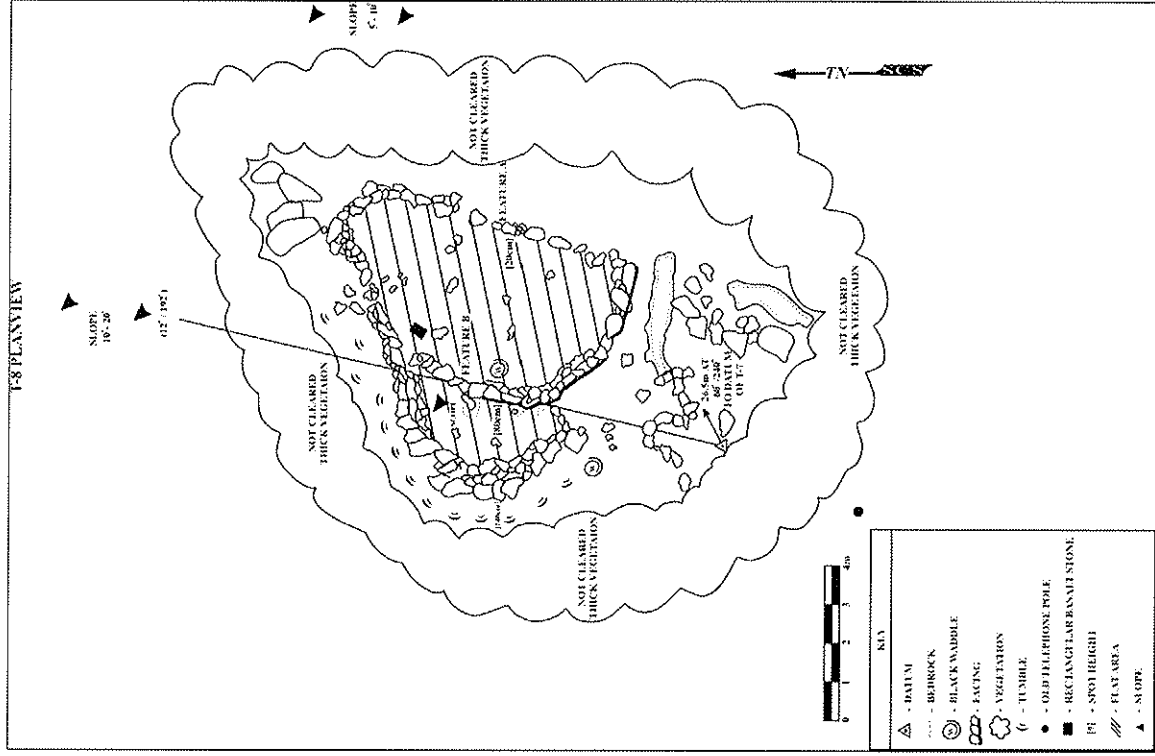


Figure 8: Site TS-8, Features 1 through 3. Plan View.

**DESCRIPTION:** Feature 1, a terrace or alignment, was located near the top of a 5° to 20° slope, approximately 50.0 m north of Keāhuatwi Gulch. Based on the size, formal construction style, and location of the feature, Feature 1 was interpreted as being related to either habitation or agricultural functions. The feature was a roughly stacked (1–2 courses high) terrace or alignment, constructed of sub-angular and sub-rounded small- to large-sized basalt boulders and large cobbles. The feature was in fair condition; areas were tumbled. Feature 1 was altered by mechanical means (e.g., during the installation of the nearby telephone pole), animal activity, and gravity.

**FORM:** Terrace  
**FUNCTION:** Habitation/Agricultural  
**AGE:** Pre-Contact  
**DIMENSIONS:** Exterior: 6.5 x 2.5 m  
 Height: 0.8 m (exterior); 0.2 m (interior)  
 Wall Thickness: 0.5 m  
**CONDITION:** Good  
**SURFACE ARTIFACTS:** Awl  
**EXCAVATION:** TU-1 revealed SSFs 1.1 and 1.2

**DESCRIPTION:** Feature 2, a terrace, was located near the top of a 5° to 20° slope; approximately 50.0 m to the northwest was a gulch. The feature was constructed of stacked large basalt cobbles and medium basalt boulders on a bedrock outcrop. The shape was relatively C-shaped and varied from one to five courses high. Based on previously known sites of similar construction style and location, Feature 2 was interpreted as related to habitation and agriculture. The feature was in good condition. There was a blow out on the southern end of the terrace, which was a probable result of cattle. The feature has been disturbed by natural and mechanical forces.

**EXCAVATION:** Test Unit 1 (TU-1) was a 0.5 x 0.5 m unit excavated in the center of Feature 2, a cornered terrace or possible enclosure on top of a small hill (Figure 9). One awl was collected from the surface. Layer 1 (10–42 cmbd) contained very dark brown (7.5YR 2.5/3) semi-compact, very fine silt loam with many medium- to fine-sized roots and some pebbles (10%). Several cultural items were screen recovered: low quality basalt flakes, burned and unburned *kukui* shell, and volcanic glass. At about 25 cmbd, charcoal chunks (1 cm diameter) were encountered; a basalt core was located in the western corner. Chunks of pinkish-yellow ash and a burn pit outline was encountered in the northern corner and deemed Subsurface Feature 1.1 (SSF 1.1), a possible hearth, which extended from 25 to 42 cmbd. A bulk soil sample and ash chunks were collected near 26 cmbd. A sample was sent to Beta Analytic, Inc. for radiocarbon analysis. A conventional date range of 290 ± 40 BP was returned.

When calibrated by OxCal v3.5 at 2 Sigma, two calibrated date ranges were obtained; A.D. 1480–1670

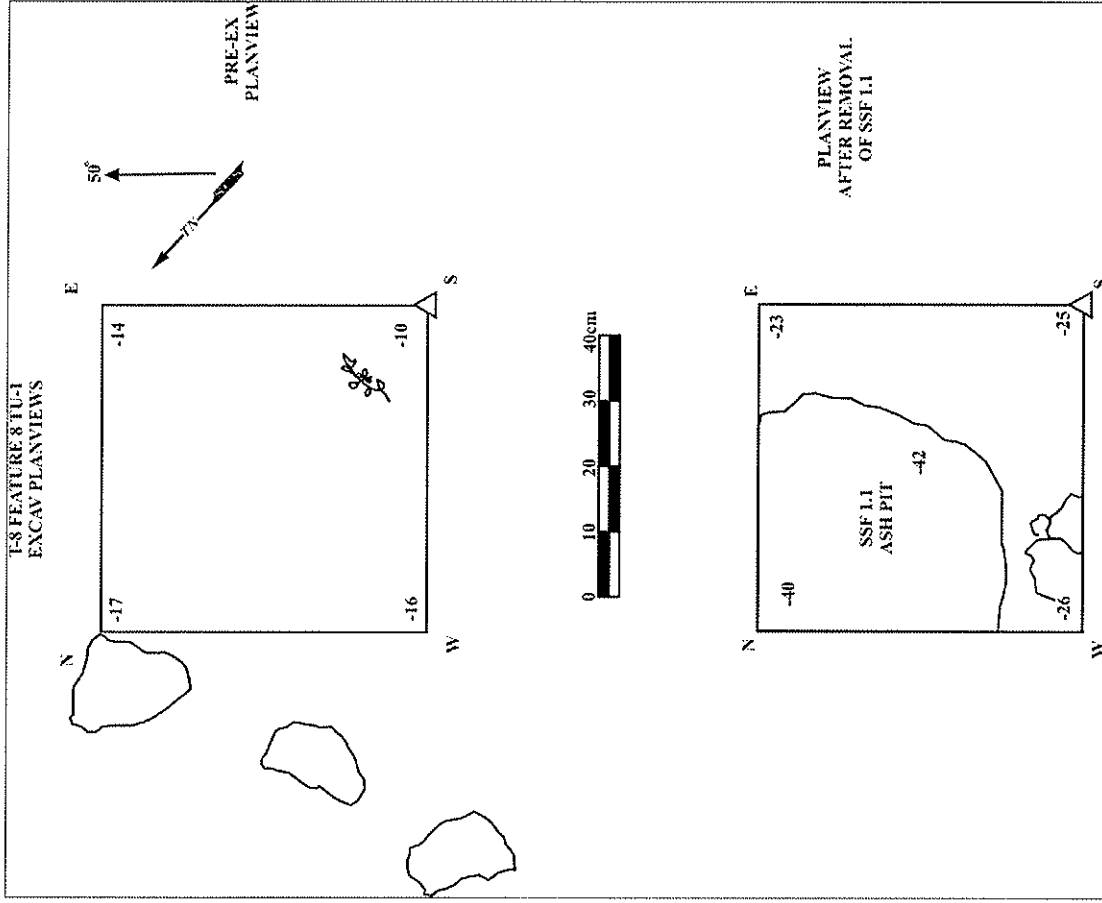


Figure 9: Site TS-8, Feature 2, Test Unit 1. Plan View.



(94.4%) and A.D. 1780–1800 (1.0%). The ashy material disappeared near 42 cmbd. No midden was recovered, save for sparse amounts of charcoal and a small possible piece of bone.

Layer II (37–62 cmbd) was a redder, dark brown (7.5YR 3/3) semi-compact silt loam with fewer roots and pebbles than Layer I. Bits of charcoal were collected near the top of Layer II, probably from SSF 1. Larger charcoal chunks were visible in the east corner, just above an elongated rock in the southeast wall, near 46 cmbd. The southwestern-half lacked charcoal; however, the charcoal staining noted in the entire northeastern-half of the unit was deemed SSF 1.2 (46–60 cmbd). Layer III (60–70 cmbd) was a soft, very fine, semi-compact yellowish, dark brown (7.5YR 3/4) with many roots and more small cobbles (20–25%). The layer was sterile and excavation termination in bedrock (Figure 10).

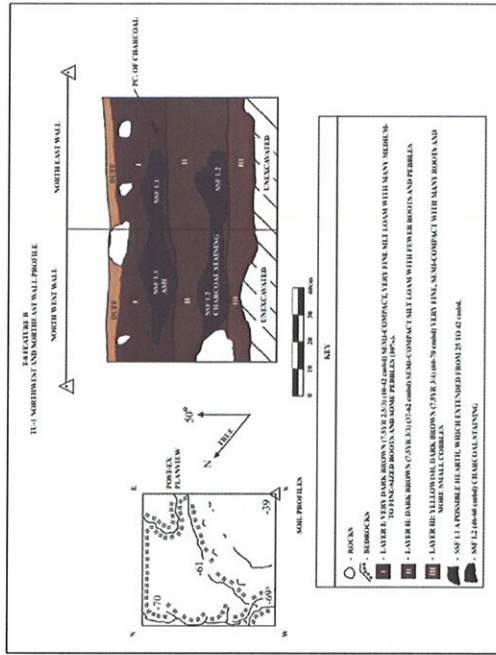


Figure 10: Site TS-8, Feature 2, Test Unit 1. Northwest and Northeast Wall Profiles.

FORM: Terrace  
 FUNCTION: Agricultural/Habitation/Undetermined  
 AGE: Pre-Contact  
 DIMENSIONS: Exterior: 9.0 x 2.0 m  
 Height: 1.4 m (exterior)  
 Wall Thickness: 1.0 m  
 CONDITION: Fair  
 SURFACE ARTIFACTS: None  
 EXCAVATION: None

DESCRIPTION: Feature 3, a stacked terrace, was located near the top of a 5° to 20° slope, approximately 50.0 m north of the gulch. The terrace was constructed of sub-angular to sub-rounded basalt small to large boulders and large cobbled; it was stacked three to ten courses high. Based on the construction style and location of the feature, it appeared to have been for habitation or agricultural functions. The feature was in fair condition; areas were tumbled. Feature 3 was altered by mechanical means (e.g., during the installation of the nearby telephone pole), animal activity, erosion, and gravity.

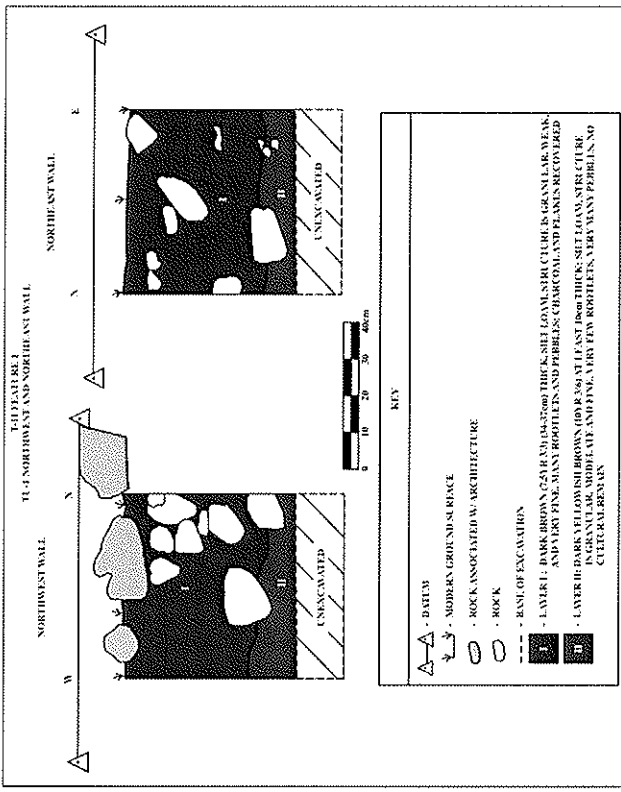
Site TS-11

FORM: Enclosure  
 FUNCTION: Habitation  
 AGE: Pre-Contact  
 DIMENSIONS: Exterior: 9.0 x 7.5 m; 0.4–0.6 m high  
 Interior: 7.25 x 4.5 m; 0.1–0.3 m high  
 Wall Thickness: 0.5–2.0 m  
 CONDITION: Fair-Poor  
 SURFACE ARTIFACTS: None  
 EXCAVATION: TU-1

DESCRIPTION: Site TS-11 was located midway down a slight hill, which sloped south-north at 10–30° and measured 10.0 x 9.0 m. One feature was present. TS-11 consisted of a rectangular-shaped enclosure that was constructed of small- to medium-sized sub-angular to sub-rounded basalt cobbles and boulders. The feature, which ran along a north-south axis at 0°/180°, was in fair-poor condition as it had been altered by animal activity, erosion, gravity, and vegetative overgrowth (Figure 11).

EXCAVATION: One 0.5 x 0.5 m test unit (TU-1) was placed against the only visible extant (i.e., not tumbled) portion of the interior wall of the feature to reveal any cultural deposits related to the construction of the feature and to aid in assessing the cultural and chronological affiliations of the feature. Layer I (10–43 cmbd) consisted of dense rootlets in the upper 5–10 cm and contained many small-, medium-, and large-sized pebbles and a few small cobbles. The sediment was a dark brown (7.5YR 3/3) semi-compact to loose, very fine grained silt loam. Charcoal was flecked throughout, some of which was collected, along with some basalt flakes.

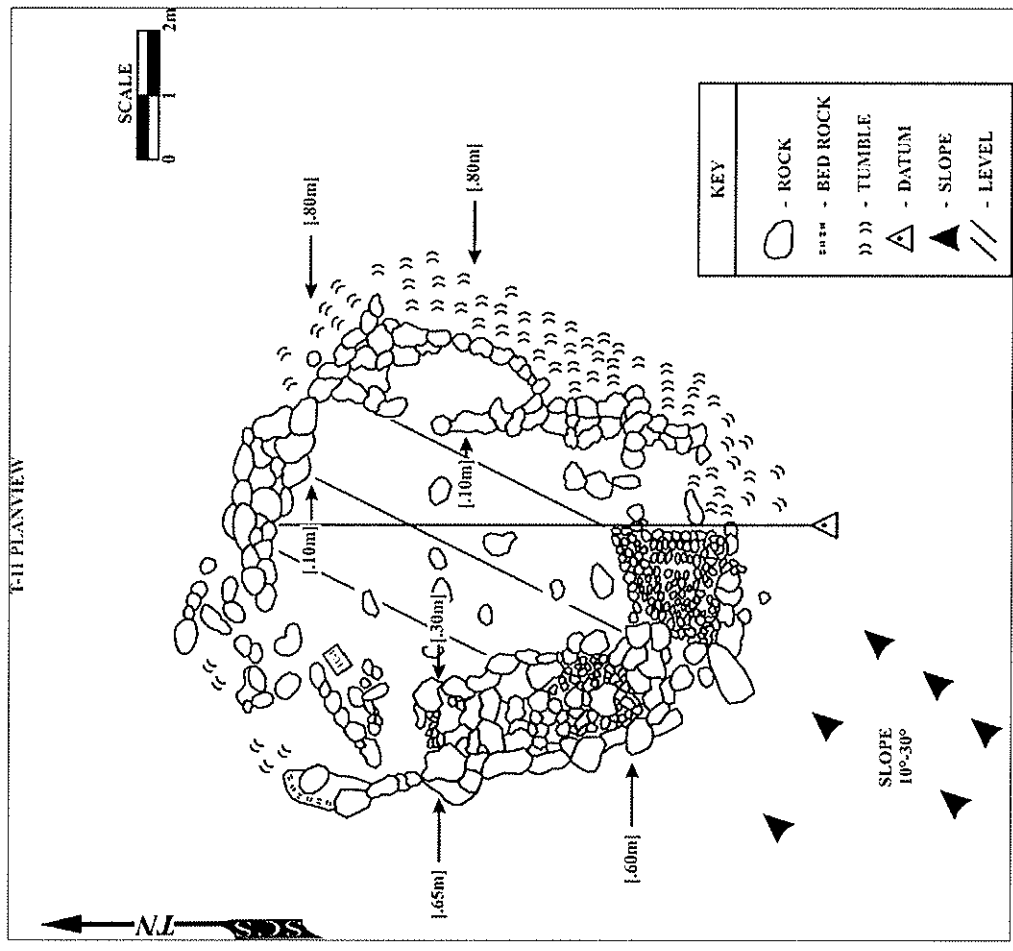
Layer II (44–57 cmbd), which contained a dark yellowish brown (10YR 3/6) fine silt loam, appeared to be a culturally sterile, saprolitic layer that included many very small sub-angular pebbles. Excavations ceased at 57 cmbd (Figure 12).



**Figure 12: Site TS-12, Feature 1, Test Unit 1. Northwest and Northeast Wall Profiles.**

**Site TS-12**  
**FORM:** C-Shaped Structure  
**FUNCTION:** Habitation  
**AGE:** Pre-Contact  
**DIMENSIONS:** Exterior: 8.0 x 8.0 m; 0.45-0.60 m high  
 Interior: 5.5 m x 4.0 m; 0.20-0.55 m high  
**CONDITION:** Fair-Poor  
**SURFACE ARTIFACTS:** None  
**EXCAVATION:** TU-1

**DESCRIPTION:** One feature, a C-shaped structure, was identified at Site TS-12, a site that measured 10.0 x 9.0 m. The feature was constructed of medium- to large-sized sub-angular basalt cobbles and was located on a low outcrop, amidst low rolling hills with a gentle slope of 5-10°. The feature, which ran north-south at 0°/180°, was in fair-poor condition; it had been altered by animal activity, erosion, gravity, and vegetative overgrowth (Figure 13).



**Figure 11: Site TS-11, Feature 1. Plan View.**



**EXCAVATION:** One 0.50 x 0.50 m test unit was placed against the eastern wall, the only extant (i.e., not tumbled) section of the wall visible on the interior of the feature in order to relate depositional episodes to the construction history. Traditional-type materials, including charcoal, *kukuri* shell, and a unifacially worked basalt flake, and basalt flakes were collected from Layer I between 20 and 44 cmbd. Layer I (20–40 cmbd) consisted of a very dark brown (7.5YR 2.5/3) very fine silt loam with many roots and rootlets and small pebbles ranging in size from 0.5–2 cm. The boundary between Layer I and Layer II was uneven and dipped down to 50 cmbd near the northwestern corner. The layer was saprolitic and contained sub-angular to sub-rounded rocks ranging in size from 0.5 cm to soft-ball sized.

Layer II (40–55 cmbd), which resembled Layer II in TS-11, consisted of dark yellowish brown (10YR 3/6) fine-grained, compact silt loam and contained few roots and very many small- and medium-sized pebbles. Excavation ceased at 55 cmbd due to hard, sterile subsurface conditions (Figure 14).

**Site TS-14**

Site TS-14 contained two features that lie on a low ridge running east-west: a C-shaped structure (Feature 1) and two terraces (Feature 2), which lie west of Feature 1. The total site size measured 19.0 x 8.5 m and ran along a southwest-northeast axis at 40°/220°. Overall site function and age were undetermined because of possible bulldozer disturbance (Figure 15).

**FORM:** C-Shaped Structure  
**FUNCTION:** Habitation  
**AGE:** Pre-Contact?  
**DIMENSIONS:** Exterior: 7.0 x 6.5 m; 1.0 m high  
 Interior: 5.0 x 2.5 m; 0.8 m high  
 Wall Thickness: 1.0 m thick  
**CONDITION:** Poor  
**SURFACE ARTIFACTS:** None  
**EXCAVATION:** None

**DESCRIPTION:** Feature 1, a C-shaped structure, was constructed of roughly stacked medium-to large-sized basalt cobbles and sub-angular to sub-rounded boulders three to four courses high in the northwest corner. The feature ran along a north-south axis at 0°/180°. Overall, the feature is in poor condition and has been altered by mechanical means and natural occurrences, such as erosion, gravity, and vegetative overgrowth.

**FORM:** Terrace  
**FUNCTION:** Agricultural

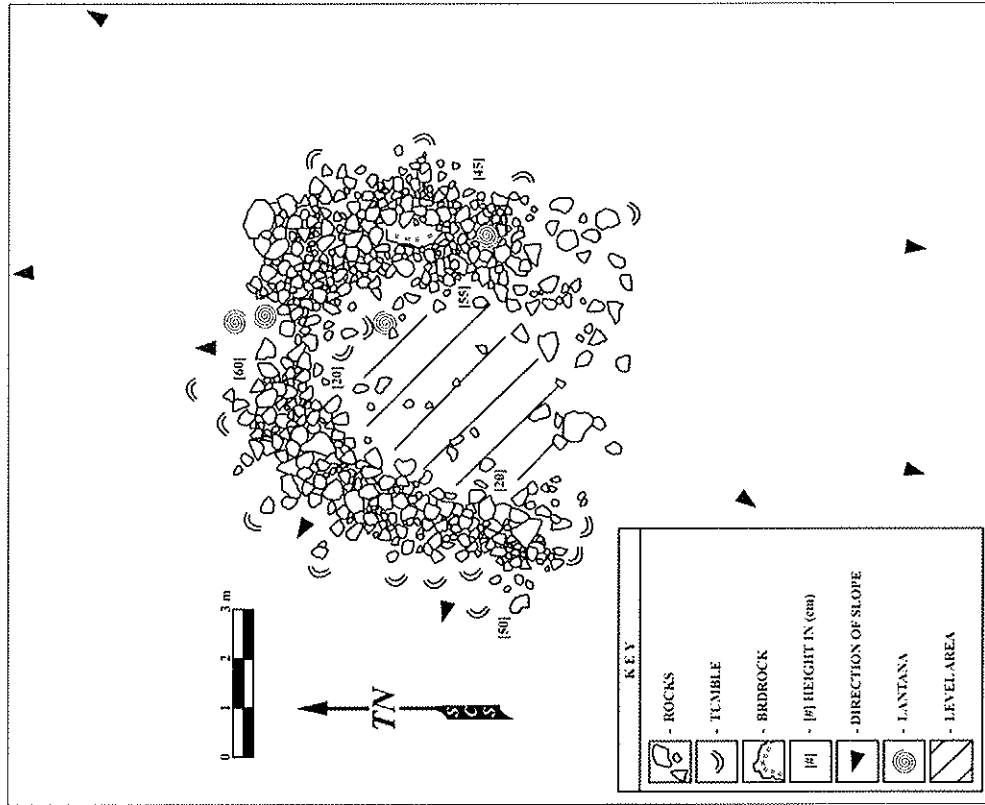


Figure 13: Site TS-12, Feature 1. Plan View.

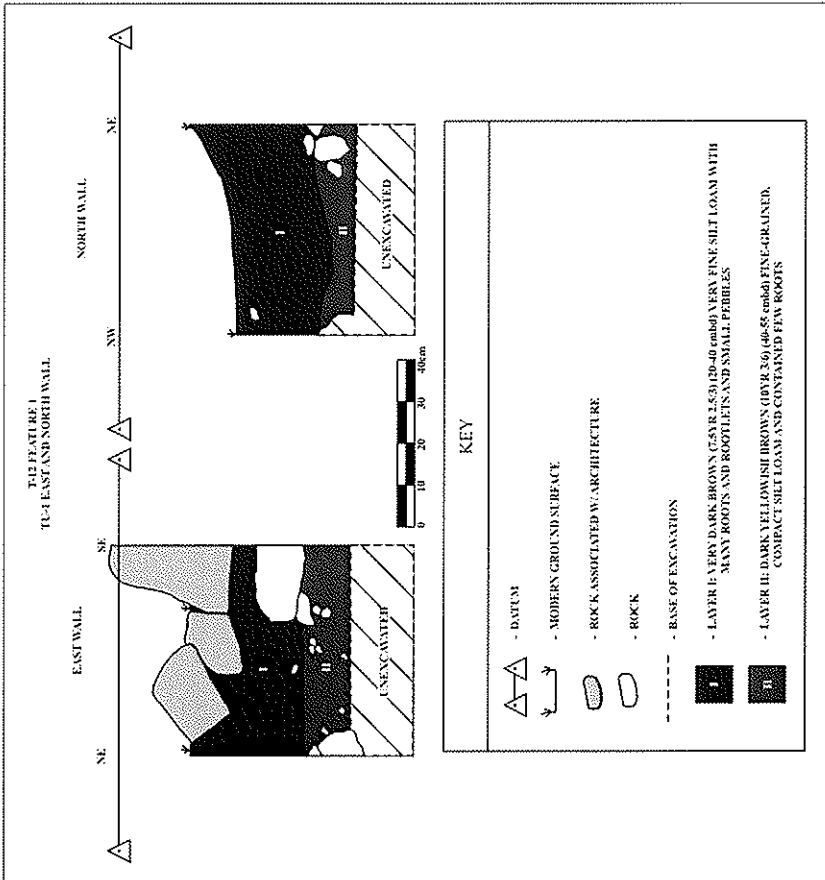


Figure 14: Site TS-12, Feature 1, Test Unit I. East and North Wall Profiles.

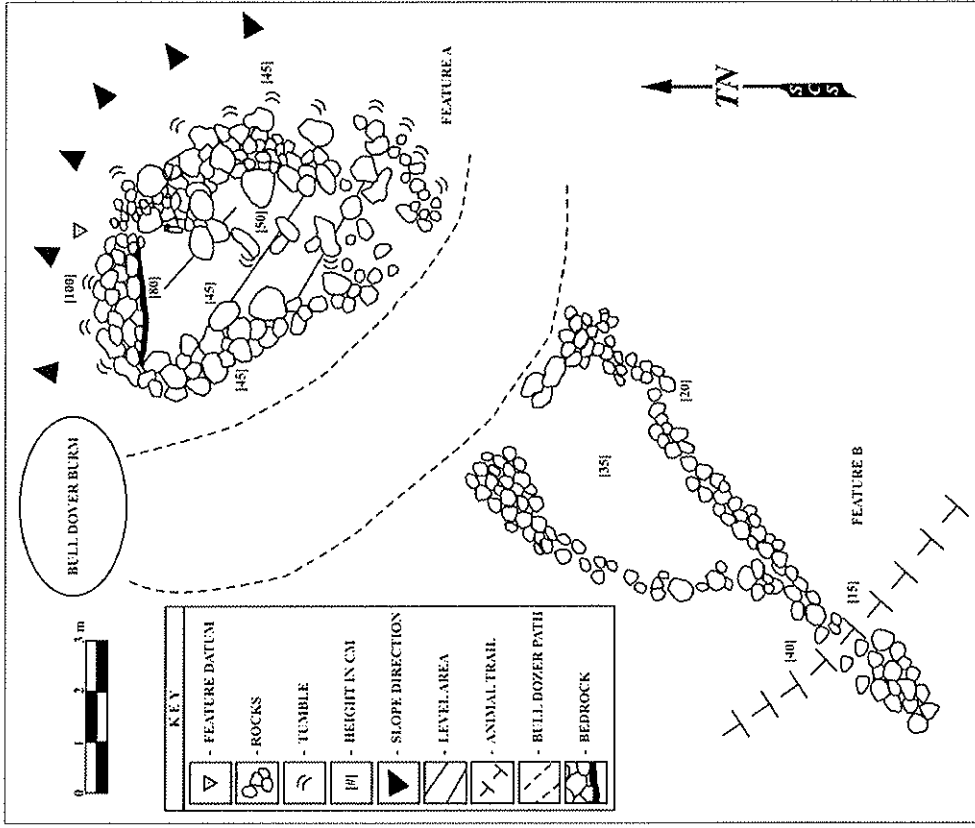


Figure 15: Site TS-14, Features 1 and 2. Plan View.

AGE: Undetermined  
 DIMENSIONS: Exterior: 11.0 x 5.0 m  
 Interior: 10.0 x 3.5 m  
 Wall Height: 1.5–4.0 m high  
 CONDITION: Poor  
 SURFACE ARTIFACTS: None  
 EXCAVATION: None

DESCRIPTION: Feature 2 was a terrace that had been constructed of small- to medium-sized basalt cobbles and semi-angular and sub-rounded boulders. The feature is in poor condition; it has been altered by bulldozer activity, animal activity, and natural forces, like erosion and gravity.

**Site TS-24**

FORM: Enclosure  
 FUNCTION: Habitation  
 AGE: Undetermined  
 DIMENSIONS: Exterior: 5.5 x 4.0 m; 0.49–0.68 m high  
 Interior: 3.0 x 1.5 m; 0.22–0.68 m high  
 Wall Height: 1.0–1.4 m

CONDITION: Fair  
 SURFACE ARTIFACTS: None  
 EXCAVATION: TU-1

DESCRIPTION: Feature 1, which was located at the base of a low outcrop ridge that was surrounded by an alluvial flat, was an oval-shaped enclosure that was constructed of small- to large-sized basalt cobbles and boulders stacked four to six courses high. A large basalt slab was incorporated into the northeastern wall and the interior was filled with small- to medium-sized cobbles. A severely degraded terrace wall was connected to and ran south of Feature 1. The long axis of Feature 1 ran north-south at 0°/180°. The feature has been altered by animal activity, gravity, and vegetative overgrowth (Figure 16).

EXCAVATION: One L-shaped test unit (TU-1) measuring 1.0 x 0.5 m + 0.5 x 0.5 m was placed in the center of the enclosure (Figure 17). Due to the abundance of rocks, the original 1.0 x 0.5 m test unit was expanded to the southeast in order to expose more working space. As the function of the feature was undetermined, the goal of TU-1 was to assess the functions and age of the feature. Layer I (10–35 cmbd) consisted of dark brown (7.5 YR 3/3) very fine, loosely compact silt loam with many roots and many small- to large-sized cobbles and pebbles. Metal fragments were located at 10 cmbd and a core was located at 27 cmbd.

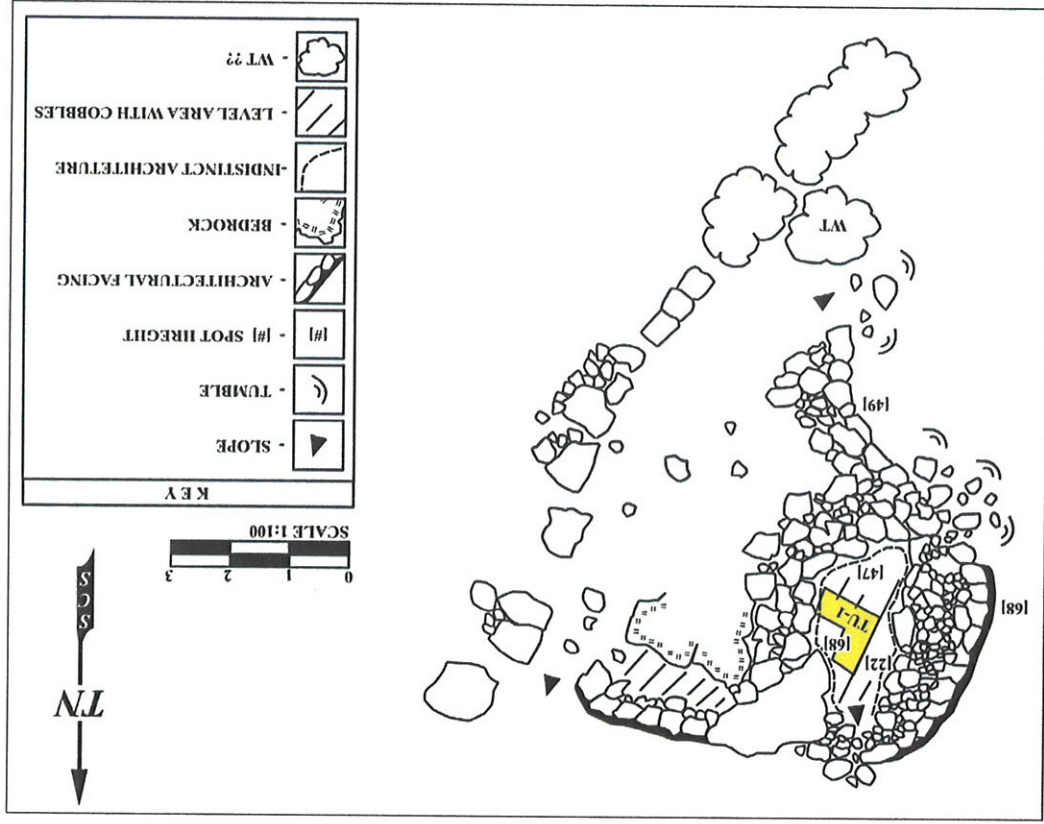


Figure 16: Site TS-24, Feature 1, Plan View.

Layer II (36-60 cmbd) consisted of a very dark grayish brown (10YR 3/2) very fine silt loam with few roots and few cobbles and pebbles. A charcoal-stain was noted in this layer and a sample was collected.

Layer III (44-74 cmbd) was present in only two little spots. This layer was a dark yellowish brown (10YR 4/4) very fine silt loam with few roots and pebbles, much like the sterile (saprolitic) layers in TS-11 and TS-12.

Excavations did not clearly reveal the age and function of Feature 1. A considerable amount of effort went into the construction of the exterior walls, yet the interior is filled with what appears to be tumbled rocks (Figure 18).

**Site TS-35:**

FORM: House Site  
 FUNCTION: Habitation  
 AGE: Historic  
 DIMENSIONS: 14.7 x 12.1 m  
 CONDITION: Poor  
 SURFACE ARTIFACTS: Metal, Ceramics, Glass, Concrete  
 EXCAVATION: None

**DESCRIPTION:** Site TS-35 was located on a flat area, with a long axis running west-east at 290°/110°. A local informant suggested that the area had been occupied by a Chinese family. The site was in very poor condition, no house pad or other construction was visible. There was a concentration of piled rocks at the western edge of the site as well as large, tumbled boulders, which may have been associated with the habitation's construction. In addition, at least ten pieces of crumbled concrete, some fused with rusty metal or basalt pieces, were scattered on the surface. One partial cement block was located; it measured 53 x 27 x 26 cm. Several pieces of blue and clear glass, metal (e.g., rusty wire, bits of galvanized roof), and ceramic fragments scattered on the surface of the site support the notion that the area was once utilized as an historic habitation.

**Site TS-36**

Site TS-36, a 7.0 x 7.0 m area, was located at the top of a slope on the *makai* edge of a level pasture area, approximately 50.0 m from TS-35. The site was composed of two features, an enclosure (Feature 1), which appeared to be an historic animal pen, and a small terrace (Feature 2), a subsidiary feature. Several artifacts were present on the surface of the site, including a metal machine part, a horseshoe, and two ceramic fragments; modern debris included a soda can and a can of sardines (Figure 19).

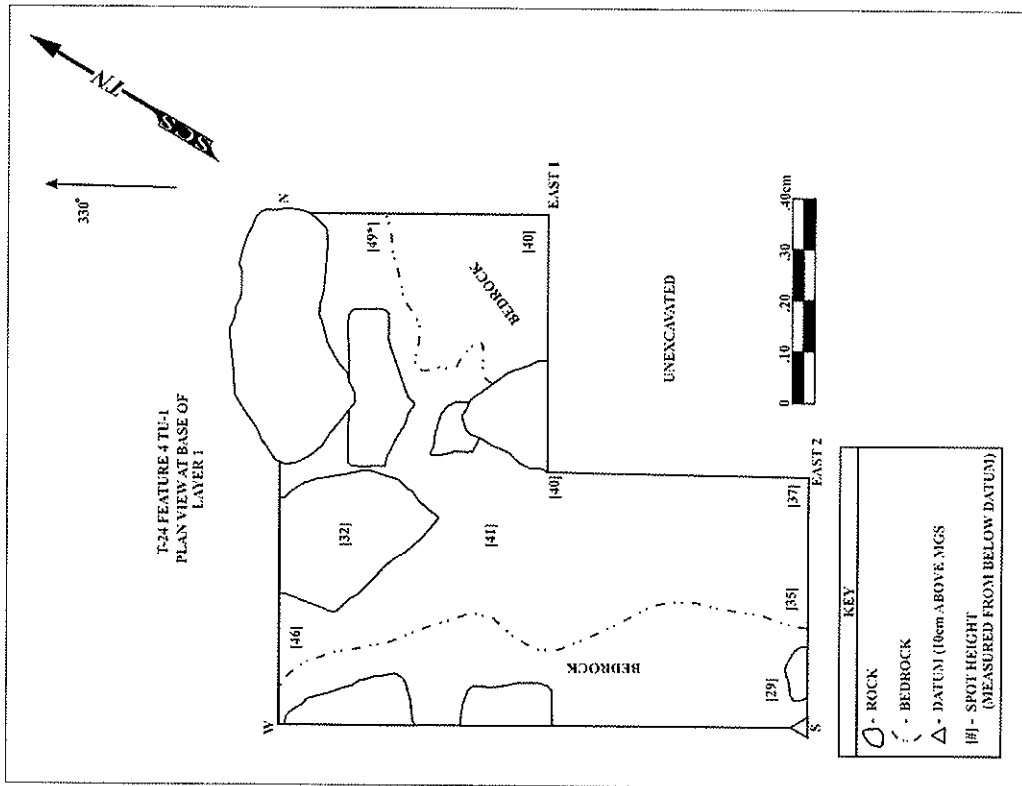


Figure 17: Site TS-24, Feature 1, Test Unit 1. Plan View.

Figure 19: Site TS-36, Features 1 and 2, Plan View.

