

# **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. EXEMPTION FROM TITLE 14, PUBLIC SERVICES

1. Exemption from Chapter 14.12, Water Availability shall be granted to exempt the project from the need to obtain written verification of long term, reliable supply of water.
2. Exemption from Chapter 14.74, Impact Fees for Traffic and Roadway Improvements in Makawao-Pukalani-Kula, Maui, Hawaii, to exempt the project from traffic impact fees should such fees be adopted prior to the issuance of building permits for the project.

C. 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.

D. 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.

**E. 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.

**F. EXEMPTIONS FROM TITLE 20, MCC, ENVIRONMENTAL PROTECTION**

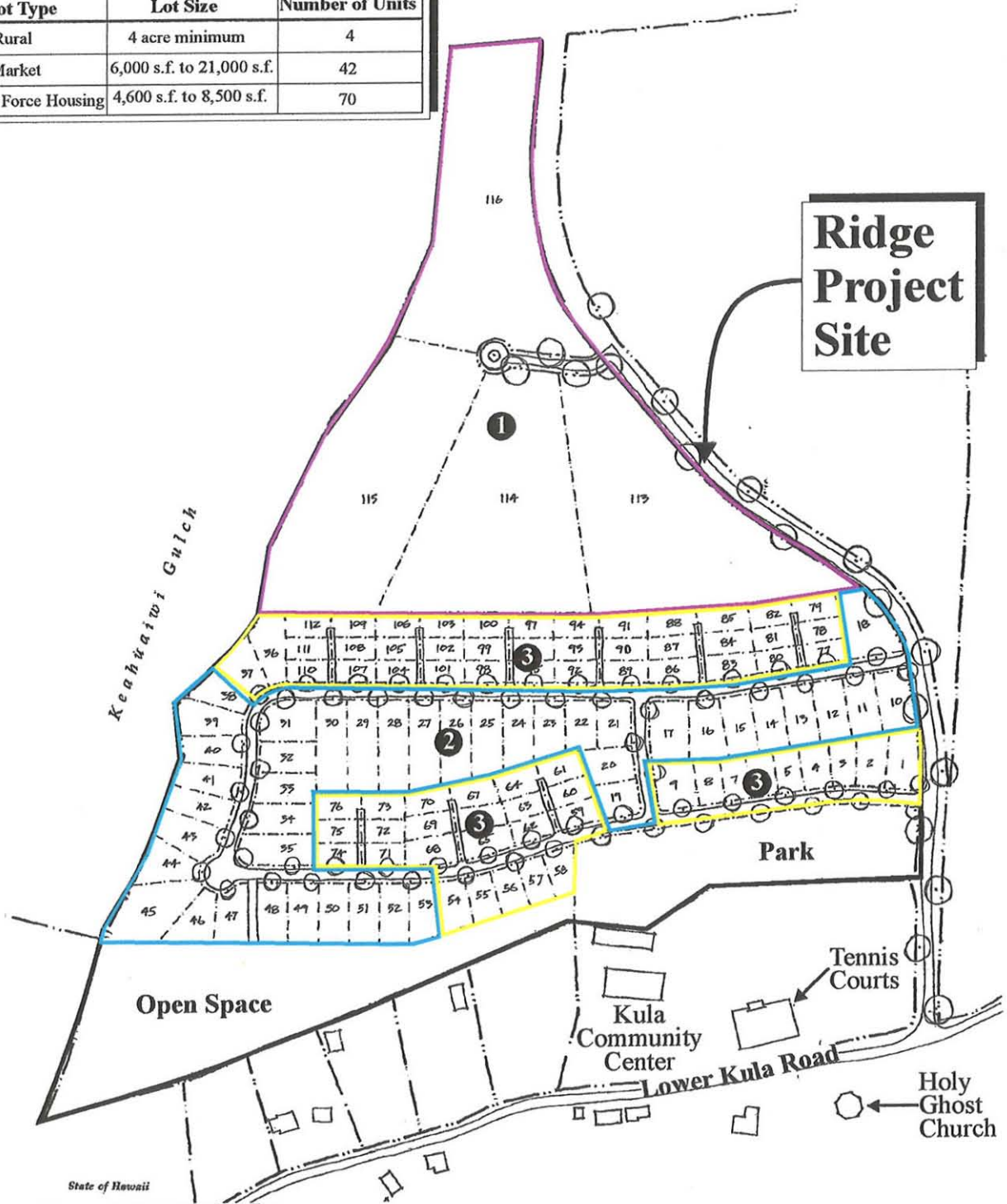
1. An exemption from Section 20.08.090, MCC, Grubbing and Grading Permit Fees, shall be granted to exempt the project from payment of grading, grubbing and excavation permit fees, as well as inspection fees.

G. 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**

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/KulaAHV/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

*DECISION ANALYSTS HAWAII, INC.*

*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 Hawai'i, 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 Hawai'i 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 Waiakoa (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>ohana</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 Hawai'i: (1) Land Capability Grouping, (2) Agricultural Lands of Importance to the State of Hawai'i, 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 Hawai'i (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 Hawai'i (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 Hawai'i, Central Maui has a mild *semitropical* climate which is due primarily to three factors: (1) Hawai'i'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>[1,8]</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 Hawai'i, 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 Hawai'i 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 Hawai'i 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 Hawai'i, 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>(1,14)</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>(15,16)</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

#### 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 Hawai'i 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 Hawai'i farmers already supply a portion of the Hawai'i 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 Hawai'i market. In 2005, the U.S. population was 296.41 million, compared to Hawai'i's resident-plus-visitor population of 1.45 million. To take advantage of this large potential, Hawai'i 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 Hawai'i 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 Hawai'i, 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 Hawai'i 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 Hawai'i 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 Hawai'i, 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 Kaua'i, 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, O'ahu 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 O'ahu because it would be too expensive to ship the sorghum juice from a Neighbor Island to O'ahu. Sorghum juice is mostly water having a low concentration of sugar compared to molasses.

Acreage requirements for a new sorghum biofuel plantation on O'ahu 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 O'ahu 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 Hawai'i.

Furthermore, the cost of importing molasses for feedstock or importing ethanol may prove less expensive than growing a biofuel crop in Hawai'i. 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 Hawai'i, 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 far higher use of ethanol in gasoline than is needed in E-10. In Hawai'i, 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 Hawai'i 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>(9)</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>1</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>(17)</sup>

A great many crops can be grown in Hawai'i'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 Hawai'i are given below.

- Hawai'i'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 Hawai'i's subtropical climate are yet to be developed.
- Crop pests are more prevalent and more expensive to control in Hawai'i 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 Hawai'i 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.



- Hawai'i 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 Hawai'i is high, as is the cost of exporting produce from Hawai'i to mainland markets. High shipping costs are due to Hawai'i'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 Hawai'i 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.
- Hawai'i farmers must compete against highly efficient mainland and foreign farms which, in a number of cases, can deliver produce to Hawai'i more cheaply than it can be produced locally. This is due to economies of scale and, in comparison to Hawai'i, 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>19,25)</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>127)</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 fallowed 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>125)</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>124)</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>128)</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 Hawai'i 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 Hawai'i.

#### 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 (DHHL) 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 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 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>[32]</sup>

#### 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 (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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- [32] Appendix B. "Selected State and County Goals, Objectives, Policies and Guidelines Related to Agricultural Lands."

