JAMES "KIMO" APANA
Mayor

JOHN E. MIN
Director

CLAYTON I. YOSHIDA
Deputy Director

COUNTY OF MAUI
DEPARTMENT OF PLANNING

RECEIVED
'03 JAN -3 P2:19
OFC. OF ENVIRONMENTAL QUALITY CONTROL

December 30, 2002

Genevieve Salmonson, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Ms. Salmonson:

RE: Final Environmental Impact Statement (EIS) for the Kapalua Mauka (PD2) Project, TMK: 4-2-01:01 (por); TMK: 4-2-05:50 (por); TMK: 4-2-05:51; TMK: 4-3-01:06 (por); TMK: 4-3-01:07 (por) and TMK: 4-3-01: 08 (por) Kapalua, Maui, Hawaii (EIS 2002/0001)

The Planning Department is hereby providing further clarification, pursuant to Chapter 200 Environmental Impact Statement Rules, Section 11-200-23(d), that the Maui Planning Department's acceptance of the Final Environmental Impact Statement ("EIS" or "Statement") for the Kapalua Mauka Project District 2 published in the Environmental Notice on November 8, 2002, was made based on the following findings and reasons:

> The Statement, in its completed form, represents an informational instrument which fulfills the definition of an environmental impact statement and adequately discloses and describes all identifiable environmental impacts and satisfactorily responds to review comments, in accordance with Hawaii Administrative Rule Section 11-200-23(a).
>
> In addition, all of the criteria set forth in Hawaii Administrative Rule ("HAR") Section 11-200-23(b) have been satisfied as follows:

1. The procedures for assessment, consultation process, review, and the preparation and submission of the statement, have all been completed satisfactorily as specified in Chapter 200, Hawaii Administrative Rules (HAR).

2. The content requirements described in Chapter 200, HAR, have been satisfied.

3. Comments submitted during the review process have received responses satisfactory to the accepting authority, or approving agency, and have been incorporated in the statement.

The final approvals for the proposed action will require further public input through public hearings at both the state and county levels. In order for the proposed action to be initiated, approvals from the State Land Use Commission, Maui County Council, Mayor, and Maui Planning Commission are required.

If additional clarification is required, please contact Ms. Ann T. Cua, Staff Planner, of this office at 270-7735.

Very truly yours,

Clayton I. Yoshida

for JOHN E. MIN
Planning Director

JEM:ATC:tlm
c: Clayton I. Yoshida, AICP, Deputy Planning Director
Thomas S. Witten, ASLA, President, PBR Hawaii
Ann T. Cua, Staff Planner
Project File
General File
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JAMES "KIMO" APANA
Mayor

JOHN E. MIN
Director

CLAYTON I. YOSHIDA
Deputy Director

COUNTY OF MAUI
DEPARTMENT OF PLANNING

October 25, 2002

RECEIVED
'02 OCT 30 P4:10
OFC. OF ENVIRONMENTAL QUALITY CONTROL

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Ms. Salmonson:

RE: Kapalua Mauka (Project District 2) Final Environmental Impact Statement (FEIS), TMK: 4-2-001:001 (Por.), 4-2-005:50 (Por.), 4-2-005:051, 4-3-001:006 (Por.), 4-3-001:007 (Por.), and 4-3-001:008 (Por.), Kapalua, Maui, Hawaii (EIS 2001/0002)

The Maui Planning Department has reviewed the Final Environmental Impact Statement (FEIS) for the subject project and finds it to be acceptable according to the requirements set forth in Title 11, Department of Health, Chapter 200, Hawaii Administrative Rules.

With this letter, we respectfully request notice of the publication of the subject FEIS and its acceptance in the November 8, 2002, OEQC Environmental Notice. Enclosed please find the following items:

- Four (4) Copies of the FEIS
- Completed OEQC Publication Form
- FEIS Distribution Cover Letter to Participants
- FEIS Distribution List

Thank you for your cooperation. If additional clarification is required, please contact Ms. Ann Cua, Staff Planner, of this office at 270-7735.

Very truly yours,

John E. Min

JOHN E. MIN
Planning Director

2002 FEIS MAUI
KAPALUA MAUKA RESORT EXPANSION

NOV 8 2002
FILE COPY

Kapalua Mauka

(PROJECT DISTRICT 2)

Final Environmental Impact Statement

TMK 4-2-01: 1 (portion); TMK 4-2-05: 50 (portion); TMK 4-2-05: 51;
TMK 4-3-01: 6 (portion); TMK 4-3-01: 7 (portion); and 4-3-01: 8 (portion),
Kapalua, Maui, Hawai'i

Prepared for:

The Accepting Authority,
County of Maui Department of Planning
&
Maui Land & Pineapple Company, Inc.

Prepared by:

PBR Hawaii

November 2002

Kapalua Mauka

(PROJECT DISTRICT 2)

Final Environmental Impact Statement

TMK 4-2-01: 1 (portion); TMK 4-2-05: 50 (portion); TMK 4-2-05: 51;
TMK 4-3-01: 6 (portion); TMK 4-3-01: 7 (portion); and 4-3-01: 8 (portion),
Kapalua, Maui, Hawai'i

This environmental impact statement is submitted pursuant to
Chapter 343, Hawaii Revised Statutes

Prepared for:
The Accepting Authority,
County of Maui Department of Planning
&
Maui Land & Pineapple Company, Inc.

Prepared by:
PBR HAWAII

This environmental impact statement and all ancillary documents were prepared under my direction or supervision and the information submitted, to the best of my knowledge, fully addresses document content requirements as set forth in Section 11-200-17 and Section 11-200-18, Hawai'i Administrative Rules.

Thomas S. Witten 11/8/02
Thomas S. Witten, ASLA, President,
PBR HAWAII

November 2002

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

1.0 Introduction & Summary

1.0 INTRODUCTION AND SUMMARY

This ~~draft~~ final environmental impact statement is prepared in accordance with Chapter 343, *Hawai'i Revised Statutes* (HRS), for the Kapalua Mauka community in West Maui, Island of Maui.

1.1 INTRODUCTION

1.1.1 Project Profile

Project Name:	Kapalua Mauka (Project District 2)
Location:	Kapalua, West Maui, Maui, Hawai'i
Judicial District:	Lahaina
Landowner:	Maui Land & Pineapple Company, Inc., and State of Hawai'i
Applicant:	Kapalua Land Company, Ltd., a wholly-owned subsidiary of Maui Land & Pineapple Company, Inc.
Tax Map Key:	4-2-01: 1 (portion); 4-2-05: 50 (portion); 4-2-05: 51; 4-3-01: 6 (portion); 4-3-01: 7 (portion); and 4-3-01: 8 (portion)
Project Area:	Approximately 925 acres
Existing Uses:	Golf course (The Village Golf Course, 16 holes), pineapple cultivation, fallow agricultural fields, vacant open space (valleys and gulches).
Proposed Use:	Residential, golf course and related amenities, and open space.
Land Use Designations:	State Land Use: Agricultural Community Plan: Project District, Agricultural, Conservation, Open Space County Zoning: Agricultural, Interim, Open Space, Project District Special Management Area (SMA): Not in SMA
Permits/Approvals Required:	Community Plan Amendment Compliance with Chapter 343, Hawai'i Revised Statutes State Land Use District Boundary Amendment from: 1) ~~Agriculture~~ Agricultural to Urban; and 2) ~~Agriculture~~ Agricultural to Rural. Project District Phase I/Change in Zoning Project District Phases II and III
Accepting Authority:	Planning Department, County of Maui

1.1.2 Compliance With State of Hawai'i And County of Maui Environmental Laws

This document has been prepared in accordance with the provisions of *Hawai'i Revised Statutes* (HRS) Chapter 343 and *Hawai'i Administrative Rules* Title 11, Department of Health, Chapter 200, Environmental Impact Statement Rules. Section 343-5, HRS, establishes eight "triggers" that require compliance with these regulations. The triggers applicable to the Kapalua Mauka Community include:

- Use of State or County lands
- Any amendment to existing county general plans, including development and community plans, where the amendment would result in designations other than agriculture, conservation, or preservation;

This document has also been prepared in accordance with Maui County Code Section 280A.060(D)(8), which requires a draft environmental assessment (EA) as one of the elements of a community plan amendment application.

Because landowner Maui Land & Pineapple Company, Inc., wishes to provide a thorough environmental review of the proposed Kapalua Mauka community, this ~~draft~~ final environmental impact statement (EIS) has been prepared rather than only an EA. This ~~draft~~ final EIS was preceded by the *Kapalua Mauka (Project District 2) Draft Environmental Impact Statement* and the *Kapalua Mauka Environmental Assessment/Environmental Impact Statement Preparation Notice* (EISPN)~~,~~. ~~which~~

The *Kapalua Mauka (Project District 2) Draft Environmental Impact Statement* was submitted to the Office of Environmental Quality Control on December 21, 2001. Notice of the availability of the draft EIS was published in the January 8, 2002 edition of OEQC's *The Environmental Notice*. Copies of the draft EIS were provided to appropriate government agencies and other organizations. The public comment period for the draft EIS ended on February 22, 2002. Comments on the draft EIS have been incorporated in this final EIS.

The *Kapalua Mauka Environmental Assessment/Environmental Impact Statement Preparation Notice* (EISPN) was submitted to the Office of Environmental Quality Control on August 10, 2001. Notice of the availability of the EISPN was published in the August 23, 2001 edition of OEQC's *The Environmental Notice*. Copies of the EISPN were provided to appropriate government agencies and other organizations. The public comment period for the EISPN ended on September 22, 2001. Comments on the EISPN have been incorporated in ~~this~~ the draft EIS ~~and final EIS~~.

1.2 EXECUTIVE SUMMARY

1.2.1 Kapalua Mauka Community Summary Description

The Kapalua Mauka community is a master-planned resort residential and recreational community comprised of 690 homes, a golf course and related recreational amenities on approximately 925 acres of land mauka of the Kapalua Resort and Honoapi'ilani highway in the West Maui region of Maui. Originally planned as a 450-acre, 750-unit community—as described in the *West Maui Community Plan* (County of Maui 1996)—the current master plan expands the area of the community but reduces the number of allowable housing units. With a reduction of 60 units, combined with the expanded area, the overall residential density is greatly reduced.

As part of the community, the current 18-hole The Village Golf Course that now has 16 holes on the site (the other two holes are makai of Honoapi'ilani Highway) is proposed to be expanded to a total of 27 holes. This expansion may include the addition of a secondary clubhouse within the Kapalua Mauka community site.

The community is designed with higher density urban uses toward the interior of the site and larger rural lots around the edges providing a gentle transition to the remaining agricultural fields. Residential uses and other development within the Kapalua Mauka community will maintain the same high standards established throughout the Kapalua Resort. The community will be master planned to ensure the appropriate use of materials, colors, site design standards, and landscaping. Community covenants and design standards will be implemented and enforced to maintain appropriate community character over time.

The Kapalua Mauka community will be integrated into the contours of the site to blend with the existing Kapalua Resort and to maintain the rural attributes of the mauka area. Although the topography is gently rolling in some areas, the portions of the community planned for residential uses are located on relatively flat areas currently cultivated in pineapple.

Approximately ~~134~~ 177 acres of the Kapalua Mauka community will remain in permanent open space that may be enjoyed by community residents and all Maui residents as passive parks. In addition, the golf course and related recreational amenities will provide open space, scenic vistas, and opportunities for both active and passive uses of the area. The community will also have extensive landscape buffers and will be designed to foster a pedestrian-oriented environment with bike and pedestrian pathways connecting to the rest of Kapalua Resort, makai of the Honoapi'ilani Highway.

The community site is proposed to include Agricultural, Rural, and Urban land use classifications as specified under the State Land Use Law (Chapter 205, Hawai'i Revised Statutes). Landowner Maui Land & Pineapple Company, Inc., will seek a State Land Use District Boundary Amendment to change the land use designation from the current Agricultural District to the appropriate districts. Residential areas would be in both Rural and Urban areas with lot sizes and housing types that correspond to the requirements of each district. Residential development is not proposed in the Agricultural district, which will be retained for the gulch areas within the community area.

Currently, 450 acres of the community site are designated as Project District 2 in the West Maui Community Plan. A community plan amendment will be sought to designate the entire 925-acre community site as Project District 2. Concurrent with the community plan amendment, landowner Maui Land & Pineapple Company, Inc., will seek to obtain the appropriate project district zoning designations for the property.

Development and sales of the Kapalua Mauka community are projected to occur over a 20-year period. Within this total time, before construction, permitting and entitlement processing is expected to take three years. Construction of the major backbone infrastructure, including the expansion of the golf course, is estimated to take two years.

1.2.2 Summary of Potential Impacts and Proposed Mitigation Measures

Development of the Kapalua Mauka community will transform the pineapples fields of the site into a resort residential and recreational community. For areas of environmental concern, appropriate mitigation measures have been planned as part of the community. For areas of particular concern, the following summarizes the associated mitigation measures that are either recommended or planned to ensure that potential adverse impacts are minimized or mitigated.

Botanical Resources

Botanical surveys of the Kapalua Mauka site found the majority of the vegetation in the area is composed of introduced species such as Eucalyptus, Formosan koa, Christmas berry, California grass, and actively cultivated pineapple fields. One relatively intact native plant community, the mixed native scrub, is found on the upper slopes of Honokahua Gulch on its mauka section. None of the plants inventoried on the Kapalua Mauka community site is a threatened or endangered species or a species of concern.

The Kapalua Mauka community will be limited to broad, gently sloping ridge areas now used for the golf course, pineapple cultivation, and pastures—all areas of exotic, introduced species. The establishment of the community will include grubbing of the pineapple fields and pastures. However, because the community will be developed in phases over a 14-year construction period, grubbed areas will be limited to specific areas for short periods of time.

The low-density, rural character of much the community will provide extensive open space. Select native species that occur naturally on the property may be incorporated as landscaping elements throughout the community. New landscaping will also include native, indigenous, and Polynesian introduced plants, increasing the botanical diversity of the area. To the extent possible, existing trees will be preserved and integrated in the community landscaping.

Wildlife Resources

Faunal surveys of the Kapalua Mauka community site found birds and mammals typical of the West Maui region. No threatened or endangered species were observed. The only native bird observed on site was the Short-eared Owl or Pueo (*Asio flammeus sandwichensis*) which is common on Maui. Other birds and mammals found on the site are introduced species. The gulches contain a dense forest of largely introduced vegetation. No unusual or unique habitats were encountered. Areas of similar habitat occur commonly in West Maui.

The low-density, rural character of much the Kapalua Mauka community will provide extensive wildlife habitat. The establishment of the community will include grubbing of the pineapple fields and pastures, possibly impacting habitat on a temporary basis. However, because the community will be developed in phases over a 14-year construction period, grubbed areas will be limited to specific areas for short periods of time. New landscaping may make the area more attractive to the introduced species of birds that already thrive in the golf course area.

Agricultural Impact

Maui Pineapple Company, Ltd. (a subsidiary of Maui Land & Pineapple Company, Inc.) currently cultivates pineapple on approximately 169 acres of the Kapalua Mauka community site. Development of the Kapalua Mauka community will require that land currently in pineapple cultivation be withdrawn from agricultural use. This amounts to 1.9 percent of the 9,100 acres currently being farmed by Maui Pineapple Company, Ltd. An agricultural impact analysis prepared for this environmental impact statement (see section 4.4 and Appendix B) concludes that the Kapalua Mauka Community will not have an adverse impact on the agricultural operations of Maui Pineapple Company, Ltd.

Archaeological Resources

Archaeological surveys of the Kapalua Mauka community site were completed in 1998 and 2001. The 1998 survey recommends preservation of three historic properties. The 2001 archaeological survey recommends preservation of 37 historic properties. Section 5.1 contains summaries of the surveys; the full surveys are included in Appendix F-1 and Appendix F-2.

All significant historical and cultural sites recommended for preservation in the surveys will be preserved. An overall preservation plan for the entire 925-acre Kapalua Mauka community site will also be prepared in consultation with the State Historic Preservation Division (SHPD) and the Maui and Lāna'i Islands Burial Council. In addition, Maui Land & Pineapple Company, Inc., and all of its subcontractors will comply will all state and county laws and rules regarding the preservation of cultural and historic sites should any be found during construction. As such, the archaeological features of the site are not expected to impacted by the development of the Kapalua Mauka community.

Cultural Impacts

To assess the cultural impacts of the Kapalua Mauka Community, Xamanek Researches reviewed historical records, performed an archaeological survey, and conducted interviews with people knowledgeable with the area.

In general, the interviews produced information supporting the expressed feeling by the interviewees that the Kapalua Mauka community was not "threatening" to perceived lifestyles by local residents. All felt that they could access the lands if they wanted to or needed to. Most were familiar with the existence of lo'i in the valleys, but did not think they were that important for agricultural uses anymore, but that they should be preserved and that access to visit the sites should be granted to those interested. Most all contributors had either hunted in the lands at one time or another, or felt that as long as they could hunt there, if they wanted to, it was "alright." All interviewees were very pleased with the preservation of archaeological sites in the valleys and their future protection. There was appreciation for the general concern shown by Kapalua for these matters and also, the protection of the land for the future.

Based on the historical background, archaeological research, and the interviews of individuals recognized as knowledgeable, the study conducted by Xamanek Researches did not identify any cultural practices that may be affected by the Kapalua Mauka community. Presently the only known recorded culturally significant sites are the archaeological features that have been identified by the archaeological surveys for the area.

Persons interviewed by Xamanek Researches for the cultural impact assessment stated they are aware of the existence of lo'i in the area, but the archaeological surveys of the Kapalua Mauka community site did not identify any lo'i. According to the revised archaeological survey by Xamanek Researches (see Appendix F-2), any lo'i in the area may be located outside of the boundaries of the Kapalua Mauka site further mauka in the gulches where there would have been more consistent flows of water.

Since all archaeological sites within the gulches will be placed in "as is" preservation and there will be no development in the gulches beyond necessary infrastructure, any lo'i that may be present will not be disturbed. ~~Mitigation measures for these~~ Preservation of the archaeological resources is discussed in section 5.1 and within the archaeological survey reports in Appendix F-1 and Appendix F-2.

Trails and Access

Landowner Maui Land & Pineapple Company, Inc., currently grants requests for access to its lands and will continue to allow access after the Kapalua Mauka community is established.

Trails on the immediate Kapalua Mauka community site are limited due to the agricultural operations. Pineapple cultivation areas are sectioned into fields with dirt roads providing access to each field. Trails to the upper mauka regions may be present, but are not marked or mapped. Unmapped roads and trails are present within the gulches of the site.

Relative to the existing agricultural use of the land, in which the entire area is gated, the establishment of the Kapalua Mauka community will make the area more accessible. Access to any trails that may be present on the site or in the area will not be limited by the development of the Kapalua Mauka community.

Traffic

A Traffic Impact Assessment Report (TIAR) prepared for the Kapalua Resort area (including the Kapalua Mauka Community) concludes: "the proposed PD-2 Development and the build out of the Kapalua Resort can be accommodated by the Honoapi'ilani Highway corridor between Kapalua and Honokōwai." However, Maui Land & Pineapple Company, Inc., is committed to paying its pro rata fair share of the costs of regional improvements to Honoapi'ilani Highway.

The implications of the traffic impacts of 750 residential units were taken into consideration when Project District 2 was included within the *West Maui Community Plan* during the 1992 plan update. According to the Plan: "the update process incorporated technical studies and assessments." These included an "Infrastructure Assessment" that identified "infrastructure (e.g., roadways, drainage, water, telephone, and electrical systems) limits and opportunities in high-growth community plan regions." The Plan also states "the update process was driven by the work of the Lahaina Citizens Advisory Committee (CAC). This 14-member panel met a total of 17 times during a 225-day deliberation process to identify, formulate and recommend appropriate revisions to the Lahaina

Community Plan." Thus, the traffic impacts of the development of Project District 2 have been considered and given a thorough public review during the community plan update process.

Population

The resort residential nature of the community will equate to a population that would be less than the population a community of this size would generate as a typical housing project oriented to full-time residents. The full-time resident population of the Kapalua Mauka community is estimated to reach 341 persons after build-out. With an estimated non-resident population of approximately 499 persons, the de facto population of the community is estimated to be approximately 840 persons at any given time. Some of the full-time residents will be relocating from other areas on the island, and some of the visitors will be drawn from other Maui resorts, so that the population of the Kapalua Mauka community will not be fully new to the island.

Public Services

Because most of the population will be visitors using their second homes, pressure on government services and funds will be less than a community of full-time residents, as visitors typically do not rely on the full range of government services that full time residents expect. However, property owners at Kapalua Mauka, even if they are not full-time residents, will pay property taxes (on high value property) on a full-time basis, and excise taxes when they purchase goods and services on the island.

The community will be subject to the Department of Education's fair share requirements for new school facilities ~~and Maui Land & Pineapple Company, Inc., is willing to designate a school site on its West Maui property if the State Department of Education determines that there is sufficient demand.~~ In comments on the draft environmental impact statement the Department of Education stated that they do not anticipate the need for a school site in the Kapalua region and that their requirements for the community would be cash-based.

Maui Land & Pineapple Company, Inc., will comply with County of Maui requirements for affordable housing. In fact, Maui Land & Pineapple Company, Inc., has a strong history of providing affordable and employee housing. All totaled, Maui Land & Pineapple Company, Inc., has developed 450 affordable/employee housing units on Maui. Maui Land & Pineapple Company, Inc., also has complied with all requirements for affordable or employee housing previously imposed as conditions of developing the existing Kapalua Resort.

In May of 2002, Maui Land & Pineapple Company, Inc., ~~will start~~ started development of Kapua Village Subdivision, a new 45-lot employee subdivision project in West Maui. Maui Land & Pineapple Company, Inc., is developing this subdivision on their own accord, as a benefit for their employees ~~. Depending on still pending County of Maui affordable housing requirements, this subdivision may satisfy, or partially satisfy, the affordable housing requirements for the Kapalua Mauka community~~ and is not receiving any County affordable housing credits for the project. These lots will be sold to employees at prices significantly below market prices.

In addition, as part of the proposed land exchange between the State of Hawai'i and Maui Land & Pineapple Company, Inc. (see section 2.1.3), Maui Land & Pineapple Company, Inc., is also proposing to obtain the State-owned parcel (TMK 4-3-01: 05) between Honoapi'ilani Highway and the Lower Honoapi'ilani Road and adjacent to the Kapalua Bay Golf Course that was proposed as a portion of the Nāpili regional park in the *West Maui Community Plan.* If Maui Land & Pineapple Company, Inc., obtains this site, they intend to maintain the area as open space and create a mauka-makai pedestrian and bicycle trail on the Kapalua side of the gulch. This open space pedestrian and bicycle trail would supplement the existing, adjacent Nāpili Park, essentially creating an extension of the existing park. In addition, Maui Land & Pineapple Company, Inc., would build and maintain the pedestrian and bicycle trail and maintain the open space without cost to the County of Maui.

Economic Impacts

The Kapalua Mauka community will enhance the economic environment and stimulate economic diversification relative to the present agricultural use of the property. Some of the economic benefits of the community include:

- During the 20-year build out and sales period the Kapalua Mauka community is projected to generate approximately $72.9 million in taxes for the County of Maui; and approximately $101.9 million for the State of Hawai'i.
- After build out annual taxes generated from the community are projected to be approximately $5.6 million for the County and approximately $5.2 million for the State.
- Total wages generated over build out are estimated to be $291.6 million.
- An estimated 4,990 "worker years" of direct on-site employment and an additional 2,495 "worker years" of off-site employment during build out (A "worker year" is the amount of time one full-time worker can work in one year).
- An estimated 226 permanent jobs and $6.2 million in annual wages from community operations and maintenance.
- More that $49.6 million per year in discretionary expenditures infused into the island economy from community residents and guests.

Water and Wastewater

Existing water systems for both potable and non-potable water in the Kapalua area are owned by ~~Kapalua Water Company, a subsidiary of~~ Maui Land & Pineapple Company, Inc. or its subsidiaries. These systems have adequate capacity to meet the needs of the Kapalua Mauka community (see section 5.9.3).

~~Kapalua Water Company, Ltd.,~~ Maui Land & Pineapple Company, Inc., or its subsidiaries will build, operate, and maintain new potable and non-potable water storage and distribution systems within the Kapalua Mauka community. In addition, a private wastewater system will be developed and connected to the County's Lahaina Wastewater Treatment Facility. The Lahaina Wastewater Treatment Facility has adequate capacity to handle the expected amount of wastewater from the community (see section 5.9.4).

Solid Waste

Kapalua Resort is an active participant in recycling programs and intends to continue its participation with the addition of Kapalua Mauka community. To the extent practical, wastes such as aluminum, paper, newspaper, glass, and plastic containers will be recycled. Green waste may be processed on-site. Waste that cannot be recycled or incorporated into on-site green waste processing will be disposed of in the County's central landfill in Pu'unēnē. The community will be serviced by a private refuse collection agency contracted by the homeowner's association.

Drainage

The community is not expected to have a significant adverse effect on either the existing watershed, downstream properties, or coastal marine waters; it will be designed to complement the site's natural attributes and mitigate environmental conflicts. Natural drainage ways will be preserved. Post-development runoff is expected to increase slightly, however, detention and desilting basins within the community site will maintain the exiting flows and there will be no increase in runoff flowing from the site (for more information on drainage of the site see Section 5.9.2). Design of the community will adhere to all state and county regulations regarding drainage and runoff so that there will be no adverse flooding conditions for downstream properties.

Maui Land & Pineapple Company, Inc., has also initiated a water quality monitoring program for Honokahua Bay and Nāpili Bay which receive runoff and groundwater flow from the Kapalua Mauka area. The intent of the first study is to establish a baseline set of conditions that can be used to evaluate impacts to water quality in Honokahua Bay and Nāpili Bay. In addition, results of the water quality assessment can be used to address the effects of groundwater withdrawal associated with the Kapalua Mauka community on the nearshore ecosystems within the two bays. Additional studies will be conduced on a periodic basis.

1.2.3 Relationship to Land Use Policies

State Land Use Law, Chapter 205, Hawai'i Revised Statutes. To accommodate the uses proposed within the Kapalua Mauka community, landowner Maui Land & Pineapple Company, Inc., will seek to reclassify approximately ~~450~~ 511 acres of the site to the Urban district and another approximately ~~341~~ 280 acres of the site to the Rural district. Approximately 134 acres will remain in the Agricultural district. Lands remaining in the Agricultural District are primarily the gulches and natural drainageways of the site and no development is proposed for these areas.

West Maui Community Plan. The Kapalua Mauka community is consistent with the intent of the *West Maui Community Plan* which envisions recreational and residential uses within Project District 2.

As proposed, the Kapalua Mauka community would be 925 acres. Approximately 450 acres of the Kapalua Mauka community site is already designated as Project District 2 in the *West Maui Community Plan.* To conform the additional area of the Kapalua Mauka community with the *West Maui Community Plan,* landowner Maui Land & Pineapple Company, Inc., will seek a community plan amendment. As stated in the Plan, the intent of Project District 2 is to provide, within the context of Kapalua Resort, a mix of recreational activities including an existing golf course (with possible expansion to 27 holes), a clubhouse, pro shop, restaurants and bars, tennis courts, swimming pool, and other related recreational amenities and commercial services. The Plan also specifies that the Project District 2 is to include 750 residential units integrated with, and complementary to, the recreational facilities.

The proposed Kapalua Mauka community will extend beyond the current Project District 2 area of 450 acres, however, the number of residential units will not exceed 690—sixty units less than specified in the *West Maui Community Plan*. The resulting community will be far less dense than what is currently envisioned and actual community growth and the required regional infrastructure needs will not exceed what has been established in the *West Maui Community Plan*, which has a community planning horizon of 20 years.

1.2.4 Required Permits and Approvals

A preliminary list of permits and approvals required for the Kapalua Mauka community is presented in below.

Required Permits and Approvals

Permit/Approval	Responsible Agency
Chapter 343, HRS compliance	County of Maui Planning Department Office of Environmental Quality Control
Community Plan Amendment	County of Maui Planning Department/County Council
State Land Use District Boundary Amendment	Land Use Commission
Project District Phase I/Change in Zone	County of Maui Planning Department/Maui Planning Commission (public hearing in West Maui)/County Council
Project District Phase II	County of Maui Planning Department/Maui Planning Commission (public hearing in West Maui)
Project District Phase III	County of Maui Planning Department
Subdivision Approval	County of Maui Department of Public Works and Waste Management
Grading/Building Permits	County of Maui Department of Public Works and Waste Management
NPDES Permit	State Department of Health
Permit to Perform Work within a State Highway Right-of-way	State Department of Transportation
Permit for Discharge into the State Drainage System	State Department of Transportation
Permit for Connection into the State Drainage System	State Department of Transportation
Compliance with Chapter 6E, HRS	State Historic Preservation Division
ADA Accessibility	Disability and Communication Access Board

1.2.5 Alternatives to the Proposed Action

The alternatives that have been considered are:

1) No action;
2) No expansion of Project District 2 (i.e., keeping Project District 2 at its current size of 450 acres and not increasing it to 925 acres);
3) Agricultural subdivision;
4) Postponing action pending further study; and
5) Alternative locations.

None of these alternatives meet all of the project objectives to: 1) provide an appropriate and sensitive use of the land in context with Maui's environmental, social, and economic needs; 2) provide for the logical and long-planned expansion of the Kapalua Resort; and 3) develop a high-quality resort residential and recreation community that respects the rural character and natural beauty of the land.

The alternatives considered and the reasons for their rejection are fully described in Section 7.

1.2.6 Probable Adverse Environmental Effects That Cannot Be Avoided

Potential adverse environmental effects that cannot be avoided include changes to the land use character of the region, the visual appearance of the site, impacts from increased traffic, increases in solid waste generated, increases in electrical power consumed, and short-term impacts to air quality and noise levels due to construction. These impacts are more fully discussed in section 8.4 and in individual sections throughout this document.

1.2.7 Cumulative and Secondary Impacts

To assess the cumulative and secondary impacts of the Kapalua Mauka community in context with other projects, the *West Maui Community Plan* was used as the basis of reasonably anticipated development in the area. The major projects anticipated for the area, as described in the *West Maui Community Plan*, are discussed in Section 8.2. Cumulative and secondary impacts resulting from these projects, along with the Kapalua Mauka community, are likely to include increased population and traffic and greater demands on public infrastructure systems and services. It also could be expected that the community character of the region may change as more people live in the area.

1.2.8 Rational for Proceeding with the Kapalua Mauka Community Notwithstanding Unavoidable Effects

In light of the above mentioned unavoidable effects, the creation of the Kapalua Mauka community should proceed because the relatively minor negative impacts of the community will be offset by substantial positive impacts, including: 1) the responsible stewardship of the land provided by the community; 2) substantial conformance with the *West Maui Community Plan*; 3) the wages, taxes, and overall positive economic impacts of the community.

1.2.9 Unresolved Issue

Maui Land & Pineapple Company, Inc., is currently in discussions with the State of Hawai'i to obtain State-owned parcels (totaling 191 acres) adjoining the majority of the Kapalua Mauka community site through a land exchange (see Section 2.1.3.) If obtained from the State, approximately 60 acres from these parcels will be included in the Kapalua Mauka community. The remainder of the land will be left in permanent open space, to be owned and maintained by Maui Land & Pineapple Company, Inc.

On July 27, 2001, the Board of Land and Natural Resources authorized Maui Land & Pineapple Company, Inc., to include approximately 60 acres of the State-owned parcels in the entitlement processing for the proposed Kapalua Mauka Community while negotiating the land exchange.