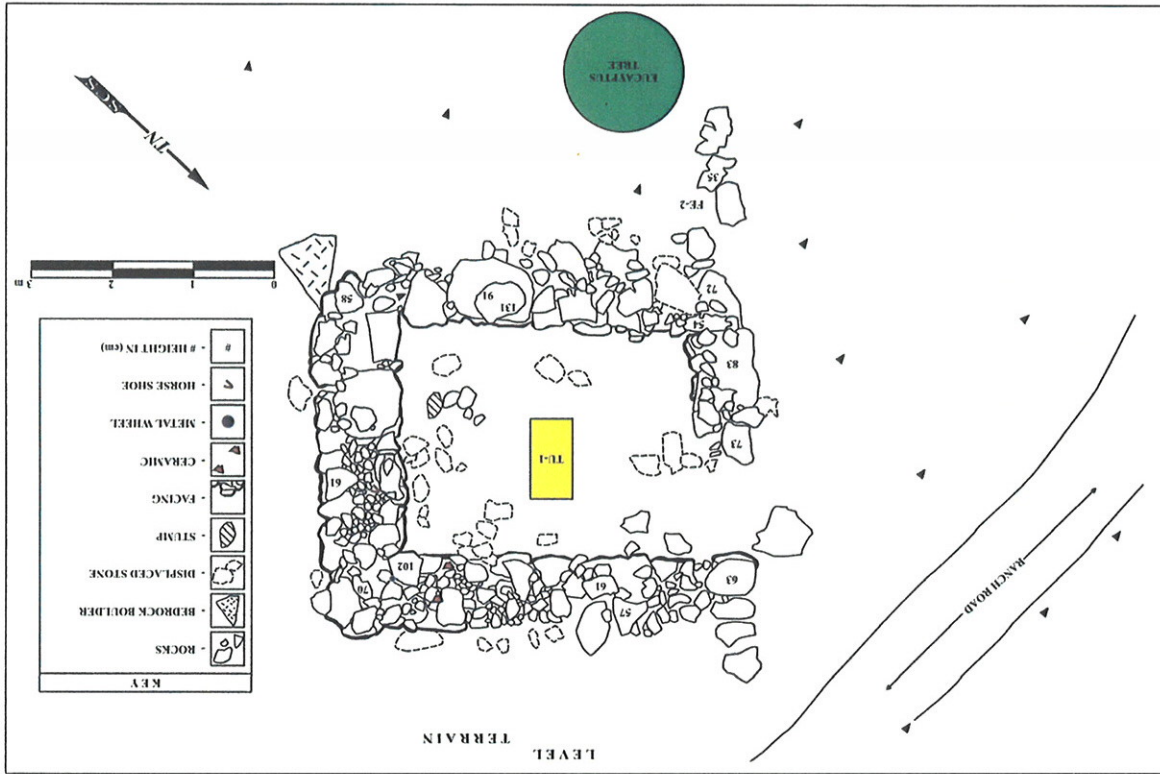
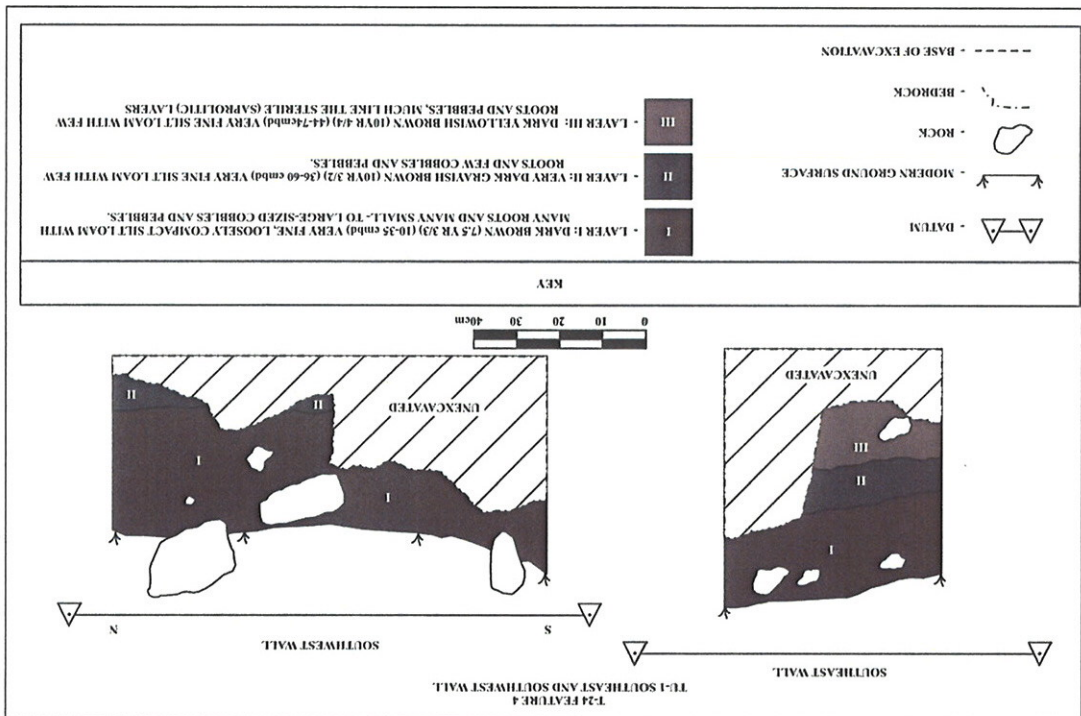


Figure 18: Site TS-24, Feature 1, Test Unit I, Southeast and Southwest Wall Profiles.



**FORM:** Enclosure  
**FUNCTION:** Habitation/Animal Husbandry  
**AGE:** Historic  
**DIMENSIONS:** Exterior: 5.3 x 4.55 m; 0.10–0.91 m high  
 Interior: 3.6 x 2.8 m; 0.28–1.31 m high  
**CONDITION:** Good  
**SURFACE ARTIFACTS:** Metal, Ceramics, and a Horseshoe  
**EXCAVATION:** TU-1

**DESCRIPTION:** Feature 1 was located at the beginning of a level area at the top of a moderately steep slope. This level area extended *maika* 100.0 m or so. A ranch road passed by the northern side of the feature and continued down slope. The feature was constructed of sub-angular, basalt boulders (largest: 105 x 70 x 40 cm), some cobbles, and a few pebbles. The interior was faced all the way around; the exterior was probably faced, but it has tumbled in some areas. The walls had been core-filled with cobbles in some areas. There was a 1.5 m wide opening in the northwestern wall of the feature. Four to five courses remain at the west and east corners. The relatively high walls of Feature 1 suggest that it may have functioned as an animal pen. The feature was in good condition, but had been altered by animal activity and gravity. A eucalyptus limb had fallen down on the feature.

**EXCAVATION:** One 1.0 x 0.5 m test unit (TU-1) was excavated in the center of the interior of Feature 1. Neighboring residents claimed that the area was a small Chinese burial plot or cemetery; however, the structure resembled historic animal pens. Layer 1 was a dark brown (7.5YR 3/4) compact silt with pebbles and cobbles throughout and many root and rootlets. Excavation terminated at 45 cm due to sterile subsurface conditions. No human remains were identified – the enclosure was not a burial plot. Glass fragments and rusty metal were collected during excavation (Figure 20).

**FORM:** Terrace  
**FUNCTION:** Habitation/Animal Husbandry (ancillary structure to Feature 1)  
**AGE:** Historic  
**DIMENSIONS:** Exterior: 1.5 x 1.2 m; 0.35 m high  
 Wall Thickness: 0.4 m  
**CONDITION:** Good  
**SURFACE ARTIFACTS:** None  
**EXCAVATION:** None

**DESCRIPTION:** Feature 2, a terrace, was constructed of three elongated, sub-angular boulders (largest: 55 x 30 x 20 cm) and stood approximately one course high. The feature probably functioned to support the southwestern wall of Feature 1 in order to prevent it from being undermined by erosion.

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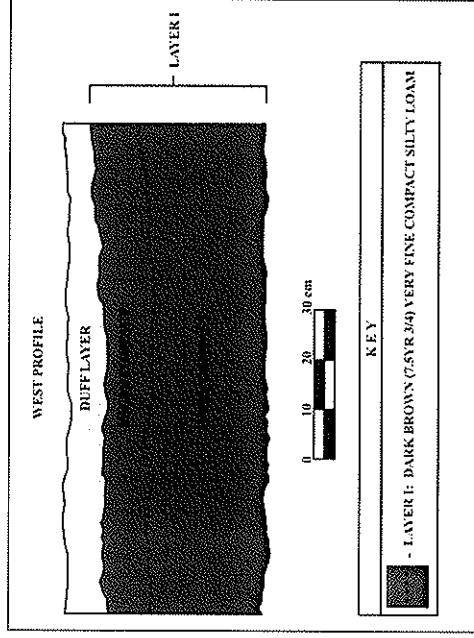


Figure 20: Site TS-36, Feature 1, Test Unit 1. West Wall Profile.

It extended down slope from the westernmost corner of Feature 1. Overall, Feature 2 was in good condition, despite having been altered by animal activity and gravity.

#### Site TS-37

**FORM:** Refuse Deposit  
**FUNCTION:** Refuse Area  
**AGE:** Historic  
**DIMENSIONS:** 14.5 x 20.0 m  
**CONDITION:** Fair-Poor  
**SURFACE ARTIFACTS:** Metal, Ceramics, Glass, Concrete  
**EXCAVATION:** None

**DESCRIPTION:** Site TS-36, an historic refuse deposit, was located on a hill slope bordering the northern edge of Keāhuaiwi Gulch. Based on several datable bottle fragments, the preliminary assessment of the site placed it c. 1920s. A local informant suggested the site was a dumping area for the house site, Site TS-35. The site was in fair-poor condition as it has been altered by animal activity, natural forces like erosion, weathering, and gravity.

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#### Site TS-126

Site TS-126, consisted of two features, a linear mound and garden enclosure (Feature 1) and a modified outcrop and enclosure (Feature 2). The site was located on a broad, generally flat area (slight 2°-3° slope southeast-northwest) that overlooked a steep (15°) slope. The site was situated 150.0–200.0 m north of Keāhuaiwi Gulch and measured approximately 14.5 x 20.0 m (Figure 21).

**FORM:** Linear Mound/Garden Enclosure  
**FUNCTION:** Agricultural/Storage  
**AGE:** Undetermined  
**DIMENSIONS:** Exterior: 5.0 x 3.0 m; 0.30–0.75 m high  
Interior: 1.5 x 1.5 m; 0.18–0.75 m high  
Wall thickness: 0.3 m (enclosure); 2.0 m (mound)  
**CONDITION:** Fair  
**SURFACE ARTIFACTS:** None  
**EXCAVATION:** None

**DESCRIPTION:** Feature 1 was a linear mound oriented northwest-southeast with a small garden enclosure appended to its northern side. The feature was constructed of informally stacked, piled, and aligned angular and sub-angular basalt cobbles ranging from approximately 10 x 10 cm to 40 x 60 x 40 cm and boulders ranging from 60 x 60 x 60 cm to 100 x 75 x 40 cm. The southern face of the feature exhibited stacking. The feature was in fair condition; natural forces like erosion, weathering, and gravity have altered it.

**FORM:** Modified Outcrop and Enclosure  
**FUNCTION:** Habitation/Agricultural  
**AGE:** Undetermined  
**DIMENSIONS:** Exterior: 5.0 x 6.5 m (15.0 x 6.5 m including modified outcrop)  
Interior: 5.0 x 1.8 m  
Height: 40–70 cm high (exterior); 40–60 cm high (interior)  
Wall thickness: 2.5 m  
**CONDITION:** Fair  
**SURFACE ARTIFACTS:** None  
**EXCAVATION:** TU-1

**DESCRIPTION:** Feature 2, a modified outcrop and enclosure was constructed of small sub-angular basalt cobbles (10 x 15 x 18 cm) and boulders (53 x 62 x 48 cm) loosely piled in a square-ish C-shaped structure with the opening facing the northwest. On the interior of the southeast wall, two courses of stacking remained. The original walls of the enclosure may have been squarer before they tumbled down. Several boulders and cobbles were piled on an exposed outcrop to the northwest. This element may be an extension of the exterior of the enclosure's northern wall; however, because the feature was in fair

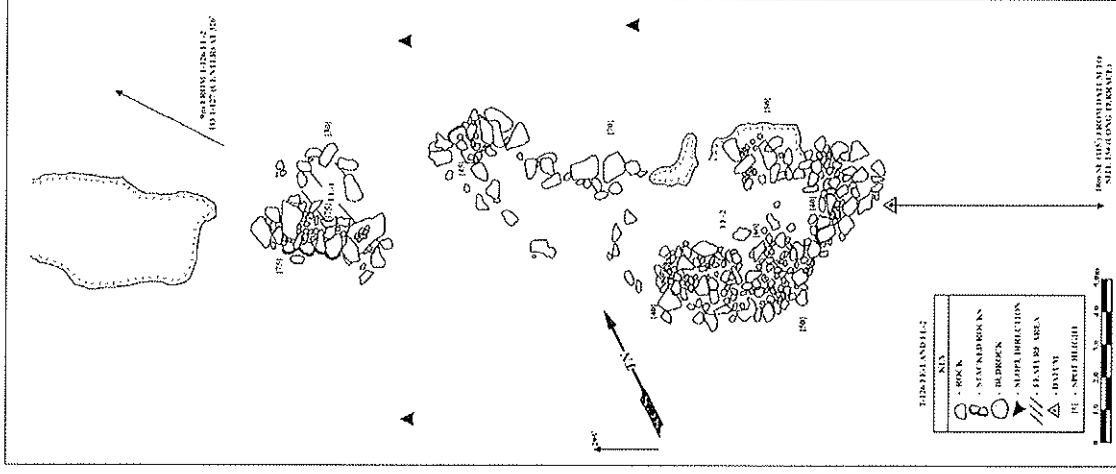


Figure 21: Site TS-126, Features 1 and 2. Plan View.

condition, having been altered by erosion and weathering, the function and original intent of the feature remains unclear.

**EXCAVATION:** One 0.5 x 0.5 m test unit was excavated in the central portion of Feature 2 that was free of rocks on the surface in order to investigate the function and age of the feature. The unit slightly sloped east-west at 2°. Vegetation on the surface of the test unit was dense and the upper (5–10 cm) deposits were highly disturbed because of bioturbation. Charcoal flecking was observed; however, there were no large pieces to collect. Layer I contained fine dark brown (7.5YR 2.5/2) silt loam with very many roots and rootlets and a few small cobbles.

Layer II was a hard, compact brown (7.5YR 3/4) silt loam with many rootlets and a few medium- to large-sized rocks. Some small, charcoal flecking appeared at this level; however it was infrequent and thus, not collected (Figure 22).

#### Site TS-128

Site TS-128, which measured 14.0 x 8.5 m, consisted of a single enclosure. Feature 1 was interpreted as a probable pre-Contact habitation feature. One test unit (TU-1) was excavated at the feature in order to reveal feature function and age. Coral, charcoal, *kukui*, basalt flakes, and volcanic glass were recovered.

**FORM:** Enclosure  
**FUNCTION:** Habitation  
**AGE:** Pre-Contact?  
**DIMENSIONS:** Exterior: 14.0 x 8.5 m; 0–0.7 m high  
 Interior: 10.5 x 7.0 m; 0.35–0.95 m high  
 Wall Thickness: 0.5–1.0 m  
**CONDITION:** Fair  
**SURFACE ARTIFACTS:** Historic Glass  
**EXCAVATION:** TU-1

**DESCRIPTION:** Feature 1 was an enclosure faced in some areas and tumbled in others. Facing on the eastern section of the feature was obscured; this portion of the feature appeared to have also served as a terrace wall. The pad of the terrace area is about 12.0 m long. A whole bottle was collected from the surface. The rectangular-shaped enclosure was constructed of small- to large-sized basalt cobbles and a few small boulders ranging in size from 7 cm to 55 cm. Stacking up to five courses high remained on the interior eastern wall. The feature was in fair condition, altered by animal activity and natural forces (Figure 23).

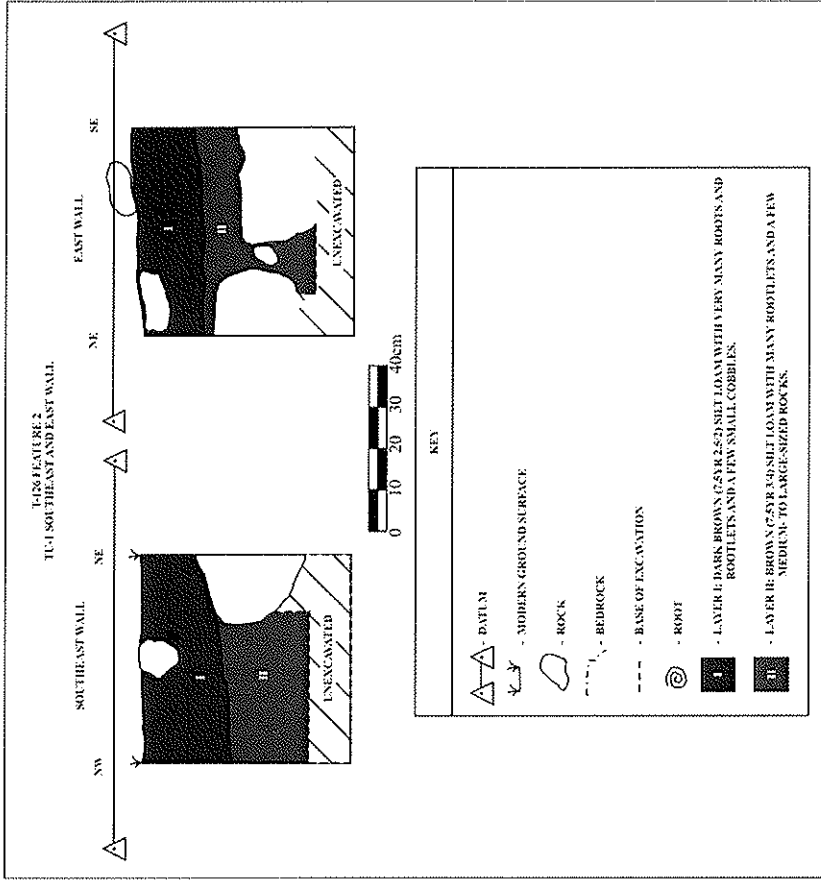


Figure 22: Site TS-126, Feature 2, Test Unit 1. Southeast and East Wall Profiles.



**EXCAVATION:** One 1.0 x 0.5 m test unit (TU-1) was excavated in the northwest interior corner of Feature 1 in order to examine existing architecture and construction history as well as to reveal feature function and age. Layer I (0-30 cmbs) consisted of a dark brown (7.5YR 3/3) compact silt with profuse rootlets. A small basalt flake was recovered near 27 cmbs.

Layer II (25-85 cmbs) contained very dark brown (7.5YR 2.5/2) compact silt with few pebbles and cobbles; rootlets were present throughout. A distinct lens containing a very dark brown (10YR 2/2) compact silt foam with charcoal flecking was identified in Layer II.

A radiocarbon dating sample was taken from the Layer II ash lens and sent to Beta Analytic, Inc. for analysis; a conventional date range of 240 ± 40 BP was returned. When calibrated by OxCal v.3.5 at 2 Sigma, four date ranges were returned: A.D. 1520-1600 (14.4%) and A.D. 1620-1690 (41.6%); A.D. 1730-1810 (32.5%) and A.D. 1920-1950 (6.9%).

Subsurface architecture was revealed at 50 cmbs; however, due to time constraints, excavations terminated. Bedrock was not hit in TU-1. Layer II produced a small amount of charcoal, a few volcanic glass and basalt flakes, two pieces of coral, and three pieces of worked/polished basalt (Figure 24). Data Recovery and possible preservation was recommended, as the feature was interpreted as pre-Contact.

**Site TS-129**

**FORM:** Lithic Scatter  
**FUNCTION:** Undetermined  
**AGE:** Pre-Contact  
**DIMENSIONS:** 15.0 x 15.0 m  
**CONDITION:** Poor  
**SURFACE ARTIFACTS:** Volcanic Glass, Basalt Flakes  
**EXCAVATION:** None

**DESCRIPTION:** The feature, lithic scatter, was near the crest of a hilltop. The southern and western sides of the hill were gently sloped 5-10°; the northern side sloped more steeply down to a deep swale. The swale ran east-west along the northern boundary fence-line. The area was nothing more than an erosional wash; the area itself probably had no function. The surface artifacts were likely deposited by erosional events.

**Site TS-133**

Site TS-133 was a site complex including eight subfeatures (Table 2), associated with an historic eistern (Feature 1) just north of the dirt jeep road, approximately one-third of the way up the

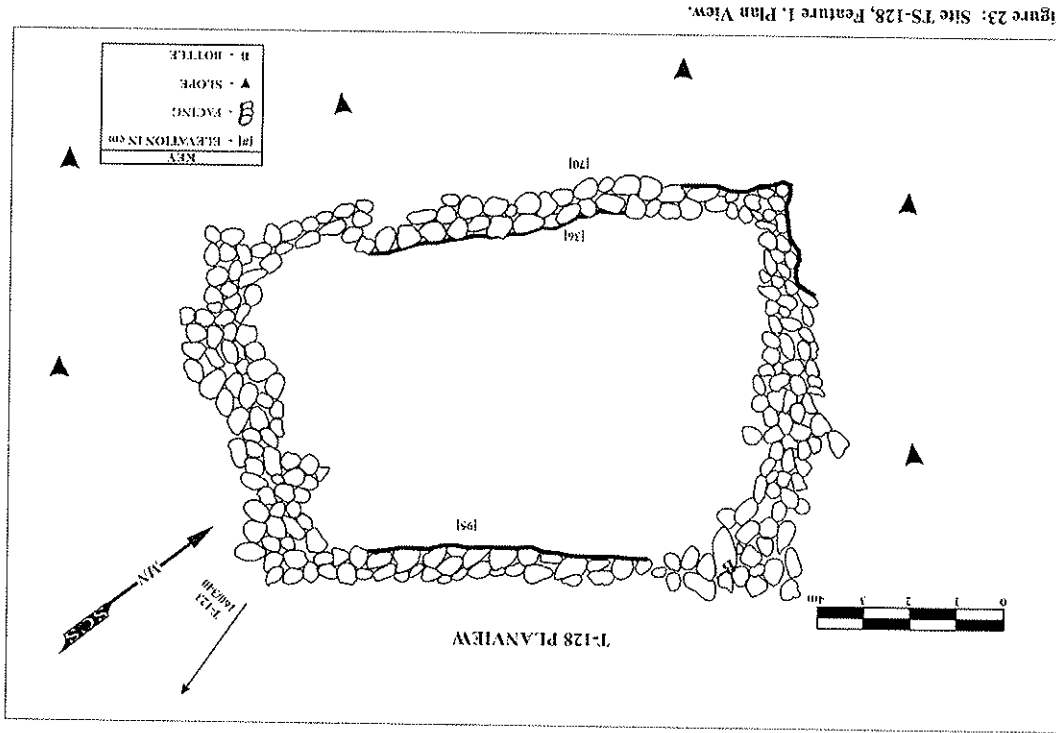


Figure 23: Site TS-128, Feature 1, Plan View.

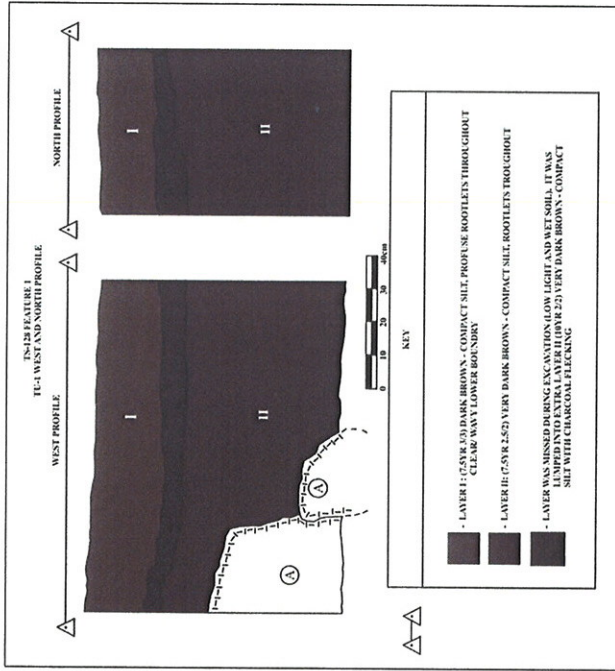


Figure 24: Site TS-128, Feature 1, Test Unit 1. West and North Wall Profiles.

northern-half of the project area. The overall terrain gently sloped southeast-northwest 10–15° near the northern boundary of the project area; rolling hills and a deep swale were located to the north. The site dimensions measured 50.0 x 30.0 m. The complex included a possible house foundation at its northern side, several low pile of rocks, C-shaped structures, and two short walls to the southeast. Scattered bits of glass, ceramic shards, concrete, and metal water pipe were observed throughout the site. Shards of glass were observed on top of Feature 6; a water pipe was located under Feature 9.

Table 2: Subfeatures Associated with Site TS-133, Feature 1, Cistern.

Feature Number and Type	Location from Feature 1 Cistern and Fence	Dimensions: Length x Width x Height (m)
2 – Square pile of rocks	3.0 m from northeast corner of fence	0.8 x 1.5 x 0.2
3 – Pile of rocks	18.0 m from the northwestern corner of fence	0.9 x 1.2 x 0.3
4 – C-shaped structure	23.0 m from the northwestern corner of the cistern fence	---
5 – Linear mound	35.0 m from the cistern	8.0 x 2.3 x 0.7
6 – Pile of rocks	40.0 m from the northwest corner of the cistern	2.0 x 2.0 x 0.7
7 – C-shaped structure	30.0 m from the northwest corner of the cistern	2.0 x 4.0 x 0.6
8 – Pile of rocks	10.0 m from the northwest corner of the cistern	1.0 x 1.5 x 0.5
9 – C-shaped structure	25.0 m from the northwest corner of the cistern	4.0 x 2.0 x 1.0 (interior)

FORM: Cistern  
 FUNCTION: Water Storage  
 AGE: Historic  
 DIMENSIONS: Diameter: 4.0 m  
 Depth: 3.0 m  
 Wall Thickness: 0.8 m  
 CONDITION: Poor  
 SURFACE ARTIFACTS: None  
 EXCAVATION: None

DESCRIPTION: Feature 1, a cistern, was surrounded by a wood and barbed wire fence that measured 6.5 x 6.5 m. The cistern walls and fence were in disrepair. In the center of the western wall were two oblong rocks, possibly a doorway. It appeared to be constructed of small cobbles that were held together with cement and a faced top, both inside and out. Eight subfeatures were associated with the Feature 1 cistern (Figure 25).



Figure 25: Site TS-133, Feature 1, Cistern. Overview to North.

Site TS-140

Site TS-140 consisted of three features. Feature 1 was a cistern (Feature 1), which was interpreted as related to animal husbandry and/or agriculture. An ABM (Automatic Bottle Machine)-made beer bottle (c. 1920s) was near the feature. Feature 2 was a severely deteriorated terrace. Feature 3 was a depressed (sunken) enclosure. One test unit (TU-1) was excavated at Feature 3; historic glass and metal fragments (e.g., rusty nails) were collected (Figure 26).

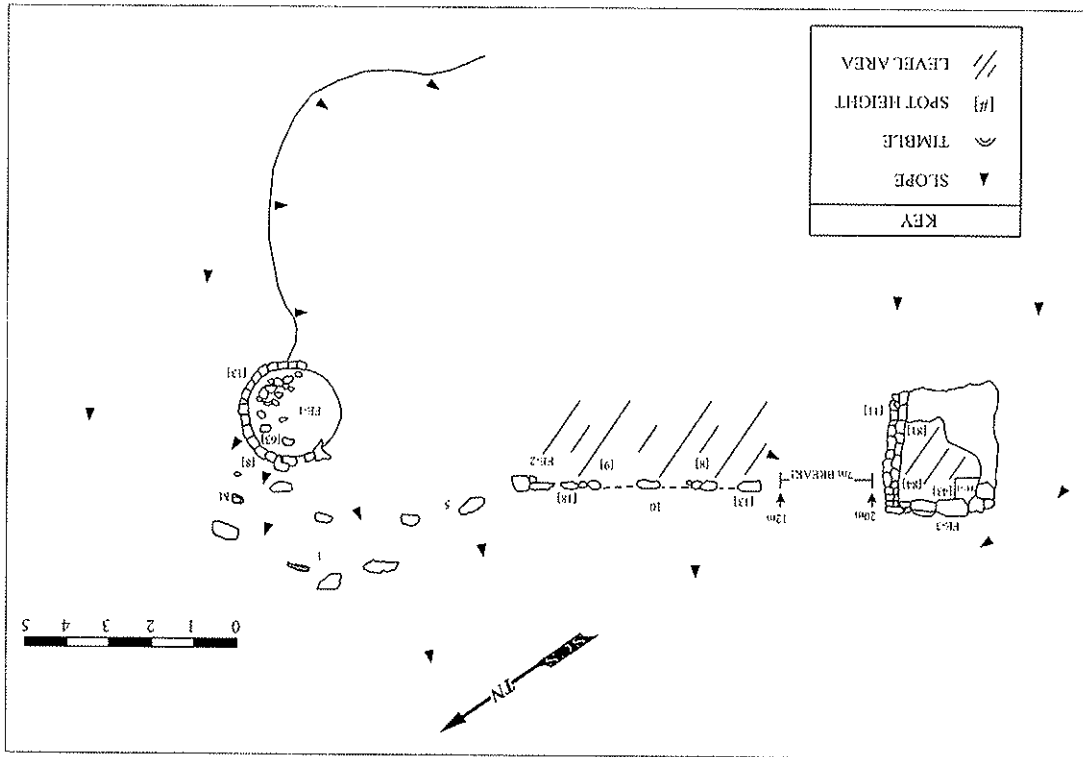


Figure 26: Site TS-140, Features 1 through 3, Plan View.

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FORM: Cistern  
 FUNCTION: Agricultural/Animal Husbandry  
 AGE: Historic  
 DIMENSIONS: Diameter: 2.4 m  
 Height: 0.08–0.13 m  
 CONDITION: Poor  
 SURFACE ARTIFACTS: Historic Glass and Concrete  
 EXCAVATION: None

DESCRIPTION: Feature 1, an historic cistern, was located on an open, flat grassy area. The cistern, which has been filled-in with soil, was constructed of medium- to large-sized cobble blocks, which were set with cement mortar. The remaining interior portion has been lined with cement. Approximately 2.3 m to the west, an ABM bottle (c. 1920s) sat on the surface. Feature 1 was in poor condition, having been altered by animal activity and natural forces, like erosion, weathering, and gravity.

FORM: Terrace  
 FUNCTION: Undetermined  
 AGE: Historic  
 DIMENSIONS: Exterior: 6.0 x 0.7 m  
 Height: 0.13–0.18 m (exterior); 0.08–0.09 (interior)  
 Wall Thickness: 0.7 m  
 CONDITION: Poor  
 SURFACE ARTIFACTS: None  
 EXCAVATION: None

DESCRIPTION: Feature 2, a terrace remnant, was in poor condition. It was constructed of a single course of small- and medium-sized basalt boulders. The feature was severely deteriorated, altered by animal trampling and natural forces.

FORM: Enclosure  
 FUNCTION: Undetermined  
 AGE: Historic  
 DIMENSIONS: Exterior: 3.0 x 2.5 m; 0.11–0.18 m high  
 Interior: 2.0 x 2.0 m; 0.43–0.84 m high  
 Height: 0.13–0.18 m (exterior); 0.08–0.09 (interior)  
 Wall Thickness: 0.5 m  
 CONDITION: Fair  
 SURFACE ARTIFACTS: None  
 EXCAVATION: TU-1

**DESCRIPTION:** Feature 3, an enclosure, was constructed of medium and large-sized basalt blocks. The feature was a sunken or depressed enclosure. It was covered with grass and tumbled throughout the southern corner. The north wall was faced and stacked four to six courses high. Feature 3 was in fair condition, having been altered by animal activity and natural forces.

**EXCAVATION:** One 0.5 x 0.5 m test unit was excavated at Feature 3. The unit was placed in the lowest interior corner of the feature, abutting the northwest and southwest walls of the feature in order to investigate if subsurface architecture relating to the surface feature was present, or if older, previously constructed features could be discovered (Figure 27). Layer I (0–23 cmbd) consisted of a brown (7.5YR 5/4) very fine silt loam with fine- and small-sized roots and less than ten percent cobbles. A small piece of rusty nail was screen recovered, but not collected.

Layer II (23–47 cmbd) contained a strong brown (7.5YR 4/6) silt loam with many fine roots and small cobbles (10%). The presence of a large rock made excavation difficult. One metal nail was screen recovered; metal nails and a glass fragment were collected in situ.

Layer III (43–52 cmbd) was a very compact dark brown (7.5YR 4/4) saprolitic soil with few fine roots and rocks. The northwest and southwest walls revealed a possible older structure or feature with subsurface construction (Figures 28 and 29).

#### Site TS-141

**FORM:** Enclosure  
**FUNCTION:** Habitation  
**AGE:** Pre-Contact  
**DIMENSIONS:** Exterior: 8.0 x 8.0 m; 0.05–0.40 m high  
 Interior: 6.0 x 6.0 m; 0.1–0.6 m high  
 Wall Thickness: 0.5 m  
**CONDITION:** Poor  
**SURFACE ARTIFACTS:** None  
**EXCAVATION:** TU-1 and TU-2 at Feature 1

**DESCRIPTION:** Feature 1, an enclosure, was located atop a small swale in the northern-half of the project area, just above the northern edge of the large gulch (Kcāhuaiwi Gulch) separating the two halves of the project area. The slope was gentle (5–10° southeast-northwest). The overall terrain was uneven, characterized by small swales and rolling hills. The feature was constructed of sub-angular basalt cobbles and boulders (15–50 cm) and arranged in a roughly rectangular shape to form an enclosure. The down slope side (northwest) was mostly tumbled and missing; the northeastern wall was more like a discontinuous alignment rather than a stacked wall. There was a shallow depression

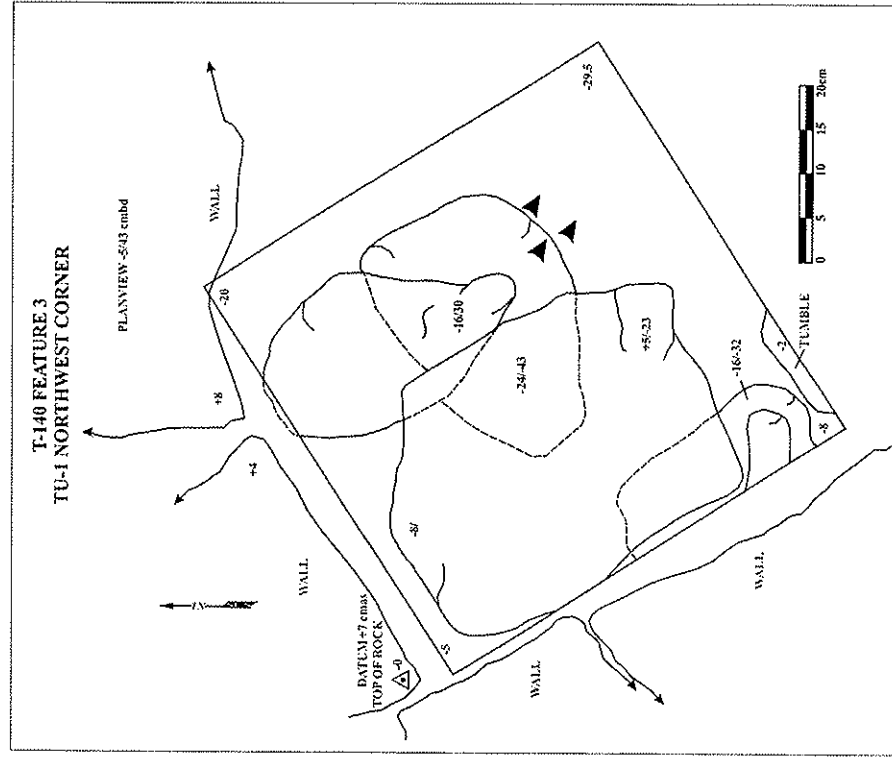


Figure 27: Site TS-140, Feature 3, Test Unit 1, Northwest Corner Plan View.

(about 2 m in diameter) in the center of the enclosure of unknown origin and function. There was a lot of tumble; about two courses remained in the south corner. Based on the construction style and location of the enclosure, Feature 1 was interpreted as having been a habitation (Figure 30).

**EXCAVATION:** Test Unit 1 (TU-1), a 0.5 x 0.5 m unit, was placed in the eastern corner of the enclosure, against the southeast and northeast walls, to assess the function, age, and cultural affiliation of the feature. Layer I (14–31 cmbd) contained very dark brown (7.5YR 2.5/2) fine silt loam with many roots and a few small cobbles. Low quality basalt flakes and volcanic glass were collected. A charcoal stain was noticed in the northern corner at about 30 cmbd. Excavation revealed pieces of charcoal and a possible piece of marine midden. Two small (about 4 cm in diameter) charcoal-stained pebbles were also recovered from the sediment.

Layer II (27–45 cmbd) was a dark brown (5YR 2.5/2) fine silt loam with many rootlets and a few small cobbles. Low quality basalt flakes and volcanic glass were collected. The layer also contained pieces of charcoal some of which was collected in situ.

Layer III (45–65 cmbd) was a hard, compact fine grained, dark brown (7.5YR 4/6) silt loam with many rootlets. Dotted inclusions resembled clay mottling or decaying rock. Excavations ceased in these sterile conditions (Figures 31 and 32).

One 1.0 x 0.5 m Test Unit 2 (TU-2) was placed over a depression in the center of Feature 1, about 2.7 m southwest of the northeast wall of the feature, in order to investigate possible causes of the depression and to aid in the assessment of the function and age of Feature 1. Layer I (10–30 cmbd) contained a dark brown (7.5YR 3/2) fine-grained silt loam with many rootlets, small roots, and many small- to medium-sized cobbles.

Layer II (20–53 cmbd) was composed of a dark reddish brown (5YR 2.5/2) fine-grained silt loam with many roots and a few small cobbles. Several basalt flakes and volcanic glass were collected, charcoal flecking occurred throughout.

Layer III (50–55 cmbd) consisted of dark brown (7.5YR 3/3) fine-grained silt loam with many rootlets. Charcoal flecking continued in this layer; however, excavation ceased due to the high concentrations of rocks (Figure 33). Due to the collection of Traditional style artifacts, Data Recovery is recommended to confirm the function and occurrence of the artifacts and the depression.

Figure 29: Site TS-140, Feature 3, Test Unit 1, Southwest Wall Profile.

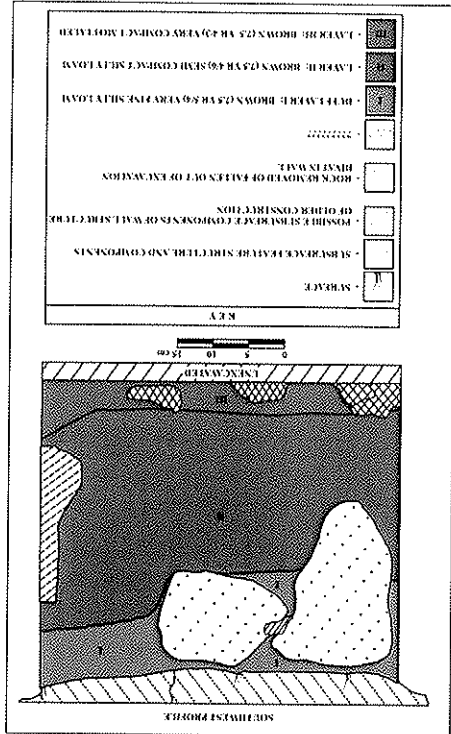
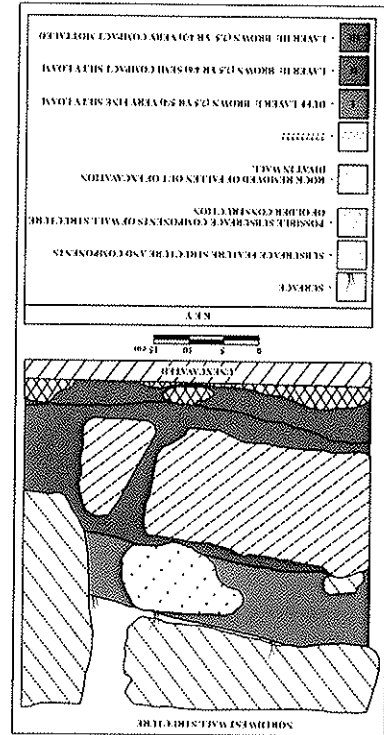


Figure 28: Site TS-140, Feature 3, Test Unit 1, Northwest Wall Profile.





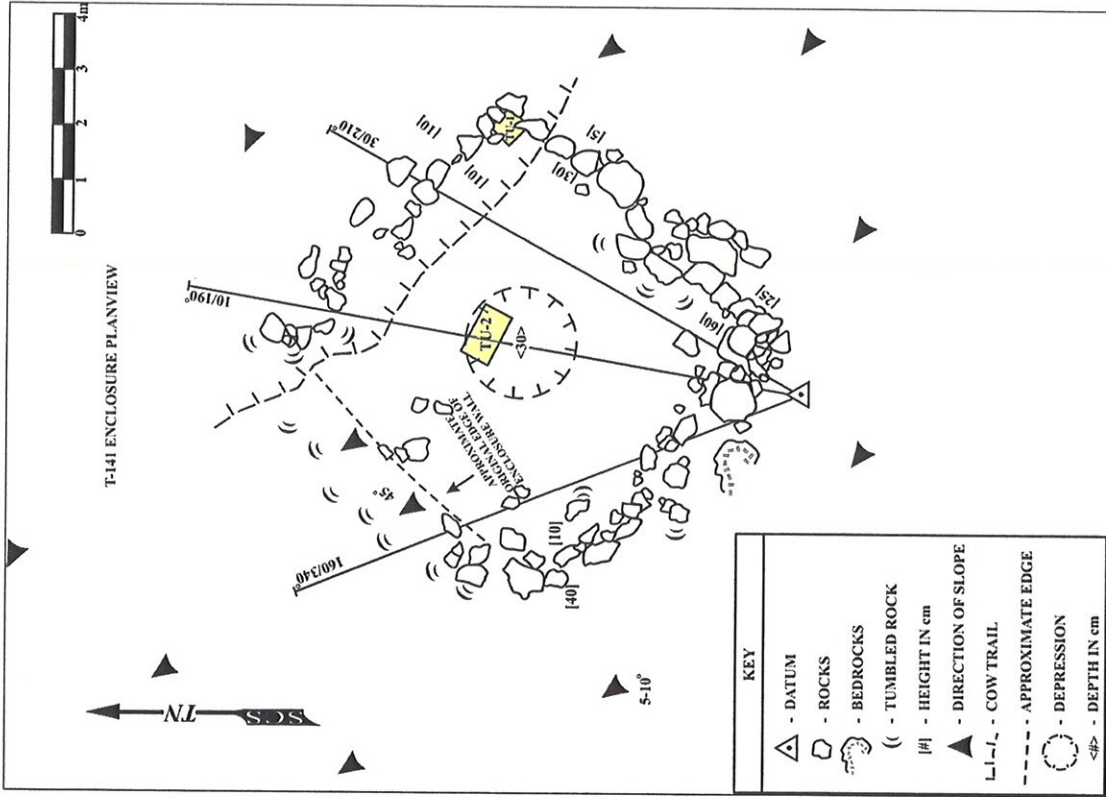


Figure 30: Site TS-141, Feature 1. Plan View.