FIGURES

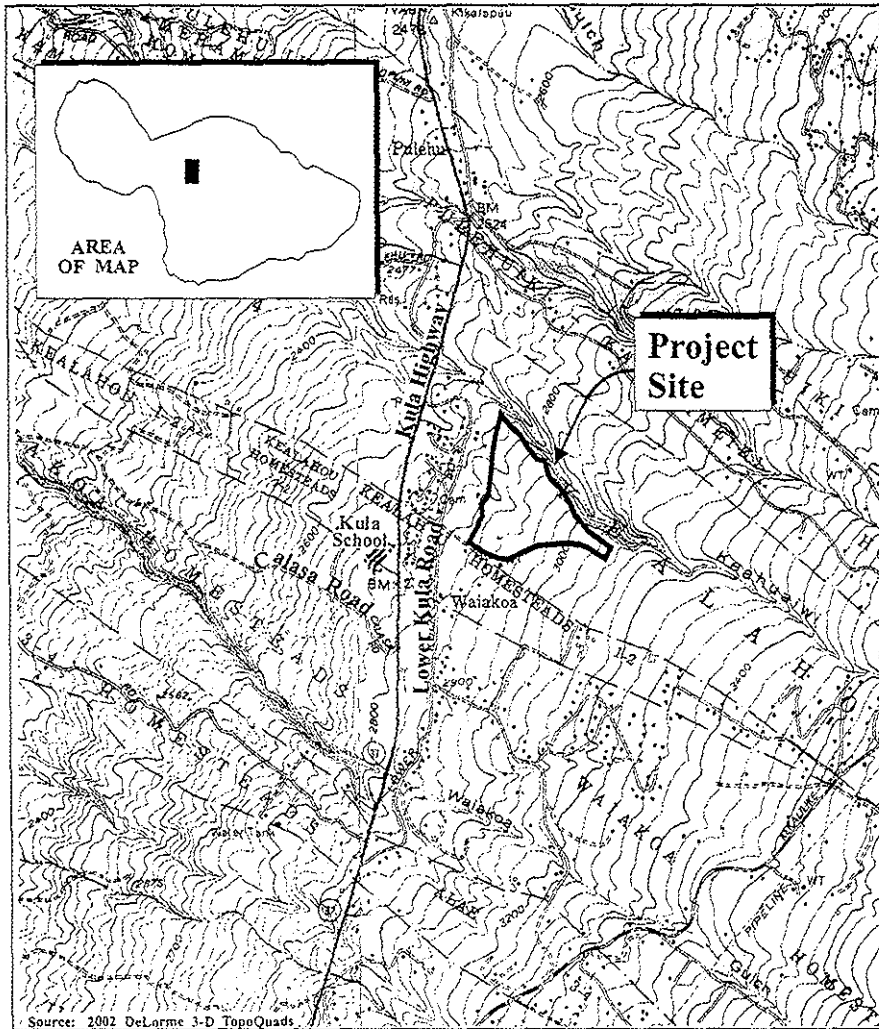


Figure 1 Proposed Kula Ridge Affordable Housing Subdivision Regional Location Map NOT TO SCALE



Prepared for: Kula Ridge, LLC

MUNEKIYO & HIRAGA, INC.

19181446\Kula Ridge\Location

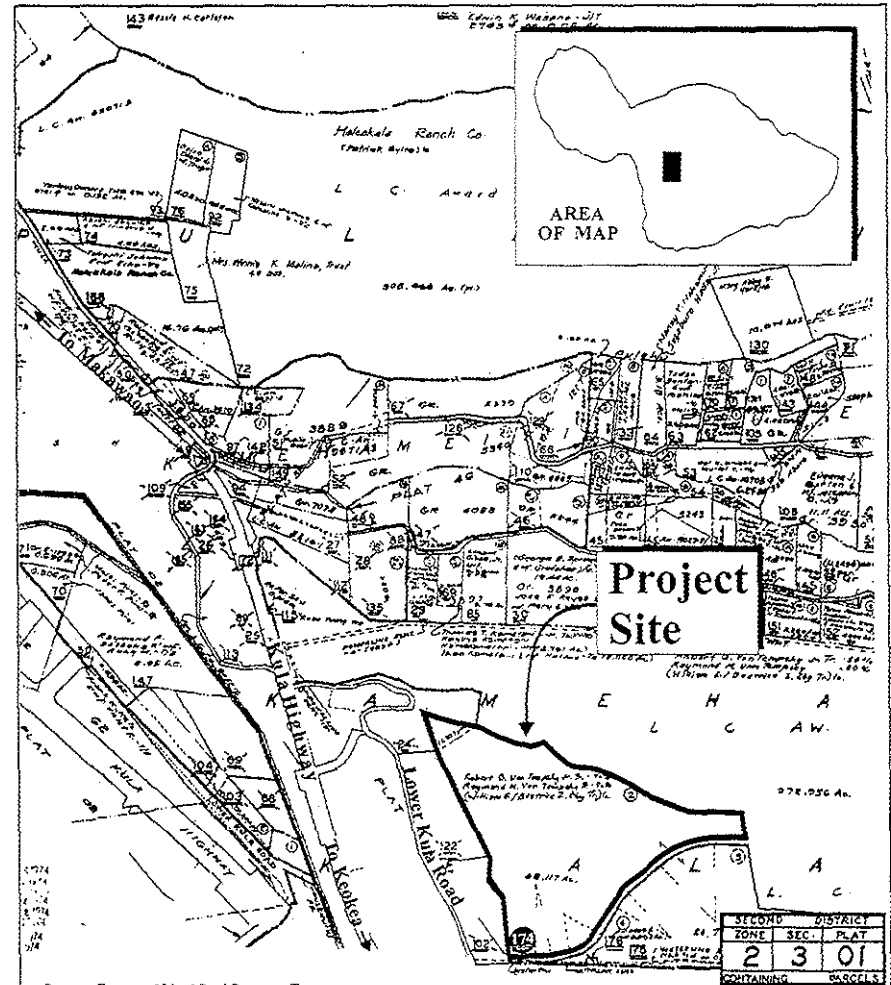


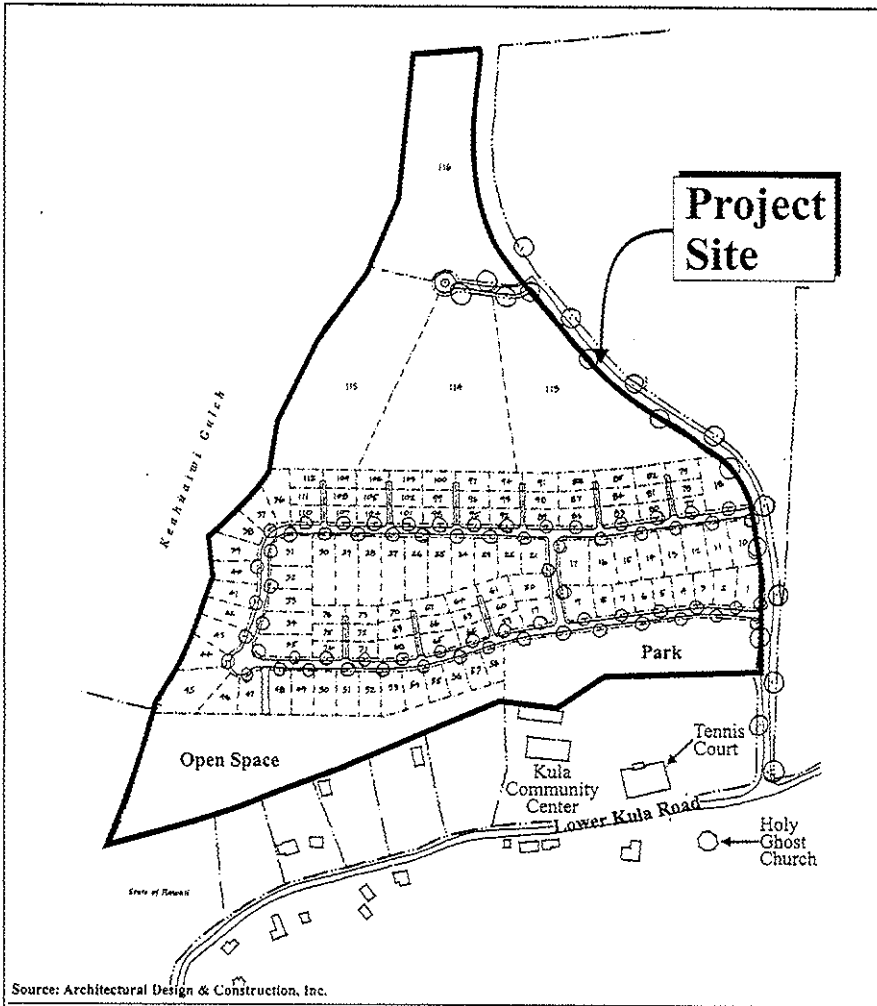
Figure 2 Proposed Kula Ridge Affordable Housing Subdivision Project Site Map NOT TO SCALE



Prepared for: Kula Ridge, LLC

MUNEKIYO & HIRAGA, INC.