At the present time, Maui Land & Pineapple Company, Inc., and the State of Hawai'i have not agreed upon a suitable parcel for the exchange and the issue remains unresolved. If a land exchange between Maui Land & Pineapple Company, Inc., and the State of Hawai'i cannot be negotiated, Maui Land & Pineapple Company, Inc., intends to proceed with the Kapalua Mauka community without the State-owned lands. This would reduce the area of the Kapalua Mauka community by approximately 60 acres (approximately six percent), so that the Kapalua Mauka community site would then be approximately 865 acres. It is not expected that the number of residential units (690) would change because of this reduction in area, however, lot sizes in some areas may be somewhat smaller. Residential density would change from approximately 0.7 units per acre to approximately 0.8 units per acre. The golf course layout may change somewhat and the amount of open space could also change slightly.

2.0 Kapalua Mauka Community Description

2.0 KAPALUA MAUKA COMMUNITY DESCRIPTION

This section provides background information and a general description of the proposed Kapalua Mauka community and discusses the development timetable and preliminary development costs.

2.1 BACKGROUND INFORMATION

2.1.1 Location

The Kapalua Mauka community site is located within the Kapalua Resort in the West Maui region of the Island of Maui, Hawai'i (Figure 1). Approximately 450 acres of the community site are described and identified as "Project District 2" within the *West Maui Community Plan.* The community site is proposed to consist of land identified by the following Tax Map Key Numbers (TMKs) (Figure 2):

TMK 4-2-01: 1 (portion)
TMK 4-2-05: 50 (portion)
TMK 4-2-05: 51

TMK 4-3-01: 6 (portion)
TMK 4-3-01: 7 (portion)
TMK 4-3-01: 8 (portion)

2.1.2 Ownership

Parcels identified as TMK 4-2-01: 1, TMK 4-2-05: 50, and TMK 4-2-05: 51 are owned by Maui Land & Pineapple Company, Inc. Combined, these parcels are approximately 4,854 acres. Approximately 865 acres of the area of these parcels will be included in the Kapalua Mauka community site.

Parcels identified as TMKs 4-3-01: 6, 4-3-01: 7, and 4-3-01: 8 are currently owned by the State of Hawai'i. Combined, these parcels are approximately 191 acres. Approximately 60 acres of the area of these parcels are proposed to be included in the Kapalua Mauka community site.

2.1.3 Proposed Land Exchange and Subdivision

Maui Land & Pineapple Company, Inc., is in discussions with the State of Hawai'i to obtain the State-owned parcels (TMKs 4-3-01: 6, 4-3-01: 7, and 4-3-01: 8) through a land exchange. On July 27, 2001, the Board of Land and Natural Resources authorized Maui Land & Pineapple Company, Inc., to include portions of TMKs 4-3-01: 6, 4-3-01: 7, and 4-3-01: 8 (totaling approximately 60 acres) in the entitlement processing for the proposed Kapalua Mauka community while negotiating the land exchange.

The State-owned lands are a narrow strip almost entirely surrounded by Maui Land & Pineapple Company, Inc., lands. The land is primarily a gulch with only the upper ridges suitable for agriculture or other uses. Maui Land & Pineapple Company, Inc., currently leases the State-owned land (State Lease S-5978) and uses the farmable portions on the upper ridges for pineapple cultivation. The State-owned land on upper ridges on the north side of the gulch currently in pineapple production are the lands Maui Land & Pineapple Company, Inc., seeks to include as part of its Kapalua Mauka community and as part of the current entitlement processing (see Figure 2).

From a planning perspective, it is logical for Maui Land & Pineapple Company, Inc., to obtain the State-owned land and include it as part of the Kapalua Mauka community. Should the State retain ownership and Maui Land & Pineapple Company, Inc., proceeds with the development of its land only, the State-owned land will become an isolated strip of land between a residential development and a gulch with limited potential for agricultural or other uses. In addition, when a suitable property is found for the land exchange, the property obtained by the State in the exchange will be of equal or greater value than the current land and may be contiguous to other State land.

The ~~four~~ three existing TMK parcels currently owned by Maui Land & Pineapple Company, Inc.,will be consolidated and then resubdivided into four newly configured parcels, one of which will be the approximately 865-acre Kapalua Mauka community site. When the State-owned parcels are obtained by Maui Land & Pineapple Company, Inc., through the land exchange, approximately 60 acres from these parcels will be added to the Kapalua Mauka community site. The remainder of the land obtained from the State will remain in agricultural use and open space and will be maintained by Maui Land & Pineapple Company, Inc. As proposed, the total area of the Kapalua Mauka community will be approximately 925 acres.

2.1.4 Surrounding Uses

Currently the lands at the proposed Kapalua Mauka community site are used for pineapple cultivation, fallow agricultural fields, open space (gulches), and for 16 holes of The Village Golf Course (the other two golf course holes are makai of the highway).

Maui Pineapple Company has a two-acre papaya farming operation located near the golf maintenance facility in Honokahua Gulch. Above the mauka community site boundary, in open grassy fields that are not planted in pineapple, about 43 acres of land are used for the occasional grazing of cattle and horses.

Access to the Kapalua Mauka community site is provided by Honoapi'ilani Highway which also forms the makai boundary of the community site. Makai of Honoapi'ilani Highway is the portion of Kapalua Resort that includes The Kapalua Bay Hotel, The Ritz-Carlton Kapalua, The Bay Golf Course and several single-family and condominium communities, including The Kapalua Bay Villas, The Golf Villas, The Ridge, The Ironwoods, The Coconut Grove at Kapalua Bay, Pineapple Hill at Kapalua, Pineapple Hill Estates, and Kapalua Place.

To the north of the Kapalua Mauka Community site is the portion of Kapalua Resort that includes The Plantation Estates, and The Plantation Golf Course. Further mauka to the north are pineapple fields, fallow agricultural land, and open space gulches. Lands to the south include open space gulches, pineapple fields, and fallow agricultural areas.

The Kapalua West Maui Airport is within a mile from the southern boundary of the Kapalua Mauka community site. In comments on the environmental impact statement preparation notice, the State Land Use Commission (LUC) requested this environmental impact statement include notation of

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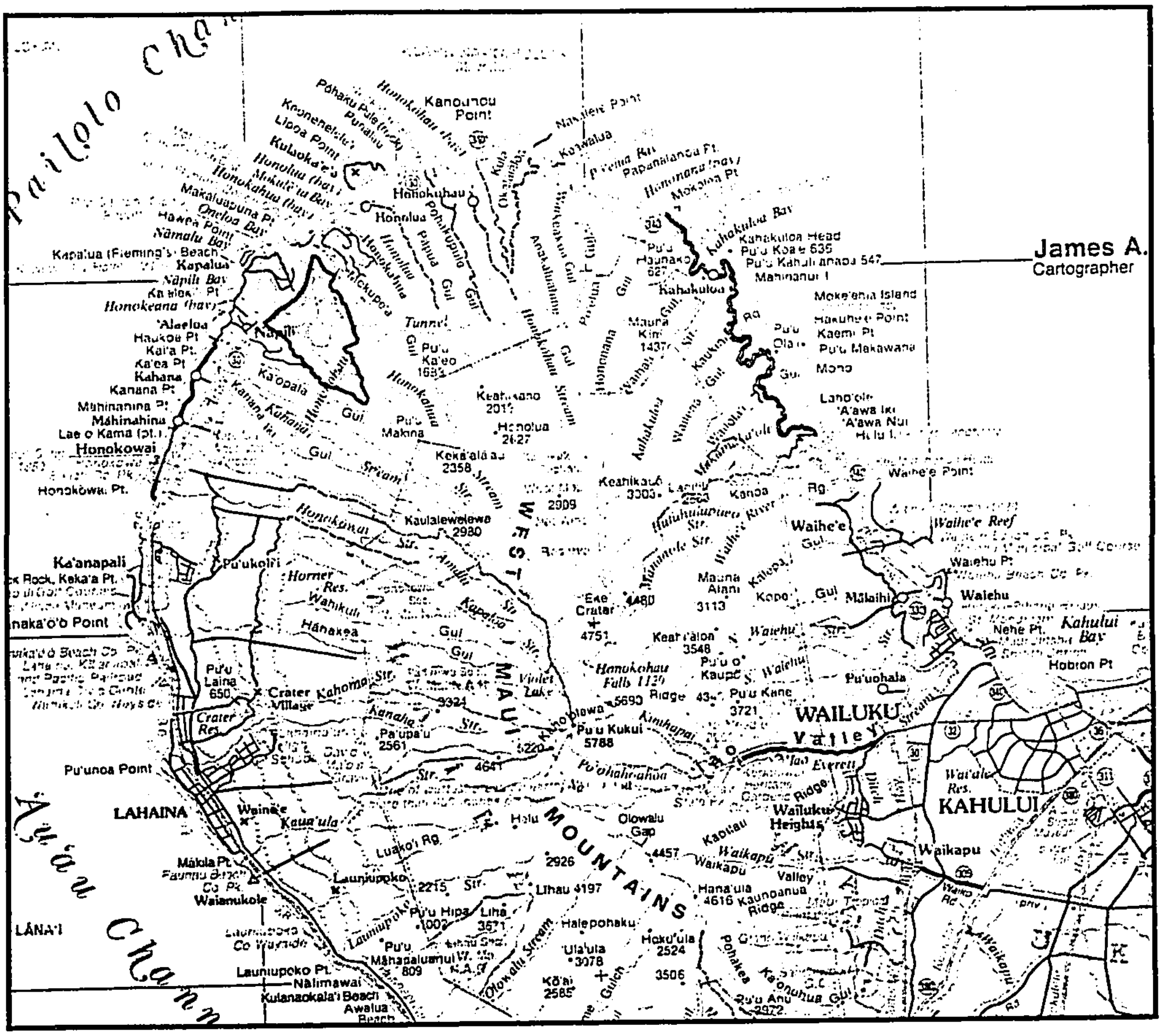

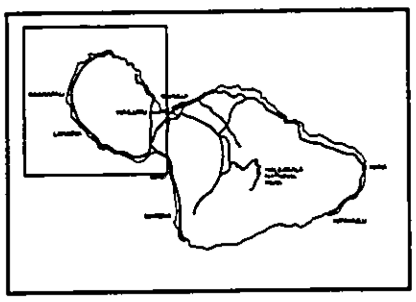

LEGEND

Project Area

FIGURE 1A

Regional Location Map

KAPALUA MAUKA

0 1.2 2.4
MILES

PBR

Source: University of Hawai'i Press

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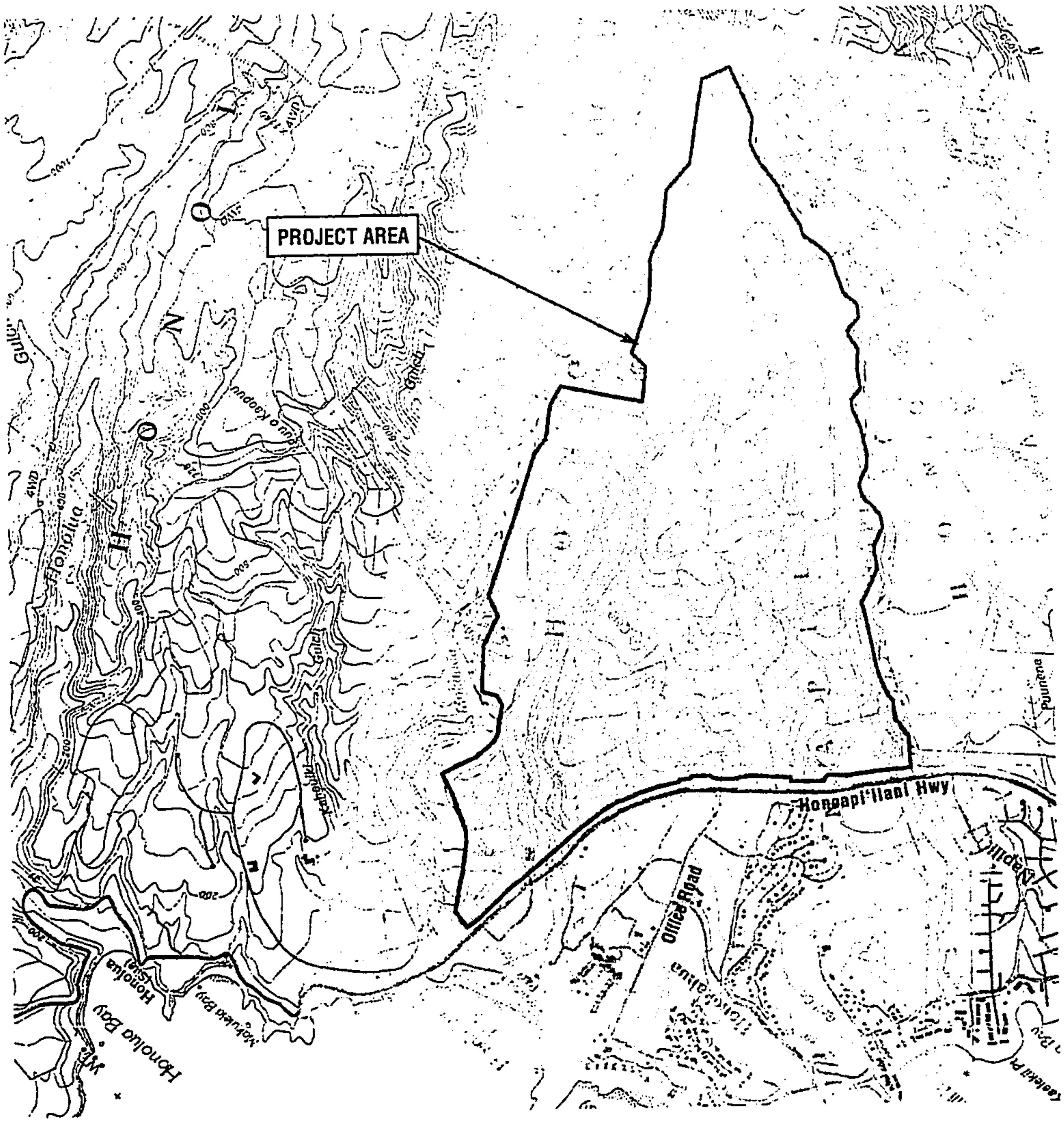
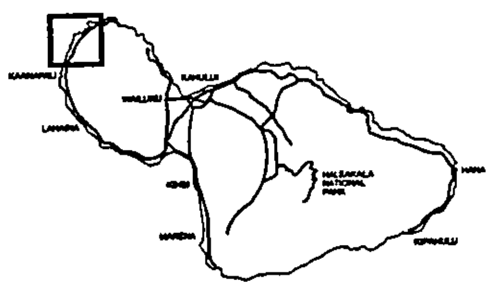


LEGEND

Project Area



Source: USGS Topographical Map

FIGURE 1B

Regional Location Map

KAPALUA MAUKA

0 1000 2000 FEET

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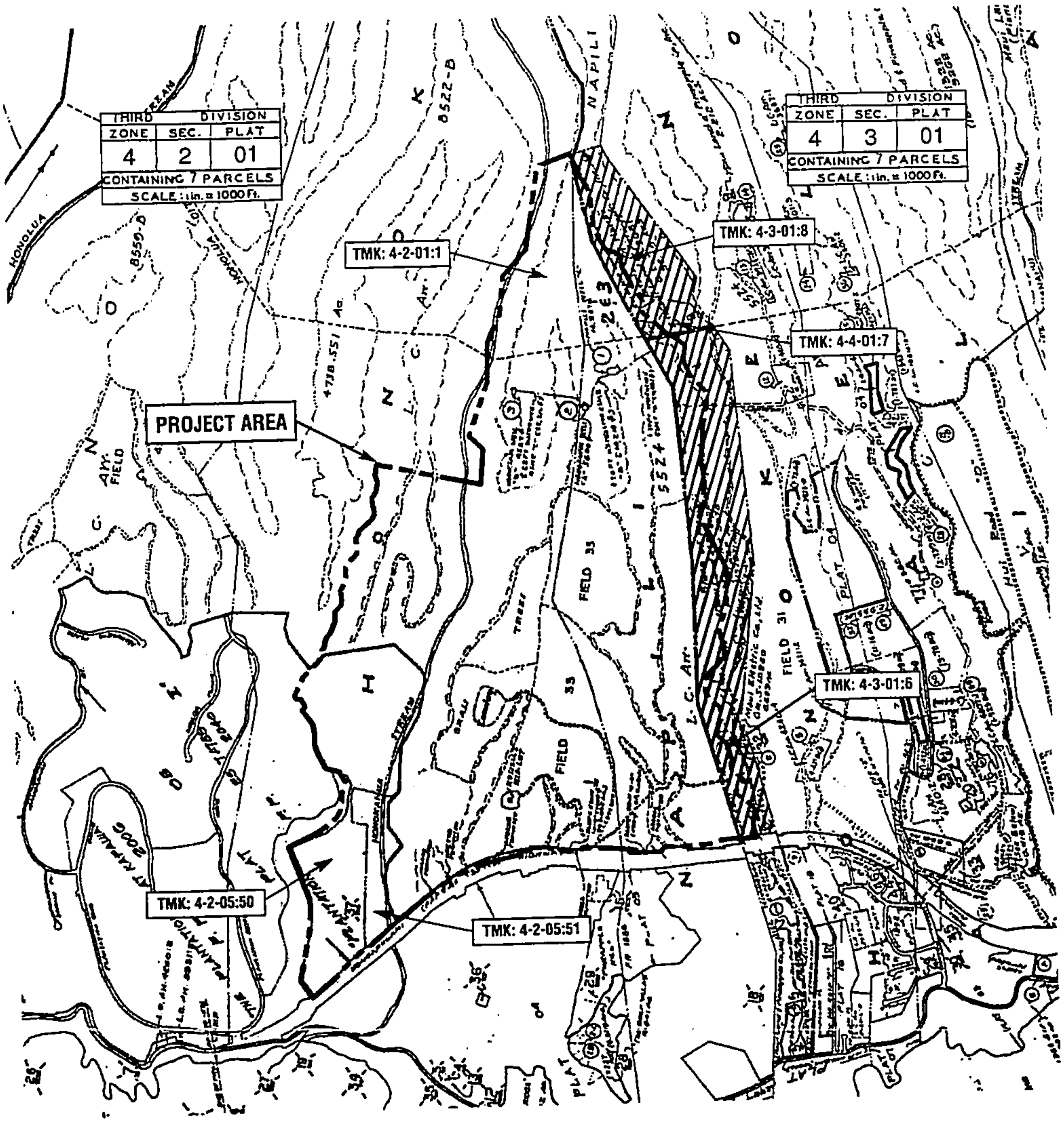

LEGEND

Project Area

State of Hawaii (Owner)

FIGURE 2
Tax Map Key

KAPALUA MAUKA

0 1000 2000
FEET

PBR HAWAII

Source: Tax Map Key

LUC Docket No. A84-577/Hawaiian Airlines, Inc., which reclassified 55 acres from the Agricultural District to the Urban District for the airport.

Kā'anapali Resort is located approximately three miles south from the Kapalua Mauka community site via Honoapi'ilani Highway. The town of Lahaina is approximately four miles south.

2.1.5 Description of the Property

The property consists of broad, flat, gently sloping ridges separated by large, heavily vegetated gulches. Essentially, all of the ridges have been altered by agricultural related activities, especially pineapple cultivation. In addition, approximately 150 acres of the property have been grubbed, graded, and landscaped for 16 holes of Kapalua Resort's The Village Golf Course. The developable areas are limited to the broad flat ridges between the gulches. See Figure 3 for photographs of the property.

Elevations of the Kapalua Mauka community site range from approximately 100 to 1,250 feet Mean Sea Level (MSL). The gulch walls are generally steep with slope grades over 50 percent. Within the gulches, there is little soil development, but portions are densely vegetated with trees and shrubs. Narrow alluvial terraces are common along the gulch bottoms and have been mostly altered by bulldozing or other means for agricultural-related activities.

Located on the northwestern slopes of the West Maui Mountains, the site is subject to the predominate northeast tradewinds. According to the *Atlas of Hawai'i* (Juvik and Juvik, 1998), average annual rainfall for this area of Maui ranges from 20 to 30 inches, depending largely on elevation. Average daily temperatures range from lows of about 66 degrees Fahrenheit to highs of about 85 degrees Fahrenheit.

2.1.6 Historical Land Uses

The current agricultural use of the property for pineapple cultivation began in approximately 1912 when Honolua Ranch (which included the property) was converted from a cattle ranch into a pineapple plantation. By the 1920s, pineapple had been planted across West Maui from Māhinahina ahupua'a to Kahakuloa ahupua'a. A cannery was built in Honokahua in 1914 and, in 1923, Honolua Ranch became Baldwin Packers, Ltd.

Soon thereafter, a small plantation community developed at Honokahua and Nāpili which was focused around the Honolua Ranch/Baldwin Packers operations. During the period from 1900 to 1940, the population of the Lahaina District more than doubled to over 15,000 persons. However, during the decades following World War II the population of Lahaina declined, reaching approximately 5,500 people by 1970.

In 1962, Maui Land & Pineapple Company, Inc., was formed when Baldwin Packers merged with Maui Pineapple company. Maui Land & Pineapple Company, Inc., created the wholly-owned subsidiary named Kapalua Land Company, Ltd., which conceived of and developed the master-planned Kapalua Resort featuring the Kapalua Bay Hotel at the shore of Honokahua ahupua'a. The hotel opened in 1978, beginning the change of the former ranch and pineapple lands of Honokahua into a world-class destination resort complex. For more information on historical land uses see section 5.2.

2.1.7 Kapalua Resort

The transformation from agricultural land to the elegant resort of today is symbolized by Kapalua's highly recognized logo of a butterfly with a pineapple in the middle. Today the Kapalua Resort includes The Kapalua Bay Hotel and The Ritz-Carlton Kapalua (containing a combined total of 747 rooms), homesites and condominiums, two ten-court tennis facilities, three 18-hole championship golf courses, a 22,000 square-foot (gross leaseable area) shopping village, and several freestanding retail, restaurant, and administrative buildings. Kapalua's residential communities, their number of units, densities, and other relevant information is contained in Table 1.

Table 1. Kapalua Resort Residential Communities

Community	Number of Units	Acres	Units per Acre	Type of Units	Description
The Bay Villas	141	16.5	8.5	MF	One and two bedroom condominiums overlooking Oneloa Bay
The Golf Villas	186	15.8	11.8	MF	One and two bedroom condominiums on the 10th and 18th fairways of The Bay Course
The Ridge Villas	161	21.5	7.5	MF	One and two bedroom condominiums on top of a ridge overlooking the ocean and The Bay Course
The Ironwoods	40	9	4.4	MF	Two and three bedroom luxury condominiums overlooking Oneloa Bay
The Coconut Grove at Kapalua Bay	36	12	3.0	MF	Three bedroom luxury condominiums fronting Kapalua Bay
Pineapple Hill at Kapalua	99	45.4	2.2	SF	Single-family homes overlooking The Bay Course and with views of the West Maui Mountains
Pineapple Hill Estates	31	19.9	1.6	SF	Single-family custom homesites overlooking The Bay Course
Kapalua Place	8	22.3	0.4	SF	Single-family beachfront homes at Oneloa Bay
The Plantation Estates	76	201.8	0.4	SF	Agricultural lots bordering The Plantation Golf Course
Total	778	364.2			

The intent of the Kapalua Resort has always been to provide a luxurious resort atmosphere removed from the Lahaina-Kā'anapali area. The Resort orients its marketing programs toward the upper-income traveler and second homeowner. To insure its ambience, the Resort is not seeking to achieve the density levels of Kā'anapali or other West Maui properties; it is an example of a low-key, low-density destination resort community.

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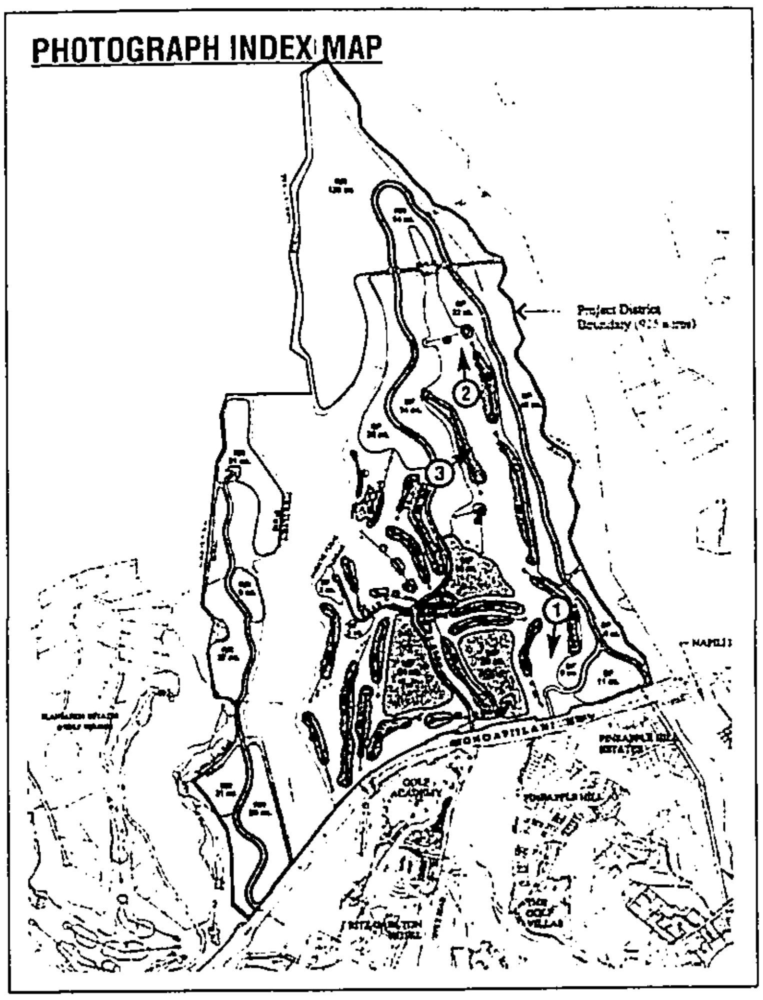
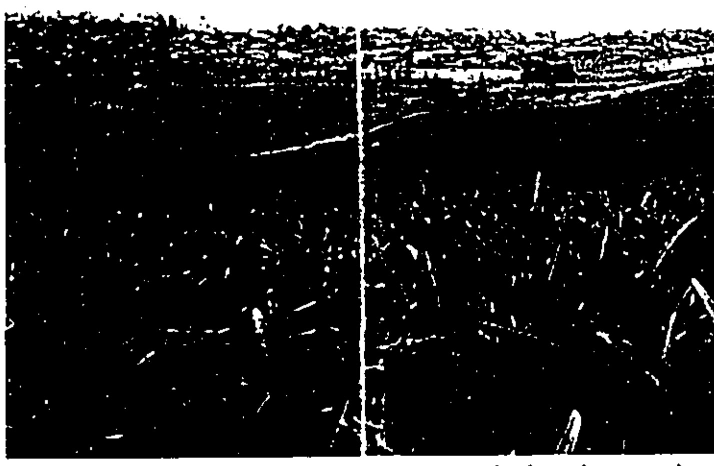
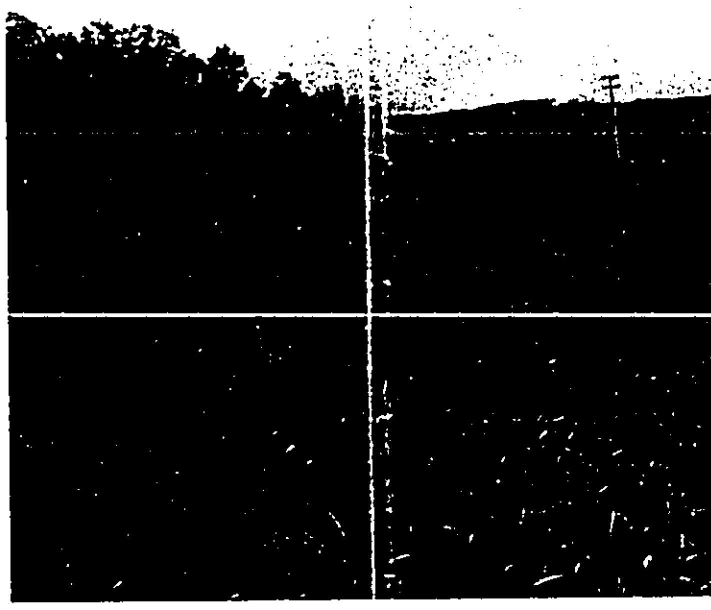



1) Much of the property 's currently in pineapple c
Kapalua Resort, can be seen in the distance o


2) At the upper elevations, pineapple fields are replaced by open fields.


3) A view looking mauka. The heavily vegetated

All photos taken on April 20, 2001

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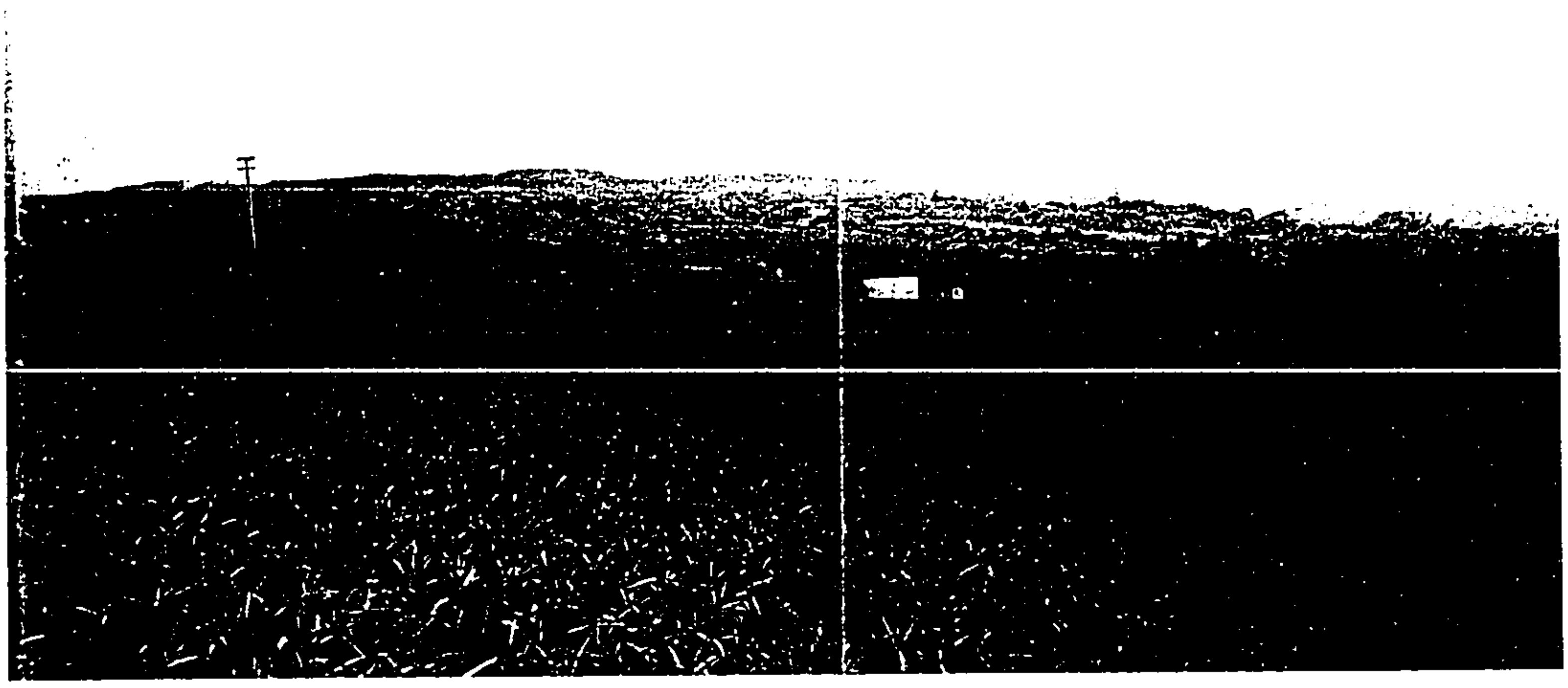
s currently in pineapple cultivation. The residences of Pineapple Hill, part of the
)e seen in the distance on the right.