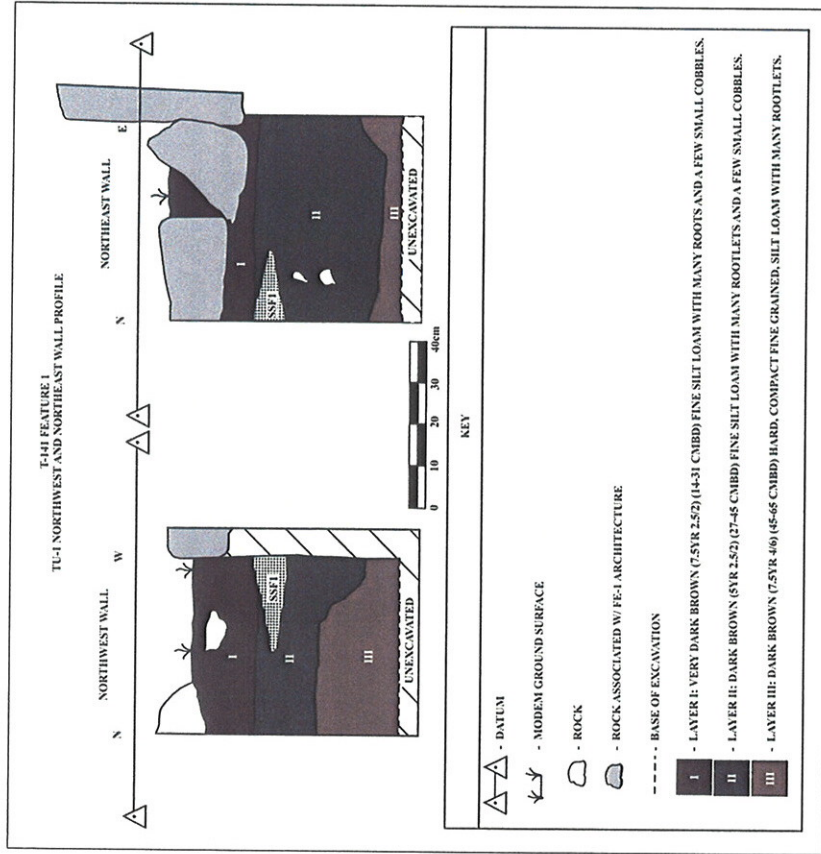


Figure 31: Site TS-141, Feature 1, Test Unit 1. Northwest and Northeast Wall Profiles.

Figure 33: Site TS-141, Feature 1, Test Unit 2, Southeast and South Wall Profiles.

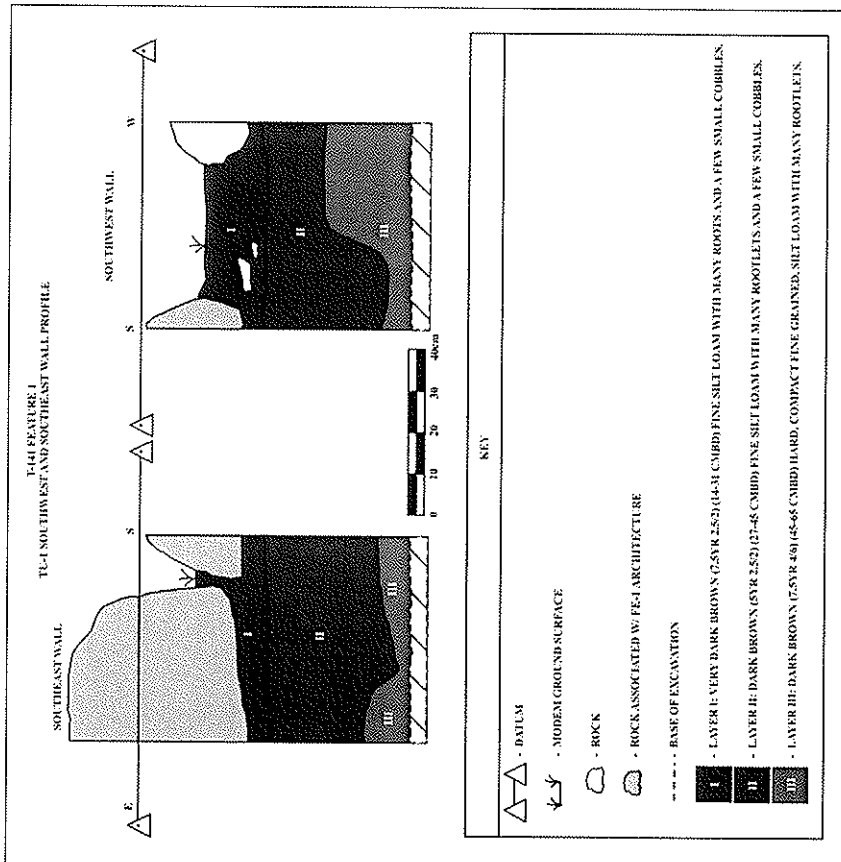
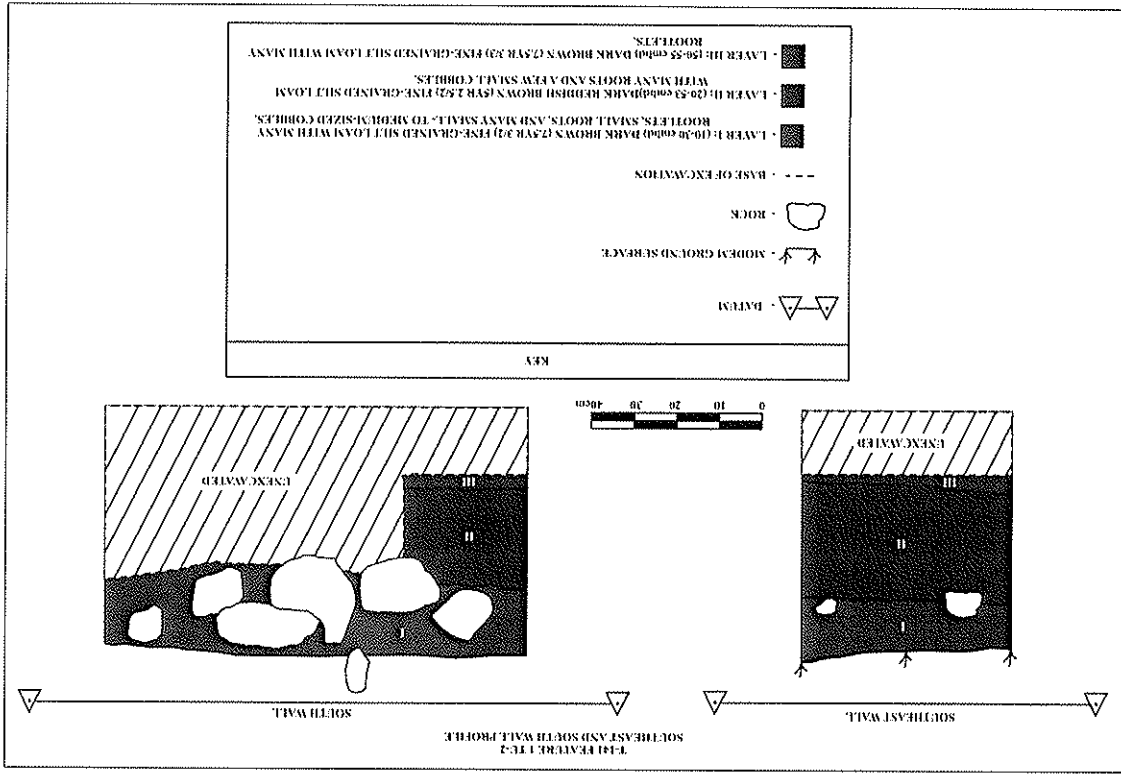


Figure 32: Site TS-141, Feature 1, Test Unit 1. Southwest and Southeast Wall Profiles.

#### Site TS-142

FORM: Enclosure  
FUNCTION: Habitation  
AGE: Pre-Contact/Historic  
DIMENSIONS: Exterior: 3.0 x 3.4 m; 0.02–0.45 m high  
Interior: 2.4 x 2.4 m; 0.02–0.36 m high  
Wall thickness: 0.6 m  
CONDITION: Excellent  
SURFACE ARTIFACTS: Ceramic teacup, Metal hoe  
EXCAVATION: TU-1

**DESCRIPTION:** Site TS-142 consisted of one feature, an enclosure, located on the edge of a level pasture, approximately 3.0 m from a drop into the gulch that bisects the project area (to the south). The overall site dimensions were 4.0 x 4.0 m. The feature was located on a level area at the edge of the pasture. The feature, a discontinuous wall of boulders mostly set into the ground with two boulders flush with the ground surface, was constructed of sub-angular, uniformly-sized basalt boulders (the largest: 0.85 m long; the smallest: 0.40 m long). No stacked stones were present. The feature remained unaltered. Based on construction method and materials, Feature 1 was interpreted as a habitation (Figure 34).

**EXCAVATION:** One 0.5 x 0.5 m test unit (TU-1) was excavated in the northwest corner of the feature, abutting the feature architecture, in order to determine if there was any subsurface architecture and to aid in determining feature function and age (Figure 35). The surface was mostly level, covered with some organic debris. The top 10–15 cm of soil was a thick mesh of fine roots and decomposing cattle manure. Layer I (10–28 cmbd) consisted of a dark brown (7.5YR 3/3) very fine silt loam with many fine- and medium-sized roots and approximately five percent rocks. At about 18 cmbd, bits of charcoal were observed; a sample was collected. Soil in the northern half of the unit appeared to be at a transition to a slightly “redder” color; soil in the southern half of the layer was charcoal stained. Bedrock was observed at 24 cmbd.

Layer II (25–47 cmbd), a very dark brown (7.5YR 2.5/2) very fine, semi-compact silt with many fine roots and approximately five percent rocks, was a very thin layer and was immediately over bedrock. Excavation terminated upon reaching bedrock (24–47 cmbd). Layer II was not observed in the southern-half of the unit where Layer I and charcoal seeped into a crack between two large pieces of bedrock. Layer II was sterile. Surface architecture confirmed the feature was a single alignment placed on top of bedrock (Figure 36).

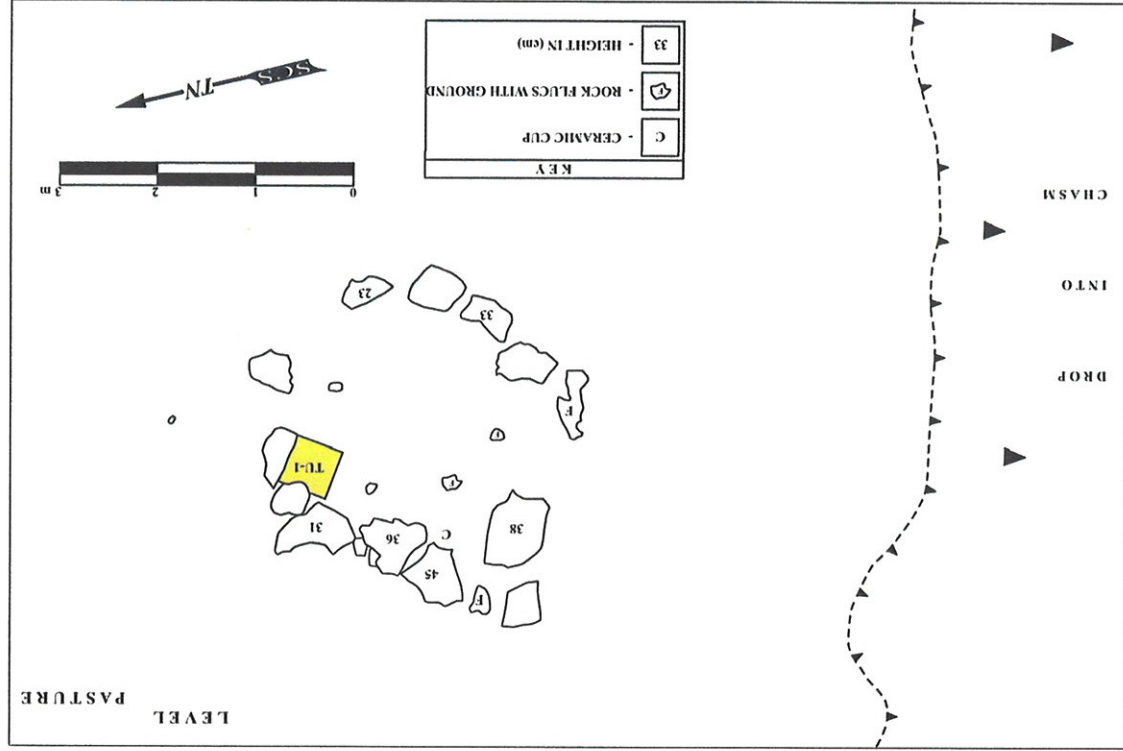


Figure 34: Site TS-142, Feature 1, Enclosure, Plan View.



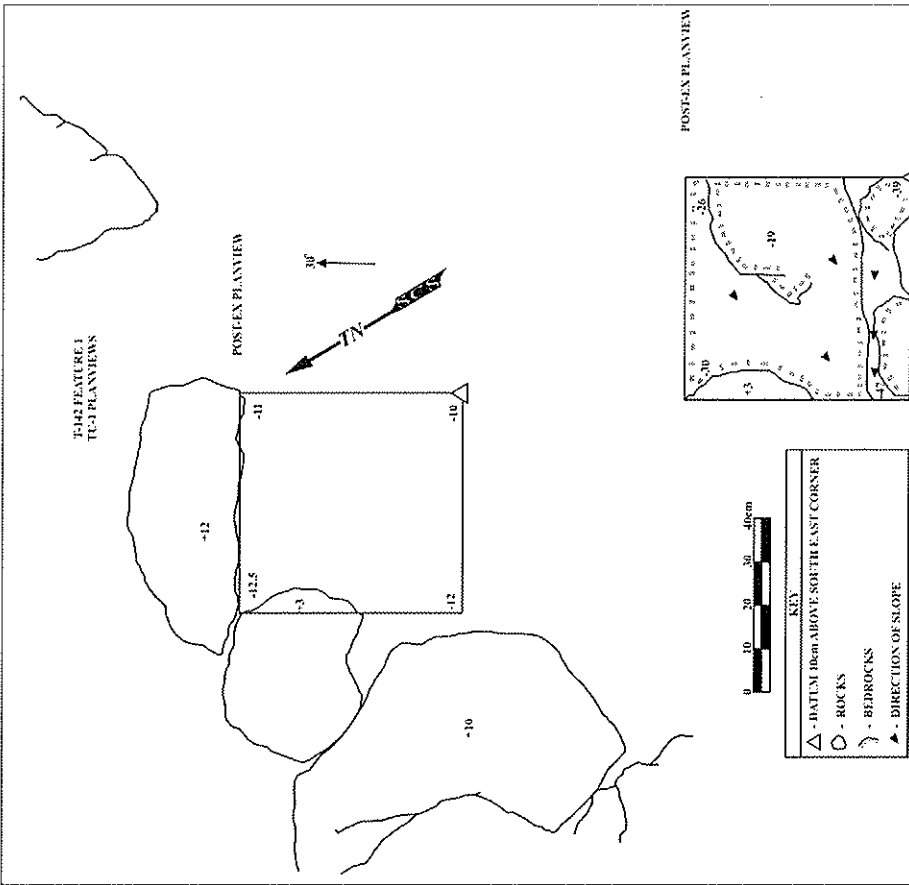


Figure 35: Site TS-142, Feature 1, Test Unit 1. Plan View.

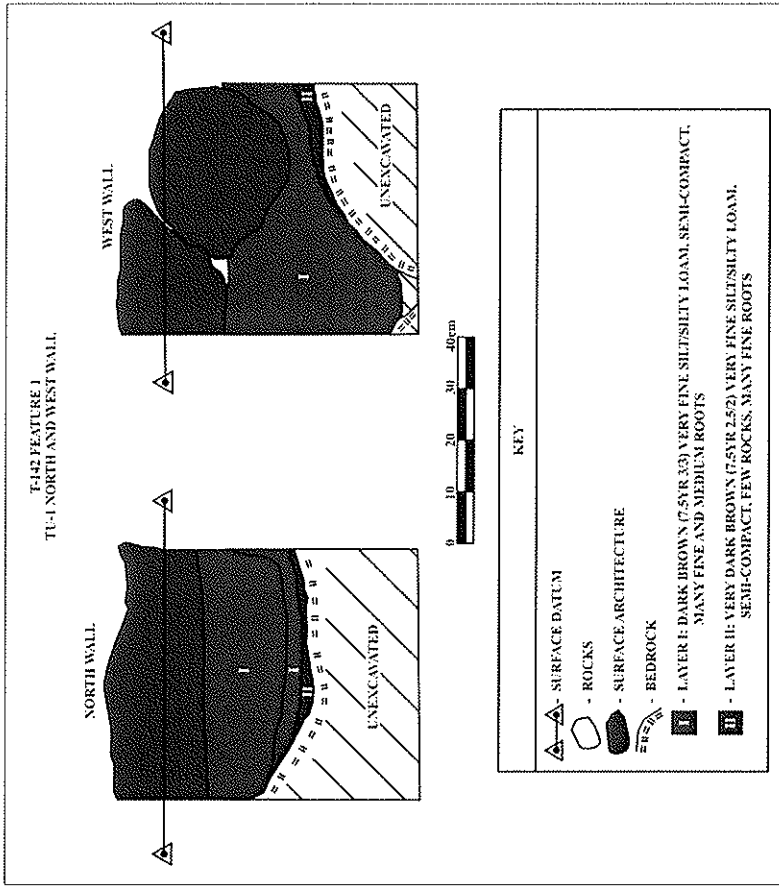


Figure 36: Site TS-142, Feature 1, Test Unit 1. North and West Wall Profiles.

### Site TS-152

FORM: Double Enclosure  
 FUNCTION: Habitation  
 AGE: Historic?

DIMENSIONS: Exterior: 8.5 x 5.5 m  
 Height: 0.35–0.97 m (exterior); 0.32–0.55 m (interior)  
 Wall thickness: 0.57–0.82 m high  
 Interior: Feature 1A: 3.25 x 2.5 m  
 Feature 1B: 3.25 x 2.0 m  
 Feature 1C: 2.0 x 1.5 m

CONDITION: Good-Fair  
 SURFACE ARTIFACTS: None  
 EXCAVATION: TU-1 in Feature 1A; TU-2 in Feature 1B

DESCRIPTION: Site TS-152 was located on a flat portion of the project area measuring 8.5 x 5.5 m. Approximately 100.0 m southeast, the slope of the area changed to 10° and it appeared that water drained between TS-152 and TS-153. Site TS-153 was 20.0 m away; Site TS-154 was 40.0 m away. Feature 1, a double enclosure, consisted of two distinct chambers, Feature 1A and 1B. Feature 1A appeared to have been accessed through Feature 1B, as a doorway between two “rooms.” The feature was constructed of sub-angular basalt cobbles (6 x 10 x 7 cm) and boulders (61 x 61 x 43 cm) stacked to form faced interior and exterior walls. Cobbles filled the interior portions of the wall. The southwestern wall was the best preserved and up to six tiers remained; in other areas, two to three courses remained. The southeast wall was highly tumbled. An interior access way may have been present; however, only tumbled rocks scatter the area. The western wall exhibited a lack of rock; not enough rock remained to rebuild the walls. Feature 1C was on a different plane than Features 1A and 1B, suggesting it may have been a “patio” or step to the double enclosure. Thus, the feature was interpreted as a possibly historic habitation. Overall, the feature remained in fair-good condition, having been altered by erosion and gravity (Figure 37).

EXCAVATION: Two test units were excavated at Site TS-152. Test Unit 1 (TU-1), a 0.5 x 0.5 m unit, was excavated in the center of the upper two contiguous enclosures in order to determine the age and function of the feature. The surface of the unit was covered with softball-sized cobble from the tumble; the area sloped gently from southeast to northwest. Layer I (0–18 cmbd) consisted of a dark brown (10YR 3/3) semi-compact silt loam with many roots and rocks (70–80%).

Layer II (15–44 cmbd) consisted of a very dark brown (7.5YR 2.5/2) very fine, semi-compact silt loam with few roots and considerably less rocks (10%). Charcoal and bits of metal were observed near 40 cmbd; only small bits of charcoal were collected.

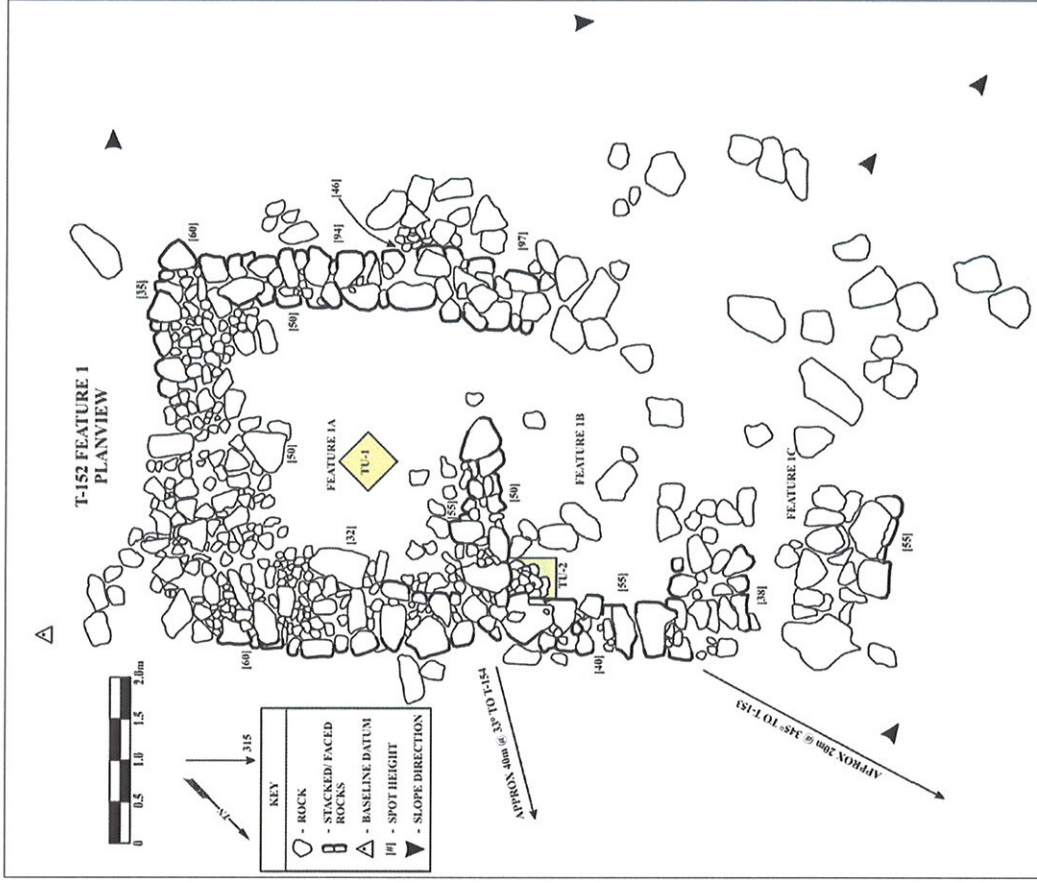


Figure 37: Site TS-152, Features 1A, 1B, and 1C. Plan View.

Layer III (44–48 cmbd) consisted of an extremely compact, dark reddish brown (5YR 3/3) sterile, saprolitic soil. This layer contained many small- to medium-sized cobbles (30–50%) which, when broken open, look vesicular and blue-black. Excavation terminated at this layer (Figure 38).

After clearing away a small amount tumble that remained, Test Unit 2 (TU-2), a 0.5 x 0.5 m unit, was excavated in the easternmost interior, corner of Feature 1B in order to assess the construction history of the feature as well as determine its cultural, function, and chronological affiliations. Layer I (10–20 cmbd) consisted of a very dark brown (7.5YR 2.5/2) fine silt loam with some roots and very few pebbles. Metal fragments appeared in the upper 20 cm. There were very few inclusions of any kind, apart from the few pebbles. A large rock spanned in width of the unit, preventing further excavation.

Layer II, a dark brown (7.5 YR 3/4) very fine silt loam, was exposed in a very small section of the unit's southern corner (Figure 39).

#### Site TS-153

FORM: Enclosure  
 FUNCTION: Habitation/Animal Husbandry  
 AGE: Historic  
 DIMENSIONS: Exterior: 5.9 x 5.5 m; 0.15–1.30 m high  
 Interior: 3.4 x 3.8 m; 0.10–1.13 m high  
 Wall thickness: 0.8 m  
 CONDITION: Fair  
 SURFACE ARTIFACTS: Basalt, Metal and Historic Glass  
 EXCAVATION: TU-1

DESCRIPTION: Site TS-153, located on relatively level pastureland, encompassed a 7.0 x 7.0 m area. Site TS-152 was located 16.0 m at 162°. Feature 1, an enclosure, was situated atop a slight rise in the fairly level pasture. The feature appeared to be an early Historic Era animal pen constructed of sub-angular basalt boulders, mostly uniform in size (largest was 70 x 30 x 20 cm). Some cobbles and pebbles were used in the northeast and southeast corners. Most of the stones have pyroxene crystals throughout. Formerly high stacked basalt walls (eight courses in the southeast corner, mostly three to four courses throughout) have tumbled inward. Two large boulders have been incorporated into the construction of this feature. The north and south walls were free-standing stacked stone; the north and east walls are terrace walls that support a level earthen embankment outside of the feature. The west wall consisted of a boulder alignment one course high. The interior floor was level and below terrain in the northern and eastern sections. There was a length of round fence wire at the western (open) side of feature. The feature is in fair condition has it has been altered by animal activity and natural forces,

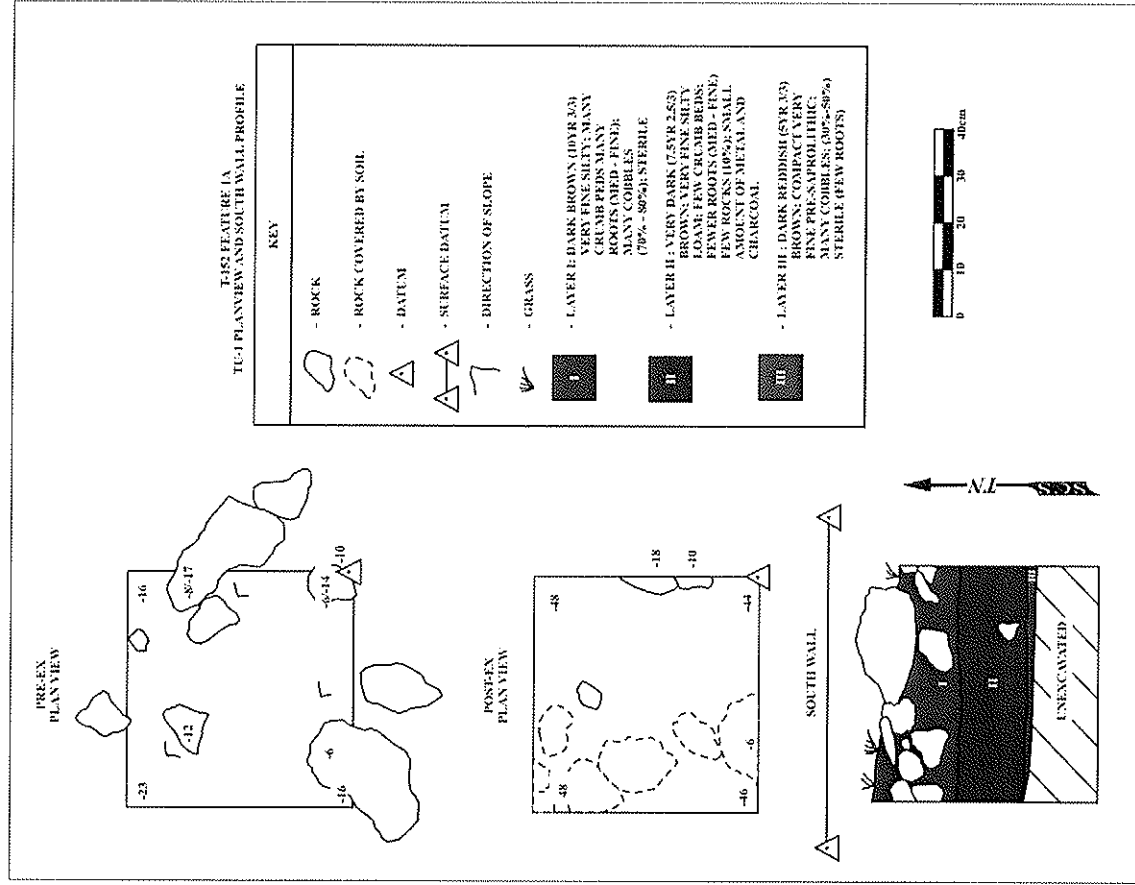


Figure 38: Site TS-152, Feature 1A, Test Unit 1. Plan View and South Wall Profile.

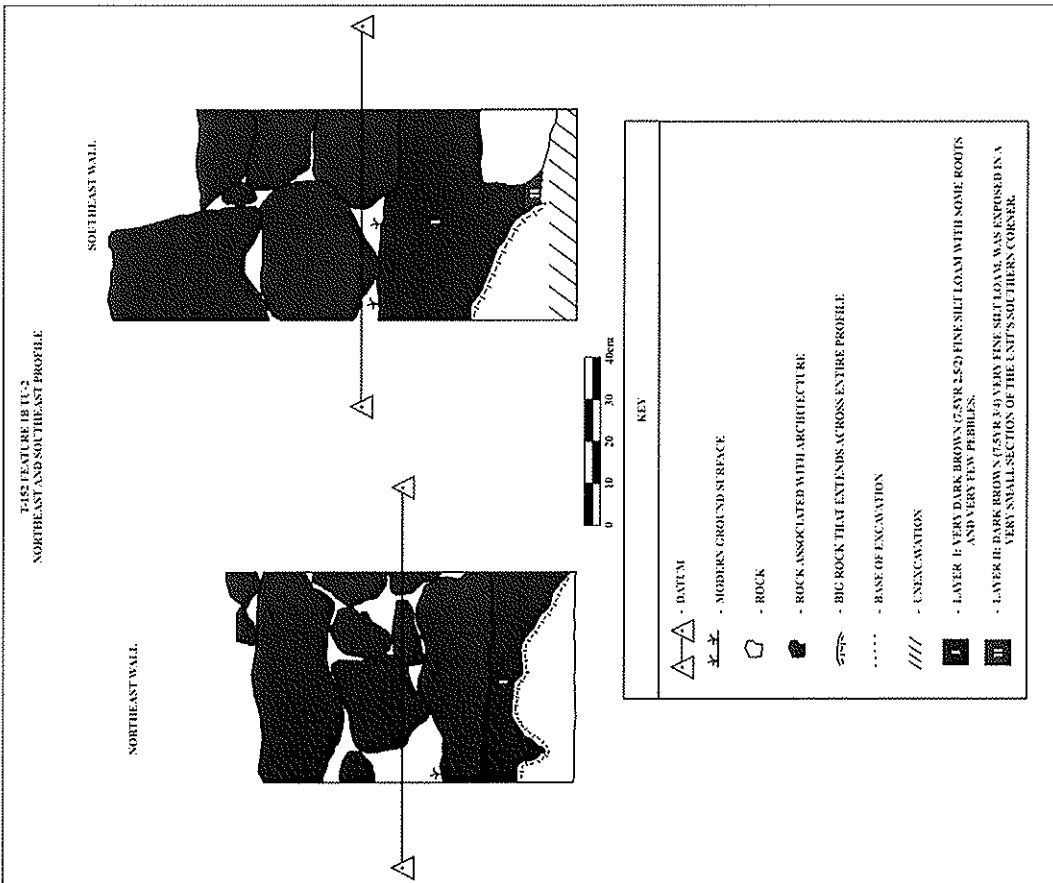


Figure 39: Site TS-152, Feature 1B, Test Unit 2. Northeast and Southeast Wall Profiles.

like gravity. A small terrace, which consisted of five boulders, was attached to the right side of the feature. It was 0.88 m long by 0.25 m high (Figure 40).

**EXCAVATION:** One 0.5 x 0.5 m test unit (TU-1) was excavated in the upper northeast corner of the feature, abutting the east wall in order to determine if wall structure extended below the surface or if artifacts were present (Figure 41). Layer 1 was a dark brown (7.5YR 3/2) fine silt loam with a few small roots and a few small cobbles (<5 cm). At 6 cmbs, some medium-sized angular cobbles were noted; however, these did not appear to be a part of the feature. Pieces of clear and amber historic glass fragments, possibly from soda and beer bottles, were screened and recovered from the surface through 12 cmbs. One small metal fragment, possibly an old nail, was encountered from the lower end of this stratum. Between 20 and 32 cmbs, two small basalt flakes were collected; one has a small area that had been finished and polished. The floor of the unit sloped to the southwest; under this was very hard, compact saprolitic soil and cobbles. Excavation terminated in Layer II, a mottled, dark reddish brown (5YR 3/3) saprolitic layer (Figure 42).

**Site TS-175**

Site TS-175 contained two features: a terrace/enclosure (Feature 1), interpreted as a pre-Contact habitation, and an enclosure (Feature 2), deemed to also have a pre-Contact habitation function. Test Unit 1 at Feature 1 revealed charcoal, *kukui*, volcanic glass, basalt, and possible fish scales and a bird beak. Test Unit 2 at Feature 2 revealed a subsurface feature, SSF 2.i, a firepit. Charcoal, marine midden, and a possible piece of bone were collected.

- FORM: Terrace/Enclosure
- FUNCTION: Habitation
- AGE: Pre-Contact
- DIMENSIONS: Exterior: 6.5 x 6.0 m; 0.39–0.6 m high  
Interior: 5.5 x 4.5 m; 0.05–0.38 m high
- CONDITION: Fair
- SURFACE ARTIFACTS: Basalt
- EXCAVATION: TU-1

**DESCRIPTION:** Feature 1 was located on top of a small knoll in an open pasture. Utilizing bedrock at the north wall, Feature 1 had an L-shaped terrace along the southern and western sides, which abutted the north wall, this giving the feature a three-sided terrace look. However, closer inspection revealed a foundation wall along the eastern segment, which helped to partially enclose the feature. The feature, which was constructed of small to large-sized cobbles and boulders, was in fair condition, altered by animal activity and natural forces (Figure 43).

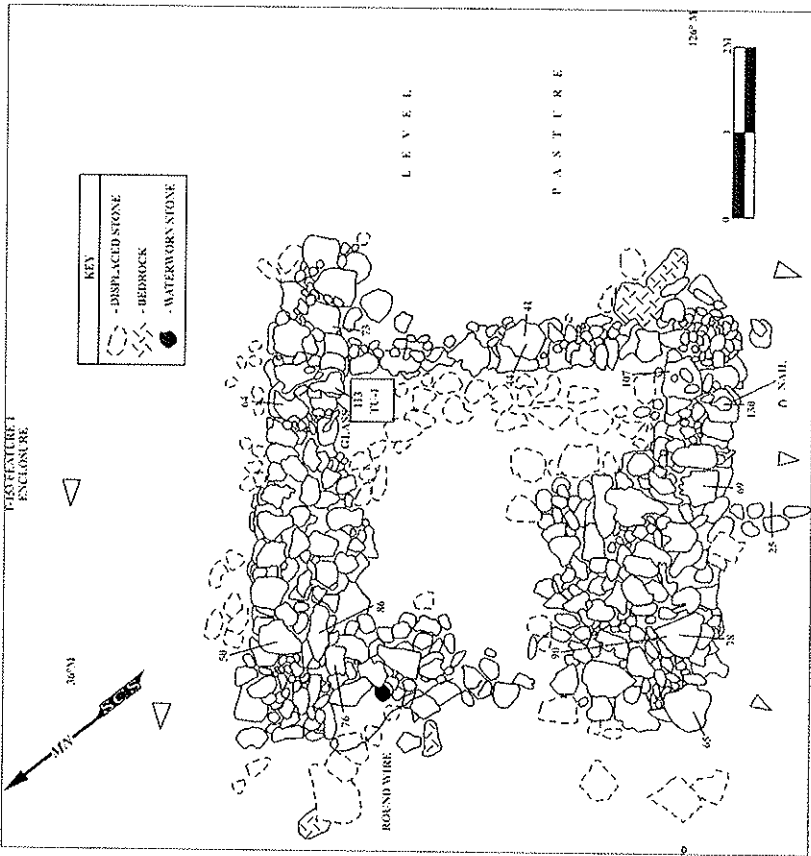


Figure 40: Site TS-153, Feature 1, Plan View.

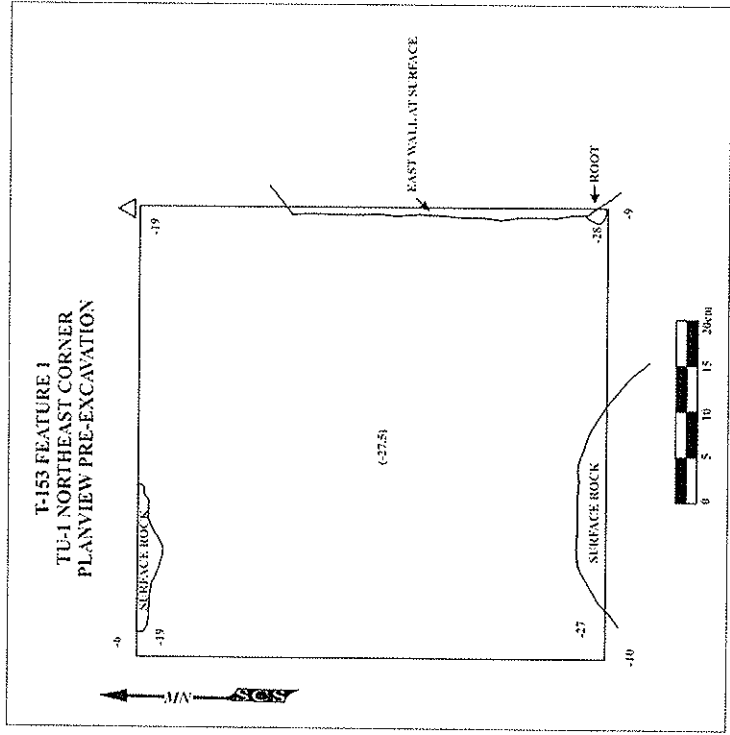


Figure 41: Site TS-153, Feature 1, Test Unit 1, Northeast Corner Plan View, Pre-Excavation.

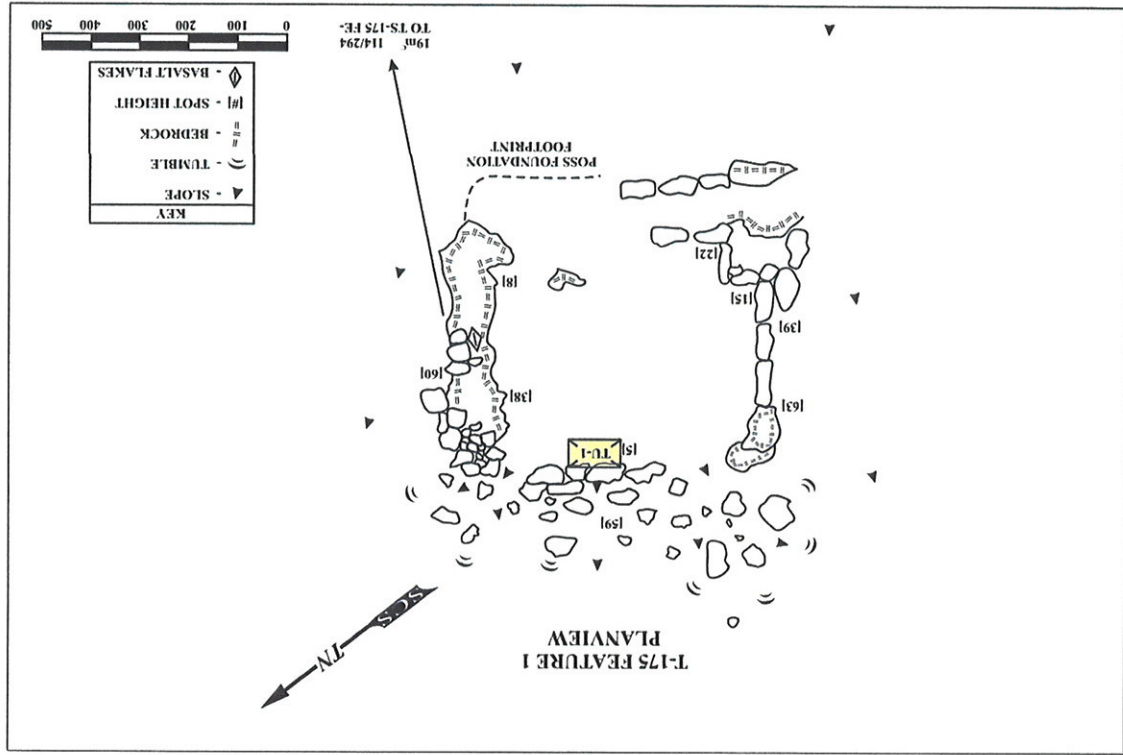


Figure 43: Site TS-175, Feature 1, Plan View.