19181446\Kula Ridge\ProjectSiteMap

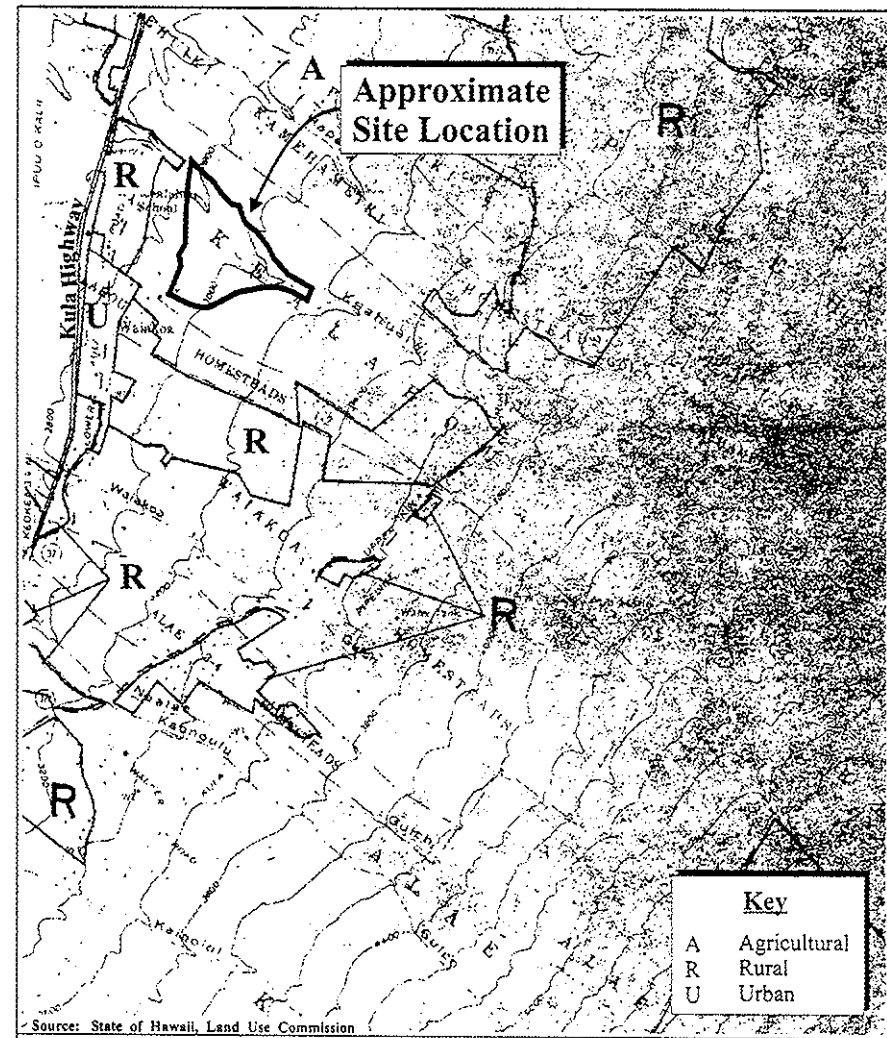


Source: Architectural Design & Construction, Inc.

**Figure 3** Proposed Kula Ridge Affordable Housing Subdivision Conceptual Site Plan NOT TO SCALE

Prepared for: Kula Ridge, LLC

MUNEKIYO & KIRAGA, INC.  
NishiKawa&KIRAGA/ConceptSite

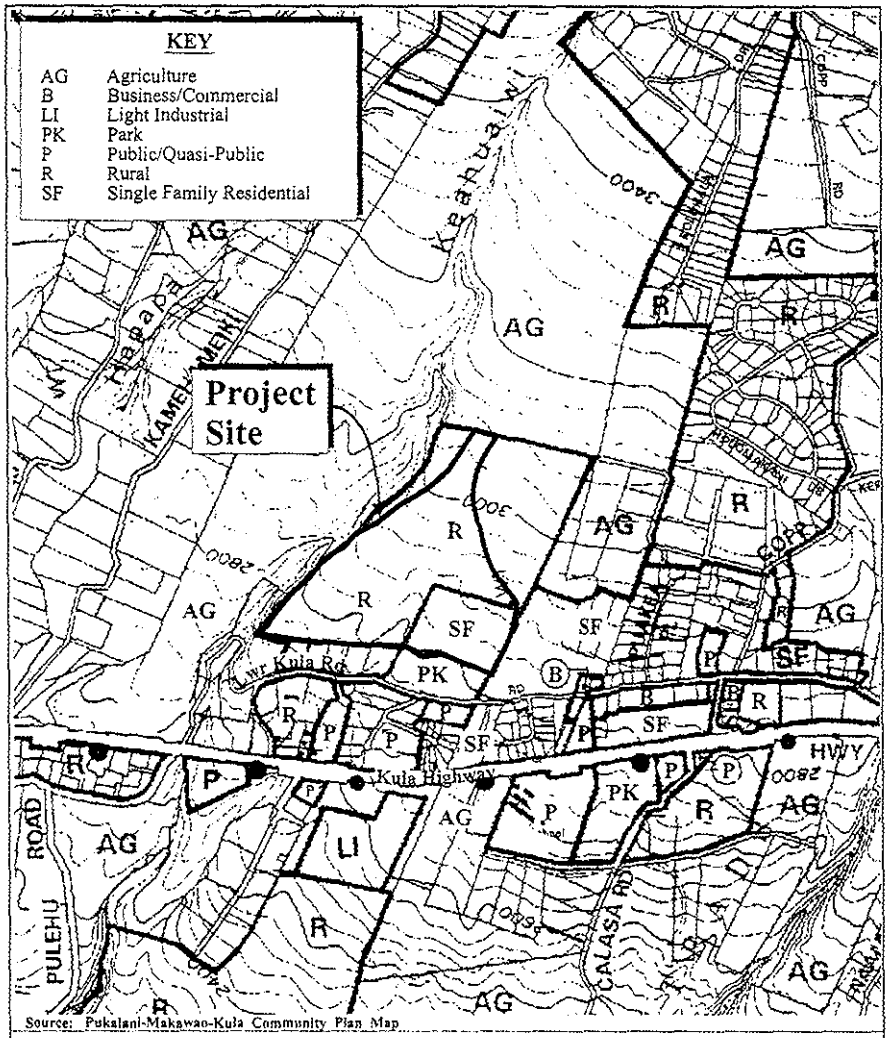


Source: State of Hawaii, Land Use Commission

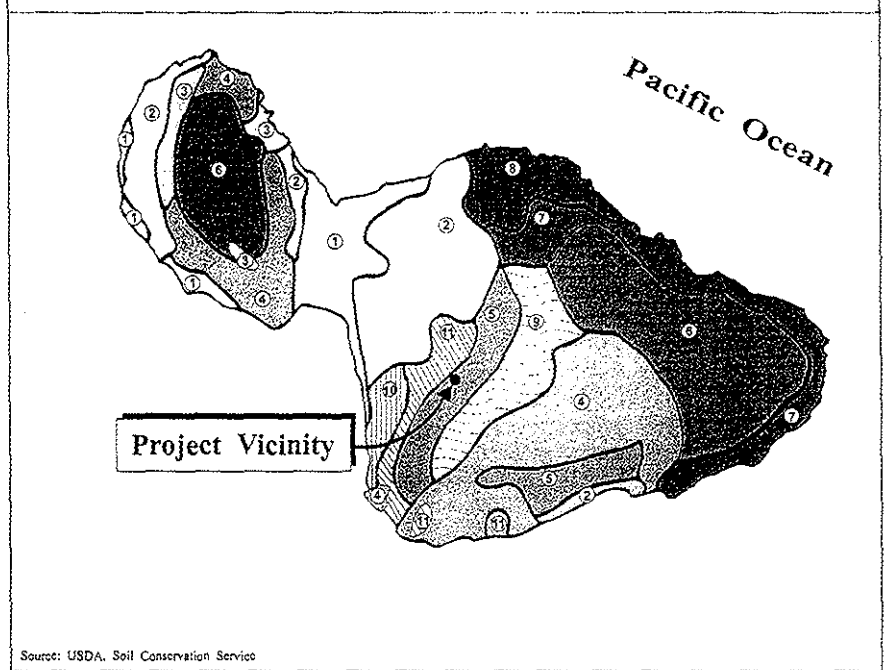
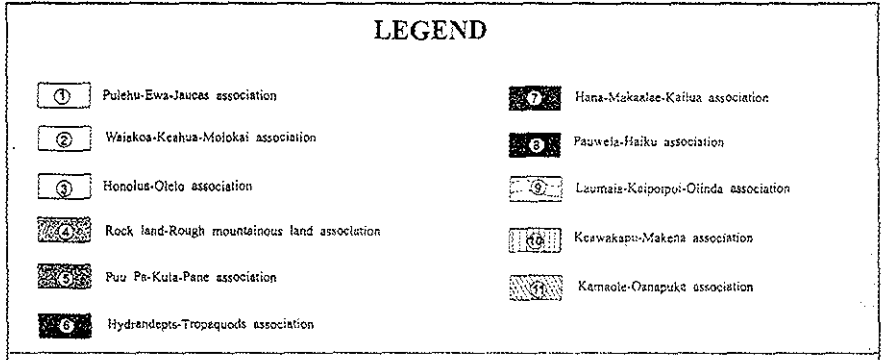
**Figure 4** Proposed Kula Ridge Affordable Housing Subdivision State Land Use District Classifications NOT TO SCALE