. The heavily vegetated areas at each side of the photo are gulches.

FIGURE 3A
Site Photographs

KAPALUA MAUKA

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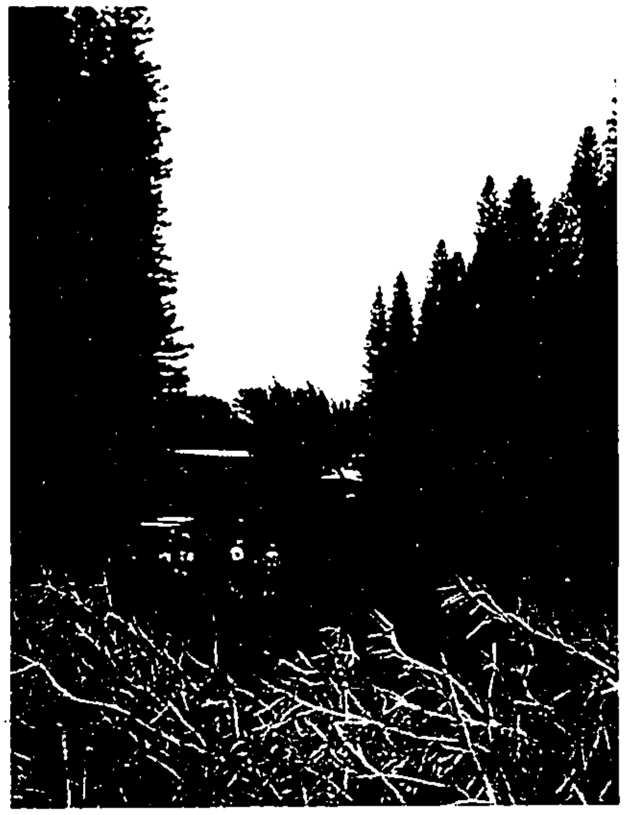
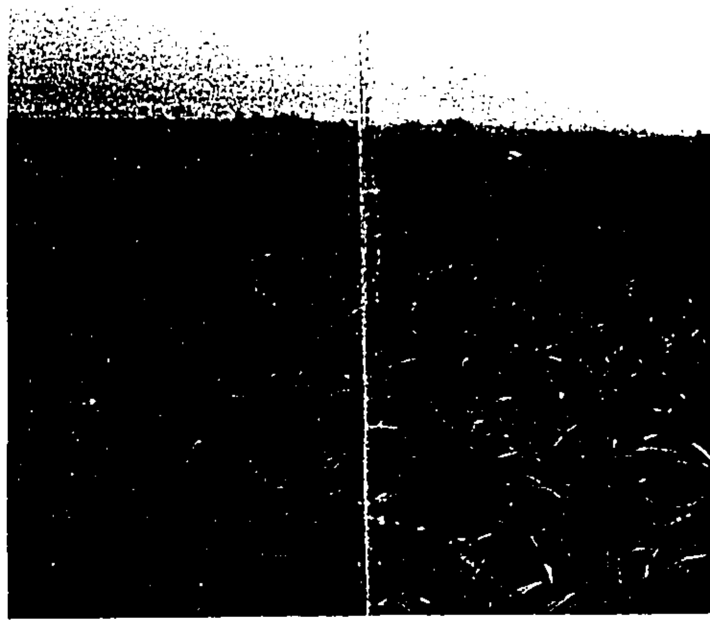
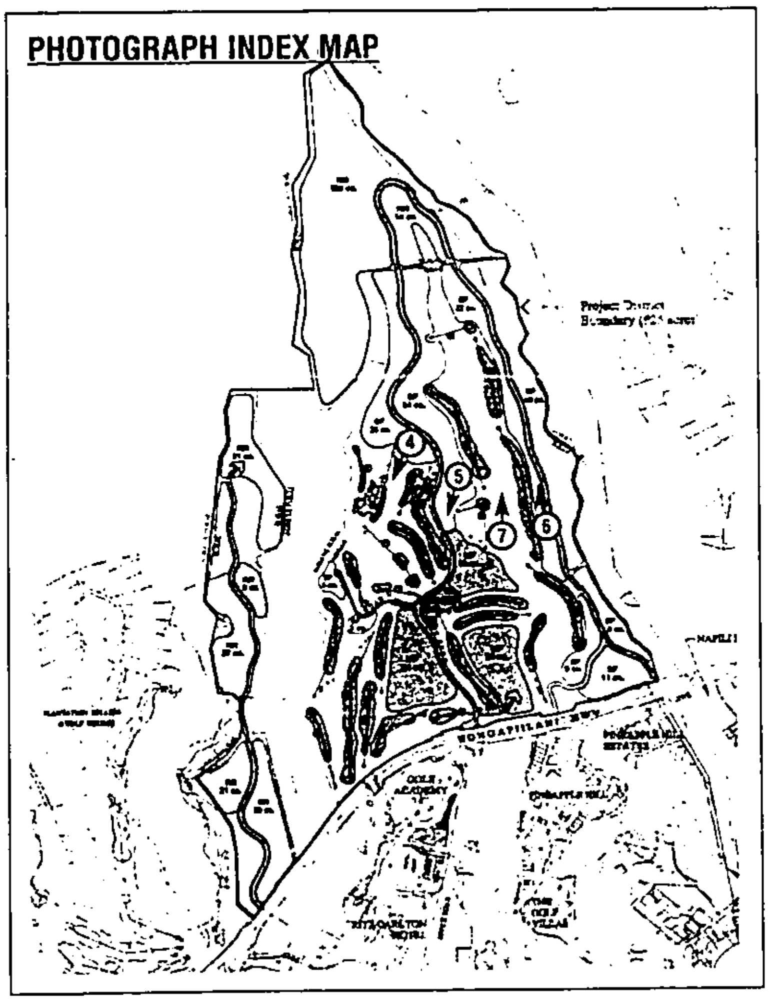


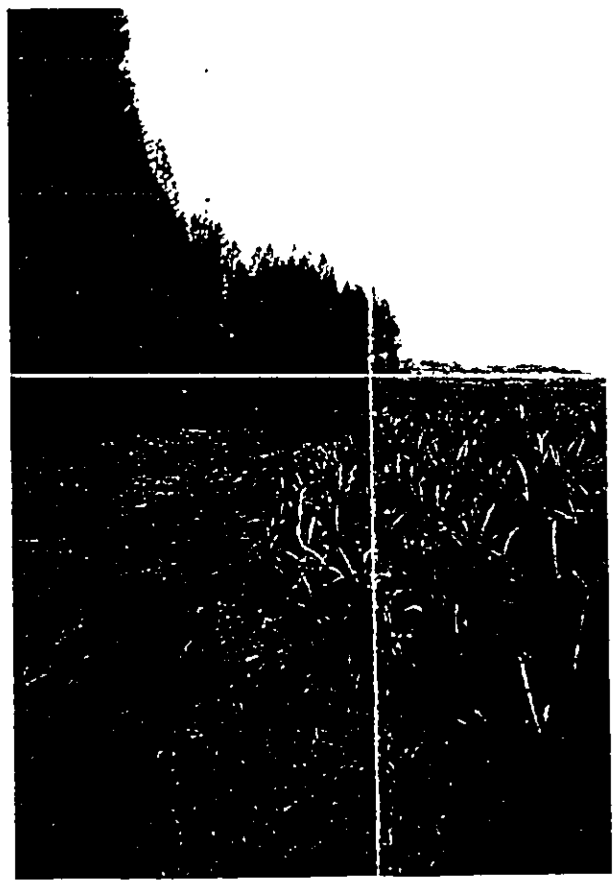
4) The Village Golf Course is already on a portion of the property.



5) Cultivated pineapple f elds. A large gulch can [cut off] distance.



All photos taken on April 20, 2001



6) Cook Pine trees have been planted at various locations on the property.

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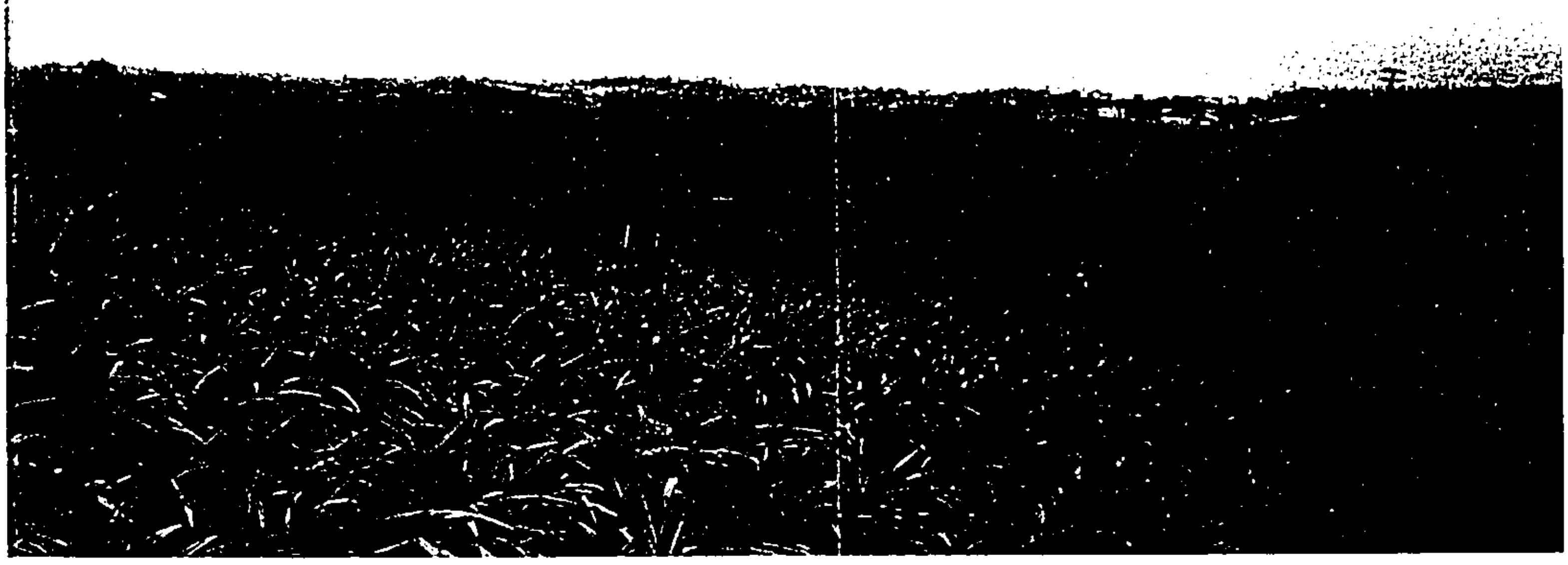
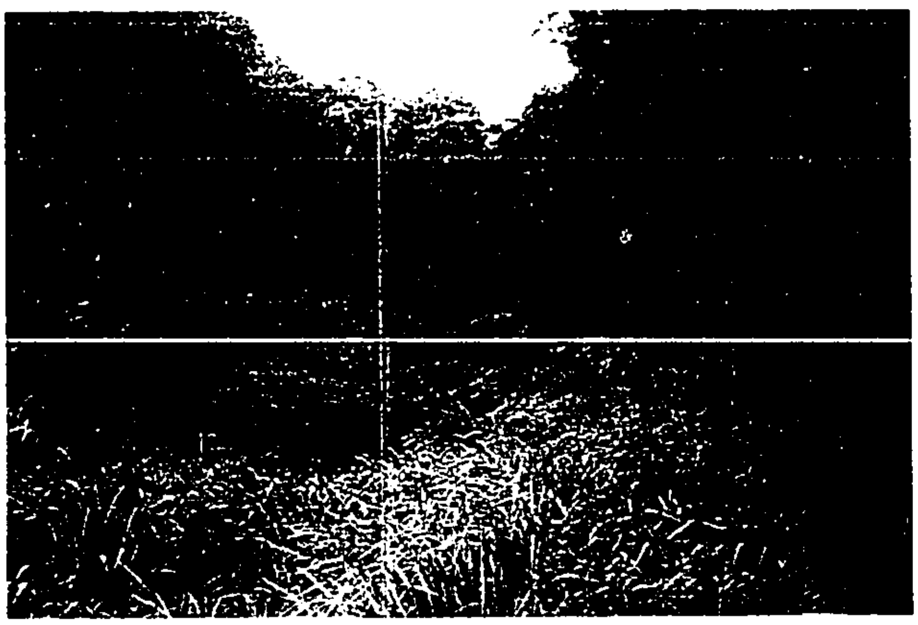


elds. A large gulch can be seen in the center of the photo as can a grove of Cook Pine trees in the



7) Typical vegetation within a gulch.

been planted
the property.

FIGURE 3B
Site Photographs

KAPALUA MAUKA

PBR

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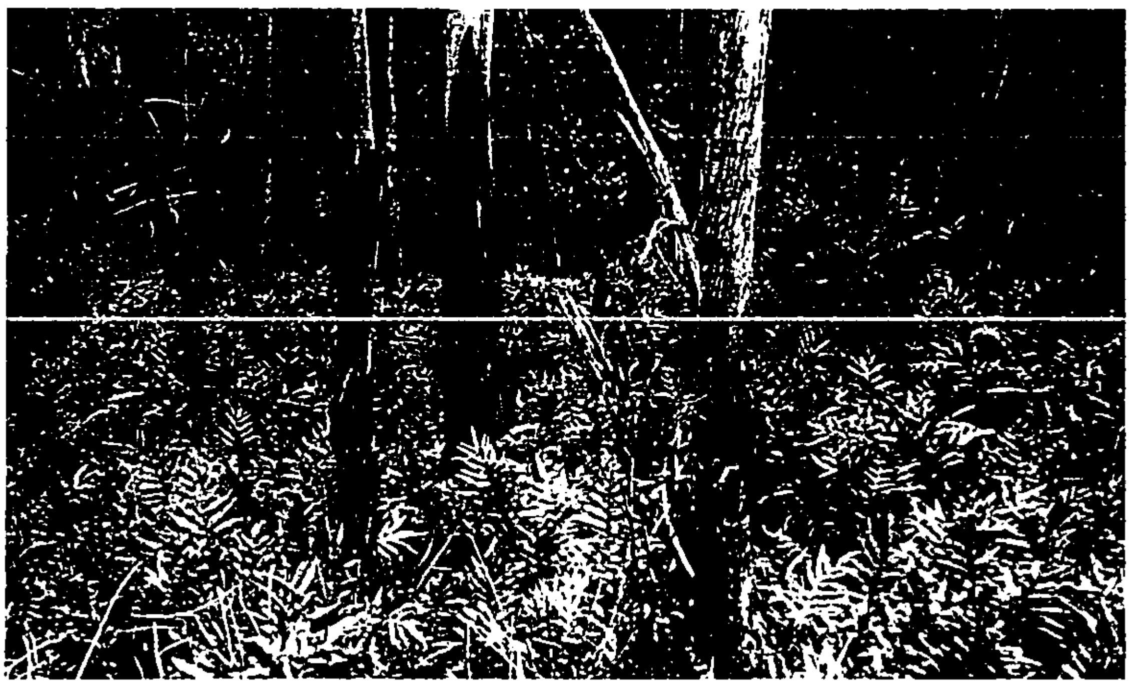
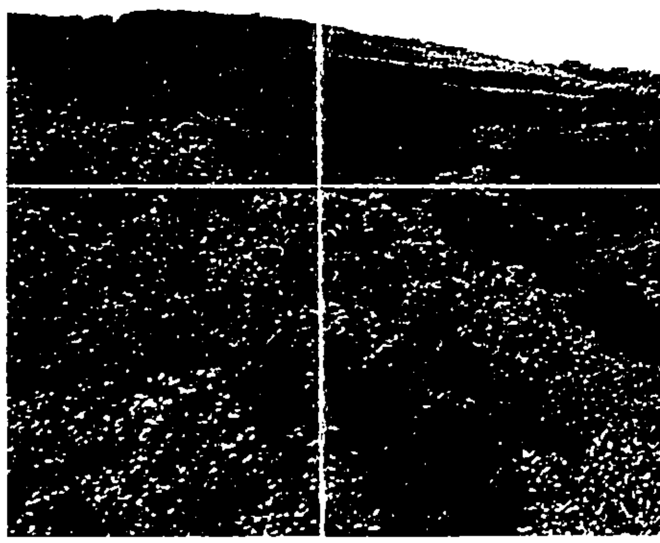
8) Honolua Bay can be seen from the upper elevations on the north side of the proposed project district.



9) Laua'e ferns and Eucalyptus trees within a gulch.



10) Looking mauka into Honokahua Gulch.

All photos taken on April 20, 2001

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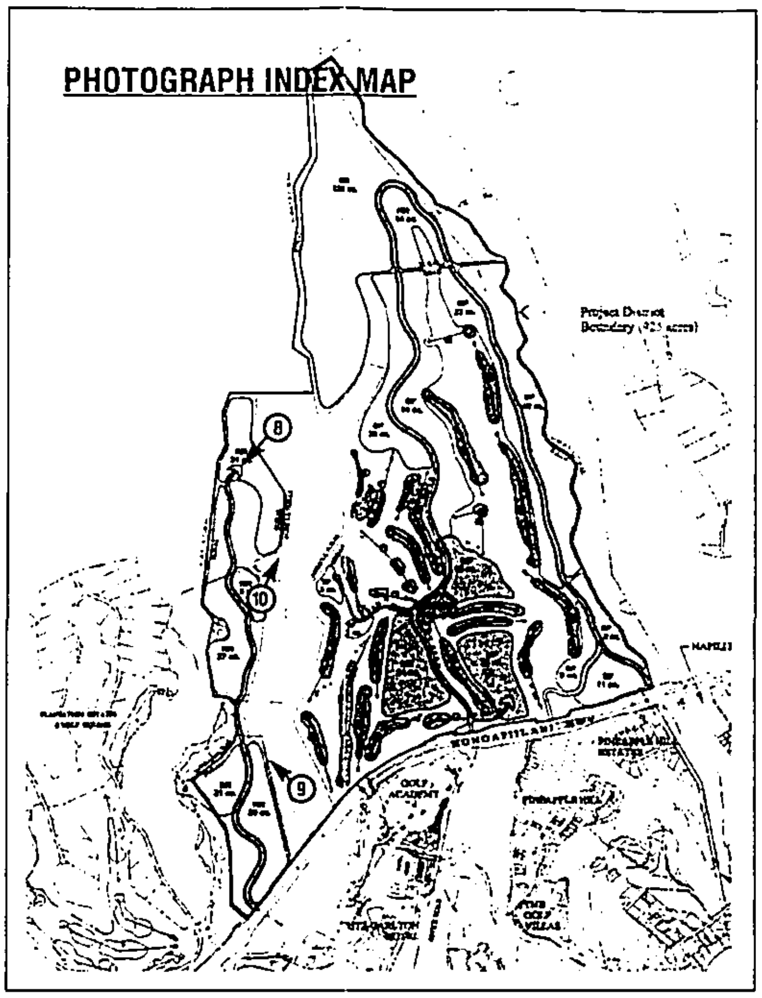

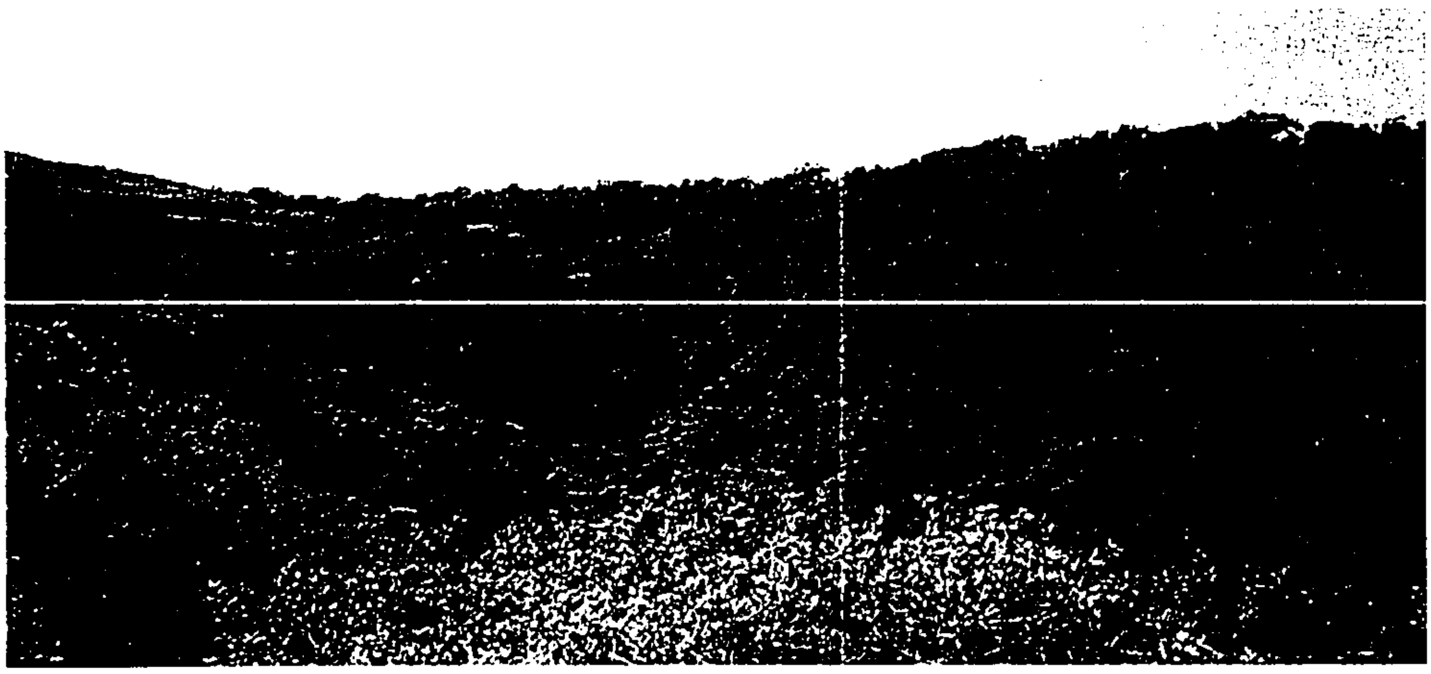

to Honokahua Gulch.

FIGURE 3C
Site Photographs

KAPALUA MAUKA

August 2001 PBR

From the outset, Kapalua was envisioned and designed as a master-planned resort community where development conformed to the contours of the land. Besides its reputation as one of the world's premiere golf destinations, the resort is increasingly becoming known for its commitment to environmental and conservation efforts.

Kapalua's trendsetting conservation programs, based on the Hawaiian ahupua'a model of caring for resources from the mountains to the sea, include partnership arrangements with the State of Hawai'i, The Nature Conservancy of Hawai'i, and Audubon International; the development of a environmental code of ethics; marketing enrichment travel packages with partial funds going to benefit The Nature Conservancy; and resort-wide dedication of all properties to the ideal of preserving the unique Hawaiian environment and cultural heritage of which Kapalua is a part.

In 1995, Kapalua Resort established the Kapalua Nature Society. Dedicated to fostering an appreciation of Maui's natural and cultural treasures, this unique environmental organization oversees the resort's Audubon International programs; publishes the semi-annual Kapalua Nature Journal; and contributes to Hawai'i's natural legacy through their Native Hawaiian Plant Reforestation Project.

Additionally, all three of the Resort's golf courses are Certified Audubon Cooperative Sanctuaries. To receive this designation the courses must meet stringent environmental standards set fourth by Audubon International for environmental planning, water conservation, habitat enhancement, public involvement, integrated pest management, and water quality management.

~~Further, in 1996, Kapalua became the first resort in the world to be certified by Audubon International under the Audubon Heritage program. In this process, every aspect of the resort was evaluated, from waste management to educational programs, cultural and natural preservation, wildlife protection, and land conservation.~~

2.2 STATEMENT OF PURPOSE AND NEED FOR THE COMMUNITY

The Kapalua Mauka community site is a superior, competitive location within an established highly-regarded destination resort that has demonstrated strong appeal among resort/residential purchasers. It is the natural expansion area for the existing Kapalua Resort, as the makai portion of the resort is nearing build-out. In addition, it has long been planned and designated as an expansion area for the Resort, as evidenced in the 1983 *Lahaina Community Plan*, and the update to this plan, the 1996 *West Maui Community Plan*.

Following an extended period when demand for resort/residential inventory and interest in further development was down significantly, over the past two years the resort/residential homesite and condominium market sectors have recovered, with the number of sales up, the number of listings down, and appreciation being seen for the first time in nearly a decade. New homes and condominiums are being well received and new developments are being proposed.

The Kapalua Mauka community will provide expansive ocean views, golf course frontage, and access to a full-line of resort amenities within a master-planned resort community for resident and second-home owners. A variety of product types will be provided to attract first and second-home buyers.

A market study prepared for the Kapalua Mauka community (Hallstrom Group 2001, Appendix A) forecasts the West Maui region will require 4,650 to 7,240 new housing units over the next twenty years. While there have been up to 5,300 units proposed for the region (excluding the Kapalua Mauka community), at Pu'ukoli'i Village, on State lands (Villages at Leiali'i), and elsewhere, these projects have not shown any activity in over a decade. It is unlikely these proposed developments will provide new inventory to meet the potential market needs in the near to mid-term.

While estimated prices of units within the Kapalua Mauka community will be affordable to only 10 to 15 percent of the resident population, this segment will still require approximately 465 to 724 new units over the next 20 years. The Kapalua Mauka community, with a total of 690 units, needs only to capture a portion of this demand to achieve rapid absorption and be considered a meaningful source of residential inventory.

2.3 GENERAL DESCRIPTION OF THE PROPOSED COMMUNITY

2.3.1 Statement of Objectives

The objectives of the Kapalua Mauka community are rooted in a deep sense of caring for the land as reflected in the Kapalua Resort's commitment to environmental stewardship. The roots of this stewardship stem from a belief that the natural resources of the land and ocean are connected to one another and must be used responsibly to protect our quality of life. Quality of life is also connected to economic development, and with the Kapalua Resort, Maui Land & Pineapple Company, Inc., has sought to balance economic considerations with responsible resort development. As such, the objectives of the Kapalua Mauka community are to:

- Provide an appropriate and sensitive use of the land in context with Maui's environmental, social, and economic needs;
- Provide for the logical and long-planned expansion of the Kapalua Resort; and
- Develop a high-quality low-density resort residential and recreation community that respects the rural character and natural beauty of the land.

2.3.2 Community Description

The proposed Kapalua Mauka community will provide additional residential opportunities at the Kapalua Resort and is also proposed to include an expansion of the existing The Village Golf Course. The master-planned community will have a variety of residential housing types, including multi-family dwellings and single-family homesites ranging in size from less than 10,000 square feet to over one acre. The potential market includes first and second-home buyers, local residents, and seniors desiring to live in a resort setting.

The resort residential nature of the community will equate to a population that would be less than the population a community of this size would generate as a typical housing project oriented to full-time residents. Because a large amount of the population will be visitors using their second homes, pressure on government services and funds will be less than a community of full-time residents, as visitors typically do not rely on the full range of government services that full time residents expect.

However, property owners at Kapalua Mauka, even if they are not full-time residents, will pay property taxes (on high value property) on a full-time basis, and excise taxes when they purchase good and services on the island (see section 5.8 for more information on population and economic impacts).

Consistent with the existing Kapalua Resort, the overall Kapalua Mauka community is not planned to be gated, however, within the community some of the individual neighborhoods may be gated. Relative to the existing pineapple fields at the site with limited access, the Kapalua Mauka community may provide increased access to mauka trails.

The community site is proposed to include Agricultural, Rural, and Urban land use classifications as specified under the State Land Use Law (Chapter 205, Hawai'i Revised Statutes) designations. As such, residential areas would be in both Rural and Urban areas with lot sizes and housing types that correspond to the requirements of each district. Residential development is not proposed in the Agricultural district, which will be retained for the gulch areas within the community area.

Originally planned as a 450-acre, 750 residential unit community—as described in the *West Maui Community Plan* (County of Maui 1996)—the current master plan expands the Kapalua Mauka community to 925 acres but reduces the number of allowable housing units to 690. With a reduction of 60 units, combined with the expanded area, the overall average residential density has been reduced from the previous 5.2 units per acre to under 1.5 units per acre within the residential areas. This lower density allows for large-lot rural residential uses as a transition to the adjacent agricultural and open space areas.

In addition to residential uses, the current 18-hole Village Golf Course that now has 16 holes on the site (the other two holes are makai of Honoapi'ilani Highway) may be expanded to a total of 27 holes. This expansion may include the addition of a secondary clubhouse within the Kapalua Mauka community. Figure 4 depicts the conceptual Kapalua Mauka Master Plan.

2.3.3 Land Use Summary

The conceptual master plan for the Kapalua Mauka community (Figure 4) includes a mix of single-family and multi-family residential areas, recreational areas (golf course and related amenities), and open space areas.

A significant portion of the single-family and multi-family residential units would be located along the golf course or overlooking the adjoining gulches. The golf course may also include a secondary clubhouse that would provide limited commercial services to community residents and The Village Golf Course users.

The proposed uses will all be within a close distance to the adjoining Kapalua Resort makai of Honoapi'ilani Highway. To reduce vehicle trips within the Kapalua Mauka community and the greater Kapalua Resort, the community will be designed to foster a bicycle/pedestrian-oriented environment. More urban-like land uses such as multi-family units will be within the core of the community as will be other amenities such as the golf course clubhouse. Surrounding the more urban-like areas will be larger rural lots and single-family homes, providing a transition to the nearby agricultural lands. The community will have extensive open space and landscape buffers along with bike and pedestrian pathways connecting to the rest of Kapalua Resort, makai of the Honoapi'ilani Highway. A planned pedestrian/bike path underpass under Honoapi'ilani Highway will connect the mauka and makai resort areas and supplement two existing golf course cart underpasses presently used only for golf course circulation.

In addition, the service area for the existing Kapalua Resort shuttle system for resort residents and guests will be expanded to include the Kapalua Mauka community. This service currently provides transportation within the resort and to and from the Kapalua/West Maui Airport. Service is provided "on call" from 6:00 AM to 11:00 PM.

In support of the community, infrastructure facilities to be expanded or improved include access and circulation roadways, drainage systems, water and wastewater systems, and electrical/communication systems (see section 5.9).

Table 2 summarizes the land use elements of the current Project District 2 as described in the *West Maui Community Plan* and the proposed expanded Project District 2, Kapalua Mauka community.

Table 2. Comparison Between the Current PD 2 and the Expanded PD 2

	Current PD 2		Expanded PD 2	
	Approximate Acres	Units	Approximate Acres	Units
Golf Course, Open Space, and Roadways	261		~~300~~ 297	
Commercial (clubhouse)	5		5	
Parks/Open Space/Buffer Zones	34		~~134~~ 177	
Elementary School	6		see "School Site" on page ~~20~~ 21	
Residential (SF and MF)	144	750	~~145~~ 209	510
Rural Residential*	-	-	~~341~~ 237	~~184~~ 180
Totals	450	750	925	690
Density Within Residential Areas	5.2 units per acre		1.5 units per acre	
Overall Project Residential Density	1.7 units per acre		0.7 units per acre	

As planned, the expanded Project District 2 will be far less dense than the current Project District 2 and will contain a greater amount of open space. Nearly half of the area (~~434~~ 474 acres) will be landscape buffers, natural gulches and ravines, and golf course. The rural residential area will provide a transition between the urban and agricultural areas. The agricultural designated areas, primarily consisting of the natural gulches and ravines of the site, will not be developed except for necessary infrastructure.