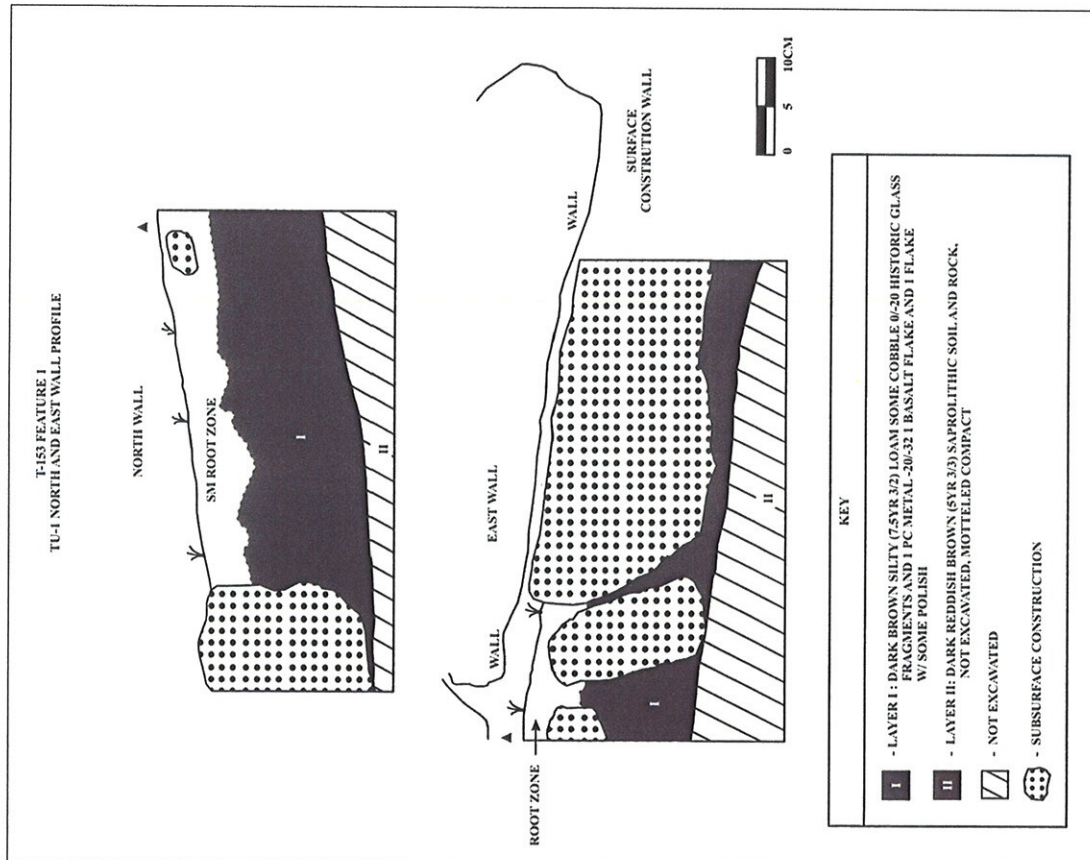


Figure 42: Site TS-153, Feature 1, North and East Wall Profiles.

**EXCAVATION:** One 1.0 x 0.5 m test unit (TU-1) was excavated on the terrace pad with the long side abutting the main retaining wall (along the down slope side of the feature) to determine the function and age of the feature, examine subsurface architecture, and to recover deposited materials that may have been deposited down slope of the feature (Figure 44). Layer I (10–25 cmbd) consisted of semi-compact dark brown (10YR 3/3) silt with many medium- and fine-sized roots and rocks (10%). At about 20 cmbd, the soil appeared darker and charcoal-stained. Charcoal, a marine shell, and basalt debitage was collected at the transition level between Layers I and II.

Layer II (20–36) was a very dark brown (7.5YR 2.5/2) semi-compact silt loam with fewer fine- to medium-sized roots and rocks (10%). Basalt and charcoal was collected throughout the layer, as well as small bits of bone fragment. A layer change was noted in the southwestern-half of the unit; the northwest side continued to get rocky, possibly because of back-fill or support for the retaining wall.

Layer III (33–46 cmbd) was a very fine, semi-compact very dark brown (7.5YR 2.5/3) silt loam with fewer fine-sized roots and rocks. Layer III contained charcoal and ochre. One sample was taken from Layer III and submitted to Beta Analytic, Inc. for radiocarbon analysis; a conventional date range of  $80 \pm 40$  BP was returned. When calibrated by OxCal v.3.5 at 2 Sigma, two date ranges were returned: A.D. 1670–1740 (26.2 %) and A.D. 1800–1960 (69.2%). Other materials were screen recovered from Layer III including basalt flakes, *kukui* shell, volcanic glass flakes, possible fish bone and a bird beak.

Layer IV (40–64 cmbd) was only present in the southwestern-half of the unit. The layer was a very fine, semi-compact dark yellowish brown (10YR 3/4) silt loam with few fine roots and rocks. The layer was sterile. The northwestern-half of the unit bottomed out on rock, which was probably part of the support for the retaining wall. The southwestern-half also bottomed out in rock. Excavation terminated here.

**FORM:** Enclosure  
**FUNCTION:** Habitation  
**AGE:** Pre-Contact  
**DIMENSIONS:** Exterior: 5.0 x 4.5 m; 0.31–0.63 m high  
 Interior: 4.5 x 3.0 m; 0.21–0.61 m high  
**CONDITION:** Poor  
**SURFACE ARTIFACTS:** None  
**EXCAVATION:** TU-2 revealed SSF: 2.1 in Layer II

**DESCRIPTION:** Feature 2 was located on top of a small knoll in an open pasture. The feature was constructed of a single course of small boulders in a rough C-shape. The feature abutted a

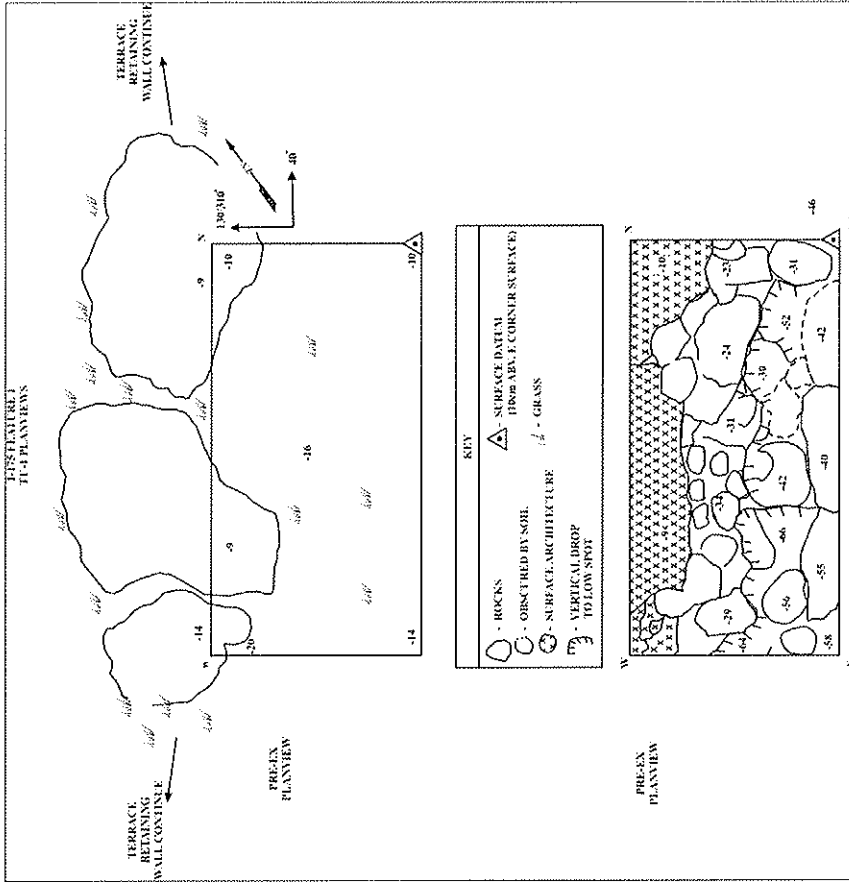


Figure 44: Site TS-175, Feature 1, Test Unit I. Plan View.



bedrock outcrop, which formed a small, crude enclosure. Feature 2 was in poor condition, having been altered by animal activity and natural forces (Figure 45).

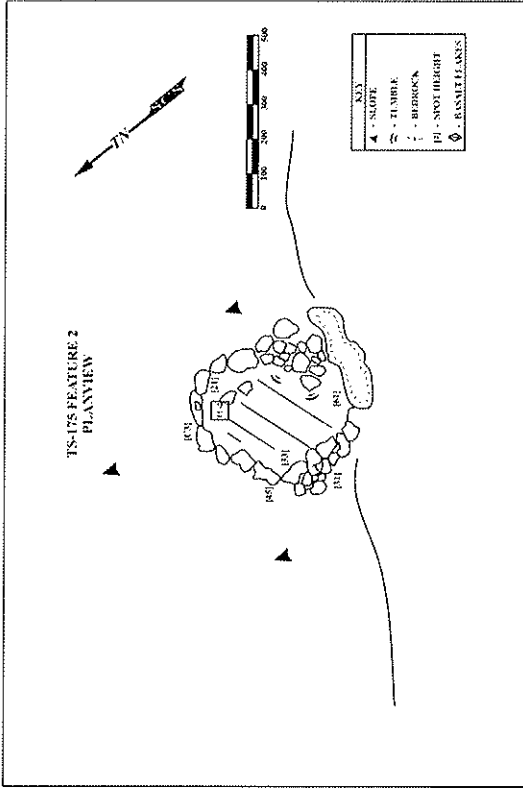


Figure 45: Site TS-175, Feature 2. Plan View.

**EXCAVATION:** One 0.5 x 0.5 m test unit (TU-2) was excavated at Feature 2, near the down slope end of the enclosure's interior in order to determine feature function and age and to look for cultural materials (Figure 46). Layer I (10–26 cmbd) was a semi-compact, very dark brown (7.5YR 2.5/2) silt loam with many medium- and fine-sized roots and some rocks (10–15%). The layer was sterile.

Layer II (22–54 cmbd) was a semi-compact dark brown (7.5YR 3/2) fine silt loam with many fine-sized roots and some rocks (10%). Charcoal, volcanic glass, and small amounts of lithics were collected. The transition to Layer III started at 35 cmbd in the northeast corner, the southwest corner and west sides bottomed out in bedrock. The southeast corner revealed more charcoal and a possible piece of bone and marine midden. The soil in the transitional zone was redder, suggesting that it had been heat altered. Subsurface Feature 2.1 (SSF 2.1), a charcoal-stained soil about 14 cm thick was a layer of heat-altered soil, was identified in Layer II. Only a portion of the feature was in the southeastern corner of the unit; SSF 2.1 continued eastward and southward, beyond the excavated area.

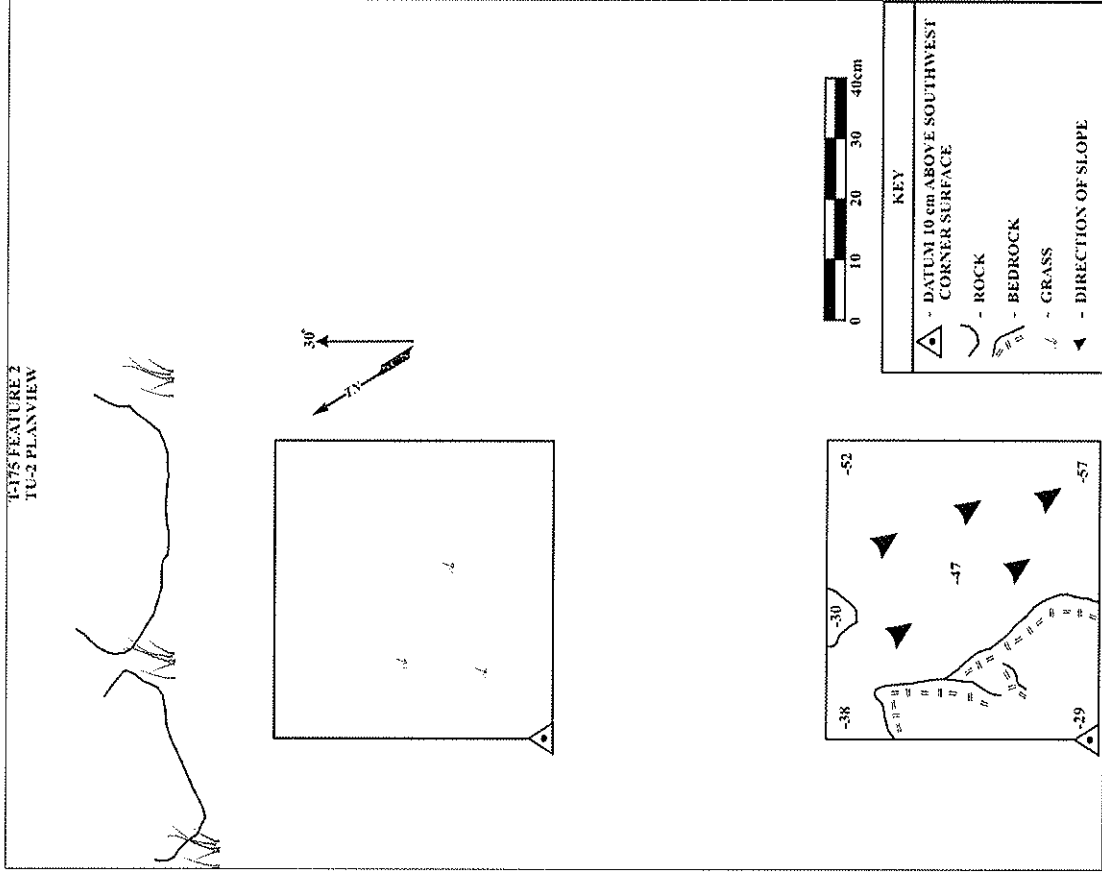


Figure 46: Site TS-175, Feature 2, Test Unit 2. Plan View.



Layer III (37–57 cmbd), which was directly below SSF 2.1, contained a brown (7.5YR 4/4) compact, saprolitic soil that contained fewer fine-sized roots and many rocks (30–40%). Excavation terminated shortly into this layer (Figure 47).

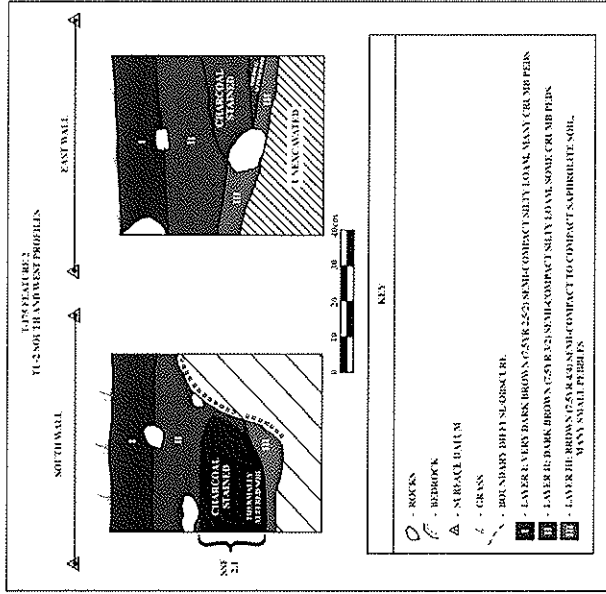


Figure 47: Site TS-175, Feature 2, Test Unit 2. South and West Wall Profiles.

#### Site TS-193

Site TS-193, which measured 25.0 x 20.0 m, was located on the top and down slope sides of a low hill about half-way up the northern side of the project area. The hill gently sloped 10–15° southeast-northwest. The terrain was largely rolling hills and small swales. The site consisted of three features. Feature 1, a terrace with a rock-filled corner, was located at the north end of the site; it was interpreted as a possibly pre-Contact habitation feature. The construction of Feature 2, a circular enclosure, was consistent with pre-Contact habitational function. Feature 3 was an L-shaped terrace, a terrace retaining wall with a corner. The feature may have been a habitation feature (Figure 48).

Two test units were excavated at this site. Test Unit 1 (TU-1) at Feature 2 revealed a fair amount of charcoal. Test Unit 2 (TU-2) at Feature 3 revealed charcoal, low quality basalt flakes and debitage, and two pieces of volcanic glass. TU-2 also revealed two subsurface features, suspected

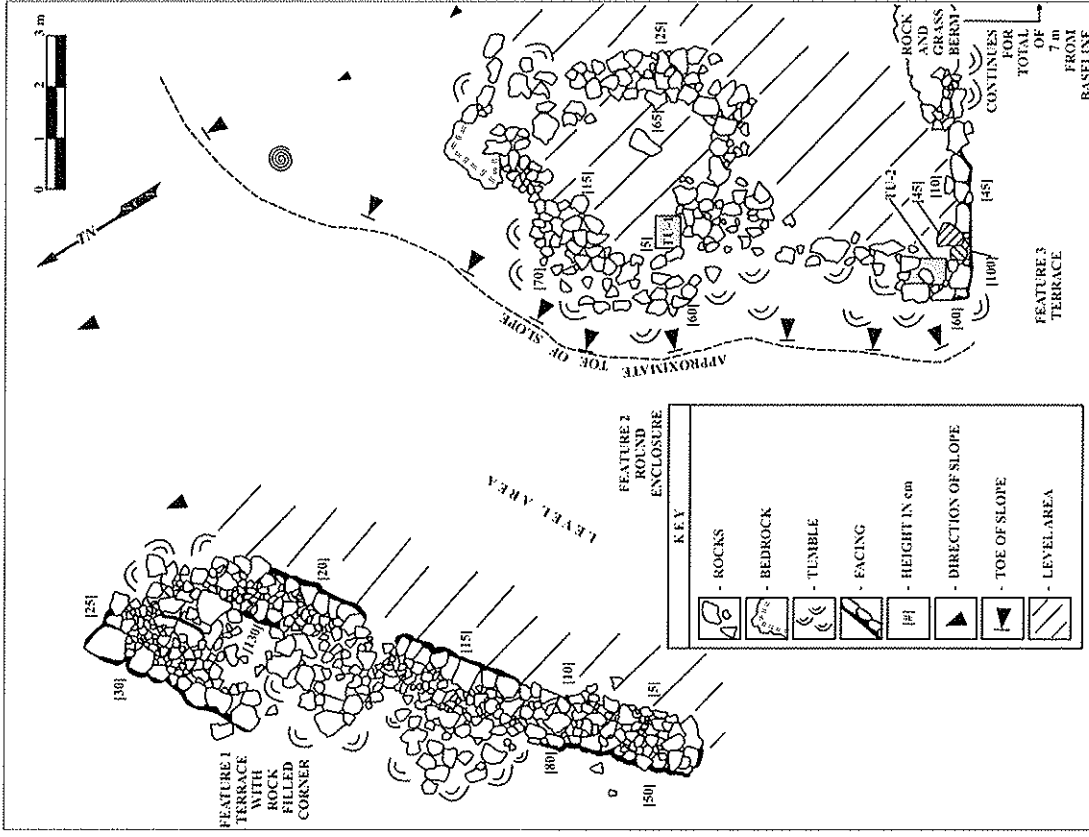


Figure 48: Site TS-193, Features 1 through 3. Plan View.

subsurface architecture (SSF 2.1) and a soft spot (SSF 2.2). A discontinuous, mostly tumbled terrace in really poor condition ran close along the base of a small hill upon which the site was located. The features reflected a pre-Contact construction style, and possibly historic modification, especially Feature 1.

**FORM:** Terrace  
**FUNCTION:** Habitation  
**AGE:** Pre-Contact?  
**DIMENSIONS:** Exterior: 12.0 x 3.5 m  
 Height: 0.3–1.3 m (down slope); 0.05–0.20 m (upslope)  
**CONDITION:** Good  
**SURFACE ARTIFACTS:** None  
**EXCAVATION:** None

**DESCRIPTION:** Feature 1 was a terrace with a low wall appended to one side. The terrace, which is similar in form to other terraces throughout the project area, may have been a pre-Contact structure which was modified and re-used historically. Stacked sub-angular basalt cobbles (10 x 15 x 10 cm) and boulders (50 x 65 x 48 cm) for the feature; five to six courses informally remained along the terrace. The lower wall/corner elements appeared to have been formed by aligning large cobbles and filling the space behind with small cobbles. The feature was in good condition, altered by erosion, weathering, and gravity; the northern corner appeared to have been robbed of stone.

**FORM:** Enclosure/Terrace  
**FUNCTION:** Habitation  
**AGE:** Pre-Contact  
**DIMENSIONS:** Exterior: 4.0 x 3.5 m; 0–1.8 m high  
 Interior: 3.0 x 2.5 m; 0–0.85 m high  
 Wall Thickness: 1.0 m  
**CONDITION:** Fair  
**SURFACE ARTIFACTS:** None  
**EXCAVATION:** TU-1

**DESCRIPTION:** The structure of Feature 2 was similar to other known pre-Contact enclosures; it may have been used for habitation. Feature 2 was constructed of sub-angular basalt cobbles ranging in size from 50 x 45 x 40 cm to 20 x 15 x 15 cm. The down slope walls were terrace walls that connected to a curvy terrace that formed the upper portion of the terrace enclosure. The down slope portions were informally piled; the upslope segments were stacked in tiers. Stacking remained two to three courses high and was best preserved in the southeast wall. The feature was in fair condition; it had been altered by animal activity and natural forces.

**EXCAVATION:** One 0.5 x 0.5 m test unit (TU-1) was excavated in the southwest corner of Feature 2 in order to examine the architecture of the feature and to determine fill episodes during the construction of the feature. Layer I (0–26 cmbs) was very dark brown (7.5YR 2.3/3) compact silt with a profuse number of rootlets throughout. A fair amount of charcoal was produced. Layer II (24–38 cmbs) consisted of a dark reddish brown (5YR 3/3) compact, mottled silt with few roots. Like Layer I, Layer II produced a fair amount of charcoal. Subsurface architecture was revealed, and it “choked out” any continued excavation. Excavation ceased here, having hit bedrock (Figure 49).

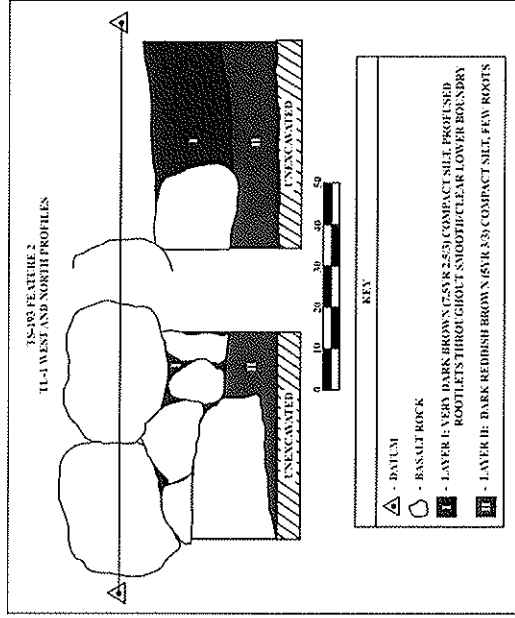


Figure 49: Site TS-193, Feature 2, Test Unit 1. West and North Wall Profiles.

**FORM:** Terrace  
**FUNCTION:** Habitation  
**AGE:** Pre-Contact  
**DIMENSIONS:** Exterior: 12.0 x 4.5 m  
 Height: 0.45–0.60 m (exterior); 0.1–0.15 m (interior)  
 Wall Thickness: 0.5 m  
**CONDITION:** Fair  
**SURFACE ARTIFACTS:** None  
**EXCAVATION:** TU-2 revealed SSF 2.1 in Layer II and SSF 2.2 in Layer III

**DESCRIPTION:** Feature 3 was a terrace/retaining wall that may have served a habitation purpose; it formed an L-shape. Two possible uprights stand near the south facing. The feature was constructed

of small- to large-sized basalt cobbles and small boulders ranging in size from 7 to 60 cm. Feature 3 was stacked one to two courses high; the south and west faces were best preserved. Overall, the feature was in fair condition; it had been altered by animal activity and natural forces.

**EXCAVATION:** Test Unit 2 was placed in the southwestern interior corner of Feature 3 in order to investigate the architecture and construction methods of the feature, as well as to determine feature function and age. Layer I (0–24 cmbs) consisted of a very dark brown (10YR 2/2) silt loam and produced a fair amount of charcoal, low quality basalt flakes and debitage, and two pieces of volcanic glass. Quality basalt flakes were recovered from the transition between Layers I and II.

Layer II (20–37 cmbs) contained a very dark brown (7.5YR 2.5/2) silt loam. Near 33 cmbs, a series of relatively flat medium- to large-sized cobbles were uncovered; subsurface architecture (i.e., a foundation floor) was suspected. TU-2 was bisected and excavation continued within the southern-half of the unit. The floor was then removed in its entirety and called Subsurface Feature (SSF) 2.1. A charcoal sample was sent to Beta Analytic, Inc for radiocarbon analysis. A conventional date range of 520 ± 40 BP was returned. When calibrated by OxCal v.3.5 at 2 Sigma, two calibrated date ranges were returned: A.D. 1300–1260 (19.1%) and A.D. 1380–1450 (76.3%).

Layer III (43–75 cmbs) was revealed below the floor architecture. Layer III was a very dark brown (7.5YR 2.5/3) silt loam. A soft spot was uncovered while cleaning the floor architecture; a bulk sample was taken from this intrusion, which was deemed SSF 2.2. Excavation terminated in sterile, subsurface conditions (Figures 50 and 51).

#### Site TS-197

Site TS-197, measuring 75.0 x 20.0 m, was a small complex of six features associated with a small swale was probably of mixed function (habitation and agricultural) as well as age (pre-Contact components with historic modifications). There was extensive modification to the outcrop ridge along the northern side of the sale. The top edge was modified. Most of the length of the modified outcrop (Feature 1) and its south side (inside the swale) were also modified with a terrace retaining walls (Feature 5) and small modified areas. Feature 2, a pile of rocks forming an enclosure, was located inside the swale. A small shelter/temporary habitation (Feature 4) was located at the base of the southern outcrop; a small enclosed area (Feature 3) was at the western end of the northern outcrop/ridge. A shallow ditch (Feature 6) ran along the base of the northern outcrop. Feature 6 may be associated with water control for agricultural use or habitation-related use, as there were several historic house sites in the project area (e.g., TS-35 and TS-254). There appeared to be a deflated terrace wall in the swale above the origin of the ditch (Figure 52).

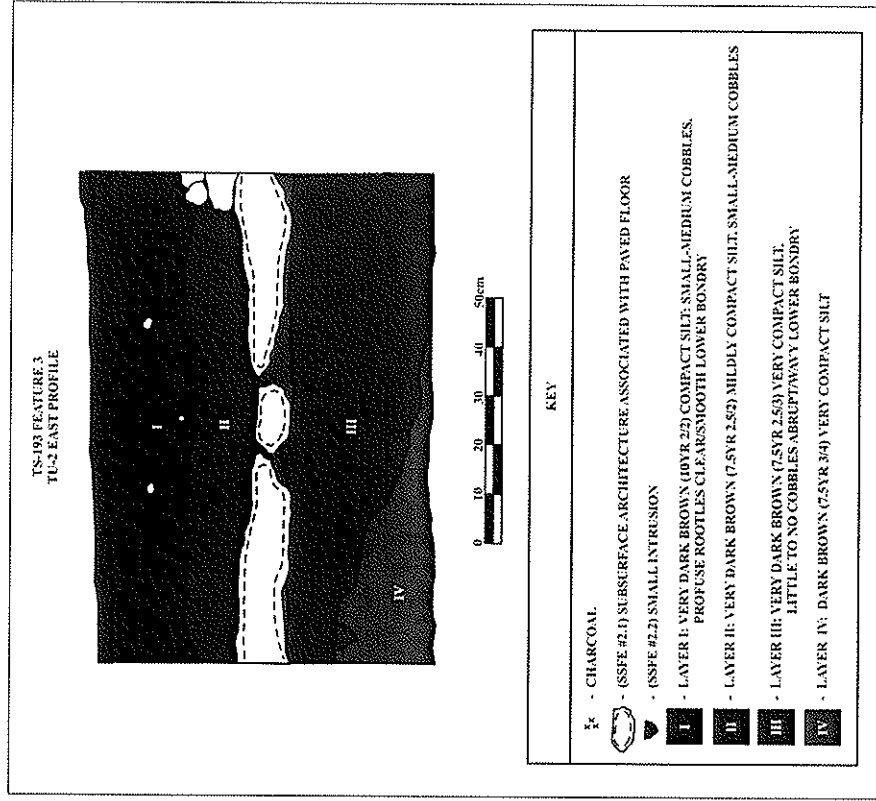


Figure 50: Site TS-193, Feature 3, Test Unit 2, East Wall Profile.

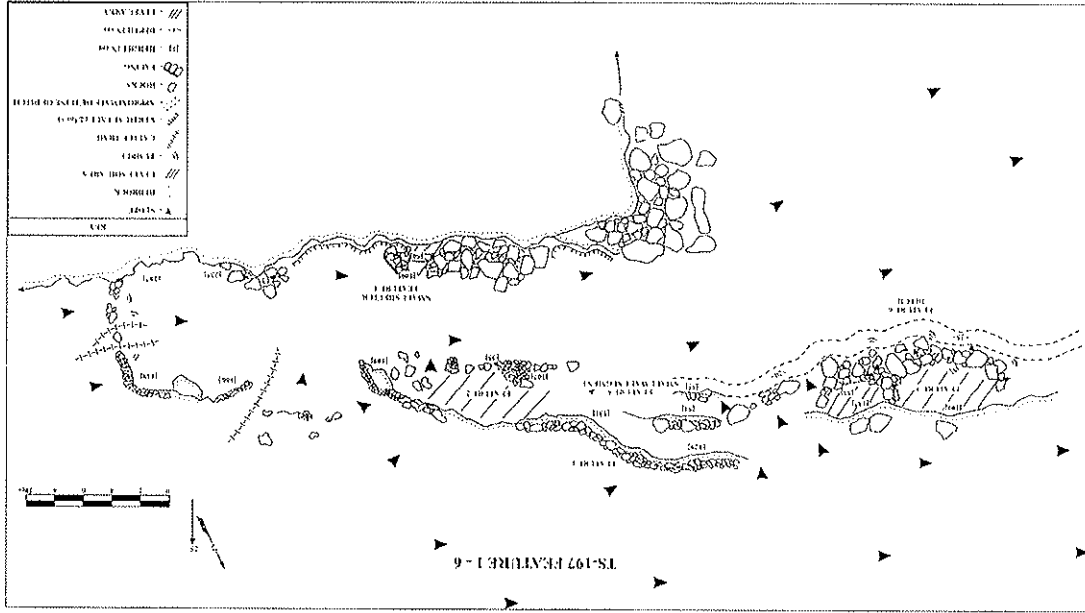


Figure S2: Site TS-197, Feature 1 through 6, Plan View.

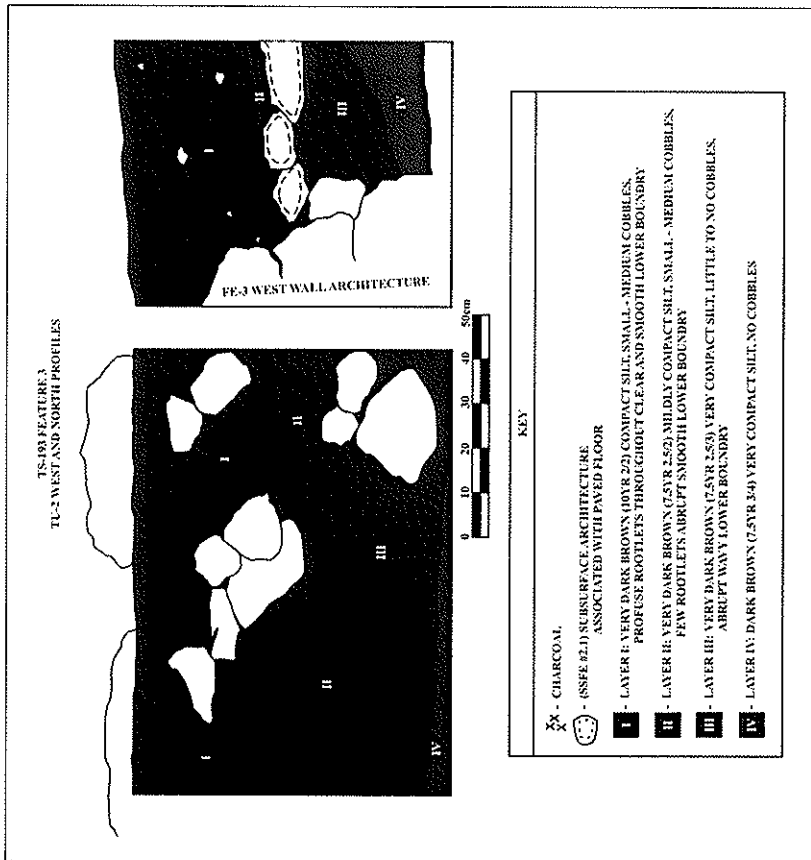


Figure 51: Site TS-193, Feature 3, Test Unit 2, West and North Wall Profiles.

FORM: Modified Outcrop  
FUNCTION: Boundary  
AGE: Undetermined  
DIMENSIONS: Exterior: 40.0+ m  
Height: 0.32–1.28 m  
Fair-Poor  
SURFACE ARTIFACTS: None  
EXCAVATION: None

DESCRIPTION: Feature 1 was a modified outcrop, which formed a discontinuous wall long the northern edge of a shallow swale. The feature had been constructed of loosely stacked medium- to large-sized basalt cobbles and small-sized basalt boulders. Feature 1 remained in fair-poor condition, having been altered by animal activity and natural forces; it was interpreted as a boundary of undetermined age.

FORM: Terrace  
FUNCTION: Habitation?  
AGE: Pre-Contact  
DIMENSIONS: Exterior: 8.0 x 4.0 m  
Height: 0.95–1.07 m  
Wall Thickness: 0.8 m  
Fair-Poor  
CONDITION: None  
SURFACE ARTIFACTS: None  
EXCAVATION: None

DESCRIPTION: Feature 2 was a degraded terrace wall with a pile of rocks and an associated pad, located nestled against the main outcrop associated with Feature 1. It was interpreted as agricultural in function. The feature remained in fair-poor condition, alerted by animal activity and natural forces.

FORM: Enclosure  
FUNCTION: Pre-Contact  
AGE: Habitation?  
DIMENSIONS: Exterior: 12.0 x 4.0m  
Interior: 11.0 x 3.75 m; 0.8–1.37 m high  
Poor  
CONDITION: None  
SURFACE ARTIFACTS: None  
EXCAVATION: None

DESCRIPTION: Feature 3 was a terrace wall that abutted a bedrock outcrop to form a small enclosure. The enclosure was constructed of loosely piled basalt boulders. The feature was in poor condition, altered by animal activity and natural forces like erosion, weathering, and gravity.

FORM: Enclosure and Modified Outcrop  
FUNCTION: Habitation/Agricultural  
AGE: Undetermined  
DIMENSIONS: Exterior: 3.8 x 2.3 m; 0.3–1.15 m high  
Interior: 2.4 x 1.3 m; 0.5–0.8 m high  
Wall Thickness: 1.0–1.1 m  
CONDITION: Good  
SURFACE ARTIFACTS: None  
EXCAVATION: None

DESCRIPTION: Feature 4 was located in a small drainage gully that abutted the southwest escarpment wall, which was about 6.0 m in height. Stacked rocks and boulders created a small, fairly flat and level interior. The ground surface was approximately 1.0+ m off the drainage bottom. It appeared that this feature had been cleared of large rocks. Feature 4 was constructed of small- to large-sized, sub-angular basalt cobbles and large boulders (sizes ranging 0.5–1.3 m) and utilized a bedrock boulder outcrop and escarpment face. Stacking three to four courses high remained in the southeast corner of the feature. The shape was oblong; there was an opening in the northwest corner and a small niche in the escarpment wall in the southwest corner of the feature. Feature 4, which was interpreted as temporary habitation, was in good condition and relatively unaltered.

FORM: Terrace  
FUNCTION: Agricultural  
AGE: Undetermined  
DIMENSIONS: Exterior: 1.6 x 1.15 m; 0.4–0.5 m high  
Wall Thickness: 0.45 m  
Poor  
CONDITION: None  
SURFACE ARTIFACTS: None  
EXCAVATION: None

DESCRIPTION: Feature 5 was a terrace located at the base of the sloping northern side of a small swale. The retaining wall consisted of small- to large-sized, sub-angular and sub-rounded basalt cobbles (10–40 cm). The retaining wall was roughly stacked (1–3 courses remained) and no real facing was left. The feature was one of several short walls on the side of the small slope in a swale. On the upper edge of a swale is a modified outcrop/wall. Based on similar structures, Feature 5 was interpreted as agricultural. It was in poor condition, altered by animal activity and natural forces, such as erosion, weathering, gravity, and vegetative overgrowth.

FORM: Ditch  
FUNCTION: Agricultural/Habitation Water Control

AGE: Undetermined  
DIMENSIONS: Exterior: 30.0 x 1.0 m  
Depth: 0.2–0.25 m  
CONDITION: Fair  
SURFACE ARTIFACTS: None  
EXCAVATION: None

**DESCRIPTION:** Feature 6, a ditch, was located in a small swale that ran northwest-southeast along the base of the northern side of a low outcrop/ridge. An extensive agricultural field system ran throughout the project area and included several historic house sites that relied on cisterns for water storage. The ditch may have been used pre-historically, adapted, and reused historically. The feature was in fair condition, altered by animal activity and erosion.

#### Site TS-237

**FORM:** Cistern  
**FUNCTION:** Water Storage  
**AGE:** Historic  
**DIMENSIONS:** Diameter: 5.0m  
Depth: 2.0 m  
**CONDITION:** Fair  
**SURFACE ARTIFACTS:** Coral  
**EXCAVATION:** None

**DESCRIPTION:** Feature 1, an historic cistern, was located in a relatively flat area, with a slight slope of 5° southeast-northwest. Overall, the terrain consisted of rolling hills and small swales with 10–20° southeast-northwest. The feature was next to a jeep road, just above the northern side of Keāhuaiwi Gulch, in the upper-third of the northern half of the project area. The cistern was constructed of basalt rocks with mortar and cement around the opening; it was surrounded by a 6.0 x 6.0 m x 90 cm high milled wood, *kāwe* wood, and hog-wire fence. The entire wall was covered with grass and the unsafe fence deterred exploration of the interior. The cistern was at least 2.0 m deep, the bottom was obscured by murky water and grass. A piece of coral was found outside the cistern during the survey, but was relocated during recording. It probably had been displaced from somewhere upslope. Feature 1 was in fair condition, altered by animal activity, erosion and weathering, and gravity.

#### Site TS-254

Site TS-254 consisted of three features, a house site/foundation (Feature 1), C-shaped structure (Feature 2), and a ditch (Feature 3). Feature 1 consisted of an L-shaped terrace, a low terrace, and a tumbled wall. Two test units (TU-1 and TU-2) were excavated at Feature 1 in order to aid in the

determination of feature function and age. Historic artifacts, such as glass, porcelain shards, metal pieces, pieces of a metal hanging scale, and a button were recovered from TU-1. TU-2 did not uncover any cultural materials; however, the unit confirmed part of the feature as a filled-in cistern. Data Recovery is recommended at Site TS-254 in order to explain the function, age, and cultural affiliations of the feature (Figure 53).