Prepared for: Kula Ridge, LLC

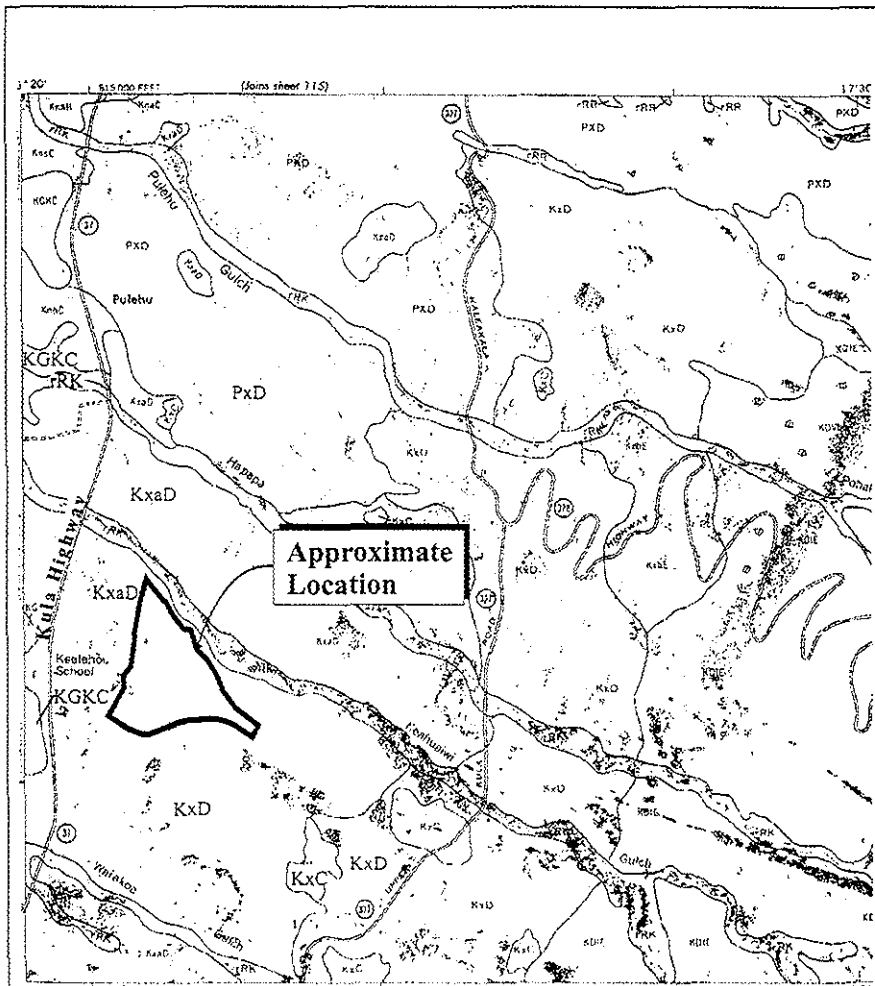
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NishiKawa&KIRAGA/SLUD



**Figure 5 Proposed Kula Ridge Affordable Housing Subdivision** NOT TO SCALE  
Community Plan Land Use Map

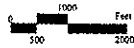


**Figure 6 Proposed Kula Ridge Affordable Housing Subdivision** NOT TO SCALE  
Soil Association Map



Source: USDA, Soil Conservation Service

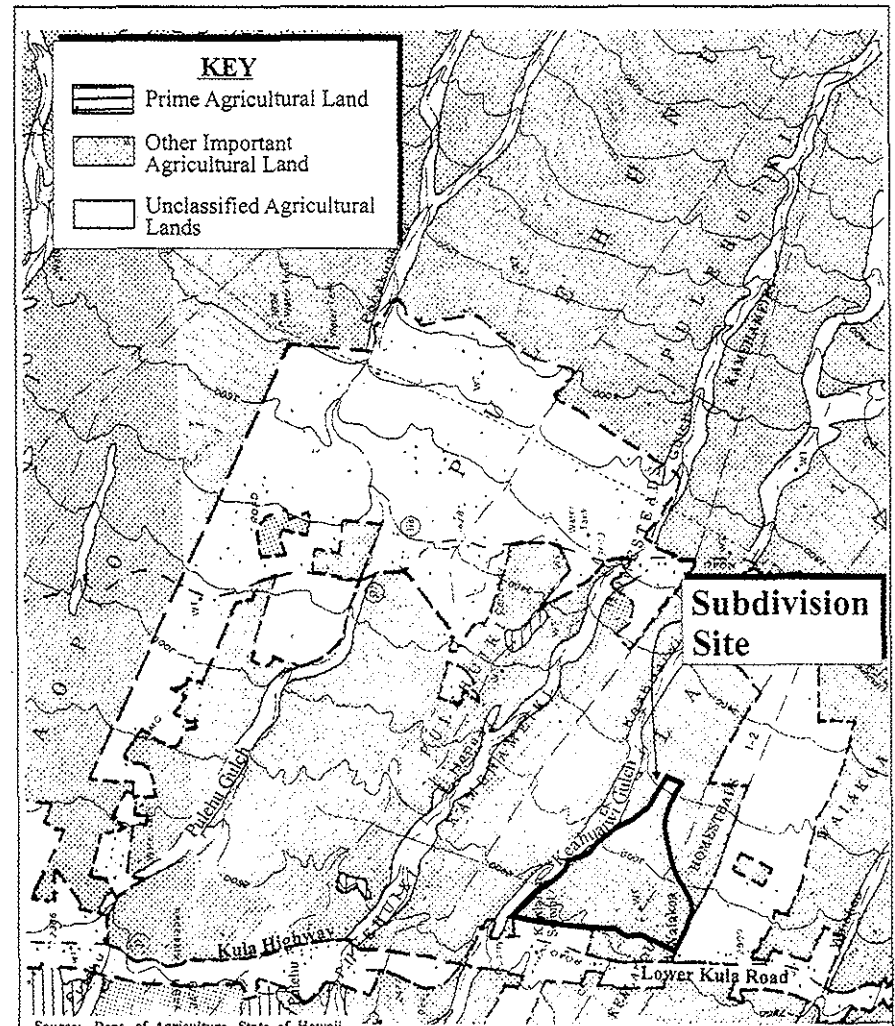
Figure 7 Proposed Kula Ridge Affordable Housing Subdivision Soil Classifications Map



Prepared for: Kula Ridge, LLC

MUNEKIYO & HIRAGA, INC.

N:\15a\Kula\KulaAffordable



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

MUNEKIYO & HIRAGA, INC.