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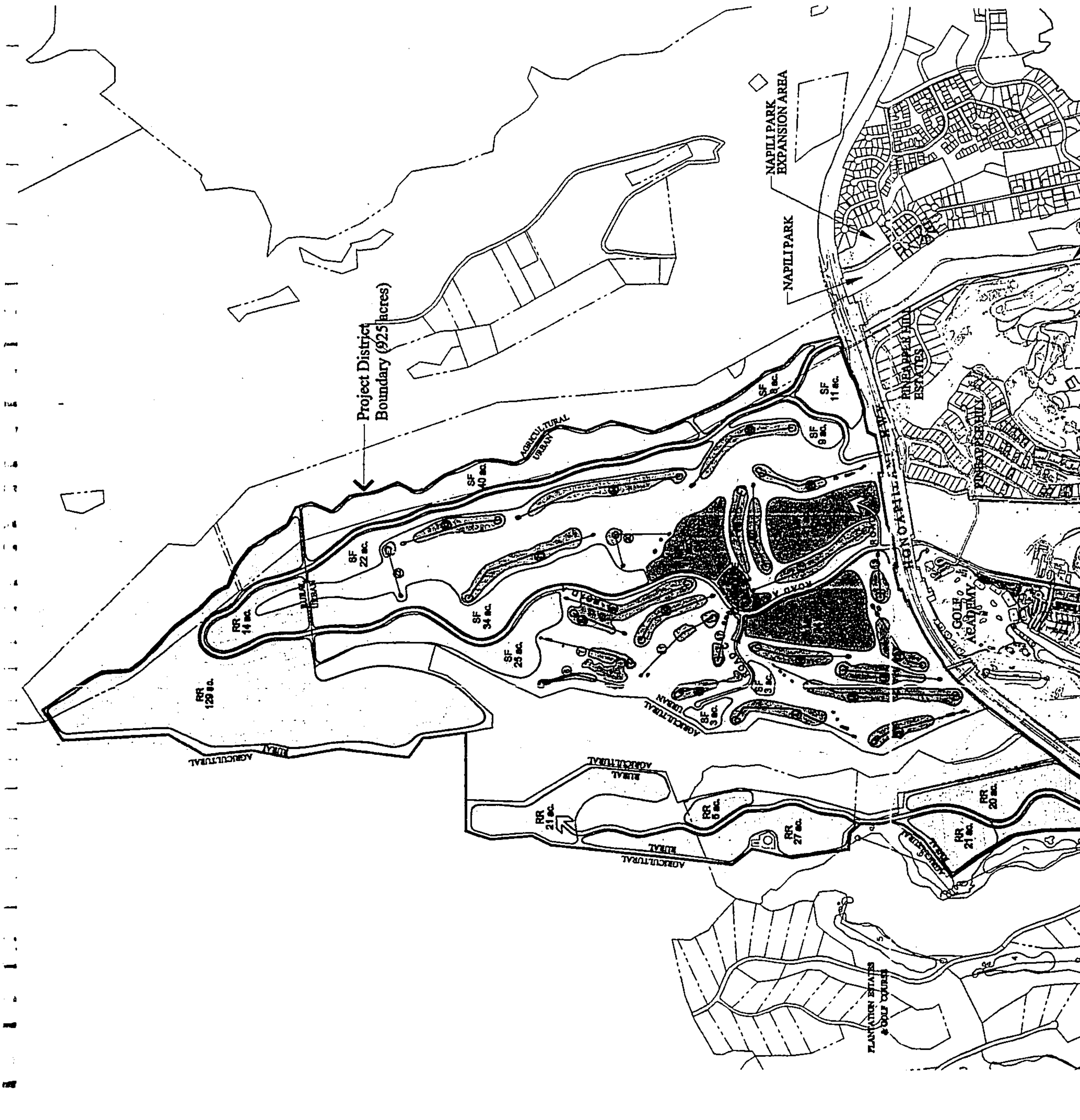

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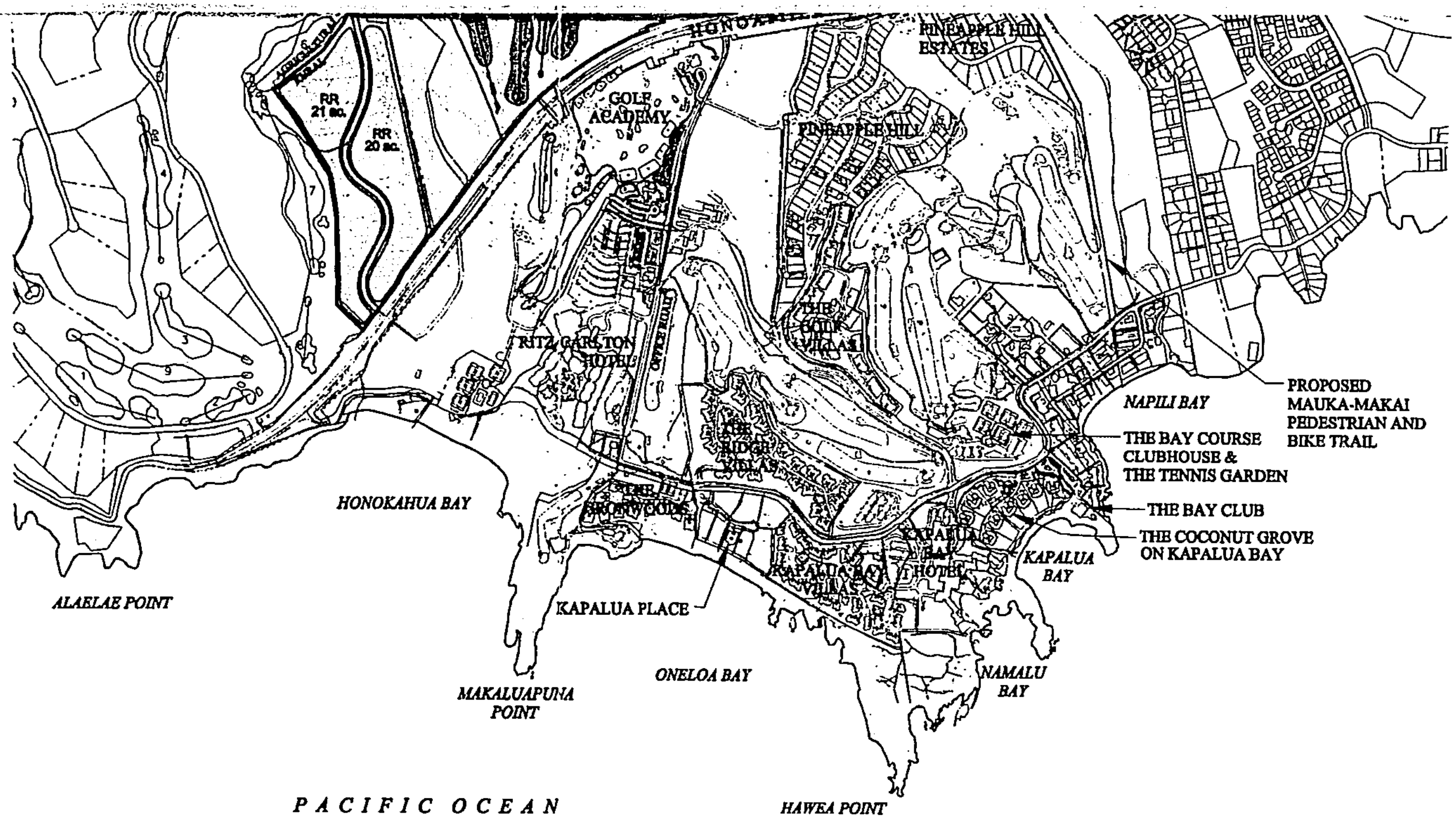

Kapalua

Kapalua Mauka Legend

Land Use	Current P.D. No. 2 Approx. Acres	Current P.D. No. 2 Units	Expanded P.D. No. 2 Approx. Acres	Expanded P.D. No. 2 Units
Golf Course/ Open Space/ Roadways	261	-	297	-
Commercial (Clubhouse)	5	-	5	-
Parks/ Open Space/ Buffer Zones	34	-	177	-
Elementary School	6	-	-	-
Residential (SF & MF)	144	750	209	510
Rural Residential (RR)	-	-	237	180
Total Residential Units	450	750	925	690
Density within Residential Areas	5.2 Units / Acre		1.5 Units / Acre	
Overall Project Residential Density	1.7 Units / Acre		0.7 Units / Acre	

Figure 4
Conceptual Master Plan
KAPALUA MAUKA

KAPALUA LAND COMPANY, LTD. WEST MAUI, HAWAII

AREA SCALE NORTH LINEAL SCALE (FEET)

PBR

DATE 6/25/02

A brief description of the major land use elements of the Conceptual Master Plan is presented below.

Rural Residential

The Rural Residential component of the community is proposed to contain single-family homesites ranging in size from a minimum of a half-acre to up to three acres. Small-scale agricultural activities will be allowed on the larger parcels~~.~~, including orchards, plant nurseries, and other horticultural activities. ~~Portions of the expanded golf course will also be within the Rural district.~~ As planned, the total Rural district area of the community is approximately ~~341~~ 280 acres, however approximately 237 acres of this area would be used for ~~and would contain~~ approximately 180 homesites.

Urban Residential

The Urban Residential component of the community is proposed to contain a mix of single-family and multi-family residential homes. Some homes may be owned under interval or fractional ownership type plans, including time share plans. ~~A majority of the~~ The golf course will also be in the Urban district along with the proposed secondary clubhouse and related commercial uses. As planned, the total area of the Urban district is approximately ~~450~~ 511 acres, however approximately ~~145~~ 209 acres of this area would be used for approximately 510 residential units. The remaining area would be used for the golf course, the clubhouse (five acres), roads, and open space.

Golf Course/Commercial/Roads

The existing The Village Golf Course located within the community site is one of three 18-hole championship courses in the Kapalua Resort destination area. The proposed expansion of the course to create a 27-hole golf course would significantly enhance the recreational amenities offered by Kapalua Resort and would contribute toward the recognition of the Island of Maui as a world-class vacation destination. As estimated on the conceptual plan, the golf course, along with roads and related open space (such as landscape buffers) would occupy approximately ~~300~~ 297 acres within the Urban ~~and Rural districts~~ district of the community site.

A proposed secondary golf clubhouse would provide limited commercial facilities in support of the golf course, but also cater to the needs of community residents. Proposed commercial facilities include a golf pro shop, restaurant, and other recreational amenities. The clubhouse and other commercial uses would occupy a site of approximately five acres.

School Site

The description for Project District 2 in the *West Maui Community Plan* allocates six acres within Project District 2 for an elementary school. However, in their comment letter on the draft environmental impact statement the Department of Education states: "The Department of Education does not anticipate that a school site will be needed in the Kapalua region." ~~While the~~ As such, the ~~current~~ concept plan for the Kapalua Mauka community does not provide for a school site~~, Maui Land & Pineapple Company, Inc., is willing to designate a school site at another location on its West Maui property if the State Department of Education determines that there is sufficient demand.~~ During development of the community Maui Land & Pineapple Company, Inc., will ~~also~~ be subject to the Department of Education's fair share requirements for new school facilities. In their letter, the Department of Education further states:

> ... our requirement would be cash-based. The current fair cash requirement is $1,011 per unit. This amount would be due as each unit closes and would thus not require an upfront payment by the developer. Funds collected from this project will be used for capital improvements program projects in the Lahainaluna High School complex which includes Lahainaluna High, Lahaina Intermediate, Princess Nahienaena Elementary, and King Kamehameha III Elementary Schools.

It should be noted that the State Department of Education's "Lahainaluna Complex Development Plan 1997-2017" (Department of Education, 1998), which projects school capital improvement projects over a 20-year planning time frame, does not specify a new elementary school on the Kapalua Mauka community site or in the Kapalua area. For more information on the need for school facilities as a result of the Kapalua Mauka community see section 5.10.1.

Parks, Open Space, and Buffer Zones

Besides the open space created by the golf course, ~~an additional 134~~ approximately 177 acres of the community site will be passive parks, open space, and buffer zones. Approximately 134 acres of this area will remain in the Agricultural district ~~and will serve as privately maintained passive parks, open space, and buffer zones.~~ ~~This area includes~~ Areas to remain in the Agricultural district include the natural gulches and ravines of the site. No residential development is proposed within these areas.

2.4 DEVELOPMENT TIMETABLE AND PRELIMINARY COSTS

Development and sales of the Kapalua Mauka community are projected to occur over a 20-year period. Within this total time, before construction, permitting and entitlement processing is expected to take three years. Construction of the major backbone infrastructure, including the expansion of the golf course, is estimated to take two years.

After necessary infrastructure is in place, construction of single-family homesites and multi-family units will begin and continue for approximately 12 years in response to market demand. Construction of the secondary clubhouse is proposed to begin during the first year of construction of the single-family homesites and multi-family units. Sales are expected to begin within the first year of construction of the single-family homesites and multi-family units and are estimated to continue approximately three years after all construction is complete (see Table 3).

Table 3. Development Timetable

Phase	Years
Entitlement Processing and Permitting	3
Construction of Basic Infrastructure	2
Construction of single and multifamily residential units and sales	12
Continued Sales	3
Total	20

Costs to develop the Kapalua Mauka community are preliminary and will be better defined during the design and planning process. Order of magnitude costs for the development of on-site infrastructure, the golf course expansion, and final subdivision layout is expected to be approximately $70 million.

Construction of single-family homes is estimated to be approximately $700,000 per house. Multi-family construction costs are estimated to be approximately $400,000 per unit. With 390 single-family homes and 300 multi-family units, construction costs for all units (690 total) is estimated to be approximately $395 million.

Construction of the golf course clubhouse and related amenities is estimated to be $6.5 million.

All totaled construction costs for the Kapalua Mauka community are estimated to be approximately $470 million.

2.5 SUSTAINABLE BUILDING DESIGN

In their comment letter on the draft environmental assessment/environmental impact statement preparation notice (EISPN), the Office of Environmental Quality Control (OEQC) requested implementation of some of the techniques described in their "Guidelines for Sustainable Building Design in Hawai'i." This document is attached with OEQC's comment letter ~~at the end of this~~ on the draft environmental impact statement. Where appropriate, techniques from this document will be suggested for inclusion in the Kapalua Mauka Community.

In their comment letter on the draft environmental impact statement, the Department of Business, Economic Development, and Tourism—Energy Resources, and Technology Division recommended that "Project buildings, activities, and site grounds should be designed with energy saving considerations." The Division called attention to the Hawai'i State Planning Act (Chapter 226, Hawai'i Revised Statutes) objective of promoting all cost-effective energy conservation through adoption of energy-efficient practices and technologies. The Division further referred to OEQC's "Guidelines for Sustainable Building Design in Hawai'i." Specific recommendations from the Division regarding recycling and energy-efficiency are incorporated in section 5.9.5, Solid Waste Facilities and section 5.9.6, Electrical and Communication Systems, of this final environmental impact statement.

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3.0 Required Permits & Approvals

3.0 REQUIRED PERMITS AND APPROVALS

The processing of various land use and development-related permits and approvals is prerequisite to implementation of the Kapalua Mauka community. Relevant State of Hawai'i and County of Maui land use plans, policies, and ordinances are described below. Conformance to plans and policies of the State of Hawai'i and the County of Maui is described in detail in Section 6.

3.1 STATE OF HAWAI'I

3.1.1 Environmental Impact Statement Law, Chapter 343, Hawai'i Revised Statutes

Compliance with Chapter 343, HRS is required as described in Section 1.1.2.

3.1.2 Land Use Law, Chapter 205, Hawai'i Revised Statutes

The State Land Use Law (Chapter 205, Hawai'i Revised Statutes (HRS)), establishes the State Land Use Commission (LUC) and gives this body the authority to designate all lands in the State into one of four districts: Urban, Rural, ~~Agriculture~~ Agricultural, or Conservation. The entire 925-acre site of the Kapalua Mauka community is currently within the State Agricultural district (Figure 5).

To accommodate the uses proposed within the Kapalua Mauka community, landowner Maui Land & Pineapple Company, Inc., will seek to reclassify approximately ~~450~~ 511 acres of the site to the Urban district and another approximately ~~341~~ 280 acres of the site to the Rural district (Figure 5). All of the uses planned within the Kapalua Mauka community are permitted in the Urban and Rural districts. Approximately 134 acres will remain in the Agricultural district and are not proposed for residential development. When reclassified, the Kapalua Mauka community will be consistent with the State Land Use Law.

3.2 COUNTY OF MAUI

Relevant land use plans and Ordinances of the County of Maui that pertain to the Kapalua Mauka community include the General Plan, the *West Maui Community Plan*, and the Maui County Code.

3.2.1 General Plan

The Kapalua Mauka community implements many of the objectives and policies of the *General Plan of the County of Maui 1990 Update*. As required by the County of Maui Charter, the *General Plan of the County of Maui* sets forth the desired sequence, patterns, and characteristics of future development. This is accomplished through long-range objectives focusing on the social, economic, and environmental effects of development coupled with specific policies designed to implement the objectives.

Specific general plan objectives and policies applicable to the Kapalua Mauka community are discussed in detail in section 6.2.1.

3.2.2 West Maui Community Plan

The *West Maui Community Plan* is one of nine community plans for Maui County. It reflects current and anticipated conditions in the West Maui region and advances planning goals, objectives, policies, and implementation considerations and serves as a decision-making guide in the region through the year 2010. The *West Maui Community Plan* provides specific recommendations addressing the goals, objectives, and policies contained in the General Plan, while still recognizing the values and unique attributes of the West Maui region.

As proposed, the Kapalua Mauka community would be 925 acres. Approximately 450 acres of the Kapalua Mauka community site is already designated as Project District 2 in the *West Maui Community Plan*. (Figure 6). As stated in the Plan, the intent of Project District 2 is to provide, within the context of Kapalua Resort, a mix of recreational activities including an existing golf course (with possible expansion to 27 holes), a clubhouse, pro shop, restaurants and bars, tennis courts, swimming pool, and other related recreational amenities and commercial services. The Plan also specifies that the Project District 2 is to include 750 residential units integrated with, and complementary to, the recreational facilities.

The proposed Kapalua Mauka community will extend beyond the current Project District 2 area of 450 acres, however, the number of residential units will not exceed 690—sixty units less than specified in the *West Maui Community Plan*. The resulting community will be far less dense than what is currently envisioned and actual community growth and the required regional infrastructure needs will not exceed what has been established in the *West Maui Community Plan*, which has a community planning horizon of 20 years.

To include the total area of the proposed Kapalua Mauka community as part of Project District 2, landowner Maui Land & Pineapple Company, Inc., will seek a community plan amendment to expand Project District 2 from 450 acres to 925 acres.

Conformance of the Kapalua Mauka community to the goals, objectives, policies, and implementing actions of the *West Maui Community Plan* is discussed in detail in Section 6.2.2.

3.2.3 Maui County Code

As discussed above, the Kapalua Mauka community will require an amendment to the *West Maui Community Plan* to expand the current Project District 2 from 450 acres to approximately 925 acres. Chapter 2.80A.060 of the Maui County Code specifies procedures for revisions or amendments of community plans. This environmental impact statement is being prepared in partial fulfillment of these requirements. All other requirements will be fulfilled.

Concurrent with the processing of the community plan amendment to designate the entire 925-acre Kapalua Mauka community site to Project District 2, landowner Maui Land & Pineapple Company, Inc., will seek to obtain the appropriate project district zoning designations as specified in Chapter 19.45 of the Maui County Code.

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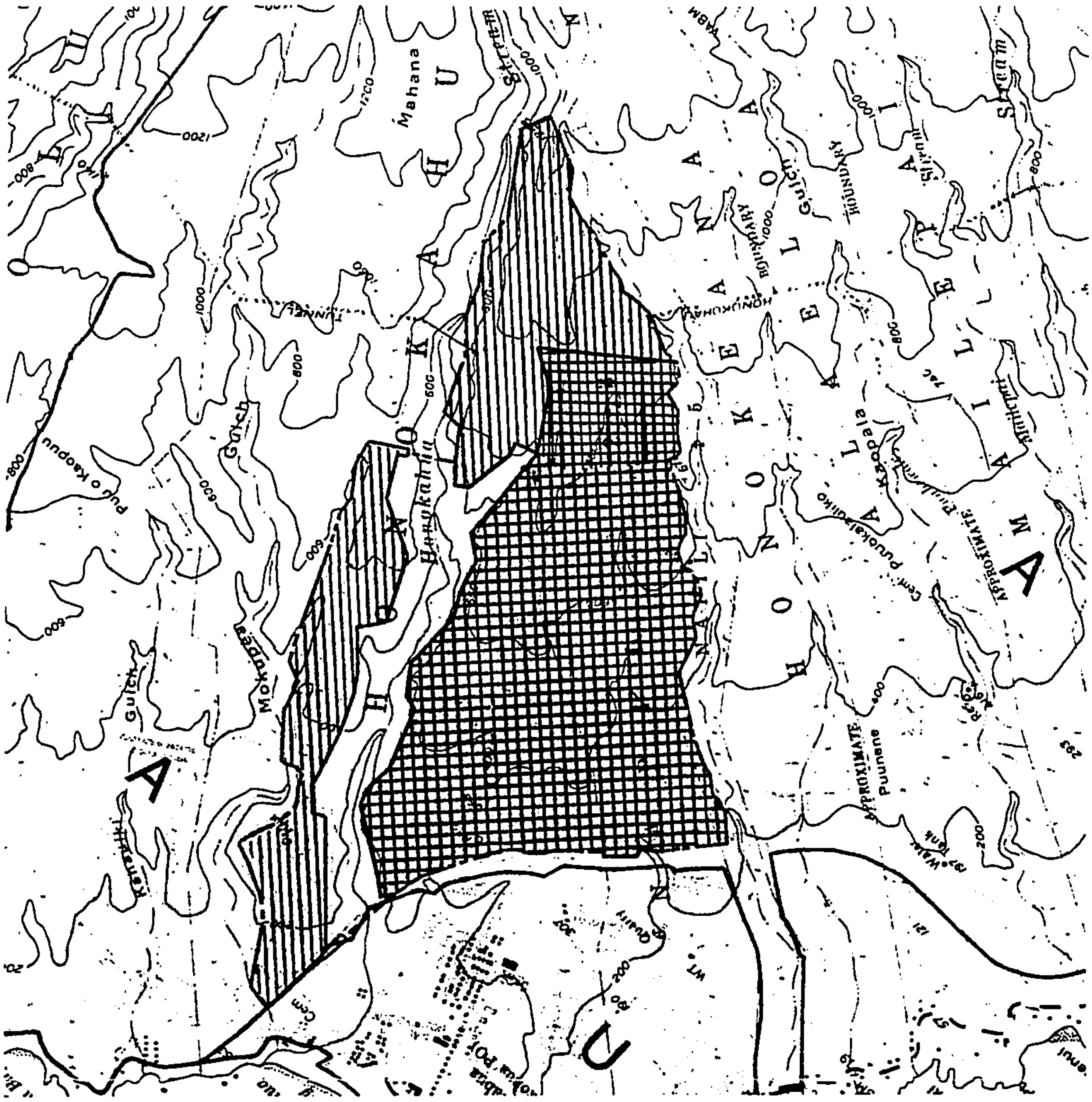

LEGEND

- A Agricultural
- U Urban
- C Conservation
- Project Area
- Proposed Rural
- Proposed Urban
- Remains Agricultural

Source: Land Use Commission

FIGURE 5
State Land Use District Boundary Map

KAPALUA MAUKA

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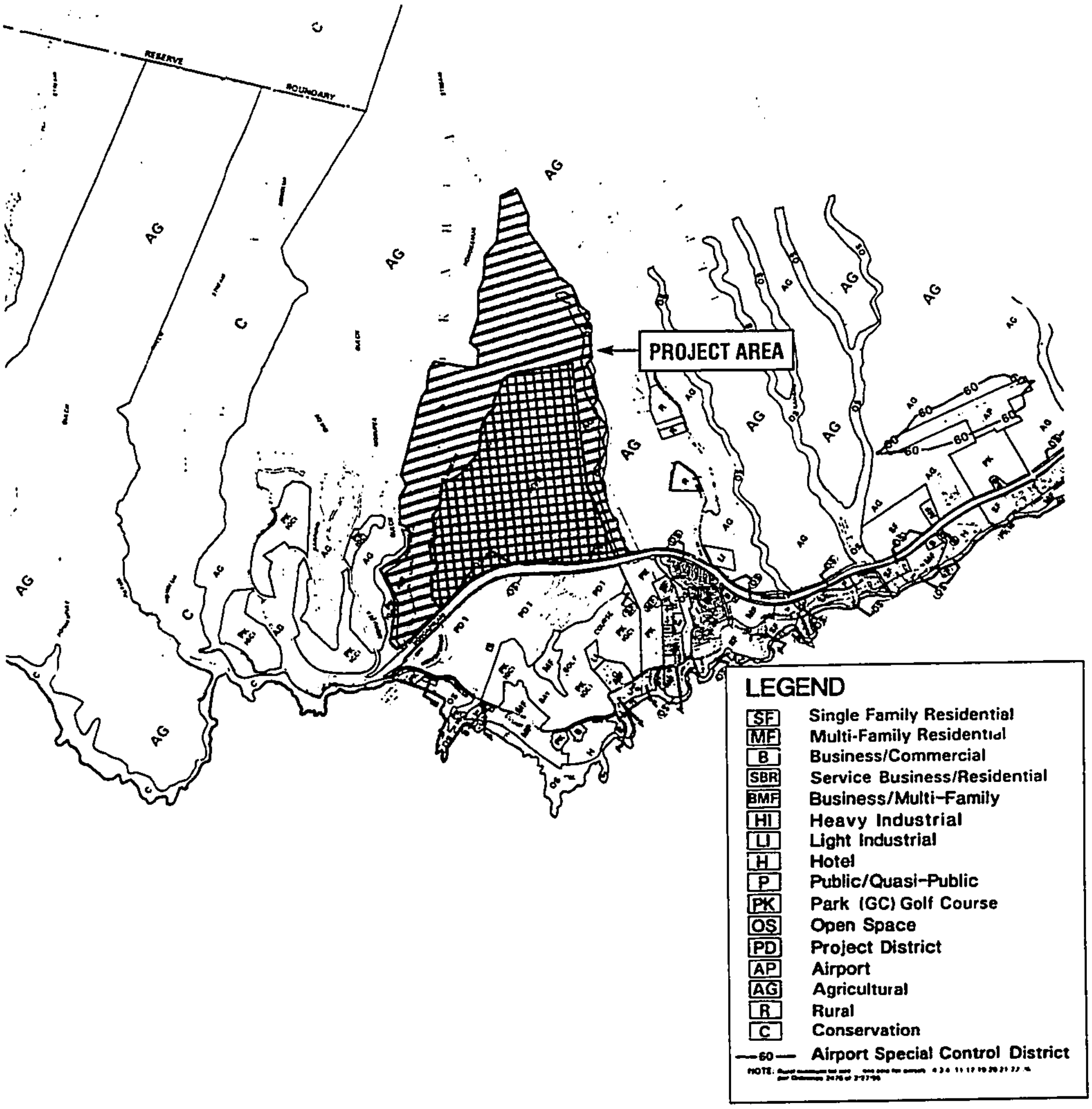

LEGEND

Project District 2 (450 Acres)

Proposed Additional Project District 2 Area (475 Acres)

Total Project Area (925 Acres)

Source: West Maui Community Plan

FIGURE 6

West Maui Community Plan
Land Use Map

KAPALUA MAUKA

0 2000 4000
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Project district development is intended to provide a flexible and creative planning approach, rather than specific land use designations, for quality developments. Project district processing involves three phases as follows:

Phase 1: Preparation and adoption of a Project District Zoning Ordinance by the County Council.

Phase 2: Preparation of a Project District Site Plan and adoption of this plan by the County Planning Commission.

Phase 3: Preparation and submittal of the Final Site Plans to the Planning Director for final review and approval.

Landowner Maui Land & Pineapple Company, Inc., will obtain all required County of Maui land use entitlements in accordance with all applicable requirements of the Maui County Code.

3.2.4 Approvals And Permits

A preliminary list of permits and approvals required for the Kapalua Mauka community is presented in Table 4.

Table 4. Required Permits and Approvals

Permit/Approval	Responsible Agency
Chapter 343, HRS compliance	County of Maui Planning Department Office of Environmental Quality Control
Community Plan Amendment	County of Maui Planning Department/County Council
State Land Use District Boundary Amendment	Land Use Commission
Project District Phase I/Change in Zone	County of Maui Planning Department/Maui Planning Commission (public hearing in West Maui)/County Council
Project District Phase II	County of Maui Planning Department/Maui Planning Commission (public hearing in West Maui)
Project District Phase III	County of Maui Planning Department
Subdivision Approval	County of Maui Department of Public Works and Waste Management
Grading/Building Permits	County of Maui Department of Public Works and Waste Management
NPDES Permit	State Department of Health
Permit to Perform Work within a State Highway Right-of-way	State Department of Transportation

Permit/Approval	Responsible Agency
Permit for Discharge into the State Drainage System	State Department of Transportation
Permit for Connection into the State Drainage System	State Department of Transportation
Compliance with Chapter 6E, HRS	State Historic Preservation Division
ADA Accessibility	Disability and Communication Access Board

4.0 Description of the Affected Natural Environment, Potential Impacts, & Mitigative Measures

4.0 DESCRIPTION OF THE AFFECTED NATURAL ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATIVE MEASURES

This section describes the existing conditions of the physical or natural environment, potential impacts of the Kapalua Mauka community on the environment, and mitigative measures to minimize any impacts.

4.1 CLIMATE

Existing Conditions

The climate of the Kapalua Mauka community site is generally mild. Temperatures in the area are generally very consistent and moderate with an average daily range of about 66 to 85 degrees Fahrenheit. The extreme minimum temperature recorded at nearby Kā'anapali is 47 degrees Fahrenheit, while the extreme maximum temperature recorded is 98 degrees Fahrenheit. Average annual rainfall in the area amounts to about 20 to 30 inches. Rainfall occurs primarily between the months of November and April.

The prevailing wind direction for the Kapalua area of Maui is northeast at 16 to 20 knots or approximately 18 miles to 23 miles per hour (Juvik and Juvik 1998). Tradewinds may sometimes attain speeds of up to 45 miles per hour. Winds from the south are infrequent, occurring only a few days during the year and mostly in winter in association with Kona storms.

Potential Impacts

The Kapalua Mauka community is not expected to have an effect on climatic conditions of the area.

Mitigative Measures

Because the Kapalua Mauka community is not expected to have an effect on climatic conditions of the area, no mitigative measures are planned.

4.2 TOPOGRAPHY AND GEOLOGY

Existing Conditions

The Kapalua Community will be located on the mauka side of Honoapi'ilani Highway in the Kapalua area of the West Maui region on the island of Maui. The proposed 925-acre community site rises from an elevation of 100 feet Mean Sea Level (MSL) at the northeasterly corner adjacent to fairways 7 and 8 of the Plantation Golf Course to approximately 1250 feet MSL at the southeasterly corner. The grade, exclusive of the gulches, varies between 10 and 15 percent. Honokōhau Gulch bisects community site near the eastern boundary. An unnamed gulch located approximately 600 feet east of the southwesterly boundary bisects the site in a mauka to makai direction.

Geologically, the island of Maui is characterized as East and West Maui, with East Maui dominated by Haleakalā Volcano. The Kapalua Resort is on the leeward side of West Maui, a volcano estimated to be more than two million years old. Its last eruptions are estimated to have occurred about 200,000 years ago. According to Juvik and Juvik (1998):

> An extinct volcano whose evolution includes shield, postshield and rejuvenated stages forms West Maui. Numerous cones, domes, dikes, flows, and pyroclastic deposits of mugearite, hawaiite, and trachyte represent the postshield stage, while the only evidence of its rejuvenated stage is a few vents and flows located mainly near Lahaina. Erosion has exposed nearly 4,900 vertical feet (1,490 meters) of volcanic layers on West Maui. (p. 43)

Macdonald, Abbott, and Peterson (1983) catagorize five major geologic units of West Maui as follows:

1. Pliocene and Pleistocene volcanic rocks, including the Wailuku and Honolua volcanic series;
2. Pleistocene and recent volcanic rocks, including the Lahaina volcanic series;
3. Pleistocene sediments which include calcareous dunes and consolidated earthy deposits;
4. Recent sediments which include unconsolidated deposits; and
5. Historic volcanic rocks.