**FORM:** House Site/Foundation  
**FUNCTION:** Habitation  
**AGE:** Historic  
**DIMENSIONS:** Exterior: 12.5 x 10.0 m; 0.02–0.93 m high  
Interior: 8.5 x 5.0 m; 0.40 m high  
**CONDITION:** Fair  
**SURFACE ARTIFACTS:** Historic Glass and Concrete  
**EXCAVATION:** TU-1 (enclosure) and TU-2 (cistern) at Feature 1

**DESCRIPTION:** Feature 1, an historic house and foundation that was constructed of small- to large-sized cobbles and small boulders, was located on the top of a small knoll in the open pasture. The feature was comprised of a large L-shaped terrace to the west and south, a low terrace to the east, and a tumbled wall to the north. Collectively, these three subfeatures formed a mid-sized enclosure that was interpreted as being an historic house and foundation. Within this enclosed area were a series of collapsed partition walls, one of which encompassed a depressed, rectangular area along the southwestern wall. On the exterior of the southwestern wall of the large L-shaped terrace, was a set of free-set basalt slabs that formed two separate sets of stairs, three to four tiers high, which gave access to an internal lanai area. Stacking four to five courses high was observed along the northwestern wall. Along the exterior of the northeastern corner was a tumbled, semi-circular wall that outlined a depression, which itself was interpreted as a filled-in water cistern. The feature was in fair condition; it has been altered by animal activity and natural forces.

**EXCAVATION:** One 0.5 x 0.5 m test unit (TU-1) was excavated in the northwestern quadrant of the Feature 1 enclosure in order to help determine the function and age of the feature and to identify the presence or absence of subsurface cultural materials (Figure 54). The interior of the feature was depressed and the surface was covered with historic glass. One sun-colored historic 1915+ bottle base was collected from the surface. Layer 1 (0–18 cmbd) was a brown (7.5YR 4/3) silt loam with many fine roots and less than ten percent rocks. Several historic artifacts were screen-recovered throughout this layer: glass, porcelain, square nails and bits of metal, and a brass face-plate from a spring-type hanging scale. The soil colored changed at 16 cmbd to a lighter, very compact, slightly mottled soil, (possibly) saprolitic soil with cobbles. This may have been the transition zone.

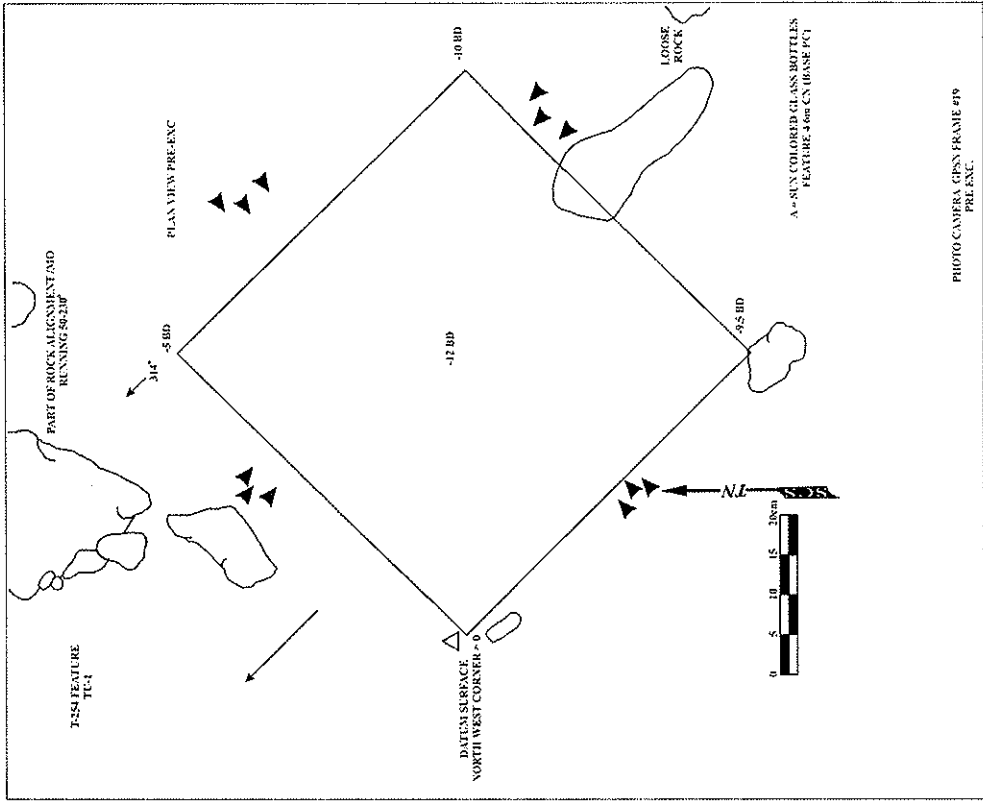


Figure 54: Site TS-254, Feature 1, Test Unit I. Plan View.

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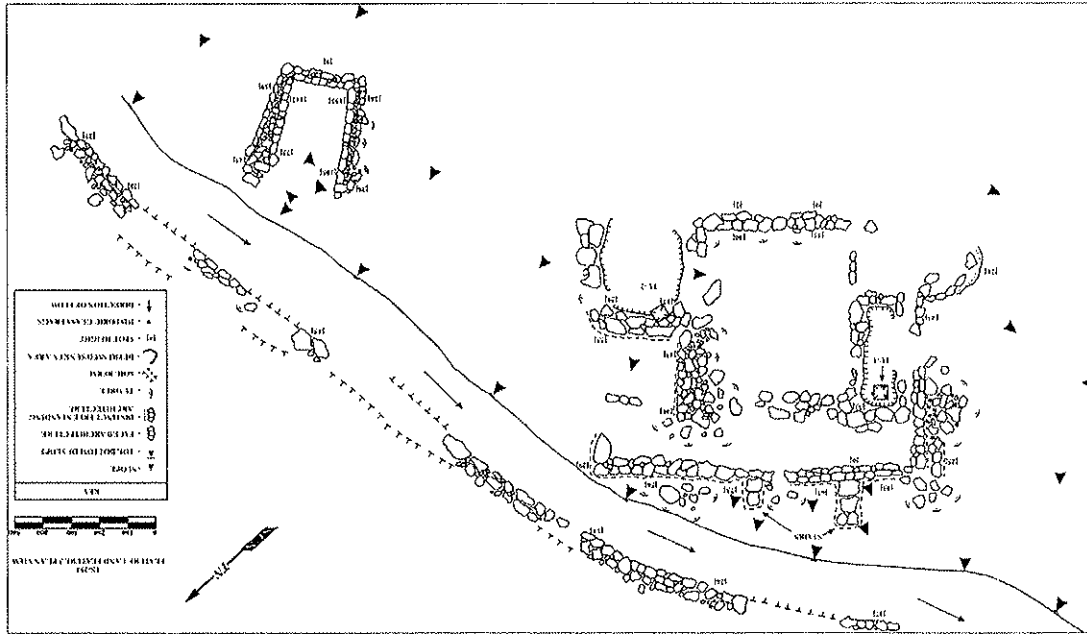


Figure 53: Site TS-254, Features 1 and 3. Plan View.

Layer II (16–25 cmbd) was a strong brown (7.5YR 4/6) silt loam with many fine- to small-sized roots and small- to medium-sized cobbles (<10%). The soil here was much more compact. Several historic artifacts were screen recovered: glass, porcelain, pieces of metal, square-nails, one button stamped in brass “32 BrooksTW. Thomas & Sons” and one fired clay jar stamped “Killer & Son” (for marmalade).

Layer III (22–32 cmbd) was a very compact, mottled, saprolitic soil, lighter than Layer II (7.5YR 5/6). Screen recovered artifacts included mostly glass from the upper levels (Figures 55 and 56).

A second 0.5 x 0.5 m test unit was excavated against two rocks with concrete plaster facing in order to determine the function and age of the feature and to recover subsurface cultural materials (Figure 57). The entire feature had many sub-components and appeared to be an historic house; however, local informants suggested pre-Contact origin. The surface of the unit was relatively level and covered with grass; the west side abutted two cement-lined rocks. Layer I (7–27 cmbd) consisted of a dark brown (10YR 3/3) semi-compact silt loam with many fine- and medium-sized roots and rocks (10%). Many small bits of concrete were observed throughout the upper 10 cm. At about 20 cmbd, many medium-sized cobbles were observed in the western-half of the unit at a base of two surface rocks with concrete. One of these was flattish and contained concrete, suggesting that most of the other rocks are tumble. Concrete on one of the surface rocks extended below the surface. The feature was interpreted as an old cistern; some of the tumbled rocks looked as if they had been shaped and used as chink.

Layer II (21–42 cmbd) was a dark brown (7.5YR 3/3) fine, semi-compact silt loam with few roots and small cobbles and pebbles (10%) and medium- to large-sized cobbles (50–60%) in the western half of the unit. Small pieces of historic glass were collected. One possible worked stone for chinking and another possible worked basalt rock were collected. The transition to Layer III in the eastern-half of the unit was about 35 cmbd; however, it was much deeper in the western-half, which also contained larger cobbles. Almost the entire western-half bottomed out at packed rock; some of the rocks in the western-half may be subsurface architecture. A large rock was removed in the northern-half of the unit; the rest remained, pending further excavation.

Layer III (34–57 cmbd) contained a dark yellowish brown silt loam with few roots and rocks (<5%). The layer was compact, reddish, not quite saprolite, but with patches of grainy gray soil. The excavation terminated in sterile soil. While there appeared to be subsurface architecture in the western-half of the unit, none was visible beneath the surface rocks that contained concrete, nor did the

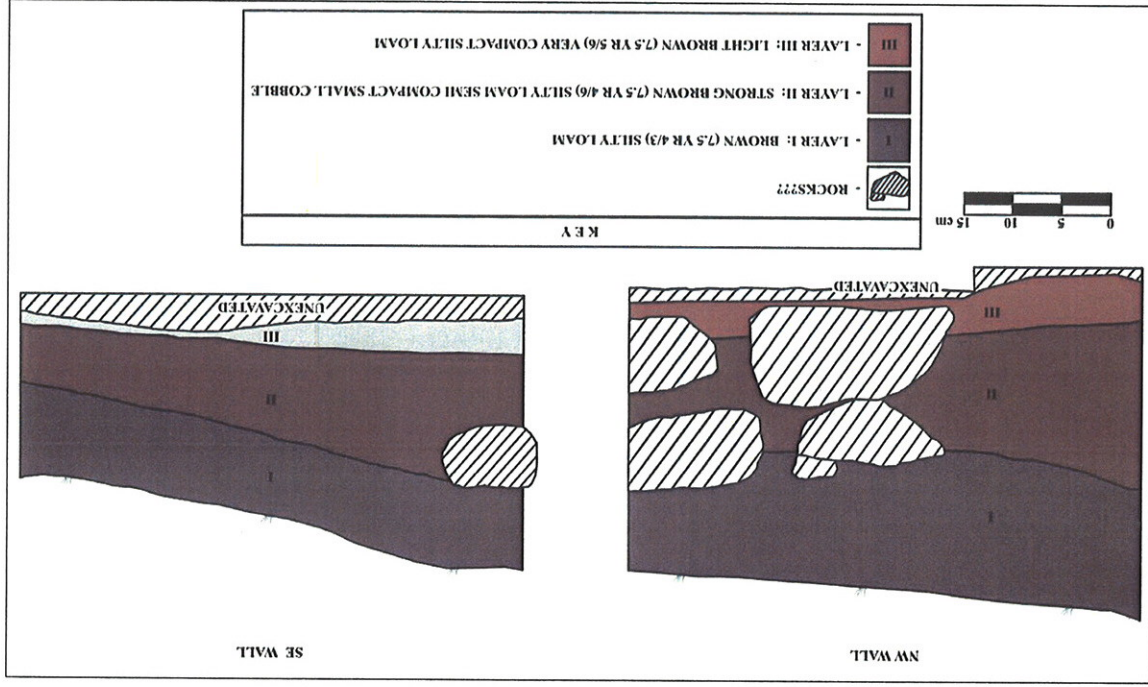


Figure 55: Site TS-254, Feature 1, Test Unit 1, Northwest and Southeast Wall Profiles.



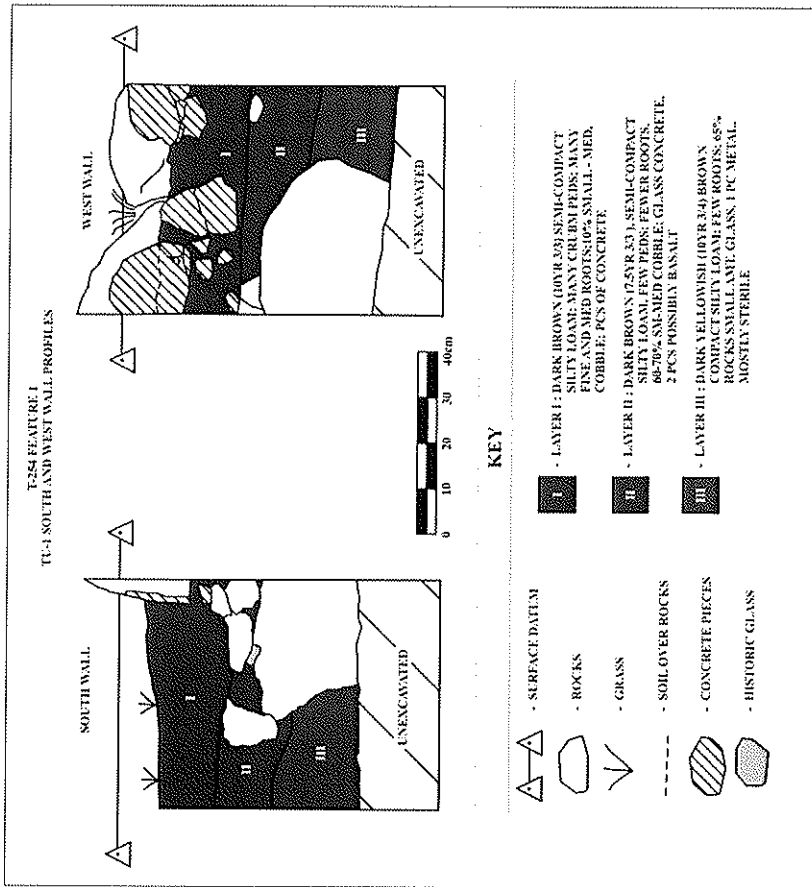


Figure 56: Site TS-254, Feature 1, Test Unit 1. South and West Wall Profiles.

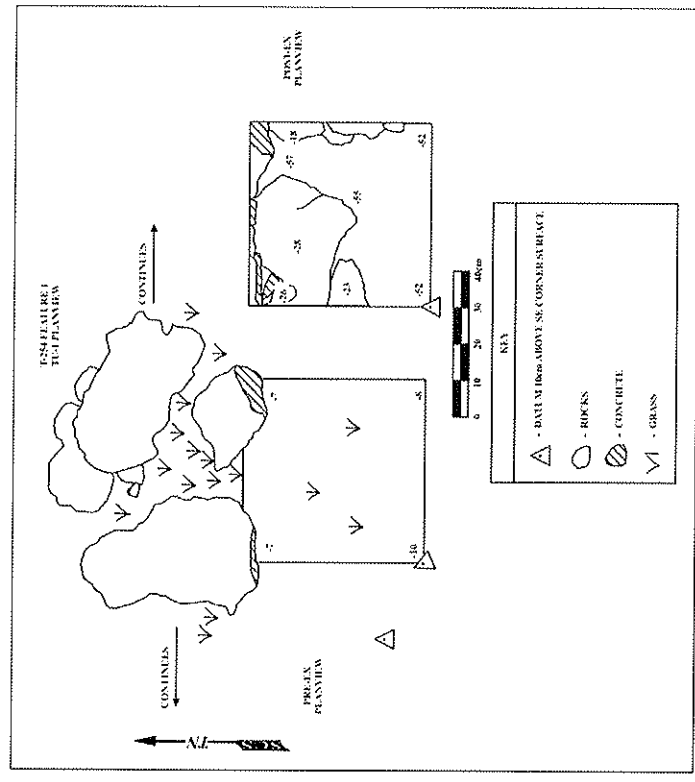


Figure 57: Site TS-254, Feature 1, Test Unit 2. Plan View.

concrete appear to continue much further down as it would have if this were the top edge of a cistern. Thus, the feature was re-interpreted as either a badly damaged cistern or some other structure with another function. Despite the presence of grass and murky water, it was believed that the interior of a cistern would be deeper than the feature observed. Alternatively, subsurface architecture may represent a previously existing structure, like a submerged wall.

- FORM: C-shaped Structure
- FUNCTION: Privy
- AGE: Historic
- DIMENSIONS: Exterior: 5.0 x 3.5 m; 0.43 m high  
Interior: 4.0 x 2.3 m; 0.73-1.53 m high  
Wall Thickness: 0.50-0.75 m
- CONDITION: Good-Fair
- SURFACE ARTIFACTS: Historic Glass
- EXCAVATION: None

**DESCRIPTION:** Feature 2, a square-cornered C-shape dug into natural slope, was located on the top of a small knoll in open pasture. The feature was constructed of stacked and faced large-sized cobbles to medium-sized basalt boulder slabs. The northwestern side of the feature gently sloped towards its interior; stacking six to eight courses high remained. The feature was in good-fair condition; however, it has been altered by animal activity, erosion, weathering, and gravity. Feature 2 has been interpreted as a privy. Time constraints prevented excavation at this feature; however, the feature is interpreted as being Historic in age.

**FORM:** Ditch  
**FUNCTION:** Agricultural  
**AGE:** Pre-Contact/Historic  
**DIMENSIONS:** 50.0+ m in length  
**CONDITION:** Fair  
**SURFACE ARTIFACTS:** None  
**EXCAVATION:** None

**DESCRIPTION:** Feature 3 was a small segment of the extensive *amazi* system that was located in the project area. The feature was constructed of discontinuous segments of aligned medium- and large-sized basalt cobbles and small boulders and an earthen berm. Feature 3 was in fair condition, as it had been altered by animal activity and natural forces.

#### Site TS-265

Site TS-265 was located about 20.0 m south of the project area's northern boundary and about 11.0 m to Kamehameiki Road. The general terrain sloped from east to west at approximately 4°, but the slope increased to 8–10° 15 m west of the site, causing the area where Feature 1 was located to appear flat. Overall, the site measured 10.0 x 10.0 m. Two test units were excavated in order to investigate the feature's function. Excavation in TU-1A revealed a darker sediment concentration, Subsurface Feature 1 (SSF 1), and a second test unit was opened (TU-1B) to explore the area. Charcoal was collected from the excavation. However, due to time constraints, excavations ceased and the subsurface feature remained unclear. Data Recovery is recommended in order to confirm the function of the subsurface feature (Figure 58).

**FORM:** Enclosure  
**FUNCTION:** Habitation  
**AGE:** Pre-Contact  
**DIMENSIONS:** Exterior: 9.5 x 9.0 m; 1.55 m high  
 Interior: 7.5 x 6.0 m; 0.2–1.35 m high  
 Wall Thickness: 1.25 m

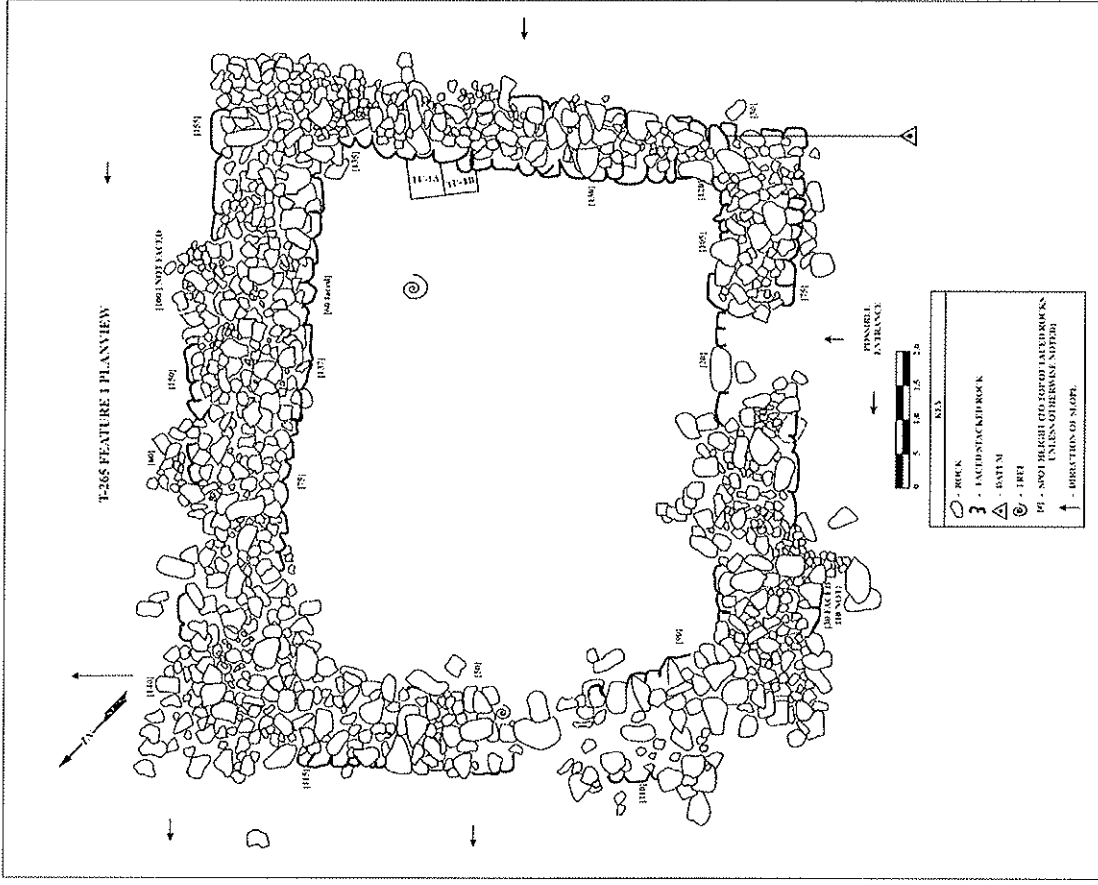


Figure 58: Site TS-265, Feature 1. Plan View. Showing Location of Test Units 1 and 2.

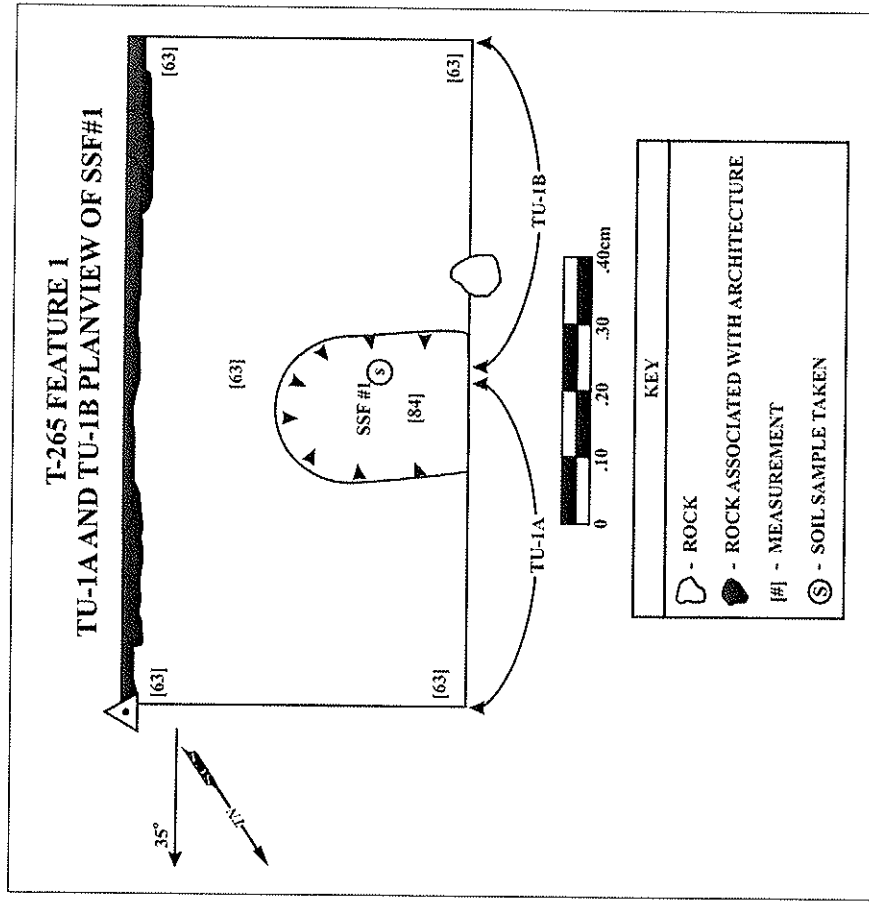


Figure 59: Site TS-265, Feature I, Test Units 1A and 1B. Plan View Showing SSF I.

CONDITION: Good  
 SURFACE ARTIFACTS: None  
 EXCAVATION: TU-1A revealed SSF I in Layer III; TU-1B

DESCRIPTION: The enclosure (Feature I) was faced with medium- to large-sized sub-angular basalt cobbles (average size: 30 x 35 x 30 cm) and small boulders (average size: 60 x 70 x 45 cm) on both the interior and exterior. Stones stacked up to eight courses remained; this was best preserved along the northern and eastern interior walls and the northern exterior wall. Based on the size and shape of the feature, Feature I was interpreted as an historic animal pen. Historically, such enclosures were used to hold large animals. The feature was in good condition, despite alteration by animal activity, gravity, and erosion.

EXCAVATION: Test Unit 1A was a 0.5 x 0.5 m unit placed against the interior of the eastern wall of Feature I in hopes of relating the feature's construction and use to depositional layers. One piece of charcoal was collected on the surface. Layer I (10-35 cmbd) consisted of dark reddish brown (5YR 2.5/2) fine silt loam with roots and rootlets, especially in the upper levels, and very few pebbles. Several basalt flakes were collected. Charcoal was noted near the boundary between Layers I and II; several pieces were collected at 31 cmbd.

Layer II (35-59 cmbd) was composed of a dark brown (7.5YR 3/3) very fine silt loam with few rootlets and pebbles. Charcoal flecking was present throughout, and concentrations were collected. No other cultural materials were noted.

Layer III was a brown (7.5YR 3/3) semi-compact, fine-grained silt loam with clumps of harder, darker brown (7.5R 4/3) sediment. From about 60-81 cmbd, a dark layer was observed. A subsurface feature (SSF I) of a darker, softer patch of sediment was uncovered in the southwest corner of Layer III. Excavation ceased at 63 cmbd and SSF I was photographed, sediment was removed and screened, and a profile was drawn. A new test unit, TU-1B, was opened to better understand this sediment (Figures 59 and 60).

Test Unit 1B was a 0.5 x 0.5 m southern expansion off TU-1A to better understand the unusual stratigraphy observed in TU-1A. The surface was recently home to a pheasant's nest; broken eggshells were scattered over the surface. The upper portions of Layer I (10-35 cmbd) contained many small- and medium-sized roots and charcoal flecks. A few basalt flakes were collected from the lower portions of the layer, at about 30 cmbd. At about 28 cmbd, charcoal flecking was present; one piece near 37 cmbd was collected *in situ*. A strange rock was collected from Layer II (35-57 cmbd).

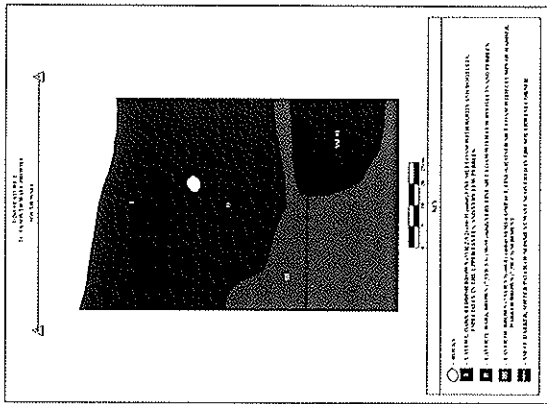


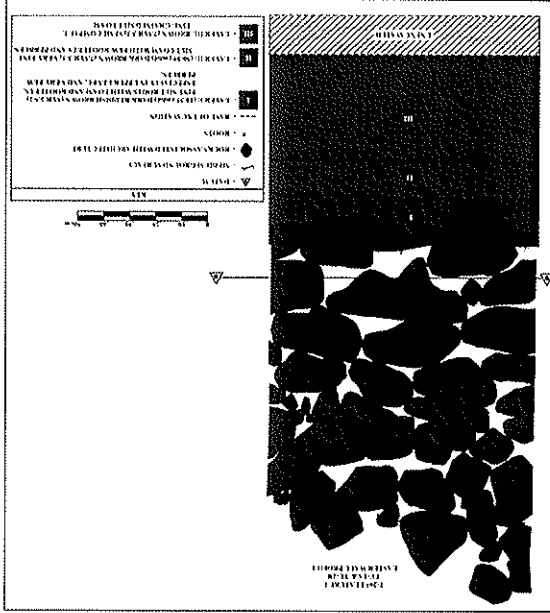
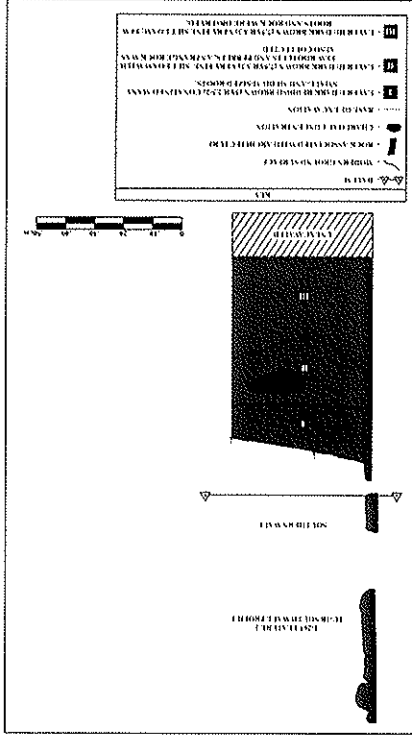
Figure 60: Site TS-265, Feature 1, Test Unit 1A, South Wall Profile.

Charcoal flecking and staining was observed in the southwest corner; a charcoal concentration has made the soil darker. Excavations ceased in TU-1B at 63 cmbd, leveling the two test units. Layer III was a mottled, dark brown (7.5YR 3/3) very fine silt loam; few roots and rocks were observed. Excavations for the site ceased at 85 cmbd and the function of SSF 1 remained unclear (Figures 61 and 62).

#### Site TS-267

Site TS-267 was located on a relatively level area (maximum slope: 5–7°) in a pasture with gently rolling hills and small swales. The general terrain of the 23.0 x 7.0 m area sloped southeast-northwest at 10–15°. It was located in the *manuka* end (northern end) of the project area, near the top of Keāhuaiwi Gulch. The site included three features: an old cistern (Feature 1), a dig hole (Feature 2), which may be associated with a cistern (it was located 6.0 m away), and a possible privy or refuse area. A terrace (Feature 3) was located 1.0 m east of the “privy” and was probably part of the agricultural field system, which was prevalent throughout the project area; it may not be related to the other two features. Initial probing of the cistern and excavated hole indicated the presence of subsurface historic materials. The cistern included a soil berm of unknown origin along its western edge. It may have been related to backfilling of the defunct cistern or removal of dirt from the cistern and the back-piling

Figure 61: Site TS-265, Feature 1, Test Unit 1A and 1B, East Wall Profile.



of soil. The soil in the cistern was very loose and at least four-feet deep. The presence of the cistern, and possible privy, indicates that the site might have been an historic house site complex (Figure 63).

FORM: Cistern  
 FUNCTION: Water Storage  
 AGE: Historic  
 DIMENSIONS: Diameter: 2.5 m  
 Interior Height: 0.45 m  
 CONDITION: Poor  
 SURFACE ARTIFACTS: Concrete  
 EXCAVATION: None

DESCRIPTION: Feature 1 was a defunct cistern. The upper 45 cm of the opening was a concrete-lined wall (20–40 cm on long axis) of basalt cobbles and mortar; it was faced on the interior. Probing indicated that the wall did not extend any deeper than 50 cm more. The rest of the cistern may have belled out or extended into a larger chamber. A significant amount of soil was piled outside of the western (down slope) side of the cistern. The cistern itself was filled to within 45 cm of the top walled edge. The soil may have accumulated because of attempts of fill the cistern or to remove soil from it. The feature was in poor condition, altered by erosion, gravity, animal activity, and possibly manual labor.

FORM: Excavated Hole  
 FUNCTION: Privy/Refuse Area  
 AGE: Historic?  
 DIMENSIONS: Exterior: 5.0 x 4.0 m  
 Depth: 0.1–1.20 m  
 CONDITION: Undetermined  
 SURFACE ARTIFACTS: None  
 EXCAVATION: None

DESCRIPTION: Feature 2 was possibly a privy or garbage pit. The deepest spot is 1.0 m from its southeast edge, where it was 1.2 m deep. The depth of the feature varied and no formal construction or excavation was apparent. The proximity between Features 1 (cistern) and 2 (hole) suggested that Feature 2 was associated in age (i.e., that it was Historic) and that its function was consistent with a historic house site complex. Thus, Feature 2 was determined to be either a refuse pit or a privy. Because its original form was unknown, its current condition could not be assessed. Animal activity, erosion and weathering, and gravity have probably altered it. Probing indicated the presence of subsurface historic materials (i.e., glass or porcelain).

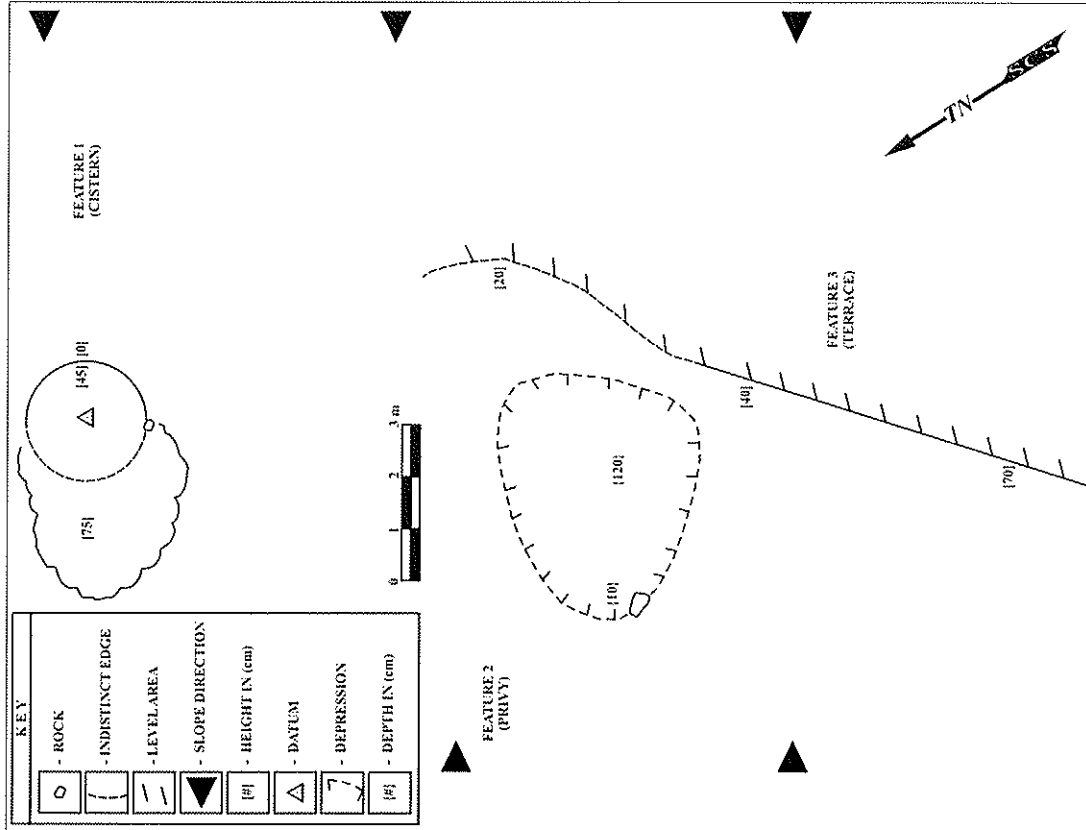


Figure 63: Site TS-267. Plan View.

**FORM:** Terrace  
**FUNCTION:** Agricultural  
**AGE:** Undetermined  
**DIMENSIONS:** Exterior: 15.0 x 1.0 m; 0.2–0.75 m high  
 Wall Thickness: 0.5 m  
**CONDITION:** Poor  
**SURFACE ARTIFACTS:** None  
**EXCAVATION:** None

**DESCRIPTION:** Feature 3 was a terrace constructed of roughly stacked sub-angular basalt cobbles one to two courses high along the southwestern portion of the feature; no facing remained. A low terrace wall with a very narrow (1.0 m maximum) soil-filled pad behind it was observed. The feature was typical of the many terraces in the agricultural field system prevalent throughout the project area; however, its proximity to two historic features, Features 1 and 2, do not necessarily mean that it was associated with them. The feature has pre-Contact components with Historic/modern reuse or modifications. It was in poor condition, having been altered by animal activity, gravity, weathering, and vegetative overgrowth.

#### Site TS-285

Site TS-285 was located on a steep east-southeast to west-southwest (18°) slope. The gulch that separates the northern and southern boundaries of the project area is approximately 150.0 m away. Four features were located in the 30.0 x 15.0 m: three terraces (Features 1, 3, and 4) and a cistern (Feature 2). Feature 2 contained cement, suggesting that the site was used historically; however, the other features, the terraces, could represent earlier constructed and used features (i.e., pre-Contact) (Figure 64).

**FORM:** Terrace  
**FUNCTION:** Habitation  
**AGE:** Pre-Contact/Historic  
**DIMENSIONS:** Exterior: 23.0 x 8.0 m; 0.45–1.60 m high  
 Wall Thickness: 0.55 m  
**CONDITION:** Fair  
**SURFACE ARTIFACTS:** None  
**EXCAVATION:** None

**DESCRIPTION:** Feature 1, a terrace that situated on a hill slope that sloped from east-southeast to west-southwest at 18°, was constructed of medium- to large-sized, sub-angular to sub-rounded basalt cobbles and small boulders (35 x 39 x 23 cm to 62 x 46 x 109 cm), stacked up to five courses high. The terrace contained remnants of a cistern (Feature 2), suggesting that it may have been used

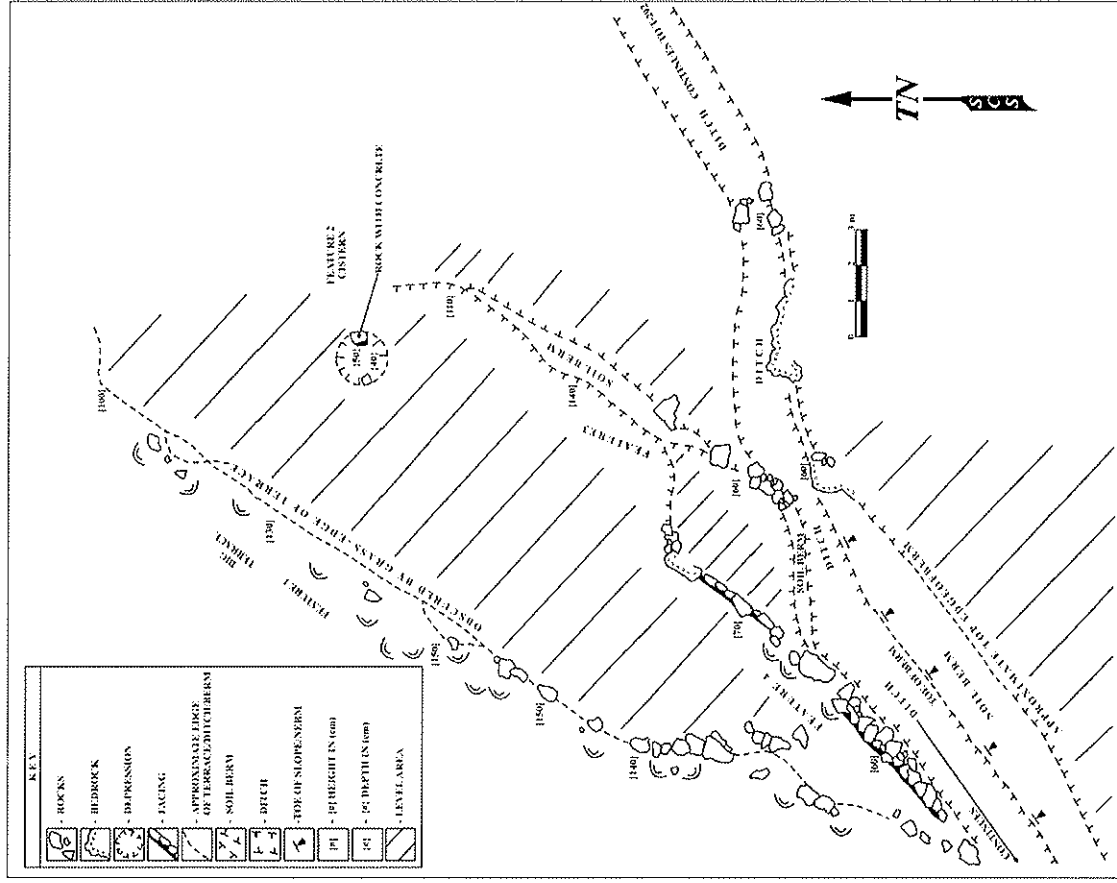


Figure 64: Site TS-285, Features 1 through 4, Plan View.

historically and possibly as a habitation area. The feature was in fair condition, altered by animal activity and natural forces like erosion, weathering, and gravity.