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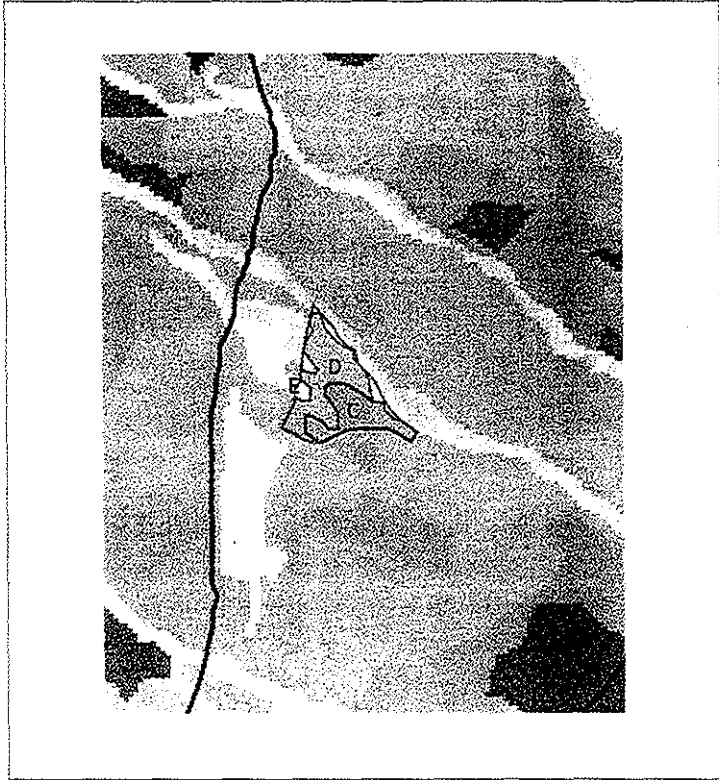
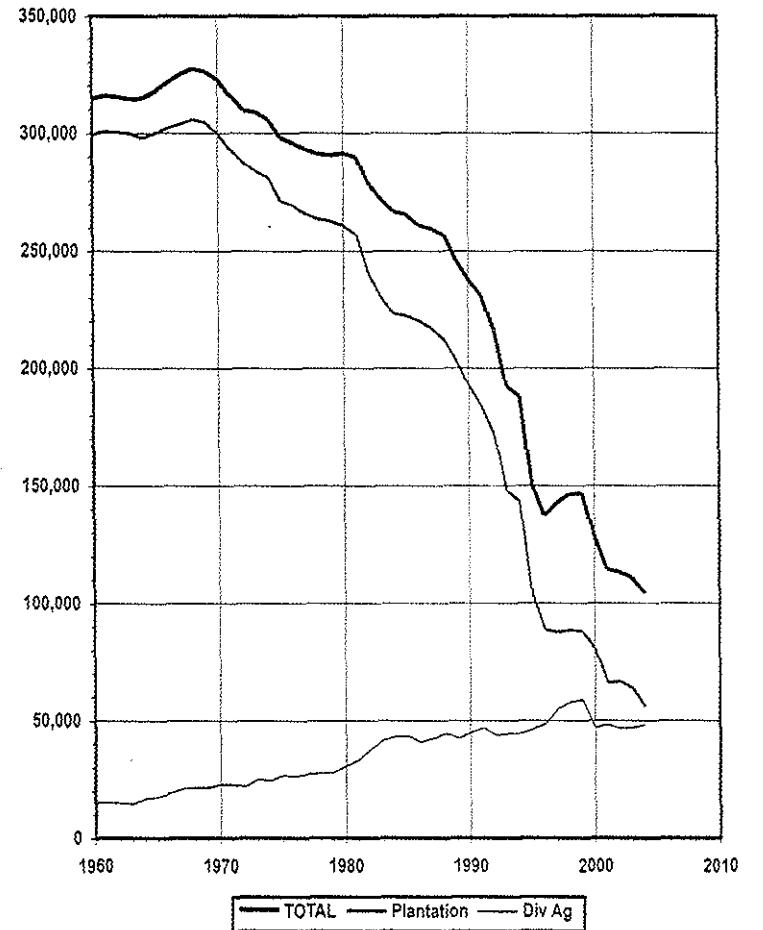


Figure 9 Proposed Kula Ridge Affordable Housing Subdivision  
Land Study Bureau Soil Ratings

Figure 10 - Statewide Acreage in Crop: 1960 to 2004



Appendix A. Maui Island Development Projects: April 2006

Project Location and Name	Entitlements	Homes or Units				Project Area		Site Ag District	
		Single-family Homes	Multi-family Homes	Hotel & Time-share Units	Total	Total Project (acres)	per Unit	Total (acres)	Adjusted (acres)
<b>West Maui</b>									
Honokowai DHHL	Committed	1,250			1,250	780	0.62	780	780
Honouua 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	338	
Kaanapali Residences - Landtech: Parcel 10-H	Committed	18			18	n.e.	n.e.	-	
Kahana Ridge Villas	Committed		117		117	n.e.	n.e.	-	
Kapalua Bay	Committed			155	155	n.e.	n.e.	-	
Kapalua Mauka: Master Plan; PD 2	Committed	690			690	1,085	1.57	1,085	1,085
Kapalua: _Master Plan; PD 1	Committed	900		1,050	1,950	249	0.13	-	
Kapalua_Mauka Residential	Committed	690			690	n.e.	n.e.	-	
Kapua Village: ML&P employees	Committed	45			45	n.e.	n.e.	-	
Laiipoa Point Homesites	Committed	40			40	n.e.	n.e.	-	
Launiupoko: Mahanalu Nui: 1	Committed	131			131	438	3.34	438	
Lokahi Kuhua	Committed	12			12	n.e.	n.e.	-	
Mahanalu Nui: Ph. 5	Committed	9			9	n.e.	n.e.	-	
Makia Plantation: Ph. 1 & 2	Committed	52			52	465	8.94	465	
Makia Ridge: Large Lots	Committed	11			11	458	41.64	458	
Mamot Maui Ocean Club: Saquel Towers	Committed			148	148	n.e.	n.e.	-	
Na Hale O Wahee: Ph. 2	Committed		26		26	5	0.19	5	5
Napili Kahuna (Kii Noe 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.	-	
Plantation Inn	Committed			14	14	n.e.	n.e.	-	
Pu'unoe: Ph. 1 & 2	Committed	24			24	169	7.00	168	
Royal Lahaina Resort: revitalization	Committed			455	455	n.e.	n.e.	-	
Sunstone	Committed	5			5	n.e.	n.e.	-	
Ukumehame Homes: Ph. 1,2+Ohanas	Committed	46			46	280	6.09	280	
Ukumehame Park	Committed				-	111	n.a.	111	111
Villages of Leialii: Ph. 1A	Committed	104			104	n.e.	n.e.	-	
Villages of Leialii: Ph. 1B	Committed	253			253	99	0.39	-	
West Maui Breakers 1	Committed		90		90	n.e.	n.e.	-	
Hyatt Regency Maui: Timeshare Project	Proposed			806	806	n.e.	n.e.	-	
Ka'anapali 2020: _Residences	Proposed	1,257	1,550		2,810	2,004	0.71	1,695	1,695
Kahoma Employee Housing	Proposed	69	12		72	17	0.24	17	17
Kahoma: _Lots	Proposed	53			53	876	16.53	874	
Kamehameha Schools Kuia Residential Infill	Proposed	900			900	211	0.23	211	211
Lipoa Point Homes	Proposed	25			25	247	9.88	244	
Makia Farms: _Largo Lots	Proposed	38			38	1,292	34.00	1,291	
Napili Mauka Residences	Proposed	10			10	n.e.	n.e.	-	
Olowalu Mauka & Makai Plan: Master	Proposed	1,500			1,500	631	0.42	609	609
Pineapple Ridge	Proposed	24			24	9	0.38	-	
Pulelehua: Master, Proposed PD	Proposed	533	349		882	309	0.35	309	309
Villages of Leialii: Master	Proposed	2,808	2,840		4,846	n.e.	n.e.	-	
Wahee Villages	Proposed	401	464		865	193	0.22	184	184
<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>5,005</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	Total Project (acres)	per Unit	Total (acres)	Adjusted (acres)
<b>North Maui</b>									
Kahul Pono Subdivision III	Committed	3			3	4	1.33	4	4
Krauss Subdivision	Committed	4			4	9	2.25	9	9
Maliko Bay Homes	Committed	8			8	45	5.63	45	
Maliko Ranch - Lots	Committed	3			3	10	3.33	10	
Maseaki Doi Subdivision	Committed	3			3	36	12.00	33	
Pe'ahi Farms at Opana Point	Committed	16			16	270	16.88	270	
Pe'ahi Hui Lends	Committed	3			3	1	0.33	1	1
Puu o Matali Rural Subdivision	Committed	3			3	n.e.	n.e.	-	
Ross Subdivision	Committed	5			5	11	2.20	11	11
Wagner Subdivision	Committed	3			3	5	1.67	5	5
Paie School Community: Project District 1	Designated	330			330	n.e.	n.e.	-	
Kuuu Residential A&B	Proposed	140			140	87	0.48	-	
<b>Total North Maui</b>		<b>521</b>			<b>521</b>	<b>458</b>		<b>386</b>	<b>30</b>
<b>Central Maui</b>									
Central Maui Landfill, Phase IV	Committed				-	29	n.e.	29	29
Consolidated Baseyards	Committed				-	21	n.a.	21	21
E Paepae Ka Pukoa: Spreckelsville	Committed	16			16	45	2.81	-	
Hale Kapahi Project	Committed		4		4	n.e.	n.e.	-	
Iao Valley Large Lot Subdivision	Committed	7			7	n.e.	n.e.	-	
Kahaluni Town Center Redevelopment	Committed		302		302	n.e.	n.e.	-	
Kane Street Condos and Shops	Committed		90		90	n.a.	n.e.	-	
Kahalani Master Plan Project District 3	Committed	1,403	829		2,232	n.e.	n.e.	-	
Lokenanu Hale: Sr. Affordable Housing	Committed		62		62	n.o.	n.e.	-	
Malahii Ag Subdivision	Committed	10			10	72	7.20	69	
Malahii Mauka Ag Subdivision	Committed	2			2	n.e.	n.e.	-	
Marriont Courtyard Hotel: Kahalua Airport	Committed			140	140	n.e.	n.e.	-	
Maui Lani: Master Plan PD 1	Committed	3,163	502		3,665	1,085	0.30	76	76
Maui Student Housing	Committed		400		400	n.e.	n.e.	-	
Pi'ihane: Project District 2	Committed	95	440		535	73	0.14	5	5
Waiehu Aina	Committed	17			17	279	16.41	261	
Waiehu Kou, Phase 3	Committed	115			115	42	0.37	20	20
Waiehu Mauka Ag Subdivision	Committed	16			16	113	7.06	113	
Waiehu Valley Large Lot Subdivision	Committed	24			24	373	15.54	373	
Waikapu Gardens	Committed	410			410	95	0.23	95	95
Waiko Mauka Ag Subdivision	Committed	2			2	22	11.00	22	
Waikuku Country Estates	Committed	184			184	452	2.46	449	449
Waialani: Eua	Committed	37			37	n.e.	n.e.	-	
Waialani: Mauka	Committed	104			104	n.e.	n.e.	-	
Winn 4lot	Committed	4			4	152	38.00	152	
Waiehu Kou, Phase 4	Committed	96			96	n.e.	n.e.	-	
Waialani: Pihaki	Committed	38			38	n.e.	n.e.	-	
Hale Hoomanu Mental Health Kokua	Designated		6		6	n.e.	n.e.	-	
Hale Maa	Designated	465			465	234	0.50	227	227