Typically, the West Maui basalt is thin-bedded ʻaʻā and pāhoehoe created by quiescent flank eruptions along rift zones. The soils of West Maui, which reach depths of about 20 feet, indicate that the volcanic activity probably stopped in the Pliocene or earliest Pleistocene era (Macdonald, Abbott, and Peterson 1983).

In describing the stage of geological erosion of West Maui, Macdonald, Abbott, and Peterson (1983) state:

> Stream erosion of West Maui volcano has reached a late youthful to submature stage. Because of the thick armor of Honolua flows, the rainy northeastern slope has reached a less advanced stage of dissection than might otherwise be expected, and broad surfaces that have not been lowered much below the original surface lie between the deep canyons. In contrast, the drier southwestern slope has been much more deeply dissected, leaving sharp-crested ridges between the valleys. (pp. 386-378)

Potential Impacts

While the addition of the community will alter how the land is used, the proposed improvements are relatively insignificant compared to the overall geologic character of the site and region. Impacts on the topography and geology of the site could be caused by alterations, such as grading, to accommodate the Kapalua Mauka community.

Mitigative Measures

The low-density, rural character of much the community will provide considerable open space and limit the need to grade extensive areas. To the extent possible, improvements will conform to the contours of the land further limiting the need for extensive grading of the site.

Because the proposed improvements are relatively insignificant compared to the overall geologic character of the site and region, and because significant impacts are not expected, extensive mitigative measures are not planned. Appropriate engineering, design, and construction measures will be undertaken to minimize potential erosion due to grading of soils during construction. Further information on soils and grading is provided in section 4.3.

4.3 SOILS

Existing Conditions

There have been three soil classification and suitability studies prepared for lands in Hawai'i: 1) the U.S. Department of Agriculture *Soil Conservation Services* Soil Survey (SCS); 2) the University of Hawai'i Land Study Bureau Detailed Land Classification; and 3) the State Department of Agriculture's Agricultural Lands of Importance to the State of Hawai'i (ALISH). The principal focus of these studies has been to describe the physical attributes of land and the relative productivity of different land types for agricultural production.

Soil Conservation Survey. The U.S.D.A. Soil Conservation Service, *Soil Survey of the Islands of Kaua'i, O'ahu, Maui, Moloka'i, and Lāna'i,* (1972) classifies the soils of the Kapalua Mauka community site into two soil associations: the Waiakoa-Keāhua-Moloka'i association and the Honolua-Olelo association (Figure 7). Soil types within these associations on the site are: 'Alaeloa silty clays (AeB, AeC, AeE), Honolua silty clays (HwC, HwD), Kahana silty clays (KbB, KbC, KbD, KcC), Rough broken land (rRR), and Rough broken and stony land (rRS). A brief description of each soil type follows:

'Alaeloa Silty Clays (AeB, AeC, AeE) These soils are generally well-drained and located in the upland regions of Maui. Elevations range from 100 to 1,500 feet above sea level with slopes ranging from 3 to 70 percent. On slopes greater than 15 percent, annual rainfall amounts are approximately 35 to 60 inches. In areas not previously eroded, the subsoil is approximately 48 inches thick, medium acidic in the surface layer and strongly acid in the subsoil. The soils are typically used for pineapple, pasture, wild life habitat, homesites, and water supply.

Honolua Silty Clays (HwC, HwD) These soils are well-drained and found on the uplands of Maui between elevations of 500 to 1,500 feet. Slopes range from 7 to 25 percent. The average annual rainfall is approximately 50 to 80 inches. These soils are used for pineapple, pasture, woodland, wildlife habitat, and water supply.

Kahana Silty Slays (KbB, KbC, KbD, KcC) These soils are well-drained and found in upland locations on Maui between the 100 and 1,200 foot elevations. Slopes range from 3 to 25 percent. Annual rainfall is approximately 30 to 45 inches per year. The typical uses for these soils are sugarcane production, pineapple, and homesites.

Rough Broken Land (rRR) - Rough Broken Land consists of very steep land broken by numerous intermittent drainage channels. In most places this soil is not stoney. It occurs in gulches and on mountainsides. Slope ranges from 40 to 70 percent. Runoff is rapid and the annual rainfall ranges from 25 to more than 200 inches. This land is primarily used for watershed and wildlife habitat.

Rough Broken and Stony Land (rRS) Rough Broken and Stony Land consists of very steep, stony gulches. Elevations range from nearly sea level to 3,000 feet. Runoff is rapid and the annual rainfall amounts to 20 to 40 inches. This land is use for pasture, wildlife habitat, and watershed.

The Soil Conservation Service's Land Capability Grouping, rates the above soil types according to eight levels, ranging from the highest classification level, I, to the lowest level, VIII. Approximately 25 acres (2.7%) of the Kapalua Mauka community site are rated IIe (AeB and KbB), indicating that they have moderate limitations that reduce the choice of plants or require moderate conservation practices. The subclassification "e" indicates that the soils are subject to erosion.

Approximately 475 acres (51.3) are rated IIIe (AeC, HwC, KbC, and KcC). Class III soils have severe limitations that reduce the choice of plants, require special service conservation practices, or both.

About 74 acres (8%) are rated IVe (HwD and KbD). Class IV soils have very severe limitations that reduce the choice of plants, require very carful management practices, or both.

Land Study Bureau Detailed Land Classification. The University of Hawai'i's Land Study Bureau *Detailed Land Classification - Island of Maui* classifies the lands of the Kapalua Mauka community site as ranging from "C" to "E" (Figure 8). This classification is based on a five-class productivity rating using the letters A, B, C, D, and E, with A representing the highest class of productivity and E the lowest.

The "E" rated soils of the site are primarily within gulches and are considered as having little or no suitability for soil based agricultural production. Within the gulches, much of the suitable topsoil has eroded or is held to the steep slopes by a thick layer of vegetation. These steep slopes will not be disturbed by the Kapalua Mauka community. The "C" and "D" soils are suitable for pineapple production, however, these fields do not contain the overall agronomic characteristics required for continued production.

Approximately 584 acres (63.1%) of the soils of the Kapalua Mauka community site are rated "C"; 17 acres (1.8%) are rated "D"; and 324 acres (35.1%) are rated "E."

Agricultural Lands of Importance To The State of Hawai'i (ALISH). The Agricultural Lands of Importance to the State of Hawai'i (ALISH) system classifies the lands of the Kapalua Mauka community site as lands as "Prime Agricultural Land," "Other Important Agricultural Land," or "not classified" (Figure 9). Prime Agricultural Land is defined as having the soil quality, growing season,

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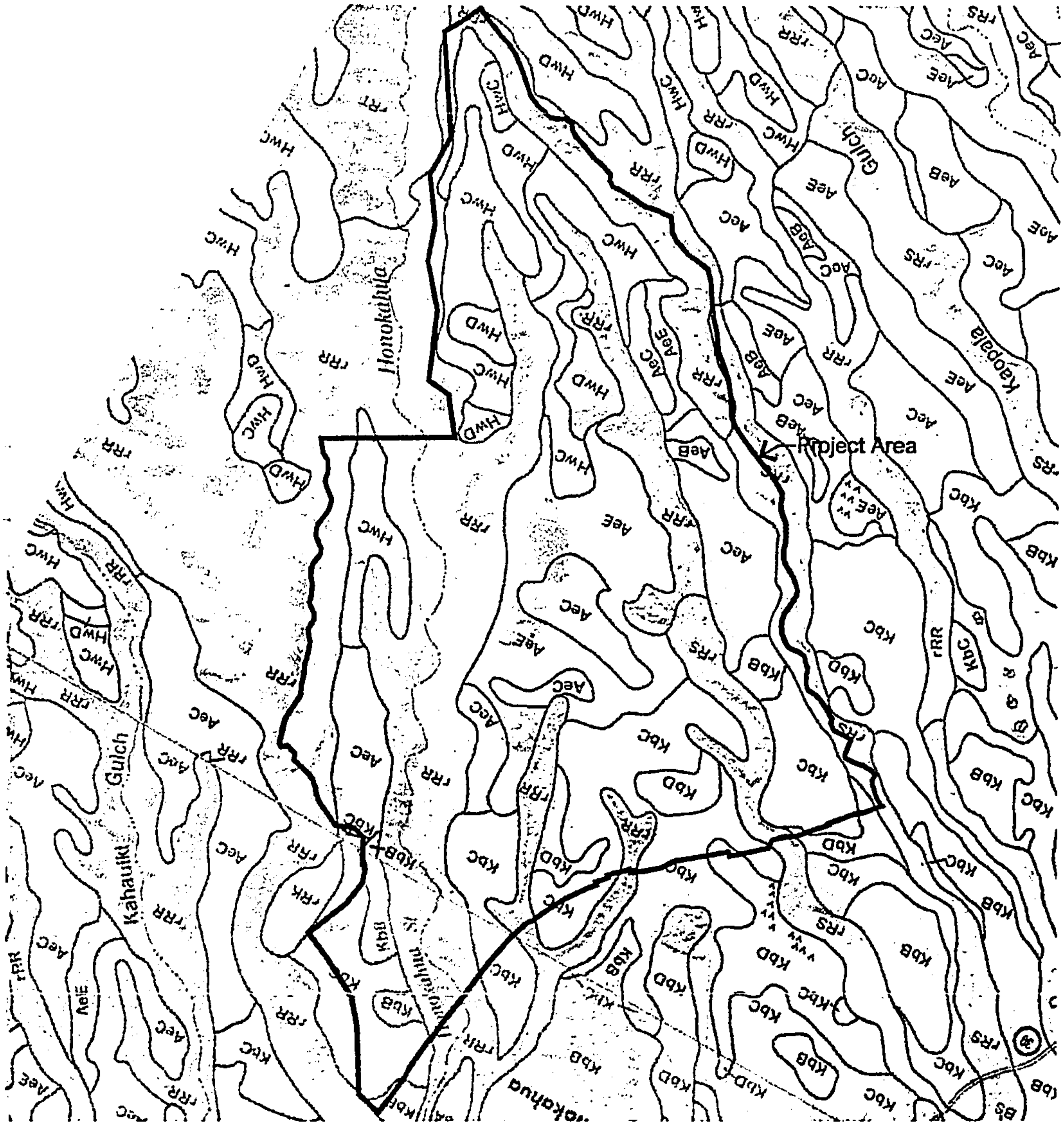


Legend

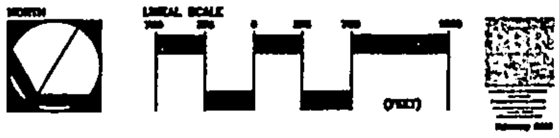
AeB	Alalou Silty Clay 3-7% Slope	KbC	Kahana Silty Clay 7-15% Slope
AeC	Alalou Silty Clay 7-15% Slope	KbD	Kahana Silty Clay 15-25% Slope
AeE	Alalou Silty Clay 15-35% Slope	rRR	Rough Broken Land
HwC	Honokua Silty Clay 7-15% Slope	rRS	Rough Broken and Stoney Land
HwD	Honokua Silty Clay 15-25% Slope	rRT	Rough Mountainous Land
KbB	Kahana Silty Clay 3-7% Slope		Project Area

Source: USDA Soil Conservation Service Soil Survey

Figure 7
Soil Conservation Service Soil Survey

Kapalua Mauka

KAPALUA LAND COMPANY, LTD. ISLAND OF MAUI



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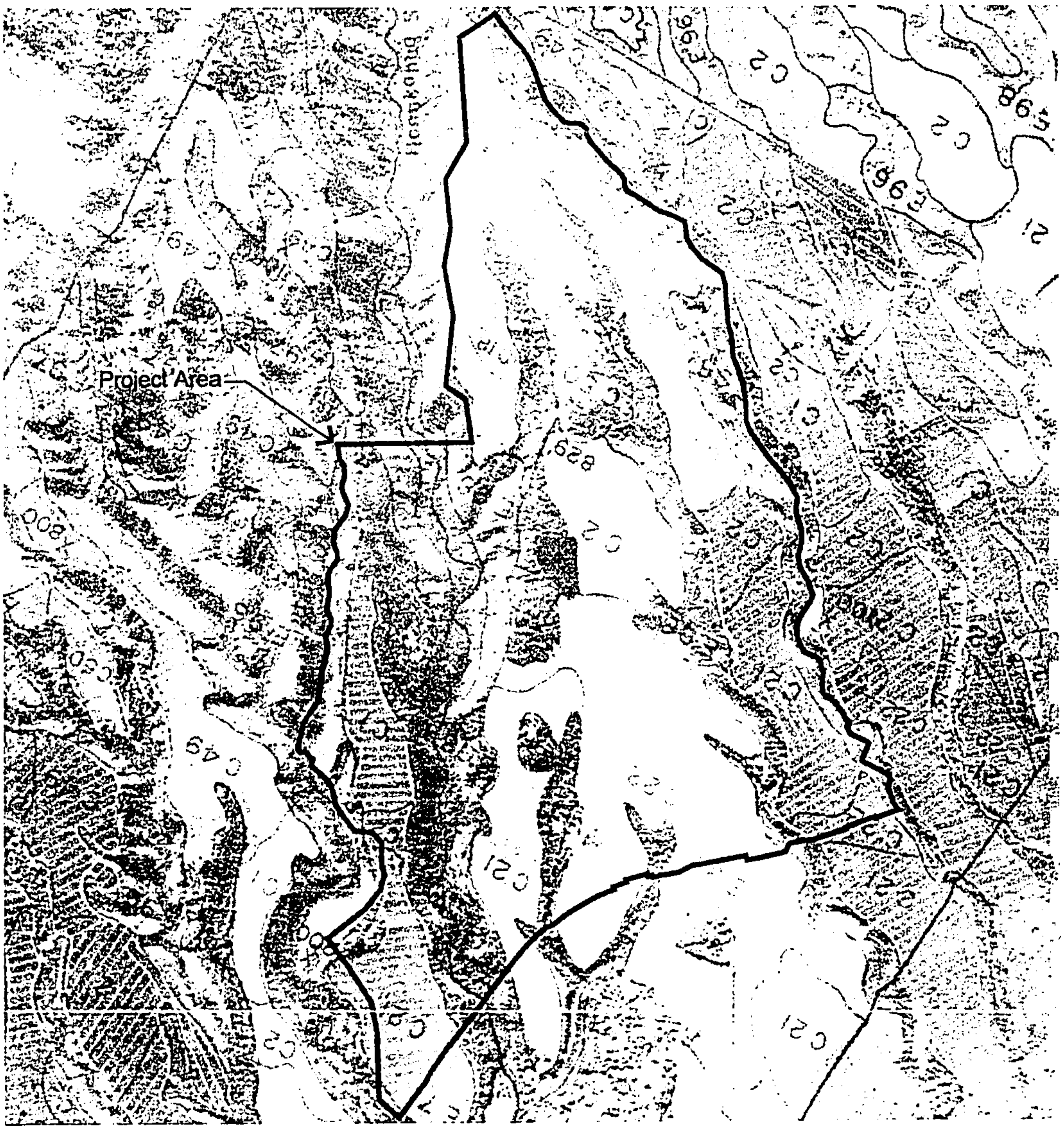

Legend

- A Excellent — Prime Agricultural Soils
- B Good — Prime Agricultural Soils
- C Fair — Marginal Agricultural Soils
- D Poor — Marginal Agricultural Soils
- E Very Poor — Marginal Agricultural Soils
- Project Area

Source: University of Hawaii Detailed Land Classification, Island of Maui

Figure 8
Detailed Land Classification

Kapalua Mauka

KAPALUA LAND COMPANY, LTD. ISLAND OF MAUI

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Legend

- Prime Agriculture Land
- Other Agricultural Land
- Not Classified
- Project Area

Source: State of Hawaii Department of Agriculture

Figure 9
Agricultural Lands of Importance to the State of Hawaii (ALISH)

Kapalua Mauka

KAPALUA LAND COMPANY, LTD. ISLAND OF MAUI and moisture supply needed to produce sustained high yields of crops economically when treated and managed according to modern farming methods. Other Important Agricultural Land is considered to have a statewide or local importance for agricultural use. The unclassified lands are located within the steep gulches and represent no value for soil-based agriculture.

Approximately 413 acres (44.6%) of the Kapalua Mauka community site are rated "Prime"; 172 acres (18.6%) are rated "Other"; and 340 acres (36.8%) are not rated.

Potential Impacts

The Kapalua Mauka community will be built on the broad, gently sloping ridges now occupied by the golf course, pineapple fields, and pastures. Part of the development process will include grading portions of these areas.

Impacts to the soils of the site include the potential for soil erosion and the generation of dust during construction. Clearing and grubbing activities will temporarily disturb the soil retention values of the existing vegetation and expose soils to erosional forces. Some wind erosion of soils could occur without a proper watering and regrassing program. Heavy rainfall could also cause erosion of soils within disturbed areas of land.

Since the gulches will not be developed; soils within the gulches will not be disturbed.

Mitigative Measures

The low-density, rural character of much the community will provide considerable open space and limit the need to grade extensive areas. To the extent possible, improvements will conform to the contours of the land further limiting the need for extensive grading of the site. In addition, because construction is estimated to take place over a 14 year period, graded areas will be limited to specific areas for short periods of time.

Grading also will be limited to less than 15 acres at one time. Upon the completion of grading for each area, all exposed areas will be grassed or landscaped. All grassing on a grading phase will be completed before commencement of grading in the next phase in compliance with the Maui County grading ordinance. Measures taken to control erosion during the site development period will include:

- Minimizing the time of construction;
- Retaining existing ground cover as long as possible;
- Constructing drainage control features early;
- Using temporary area sprinklers in non-active construction areas when ground cover is removed;
- Providing a water truck on site during the construction period to provide for immediate sprinkling as needed;
- Using temporary berms and cut-off ditches, where needed, for control of erosion;
- Watering graded areas when construction activity for each day has ceased;

- Grassing or planting all cut and fill slopes immediately after grading work has been completed; and
- Installing silt screens where appropriate.

All construction activities will comply with all applicable federal, State, and County regulations and rules for erosion control. Before issuance of a grading permit by the County of Maui, the final erosion control plan and best management practices required for the NPDES permit will be completed. All construction activities will also comply with the provisions of Chapter 11-60.1, Hawai'i Administrative Rules, Section 11-60.1-33 on Fugitive Dust.

After construction, establishment of permanent landscaping will provide long-term erosion control.

4.4 AGRICULTURAL IMPACT

An agricultural impact study was prepared by Decision Analysts Hawai'i, Inc., to examine the impact of the Kapalua Mauka community in relation to the current use of a portion of the site for pineapple cultivation. This study is summarized below. The full study is included in Appendix B.

Existing Conditions

About 500 to 585 acres of the proposed Kapalua Mauka community site are well-suited for growing low-elevation crops. This evaluation is based on the favorable soil conditions and ratings over much of the site, gently or moderately sloping terrain over this same area, mild sunny climate, available irrigation water, and good access.

Maui Pineapple Company, Ltd., (a subsidiary of Maui Land & Pineapple Company, Inc.) currently cultivates pineapple on approximately 169 acres of the proposed community site. Other areas are fallow pineapple fields, the existing Village Golf Course, pastureland, and open space gulches and ravines.

Potential Impacts

Development of the Kapalua Mauka community will require that the approximately 169 acres of land currently in pineapple cultivation be withdrawn from agricultural use. This amounts to 1.9 percent of the 9,100 acres currently being farmed by Maui Pineapple Company. Averaged over time, 169 acres yield about 3,245 tons of pineapple per year, which in turn generates revenues of about $1.6 million per year. Employment associated with farming this amount of land and processing the pineapple amounts to about 20 workers receiving an annual payroll of $560,000.

Once the Kapalua Mauka community is built, nearby pineapple operations are not likely to cause significant nuisance problems because none of the new homes will be close to field operations. The nearest homes will be separated from pineapple operations by wide gulches: 1,000 feet or more for homes downwind of fields (based on prevailing trade winds), and 300 feet or more for homes upwind of fields.

Mitigative Measures

Maui Pineapple Company, Ltd., is currently downsizing its operations in response to global economic forces and trends and to capitalize on its competitive advantages. Much of the reductions in plantings will occur in West Maui because of the comparatively long trucking distance to the cannery and packing plant in Kahului.

Because of this planned downsizing, development of the Kapalua Mauka community will not result in any reduction in cultivated acreage beyond that already scheduled for downsizing. With or without the withdrawal of 169 acres for the community, Maui Pineapple Company, Ltd, will retain sufficient land to meet its lowered production targets. Furthermore, if replacement land is needed, it could be made available from Maui Pineapple Company, Ltd's inventory of uncultivated fields, and possibly from nearby land that could be leased.

In view of these findings, the Kapalua Mauka Community will not have an adverse impact on Maui Pineapple Company, Ltd., and no mitigation measures are necessary. In fact, the Kapalua Mauka community could benefit Maui Pineapple Company, Ltd., and contribute toward its long-term survival because the community will strengthen the profitability of the parent company (Maui Land & Pineapple Company, Inc.), and a portion of these profits could be used, if necessary, to help carry Maui Pineapple Company, Ltd., during lean years.

In regard to the loss of agricultural land for residential and recreational uses, the Kapalua Mauka community will reduce the availability of agricultural land by a small amount. However, because of the vast amount of land that has been released from plantation agriculture in West Maui and throughout the State (about 305,500 acres since 1968), ample agricultural land is available on Maui and other islands to accommodate agricultural activities.

4.5 NATURAL HAZARDS

Existing Conditions

Natural hazards impacting the Hawaiian islands include hurricanes, volcanic eruptions, earthquakes, and flooding.

Volcanic hazards in the area of the Kapalua Mauka community are considered minimal due to the extinct status of the volcano comprising West Maui. No lava flows have impacted the West Maui region for at least 20,000 years (MacDonald, Abbott, & Peterson 1983).

In Hawai'i most earthquakes are linked to volcanic activity, unlike other areas where a shift in tectonic plates is the cause of an earthquake. Each year thousands of earthquakes occur in Hawai'i, the vast majority of them so small they are detectable only with highly sensitive instruments. However, moderate and disastrous earthquakes have rocked the islands.

The 1938 Maui Earthquake, with a magnitude of 6.7-6.9 and an epicenter six miles north of Maui, created landslides and forced the closure of the road to Hana. Damaged water pipes and ground fractures also were reported in Lahaina.

Devastating hurricanes have impacted Hawai'i twice in the past two decades: Hurricane 'Iwa in 1982 and Hurricane 'Iniki in 1992. While it is difficult to predict these natural occurrences, it is reasonable to assume that future events could be likely given the recent record.

Flood hazards are primarily identified by the Flood Insurance Rate Map (FIRM) prepared by the Federal Emergency Management Agency (FEMA), National Flood Insurance Program. According to the FIRM, the site of the Kapalua Mauka community is within "Zone C", which indicates an area of minimal flooding (Figure 10).

Other natural hazards that may be associated with the site are those areas associated with steep slopes and the potential for flooding in the bottom of the gulch areas.

Potential Impacts

The establishment of the Kapalua Mauka community will not exacerbate any hazard conditions. Because of the extinct status of the volcano comprising West Maui, volcanic impacts to the community are considered unlikely. Earthquake hazards in the area are no greater than other locations on Maui. Buildings, as well as roadways, sewer, and water lines could be damaged by an earthquake of sufficient magnitude.

The Kapalua Mauka community, as the rest of Maui or the state, is no more or less vulnerable to the destructive winds and torrential rains associated with hurricanes. Because the community will be built on the broad, gently sloping ridges now occupied by the golf course, pineapple fields, and pastures, and not in the gulches, impacts from flooding are not expected. Section 5.9.2 contains more information on the drainage of the site and discusses proposed impacts and improvements related to drainage infrastructure.

Mitigation Measures

Volcanic impacts to the community are considered unlikely, however mitigation of lava flow hazards is limited to the provision of adequate evacuation routes and a civil defense warning system designed to provide area residents with as much advance notice of a threatening lava flow as possible.

Mitigation of hazards associated with earthquakes include adherence to Maui County building codes and standards to minimize potential damage to structures. All buildings and structures will be designed and constructed in compliance with applicable building codes and standards.

Likewise, the potential impact of destructive winds and torrential rainfall of hurricanes will be mitigated by compliance with the Maui County Building Code.

Flood hazards will be mitigated by restricting development of the community to the broad, gently sloping ridges now occupied by the golf course, pineapple fields, and pastures, and not allowing development in the gulches. Section 5.9.2 contains more information on drainage of the site and discusses proposed impacts and improvements related to drainage infrastructure.

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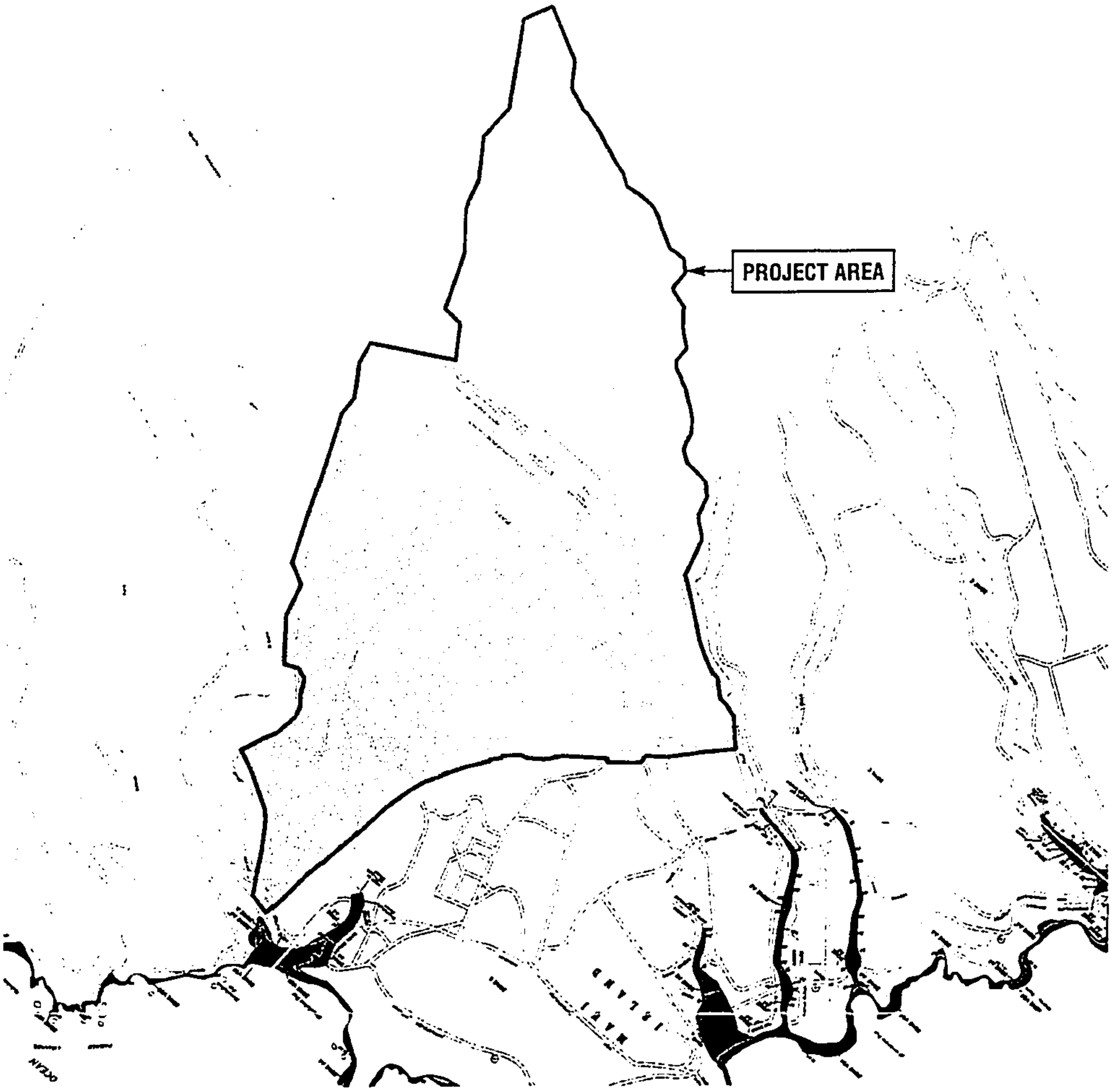

LEGEND

	Project Area
C	Areas of Minimal Flooding
V29	Areas of 100-year Coastal Flood with Velocity (Wave Action): Base Flood Elevations and Flood Hazard Factors Determined.

Source: Flood Insurance Rate Maps #150003 0138B, #150003 0139B

FIGURE 10

Flood Insurance Rate Map

KAPALUA MAUKA

0 1000 2000 FEET

PBR

4.6 BOTANICAL RESOURCES

Existing Conditions

Two reports were prepared to assess the botanical resources of the Kapalua Mauka community and to suggest possible mitigation measures. The first, a biological survey (Nagata 1997) covers the original 450-acre Project District 2 area and surveys both the flora and fauna of the site. The second, a botanical survey (Char 2001), covers the additional area proposed to be included in the expanded project district and includes only the flora of the area. Figure 11 shows the areas of both surveys. Both surveys are summarized below. The full surveys are included in Appendix C (Nagata 1997) and Appendix D (Char 2001).

1997 Survey (Nagata)

The biological survey (Nagata 1997) of the original 450-acre Project District 2 site found the vegetation of the area to consist of golf course plantings, forestry plantings, and pineapple fields. For the most part, the vegetation has been introduced and does not resemble a natural state. Of the eight plant communities recognized, only one is representative of the original vegetation in the region. The eight plant communities are described as follows:

Cultivated Land. This plant community is comprised of more than 75 percent of the approximately 200 plant species recorded on the property. The Village Golf Course at Kapalua, all ravines and uncultivated areas between the holes and pineapple fields make up this community. Consisting of a mosaic of lawns and other landscaped areas, fairways and greens, grasslands, thickets and forest, it is the largest and the most complex of all the vegetation types in the community site. Representative plant species (exclusive of the golf course area) include: thickets of guava, koa-haole and Christmas berry, various grasses, and pineapple.

Eucalyptus Forest. The Eucalyptus Forest is the second largest vegetation type and consists of extensive stands of Swamp mahogany and one or more other species of Eucalyptus which were probably planted for reforestation. Generally, these trees are at least 50 feet tall and located within Honokahua Gulch and in the large gulch within the golf course. The trees form closed-canopied stands in some locations. In the large gulch, trees can attain heights of nearly 100 feet. Groves of Ironwood and Formosan koa also occur in certain sites.

Styphelia-Dodonaea Scrub. The only native plant community in the site is the *Styphelia-Dodonaea Scrub*. It occurs in the mauka portion of Honokahua gulch at mid to upper slope where Eucalyptus cease to be dominant on steep slopes with shallow soils. Within this community, these native species provide at least 90 percent cover except in rocky areas. The vegetation is dominated by pūkiawe and ‘a‘ali‘i 3-7 feet tall with moderate numbers of ‘akia, ‘ōhi‘a-lehua (*Metrosideros polymorpha*) and huehue (*Cocculus trilobus*). There is also a small colony of about 15 individuals of the native sandalwood.

Christmas Berry Thicket. The lower slopes below the *Schinus-Dodonaea Scrub* community and the floor of Honokahua gulch is dominated by dense stands of Christmas berry. On the slopes, thickets are very dense limiting the establishment of other species. On the gulch floor the Christmas berry becomes 15-20 inches tall with an open understory and a well developed herb layer of basketgrass (*Oplismenus hirtellus*) and laua'e.

Mixed Forest. The Mixed Forest occurs on the floor of Honokahua Gulch and consists mostly of a closed-canopied forest of 50-60 feet tall Java plum, Eucalyptus, and kukui (*Aleurites moluccana*).

Mixed Gulch. The Mixed Gulch community occurs in the middle portion of the west gulch and consists of an extensive community of Eucalyptus, ironwood, Christmas berry, Formosan koa, guava and koa-haole.