FORM: Cistern  
FUNCTION: Water Storage  
AGE: Historic  
DIMENSIONS: Diameter: 1.9 m  
Interior Height: 0.30–0.55 m  
CONDITION: Poor  
SURFACE ARTIFACTS: Concrete  
EXCAVATION: None

DESCRIPTION: Very little of the Feature 2 cistern remained. It would have been round, but only eastern portions remained. Visible portions were constructed of basalt cobbles (23 x 18 x 27 cm to 33 x 35 x 25 cm) stacked about two courses high then covered with cement. Approximately 0.50 m of uncemented wall remained. Based on the shape of similar features, Feature 2 was interpreted as a cistern; the presence of cement suggested it was used historically. Feature 2 was in poor shape, altered by animal activity and natural forces like erosion, weathering, gravity, and overgrown vegetation.

FORM: Terrace  
FUNCTION: Undetermined  
AGE: Pre-Contact/Historic  
DIMENSIONS: Exterior: 15.0 x 6.0 m; 0.60–1.30 m high  
Wall Thickness: 0.80 m  
CONDITION: Fair-Poor  
SURFACE ARTIFACTS: None  
EXCAVATION: None

DESCRIPTION: Much of Feature 3, a terrace, appeared to be earthen; whether it was constructed that way or of stones were tumbled or removed remained unclear. Remaining construction incorporated sub-angular to sub-rounded basalt stones, two to three courses high. Two to three tiers remain, although it was hard to see due to vegetative overgrowth. Construction incorporating both soil and basalt are demonstrative of either pre-Contact or Historic construction; however, no excavation to confirm the feature's function and age occurred. The southwestern portions of the terrace were possibly affiliated with the *zarwai* that ran upslope of TS-285 and may have prevented water flowing from the ditch into the Feature 1 terrace. The feature was in fair-poor condition, altered by animal activity and natural forces like erosion, weathering, gravity, and overgrown vegetation.

FORM: Terrace  
FUNCTION: Undetermined

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AGE: Pre-Contact/Historic  
DIMENSIONS: Exterior: 14.0 x 3.0 m; 0.30–0.48 m high  
Wall Thickness: 0.65 m  
CONDITION: Fair  
SURFACE ARTIFACTS: None  
EXCAVATION: None

DESCRIPTION: Feature 4, a terrace that was constructed of soil and sub-angular to sub-rounded basalt cobbles ranging in size from 17 x 11 x 33 cm to 42 x 37 x 48 cm, was obscured by vegetation; however, two to four courses remained in the central portions. Like Feature 3, Feature 4 may have been associated with the *zarwai* that ran northeast-southwest along the upslope boundary of TS-285.

#### Site TS-298

Site TS-298 consisted of seven features: two L-shaped structures (Features 1 and 6), four terraces (features 2, 3, 4, 5), and one linear mound with a corner (Feature 7). The construction of these features was consistent with the pre-Contact period, but they were historically modified – several waterlines, both metal and plastic pipes, crossed the site. The location and structure of the features were consistent with known habitation sites and associated agricultural features on hillsides. The site measured 50.0 m x 25.0 m and was situated on the western side of a small hill that sloped gently to the west (10–20°), approximately 20.0 m east of the western fence-boundary for the southern-half of the project area. There were small areas of exposed bedrock on the hillside (Figure 65).

FORM: L-shaped Structure  
FUNCTION: Habitation?  
AGE: Pre-Contact/Historic  
DIMENSIONS: Exterior: 7.0 m (longer side) x 5.0 m; 5.0 m (shorter side) x 5.0 m  
Wall Thickness: 1.0–2.0 m  
Height: 0.45–0.75 m (exterior); 0.50–0.65 m (interior)  
CONDITION: Fair  
SURFACE ARTIFACTS: None  
EXCAVATION: None

DESCRIPTION: Feature 1, an L-shaped structure, was constructed of roughly stacked angular basalt cobbles two to four courses high, with no facing. Smaller cobbles were used to fill in area. The long leg of the L-shape was parallel to the top of the hill and its short leg was at the north end and ran down slope to the west. The structure and form of Feature 1, given its location on the hillside relative to other features at the site, may indicate the feature was a temporary habitation or shelter. Feature 1 was in fair condition; it was altered by animal trampling, erosion, gravity, and vegetative overgrowth.

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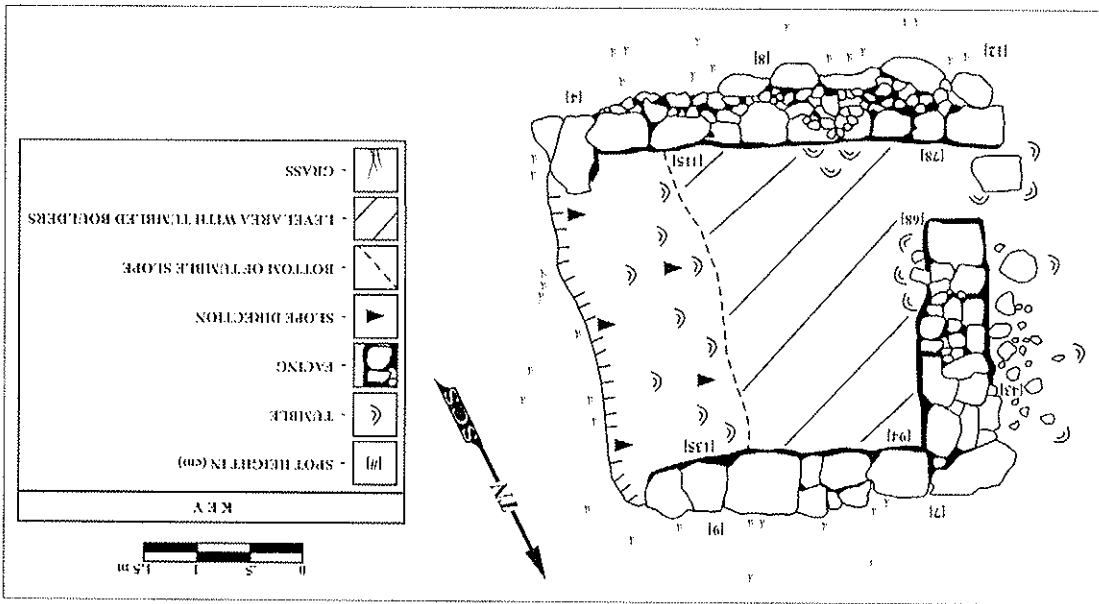


Figure 65: Site TS-298, Features 1 through 7, Plan View.

FORM: Terrace  
 FUNCTION: Agricultural  
 AGE: Pre-Contact/Historic  
 DIMENSIONS: Terrace: 20.5 x 0.5-1.5 m; 70-95 cm  
 Pile of Rocks: 2.5 x 2.0 m; 30-90 cm  
 Wall Thickness: 0.5-1.0 m  
 Height: 0.45-0.75 m (exterior); 0.50-0.65 m (interior)  
 CONDITION: Poor  
 SURFACE ARTIFACTS: None  
 EXCAVATION: None

DESCRIPTION: Feature 2 was a discontinuous retaining wall that was constructed of medium and large angular cobbles roughly stacked one to two courses high. Lots of tumble was found around the feature; no facing remained. A level, soil-filled terrace pad was observed on the upslope side. An irregularly-shaped pile rocks was located at the northeast end; the southwest end abuted the northern leg of Feature 6, an alignment. Based on the construction of other known agricultural structures, Feature 2 was interpreted as agricultural. It was in poor condition, having been altered by animal activity, erosion, gravity, and overgrown vegetation.

FORM: Terrace  
 FUNCTION: Agricultural  
 AGE: Pre-Contact/Historic  
 DIMENSIONS: Exterior: 24.0 m long  
 Wall Thickness: 0.5-0.75 m  
 Height: 0.75-1.0 m (exterior)  
 CONDITION: Fair  
 SURFACE ARTIFACTS: None  
 EXCAVATION: None

DESCRIPTION: Feature 3 was a retaining wall constructed of angular medium- to large-sized basalt cobbles and small- to medium-sized boulders roughly stacked five to seven courses high. There was a lot of tumble and no facing remained. There was a level soil-filled terrace pad upslope of the wall. Based on the construction and form of other known agricultural structures, Feature 3 was interpreted as agricultural. It was in poor condition, having been altered by animal activity, erosion, gravity, and overgrown vegetation.

FORM: Terrace  
 FUNCTION: Agricultural  
 AGE: Pre-Contact/Historic  
 DIMENSIONS: Length: 9.5 m long  
 Interior Height: <10 cm high



Exterior height: 1.0 m  
Flat pad: 9.5 x 10.0 m  
Wall Thickness: 0.5–0.75 m

CONDITION: Fair  
SURFACE ARTIFACTS: None  
EXCAVATION: None

**DESCRIPTION:** Feature 4 was a terrace constructed of loosely stacked and piled sub-angular basalt cobbles and boulders ranging in size from 10 x 8 x 11 cm to 60 x 70 x 50 cm. No distinct coursing remained. Based on the construction and form of other known agricultural structures, Feature 4 was interpreted as agricultural. It was in fair condition, having been altered by animal activity, erosion, and gravity.

FORM: Terrace  
FUNCTION: Agricultural  
AGE: Pre-Contact/Historic  
DIMENSIONS: Exterior: 36.5 m long  
Interior: 0–0.15 m high  
Flat pad: 2.0–5.0 m wide  
Wall Thickness: 1.0 m  
Height: 0.70–1.20 m (exterior)

CONDITION: Fair  
SURFACE ARTIFACTS: None  
EXCAVATION: None

**DESCRIPTION:** Feature 5, a terrace, was constructed of loosely stacked sub-angular basalt cobbles and boulders (8 x 7 x 11 cm to 49 x 73 x 65 cm) at the face of a flat terrace. Based on the construction and form of other known agricultural structures, Feature 5 was interpreted as agricultural. Although the age of the feature was unclear, it was suspected that pre-Contact features throughout the project area were modified and used historically. The feature was in fair condition, having been altered by animal activity, erosion, and gravity. Feature 5 was oriented at 10° immediately down slope (west) of Feature 7.

FORM: L-shaped Alignment  
FUNCTION: Habitation  
AGE: Pre-Contact/Historic  
DIMENSIONS: Exterior: 9.0 x 4.0 m  
Wall Thickness: 0.6–1.8 m  
Height: 0.20–0.85 m (exterior); 0.10–0.50 m (interior)

CONDITION: Fair  
SURFACE ARTIFACTS: None

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EXCAVATION: None

**DESCRIPTION:** Feature 6 was an L-shaped alignment situated between Features 2 and 5. The structure was constructed of soil and stacked angular and sub-angular basalt and vesicular basalt boulders, cobbles, and pebbles that ranged in size from 8 x 3 x 6 cm to 1 m x 43 cm x 68 cm. Exterior rocks averaged 40 x 50 x 60 cm; interior rocks averaged 20 x 20 x 10 cm. No distinct tiers were observed because of the irregular size and shape of the construction material. The condition of the site was deemed fair; however, since the original form was unclear, its present condition is unknown. Alteration has occurred, largely due to animal activity, erosion, and gravity. Tumbling and cattle trails were visible.

FORM: Linear Mound Alignment  
FUNCTION: Undetermined  
AGE: Pre-Contact/Historic  
DIMENSIONS: Exterior: 7.0 x 2.0 m  
Height: 0.75 m (exterior); 0.1–0.5 m (interior)

CONDITION: Fair-Poor  
SURFACE ARTIFACTS: None  
EXCAVATION: None

**DESCRIPTION:** Feature 7 was comprised of three irregular rock mounds separated by cow trails. It was constructed of piled sub-angular basalt cobbles and boulders (20 x 17 x 15 cm to 57 x 33 x 48 cm) on and around an exposed outcrop. Individually, the mounds were irregular; together, they were roughly linear. On their own, these features resembled clearing mounds or rock piles, but when viewed as part of the entire site, it appeared that they could possibly have formed an enclosure (now degraded) made up of Feature 1 and Feature 6. Feature 7 remained in fair-poor condition, having been altered by animal trampling.

#### Site TS-327

FORM: Cistern  
FUNCTION: Water Storage  
AGE: Historic  
DIMENSIONS: Diameter: 3.5 m (exterior); 2.5 m (interior)  
Height: 0.20 m  
Wall thickness: 0.45 m

CONDITION: Poor  
SURFACE ARTIFACTS: None  
EXCAVATION: None

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A total of five test units were excavated: Test Units 1 and 4 were excavated in Feature 1A and TU-2 and TU-5 were excavated in Feature 1B. A range of cultural materials was revealed during excavation: charcoal, faunal remains, metal and glass fragments, a brick, and a wooden and a shell button. One subsurface feature was revealed; it contained charcoal, metal and glass shards, a button, and carbonized corn kernels. One Stratigraphic Trench (ST-1) was excavated near the Feature 2A cistern and revealed a firebrick, glass and porcelain shards, and a porcelain button. Test Unit 3 was located near the terrace wall at Feature 3; ceramic fragments were recovered (Figure 67).

**FORM:** Double Enclosure

**FUNCTION:** Habitation

**AGE:** Historic

**DIMENSIONS:** Overall: 9.25 x 6.1 m; 0.25–0.67 m high

Feature 1A Interior: 3.3 x 4.0 m; 1.34 m high

Feature 1B Interior: 1.8 x 3.4 m

Wall Thickness: 1.0 m

**CONDITION:** Fair

**SURFACE ARTIFACTS:** None

**EXCAVATION:** TU-1 and TU-4 in Feature 1A, SSF 1 revealed in TU-4; TU-2 and TU-5 in Feature 1B

**DESCRIPTION:** Feature 1 consisted of a double enclosure located on a moderately steep north-facing hillside slope overlooking a ravine (100 m) and the coastline. The feature was constructed in the traditional way – with stacked basalt sub-angular boulders (average size: 1.0 x 0.5 x 0.5 m) and some cobbles. The back wall (in the hillside) was about five courses high; the remaining walls were two to three courses high. Stacked walls divided the feature into “rooms” and a cut was made into the hillside to create a level, interior floor, suggesting the structure functioned as a habitation. The northern end of the feature was supported by a terrace wall, which was mostly tumbled. It was in fair condition, having been altered by natural forces and animal activity.

In addition to the double enclosure (Feature 1A and 1B), Feature 1 consisted of four subfeatures. Feature 1C was a low, rough terrace that was attached to the southeastern corner of Feature 1. It measured 2.2 x 1.0 m x 0.45 m high. Feature 1D was a rough, discontinuous boulder alignment that was attached to the northeastern corner of Feature 1. It measured 4.7 x 0.35 m x 0.3 m high. Feature 1E was a small terrace approximately 4.0 m south of the southwestern corner of Feature 1A. The terrace measured 5.5 x 0.6–0.8 m and was 0.55–0.90 m high. Feature 1F was a small terrace approximately 1.5 m from the southern end of Feature 1E. It measured 4.0 x 0.35–0.9 m and was 0.22–0.65 m high.



**EXCAVATION:** Four test units were excavated at Feature 1: TU-1 and TU-4 were excavated in Feature 1A; TU-2 and TU-5 were excavated in Feature 1B. Test Unit 1, a 0.5 x 0.5 m unit, was placed in a flat area against the western wall of Feature 1A, an interior wall separating Features 1A and 1B, in order to better understand the elements of construction, age, and function of the structure and to possibly encounter cultural deposits. Topsoil and Layer I of the unit was indistinct. Layer I (7-46 cmbd) consisted of very dark brown (7.5YR 2.5/2) very fine silt loam and contained many roots and a few sub-angular pebbles. Several cultural items were collected: metal, animal bone, glass, charcoal, leather, and an unidentified item. The boulder that formed part of the western wall of Feature 1A extended to 33 cmbd. There were a few (at least 3) smaller stones beneath this large boulder. It remained unclear whether these boulders were part of the larger architecture. Charcoal flecks were noted around 30 cmbd and several pieces were collected from the southeastern corner at 38 cmbd. No staining was noted during the excavation.

Layer II (42-51 cmbd) contained a dark brown (10YR 3/3), fine, compact silt loam with few small roots and a few sub-angular pebbles. A wooden button and animal bone were collected from the upper portions of the layer, on the boundary between Layers I and II. Saprolitic rock cropped up throughout the layer and excavated shortly ceased. The feature and undulating surface boundary between layers suggests that Layer II may not represent the floor surface (Figure 68).

Test Unit 4 was also excavated at Feature 1A. The 1.0 x 0.5 m unit was placed against the eastern, interior wall of the feature in order to compare depths between the eastern (TU-4) and western (TU-1) walls, to assess the construction history of the feature, and identify the floor surface. Layer I (5-45 cmbd) consisted of very dark brown (7.5YR 2.5/2) very fine silt loam with many rootlets, few roots, and very few pebbles. One subsurface feature (SSF 1), a charcoal stain, was revealed between 20 and 31 cmbd, between Layers I and II. Cultural debris was collected: charcoal, faunal remains, glass, metal fragments, carbonized corn kernels, and a button or washer. Layer II (38-51 cmbd) was a culturally sterile layer that contained dark brown (10YR 3/3) hard, semi-compact silt loam with few roots and a few small sub-angular rocks (Figure 69).

Test Unit 2, a 0.5 x 0.5 m unit, was excavated in the interior, northeastern corner of Feature 1B, at the down slope corner of the feature with the north and east sides abutting the architecture (Figure 70). The purpose of the test unit was to determine the function and age of the feature, and to examine subsurface architecture. Half of a brick was removed from the surface of the southeast corner. Layer I (10-30 cmbd) consisted of very dark brown (7.5YR 2.5/2) semi-compact silt loam with many roots and few rocks (3%). A piece of wire, glass, and pieces of porcelain were also recovered. Some charcoal flecks were observed, but not collected.

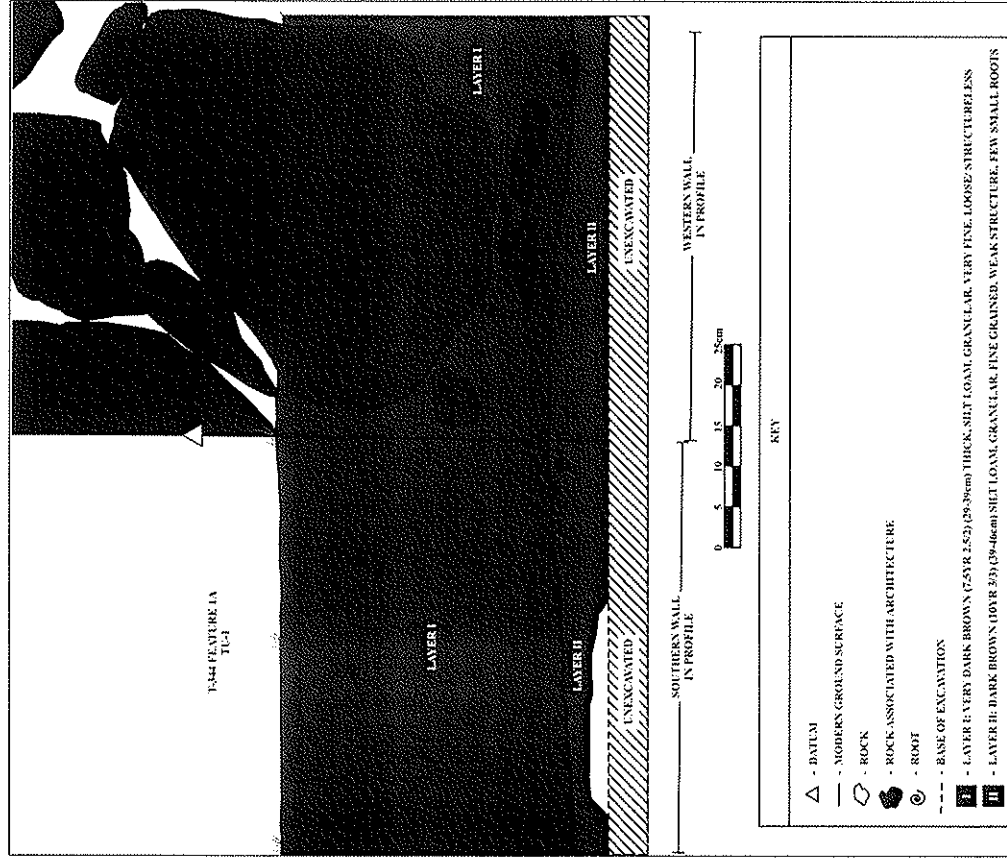


Figure 68: Site TS-344, Feature 1A, Test Unit 1. South and West Wall Profiles.

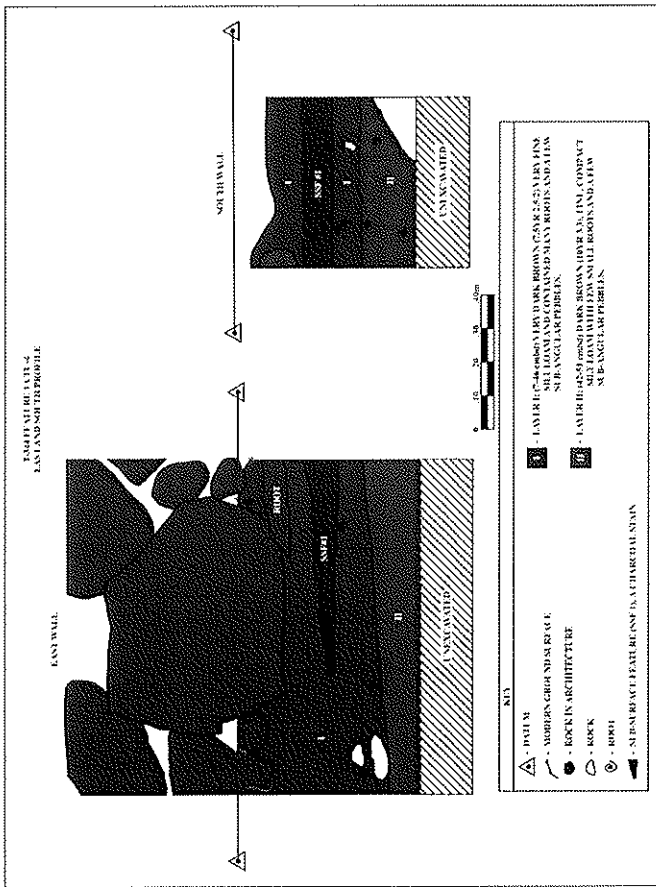


Figure 69: Site TS-344, Feature 1A, Test Unit 4. East and South Wall Profiles.

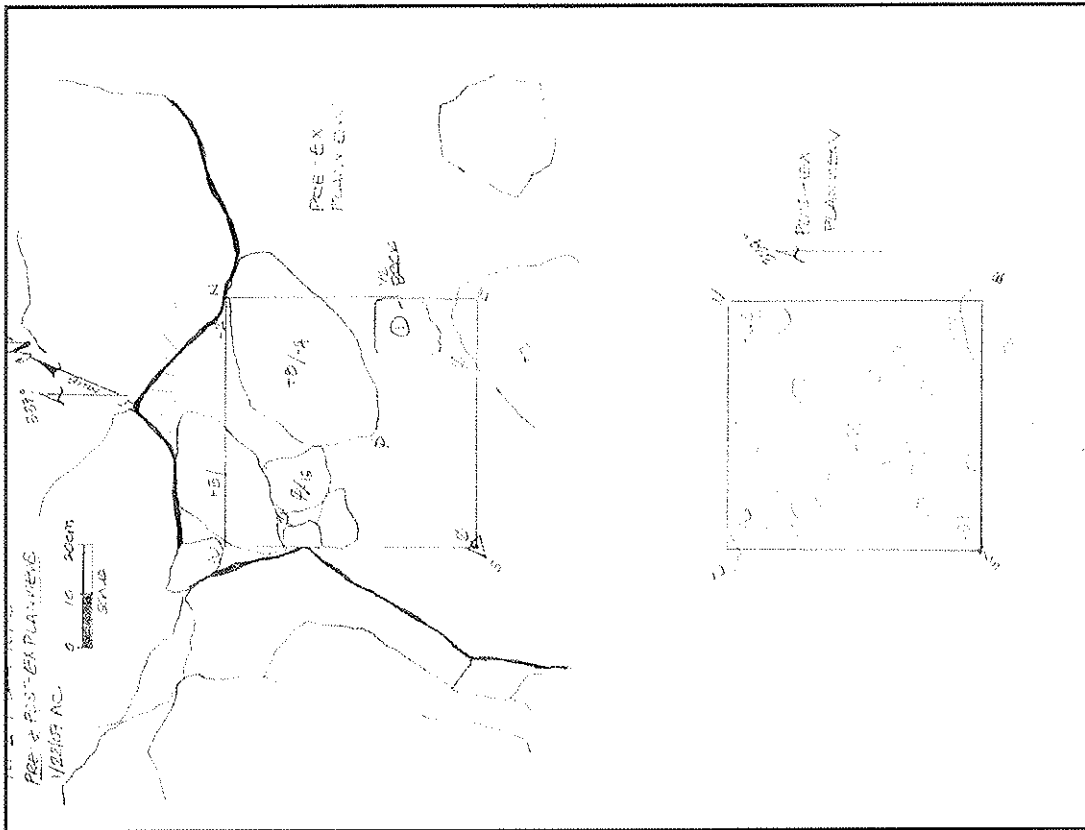
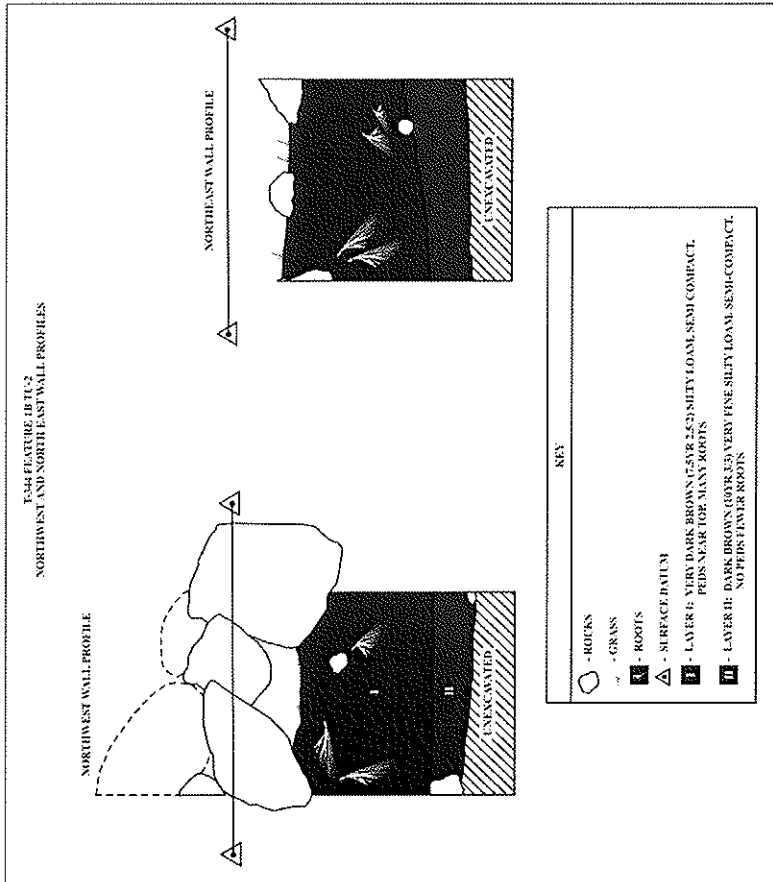


Figure 70: Site TS-344, Feature 1B, Test Unit 2. Pre- and Post-Excavation Plan Views.



Layer II (43-60 cmbd) consisted of dark brown (10YR 3/3) semi-compact silt loam with few roots and many rocks (<10% in the top half, 50-60% in the bottom half). The layer was sterile. At 50 cmbd, bluish-gray, soft rocks were encountered; excavation halted shortly thereafter (Figure 71).

Test Unit 5, a 0.5 x 0.5 m unit, was excavated in the center of Feature 1B, one of the two conjoined enclosures, in order to determine feature function and age. Stratigraphy resembled that of TU-2. Layer I contained very dark brown (7.5YR 2.5/2) semi-compact silt loam with many roots and some rocks (10%). A small amount of old pieces of metal, glass, and a shell button were collected. Charcoal flecking in the southeastern half of the unit was encountered; it turned into a charcoal lens 3-4 cm thick. The lens was noted in the rest of the unit; however, it was only 1 cm thick. Large pieces of charcoal and carbonized corn kernels were recovered. Excavation terminated in Layer II, a dark brown (10YR 3/3) semi-compact silt loam with few roots and many rocks (<10% in the top-half, 50-60% in the bottom-half) (Figure 72).

FORM: Cistern and Trash Dump (Privy?)  
 FUNCTION: Water Storage  
 AGE: Historic  
 DIMENSIONS: Diameter: 4.0 m  
 Trash Area: 8.0 x 8.0 m  
 CONDITION: Poor  
 SURFACE ARTIFACTS: Glass and Ceramic Fragments, Metal, Concrete  
 EXCAVATION: ST-1 in the Cistern

DESCRIPTION: Feature 2 consisted of two subfeatures -- a cistern (Feature 2A) and a trash dump or possible privy (Feature 2B) located in top of a hill (5° slope from southeast to northwest) overlooking Feature 1 to the northeast and the rest of the project area to the west. The cistern was a circular structure with a depressed center, constructed of angular to sub-angular basalt cobbles that were arranged in a circle and cemented along its interior side. The trash area was a loose pile of rocks (possibly bulldozed) with glass and metal pieces in small depressions (40-50 cm). The feature was in poor condition as only small remnants of the cistern wall remained; it had been altered by animal activity and natural forces, such as erosion, gravity, and vegetative overgrowth, and possibly by mechanical means, like bulldozing.

EXCAVATION: One Stratigraphic Trench (ST-1) was excavated adjacent to the eastern wall of the Feature 2A cistern. Excavation revealed Layer I, a dark brown (7.5 YR 3/4) loose silt with 90 percent cobbles and boulders throughout, and very few historic artifacts: a firebrick, glass and porcelain shards, and a porcelain button. Rusty wire was observed, but not collected. Excavation

terminated near 161 cmbs due to an abundance of rocks and a lack of significant cultural materials (Figure 73).

FORM: Terrace  
 FUNCTION: Habitation  
 AGE: Pre-Contact/Historic  
 DIMENSIONS: Exterior: 7.8 x 4.3 m  
 Height: 0.75 m (down slope wall exterior)  
 0.35 m (upslope wall exterior)  
 Wall Thickness: 1.0 m  
 CONDITION: Fair  
 SURFACE ARTIFACTS: None  
 EXCAVATION: TU-3

DESCRIPTION: Feature 3, a small rectangular terrace pad, was constructed of loosely aligned sub-angular, basalt boulders (51 x 30 x 38 cm) and cobbles (16 x 1 x 10 cm). The feature was located along the down slope edge of a raised earthen platform. The terrace wall was roughly built with boulders, approximately one course high. Stacking may once have been present as suggested by tumble immediately down slope from the terrace. The northwest wall was the tallest and most clearly defined as it shored up the most earth deposited to form a flat pad. The northeast, northwest, and southwest walls were on the same plane; the southeast wall appeared to shore up the cut made when forming the flat pad. The northwest side was raised; the southeast side was slightly cut. The feature, a structure consistent with habitation platforms, was in fair condition, altered by natural forces, such as gravity, erosion, and vegetative overgrowth.

EXCAVATION: One 0.5 x 0.5 m test unit (TU-3) was excavated against the terrace wall at Feature 3, at the northern end of the feature. Layer 1 (0-15 cm) was a light grayish brown (10YR 3/4) very fine silt loam with many fine rocks and few rocks. A large boulder in the southwestern corner of the unit was part of the terrace wall. Ceramic fragments were recovered at the northwestern corner of the unit. Layer I/Level 2 (10-20 cmbs) was a slightly more reddish color. Layer II (14-31 cmbs) was similar to Layer I, but with more clay, and was located below the two architectural stones in the western-half of the unit. The soil was a dark yellowish brown (10YR 3/6) very fine clayey silt loam with fine roots and few rocks. Layer III consisted of a dark brown (7.5YR 3/2) very fine silt clay with few roots and pebbles (Figure 74).

Figure 73: Site TS-344, Feature 2, Stratigraphic Trench 1, West Wall Profile.

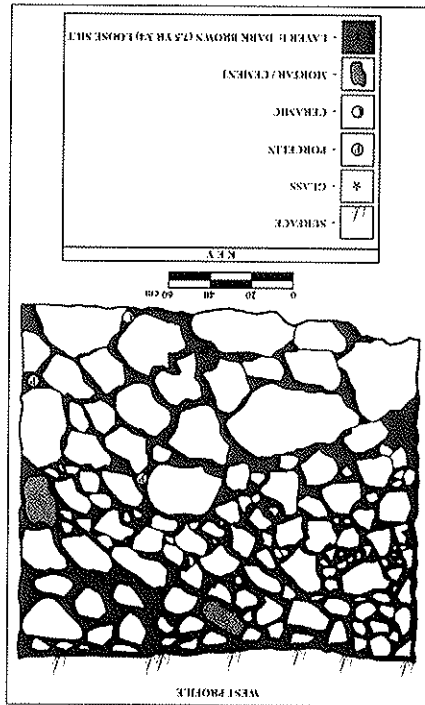
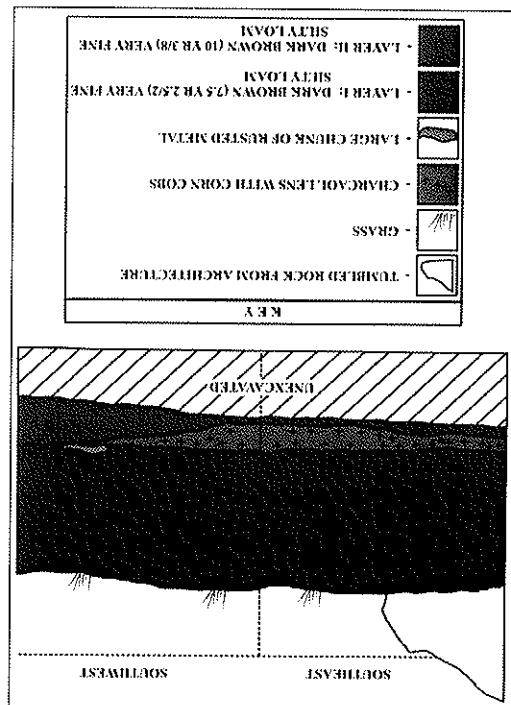


Figure 72: Site TS-344, Feature 1B, Test Unit 5, Southeast and Southwest Wall Profiles.



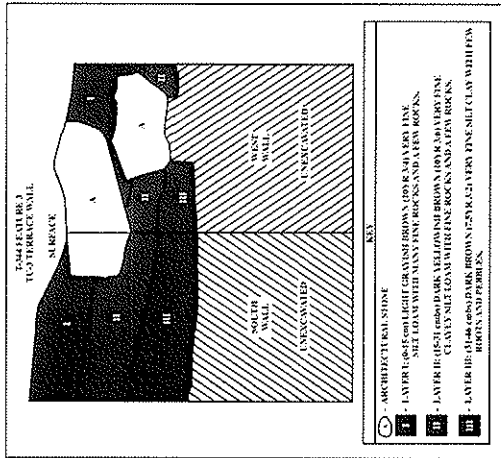


Figure 74: Site TS-344, Feature 3, Test Unit 3. South and West Wall Profiles.

**Site TS-355**

**FORM:** Enclosure

**FUNCTION:** Habitation

**AGE:** Undetermined

**DIMENSIONS:** Exterior: 5.0 x 3.5 m

Height: 0.29–0.31 m (exterior); 0.07–0.62 m (interior)

Wall Thickness: 0.8–1.1 m

**CONDITION:** Fair

**SURFACE ARTIFACTS:** None

**EXCAVATION:** None

**DESCRIPTION:** The enclosure was located mid-slope on a small knoll within an open, undulating pasture. The feature was constructed of medium- and large-sized cobbles and small-sized boulders stacked four to seven courses high. The rectangular-shaped enclosure was tumbled and collapsed. The feature had a level-soil interior, partially covered by tumble, and a small basalt core was located. Data Recovery is recommended to assess the function and age of the enclosure (Figure 75).

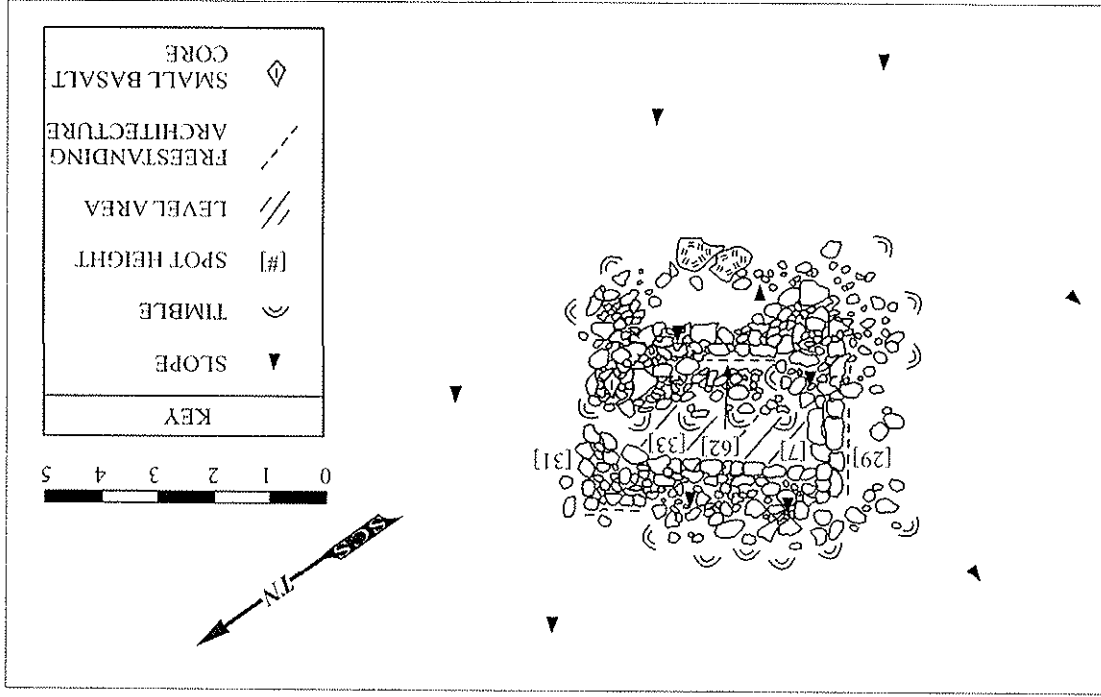


Figure 75: Site TS-355, Feature 1, Plan View.



#### Site TS-359

FORM: Lithic Scatter  
FUNCTION: Work Shop (?)  
AGE: Pre-Contact  
DIMENSIONS: 15.0 x 15.0 m  
CONDITION: Fair  
SURFACE ARTIFACTS: Broken Adze Pieces  
EXCAVATION: None

DESCRIPTION: Lithic scatter (Feature 1) was located on top of a deflated ridge-top that had a small amount of an exposed bedrock outcrop. A dirt road was just (*mauka*) and cut through the gully to the north side. Several broken adze pieces and flakes were collected.

#### Site TS-362

FORM: Enclosure  
FUNCTION: Habitation/Agricultural  
AGE: Undetermined  
DIMENSIONS: Exterior: 4.5 x 3.5 m; 0.64–0.93 m high  
Interior: 2.5 x 2.0 m; 0.71–1.12 m high  
Wall Thickness: 0.7–0.85 m  
CONDITION: Fair  
SURFACE ARTIFACTS: None  
EXCAVATION: None

DESCRIPTION: The rectangular-shaped enclosure, which was located on a low knoll in an open field, was constructed of medium- to large-sized basalt cobbles and small boulders; an opening within the northwest corner was visible. Architectural stacking was present throughout the feature and varied from four to nine courses high. A golf ball-sized Styrofoam chunk was present within the feature's interior. Excavation is recommended to determine feature function and age (Figure 76).