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Project Location and Name	Entitlements	Homes or Units				Project Area		State Ag District	
		Single-family Homes	Multi-family Homes	Hotel & Time-share Units	Total	Total Project (acres)	per Unit	Total (acres)	Adjusted (acres)
<b>Central Maui</b>									
Maui Business Park Phase II	Designated				-	245	n.a.	232	232
Maui Expo Systems (Eko Systems)	Designated				-	58	n.a.	58	58
Meo B.E.S.T. House	Designated		12		12	n.e.	n.e.	-	
Betsill Bros. Mixed Use	Proposed		5		5	n.e.	n.e.	-	
Central Maui Senior Housing	Proposed		40		40	n.e.	n.e.	-	
Free Church of Tonga	Proposed				-	9	n.a.	9	9
Kikuchi Residential at Wai'ale	Proposed	500			500	154	0.31	154	154
Na Mala O Waihee Homes	Proposed	35			35	11	0.31	11	11
Pu'unani	Proposed	399	95		494	212	0.43	212	212
Spreckelsville Mauka A&B	Proposed	360			360	228	0.60	228	228
Wai'ale	Proposed	1,065	2,715		3,780	847	0.22	846	846
Waikapu Mauka Towne	Proposed	190	190		380	n.e.	n.e.	-	
<b>Total Central Maui</b>		<b>8,776</b>	<b>5,692</b>	<b>140</b>	<b>14,610</b>	<b>4,851</b>		<b>3,662</b>	<b>2,672</b>
<b>South Maui</b>									
Alii Village Subdiv.	Committed	27			27	n.e.	n.e.	-	
Aloha Village	Committed		78		78	n.e.	n.e.	-	
Ameron Hawaii	Committed				-	2	n.a.	2	2
Central Maui Baseyard	Committed				-	451	n.a.	-	
Chambers Apartments	Committed		18		18	n.e.	n.e.	-	
Club World Mark Kihei	Committed			200	200	n.e.	n.e.	-	
Cove Beach Villas	Committed		32		32	n.e.	n.e.	-	
Hale Mahaolu Ehiku 1: Phase 1	Committed		54		54	n.e.	n.e.	-	
Hale Mahaolu Ehiku 2: Phase 2	Committed		58		58	n.e.	n.e.	-	
Hokulani Golf Villas	Committed	182	56		240	n.e.	n.e.	-	
Honu Aia Hale	Committed	62			62	n.e.	n.e.	-	
Hooehani Subdivision	Committed	28			28	n.e.	n.e.	-	
Hoolieai Waiea MF-9	Committed		120		120	n.e.	n.e.	-	
Irill Condos	Committed	4			4	n.e.	n.e.	-	
Kai An'i Village MF Residential Project	Committed	99			99	n.e.	n.e.	-	
Kai Makani	Committed	112			112	n.e.	n.e.	-	
Kai Malu Waiea Master	Committed	150			150	n.e.	n.e.	-	
Kalama Heights: Phase 2	Committed		80		80	n.e.	n.e.	-	
Kalama Hills	Committed	12			12	n.e.	n.e.	-	
Kamaali Alayna Estates (Waipuhani Estates)	Committed	92			92	n.e.	n.e.	-	
Kanani Waioa	Committed	38			38	n.a.	n.a.	-	
Ke Alii Homes	Committed	95			95	n.e.	n.e.	-	
Ke Alii Ocean Villas	Committed	14	144		158	n.e.	n.e.	-	
Kenolo Lili'ani Sub	Committed	7			7	n.e.	n.e.	-	
Kenolo Place	Committed	12			12	n.e.	n.e.	-	
Kihei Haneloi Condominiums	Committed		4		4	n.e.	n.e.	-	
Kihei Kauhale	Committed	26			26	n.e.	n.e.	-	
Kiuhana: Hema	Committed	31			31	n.e.	n.e.	-	
Landry Apts.	Committed		18		18	n.e.	n.e.	-	
Lāoa Village Subdivision	Committed	65			65	n.e.	n.e.	-	

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	Total Project (acres)	Acres per Unit	Total (acres)	Adjusted (acres)
Malukie at Wailea: Condos	Committed		15		15	n.e.	n.e.	-	
Maui Lu Timeshare	Committed		388	400	788	n.e.	n.e.	-	
Maui Research & Tech Park: _Project District 6	Committed					387	n.e.	234	234
MF21 Subdivision: _PD 8	Committed	7			7	22	3.14	22	
Moana Estates	Committed	90			90	n.e.	n.e.	-	
One Palaua Bay: PD 8	Committed	17			17	n.e.	n.e.	-	
One Wailea Dev	Committed	20			20	n.e.	n.e.	-	
Osterstock Subdivision: 7 lot	Committed	7			7	n.e.	n.e.	-	
Papaani Lots	Committed	16			16	5	0.31	3	3
Papaani Subdivision	Committed	8			8	n.e.	n.e.	-	
Paradise Ridge Estates	Committed		32		32	n.e.	n.e.	-	
Wailea Beach Villas	Committed		105		105	n.e.	n.e.	-	
Wailea MF-10	Committed		144		144	n.e.	n.e.	-	
Wailea MF-10 Subdivision	Committed		9		9	n.e.	n.e.	-	
Wailea MF-11	Committed	12			12	n.e.	n.e.	-	
Wailea Villas (MF-4) (Papa'i)	Committed	25			25	n.e.	n.e.	-	
Garcia Makana Residences	Designated	10			10	5	0.50	5	5
Hale Pama Condos	Designated		6		6	n.e.	n.e.	-	
Ki'ohana: Mauka	Designated	73			73	n.e.	n.e.	-	
Ki'ohana: Waena	Designated	31			31	n.e.	n.e.	-	
Ma'alaea Mauka Residential: _Project District 12	Designated	1,150			1,150	257	0.22	257	257
Ma'alaea Village A&B: _Project District 11	Designated	2,000			2,000	808	0.40	765	765
Pu'unene Airstrip: _Project District 10	Designated					558	n.a.	558	558
Wailea 670 (Honua'ula) _Project District 9	Designated	1,400			1,400	584	0.42	584	584
Ka Ono Ulu: _Industrial Park	Proposed					96	n.a.	96	96
Kalani Condos Makana	Proposed		4		4	1	0.25	1	1
Kamaole Heights	Proposed		96	24	122	n.e.	n.e.	-	
Khei Kaiwahine Res. A&B	Proposed	600			600	114	0.19	114	114
Makana Resort: Hotel & Condos	Proposed		1,105	545	1,650	718	0.44	31	31
<b>Total South Maui</b>		<b>6,158</b>	<b>2,925</b>	<b>1,169</b>	<b>10,262</b>	<b>4,068</b>		<b>2,672</b>	<b>2,650</b>
<b>Upcountry Maui</b>									
A.L. & P. Phillips Subdivision	Committed	3			3	11	3.87	11	
Abner Dolma Subdivision	Committed	3			3	6	2.00	6	6
Bayong Subdivision	Committed	3			3	8	2.67	8	
Blackburn Subdivision	Committed	5			5	n.e.	n.e.	-	
Cameron Kaluanui Subdivision	Committed	3			3	n.e.	n.e.	-	
DeRego Subdivision	Committed	7			7	59	8.43	59	
Erehwon Estates Subdivision	Committed	7			7	40	5.71	40	
Freitas Subdivision	Committed	4			4	3	0.75	-	
Haleakala Homesteads 1 & 2	Committed	15			15	81	5.40	87	
Hali'imaile: _Residential	Committed	148			148	69	0.47	8	8
Jacaranda Hill	Committed	3			3	2	0.67	2	2
Joan Ferreira Subdivision	Committed	3			3	24	8.00	24	
Kaalahou 1 & 2 Homesteads	Committed	7			7	15	2.29	7	7