Formosan Koa Forest. The Formosan Koa community is especially abundant in the mauka section of the west gulch where it occupies both sides of the gulch and the gulch floor. Many of the Formosan Koa individually are 30-50 inches high with an open understory of sapling Formosan koa, Christmas berry and guava.

Koa-haole Thicket. This community is dominated by extensive stands of Koa-haole 10-20 inches tall with emergent scattered Eucalyptus and small clusters of Christmas berry and formosan koa. The herb layer is also well-developed with vegetation cover of nearly 100 percent consisting of various grasses.

Native plants are found in certain portions of the site and several native species are found in small to moderate numbers throughout much of the property. The landscaped portions of the golf course and the pineapple fields are the only subcommunities without native species. Combined, 18 native species are found on the site. All are common to the lowlands and forests of most of the islands of Hawai'i.

The 1997 biological survey (Nagata 1997) also mentions that "two federally-listed Endangered Species are being cultivated in the Audubon Cooperative Sanctuary near the second hole of the Village Golf Course." This area is actually a working nursery where plants are propagated for resort use and is makai of Honoapi'ilani Highway, outside of the Kapalua Mauka community site. Two species in the nursery are federally listed Endangered Species. The Ma'o hauhele, native to Moloka'i, Lāna'i, Maui, and Hawai'i, was listed in 1994. Two thriving individuals are cultivated in the nursery. The uhuuhi, native to Kaua'i, O'ahu, West Maui, and Hawai'i, was listed in 1986. There is one uhuuhi planted in the nursery.

2001 Survey (Char)

The 2001 botanical survey (Char 2001) covered the additional area proposed to be included in the expanded project district. The survey recognized five major vegetation cover types or plant communities. The majority of the vegetation in the area is composed of introduced species such as *Eucalyptus*, Formosan koa, Christmas berry, California grass, and actively cultivated pineapple fields. One relatively intact native plant community, the mixed native scrub, is found on the upper slopes of Honokahua Gulch on its mauka section. None of the plants inventoried is a threatened or endangered species or a species of concern. The five plant communities are described as follows:

Cultivated Land. This vegetation type covers the greatest area on the study site and is the most variable. Cultivated land includes the pineapple fields, pastures, and disturbed areas along the gulch bottoms and roadsides. It is dominated by introduced plants, many of them weedy species.

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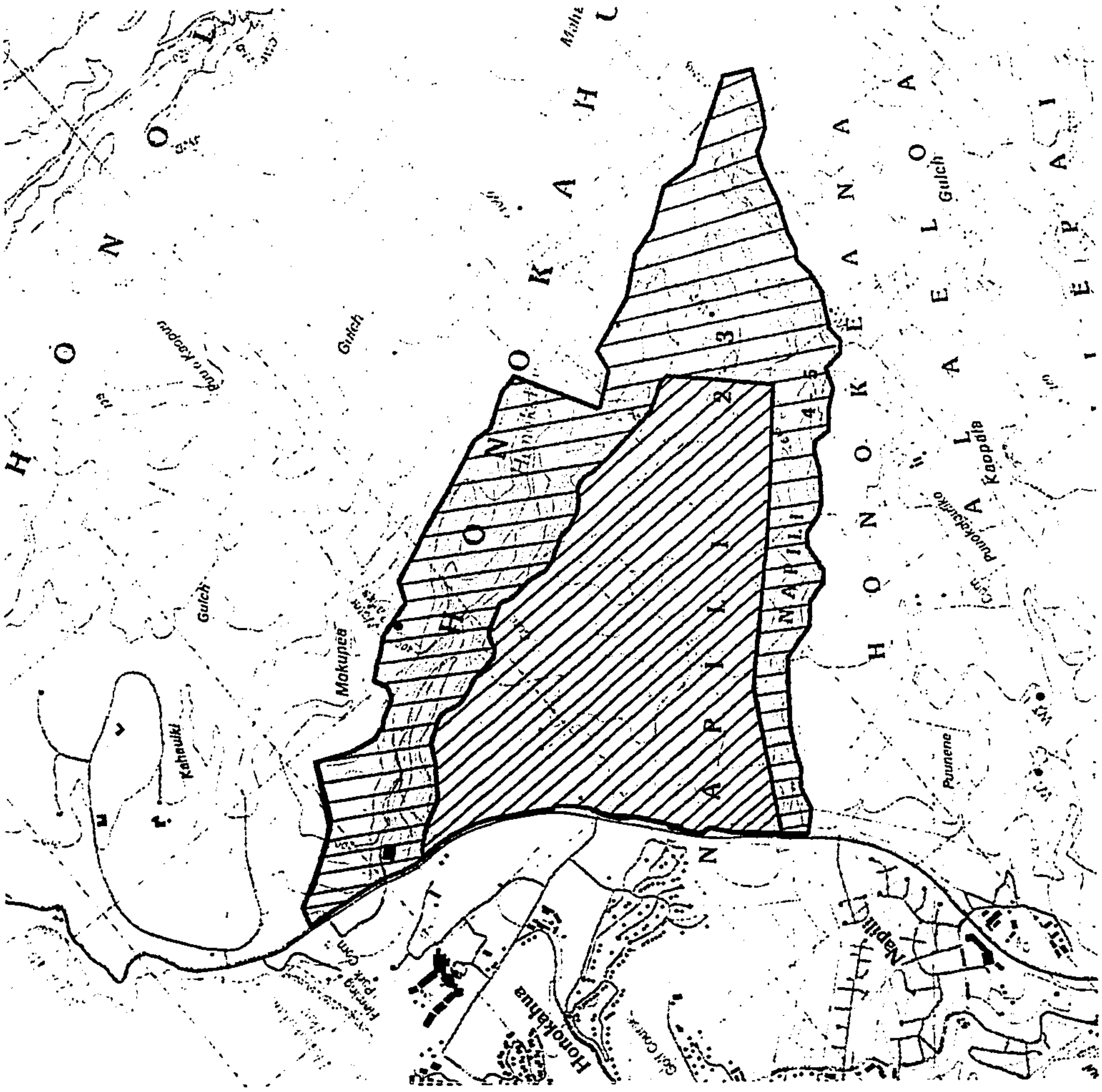

LEGEND

Nagata 1997 Survey Area

Char 2001 Survey Area

Map Source: U.S. Geological Survey

FIGURE 11

Areas of Botanical Surveys

KAPALUA MAUKA

0 1000 2000 FEET

PBR

Actively cultivated pineapple *(Ananas comosus)* fields comprise the bulk of the cultivated land. The densely packed rows of pineapple plants support few weeds. These include sourgrass *(Digitaria insularis)*, Natal redtop grass *(Melinis repens)*, and Guinea grass *(Panicum maximum)*.

Grassy, mostly open pastures are found on the ridges between the 800 foot and 1,280 foot elevation. This area appears to have been in pineapple cultivation at one time. The grass cover usually consists of a mixture of broomsedge grass *(Andropogon virginicus)*, African dropseed *(Sporobolus africanus)*, and golden beardgrass *(Chrysopogon aciculatus)*, but in some places broomsedge may be the dominant grass cover. Clumps of young Formosan koa trees *(Acacia cunfusa)*, 3 to 15 feet tall, are common in some places. Other plant species observed in the pastures in fairly large numbers include Glenwood grass *(Sacciolepis indica)*, Spanish clover *(Desmodium incanum)*, Asiatic pennywort *(Centella asiatica)*, Hilo grass *(Paspalum conjugatum)*, and narrow-leaved carpetgrass *(Axonopus fissifolius)*.

At about the 1,200 foot elevation, the woody components increase; these include Christmas berry *(Schinus terebinthifolius)* Formosan koa, silk oak *(Grevillea robusta)* and waiawī *(Psidium cattleianum* var. *littorale)*. Ground cover is a mixture of broomsedge grass, hairy swordfern *(Nephrolepis multiflora)*, and molassesgrass *(Melinis minutiflora)*. Scattered, tangled mats of uluhe fern *(Dicranopteris linearis)*, 3 feet tall, also become common.

Storage and maintenance areas for the golf course are found in Honokahua Gulch where the gulch floor broadens out along its lower reaches. A large planting of papaya *(Carica papaya)* and a smaller planting of banana *(Musa X paradisiaca)* are also found here. Weedy, mostly annual plants are abundant on the disturbed areas.

Also included in the cultivated land plant community is the roadside vegetation. Where the roads abut the gulches or cross into the gulches, the vegetation consists of dense clumps of elephant grass *(Pennisetum purpureum)* and thick mats of molassesgrass and California grass *(Brachiaria mutica)*. Scattered thickets of Christmas berry, koa haole *(Leucaena leucocephala)*, and guava *(Psidium guajava)* are common to abundant.

Introduced Forest. Large, tall stands of introduced tree species such as *Eucalyptus*, river-oak ironwood *(Casuarina cunninghamiana)*, and Cook Pine *(Araucaria columnaris)* occur in Honokahua Gulch and the smaller Nāpili 2-3 and Nāpili 4-5 gulches. Extensive stands of swamp mahogany *(Eucalyptus robusta)* and other *Eucalyptus* species form a closed canopied forest, 50 to 100 feet tall. On the steeper slopes or where the soil is thin and rocky, the *Eucalyptus* trees are shorter and the canopy open. Understory is typically poorly developed with scattered Christmas berry shrubs, *Eucalyptus* saplings, and clumps of sourgrass. In some of the smaller gulches, laua'e fern *(Phymatosorus scolopendria)* is abundant. In many places, however, Christmas berry forms a dense thicket, 15 to 20 feet tall. Where the *Eucalyptus* trees are shorter and more open, native species such as pūkiawe *(Styphelia tameiameiae)*, 'a'ali'i *(Dodonaea viscosa)*, 'ūlei *(Osteomeles anthyllidifolia)*, 'akia *(Wikstroemia Oahuensis)*, and 'ōhi'a lehua *(Metrosideros polymorpha)* are occasionally encountered.

Formosan koa, 20 to 40 feet tall, is also abundant in the gulches as well as some of the broad ridges. The understory vegetation is variable. On the ridges, it consists of rather dense clumps of sourgrass, broomsedge, and nettle-leaved vervain *(Stachytarpheta cayennsis)*. On the steeper slopes, Christmas berry shrubs form a dense cover between the trees. Smaller stands of river-oak ironwood and Cook pine are found on the upper slopes of the gulches. Understory is sparse with a few Christmas berry and strawberry guava *(Psidium cattleianum)* shrubs and clumps of sourgrass; a layer of leaf litter is typically found under these trees.

On the floor of Honokahua Gulch, the forest is a mixture of Java plum *(Syzygium cumini)*, kukui *(Aleurites moluccana)*, and stands of *Eucalyptus* and Formosan koa. A few old common mango trees *(Mangifera indica)* with large rounded crowns are also occasionally encountered. Christmas berry shrubs form a dense cover between the trees. Groundcover is composed of the more shade-tolerant species such as basketgrass *(Oplismenus hirtellus)* and laua'e fern. Coffee shrubs *(Coffea arabica)* are common in some places on the gulch floor.

Christmas Berry Thicket. Dense thickets of Christmas berry dominate the slopes and floor of Honokahua Gulch. Ground cover is sparse with leaf litter and bare soil prominent. Where the Christmas berry thins out or along the margins of the thickets where there is more light, molassesgrass, Spanish clover, partridge pea *(Chamaecrista nictitans)*, nettle-leaved vervain, and guava are common. Small stands of Formosan koa and a few lama trees *(Diospyros sandwicensis)* can also be found here.

Mixed Native Scrub. The upper slopes of Honokahua Gulch support mixed native scrub vegetation. The best examples of this plant community can be found on the upper slopes where the water pipeline (siphon) drops into the gulch and up to the project's upper boundary near a small pu'u at the 1,258 foot elevation. The slopes are very steep in this area.

The vegetation consists of low, windswept shrubs of 'a'ali'i, pūkiawe, and 'akia, and scattered 'ōhi'a lehua trees, 3 to 7 feet tall. Patches of uluhe fern are occasional. Other native plants found here in smaller numbers include ko'oko'olau *(Bidens micrantha* ssp. *micrantha)*, 'ama'u *(Sadleria cyatheoides)*, lama, 'akoko *(Chamaesyce celastroides* var. *amplectans)*, koa *(Acacia koa)*, 'ilima *(Sida fallax)*, naio *(Myoporum sandwicense)*, 'ūlei, and alahe'e *(Psydrax odorata)*. Two plants of a native, woody lobelia, *Cyanea elliptica*, are found about 50 feet downslope of the small pu'u at the 1,258 foot the elevation; a small grove of *Araucaria* sp. trees is planted on the pu'u. 'Ala'ala wai nui *(Peperomia blanda* var. *floribunda)* is locally common on some rocky outcrops. Ground cover consists primarily of molassesgrass and kīlau fern *(Pteridium aquilinum* var. *decompositum)*.

Koa Haole Thicket. Koa haole thicket is found along the lower portions of the study site in the gulches and bordering the highway. Koa haole shrubs, 6 to 12 feet tall, form somewhat dense thickets in these areas. A few scattered Christmas berry shrubs and Formosan koa trees are occasionally observed. Guinea grass, 3 to 4 feet tall, forms a dense cover between the woody components. The white flowered thunbergia *(Thunbergia fragrans)* is common. A number of weedy species associated with disturbed sites are also found in this vegetation type. These include Chinese violet *(Asystasia gangetica)*, spiny amaranth *(Amaranthus spinosus)*, castor bean *(Ricinus communis)*, sourbush *(Pluchea carolinensis)*, coat buttons *(Tridax procuinbens)*, wild bittermelon *(Momordica charantia)*, indigo *(Indigofera suffruticosa)*, and swollen fingergrass *(Chloris barbaca)*.

Potential Impacts

The Kapalua Mauka community will be built on the broad, gently sloping ridges now occupied by the golf course, pineapple fields, and pastures. These areas primarily contain introduced species.

The development of the community will involve clearing of the pineapple fields and portions of the pastures. New landscaping will be introduced within the community site, creating a more diverse range of plants. Where possible, existing trees will be preserved and integrated with the community landscaping.

Native plant vegetation occurs on the slopes and floors of the gulches, particulary on the very steep upper slopes of Honokahua Gulch. No development is planned in gulch areas, and thus impacts to native plant vegetation are not expected.

No threatened or endangered plants are known to exist in either the current Project District 2 area or the proposed expanded area. As previously noted, two federally-listed endangered plant species (Ma'o hauhele and uhuuhi) are being cultivated in the nursery near the second hole of the Village Golf Course makai of the Kapalua Mauka community site area. These species are not natural to the area but are being cultivated for public education. Plants located within the nursery will not be impacted by the Kapalua Mauka community.

Mitigation Measures

The Kapalua Mauka community will be limited to broad, gently sloping ridge areas now used for the golf course, pineapple cultivation, and pastures—all areas of exotic, introduced species. The establishment of the community will include grubbing of the pineapple fields and pastures. However, because the community will be developed in phases over a 20-year build out period, grubbed areas will be limited to specific areas for short periods of time.

The low-density, rural character of much the community will provide extensive open space. Select native species that occur naturally on the property may be incorporated as landscaping elements throughout the community. New landscaping will also include, native, indigenous, and Polynesian introduced plants, increasing the botanical diversity of the area. To the extent possible, existing trees will be preserved and integrated in the community landscaping.

Existing native species are primarily limited to the gulch areas. No development is planned in the gulches. To prevent disturbance to the mixed native scrub vegetation, particulary on the slopes of Honokahua Gulch, major disturbances on or near these slopes will be avoided.

All three of Kapalua Resort's golf courses are Certified Audubon Cooperative Sanctuaries. To receive this designation the courses must meet stringent environmental standards set fourth by Audubon International for environmental planning, water conservation, habitat enhancement, public involvement, integrated pest management, and water quality management. Any expansion of the Village Golf Course within the Kapalua Mauka community will meet the same high standards.

4.7 WILDLIFE RESOURCES

Existing Conditions

Two reports were prepared to assess the wildlife resources of the Kapalua Mauka community and to suggest possible mitigation measures. The first, a biological survey (Nagata 1997) covers the original 450-acre Project District 2 area and surveys both the flora and fauna of the site. The second, an avifaunal and feral mammal survey (Bruner 2001), covers the additional area proposed to be included in the expanded project district and includes only the fauna of the area. Figure 12 shows the areas of both surveys. Both surveys are summarized below. The full surveys are included in Appendix C (Nagata 1997) and Appendix E (Bruner 2001).

1997 Survey (Nagata)

During the field inspection for the biological survey (Nagata 1997) of the original 450-acre Project District 2 site no mammals were observed, however, Nagata (1997) reports that there is a strong probability that mongoose and perhaps feral cats are present. One or more species of rats and mice also are likely to inhabit the area.

Nagata (1997) reports that 12 bird species were observed during the 1997 survey; one is a migratory species and the others are common urban, game, field, or domesticated species. The birds observed were[1]:

- **Mallard duck** (*Anas platyrhynchos*): Six birds were seen on the lake near the Village Golf Course 5th tee.
- **Pacific golden plover** (*Pluvialis dominica*): Three birds were observed on the fairways of the 8th hole of the golf course.
- **Barred dove** (*Geopelia striata*): The common dove was observed in small numbers primarily in the golf course area.
- **Lace-neck dove** (*Streptopelia chinensis*): These doves were seen in small to moderate numbers in the golf course area, pineapple fields, and some gulch areas.
- **Red-crested cardinal** (*Paroaria coronata*): This species was seen in large numbers in the golf course area. It was also seen in smaller numbers in Honokahua Gulch and in the large gulch within the golf course.
- **Kentucky cardinal** (*Richmondena cardinalis*): This species is widely distributed and is one of the most abundant species on the site. It inhabits all areas and is particularly abundant in the gulches.
- **House sparrow** (*Passer domesticus*): House sparrows are among the least common species on the site. They were observed in moderate numbers only in the golf course area.
- **Indian gray francolin** (*Francolinus pondicerianus*): These game birds were observed and heard in the gulches, the golf course area, and the pineapple fields.
- **Rice-bird** (*Lonchura punctulata*): Rice birds were seen in small numbers in gulches, the golf course area, and the pineapple fields.
- **Common mynah** (*Acridotheres tristis*): Small numbers of common mynahs were seen in gulches, the pineapple fields, and especially in the golf course area.
- **Chinese thrush** (*Garrulax canorus*): This is one of the most conspicuous species on the property. Its varied songs were heard throughout the site except in the mauka portion of Honokahua Gulch. However, it is a very shy bird and only three pairs were actually seen.

[1] Bruner (2001) reports that Nagata (1997) uses out of date common names of some birds in his survey data. Nagata follows a 1981 source that has names used in the 1950s and 1960s.

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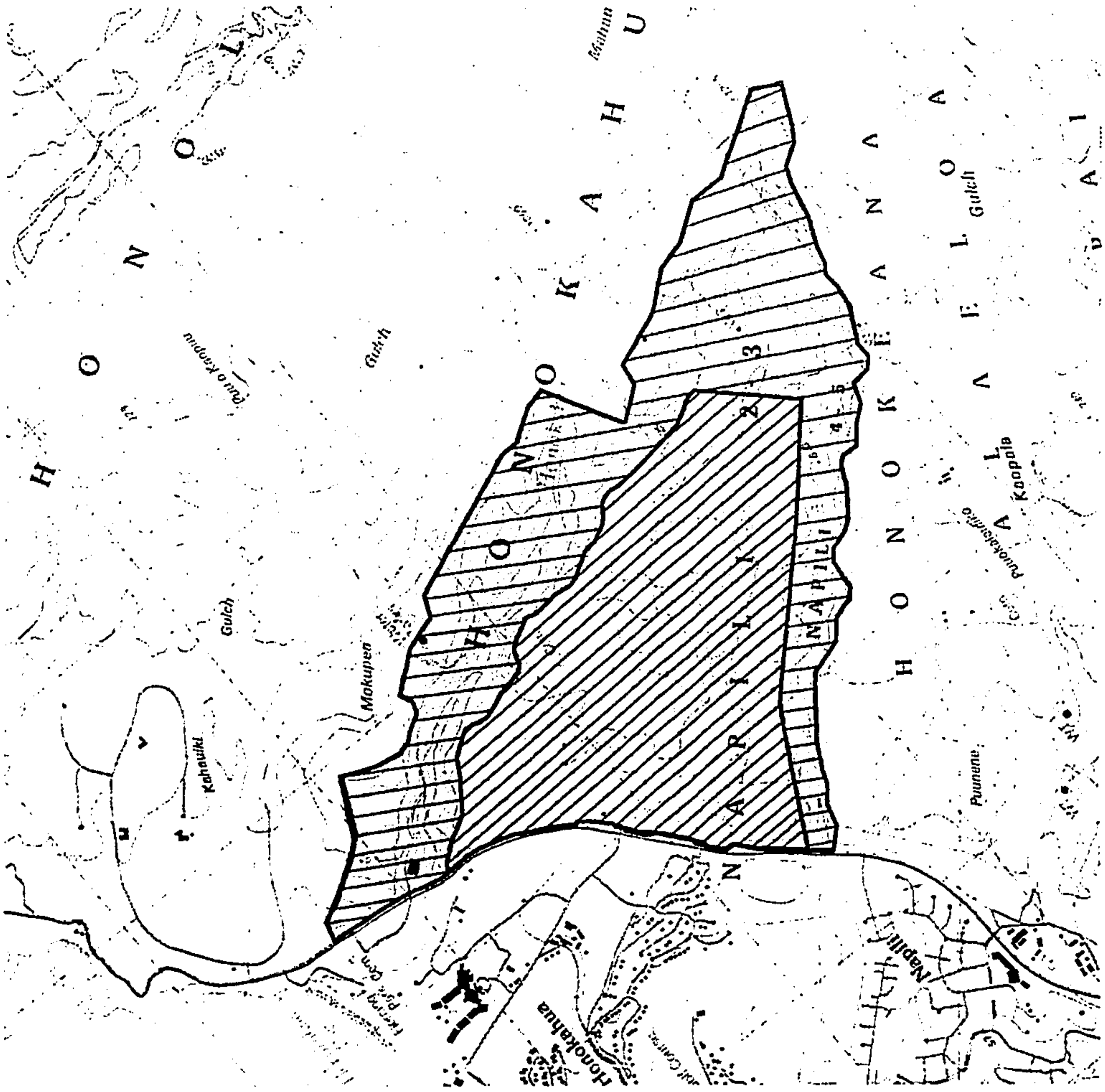

LEGEND

Nagata 1997 Survey Area

Bruner 2001 Survey Area

Map Source: U.S. Geological Survey

FIGURE 12

Areas of Faunal Surveys

KAPALUA MAUKA

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2001 Survey (Burner)

The 2001 survey (Bruner 2001) covered the additional area proposed to be included in the expanded project district and nearby lands. The birds and mammals found were typical of this region of Maui. No threatened or endangered species were recorded. The gulches contain a dense forest of largely introduced vegetation. No unusual or unique habitats were encountered. Areas of similar habitat occur commonly in West Maui. The following wildlife resources were identified:

Native birds (Landbirds and Seabirds). The only native bird recorded on the survey was the Short-eared Owl or Pueo (*Asio flammeus sandwichensis*). One Pueo was seen foraging over a pineapple field adjoining the expanded Project District 2 site on the morning of March 3, 2001. This species is listed as endangered on O'ahu by the State of Hawai'i, but not on Maui. Pueo are diurnal foragers and use a wide variety of habitats (Pratt et al. 1987; Hawai'i Audubon Society 1993). This species is commonly seen on Maui, especially in forested and agricultural lands. The only other native landbird that might occur in the upper elevation forested gulches in the Maui 'Amakihi (*Hemignathus virens wilsoni*). This species is not threatened or endangered.

No seabirds were seen on the survey. The gulches are too accessible to predators for seabirds to nest. The endangered Dark-rumped Petrel (Pterodroma Phaeopygia sandwichensis) nests at a much higher elevation on Haleakalā.

Migratory Birds. The only migratory species observed on the survey was the Pacific Golden-plover (*Pluvialis fula*). This species is not threatened or endangered. They are the most abundant of the winter migrants to Hawai'i (Johnson, et al. 1981, 1989). A total of 16 plover were tallied over the course of the survey. These birds were seen along the pineapple field roads and on the golf course adjoining gulches. Plover require open habitat for foraging and would not occur in the forested gulches.

Waterbirds. No water birds were tallied on the 2001 survey. No standing water or habitat suitable for waterbirds was noted. Nagata (1997) recorded mallard ducks (*Anas Platyrynchos*) at the lake near the 5th tee of the golf course. The golf course was not a part of the 2001 survey area.

Introduced Birds. Fourteen species of introduced birds were accounted for over the course of the survey. None of these are endangered or threatened. This array of birds conforms to data obtained in earlier studies (Bruner 1989, Nagata 1997). The avifaunal and feral mammal survey (Bruner 2001) in Appendix E provides a list of the introduced birds and their relative abundance.

Mammals. Evidence in the form of visual sightings and tracks revealed a total of four species of mammals. Eleven Small Indian Mongoose (*Herpestes auropunctatus*), three feral Cats (*Felis catus*) one Roof Rat (*Rattus rattus*) were seen. Tracks for pigs (*Sus scrofa*) were observed at several location in the gulches. Mice (*Mus musculus*) were not found, but likely occur on the property. The endangered, native Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) was not recorded. This species is relatively rare on Maui (Tomich 1968; Kepler and Scott 1990). Their behavior and distribution elsewhere on Hawai'i have been examined (Jacobs 1991; Reynolds et al. 1998). This species forages at dust and after dark in a wide variety of habitats including urban areas. They generally roost in trees during the day.

Potential Impacts

No threatened or endangered species of wildlife were observed on the Kapalua Mauka community site during the 1997 biological survey (Nagata 1997) or the 2001 avifaunal and feral mammal survey (Bruner 2001). The only native bird observed on the site (the Short-eared Owl or Pueo) is common on Maui. Most of the species of birds and mammals found on the site are introduced. In addition the mammals on site, or believed to be on site, are often regarded as pests (i.e., pigs, mongooses, rats, and mice).

The low-density, rural character of much the community will provide extensive open space and wildlife habitat. The establishment of the community will include grubbing of the pineapple fields and pastures, possibly impacting habitat on a temporary basis. However, because the community will be developed in phases over a 14-year construction period, grubbed areas will be limited to specific areas for short periods of time. New landscaping of the Kapalua Mauka community will include native, indigenous, and Polynesian introduced plants, perhaps making the area more attractive to the introduced species of birds that already thrive in the golf course areas. To the extent possible, exiting trees on site will be retained.

As mentioned in the Botanical Resources section (Section 4.6), all three of Kapalua Resort's golf courses are Certified Audubon Cooperative Sanctuaries. To receive this designation the courses must meet stringent environmental standards set fourth by Audubon International for environmental planning, water conservation, habitat enhancement, public involvement, integrated pest management, and water quality management. Any expansion of the Village Golf Course within the Kapalua Mauka community will meet the same high standards.

Because the gulches will not be developed, impacts to bird and mammal habitat in these areas are not expected.

Mitigation Measures

No significant impact is expected to occur to any wildlife species on the property; however, several measures will be implemented that will minimize effects on wildlife.

Rural Character. The low-density, rural character of much the community will provide extensive open space and will contribute to increased habitat diversity. The greater diversity in plant materials, may actually increase the available habitat for several species, including endemic shorebirds such as the Golden Plover.

Preservation of Existing Trees. To the extent possible, exiting trees on site will be retained and incorporated into the landscaping of the community.

Landscape with Native Plant Species. Select native species that occur naturally on the property may be incorporated as landscaping elements throughout the community.

Audubon Cooperative Sanctuary Standards. As previously mentioned, any expansion of the Village Golf Course within the Kapalua Mauka community will meet Certified Audubon Cooperative Sanctuary standards.

Pesticides Control. Use of pesticides will be controlled on the site to avoid impacts to wildlife. Only those pesticides that are allowed by law will be applied on the golf course under the supervision of a trained grounds manager.

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5.0 Assessment of Existing Human Environment, Potential Impacts, & Mitigative Measures

5.0 ASSESSMENT OF EXISTING HUMAN ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATIVE MEASURES

5.1 ARCHAEOLOGICAL AND HISTORIC RESOURCES

Two archaeological surveys of the Kapalua Mauka community site were conducted to document archaeological sites and recommend mitigation measures. The first (Cultural Surveys Hawaii, Inc., 1998), covers the original 450-acre Project District 2 area. The second (Xamanek Researches 2001), covers the additional 475-acre area proposed to be included in the expanded project district. Figure 13 shows the areas of both surveys. Both survey reports are summarized below. The full survey reports are included in Appendix F-1 and Appendix F-2.

<u>Existing Conditions</u>

Current Project District 2 Area Survey (Cultural Surveys Hawaii, Inc., 1998)

The archaeological inventory survey of the 450-acre area specified as Project District 2 on the *West Maui Community Plan* was conducted in 1997. The subsequent report was completed in 1998 (Cultural Surveys Hawaii, Inc., 1998).

The survey identified eight historic properties. These consist of walls, boulder terraces, a boulder pavement, an overhang shelter cave, a historic reservoir, a road bridge, and a cemetery. One of the historic properties is described as the "Honokahua Historic District." This site was identified and described during the state-wide inventory of historic places in 1974, but is not on the Hawai'i State or National Registers of Historic Places.

The survey report classifies the eight sites into six functional categories as follows:

<u>District</u>

The Honokahua Historic District (Site 1591) contains several types of features that relate to plantation era agriculture in the area. These features include the plantation village, the cannery facilities of Baldwin Packers, Honolulu Ranch Stables, Honolua Ditch, the Maui Pineapple Company, Ltd., office, plantation camp housing, two churches, and an occupied plantation residence on a hill overlooking the tenth tee of The Village Golf course. All of these features, except the plantation residence, are outside of the Kapalua Project District 2 area.

<u>Agriculture</u>

Two of the identified sites are interpreted as primarily agricultural in function. Site 4459 is associated with historic dryland agriculture located on the alluvial terraces of Honokahua Stream. The site is characterized by a wall section constructed of large boulders, oriented parallel with the stream, possibly serving as a means to diverting water away from crops in times of flooding. This site is presumed to be of historic age and built after the Honokahua ditch system diverted water from the gulch except in times of heavy rain when overflow from the ditch system would be sent flash-flooding down the valley.

The other agricultural site (Site 4463) has evidence of combined animal containment practices in association with historic dryland agriculture. It consists of a reservoir, a modified outcrop, and three walls for animal containment features. These agricultural features are attributed to large-scale pineapple production during the 20^{th} century.

Animal Fencing or Containment

Two sites are interpreted as serving as animal fencing or containment features. Site 4465 is an area with a series of wall segments interpreted as fences. The walls are oriented cross-slope (following along contours), or parallel to existing geographical features (such as streams, bedrock outcrops, and roads) to form areas where animals (e.g., cattle, horses) may not enter or may be confined within. Site 4463 has the remains of five features including three stone wall segments for animal containment and two agricultural features comprising a reservoir and a stone pavement on a modified outcrop.

Burial

Site 4462 is a historic cemetery, commonly know as the "Honokahua Camp Cemetery," located on a prominent bluff near the third, fourth, and fifth holes of The Village Golf Course. The cemetery incorporates an area approximately 82 feet long by 32 feet wide. Fifty-eight marked graves are present. Six of the graves have elaborate headstones of marble or other stone with inscriptions in English or ideographic characters of Chinese or Japanese. The remaining 52 graves do not have headstones but are marked with wood crosses surrounded by small boulders. Glass and metal flower containers were observed throughout the site. Vegetation surrounding the site is trimmed, indicating that upkeep of the cemetery is on-going.

Temporary Habitation

Two identified sites are classified as temporary habitations. Both of these sites are believed to be prehistoric or early prehistoric in age. This interpretation is based on the absence of historic artifacts and the traditional Hawaiian techniques used in site construction. Both sites are within Honokahua Valley. The sites range in size between one or two structural features.