#### Site TS-363

FORM: Enclosure  
FUNCTION: Habitation?  
AGE: Pre-Contact/Historic  
DIMENSIONS: Exterior: 4.5 x 3.0 m; 0.2–1.15 m high  
Interior: 4.0 x 2.3 m; 1.15 m high  
Wall Thickness: 0.75–1.0 m  
CONDITION: Fair-Poor  
SURFACE ARTIFACTS: None  
EXCAVATION: TU-1 and TU-2

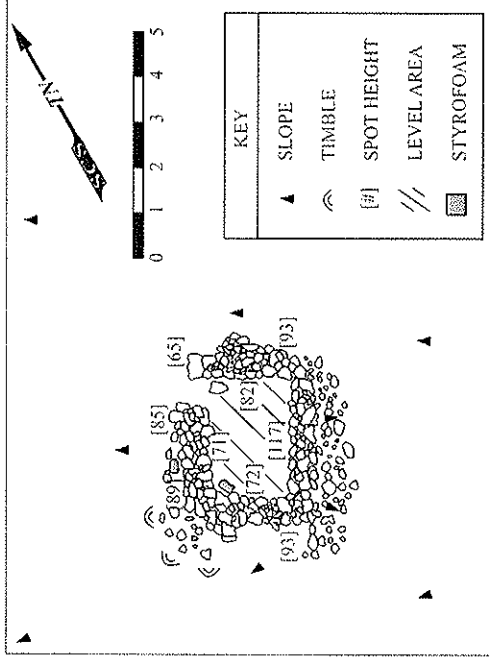


Figure 76. Site TS-362, Feature 1. Plan View.

DESCRIPTION: One feature, an enclosure, was identified in Site TS-363; it was located in the side of a low hill facing down slope (southwest). The overall terrain was mostly level with small swales, small hills, and many visible terraces. The enclosure was constructed of stacked and faced basalt cobbles and boulders (5–50 cm). A large portion of the down slope walls (the south and west walls) were tumbled and existed only as an unstructured rock and soil berm. The north sides, including the northeast and northwest interior corners, as well as a very small portion of the east side near the center, were still nicely faced. Stacking remained in these areas between five and seven courses high. The interior was level and soil-filled. The north wall exterior hooked outward to form a small shelter-like space with a small, slight depression in it. There was also a possible ramp starting at the northeast corner and leading to the center of the east wall; however, this area was very tumbled. The enclosure was composed of pre-Contact elements and may have modified and re-used historically. It is in fair-poor condition, having been altered by animal activity and natural forces (Figures 77 and 78).

EXCAVATION: One 0.5 x 0.5 m test unit (TU-1) was excavated in the southwestern interior corner of Feature 1 in order to investigate the internal architecture of the feature as well as to determine feature function and age. Layer 1 (4–10 cmbs) was a dark brown (7.5YR 3/3) mildly compact silt loam

Figure 78: Site TS-363, Feature 1, Plan View.

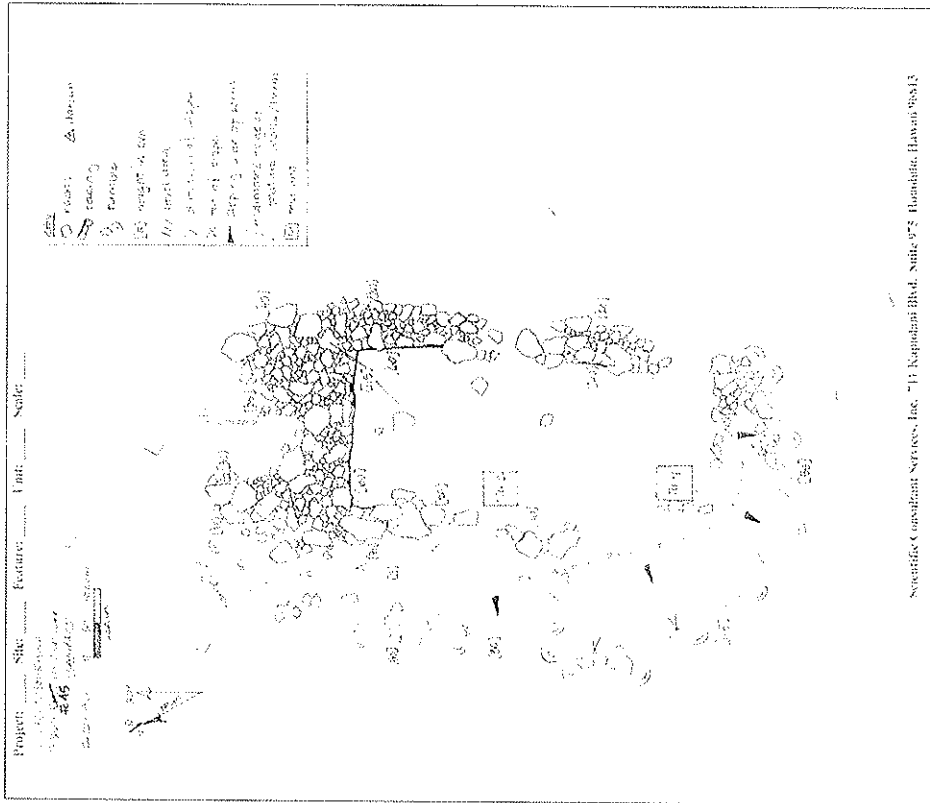
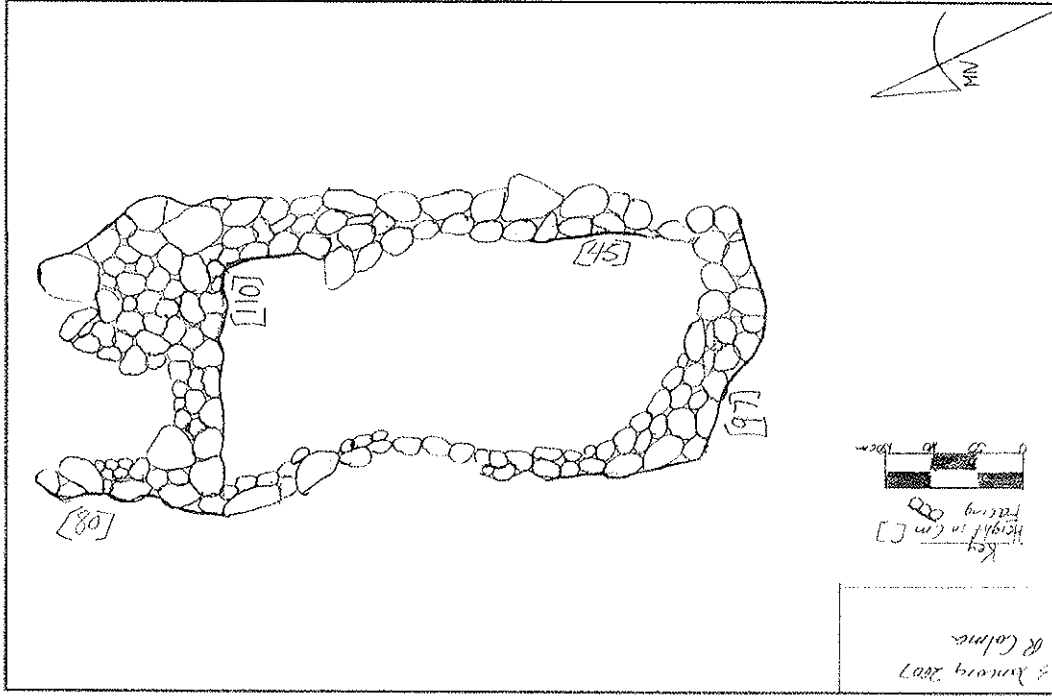


Figure 77: Site TS-363, Feature 1, Plan View.

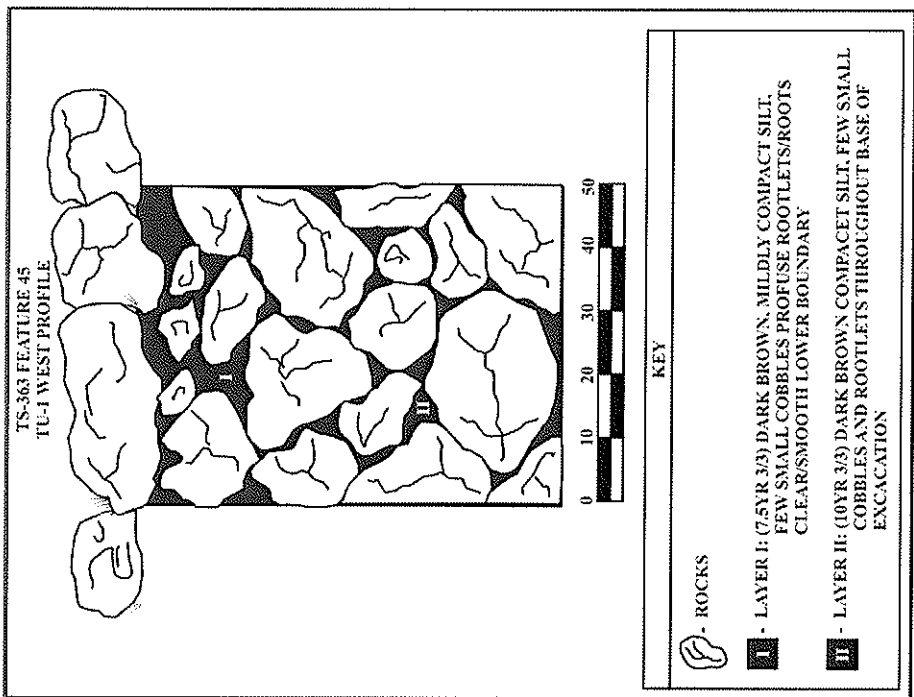


Figure 79: Site TS-363, Feature 1, Test Unit 1, West Wall Profile.

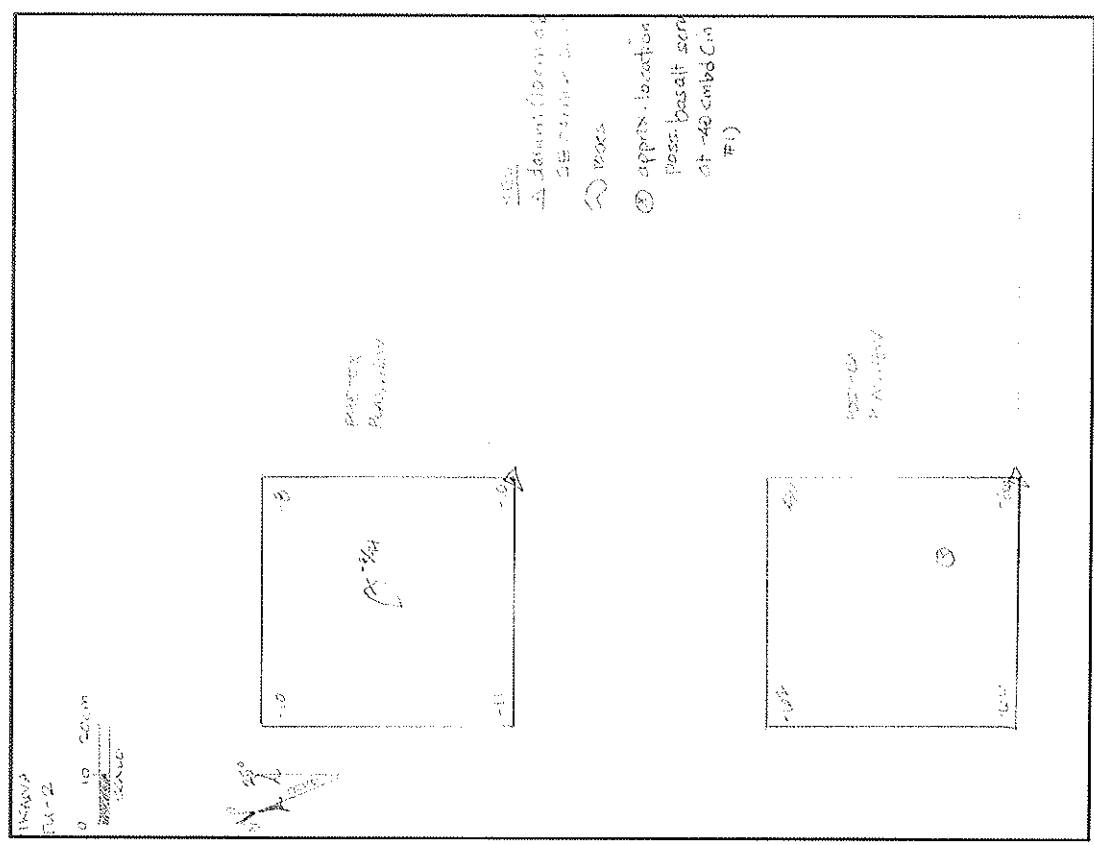


Figure 80: Site TS-363, Feature 1, Test Unit 1, Plan View.

with few small cobbles and an abundance of roots and rootlets throughout. No cultural remains were found in this layer.

Layer II (14-67 cmbd) was a very dark brown (10YR 3/3) compact silt with few small cobbles and few rootlets. A small soft spot was located within the southwest corner of the feature, near 42 cmbd. This area was interpreted as being related to the architectural/building episode of Feature 1. Architecture associated with the west wall of Feature 1 continued through Layer II. Excavation terminated near 66 cmbd due to a lack of cultural materials (Figure 79).

A second 0.5 x 0.5 m test unit (TU-2) was excavated in the center of the enclosure in order to aid in the determination of the function and age of the feature (Figure 80). Layer I (8-26 cmbd) contained a semi-compact dark yellow brown (10YR 3/4) silt loam with many fine-sized roots and many rocks. Many of the rocks removed were considered tumble. Layer II (22-46 cmbd) was composed of a very fine, very dark brown (10YR 2/2) silt loam with few fine-sized roots and medium-sized cobbles (10%). Charcoal flecking was present throughout the layer; it was considered root-burn. In the northeastern section of the layer, one piece of basalt, possibly a scraper, was recovered. In addition, a rusty nail was also recovered. Layer III (46-66 cmbd) was a dark brown (7.5YR 3/4) semi-compact silt loam with few fine roots and ten percent rocks. Excavation terminated in sterile conditions (Figure 81).

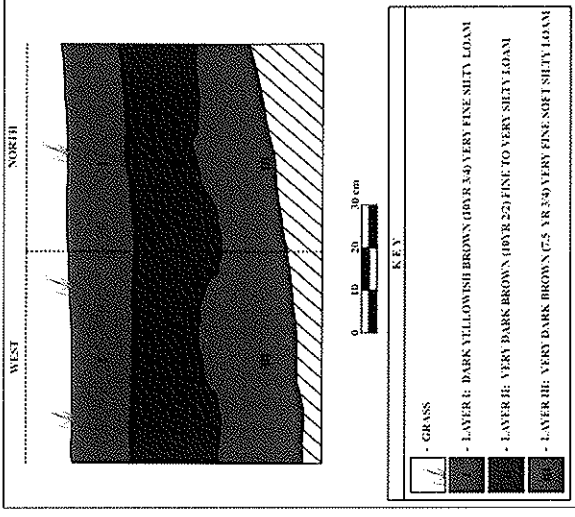


Figure 81: Site TS-363, Feature 1, Test Unit 2. West and North Wall Profiles.

#### Site TS-367

Site TS-367 contained two features, Feature 1, a terrace, possibly related to agricultural, and Feature 2, a cistern, related to historic habitation.

FORM: Terrace  
 FUNCTION: Agricultural  
 AGE: Historic?  
 DIMENSIONS: Side A: 0.9 x 0.2 m; 0.15 m high; 0.2 m thick  
 Side B: 3.6 x 1.15 m; 0.45-0.96 m high; 0.15 m thick  
 Side C: 4.5 x 4.0 m; 1.33-1.04 m high; 0.9 m thick  
 Side D: 1.2 x 4.0 m; 0.35 m thick  
 CONDITION: Fair  
 SURFACE ARTIFACTS: None  
 EXCAVATION: None

DESCRIPTION: Located on a swale just south of the gulch, the terrace at TS-367 was formed by cutting earth and facing the cut with stacked cobbles in three to five tiers. The sub-angular and sub-rounded basalt cobbles ranged in size, from 2.5 x 3.0 x 2.5 cm to 4.0 x 6.0 x 6.0 cm. The center in each of

the two sections of the terrace were blown out, thus it was recorded in segments. The terminal ends of the terrace (northeast and southwest) have little perpendicular alignment stacking. The feature resembled other historic agricultural terraces; its proximity to the cistern suggests that a habitation site was probably nearby. It exhibited considerable modification and remained in fair condition, having been altered by animal activity and natural forces like gravity and erosion.

**FORM:** Cistern  
**FUNCTION:** Habitation/Water Storage  
**AGE:** Historic  
**DIMENSIONS:** Diameter: 2.6 m (exterior); 1.7 m (interior)  
**CONDITION:** Poor  
**SURFACE ARTIFACTS:** Historic Glass  
**EXCAVATION:** None

**DESCRIPTION:** A cistern was located on a 15° southeast-northwest. Medium- to large-sized basalt cobble (30–40 cm long axis) had been cemented together to form the edge of the cistern, a “collar” of basalt cobble and cement facing on the outside and probably on the top and inner portions of the feature; however, it is now deteriorated. Only a remnant of the northern edge of the cistern and a possible depression in the center of the cistern was visible. It was in poor condition, having been altered by animal activity and natural forces.

#### Site TS-372

Site TS-372, which measured 10.0 x 20.0 m, was located on the sloping side of a low hill (10°) in the northeastern corner of the southern-half of the project area, next to Keāhūaiwi Gulch. The site consisted of two features: two short, possibly habitation related, terraces (Feature 1) and an additional terrace (Feature 2) approximately 18.0 m away. All terraces ran parallel to the slope contour; the shape and size are consistent with habitation terraces. One piece of ceramic was found at Feature 2. One test unit (TU-1) was excavated at Feature 1; historic glass, metal, and porcelain fragments were recovered (Figure 82).

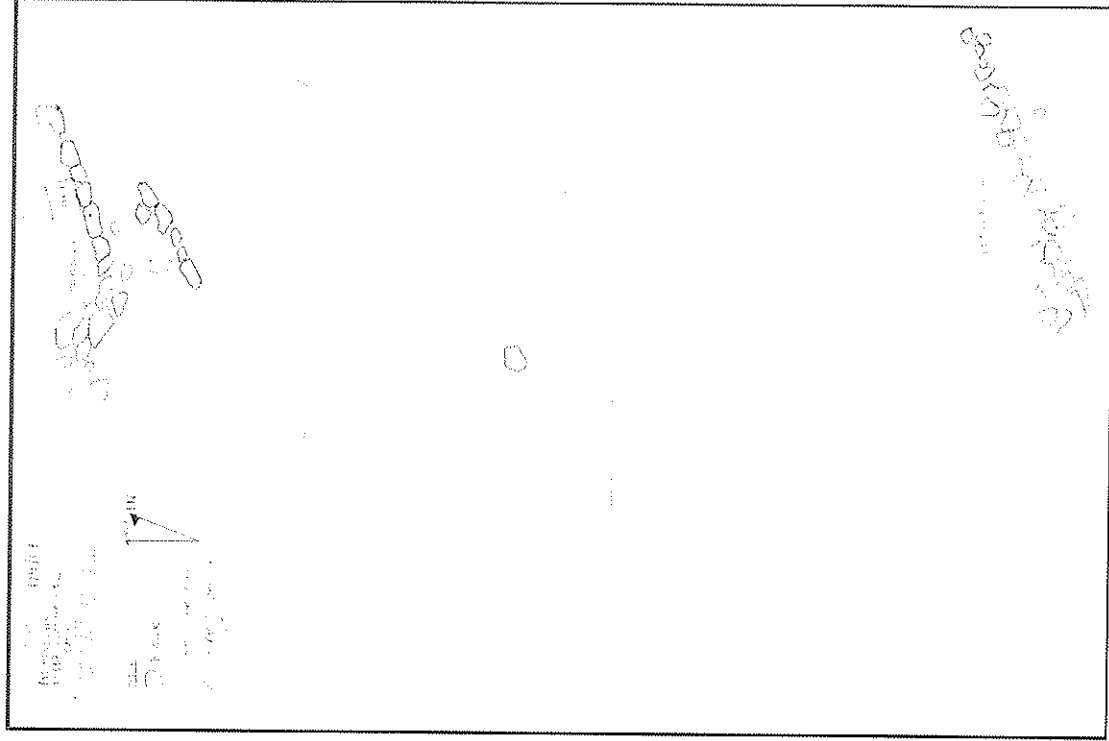


Figure 82: Site TS-372, Features 1 and 2. Plan View.

FORM: Terrace  
 FUNCTION: Habitation  
 AGE: Historic  
 DIMENSIONS: Exterior: 2.4 x 3.7 m; 0.35 m high  
 CONDITION: Fair  
 SURFACE ARTIFACTS: None  
 EXCAVATION: TU-1

DESCRIPTION: The feature included two terraces that ran parallel to each other. The first terrace was an L-shaped or platform-shaped terrace; the second terrace sat about 0.75 m west, paralleling the western end of the first. The second terrace also was a linear shape. The construction method, which resembled other habitation-related structures, consisted of a variety of different sized sub-angular and angular basalt cobbles (7–40 cm). The feature was in fair condition, having been altered by animal activity and erosion.

EXCAVATION: One 0.5 x 0.5 m test unit was excavated on the terrace pad in the center of the Feature 1 terrace, abutting the retaining wall. A location was chosen near the down slope end of the terrace pad, where eroding materials were likely to collect, also in hope of exploring terrace architecture. Excavation ensued with the hopes of determining the function and age of the feature. The area was generally level. Layer I (4–20 cmbd) was a very fine, compact dark brown (10YR 3/5) silt loam with many fine- and medium-sized roots and rocks (<10%). Broken pieces of bottle glass, one piece of porcelain, and one piece of metal were recovered.

Layer II was a compact, very fine dark yellowish brown (10YR 3/6) silt loam with few roots and rocks. At about 20 cmbd, a fill episode, which consisted of a fine, compact dark brown (7.5YR 3/4) silt loam with no roots and very few rocks, was visible throughout the unit, behind the terrace architecture. Excavation terminated in sterile conditions (Figure 83).

FORM: Terrace  
 FUNCTION: Habitation  
 AGE: Historic  
 DIMENSIONS: Exterior: 5.0 x 1.0 m; 0.45–0.55 m high  
 Wall Thickness: 0.3–0.4 m  
 CONDITION: Fair  
 SURFACE ARTIFACTS: None  
 EXCAVATION: None

DESCRIPTION: Feature 2 is about 18.0 m northwest of Feature 1. The feature, which resembled other pre-Contact habitation and agricultural structures, consisted of a stacked basalt rock retaining

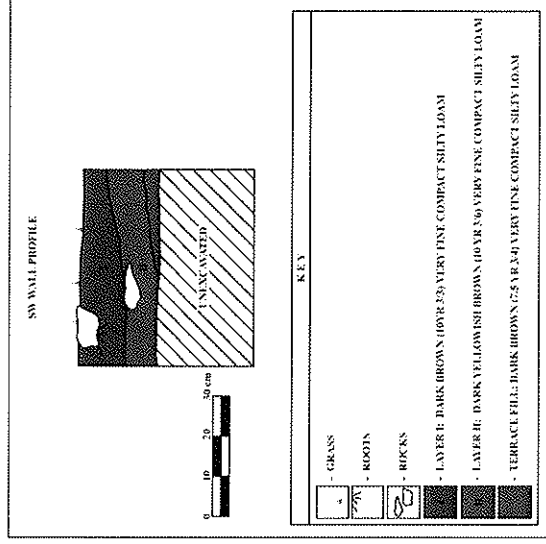


Figure 83: Site TS-374, Feature 2, Test Unit 1, Southwest Wall Profile.

wall with a filled-on terrace pad behind it. Feature 2 contained sub-angular basalt cobbles (12–40 cm) and stacking three to four courses high remained in all areas except for the ends of the feature.

Site TS-374 (State Site 50-50-11-1050)

One site containing petroglyphs was re-identified during the current survey. Site 50-50-11-1050, Keāhuaiwi Rock Art, was deemed “valuable” to local cultural and history and was placed on the list of Historic Places in 1974. The site, originally identified by Elspeth Sterling and Lloyd Soehren in 1962, consisted of three features: Feature 1299 was the rock shelter on the south side of the gully; Feature 1300 included seven pictograph clusters on the north side of the gully; and Feature 1301 included two petroglyph clusters, one on the south side next to the rock shelter, and one on the north side between pictograph clusters 6 and 7 (A-6 and A-7). The site exemplifies pre-Contact and historical Hawaiian petroglyphs and possible habitation (rock shelter). Site -1050 has been recommended for Preservation and Data Recovery.

FORM: Rock Shelter  
 FUNCTION: Habitation  
 AGE: Pre-Contact/Historic  
 CONDITION: Fair

SURFACE ARTIFACTS: None  
EXCAVATION: None

**DESCRIPTION:** Feature 1299, the rock shelter, was located on the south side of the gully. Seven clusters of previously unrecorded pictographs directly associated with the rock shelter entrance were recorded during the current survey (Panels 1 through 7 going from east to west). Additionally there was a previously unrecorded panel which contained one petroglyph to the far east of Panel 7; this was called Panel 8. Data recovery is recommended, emphasizing testing of the rock shelter interior.

**FORM:** Pictographs  
**FUNCTION:** Rock Art  
**AGE:** Pre-Contact/Historic  
**CONDITION:** Fair-Poor  
**SURFACE ARTIFACTS:** None  
**EXCAVATION:** None

**DESCRIPTION:** This feature included seven original clusters of pictographs (A-1 through A-7) all located on the north side of the gully. Seven new clusters were observed (N-1 through N-6), at least three of which are of recent/modern origin. Also a detailed Plan View map of the extent of the feature area was completed during this phase of Inventory Survey (Figure 84). Preservation and possibly additional data recovery as recommended, as some of the nicer clusters were too high to record safely and have not been previously recorded by Hommon *et al.*

**FORM:** Petroglyphs  
**FUNCTION:** Rock Art  
**AGE:** Pre-Contact/Historic  
**CONDITION:** Fair-Poor  
**SURFACE ARTIFACTS:** None  
**EXCAVATION:** None

**DESCRIPTION:** The Feature 1301 petroglyph cluster B-1 was also located on the south side of the gully, just to the east of Feature 1299, Panel 1. According to the State records, the feature included seven anthropomorphic figures; however, only three were visible at the time of the current survey, one of which included a large anthropomorph with triangular body, muscles, and *zile* (penis). Despite originally being recorded in good condition, Feature 1302 was in poor condition, having been altered by weathering (e.g., rain, sun, wind) and vegetative overgrowth (e.g., lichen).

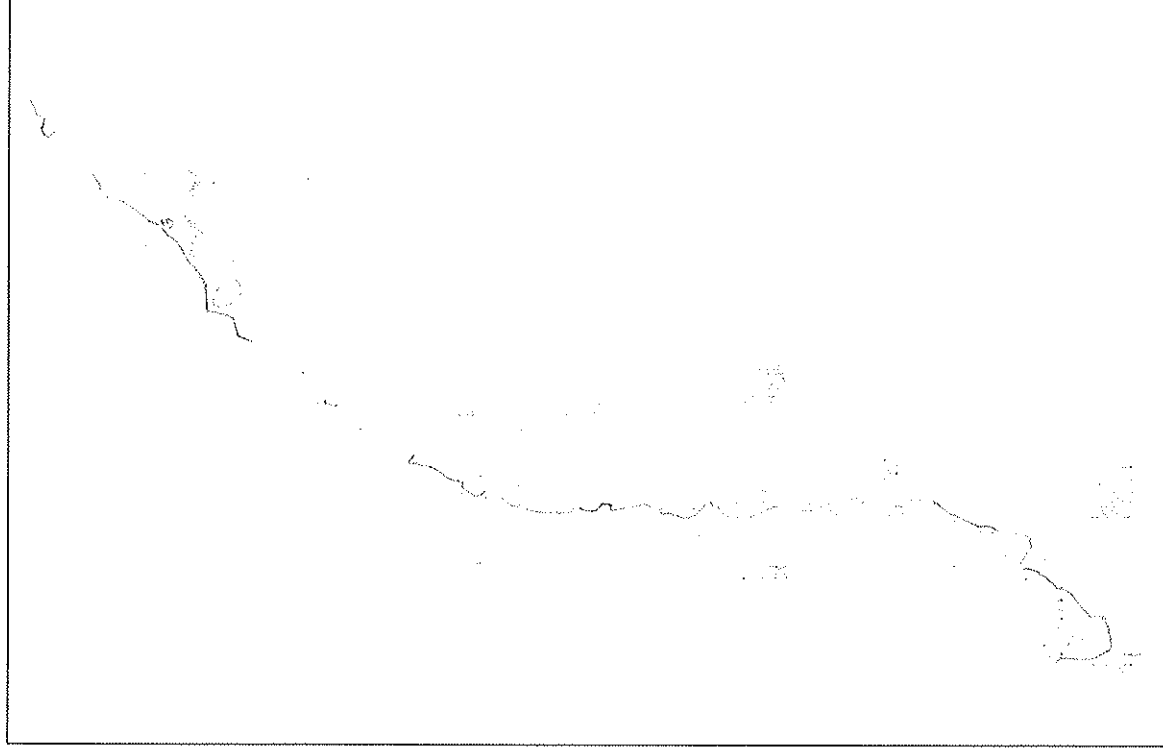


Figure 84: Site TS-374, Features 1 through 3, Plan View.

B-2, the petroglyph cluster between Feature 1300 clusters A-6 and A-7 was not relocated. It remains either in extremely poor deteriorated condition or was covered over with lichen, soil that had eroded into the gully, or by material from wasp/bee nests.

**Site TS-400**

FORM: Agricultural Field System  
FUNCTION: Agriculture  
AGE: Pre-Contact/Historic  
CONDITION: Good to Poor  
SURFACE ARTIFACTS: None  
EXCAVATION: None

**DESCRIPTION:** An underlying agricultural field system encompassed a majority of the project area; its vast array of features was grouped together under one site. Features associated with the site included terraces, enclosures, modified outcrops (often surrounded by other low walls), L-shaped structures, C-shaped structures, rock piles and mounds, and tumbled platforms. The age of many of the features were deemed undetermined due to deterioration via animal activity, mechanical activity (e.g., bulldozers), and natural weathering. However, based on the construction methods and styles of known forms and discussions with local informants, it was suggested that most of the agricultural field system was Historic in age. Based on excavations within the project area and radiocarbon analysis of recovered artifacts, it appeared that parts of the site were constructed pre-Contact. Use of the area may have originated in the pre-Contact times and continued through the Historic Period (Figures 85 and 86).

**DISCUSSION AND CONCLUSION**

A pedestrian survey of approximately 272 acres revealed the presence of 40 archaeological sites, State Site 50-50-XX-XXXX through 50-50-XX-XXXX. Of the 40 sites, 39 were newly recorded and one site, State Site 50-50-11-1050, which contained a rock shelter and numerous petroglyphs and pictographs, was re-identified. Of the 39 newly recorded sites, one site number was assigned to the vast array of agricultural features found across the project area (Site TS-400) (State Site 50-50-XX-XXXX) (Figure 87). Excluding all of the features included with the agricultural site (Site -XXXX), a total of 74 features were documented. Twenty features were determined to be pre-Contact, 22 were Historic, and 13 were undetermined. Eighteen features were interpreted as demonstrating characteristics from both the pre-Contact and Historic periods. Based on similar construction methods and materials of other known sites, all of the features identified during the Inventory Survey were interpreted as related to habitation, refuse sites/privies, agricultural functions, animal husbandry and ranching activities, and/or storage or water control. A variety of features were identified including terraces, enclosures, C-shaped structures, L-shaped structures, linear mounds, rock piles, ditches, and

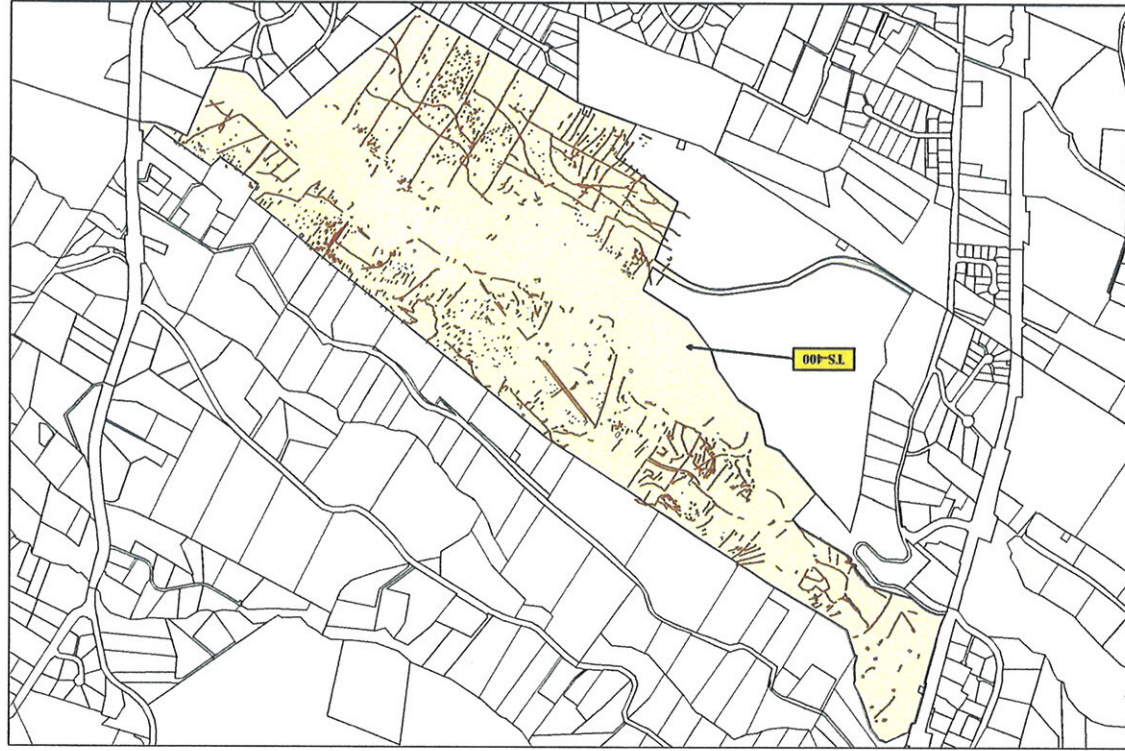


Figure 85: Site TS-400, Map of Overall Agricultural Site.



Figure 87: USGS map Showing Site Locations and Agricultural Features.

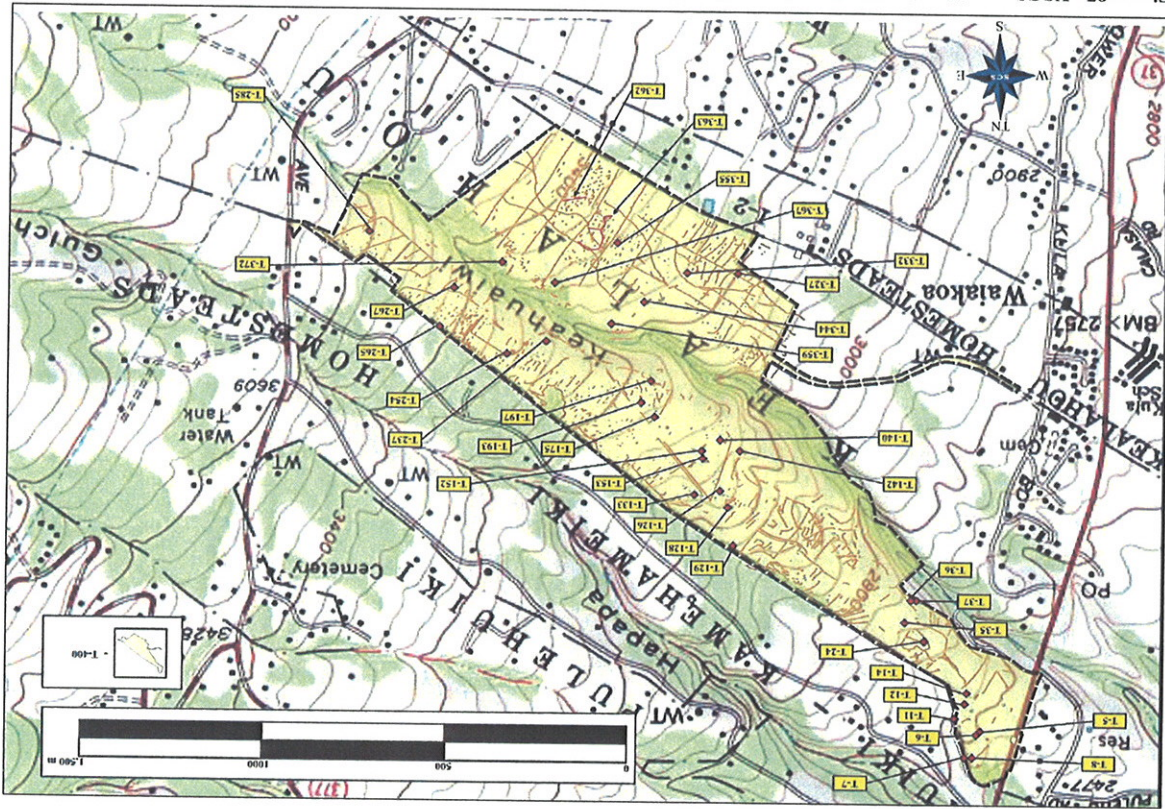


Figure 86: Site TS-400. Showing Agricultural Terracing Throughout Project Area.



cisterns and refuse sites (privies) possibly associated with historic house sites also located on the property. Table 1, summarized earlier, shows the sites and features identified during the Inventory Survey.

Thirty-three excavations were dug at 21 sites during the current Inventory Survey. Most of the trenches exhibited two or three stratigraphic layers. Of the 33 excavations, 13 (39.4%) trenches revealed 2 layers and 14 (42.4%) trenches contained 3 layers. A variety of cultural material was obtained: charcoal, basalt flakes (polished and unpolished), rusty metal (e.g., nail, wire for fencing, etc.), volcanic glass, bottle glass shards, marine shells, faunal remains, debitage, porcelain and ceramic fragments, buttons, and an old hanging scale. Eight subsurface features were identified at six sites; all were associated with habitation, agriculture, and water storage. Site T-7 contained an *imu* (SSF 1 in Feature 1, TU-1). Site TS-8 contained a possible hearth (SSF 1.1 in Feature 2, TU-1) and a layer of charcoal staining (SSF 1.2 in Feature 2, TU-1). Site -175 contained charcoal-stained soil about 14 cm thick, which was interpreted as a firepit (SSF 1.2 in Feature 2, TU-2). Site -193 contained subsurface architecture (SSF 2.1 in Feature 3, TU-2) and a soft spot in the architecture floor (SSF 2.2 in Feature 3, TU-2). A dark patch of sediment was deemed SSF 1 at Site -265, Feature 1, TU-1A. A charcoal stain was observed in Feature 1A, TU-4 at Site -344 (SSF 1). Cultural debris was collected: charcoal, faunal remains, glass, metal, and carbonized corn kernels. Appendix B summarizes the radiocarbon analysis.

Four radiocarbon dating samples were sent to Beta Analytic, Inc. for radiocarbon dating. A sample from near SSF 1.1, located in Layer II of TU-1 of Feature 2 at Site TS-8, returned a conventional date range of 290 ± 40 BP. When calibrated by OxCal v3.5 at 2 Sigma, the date ranges were A.D. 1480–1670 (94.4%), and A.D. 1780–1800 (1.0%), clearly within the pre-Contact period.

The sample taken from the dark lens with charcoal flecking observed in Layer II of TU-1 at Feature 1 in Site TS-128 returned a conventional date range of 240 ± 40 BP. When calibrated by OxCal v.3.5 at 2 Sigma, four date ranges were returned: A.D. 1520–1600 (14.4%); A.D. 1620–1690 (41.6%); A.D. 1730–1810 (32.5%) and A.D. 1920–1950 (6.9%). These date ranges place the feature and site with late pre-Contact to early historic periods.

A sample from Site TS-175, which was taken from Layer III in TU-1 at Feature 1, returned a conventional date range of 80 ± 40 BP. When calibrated by OxCal v.3.5 at 2 Sigma, two date ranges were returned: A.D. 1670–1740 (26.2 %) and A.D. 1800–1960 (69.2%). These dates place the feature and site within late pre-Contact to historic periods.

Lastly, the sample taken from SSF 2.1, within Layer II of TU-2 at Feature 3 in Site TS-193, returned a conventional date range of 520 ± 40 BP. When calibrated by OxCal v.3.5 at 2 Sigma, two

date ranges were returned: A.D. 1300–1360 (19.1%) and A.D. 1380–1450 (76.3%). The feature and site are placed well within to pre-Contact period.

As evidenced by the returned radiocarbon dates, and based on construction methods and other similar documented sites, many of the sites identified during the current survey were interpreted as being late pre-Contact to early historic in origin. The sites were interpreted as being related to habitation, agricultural practices, and water storage. Sites may have been constructed pre-historically and then modified and re-used historically, demonstrating continuous use through time. However, more information is needed to confirm this hypothesis.