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Project Location and Name	Entitlements	Homes or Units				Project Area		State Ag District	
		Single-family Homes	Multi-family Homes	Hotel & Time-share Units	Total	Total Project (acres)	Acres per Unit	Total (acres)	Adjusted (acres)
Keekee/Waihoi Subdivision DHHL	Committed	405			405	445	1.10	445	445
Kulamelu: Mauka Res	Committed	14			14	n.e.	n.e.	-	
Kulamanu Estates: Phase 1	Committed	40			40	n.o.	n.o.	-	
Kulamanu Estates: Phase 2, Jacaranda Grove	Committed	13			13	n.o.	n.o.	-	
Kulumanu Ridge: Ridge at Kulumanu	Committed	57			57	n.e.	n.e.	-	
Maha Wilege Subdivision	Committed	24			24	n.o.	n.o.	-	
Mary Decembra Subdivision	Committed	3			3	n.e.	n.e.	-	
Mau/Waioli Subdivision	Committed	3			3	7	2.33	7	7
Piholo Farms Subd.	Committed	10			10	23	2.30	23	23
Slice Subdivision	Committed	3			3	n.e.	n.e.	-	
Waihoi Hikiina Subdivision (Kula Res 1,2) DHHL	Committed	35			35	261	7.25	261	
Waihoi Lot 134 (Kula Res 1,2) OHHL	Committed	4			4	200	50.00	190	
Waihoi Uka Subdivision (Kula Res 1,2) DHHL	Committed	56			56	192	3.43	192	
Wilfred "Hoopal" Phillips Subd	Committed	3			3	2	0.67	2	2
Barto Project Crook Estate: Project District 3	Designated		64		64	n.e.	n.e.	-	
Kauahe Lani: _Pukalani Makai	Designated	155			155	81	0.52	81	81
Kula Lodge: Project District 1	Designated			15	15	n.e.	n.e.	-	
Silversword Inn: Project District 2	Designated			12	12	n.e.	n.e.	-	
Hali'imaile Expansion: _A&B400	Proposed	1,200			1,200	353	0.29	351	351
Hali'imaile Expansion: _ML&P348	Proposed	1,500			1,500	441	0.28	421	421
Ka Ono Ulu Lots	Proposed	2			2	3	1.50	-	
Kualono by Hanohano	Proposed	49			49	14	0.29	14	14
Kula Ridge Affordable Housing Subdivision	Proposed	116			116	48	0.41	48	36
Kula Senior Housing	Proposed		36		36	n.e.	n.e.	-	
<b>Total Upcountry Maui</b>		<b>3,995</b>	<b>100</b>	<b>27</b>	<b>4,032</b>	<b>2,386</b>		<b>2,297</b>	<b>1,403</b>
<b>East Maui</b>									
Hamao Beach Subdivision	Committed	3			3	2	0.67	1	1
Hana Com. Health Ctr. Exp.	Committed		20		20	n.e.	n.e.	-	
Hana Ranch Affordable Housing	Committed	288			288	38	0.13	38	38
Hana Ranch Store	Committed					39	n.e.	3	3
Hana Substation Subdivision	Committed	3			3	25	8.33	20	
Honomeale Subdivision	Committed	8			8	42	5.25	42	
Waihu Hana Homes: DHHL	Committed	102			102	724	7.10	724	
Garden of Eden Arboretum	Proposed	3			3	30	10.00	30	
Halani Gardens 2 Self Help Housing Corp	Proposed	14			14	5	0.43	6	6
<b>Total East Maui</b>		<b>421</b>	<b>20</b>	<b>-</b>	<b>441</b>	<b>996</b>		<b>864</b>	<b>48</b>
<b>TOTAL MAUI ISLAND</b>		<b>30,988</b>	<b>14,898</b>	<b>4,879</b>	<b>50,765</b>	<b>23,316</b>		<b>18,882</b>	<b>11,809</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.

**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.

- (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.

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  
RESOURCES

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 Waiakoa Village. Within them, support the following land use and circulation patterns:
  - c. Within Hali'imaile: Existing agricultural operations and baseyard.
  - d. Within and surrounding Waiakoa: 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**

for the

**KULA RIDGE PROJECT**

**KULA, MAUI**

by

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Kokomo, Maui  
April 2006

Prepared for: Kula Ridge LLC.

**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 Keahuaiwi 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 (KxaD) 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 'ohe (*Tetraplasandra kavaensis*), 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.

## 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 (*Neonotonia wightii*), Castor bean (*Ricinus communis*) and apple of Peru (*Nicandra physalodes*). A few fruit trees occupy the field margins: avocado (*Persea americana*), Peach (*Prunus persica*) and pomegranate (*Punica granatum*).

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 ternifolia*), kalamaiō (*Eragrostis atropioides*), kupala (*Sicyos pachycarpus*), 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.

## 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

### FERNS

DENNSTAEDTIACEAE (Bracken Fern Family)

*Pteridium aquilinum* (L.) Kuhn var.  
*decompositum* (Gaud.) R.M. Tyron

## COMMON NAME

kilau

## STATUS

endemic

## ABUND.

rare

PTERIDACEAE (Brake Fern Family)

*Pellaea ternifolia* (Cav.) Link

kalamoho laulii

indigenous rare

### MONOCOTS

AGAVACEAE (Agave Family)

*Furcraea foetida* (L.) Haworth

Mauritius hemp

non-native rare

COMMELINACEAE (Dayflower Family)

*Commelina diffusa* N.L. Burm.

honohono

non-native rare

POACEAE (Grass Family)

*Axonopus fissifolius* (Raddi) Kuhlm.

narrow-leaved carpet  
grass

non-native rare

*Bromus catharticus* Vahl

rescue grass

non-native rare

*Bromus hordeaceus* L.

soft chess

non-native rare

*Cenchrus ciliaris* Kunth

buffelgrass

non-native rare

*Chloris gayana* Kunth

Rhodes grass

non-native rare

*Cynodon dactylon* (L.) Pers.

manienie

non-native uncomm

*Digitaria violascens* Link

kukaepua'a

non-native rare

*Ehrharta erecta* Lam.

-----

non-native uncomm

*Eleusine indica* (L.) Gaertn.

wiregrass

non-native rare

*Eragrostis atropioides* Hillebr.

kalamalo

endemic rare

*Eragrostis pectinacea* (Michx.) Nees

Carolina lovegrass

non-native rare

*Melinis minutiflora* P. Beauv.

molasses grass

non-native rare

*Melinis repens* (Willd.) Zizka

Natal redtop

non-native uncomm

*Panicum maximum* Jacq.