The site 4460 is a rock overhang shelter located at the base of the Honokahua Valley's west wall. Accessed by scrambling up about 40 feet of boulder talus from the streambed to a vertical section of cliff, the rock-shelter is cave-like at its opening and extends 9.5 feet into the cliff face. The floor of the shelter appears to be mostly bedrock in the mauka portion, while the makai portion has a covering of silt and cave earth. This sediment is held in the shelter interior by a partially buried, small boulder alignment.

Subsurface testing conducted at the overhang shelter site yielded sparse middens and a small hearth with abundant charcoal. Based on these findings the site is believed to be a historic, temporary-use, shelter site. Radiocarbon dates from a charcoal sample suggests a likely date for the overhang shelter to range from between 1800 and 1940.

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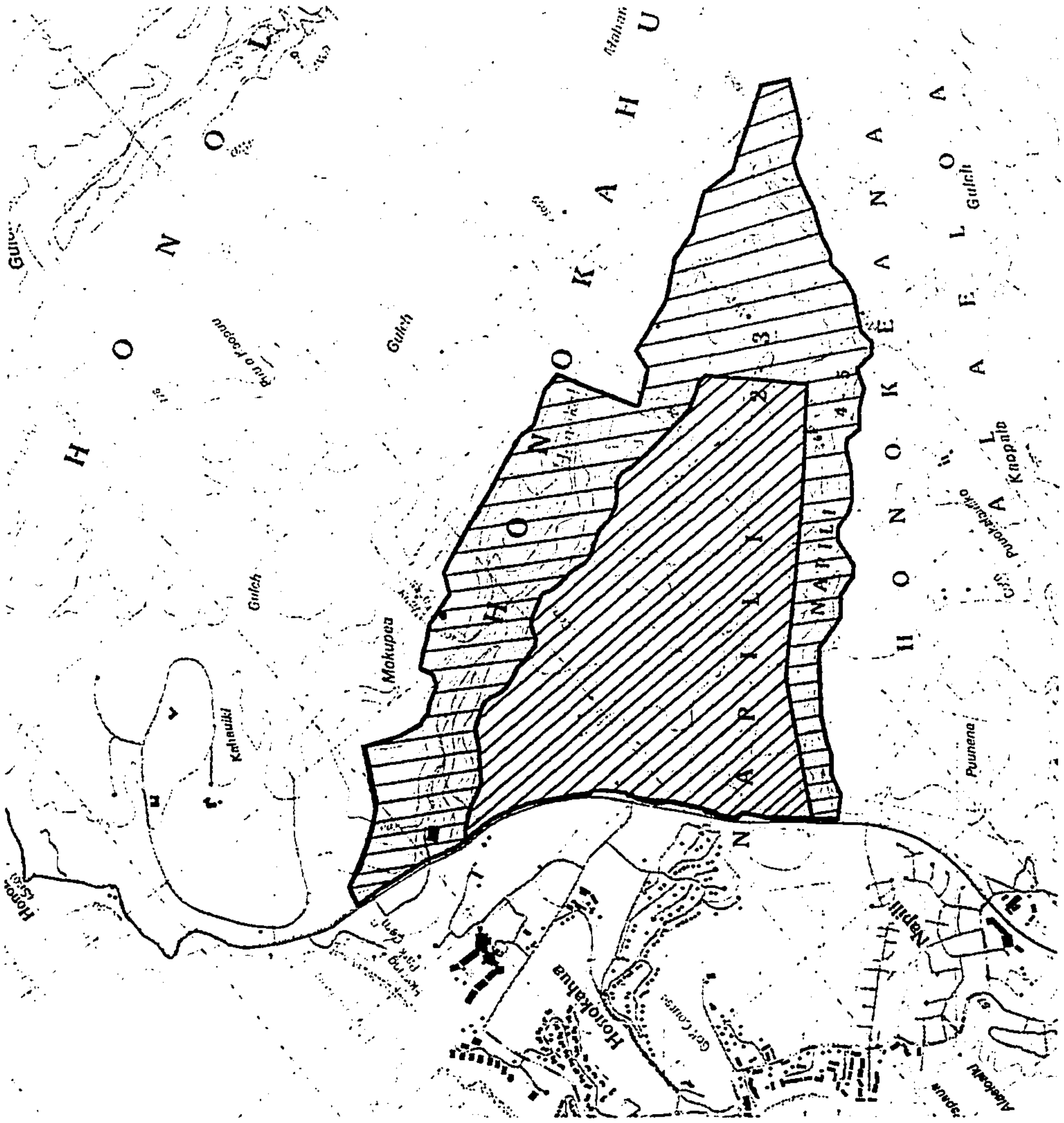

LEGEND

Current Project District 2 (450 acres)
Cultural Surveys Hawai'i Inc., 1998 Survey Area

Proposed Expanded Project District 2 (475 acres)
Xamanek Researches, 2001 Survey Area

Source: U.S. Geological Survey

FIGURE 13

Archaeological Surveys

KAPALUA MAUKA

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PBR

Site 4461 consists of a stacked boulder wall enclosing an area of cobble paving in the talus, and a petroglyph in the cliff face. It is at the base of the steep western wall of Honokahua Gulch. The surrounding terrain is a wide, level alluvial terrace that is covered with scattered koa haole, kukui, grasses, and Christmas berry. Large boulder piles are scattered over the surrounding terrain suggesting bulldozing activity in the past. A single anthropomorphic petroglyph is pecked into the cliff face at the back of the terraced pavement area. The bedrock exhibits columnar or block jointing, and the petroglyph is positioned on a north, or makai facing exposure of one of the blocks that forms a shallow overhang at the cliff base. The figure measures approximately eight inches tall by eight inches wide.

Subsurface testing was conducted at the terrace-platform where the petroglyph was found. Cultural material from this site was very limited, thus, the interpretation regarding the function and age is not conclusive. The overall site is believe to be an agricultural work area and storage platform.

Transportation

One site (4464) is interpreted as relating to historic transportation. The site is either a historic concrete tee beam style of bridge or a reinforced concrete flat slab bridge (if there are rebars inside the concrete slab it is the latter). The permanence of the construction materials used in the making of the bridge, as well as the construction style, suggest that the site is capable of handling heavy traffic.

Expanded Project District 2 Area Survey (Xamanek Researches, 2001)

An archaeological inventory survey of the additional 475-acre area proposed to be included in the expanded Project District 2 was conducted in the spring and summer of 2001. The subsequent report was completed in the fall of 2001 (Xamanek Researches, 2001). A total of 37 previously unidentified sites were located during the survey. In addition, further information was gathered on a previously identified rock wall and an exposed portion of Honolua Ditch was photographed. The site types found during the survey include single and multiple component agricultural sites including terraces, temporary and more permanent habitation areas, possible ceremonial areas, possible burial features, and ranch era and plantation sites.

Precontact to 1850s Sites

Twenty-eight of the sites located during the survey are interpreted as precontact or probable precontact cultural resources. The sites include agriculture, habitation, possible burial, and possible ceremonial functions. There were 61 recognizable features associated with these ~~25~~ 28 sites. Some sites have been impacted by post-contact activities associated with road construction—especially in Honokahua Gulch. However, most precontact or possible sites appear to be largely intact.

Based on radiocarbon dating results, only one feature can be positively identified as a precontact feature (Feature D at site 5156). This feature is interpreted as an agricultural terrace that may have been used as early as the mid-1400s.

There are ~~five~~ four sites that are thought to possibly contain burials (5139, ~~5141~~, 5142, 5157, and 5158). All of these potential burial sites are located in Honokahua Gulch. Feature E of site 5139 is a small rock overhang that contains a piece of coral on its interior surface, suggesting a use other than shelter, and possibly a burial. ~~Site 5141 is a roughly oval shaped cluster of sub-angular cobbles and boulders. A single upright trapezoidal-shaped stone is located in the southern corner of the cluster.~~ Site 5142 is a rock overhang with a maximum ceiling height of less than three feet. Its low ceiling height makes it unlikely that it would have been used as a temporary habitation site~~, and is tentatively interpreted as a burial site.~~ There have been instances elsewhere on Maui where constricted overhangs similar to Site 5142 were confirmed to contain human remains. Site 5157 ~~appears to be a burial site; it~~ is a rock overhang with an oval arrangement of angular cobbles near the entrance that could contain a burial. Site 5158 contains two features that may also contain burials: feature C of is a small oval-shaped rock pile, while feature F is a small platform.

Three sites are thought to be ceremonial or contain ceremonial features. Site 5138, located in the southwestern slope of Honokahua Gulch, contains agricultural, habitation, and possible ceremonial features. The possible ceremonial feature of this site is a small, level terraced area that is unique in its quality of construction and small size. The positioning of the feature and the overall care with which it is was constructed suggests a ceremonial rather than agricultural function. While this interpretation is somewhat subjective, there are no other similar features located within the survey area.

Sites 5130 and 5155 are tentatively interpreted as possible ceremonial structures. Site 5130 is a small enclosure with a rounded triangular shape located in Nāpili Gulch. Its walls are generally well built of sub-angular cobbles and boulders. A formal entryway appears to exist along its central northern side that faces the stream.

Site 5155 is located in the bottom of Honokahua Gulch in a level area about 18 feet from the streambed, near a large bend. The site consists of a substantial rock wall enclosure, roughly oval shaped with stacked, faced walls build of sub-angular boulders and cobbles. Two large boulders occupy most of the surface area inside the enclosure. These boulders are embedded in the ground and the structure appears of have been purposefully built around them. The site is tentatively interpreted as a ceremonial structure based on its high construction quality, a lack of any food midden remains, and the presence of the two partly exposed boulders in its interior.

Nine rock overhang sites are interpreted as temporary habitation shelters and several features associated with identified sites are thought to have agricultural or habitation functions.

In general, precontact to mid-1800s sites are located in portions of the area that have not been heavily impacted by subsequent ranch and pineapple plantation era activities.

Ranch and Plantation Era Sites

Nine of the sites identified are interpreted as associated with the ranch and plantation eras. These sites include: 1) the remains of a plantation era concrete bridge foundation and a bridge and roadway, both in Nāpili Gulch; 2) a plantation era water intake between Honokahua Gulch and the Nāpili Gulches; 3) five rock walls in Honokahua Gulch; and 4) one rock wall in Mokupe'a Gulch.

Two of the walls in Honokahua Gulch as well as the wall in Mokupe'a Gulch are interpreted as animal containment walls. Two other walls in Honokahua Gulch are interpreted as possible boundary walls that also may have served as animal containment features. According the former superintendent of Honolua Plantation, the two bridges in Nāpili Gulch were built in the 1920s or

1930s. The water intake was probably built after the completion of the Honolua Ditch in the early 1900s.

Potential Impacts and Mitigation Measures

All archaeological sites identified by both surveys, except the Honokahua Camp Cemetery and the Honokahua Historic District, are located in gulch areas and not on the portions of the Kapalua Mauka community site proposed for development. A licensed land surveyor has mapped the precise locations of all identified archaeological sites. The archaeological sites within the gulches will be placed in "as is" preservation. An overall preservation plan for the entire 925-acre Kapalua Mauka community site will also be prepared in consultation with the State Historic Preservation Division (SHPD) and the Maui and Lāna'i Islands Burial Council. As such, the archaeological features of the site are not expected to be impacted by the development of the Kapalua Mauka community.

Preservation and maintenance of the of the Honokahua Camp Cemetery will be further discussed in the overall preservation plan for the entire 925-acre Kapalua Mauka community site. The cemetery is currently maintained as part of The Village Golf Course operations. It is expected that is will continue. Access to the cemetery is currently provided by special request through the golf course operations. People who request a visit are provided with a golf cart to access the site. This practice is also expected to continue.

Specific preservation measures recommended in each archaeological survey report are discussed below.

The 1997 survey report recommended preservation of three of the eight historic properties identified: the rock overhang shelter (site 4460), the complex containing the petroglyph (site 4461), and the Honokahua Plantation Cemetery (site 4462).

The State Historic Preservation Division (SHPD) reviewed the 1998 archaeological survey report and concurred with the above recommendations. In their letter dated July 31, 1998 (see Appendix F-1), the State Historic Preservation Division stated: "In sum, we agree three significant historic sites are present (4460 [the overhang shelter], 4461 [the petroglyph site], 4462 [the cemetery]). A fourth (the bridge, 4464) may be significant."

Regarding the bridge, the 1997 survey also recommended detailed architectural data collection for the stone and concrete bridge (site 4464) to allow evaluation of its condition of preservation for comparison with other structures of the same type on Maui. In their 1998 letter, the State Historic Preservation Division recommended that site 4464 (a bridge) undergo additional recording in the field. Cultural Surveys Hawaii, Inc., subsequently addressed the State Historic Preservation Division's concerns, and in December 2001 received a follow-up letter from State Historic Preservation Division (see Appendix F-1) stating: "Your revisions have addressed our initial concerns, and the report is acceptable."

The 1997 survey further recommended that the boundary of the Honokahua District (site 1591) be redrawn so as to exclude the many acres of golf course land that is no longer relevant to the pineapple plantation era. The area recommended to be excluded from Honokahua District includes the plantation house on a hill overlooking the tenth tee of The Village Golf Course. In their letter, the State Historic Preservation Division stated: "The golf course located in the NW corner of the subject property lies within the boundaries of State Site 1591 (the Honokahua Historic District), but it contains no significant historic sites today . . . We will also take into consideration the recommendation that State Site 1591 (the Honokahua Historic District) be redrawn to exclude the present golf course in the NW corner of the subject property." Regarding the plantation residence, both the consultant archaeologist and the State Historic Preservation Division agree that it is not a significant feature of the Honokahua Historic District. In addition, extensive remodeling in the 1980s may have eroded any remaining historic integrity of the house. Current plans are to raze the house. Therefore it would not become one of the 690 housing units in Kapalua Mauka community.

The 1997 survey concluded the remaining sites (sites 4459, 4463, and 4465) have yielded all the information they are likely to through the archaeological survey and therefore, no further archaeological investigation is recommended for these sites. The State Historic Preservation Division concurred with this assessment by stating in their 1998 letter: "We agree that 3 of the plantation era sites (4459, 4463, 4465) are 'no longer significant' given the fact that sufficient information was recorded during the survey."

In regard to the 37 sites identified in the 2001 survey, the survey report concludes the majority of these sites are still considered significant and recommends passive preservation. The survey report states that while six of the walls within Honokahua Gulch could be considered no longer significant in other situations, these sites are part of the relatively well-preserved complex of sites within this large gulch and therefore there is the opportunity to preserve these more marginal, probable post-contact, walls that are part of the cultural landscape within Honokahua Gulch.

In addition, the 2001 survey report recommends that all sites identified as potential burial sites be preserved. These sites, along will all other identified sites, will be placed in "as is" preservation and the disposition of the potential burial features will be discussed with the Maui and Lāna'i Islands Burial Council and the State Historic Preservation Division.

~~The recommendations of the 2001 survey report are subject to the review and approval of the State Historic Preservation Division.~~ The State Historic Preservation Division reviewed the 2001 survey report and requested some revisions (see letter dated April 2002 in Appendix F-2). Subsequently the report was revised, and the State Historic Preservation Division has found the revised report acceptable (see letter dated July 30, 2002 in Appendix F-2). All final recommendations as determined by the State Historic Preservation Division will be implemented.

In addition to the above mitigation and preservation recommendations, all construction plans will include the following language as normally recommended by the State Historic Preservation Division:

> Should historic remains such as artifacts, burials, concentrations of shell or charcoal be encountered during the construction activities, work shall cease immediately in the immediate vicinity of the find and the find shall be protected from further damage. The contractor shall immediately contact the State Historic Preservation Division at 692-8015 which will assess the significance of the find and recommend an appropriate mitigation measures, if necessary.

5.2 CULTURAL IMPACTS

To assess the cultural impacts of the Kapalua Mauka community, Xamanek Researches prepared a study titled: "A Historic and Traditional Land Use Study Utilizing Oral History Interviews for Assessing Cultural Impacts, for the Kapalua Project 2 and Expanded Project 2, Kapalua, Maui, Hawai'i." (Xamanek Researches 2001). The study covers the entire 925-acre Kapalua Mauka community site and the surrounding region. It is summarized below. The full study is included in Appendix G.

Historical Overview

The Kapalua Mauka community site lies within the ahupua'a of Honokahua and Nāpili 2-3, located in West Maui within the traditional moku (district) of Kā'anapali. There is a useful record of historic literature documenting the settlement patterns and traditional land use practices in this region. For example, in their description of West Maui, Handy and Handy (1972) note:

> North of Lahaina there are five valleys watered by streams draining the western slopes of the West Maui watershed: Honokōwai, Kahana, Honokahua, Honolua, and Honokōhau. The first four all had extensive lo'i in their valley bottoms, where terraces rose tier on tier in symmetrical stone-faced lo'i. On this part of the coast there is no sloping kula land seaward of the valleys as there is back of Lahaina and southeastward. Honokahua in particular, which is watered by a large rivulet flowing from far back in the mountains, has the most extensive system of lo'i along this coast. (p. 494)

The precontact settlement pattern in this region of Maui includes permanent and temporary habitation sites located along the coastal regions and in the inland valleys. While the early post contact population is known not to have been great, the precontact population was likely considerably larger. The extensive burial ground at Honokahua suggests a sizable precontact population.

The kinds of sites associated with habitation that are typical along the coast are stone structures such as enclosures, midden deposits, and burial areas. In the valleys, sites such as stone wall enclosures, pond fields and irrigation ditches associated with taro production are found. Temporary habitation sites in the form of rock shelters are present in both valleys and along the rocky coast.

Censuses taken by Protestant missionaries throughout the Hawaiian Islands beginning in 1831 provide the earliest documentation of the size of the population after the first decades of western contact. During the first census of Maui island in 1831-1832, a total population of 2,982 persons was recorded in the Kā'anapali district—this represented 8.5 percent of the total island population of 35,062 persons. By the census of 1836, the Kā'anapali population had dropped to 1,341 persons, comprising 5.5 percent of the Maui island population of 24,199. These early censuses do not record specific Honokahua or Nāpili population numbers.

In the late 1790s, King Kamehameha I awarded the ahupua'a of Honokahua to Isaac Davis, one of two Englishmen who had served as advisors to him while he consolidated his power within the islands. When Davis suddenly died in 1810, John Young, the other Englishman advisor, took over the management of the ahupua'a. Upon his death in 1835 it was divided between his and Davis' heirs.

During the great Mahele in 1848 the entire 2650-acre Honokahua ahupua'a was awarded to Davis' daughter, Kale (Sally) Davis, then wife of Alexander Adams, who was also a favorite advisor to King Kamehameha I. No kuleana awards were granted in Honokahua.

In addition to this grant, the ahupua'a of Nāpili 1-3 (comprising 603 acres) was awarded to Laura Konia, by Kamehameha III. Konia was the granddaughter Kamehameha I and wife of Abenera Paki. Paki and Konia were the parents of Bernice Pauahi Bishop. Other ahupua'a awarded to Konia were Honokeana, 'Alaeloa, and Mailepai. No kuleana awards were granted in Nāpili.

During the mid-1800s missionaries and entrepreneurs moved into the West Maui region, reshaping the landscape for western enterprises and pursuits. Reverend Dwight Baldwin, who arrived in Hawai'i in 1831, was stationed in Lahaina from 1835 to 1870. During the 1850s Baldwin had been granted 2,675 acres of land in northwest Maui. This land holding would be the basis of enterprises over expanding areas of West Maui undertaken by his son, Henry Perrine Baldwin.

During the later years of the 1800s, Henry Baldwin began leasing and purchasing tracts of land in West Maui, intending to set up a cattle ranching operation. In the early 1890s Baldwin established Honolua Ranch, headquartered at Honolua Bay in Honolua ahupua'a, immediately adjacent to Honokahua ahupua'a. The ranch, under its first manager Richard C. Searle Sr., soon became the focus of activity in West Maui.

As Honolua Ranch developed, Baldwin's land purchases included the Nāpili and the Honokahua lands of Kale Davis, which, by then, had become a holding of James Campbell.

Following Baldwin's death in 1911, David T. Fleming became manger of Honolua Ranch. Fleming had experience growing pineapple in Haiku and gradually began shifting the focus of the ranch to pineapple production. By the 1920s, pineapple had been planted across West Maui from Māhinahina ahupua'a to Kahakuloa ahupua'a. A cannery was built in Honokahua in 1914 and, in 1923, Honolua Ranch became Baldwin Packers, Ltd. The Honokahua cannery ceased operation in 1920 when a new cannery was built in Lahaina.

During this time a small plantation community developed at Honokahua and Nāpili, focused around the Honolua Ranch/Baldwin Packers operations. The expanding role of pineapple in the life of West Maui is reflected in the increasing population totals recorded in territorial censuses during the first half of the 1900s. The Lahaina District had a total population of 7,953 persons in 1900, 11,742 persons in 1910, and 14,941 persons in 1920. During the decades following World War II, however, population totals for Lahaina dropped, reaching 5,524 in 1970 (Schmitt 1977).

In 1962 Maui Land & Pineapple Company, Inc., was formed when Baldwin Packers, Ltd., merged with Maui Pineapple Company, Inc. Maui Land & Pineapple Company, Inc., became the parent company of Kapalua Land Company, Ltd., which conceived of a master planned resort featuring The Kapalua Bay Hotel at the shore of Honokahua ahupua'a. The hotel opened in 1978, beginning the transformation of the former ranch and pineapple lands in to a modern resort complex.

Informant Interviews

The purpose of undertaking oral history is to help elucidate historically recorded land use practices or settlement patterns, or to provide additional data that existing data do not contain. Understanding what areas were accessed, and for what reasons, is critical to an overview of traditional uses and settlement patterns, which can lead to a prediction of the cultural impact of the proposed development.

In anthropological literature dealing with the bringing together of data regarding human cultural and behavioral history, ethnography and ethnology are the areas most concerned with methods for recovering oral histories from people still living who remember customs, belief systems, and the effects of these factors on particular ethnic beliefs and behavior. In oral history studies allowances are made for variability in memory patterns (checked by cross-referencing individuals in a given socio-cultural context), socio-temporal context (age-group reference of a given individual) and other factors influencing the data. It is not possible to gather oral histories that are absolutely accurate. It is, however, possible to gather data that are meaningful and important within a given cultural context.

For this study Xamanek Researches first conducted interviews in 1999 with people knowledgeable with the area. This research was followed up with additional interviews, in some cases with additional informants, in September and October of 2001. A total of eight people were interviewed. Additional people were contacted but could not be interviewed. Efforts will continue to reach these additional people, and if they agree to be interviewed, their input will be published in an addendum to the original study. The conclusions reached based on the interviews follow. More complete information regarding the information provided by the interviewees in contained in the full study, contained in Appendix G.

In general, the interviews produced information supporting the expressed feeling by the interviewees that the Kapalua Mauka community was not "threatening" to perceived lifestyles by local residents. All felt that they could access the lands if they wanted to or needed to. Most were familiar with the existence of lo'i in the valleys, but did not think they were that important for agricultural uses anymore, but that they should be preserved and that access to visit the sites should be granted to those interested. Most all contributors had either hunted in the lands at one time or another, or felt that as long as they could hunt there, if they wanted to, it was "alright." All interviewees were very pleased with the preservation of archaeological sites in the valleys and their future protection. There was appreciation for the general concern shown by Kapalua for these matters and also, the protection of the land for the future.

To conclude, the information obtained from the interviews corroborates perceptions that:

1) The valley lo'i and other structures are no longer used in agricultural production, as they once were;
2) The uplands between the valleys are presently in, and have been in pineapple production for many decades; and
3) The plantation owns these lands and will grant entry permits to hunters wishing to hunt for wild game in the valleys.

In addition, no interviewee provided opinions contrary to those expressed by other interviewees. There was some concern expressed over the need to preserve Native Hawaiian sites, but most concurred that Kapalua would try to protect them.

Cultural Assessment

Based on the historical background, archaeological research, and on the interviews of individuals recognized as knowledgeable, the study conducted by Xamanek Researches (2001) did not identify any cultural practices that may be affected by the Kapalua Mauka community. Presently the only ~~known~~ recorded culturally significant sites are the archaeological features that have been identified by the archaeological surveys for the area.

Persons interviewed by Xamanek Researches for the cultural impact assessment stated they are aware of the existence of lo'i in the area, but the archaeological surveys of the Kapalua Mauka community site did not identify any lo'i. According to the revised archaeological survey by Xamanek Researches (see Appendix F-2), any lo'i in the area may be located outside of the boundaries of the Kapalua Mauka site further mauka in the gulches where there would have been more consistent flows of water.

Landowner Maui Land & Pineapple Company, Inc., currently grants requests for access to its lands and will continue to allow access after the Kapalua Mauka community is established (see the following section). ~~Mitigation~~ Preservation of ~~these~~ the archaeological resources is discussed within the archaeological survey reports and in the preceding section on archaeological and historical resources. Since all archaeological sites within the gulches will be placed in "as is" preservation and there will be no development in the gulches beyond necessary infrastructure, any lo'i that may be present will not be disturbed.

In their comments on the draft environmental impact statement the Office of Hawaiian Affairs expressed concerns regarding the impacts to the near shore marine environment from increased pumping of water from wells. In the Office of Hawaiian Affairs letter it was stated: "If increased pumpage reduces groundwater flow discharges into the nearshore marine environment, Hawaiian gathering of food sources may be affected." The Office of Hawaiian Affairs requested that: "The final EIS should address the impact of groundwater withdrawal for the project on the nearshore ecosystems and any cultural practices dependent on nearshore dependent on nearshore resources."

In response to these concerns and other concerns regarding marine water quality in Honokahua Bay and Nāpili Bay, Maui Land & Pineapple Company, Inc., commissioned a study to: 1) establish a baseline set of conditions that can be used to evaluate impacts to water quality in Honokahua Bay and Nāpili Bay, which will receive runoff and groundwater flow from the area of the Kapalua Mauka community site; and 2) determine whether increased pumping of groundwater for the Kapalua Mauka community will reduce groundwater flows into the near shore marine environment and thus affect marine resources. In part, the study concludes:

> There are several reasons why the withdraw of ground water from the proposed development will not likely result in alteration to biotic communities. First, the engineering estimates indicate that the project will remove only about 2% of the groundwater flux to the nearshore area, which is well within the natural variability

of discharge. Secondly, results of the present study indicate that the nearshore region which is exposed to decreased salinity/increased nutrients is very narrow as a result of the typical physical mixing of water from wind and waves. Thirdly, the area has been subjected to increases in nutrient concentrations in groundwater from agricultural and resort development for decades. Pumpage of a small percentage of groundwater will serve to lower nutrient delivery to the nearshore area, moving the system back toward the level that occurred prior to human activity on the shoreline.

Based on this conclusion, nearshore ecosystems and cultural practices dependent on nearshore resources are not expected to be impacted by the pumping of water from wells for the Kapalua Mauka community. Conclusions of the study regarding other water quality issues are included in Section 5.9.2 of this Final EIS. The full marine water quality study is included in Appendix H. Additional information on potable and non potable water is included in Section 5.9.3.

5.3 ACCESS AND TRAILS

Existing Conditions

Trails on the immediate Kapalua Mauka community site are limited due to the agricultural operations. Pineapple cultivation areas are sectioned into fields with dirt roads providing access to each field. Trails to the upper mauka regions may be present, but are not marked or mapped. Unmapped roads and trails are present within the gulches of the site.

Currently access to the Kapalua Mauka community site is restricted due to the ongoing agricultural operations in the area. The area is fenced and gated, however, access is allowed with a permit.

Maui Land & Pineapple Company, Inc., grants requests for access to its West Maui lands. In 2001, Maui Land & Pineapple Company, Inc., issued over 150 access permits. Nearly half of these requests where for gathering or harvesting (49%), while other requests were for hunting (11%), fishing (11%), research (14%), recreation (11%), or other activities (4%). Visitors granted access are given a key to a specific gate and must return the key within an allotted time.

Potential Impacts and Mitigation Measures

Access to any trails that may be present on the site or in the area will not be limited by the development of the Kapalua Mauka community. Relative to the existing agricultural use of the land, in which the entire area is gated, the establishment of the Kapalua Mauka community will make the area more accessible.

Consistent with the existing Kapalua Resort, the overall Kapalua Mauka Community is not planned to be gated. Public access will be allowed on the community streets, however, some of the individual neighborhoods may be gated. It has not been determined where these individual neighborhoods would be located within the site or at what phase they would be built. In any case, any gated neighborhood will not be so extensive as to block access to mauka trails that may be identified. In addition, access within any gated neighborhood would not be so restricted as to prohibit anyone with a legitimate reason from accessing an area.

In addition, nearly all historic or archaeological sites are located in the gulches. There is no development planned in gulch areas beyond necessary infrastructure. Consequently, the establishment of the Kapalua Mauka will not change the current practice of allowing access to sites with permission. Because the archaeological sites will be placed in "as is" preservation, a permit system is necessary to protect the sites, as is done in other areas of Maui.

5.4 ROADWAYS AND TRAFFIC

A Traffic Impact Analysis Report (TIAR) for the entire Kapalua Resort area, including the Kapalua Mauka community was prepared by Parsons Brinckerhoff Quade & Douglas. The report was finalized in December 2001. Key elements of the analysis are summarized below. The complete report is included in Appendix I.

Existing Conditions

Existing roadways and intersections in the vicinity of the Kapalua Resort include:

Honoapi'ilani Highway: An arterial highway oriented in the north-south direction within the Kapalua area. It is the main route providing north-south mobility in West Maui and provides a primary connection between West Maui and the rest of Maui. From Nākālele Point to Honokōwai it is a two-lane, undivided roadway. Between Honokōwai and south Lahaina it is a four-lane, undivided roadway. From south Lahaina to Wailuku it is again a two-lane undivided roadway. The segment of Honoapi'ilani Highway analyzed in the traffic report extends from Office Road on the north to Lower Honoapi'ilani Road in Honokōwai. The posted speed limit on Honoapi'ilani Highway on this segment is 45 miles per hour.

Office Road: The main mauka-makai circulator roadway that serves the Kapalua Resort. It provides direct access to various facilities in the resort including The Kapalua Bay Hotel, The Ritz-Carlton Kapalua Hotel, The Village Golf Course, Kapalua Golf Academy, the Kapalua Tennis Complexes, The Kapalua Art School, Honolua Store, and several residential neighborhoods in Kapalua. It also provides access to Simpson Way and the existing resort residential development of Pineapple Hill at Kapalua. Office Road is a two-lane collector that extends from Honoapi'ilani Highway to Lower Honoapi'ilani Road. The intersections of Office Road with Honoapi'ilani Highway and Lower Honoapi'ilani Road operate as unsignalized intersections with stop signs controlling Office Road. Office Road is currently an undivided road with approximately 10-foot travel lanes and a posted speed limit of 25 miles per hour.

Lower Honoapi'ilani Road: This is the old Honoapi'ilani Highway. It is a two-lane, undivided roadway that runs parallel to Honoapi'ilani Highway starting at Kapalua Resort and extending south to intersect Honoapi'ilani Highway just south of the Honokōwai Stream bridge. The Honoapi'ilani Highway/Lower Honoapi'ilani Road intersection is signalized.

Pineapple Hill/Site 19 Service Access: This is an existing driveway on the makai side of Honoapi'ilani Highway that provides a secondary access to the Pineapple Hill subdivision. Residents of Pineapple Hill currently access the subdivision via Simpson Way off of Office Road, internal to Kapalua Resort.

Mahia Street: This street intersects with Honoapi'ilani Highway in "T" intersection immediately south of Kapalua Resort and Pineapple Hill estates. It provides access to Nāpili Park and the Honokeana subdivision further makai from the park.

Nāpilihau Street, Ho'ohui Road and Akahele Street: These are all two-lane roads which provide mauka-makai access between Honoapi'ilani Highway and Lower Honoapi'ilani Road.