#### SIGNIFICANCE ASSESSMENT AND RECOMMENDATIONS

A total of 40 sites were identified on the project area during the Inventory Survey (Table 3). These sites have been evaluated for significance according to the established criteria for the Hawai'i State Register of Historic Places §13-275-6. The five criteria are classified as follows:

Criterion A: Site is associated with events that have made a significant contribution to the broad patterns of our history;

Criterion B: Site is associated with the lives of persons significant to our past;

Criterion C: Site is an excellent site type; embodies distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual construction;

Criterion D: Site has yielded or has the potential to yield information important in prehistory or history; and

Criterion E: Site has cultural significance to an ethnic group; examples include religious structures, burials, major traditional trails, and traditional cultural places (State of Hawai'i criteria only).

A total of 39 of the sites identified during the Inventory Survey have been found to be significant for information content only (Criterion D). The petroglyph site (State Site 50-50-1-1050) is significant under Criterion D and E. However, Data Recovery is recommended for several sites, including Sites TS-8, -128, -141, -193, -254, -265, -355, -362, and -1050, in order to confirm the age, function, and cultural affiliation of the above said sites and features.



Table 3: List of Sites and Significance Assessment and Mitigation Recommendations.

SCS Temporary Site Number	State Site Number	Form	Function	Age	Significance	Mitigation
5		Enclosure	Habitat	Pre-Contact	D	NFW
6		Wall/Terrace	Animal Husbandry	Undetermined	D	NFW
7		C-Shaped Structure	Habitat	Undetermined	D	NFW
8		Terrace	Habitat/Agricultural/Undetermined	Pre-Contact	D	DR
11		Enclosure	Habitat	Pre-Contact	D	NFW
12		C-Shaped Structure	Habitat	Pre-Contact	D	NFW
14		C-Shaped Structure	Habitat	Pre-Contact?	D	NFW
24		Terrace	Agricultural	Undetermined	D	NFW
35		Enclosure	Habitat	Undetermined	D	NFW
36		Enclosure	Habitat/Animal Husbandry	Historic	D	NFW
37		Terrace	Refuse Area	Historic	D	NFW
126		Linear Mound/Garden Enclosure	Agricultural/Storage	Historic	D	NFW
128		Modified Outcrop/Enclosure	Habitat/Agricultural	Undetermined	D	NFW
129		Lithic Scatter	Habitat	Pre-Contact?	D	DR
133		Cistern (8 sub-features, including piles of rocks, mounds, and C-shaped structures)	Water Storage	Historic	D	NFW
140		Cistern	Agricultural/Animal Husbandry	Undetermined	D	NFW
141		Enclosure	Undetermined	Historic	D	NFW
142		Enclosure	Habitat	Pre-Contact	D	DR
152		Double Enclosure	Habitat	Pre-Contact?/Historic	D	NFW
153		Enclosure	Habitat/Animal Husbandry	Historic	D	NFW
175		Terrace/Enclosure	Habitat	Pre-Contact	D	NFW
193		Enclosure/Terrace	Habitat	Pre-Contact?	D	DR
197		Enclosure and Modified Outcrop	Habitat? Agricultural	Pre-Contact	D	NFW
237		Cistern	Agricultural/Habitat/Animal Husbandry	Undetermined	D	NFW

254		House Site/Foundation	Habitat	Historic	D	DR
265		Enclosure	Habitat	Pre-Contact	D	DR
267		Excavated Hole	Water Storage	Pre-Contact	D	DR
285		Terrace	Water Storage	Pre-Contact/Undetermined	D	NFW
298		L-shaped Structure	Agricultural	Pre-Contact/Undetermined	D	NFW
327		Linear Mound Alignment	Agricultural	Pre-Contact/Undetermined	D	NFW
332		Enclosure	Habitat	Pre-Contact/Undetermined	D	NFW
344		Double Enclosure (with 4 terrace sub-features) and Trash Dump (Privy?)	Water Storage	Historic	D	NFW
355		Enclosure	Habitat	Undetermined	D	DR
359		Lithic Scatter	Work Shop?	Undetermined	D	DR
362		Enclosure	Habitat/Agricultural	Undetermined	D	DR
363		Enclosure	Habitat	Pre-Contact	D	NFW
367		Terrace	Agricultural	Pre-Contact/Undetermined	D	NFW
372		Terrace	Habitat/Animal Husbandry	Historic	D	NFW
374	11-1050	Rock Shelter	Habitat	Pre-Contact/Undetermined	D, E	DR & PRESV
400		Agricultural complex	Agricultural	Pre-Contact/Undetermined	D	NFW

NFW = No Further Work  
DR = Data Recovery  
Presv = Preservation

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APPENDIX A: MIDDEN ANALYSIS

Bag	Site	Feature	Unit	Layer	Depth (cmbd)	Collected Material	Measurements (cm), (g <sup>2</sup> )	Count	Description
28	I.S.O	-	-	Surface	-	Basalt	-	1	Basalt
1	T-7	1	-	Surface	-	Basalt Core	-	1	Debitage
3	T-7	1	TU-1	SSFE 1.1	-	Charcoal	13.3	-	-
1	T-8	B	TU-1	Surface	-	Basalt Awl	L=9.4, W=5.2, Th=2.3	1	-
2B	T-8	B	TU-1	1	10-42	Kukui	0.8	1	-
2C	T-8	B	TU-1	1	10-42	Volcanic Glass	-	1	-
2D	T-8	B	TU-1	1	10-42	Basalt	-	20	Debitage
4	T-8	B	TU-1	SSFE 1.1	26-29	Soil Sample	95.0	-	-
1	T-11	1	TU-1	1	10-50	Basalt	-	3	Debitage
1	T-12	1	TU-1	1	27	Kukui	0.7	-	-
2	T-12	1	TU-1	1	41	Basalt	-	1	Debitage
3	T-12	1	TU-1	1	17-44	Basalt	-	7	Debitage
2	T-24	4	TU-1	1	27	Basalt Core	-	1	-
1	T-24	4	TU-1	1	10	Various Metal	-	34	29 flat fragments, 5 nail fragments
24	T-33	-	-	Surface	-	Basalt Core	-	1	Basalt Core
21A	T-34	1	-	Surface	-	Porcelain	-	3	Cup sherd, white with blue Asian design
21B	T-34	1	-	Surface	-	Glass Bottle	-	1	Dark amber glass
6A	T-37	-	-	Surface	-	Glass Bottle Body/Base	-	2	Aqua Maui Soda Works base and body sherd
6B	T-37	-	-	Surface	-	Glass Sherd	-	1	Purple tint; 1890-1920s
6C	T-37	-	-	Surface	-	Glass Rim	-	1	Colorless with scalloped cut on rim



2E	T-128	1	TU-1	II	25/30-Kukui	82/85 cbs	-	-	-	-	-
2F	T-128	1	TU-1	II	25/30- Polished Basalt Fragment	82/85 cbs	-	-	-	1	-
3	T-128	1	TU-1	II	69-73 Worked Basalt Fragment	69-73 cbs	-	-	-	1	-
23A	T-129	1	-	-	Surface	-	-	-	-	1	-
23B	T-129	1	-	-	Surface	-	-	-	-	1	-
4	T-138	-	-	-	Surface, in washout	-	-	-	-	2	-
1	T-140	3	NW	II	Metal Wire	38	-	-	-	1	-
2	T-140	3	quad	II	Metal Wire Nail	23-47	-	-	-	1	-
3	T-140	3	TU-1	II	Metal Nail	43,5-44	-	-	-	1	-
4	T-140	3	TU-1	II	Glass Shard	43,5-44	-	-	-	1	-
5	T-140	3	TU-1	III	Metal Nail	43-43,5	-	-	-	1	-
6	T-140	3	TU-1	II	Metal Nail	40-46	-	-	-	4	-
1	T-141	1	TU-1	I	Volcanic Glass Fragments	17	-	-	-	1	-
2	T-141	1	TU-1	I	Basalt Debitage	23	-	-	-	7	-
5	T-141	1	TU-1	I, SSFE 1	Basalt Soil Sample	30-37	33,4	-	-	-	-
7A	T-141	1	TU-1	II	Basalt Debitage	29	-	-	-	6	-
7B	T-141	1	TU-1	II	Glass Debitage	29	-	-	-	1	-
9	T-141	1	TU-2	II	Basalt Debitage	24-53	-	-	-	17	-

A3

25	T-51	1	-	-	Surface	-	-	-	-	1	-
18	T-52	-	-	-	Surface	-	-	-	-	1	-
10A	T-55	1	-	-	Surface	-	-	-	-	1	-
10B	T-55	1	-	-	Surface	-	-	-	-	1	-
27	T-62	1	-	-	Surface	-	-	-	-	1	-
15	T-77	-	-	-	Surface	-	-	-	-	1	-
5	T-101	-	-	-	Surface	-	-	-	-	1	-
3	T-118	-	-	-	Surface	-	-	-	-	1	-
7	T-128	1	-	-	Surface	-	-	-	-	2	-
1A	T-128	1	TU-1	I	Basalt 0/10- Debitage	25/30 cbs	-	-	-	1	-
1B	T-128	1	TU-1	I	Basalt Waterworn Pebble	26-27 cbs	-	-	-	1	-
2B	T-128	1	TU-1	II	Basalt Debitage	25/30- 82/85 cbs	-	-	-	15	-
2C	T-128	1	TU-1	II	Volcanic Glass Debitage	25/30- 82/85 cbs	-	-	-	4	-
2D	T-128	1	TU-1	II	Basalt Debitage	25/30- 82/85 cbs	-	-	-	2	Non-worked

A2

11B	T-175	1	-	-	1	Basalt Surface	Basalt	-	-	1
11C	T-175	1	-	-	1	Surface	Basalt	-	-	1
2F	T-175	1	-	-	11	III	Basalt	-	-	-
2G	T-175	1	-	-	7	III	Volcanic	-	-	-
2H	T-175	1	-	-	-	III	Debitage	-	-	-
2I	T-175	1	-	-	-	III	Kukui	0.8	-	-
2J	T-175	1	-	-	1	III	Marine	< 0.1	-	1
3D	T-175	2	-	-	18	II	Debitage	-	-	-
3E	T-175	2	-	-	3	II	Volcanic	-	-	-
3F	T-175	2	-	-	1	II	Unidentified	-	-	-
3B	T-193	3	-	-	14	I	Basalt	-	-	-
3C	T-193	3	-	-	2	I	Volcanic	-	-	-
4B	T-193	3	-	-	1	II	Debitage	1.5	-	1
5B	T-193	3	-	-	13	II	Basalt	-	-	-
5C	T-193	3	-	-	1	II	Volcanic	-	-	-
19	T-238	-	-	-	1	Surface, 25 m	Basalt Core	-	-	-
17	T-242	8	-	-	1	Surface	Basalt	-	-	-

10	T-141	1	-	-	2	II	Volcanic	-	-	-
8A	T-142	-	-	-	1	Surface	Glass Body	W=6.0, Th=0.5	-	1
8B	T-142	-	-	-	1	Surface	Glass Bottle	Th=0.5	-	1
8C	T-142	-	-	-	1	Surface	Porcelain	-	-	1
8D	T-142	-	-	-	1	Surface	Porcelain	-	-	1
9	T-142	-	-	-	1	Surface	Metal Hoe	-	-	1
29	T-145	-	-	-	1	Surface	Basalt	-	-	1
22	T-148/149	-	-	-	1	Surface	Basalt Fragment	W=6.5, Th=2.8	-	1
2	T-152	1B	-	-	72	II	Metal	-	-	-
1A	T-153	1	-	-	6	I	Glass Bottle	-	-	-
1B	T-153	1	-	-	1	I	Glass Bottle	-	-	1
1C	T-153	1	-	-	1	I	Metal Nail	-	-	-
2	T-153	1	-	-	3	I	Glass Bottle	-	-	-
3	T-153	1	-	-	2	I	Basalt Flake	-	-	1
2A	T-154	1	-	-	1	I	Glass Bottle	-	-	1
2B	T-154	1	-	-	1	I	Glass Bottle	-	-	1
2C	T-154	1	-	-	1	I	Glass Bottle	-	-	1
2	T-161	1	-	-	1	Surface	Basalt Core	-	-	-
11A	T-175	1	-	-	1	Surface	Basalt	-	-	-



3G	T-254	1	TU-1	II	16-25	Class Bottle	Colorless glass	1	-
3H	T-254	1	TU-1	II	16-25	Class Base	Bowl sherd; colorless glass	1	-
3I	T-254	1	TU-1	II	16-25	Whiteware Sherd	Jar sherd; whiteware with white glaze	1	-
3J	T-254	1	TU-1	II	16-25	Porcelain Base Sherd	Rice bowl sherd; white with blue asian geometric design	2	-
3K	T-254	1	TU-1	II	16-25	Porcelain Rim Sherd	Rice bowl sherd; white with blue asian geometric design	1	-
3L	T-254	1	TU-1	II	16-25	Porcelain Base Sherd	Rice bowl sherd; white with blue asian geometric design	1	-
3M	T-254	1	TU-1	II	16-25	Porcelain Rim Sherd	Rice bowl sherd; white with blue asian geometric design	4	-
3N	T-254	1	TU-1	II	16-25	Porcelain Rim Sherd	Rice bowl sherd; white with blue circular flower asian pattern	5	-
3O	T-254	1	TU-1	II	16-25	Porcelain Rim/Body Sherd	White glaze	6	-
3P	T-254	1	TU-1	II	16-25	Porcelain Rim Sherd	Bowl sherd; white with blue fading glaze pattern	4	-
3Q	T-254	1	TU-1	II	16-25	Porcelain Sherd	White with blue anchor design	1	-
3R	T-254	1	TU-1	II	16-25	Porcelain Rim/Body Sherd	White with blue asian floral design	2	-
3S	T-254	1	TU-1	II	16-25	Porcelain Sherd	White with faded blue swirl design-asian	4	-
3T	T-254	1	TU-1	II	16-25	Metal Latch	-	1	-
3U	T-254	1	TU-1	II	16-25	Metal Square	-	1	-
3V	T-254	1	TU-1	II	16-25	Metal Nail	U-shaped	3	-
3W	T-254	1	TU-1	II	16-25	Various Metal Fragments	9 flat fragments, 1 wire	10	-
4A	T-254	1	TU-2	II	21-42	Basalt Cobble	-	2	-

12A	T-254	1	-	-	-	Building Material	Surface, s of foundation	1	-
12B	T-254	1	-	-	-	Class Bottle	Surface, s of foundation	1	-
12C	T-254	1	-	-	-	Porcelain Sherd	Surface, s of foundation	1	-
12D	T-254	1	-	-	-	Porcelain Sherd	Surface, s of foundation	1	-
12E	T-254	1	-	-	-	Porcelain Sherd	Surface, s of foundation	1	-
12F	T-254	1	-	-	-	Porcelain Body/Base Sherd	Surface, s of foundation	1	W=6.3, Th=0.4
12G	T-254	1	-	-	-	Porcelain Sherd	Surface, s of foundation	1	-
12H	T-254	1	-	-	-	Porcelain Sherd	Surface, s of foundation	4	-
12I	T-254	1	-	-	-	Porcelain Rim Sherd	Surface, s of foundation	1	-
1	T-254	1	TU-1	NE Quad	-	Class Bottle	Surface, s of foundation	1	-
3A	T-254	1	TU-1	II	16-25	Class Bottle	Amber glass	1	-
3B	T-254	1	TU-1	II	16-25	Class Bottle	Aqua glass	1	-
3C	T-254	1	TU-1	II	16-25	Class Bottle	Olive green glass	10	-
3D	T-254	1	TU-1	II	16-25	Class Bottle	Medium green glass, kick up base	2	-
3E	T-254	1	TU-1	II	16-25	Class Bottle	Colorless glass	12	-
3F	T-254	1	TU-1	II	16-25	Class Jar	Colorless glass	1	-
12A	T-254	1	-	-	-	Building Material	Surface, s of foundation	1	-
12B	T-254	1	-	-	-	Class Bottle	Surface, s of foundation	1	-
12C	T-254	1	-	-	-	Porcelain Sherd	Surface, s of foundation	1	-
12D	T-254	1	-	-	-	Porcelain Sherd	Surface, s of foundation	1	-
12E	T-254	1	-	-	-	Porcelain Sherd	Surface, s of foundation	1	-
12F	T-254	1	-	-	-	Porcelain Body/Base Sherd	Surface, s of foundation	1	W=6.3, Th=0.4
12G	T-254	1	-	-	-	Porcelain Sherd	Surface, s of foundation	1	-
12H	T-254	1	-	-	-	Porcelain Sherd	Surface, s of foundation	4	-
12I	T-254	1	-	-	-	Porcelain Rim Sherd	Surface, s of foundation	1	-
1	T-254	1	TU-1	NE Quad	-	Class Bottle	Surface, s of foundation	1	-
3A	T-254	1	TU-1	II	16-25	Class Bottle	Amber glass	1	-
3B	T-254	1	TU-1	II	16-25	Class Bottle	Aqua glass	1	-
3C	T-254	1	TU-1	II	16-25	Class Bottle	Olive green glass	10	-
3D	T-254	1	TU-1	II	16-25	Class Bottle	Medium green glass, kick up base	2	-
3E	T-254	1	TU-1	II	16-25	Class Bottle	Colorless glass	12	-
3F	T-254	1	TU-1	II	16-25	Class Jar	Colorless glass	1	-

6M	T-254	1	TU-1	II/III	27-32	Leather with metal stud	2	-	-	Leather with metal stud
14	T-256	5	-	Surface	-	Coral Abrader?	1	201.1	-	-
16A	T-261	50	-	SE corner	-	Glass Bottle	1	L=24.0, W=5.7	1	Dark amber glass, base embossed with ABG C St L; 1891-1925
16B	T-261	50	-	Surface, SE corner	-	Glass Bottle	1	L=24.6, W=6.3	1	Dark amber glass, mouth blown, turn mold, tooled finish lip, base indentation; 1890-1920
1	T-265	1	TU-1	I	10	Basalt Debris	7	-	-	-
3	T-265	1	TU-1	II	34	Charcoal	-	8.9	-	-
5	T-265	1	TU-1A/1B	-	-	Soil Sample	-	36.2	-	-
7	T-265	1	IB	I	30	Charcoal	-	0.7	-	-
6	T-265	1	IB	I	10	Basalt Debris	3	-	-	-
9	T-265	1	IB	II	-	Basalt Debris	8	-	-	-
10	T-265	1	IB	II	-	Basalt Debris	1	-	-	-
13	T-280	7	-	Surface	-	Glass Bottle Body and Base Shards	10	-	-	Light blue glass, base has B in a circle; suspected Brockway Machine Bottle Company (1907-1933) or Brockway Glass Company (post-1933). Manufacturer's stamp was utilized post 1925.
1A	T-344	1A	I	I	-	Metal Fragment	3	-	-	Corroded
1B	T-344	1A	I	I	-	Metal Fragment	16	-	-	Corroded
2A	T-344	1A	I	I	-	Fragment	2	9.2	-	Mammal bone
2B	T-344	1A	I	I	-	Vertebrae	1	8.3	-	Mammal bone
2C	T-344	1A	I	I	-	Vertebrae	4	10.7	-	Mammal bone
3	T-344	1A	I	I	-	Charcoal	-	9.6	-	-
4	T-344	1A	I	I	-	Glass Shard	1	-	-	Light amber color

A9

4B	T-254	1	TU-2	II	21-42	Concrete	1	-	-	-
4C	T-254	1	TU-2	II	21-42	Glass Bottle Body Shard	2	-	-	Aqua glass
4D	T-254	1	TU-2	II	21-42	Glass Shard	1	-	-	Possible window pane
5A	T-254	1	TU-2	III	34-57	Glass Bottle Body Shard	6	-	-	Aqua glass
5B	T-254	1	TU-2	III	34-57	Glass Shard	1	-	-	Colorless flat and thin shard
5C	T-254	1	TU-2	III	34-57	Glass Bottle Body Shard	1	-	-	Amber glass
5D	T-254	1	TU-2	III	34-57	Metal Body Shard	1	-	-	Flat piece
6A	T-254	1	TU-2	III	34-57	Glass Bottle Fragment	1	-	-	Amber glass
6B	T-254	1	TU-1	II/III	27-32	Glass Bottle Body Shard	7	-	-	Olive green glass
6C	T-254	1	TU-1	II/III	27-32	Glass Bottle Body Shard	1	-	-	Olive green glass
6D	T-254	1	TU-1	II/III	27-32	Glass Shard	7	-	-	Colorless flat and thin shard
6E	T-254	1	TU-1	II/III	27-32	Glass Bottle	4	-	-	Colorless glass
6F	T-254	1	TU-1	II/III	27-32	White ware Body and Base Shard	4	-	-	Jar shard; white ware with white glaze
6G	T-254	1	TU-1	II/III	27-32	White ware Body and Base Shard	4	-	-	Jar shard; white ware with black lettering James Keiller & Sons Marmalade; 1882
6H	T-254	1	TU-1	II/III	27-32	Porcelain Shard	16	-	-	Rice bowl shard; white with Marmalade; 1882
6I	T-254	1	TU-1	II/III	27-32	Porcelain Shard	3	-	-	Rice bowl shard; white with faded blue glaze design
6J	T-254	1	TU-1	II/III	27-32	Metal Nail Fragments	11	-	-	-
6K	T-254	1	TU-1	II/III	27-32	Metal Fragment	11	-	-	Flat piece
6L	T-254	1	TU-1	II/III	27-32	Metal Button	1	-	-	4-hole; engraved with thomas & sons 32 Brookstvw.

A8

28	T-344	1A	4	1	33	Vertebrae	11.6	4	Mammal bone
27	T-344	1A	4	1	33	Metal Nail	-	2	-
30	T-344	1A	4	1	34	Vertebrae	2.9	-	Burnt mammal bone
29	T-344	1A	4	1	34	Glass Shard	-	2	Colorless glass
31	T-344	1A	4	1	38	Carbonized Corn	14.0	-	-
32A	T-344	1A	4	1	42	Metal Fragment	-	59	-
32B	T-344	1A	4	1	42	Metal Pin	-	1	-
41	T-344	1A	4	1	5-45	Vertebrae	16.5	14	Mammal bone
36	T-344	1A	4	1	-	Metal Fragment	-	1	-
37	T-344	1A	4	1	-	Ash Sample	3.1	-	-
38	T-344	1A	4	1	30	Charcoal	0.7	1	Possible carbonized corn
39	T-344	1A	4	1	29	Charcoal	5.8	-	-
40	T-344	1A	4	1	-	Vertebrae	11.6	8	Mammal bone
10	T-344	1B	2	1	-	Clay Brick	-	1	-
11A	T-344	1B	2	1	-	Glass Shard	-	2	Amber glass
11B	T-344	1B	2	1	-	Whiteware	-	3	Plate shard with white glaze, stamped in green "England"
11C	T-344	1B	2	1	-	Various Metal Fragments	-	4	Two wire fragments, 1 flat fragment, 1 possible nail fragment, corroded
12A	T-344	1B	5	1	-	Charcoal	2.6	-	-
12B	T-344	1B	5	1	-	Possible Burnt Corn Kernel	1.6	-	-
12C	T-344	1B	5	1	-	Possible Burnt Corn Cob	17.1	2	-
12D	T-344	1B	5	1	-	Glass Shard	-	1	Colorless glass, very thin
12E	T-344	1B	5	1	-	Glass Finish	-	1	Colorless glass, rim fragment
12F	T-344	1B	5	1	-	Porcelain Globule	-	1	White, possibly button perform possible vase shard

5	T-344	1A	1	1	-	Slate Pencil	-	1	-
6	T-344	1A	1	1	-	Metal Shoe	-	4	-
Lab 7	T-344	1A	1	1	-	Whiteware Eycler	-	1	Plate shard, white glaze with green transfer print leaf design
8	T-344	1A	1	1	-	Vertebrae	3.5	2	Mammal bone
7	T-344	1A	1	1	-	Bone Button	-	2	Mammal bone
14	T-344	1A	4	1	-	Vertebrae	4.6	4	Mammal bone
16	T-344	1A	4	1	-	Glass Bottle Body Shard	-	2	Dark amber
33	T-344	1A	4	1	-	Porcelain Button	-	1	Complete, circular, 4-hole, flattened center. Prosser-type obverse raised with depressed center, reverse raised with center, reverse raised with center, reverse raised with center, reverse raised with center (c. 1850-1920).
15	T-344	1A	4	1	-	Ceramic Bottle Top	L=2.8, W=2.1	1	Stamped in red with California Bottling Co San Francisco
34	T-344	1A	4	1	-	Glass Button	D=0.7	1	Black glass-type, notched on top; post 1840-1960
20	T-344	1A	4	1	-	Slag	41.0	3	-
18	T-344	1A	4	1	-	Charcoal	27.4	-	-
18	T-344	1A	4	1	-	Carbonized Corn	1.0	-	-
24	T-344	1A	4	1	-	Charcoal	3.5	-	-
26	T-344	1A	4	1	-	Carbonized Corn	3.1	-	-
25	T-344	1A	4	1	-	Metal Fragment	-	14	-
17	T-344	1A	4	1	-	Metal Square	-	2	-
35	T-344	1A	4	1	-	Various Metal Nail	-	64	49 flat fragments, 10 round headed nail frags, 5 nail fragments
21	T-344	1A	4	1	-	Charcoal	0.6	-	-
22	T-344	1A	4	1	-	Metal Washer	-	2	-
23	T-344	1A	4	1	-	Metal Cap	-	5	-

20A	T-359	1	-	Surface	-	Basalt Flake	Basalt Flake	1	-
20B	T-359	1	-	Surface	-	Possible with Polish	Possible with Polish	1	-
20C	T-359	1	-	Surface	-	Basalt	Basalt	1	-
20D	T-359	1	-	Surface	-	Basalt	Basalt	1	-
20E	T-359	1	-	Surface	-	Basalt	Basalt	1	-
20F	T-359	1	-	Surface	-	Basalt	Basalt	1	-
20G	T-359	1	-	Surface	-	Basalt Core	Basalt Core	1	-
1A	T-363	1	2	II	10-45	Possible Basalt Scaper	Basalt Scaper L=9.0, W=5.5, Th=1.5	1	-
1B	T-363	1	2	II	10-45	Metal Square	Metal Square L=5, W=0.7	1	Corroded
-	T-367	1	1	BT-4	Surface	Metal Tea Kettle	Metal Tea Kettle	1	Corroded, no bottom surface
Lab 1	T-367	1	1	BT-4	Surface	Glass Bottle	Glass Bottle	3	Aqua sherd
Lab 2	T-367	1	1	BT-4	Surface	Glass Bottle	Glass Bottle W=7.2, Th=0.5	1	Aqua glass, turn mold, base indentation
Lab 3	T-367	1	1	BT-4	Surface	Glass Bottle	Glass Bottle	1	Aqua glass, month blown, tooled finish lip; post-1890s
Lab 4	T-367	1	1	BT-4	Surface	Glass Bottle	Glass Bottle	1	Aqua glass, machine made, possible soda bottle; post-1910
Lab 5	T-367	1	1	BT-4	Surface	Glass Bottle	Glass Bottle	1	Aqua glass, machine made, possible soda bottle; post-1910
Lab 6	T-367	1	1	BT-4	Surface	Glass Bottle	Glass Bottle	1	Medium amber, embossed with Sacramento CAL; post-1920s
Lab 7	T-367	1	1	BT-4	Surface	Glass Bottle	Glass Bottle	1	Medium amber, embossed with ...berdeen...

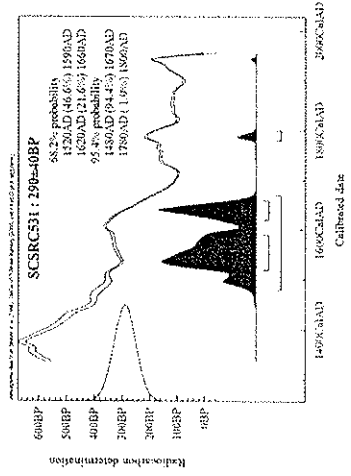
12G	T-344	1B	5	1	0-32	Non- Diagnostic	Non- Diagnostic	5	Corroded
12H	T-344	1B	5	1	0-32	Non- Diagnostic	Non- Diagnostic	13	Corroded
13A	T-344	2A	2A	ST-1	0-175	Flat Glass Fragment	Flat Glass Fragment	3	Possible window pane
13B	T-344	2A	2A	ST-1	0-175	Glass Bottle	Glass Bottle	3	Colorless glass
13C	T-344	2A	2A	ST-1	0-175	Glass Bottle	Glass Bottle	1	Colorless glass, medicine bottle, tooled finish lip; post 1870s
13D	T-344	2A	2A	ST-1	0-175	Glass Bottle	Glass Bottle	1	Light olive green
13E	T-344	2A	2A	ST-1	0-175	Glass Bottle	Glass Bottle	1	Dark amber
13F	T-344	2A	2A	ST-1	0-175	WhiteWare	WhiteWare	1	WhiteWare with white glaze
13G	T-344	2A	2A	ST-1	0-175	WhiteWare	WhiteWare	1	WhiteWare with cracked design
13G	T-344	2A	2A	ST-1	0-175	Ceramic Tile	Ceramic Tile	1	Tile with black glaze on upper surface on one side
13I	T-344	2A	2A	ST-1	0-175	Porcelain	Porcelain	1	D=1.0 Complete, circular, 4-hole, obverse raised with depressed center, reverse raised with flattened center; Prosser-type (c.1850-1920).
13J	T-344	2A	2A	ST-1	0-175	Clay Brick	Clay Brick	1	Firebrick
13K	T-344	2A	2A	ST-1	0-175	Mortar	Mortar	1	-
13L	T-344	2A	2A	ST-1	0-175	Basalt	Basalt	2	-

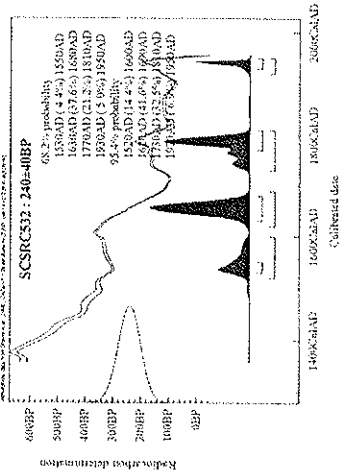
Lab #	IC #	1.S.O. <sup>1</sup>	Isolated Find	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
Lab 8	F-367	1	BT-4																						27-223	Glass Bottle	Th=0.5	2	Dark amber bottle base sherd, kick-up base
Lab 9	F-367	1	BT-4																						27-223	Glass Bottle	Th=0.5	1	Dark amber, tooled Finish hp, straight brandy closure; post-1890s
Lab 10	F-367	1	BT-4																						27-223	Glass Bottle	W=6.0, Th=0.5	1	Aqua glass, bottle missing lip, embossed with Maui Soda Works net contents 9 fluid ounces; post-1920s
26	F-369	-	-	Surface	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Basalt Adze	-	1	-
1A	F-372	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4-20	Glass Sherds	-	7	Six olive green color, 1 dark amber color
1B	F-372	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4-20	Porcelain Sherd	-	1	Blue tint on outer side, white on inner side
1C	F-372	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4-20	Metal Rod	-	1	Corroded

<sup>1</sup> Centimeter measurements for artifacts only.  
<sup>2</sup> Gram measurements for organic and soil-related matrices only.

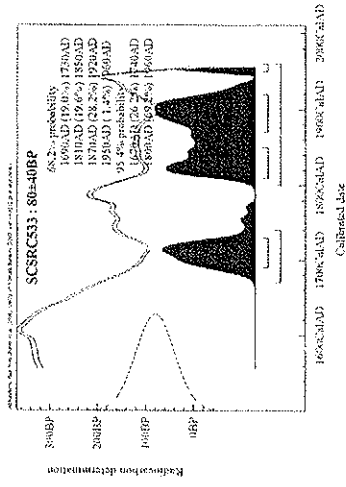
APPENDIX B: RADIOCARBON ANALYSIS

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(±)
Beta - 229717 SAMPLE : SCSRC531 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (charred material) acidalkalifacid 2 SIGMA CALIBRATION : Cal AD 1486 to 1600 (Cal BP 470 to 380)	270 ± 40 BP	-23.8 ‰	390 ± 40 BP
Beta - 229748 SAMPLE : SCSRC532 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (charred material) acidalkalifacid 2 SIGMA CALIBRATION : Cal AD 1530 to 1560 (Cal BP 420 to 390) AND Cal AD 1630 to 1680 (Cal BP 320 to 270) Cal AD 1740 to 1840 (Cal BP 210 to 150) AND Cal AD 1940 to 1950 (Cal BP 90 to 6)	230 ± 40 BP	-24.4 ‰	240 ± 40 BP
Beta - 229759 SAMPLE : SCSRC533 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (charred material) acidalkalifacid 2 SIGMA CALIBRATION : Cal AD 1680 to 1740 (Cal BP 270 to 210) AND Cal AD 1800 to 1940 (Cal BP 150 to 20) Cal AD 1950 to 1965 (Cal BP 0 to 0)	101 ± 0.5 pMC	-11.1 ‰	80 ± 40 BP
Beta - 229750 SAMPLE : SCSRC334 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (charred material) acidalkalifacid 2 SIGMA CALIBRATION : Cal AD 1320 to 1350 (Cal BP 630 to 600) AND Cal AD 1390 to 1440 (Cal BP 560 to 510)	530 ± 40 BP	-25.6 ‰	520 ± 40 BP

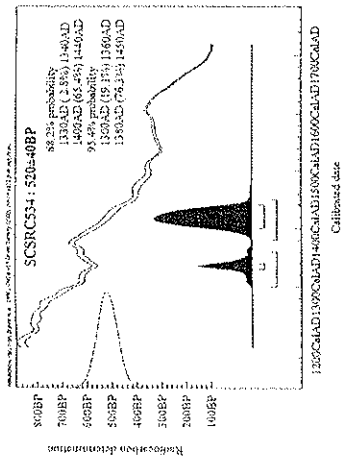




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# **APPENDIX K.**

**Meeting Minutes With  
Residents Dated July 13,  
2006**

November 20, 2006

## **MEETING MEMORANDUM**

**Date of Meeting:** July 13, 2006

**From:** Rowena Dagdag, Planner

**Subject:** Kula Ridge Affordable Housing Subdivision

**Participants:** Clayton Nishikawa, (*Architectural Design & Construction, Inc.*)  
Stacy Otomo, (*Otomo Engineering, Inc.*)  
Michael Munekiyo, (*Munekiyo & Hiraga, Inc.*)  
Rowena Dagdag, (*Munekiyo & Hiraga, Inc.*)  
Community Participants, (*See Attached*)

The purpose of the meeting was to introduce the proposed Kula Ridge Subdivision project to residents and community members living in proximity to the proposed project site. The project would require a district boundary amendment and seek exemptions from the community plan amendment and change in zoning process through the Section 201G-118, Hawaii Revised Statutes (HRS) application process.

1. C. Nishikawa provided a brief summary of the project's description and displayed the proposed house plan designs. He noted that the project will involve the development of 116 improved lots, with 70 (60 percent) affordable house/lot packages and 46 (40 percent) market lots.
2. A rendering of what the affordable units would look like using a private access easement for 6 of the lots was displayed. C. Nishikawa stated that one of his reasons for developing affordable housing was to provide well designed affordable homes for Maui residents and their children.
3. The project is moving ahead to obtain the proper sequence of approvals. C. Nishikawa has already met with the Kula Community Association, the Maui County Council members, and with the Mayor. All had recommended that he meet with the residents living near the proposed project to answer any questions or address any concerns that they have regarding the project.


4. M. Munekiyo explained that the project was in its preliminary stages in terms of the environmental assessment and Land Use Commission process. He further explained that the environmental assessment process would help identify areas that would be impacted and suggest improvements that need to be made to mitigate or minimize project impacts.
5. M. Munekiyo stated that the project will need to go through the State Land Use Commission for a district boundary amendment to reclassify the land use from Agricultural to Rural and Urban. Exemptions from the community plan amendment and change in zoning process will be requested as part of the Section 201G-118, HRS application process.
6. The project is to be processed as a Section 201G, HRS application, which allows an affordable housing project to be expedited through exemptions. The regular process would take approximately 3 to 4 years. During the application process, there will be formal opportunities for the public to comment and provide feedback.
7. A resident expressed her concern over water rights and asked if the project would receive water before others who have been waiting for a water meter. M. Munekiyo replied that although the Section 201G, HRS process allows for certain exemptions, it would not permit exemptions relating to the provision of water source and water infrastructure.
8. C. Nishikawa stated that he recently met with the Water Director, who suggested that he find his own water. C. Nishikawa is currently negotiating with Maui Land and Pineapple Company and A&B who are drilling wells in the Upcountry area. The water from these wells could service the project site. He further indicated that he would pay for a percentage of the well being drilled by the companies.
9. The well would eventually be connected to the County water system.
10. D. Mayer stated that the Kula Community Association board members met with C. Nishikawa about two (2) months ago and reviewed the project with him. The association has provided C. Nishikawa with comments and concerns regarding the project. D. Mayer indicated that he was not satisfied with the update regarding the water situation, but was willing to be of help to resolve the issues.
11. A septic tank system will be installed in the homes. C. Nishikawa stated the benefits of a septic system and pointed out the disadvantages of a larger single wastewater system. C. Nishikawa is coordinating with the Department of Health to obtain permission to utilize individual wastewater systems as being proposed.
12. A resident asked if the homes could be expanded to accommodate growing families. C. Nishikawa stated that there would be enough room on the individual lots for expansion. He noted that there would be no need for a larger water meter,

but that the homes may need a larger septic system. Homes would have a 5/8-inch meter.

13. A question was raised regarding the community plan designation, and if there was any mention of density to the area. Residents were concerned that the 116 improved lots would result in increased traffic. They were concerned about the safety of the roads and a large number of cars in the subdivision.
14. C. Nishikawa indicated that the smaller homes would be able to accommodate two (2) cars off-street, with the larger homes accommodating up to four (4) cars off-street. Parking on the access driveway would not be allowed for the affordable homes with a private access driveway.
15. The larger density (116 improved lots) is required to keep the affordable housing cost lower.
16. Ohana units will not be allowed on the individual lots.
17. A resident raised concern about the four (4) large lots on the eastern boundary of the property. Residents are concerned about it becoming a "gentlemen" ranch. M. Munekiyo stated that the current state land use designation will be kept as agricultural or rural.
18. A resident raised concern over the sidewalk along Lower Kula Road and suggested improvements to it. Residents also felt that Lower Kula Road was too narrow to accommodate traffic leading up to the 116 lot subdivision. M. Munekiyo stated that a traffic impact analysis was being done to identify improvements and mitigation measures that need to be made before approval of the subdivision.
19. A resident raised a concern over outdoor lights and its negative impact on the Haleakala Observatory. He suggested that we contact the University of Hawaii Institute For Astronomy for their comments.
20. C. Nishikawa noted that the Maui Police Department would like to see adequate lighting in the new neighborhood to address safety concerns. Residents felt that the police officers would be able to continue their work safely with low lighting.
21. A resident commented that some years ago, the Carden Academy proposed to build a school on Lower Kula Road but was denied approval by the Maui Planning Commission due to traffic impact reasons.
22. A resident felt that the project should be located somewhere else where there is less impact to the surrounding neighborhood. An affordable housing project could be done somewhere else.

23. M. Munekiyo stated that there will be several meetings where residents will be able to testify and provide comments over the project. The public will be able to give testimony before the State Land Use Commission during meetings regarding the environmental assessment. After a draft of the environmental assessment has been published, a 30-day comment period will be held for residents to provide feedback. The applicant will review and address the comments received during the draft environmental assessment comment period.
24. M. Munekiyo noted that residents living within 500 feet of the proposed project site were invited to the meeting, but welcomed others in the Kula area to attend. He added that more meetings could be held to update residents on the status of the project and to gather more comments.
25. A resident noted that 6:00 p.m. may be too early in the evening to hold a meeting. A better time would be at 7:00 p.m.
26. Residents asked D. Mayer if the Kula Community Association could act as the spearhead for upcoming meetings. They want to be informed of any meetings or hearings regarding the projects that impact the entire Kula Community. D. Mayer responded that a website is available at [www.kulamaui.org](http://www.kulamaui.org). The website includes information that residents would find useful.
27. C. Nishikawa stated that water and roadway infrastructure are very important issues that need to be addressed and resolved. He is willing to work with residents and the Kula Community Association on these issues.

In closing the meeting, M. Munekiyo stated that the applicant would like to come back to the community to provide updates and receive comments as the project progresses.

  
\_\_\_\_\_  
Rowena M. Dagdag, Planner

RMD:yp  
Attachment

cc: Clayton Nishikawa, Architectural Design & Construction, Inc. (w/attachment)  
Stacy Otomo, Otomo Engineering, Inc. (w/out attachment)  
Dick Mayer, Kula Community Association (w/attachment)

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