Guinea grass

non-native rare

<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>STATUS</u>	<u>ABUNDANC</u>
<i>Paspalum dilatatum</i> Poir.	Dallis grass	non-native	uncommon
<i>Pennisetum clandestinum</i> Chiov.	Kikuyu grass	non-native	common
<i>Setaria verticillata</i> (L.) P. Beauv.	bristly foxtail	non-native	rare
<i>Sporobolus africanus</i> (Poir.) Robyns & Tournay	African dropseed	non-native	rare
<i>Vulpia myuros</i> (L.) C.C. Gmelin	rat tail fescue	non-native	rare
<b>DICOTS</b>			
ACANTHACEAE (Acanth Family)			
<i>Thunbergia alata</i> Bojer ex Sims	black-eyed susan vine	non-native	rare
AMARANTHACEAE (Amaranth Family)			
<i>Amaranthus hybridus</i> L.	green amaranth	non-native	uncommon
<i>Amaranthus viridis</i> L.	spleen amaranth	non-native	rare
ANACARDIACEAE (Mango Family)			
<i>Schinus terebinthifolius</i> Raddi.	Christmas berry	non-native	rare
APIACEAE (Parsley Family)			
<i>Coriandrum sativum</i> L.	coriander	non-native	uncommon
ASCLEPIADACEAE (Milkweed Family)			
<i>Asclepias curassavica</i> L.	butterfly bush	non-native	rare
<i>Asclepias physocarpa</i> (E.Meyer) Schlecter	balloon plant	non-native	rare
ASTERACEAE (Sunflower Family)			
<i>Bidens pilosa</i> L.	Spanish needle	non-native	common
<i>Conyza bonariensis</i> (L.) Cronq.	hairy horseweed	non-native	uncommon
<i>Cotula australis</i> (Sieber ex Spreng.) J.D. Hooker	Australian brass buttons	non-native	uncommon
<i>Galinsoga parviflora</i> Cav.	-----	non-native	uncommon
<i>Gamochaeta purpurea</i> (L.) Cabrera	purple cudweed	non-native	rare
<i>Hypochoeris glabra</i> L.	smooth cats ear	non-native	rare

<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>STATUS</u>	<u>ABUNDANC</u>
<i>Lactuca sativa</i> L.	prickly lettuce	non-native	rare
<i>Senecio madagascariensis</i> Poir.	fire weed	non-native	uncommon
<i>Sonchus oleraceus</i> L.	<i>yualele</i>	non-native	rare
<i>Verbesina encelioides</i> (Cav.) Benth. & Hook.	golden crown-beard	non-native	common
BIGNONIACEAE (Bignonia Family)			
<i>Jacaranda mimosifolia</i> D. Don	jacaranda	non-native	rare
<i>Podranea ricasoliana</i> (Tanfani) Sprague	pink trumpet vine	non-native	rare
BRASSICACEAE (Mustard Family)			
<i>Capsella bursa-pastoris</i> (L.) Medick	shepherds purse	non-native	uncommon
<i>Coronopus didymus</i> (L.) Sm.	swine cress	non-native	uncommon
<i>Lepidium virginicum</i> L.	-----	non-native	rare
<i>Sisymbrium officinale</i> (L.) Scop.	hedge mustard	non-native	rare
CACTACEAE (Cactus Family)			
<i>Opuntia ficus-indica</i> (L.) Mill.	panini	non-native	rare
CARYOPHYLLACEAE (Pink Family)			
<i>Petrorhagia velutina</i> (Guss.) P. Ball & Heyw.	childing pink	non-native	rare
<i>Polycarpon tetraphyllum</i> (L.) L.	-----	non-native	rare
<i>Silene gallica</i> L.	small-flowered catchfly	non-native	rare
CHENOPODIACEAE (Goosefoot Family)			
<i>Chenopodium album</i> L.	goosefoot	non-native	uncommon
<i>Chenopodium ambrosioides</i> L.	Mexican tea	non-native	rare
<i>Chenopodium murale</i> L.	'aheahea	non-native	rare
CONVOLVULACEAE (Morning Glory Family)			
<i>Ipomoea indica</i> (J.Burm.) Merr.	koali awahia	indigenous	uncommon
CUCURBITACEAE (Gourd Family)			

<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>STATUS</u>	<u>ABUNDANCE</u>
<i>Sicyos pachycarpus</i> Hook. & Arnott	kupala	endemic	uncommon
EUPHORBIACEAE (Spurge Family)			
<i>Ricinus communis</i> L.	Castor bean	non-native	uncommon
FABACEAE (Pea Family)			
<i>Acacia mearnsii</i> De Wildman	black wattle	non-native	uncommon
<i>Chamaecrista nictitans</i> (L.) Moench	partridge pea	non-native	rare
<i>Desmodium intortum</i> (Mill.) Urb.	-----	non-native	rare
<i>Desmodium sandwicense</i> E. Meyer	Spanish clover	non-native	uncommon
<i>Indigofera suffruticosa</i> Mill.	'iniko	non-native	uncommon
<i>Macroptilium lathyroides</i> (L.) Urb.	wild bean	non-native	rare
<i>Medicago lupulina</i> L.	black medick	non-native	rare
<i>Medicago polymorpha</i> L.	bur clover	non-native	uncommon
<i>Melilotus indica</i> (L.) All.	yellow sweet clover	non-native	uncommon
<i>Neonotonia wightii</i> (Wight & Arnott) Lackey	tineroo	non-native	uncommon
<i>Trifolium repens</i> L.	white clover	non-native	uncommon
<i>Vicia sativa</i> L.	common vetch	non-native	rare
LAMIACEAE (Mint Family)			
<i>Salvia coccinea</i> B. Juss. ex Murray	scarlet sage	non-native	rare
LAURACEAE (Laurel Family)			
<i>Persea americana</i> Mill.	avocado	non-native	rare
MALVACEAE (Mallow Family)			
<i>Abutilon grandifolium</i> (Willd.) Sweet	hairy abutilon	non-native	uncommon
<i>Malva neglecta</i> Walfr.	cheeseweed	non-native	rare
<i>Sida rhombifolia</i> L.	Cuban jute	non-native	uncommon
MYRTACEAE (Myrtle Family)			
<i>Eucalyptus robusta</i> J.E. Smith	swamp-mahogany	non-native	rare

<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>STATUS</u>	<u>ABUNDANCE</u>
<i>Psidium guajava</i> L.	guava	non-native	rare
ONAGRACEAE (Evening Primrose Family)			
<i>Oenothera laciniata</i> J. Hill	cut-leaved evening primrose	non-native	rare
OXALIDACEAE (Wood Sorrel Family)			
<i>Oxalis corniculata</i> L.	'ihi'ai	non-native	rare
PASSIFLORACEAE (Passion Flower Family)			
<i>Passiflora subpeltata</i> Ort.	white passion flower	non-native	rare
PLANTAGINACEAE (Plantain Family)			
<i>Plantago lanceolata</i> L.	narrow-leaved plantain	non-native	rare
PORTULACACEAE (Purslane Family)			
<i>Portulaca oleracea</i> L.	pigweed	non-native	rare
PRIMULACEAE (Primrose Family)			
<i>Anagallis arvensis</i> L.	scarlet pimpernel	non-native	rare
PROTEACEAE (Protea Family)			
<i>Grevillea robusta</i> A. Cunn. ex R. Br.	silk oak	non-native	rare
PUNICACEAE (Pomegranate Family)			
<i>Punica granatum</i> L.	pomegranate	non-native	rare
ROSACEAE (Rose Family)			
<i>Cotoneaster pannosus</i> Franch.	cotoneaster	non-native	rare
<i>Prunus persica</i> (L.) Batsch	peach	non-native	rare
SOLANACEAE (Nightshade Family)			
<i>Nicandra physalodes</i> (L.) Gaertn.	apple of Peru	non-native	uncommon
<i>Solanum americanum</i> Mill.	popoio	indigenous	rare
STERCULIACEAE (Cacao Family)			
<i>Waltheria indica</i> L.	'uhaloa	indigenous	rare
TILIACEAE (Linden Family)			

SCIENTIFIC NAME

*Triumfetta semitriloba* Jacq.

TROPAEOLACEAE (Nasturtium Family)

*Tropaeolum majus* L.

VERBENACEAE (Verbena Family)

*Lantana camara* L.

*Verbena littoralis* Kunth

COMMON NAME

Sacramento bur

garden nasturtium

lantana

ha'u owi

STATUS

non-native

non-native

non-native

non-native

ABUNDANCE

uncommon

rare

uncommon

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 (*Lasturus 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 Keahuaiwi 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 auro-punctatus*), 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 cardinalis*) – 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 sandwichensis*) – 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 diphone*) – One bush warbler was heard calling from dense brush near the bottom of the property.

Pacific golden plover, Kolea (*Phuvialis 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 (*Nothocestrum 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.

<u>COMMON NAME</u>	<u>SCIENTIFIC NAME</u>	<u>STATUS</u>	<u>ABUNDANCE</u>
<b><u>MAMMALS</u></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><u>BIRDS</u></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>Pluvialis fulva</i>	migratory	rare

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