Based on traffic counts, the TIAR found that: "the existing Honoapi'ilani Highway corridor between Lower Honoapi'ilani Road in Honokōwai and Office Road operates well during the peak hours." The TIAR further states: "there is available capacity for traffic growth in this corridor."

Kapalua Resort also operates a shuttle system for resort residents and guests that provides transportation within the resort and to and from the Kapalua/West Maui Airport. Service is provided "on call" from 6:00 AM to 11:00 PM. The shuttle service carries approximately 18,000 passengers per year.

Potential Impacts

The Traffic Impact Assessment Report concludes "the proposed PD-2 Development and the buildout of the Kapalua Resort [including the Kapalua Mauka Community] can be accommodated by the Honoapi'ilani Highway corridor between Kapalua and Honokōwai."

This conclusion is based on future traffic volumes consisting of three components: 1) traffic generated by the Kapalua Mauka community; 2) traffic generated by the build-out of the existing Kapalua Resort and Plantation Estates areas; and 3) regional traffic growth not associated with Kapalua. The *Maui Long-Range Land Transportation Plan* (February 1997) was used as a basis for the regional traffic growth component. The Kapalua Mauka community and the exiting Kapalua Resort and Plantation Estates area components were estimated using trip generation relationships documented in the Institute of Transportation Engineers (ITE) publication, *Trip Generation, 6th Edition.*

The implications of the traffic impacts of 750 residential units were taken into consideration when Project District 2 was included within the *West Maui Community Plan* during the 1992 plan update. According to the Plan: "the update process incorporated technical studies and assessments." These included an "Infrastructure Assessment" that identified "infrastructure (e.g., roadways, drainage, water, telephone, and electrical systems) limits and opportunities in high-growth community plan regions." The Plan also states "the update process was driven by the work of the Lahaina Citizens Advisory Committee (CAC). This 14 member panel met a total of 17 times during a 225-day deliberation process to identify, formulate and recommend appropriate revisions to the Lahaina Community Plan." Thus, the implications of the development of Project District 2 have been considered and given a thorough public review during the community plan update process.

Mitigation Measures

The Kapalua Mauka community is projected to be built over a 20-year period, with an average of approximately 40 units per year. This will allow highway improvements, such as the Lahaina Bypass, to be built over a period of time, concurrently with, or ahead of demand. According to the recently released Final Supplemental Environmental Impact Statement for the Lahaina Bypass, construction on the Bypass is projected to start in late 2004.

The Kapalua Mauka community will be designed to foster a bicycle/pedestrian-oriented environment within the community and the greater Kapalua Resort. More urban-like land uses such as multi-family units will be within the core of the community as will be other amenities such as the golf course clubhouse. Surrounding the more urban-like areas will be larger rural lots and single-family homes, providing a transition to the nearby agricultural lands. The community will have extensive open space and landscape buffers along with bike and pedestrian pathways connecting to the rest of Kapalua Resort, makai of the Honoapi'ilani Highway.

In addition, the service area for the existing Kapalua Resort shuttle system for resort residents and guests will be expanded to include the Kapalua Mauka community. This service currently provides transportation within the resort and to and from the Kapalua/West Maui Airport. Service is provided "on call" from 6:00 AM to 11:00 PM.

Vehicle access to the Kapalua Mauka community will be provided via Honoapi'ilani Highway from three entrance points: 1) a new "T" intersection near the south boundary of the community; 2) opposite the existing Office Road; and 3) at a new "T" intersection between Office Road and Plantation Estates Drive (See Figure 4).

It is assumed in the TIAR that the Office Road/Honoapi'ilani Highway intersection will be signalized. This signal will be planned, designed, and constructed when warranted. Maui Land & Pineapple Company, Inc., will monitor traffic in coordination with the State Highways Maui District Office and conduct timely warrant studies.

All ~~accesses~~ proposed and existing intersections with Honoapi'ilani Highway will be provided with right-turn deceleration lanes and left-turn storage deceleration lanes. All improvements required for direct access to the Kapalua Mauka community, including improvements to the State Highway right of way, will meet current State standards and will be planned, designed, and constructed at no cost to the State or County. Maui Land & Pineapple Company, Inc., is also committed to paying its pro rata fair share of the costs of regional improvements to Honoapi'ilani Highway.

The use of impact fees imposed on developers by the County of Maui may also be a source of funding for regional transportation improvements in West Maui. Chapter 14.62 of the Maui County Code establishes a framework for imposing impact fees for traffic and roadway improvements in West Maui. The law calls for the creation of the West Maui Transportation Plan; however, since Chapter 14.62 was enacted in 1988, this plan was never prepared. The West Maui Transportation Plan is essential to the establishment of impact fees because Chapter 14.62 requires: "A schedule for determining traffic impact fees shall be established by the west Maui transportation plan." In 2002, the County of Maui hired a consultant to develop a transportation planning model that will help the County determine impact fees for new developments that generate traffic. This study will cover the entire island and may be used as the implementing action for Chapter 14.62 of the Maui County Code.

5.5 NOISE

Two environmental noise assessment studies were prepared by D.L. Adams & Associates, Ltd. to examine the potential noise impact due to the Kapalua Mauka community and to suggest possible mitigation measures. One study covers the original 450-acre Project District 2 area; the second study covers the additional 475 acres proposed to be included in the expanded project district. The studies use guidelines of various local and federal agencies including the U.S. Federal Highway Administration, Hawai'i Department of Transportation, U.S. Department of Housing and Urban Development, U.S. Environmental Protection Agency, and the State Department of Health. Both studies are summarized below. The full studies are included in Appendix J-1 and Appendix J-2.

Exiting Conditions

The Kapalua Mauka community site is currently exposed to daytime ambient noise levels of 54 to 67 decibels (dBA), with the dominate noise sources being traffic from Honoapi'ilani Highway, wind, and occasional distant aircraft. Nearby noise sensitive areas include residential areas, churches, and the golf courses of the Kapalua Resort.

Potential Impacts

Potential impacts on the noise quality of the site and area are primarily limited to those generated by construction activity noise in the short-term, and increased traffic in the long-term. Other potential sources of noise could be increased human noise associated with residential and resort oriented land uses.

Construction Noise. The dominate noise sources during construction will probably be earth moving equipment such as bulldozers and diesel trucks. Construction related noise will impact the existing golf course and may impact nearby residences. Increased noise activity due to construction would be limited to daytime hours and persist only during the construction period. Noise from construction activities will be short-term and must comply with State of Hawai'i Department of Health noise regulations.

Traffic Noise. Traffic-generated noise due to the development of the Kapalua Mauka community is not expected to be significant. The maximum traffic noise level increase along the assessed roadways due to the community is predicted to be less than 1 dB, which is below the threshold of perceptible change in noise level for most people with normal hearing. However, traffic noise from Honoapi'ilani Highway could impact residential properties within 75 feet of the highway.

Mitigation Measures

Construction Noise. Proper mitigating measures will be employed to minimize construction-related noise impacts and comply with all federal and state noise control regulations. All work will be monitored to comply with State of Hawai'i Department of Health (DOH) noise regulations (Administrative Rules of the Department of Health, Chapter 11-46, Community Noise Control). When construction noise exceeds, or is expected to exceed, the DOH's allowable limits, a permit must be obtained from the DOH. Required permit conditions for construction activities include:

- No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels . . . before 7:00 a.m. and after 6:00 p.m. of the same day, Monday through Friday.

- No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels . . . before 9:00 a.m. and after 6:00 p.m. on Saturday.

- No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels on Sundays and on holidays.

In addition, construction equipment and on-site vehicles or devices requiring an exhaust of gas or air must be equipped with mufflers. Also, construction vehicles using traffic-ways must satisfy the DOH's vehicle noise requirements.

Traffic Noise. Because traffic-generated noise due to the development of the Kapalua Mauka community is predicted to be imperceptible to people with normal hearing, no traffic noise mitigation measures are planned. However, because traffic noise from Honoapi'ilani Highway could impact nearby residences, new residences should be constructed at least 75 feet from the highway.

5.6 AIR QUALITY

An air quality study was prepared by B.D. Neal & Associates to examine the potential short- and long-term air quality impacts that could occur as a result of development and use of the Kapalua Mauka community. This study also suggests mitigative measures to reduce any potential air quality impacts where possible and appropriate. The study is summarized below. The full study is included in Appendix K.

Existing Conditions

The air quality at the Kapalua Mauka community is believed to be relatively good, however, no ambient air quality data for the Kapalua area has been reported by the State Department of Health. Existing impacts to air quality include distant volcanic emissions (VOG) and possibly occasional localized impacts from traffic congestion. Emissions of fugitive dust can occur during periods where agricultural operations and field activity expose soils.

Regional and local climate along with the amount and type of human activity generally dictate the air quality of a given location. The climate of the Kapalua Mauka community is affected by its near coastal location and by nearby mountains. Winds are variable but are often trade winds from the north or northeast. Temperatures in the area are generally very consistent and moderate with an average daily range of about 66 to 85 degrees Fahrenheit.

Both federal and state standards have been established to maintain ambient air quality. At the present time, seven parameters are regulated, including: particulate matter, sulfur dioxide, hydrogen sulfide, nitrogen dioxide, carbon monoxide, ozone, and lead. State of Hawai'i air quality standards are more stringent than the comparable national standards except for those pertaining to sulfur dioxide and particulate matter, which are equivalent.

Potential Impacts

The development of the site for the Kapalua Mauka community may result in short- and long-term impacts on air quality either directly or indirectly as a consequence of construction and use. However, it is anticipated that no State or Federal air quality standards will be violated during or after development of the Kapalua Mauka community.

Short-Term Air Quality Impacts. Short-term impacts from fugitive dust will likely occur during the project construction phase. To a lesser extent, exhaust emissions from stationary and mobile construction equipment, from the disruption of traffic, and from workers' vehicles may also affect air quality during the period of construction.

Long-Term Air Quality Impacts. After construction, motor vehicles coming to and from the Kapalua Mauka community will result in a long-term increase in air pollution emissions. To assess the impact of emissions from these vehicles, an air quality modeling study was undertaken to estimate current ambient concentrations of carbon monoxide at several intersections near the Kapalua Mauka community site and to predict future levels both with and without the community.

During worst-case conditions, model results indicated that one-hour and eight-hour carbon monoxide concentrations will be within both the state and the national ambient air quality standards. In the year 2020 without the project, carbon monoxide concentrations were predicted to decrease somewhat at most locations. With the community in the year 2020 carbon monoxide concentrations were estimated to remain nearly unchanged compared to the without-project case intersections along Honoapi'ilani Highway, except at Office Road where a substantial increase over current conditions will likely occur. But even with the substantial increase, concentrations at this location should remain relatively low and well within the standards. Due to the very small impact the community is expected to have, implementing mitigation measures for traffic-related air quality impacts is probably unnecessary and unwarranted.

Electrical Demand and Solid Waste Disposal. Depending on the demand levels, long-term impacts on air quality are also possible due to indirect emissions associated with the community's electrical power and solid waste disposal requirements. Quantitative estimates of these potential impacts were not made, but based on the estimated demand levels and emission rates involved, any significant impacts are unlikely. Nevertheless, incorporating energy conservation design features and promoting conservation and recycling programs within the Kapalua Mauka community could serve to further reduce any associated impacts and conserve the island's resources.

Pesticide Applications. Pesticides will be used to maintain golf course grasses. If applied during low wind conditions using proper application techniques, contamination of nearby, downwind areas by airborne drift should not be a problem. Use of shrouded spray equipment fitted with computerized flow controllers, maintaining a buffer distance of at least 100 feet between target spray areas and populated locations, and planting vegetation screens along populated areas of the golf course perimeter would provide added measures of protection.

Mitigation Measures

Several mitigation measures will be implemented to minimize potential air quality impacts, as listed below.

Dust Control: Fugitive dust emissions can be controlled to a large extent by watering of active work areas, using wind screens, keeping adjacent paved roads clean, and by covering of open-bed trucks. Other dust control measures could include limiting the area that can be disturbed at any given time and/or mulching or chemically stabilizing inactive areas that have been worked. Paving and landscaping of project areas early in the construction schedule will also reduce dust emissions. Monitoring dust at the project boundary during the period of construction could be considered as a means to evaluate the effectiveness of the project dust control program. All construction activities will comply with the provisions of Hawai'i Administrative Rules, Chapter 11-60.1, "Air Pollution Control," Section 11-60.1-33, Fugitive Dust.

In their comment letter on the draft environmental impact statement, the State of Hawai'i Department of Health stated: "Implementation of adequate dust control measures during all phases of construction is warranted." They recommended that a dust control management plan be developed which identifies and addresses activities having a potential to generate fugitive dust. They further recommended that contractors should provide adequate measures to control dust from road areas and during the various phases of construction, including:

- Planning the different phases of construction, focusing on minimizing the amount of dust generating materials and activities, centralizing on-site vehicular traffic routs, and locating potentially dusty equipment in areas of the least impact;
- Providing an adequate water source at the site prior to start up of construction activities;
- Landscaping and rapid covering of bare areas, including slopes, starting form the initial grading phase;
- Controlling of dust from shoulders and access roads;
- Providing adequate dust control measures during weekends, after hours, and before daily start-up of construction activities; and
- Controlling dust from debris being hauled away from the project site.

Construction Equipment Transport: Exhaust emissions can be mitigated by moving construction equipment and workers to and from the project site during off-peak traffic hours.

Post Construction. The air quality modeling study discussed above in "Long-Term Air Quality Impacts" concludes that due to the very small impact the project is expected to have, implementing mitigation measures for traffic-related air quality impacts is probably unnecessary and unwarranted.

Pesticide Application Controls: If proper safety precautions are followed, the potential for serious air quality degradation from chemical spraying for turfgrass maintenance can be virtually eliminated.

Measures available to control drift from pesticide application include: 1) using coarse nozzle and low pressure spray equipment; 2) using shielded or shrouded sprayers; 3) using flow-control computers; 4) using thickener additives; 5) using non-volatile or low-volatile chemicals; 6) applying at lowest possible height and during low wind speed conditions when the wind direction will carry any drift away from populated areas; 7) applying during periods when the temperature is cooler and the humidity is higher and when ground-based temperature inversion conditions are absent; 8) maintaining an adequate buffer distance (at least 100 feet) between sprayer and populated areas; and 9) planting trees and shrubs around golf course perimeters to intercept drift at golf course boundaries.

5.7 VISUAL RESOURCES

Existing Conditions

Looking mauka from Honoapi'ilani Highway the dominate view of the Kapalua Mauka community site is of gently sloping, neatly cultivated pineapple fields. From time to time some fields may be fallow or in the process of being replanted. Access roads segregate the crops into individual fields and tall stands of Cook Pine trees planted as wind breaks are apparent. The overall look of the property is agricultural.

In places, deep gulches interrupt the organized look of the pineapple fields. The random vegetation within the gulches contrasts dramatically with the orderly rows of the pineapple fields. Within the gulches, trees periodically peak above the ridge lines.

Fairways and greens of the Village Golf Course are also visible from various points along the highway. Distant mauka views are of the peaks of the West Maui Mountains. Makai views are of Kapalua Resort, the ocean, and the islands of Moloka'i and Lāna'i. See Figure 3 for site photographs.

Potential Impacts

Because of the rural character and low-density of much of the Kapalua Mauka community, looking mauka from Honoapi'ilani Highway, the open space character of the site will remain intact, but visually change from pineapple fields to low-density residential and golf course land uses. In places house sites will be visible, but because of the relatively large lot sizes, there will be substantial open space between houses. The community is designed with higher density uses toward the interior of the site, with larger rural lots around the edges serving as a transition to the remaining agricultural fields. The dominate view from Honoapi'ilani Highway will still be of green vegetated areas.

Residential uses and other development within the Kapalua Mauka community will maintain the same high standards established throughout the Kapalua Resort. Although the topography is gently rolling in some areas, the portions of the community planned for residential uses are located on relatively flat areas currently cultivated in pineapple. To the extent possible, improvements will conform to the contours of the land further limiting the need for extensive grading of the site.

Mitigation Measures

Kapalua Mauka community will be integrated into the contours of the site to blend with the existing Kapalua Resort community and to maintain the rural attributes of the mauka area. Large lot rural uses are planned to provide a gentle transition to the surrounding agricultural and open space uses. The low-density, rural character of much of the community will provide considerable open space. New landscaping will increase the botanical diversity of the area and maintain the dominate view of green vegetated areas. To the extent possible, existing trees will be preserved and integrated in the community landscaping.

The community will be master planned to ensure the appropriate use of materials, colors, site design standards, and landscaping. Community covenants and design standards will be implemented and enforced to maintain appropriate community character over time. The community must also gain approval from the County Council and Planning Commission which will also evaluate the major components of the community design.

5.8 SOCIO-ECONOMIC IMPACTS

A market study, economic impact analysis and public cost/benefit assessment was prepared for the Kapalua Mauka community by The Hallstrom Group. The study is summarized below. The full study is included in Appendix A.

5.8.1 Social Impacts

5.8.1.1 Population

Existing Conditions

The resident population of Maui County is 128,094 persons, according to the 2000 United States Census. This is more than double the 1980 total of 62,823 persons, equating to a compounded annual growth rate of 3.67 percent over the last two decades. In addition to the resident population, approximately 38,000 non-residents populate Maui on any given day.

The resident population of West Maui (includes Lahaina, Kā'anapali, Nāpili-Honokōwai, and Kapalua) is 17,748 persons, according to the 2000 United States Census. Over the past three decades the compounded annual growth rate of the region has been 3.98 percent. In addition to the resident population, approximately 15,000 non-residents populate the West Maui region on any given day.

Potential Impacts and Mitigative Measures

The homes at the Kapalua Mauka community will be a collection of primary and second/vacation home residences. The full-time resident (primary) population of the Kapalua Mauka community is estimated to reach 341 persons after build-out. With an estimated non-resident population of approximately 499 persons, the de facto population of the community is estimated to be approximately 840 persons at any given time. This is less than half the population a community of this size would generate as a typical housing project oriented to full-time residents. Because most of the population will be visitors using their second homes, pressure on government services and funds will be less that a community of full-time residents, as visitors typically do not rely on the full range of government services that full time residents expect. However, property owners at Kapalua Mauka, even if they are not full-time residents, will pay property taxes (on high value property) on a full-time basis, and excise taxes when they purchase goods and services on the island.

Analysis of State of Hawai'i and Maui County budgets indicates the actual effect of governmental services relating to the population of the Kapalua Mauka community would not create the need to expand additional county and state funding on Maui. The de facto population of 840 persons and their automobiles represent a relatively insignificant less than one-half a percent expansion of the total de facto island person and car population. Further, some of the full-time residents will be relocating from other areas on the island, and some of the visitors will be drawn from other Maui resorts, so that the population of the Kapalua Mauka community will not be fully new to the island.

A maximum of 20 percent of the single-family homes in the community are estimated to be used by full-time resident households, with the remaining 80 percent being second/vacation homes. In full-time single-family residences, the average household size is forecast at 3.1 persons, so that by community build out there will be 242 permanent residents. For second/vacation single-family homes, the average party size is estimated at 3.5 persons, with the house occupied about 20 percent of the time. This will create an average of 218 second-home users and their guests in the community in addition to full-time residents.

Only about 15 percent of the multi-family units are expected to house full-time residents. In full-time, multi-family units, the average household size is forecast at 2.2 persons, so that by community build out there will be 99 permanent residents. For second/vacation multi-family units, the average party size is estimated at 2.2 persons, with the unit occupied about 50 percent of the time. This will create an average of 281 second/vacation multi-family users and their guests in the community in addition to full-time residents.

5.8.1.2 Housing

Existing Conditions

West Maui has had an acute shortage of available housing units for several decades due to the scarcity of urban land and supporting infrastructure. Federal, state, and local public agency studies indicate there is an unmet demand reaching from several hundred to as many as 5,000 housing units in the greater Lahaina area. In the late 1980s, the United States Department of Housing and Urban Development declared that the region was among the tightest housing markets in the nation.

While the recession of the 1990s squelched activity, latent demand remained and began to re-emerge with the onset of economic recovery in the late 1990s. Demand has remained strong into 2001, however there has been virtually no meaningful new housing inventory made available in the region in the past decade.

It is forecasted that the West Maui region will require 4,650 to 7,240 new housing units over the next twenty years. While there have been up to 5,300 units proposed for the region (excluding the Kapalua Mauka community), at Pu'ukoli'i Village, on State lands (Villages at Leiali'i), and elsewhere, these projects have not shown any activity in over a decade. It is unlikely these proposed developments will provide new inventory to meet the potential market needs in the near to mid-term.

Potential Impacts and Mitigative Measures

The Kapalua Mauka community will contain a total of 690 new single-family homesites and multi-family units. While estimated prices of units within the Kapalua Mauka community will be affordable to only 10 to 15 percent of the resident population, this segment will still require approximately 465 to 724 new units over the next 20 years. The Kapalua Mauka community needs only to capture a portion of this demand to achieve rapid absorption and be considered a meaningful source of residential inventory.

While the Kapalua Mauka community will help to satisfy the demand for resort homes within the Kapalua Resort, landowner Maui Land & Pineapple Company, Inc., will comply with County of Maui requirements for affordable housing.

Maui Land & Pineapple Company, Inc., has a strong history of providing affordable housing for their employees and has complied with all requirements for affordable employee housing previously imposed as conditions of developing the existing Kapalua Resort. Completed West Maui projects include Nāpilihau Planned Development (174 units, in partnership with the State) and Honokeana Subdivision Phase I (38 units). Maui Land & Pineapple Company, Inc., also donated 13.5 acres of land in West Maui for the County Hale Noho Subdivision (which contains 72 homes built by the County).

In conjunction with its Upcountry operations, Maui Land & Pineapple Company, Inc., has provided affordable employee housing in Hāli'imaile (176 units and 15 units) and in Makawao at the Pu'u Koa Subdivision (47 units).

In May of 2002, Maui Land & Pineapple Company, Inc., ~~will start~~ started development of Kapua Village Subdivision, a new 45-lot employee subdivision project in West Maui. Maui Land & Pineapple Company, Inc., is developing this subdivision on their own accord, as a benefit for their employees . ~~Depending on still pending County of Maui affordable housing requirements, this subdivision may satisfy, or partially satisfy, the affordable housing requirements for the Kapalua Mauka community~~ and is not receiving any County affordable housing credits for the project. These lots will be sold to employees at prices significantly below market prices.

All totaled, Maui Land & Pineapple Company, Inc., has developed (independently or in partnership with the State) 450 affordable employee housing units on Maui. They have also donated land to the County for County-built affordable housing. Further, in 2002, they will provide an additional 45 affordable lots in West Maui for employees at prices below market.

5.8.1.3 Community Character

Existing Conditions

West Maui, generally, and Kapalua specifically, are among the most desirable resort/residential areas in Hawai'i, with an exceptional and diverse visitor industry, a historic town offering a range of modern services, a superior climate, lush natural beauty, and a variety of recreational resources. While areas adjacent to Kā'anapali Beach and Lahaina have become more urbanized in character, Kapalua Resort has maintained a low density rural character and a reputation as a relaxed vacation area. In contrast to the master planned Kapalua Resort, freestanding condominium and single-family units line the coastal strip between Kapalua and Kā'anapali Beach.

The intent of the Kapalua Resort has always been to provide a luxurious resort atmosphere removed from the Lahaina-Kā'anapali area. From the outset, Kapalua was envisioned and designed as a master-planned resort community where development conformed to the contours of the land. To insure its ambience, the Kapalua Resort has not been developed to the density levels of Kā'anapali or other West Maui properties, rather it is an example of a low-key, low-density destination resort community.

Potential Impacts and Mitigative Measures

Residential uses and other development within the Kapalua Mauka community will maintain the same high standards established throughout the Kapalua Resort. Although the topography is gently rolling in some areas, the portions of the community planned for residential uses are located on relatively flat areas currently cultivated in pineapple. To the extent possible, improvements will conform to the contours of the land limiting the need for extensive grading of the site.

The Kapalua Mauka community will be designed to blend with the existing Kapalua Resort and to maintain the rural attributes of the mauka area. Large lot rural uses are planned to provide a gentle transition to the surrounding agricultural and open space uses. The low-density, rural character of much the community will provide considerable open space. New landscaping will increase the botanical diversity of the area and maintain the dominate view of green vegetated areas. To the extent possible, existing trees will be preserved and integrated in the community landscaping.

The community will be master planned to ensure the appropriate use of materials, colors, site design standards, and landscaping. Community covenants and design standards will be implemented and enforced to maintain appropriate community character over time. The community must also gain approval from the County Council and Planning Commission which will also evaluate the major components of the community design.

5.8.2 Economic Impacts

Existing Conditions

The ten mile urban strand stretching close by the coastline from Puamana to the Ritz Carlton Kapalua Hotel has been the economic engine that changed Maui from an isolated agrarian community to a world-class vacation destination boasting the finest in tourism infrastructure. While extensive quality development in the Kīhei-Makena corridor in the 1980s placed that region in a competitive position with greater Lahaina, the South Maui area lacks the history and charm of West Maui.

Despite having urban uses on only 6.4 percent of the total district land base, which is still dominated by agricultural and conservation holdings, the West Maui region houses nearly one-quarter of all

Maui jobs, generates upwards of $3 billion in economic activity annually, and represents almost 30 percent of the island tax base and more than 20 percent of countywide assessed real property value.

Potential Impacts and Mitigative Measures

Impacts Associated with Development

As proposed and planned, the Kapalua Mauka community will generate approximately $1.14 billion in direct, new capital investment and spending into the Maui economy over its 20-year build out and sales period. Approximately $470.8 million in direct construction costs will be spent over a 14-year build-out period, averaging 33.6 million per year. This represents an up to 19 percent increase in construction and supply business activity over recent levels. On a stabilized basis after construction, maintenance/renovation workers, clubhouse employees, condominium staff, and other on- and off-site positions will earn approximately $6.2 million in wages each year, and residents and guests at the community will spend approximately $49.4 million annually in the local economy.

A total of 4,990 "worker years"[2] of direct on-site employment will be created during the 20-year construction and sales period, along with an additional 2,495 worker years in associated and indirect off-site employment. In post-development years, the community will directly provide the stabilized equivalent of 226 on- and off-site positions. The average number of jobs in the construction phase will be about 438 per year, equivalent to a 0.58 percent increase in overall island employment. This could lower unemployment in the construction trades by 50 percent over current levels.

Further, unlike a hotel or large condominium project which provides work for large contractors for a few years, the Kapalua Mauka community will generate work for a diverse group of smaller contractors and trade workers over an extended time frame, as the high-quality homes of the community will require a high degree of craftsmanship.

Employee wages of approximately $291.6 million will be paid out during the initial 20 year development and sales period. Wages of approximately $6.2 million annually are projected on a stabilized basis for maintenance and repairs, condominium staff, clubhouse employees, and other on-site workers.

Discretionary expenditures by the de facto population of community are expected to reach $49.4 million annually at build-out. The total household income of full-time residents is forecast to reach a stabilized level of $39.2 million per year.

The expenditure of employee wages, business profits, and resident and guest discretionary funds into the Maui economy will enhance hundreds of additional off-site, secondary and indirect jobs on the island and will generate several million dollars in additional wages.

The total direct, local, economic impact to Maui (dollars flowing into the island market) is estimated to be $1.14 billion during the two decade construction and sales period, and stabilize at $64.2 million annually after build out. As these dollars move through the island economy, they will have a

[2] A worker year is the amount of time one full-time worker can work in one year.

multiplier effect increasing the economic impact of the Kapalua Mauka community to Maui to approximately $2.29 billion.

Taxes and Government Revenues

Fiscal and economic impacts from the short-term construction and long-term operation of the Kapalua Mauka community are expected to directly benefit the State of Hawai'i and County of Maui through three major tax sources: real property taxes, gross excise tax receipts, and state income taxes. In no year will the State or the County suffer a revenue shortfall due to the Kapalua Mauka community.

As projected, the County of Maui will receive $72.9 million in real property tax revenue from the Kapalua Mauka community over the 20-year build-out and sales period, and an estimated $5.6 million per year thereafter. The county government operating costs associated with serving the community, using a per capita basis, will is estimated to total $18.9 million for the two decade timeframe, and be approximately $1.5 million on a stabilized basis. The County will enjoy a net revenue benefit (taxes less costs) totaling $53.9 million during the first 20 years of construction and sales, and $4.1 million each year after build-out.

The State of Hawai'i will also show a positive net revenue benefit from the Kapalua Mauka community. The total gross tax revenues during the two-decade period will reach $101.9 million from income and gross excise taxes, and will stabilize at $5.2 million annually following build-out. State costs associated with the community on a per capita basis will be $56.7 million during the build-out and sales time frame and $4.4 million per year subsequently. The state will experience an net profit of $45.2 million in the 20 years and a stabilized benefit of $819,150 after build-out.

5.9 INFRASTRUCTURE

A Preliminary Engineering Report and a Preliminary Drainage Report were prepared for the Kapalua Mauka community by Warren S. Unemori Engineering, Inc. Key elements of the reports are summarized below. The complete reports are included in Appendix L-1 (Engineering) and Appendix L-2 (Drainage).

5.9.1 Roadway Facilities

Existing Conditions

The community site is adjacent to the existing Honoapi'ilani Highway, the main traffic artery that links Kapalua to Lahaina and the rest of Maui. Although Honoapi'ilani Highway is a limited access highway, several access permitted openings are in place along the Kapalua Mauka community site frontage.

The main access is opposite the Office Road/Honoapi'ilani Highway intersection at the crest of Honoapi'ilani Highway. This access point was constructed with left turn as well as acceleration and deceleration lanes. A second access permitted point is located opposite the present service vehicle entrance to the Pineapple Hill community. A third permitted access point is located at the Southwesterly corner of the Kapalua Mauka community site. This access is currently being used to access the State-owned parcels (TMK 4-3-01 parcels 6 and 8) and is fully improved. A fourth permitted access point to the north provides access north of Honokahua Gulch and before Plantation Estates Drive.

Potential Impacts and Mitigative Measures

The Kapalua Mauka Community will have at least three access points from Honoapi'ilani Highway: 1) a "T" intersection at the southwesterly corner of the Kapalua Mauka community site; 2) a four-way intersection opposite Office Road at the crest of Honoapi'ilani Highway; and 3) a "T" intersection north of Honokahua Gulch and before Plantation Estates Drive (See Figure 4, concept plan).

Internally, a collector road will be extended from the main entrance opposite Office Road up the middle of the east ridge to the various development areas. A secondary road across the unnamed gulch will link the southwesterly half of the community to the main collection road. Access to the southwesterly portion of the site will be provided from the "T" intersection at the southwesterly corner of the Kapalua Mauka community site. An internal road will also be built from the "T" intersection north of Honokahua Gulch.

As suggested by the Office of Environmental Quality Control in comments on the environmental impact statement preparation notice, if available on Maui, the use of glass-asphalt aggregate ("glasphalt") will be considered in the design of roads within the Kapalua Mauka community.

For information regarding grading for construction of the internal roadways see Section 4.3. For information regarding traffic see Section 5.4.

5.9.2 Drainage

Existing Conditions

The Flood Insurance Rate Map (Community-Panel No. 150003 0139B) (Figure 10) indicates that site of the Kapalua Mauka community is within "Zone C," an area of minimal flooding.

Currently, runoff from the 925-acre Kapalua Mauka community site sheet flows into Honokahua Gulch and an unnamed gulch. The current onsite peak runoff for a 100-year, 24 hour rainstorm for the site (which includes 16 holes of the Village Golf Course and pineapple fields) is estimated to be 1873 cubic feet per second (cfs). ~~Of this total,~~ Drainage from approximately 72 percent of the site ends up in Honokahua Gulch where it crosses under Honoapi'ilani Highway via a concrete bridge crossing and then sheet flows across an existing grassed channel area before discharging into the ocean. Drainage from ~~Approximately~~ approximately 28 percent of the site flows into the unnamed gulch. Runoff from this unnamed gulch ends up in a retention basin located west of Pineapple Hill and mauka of fairways 11 and 12 of the Kapalua Bay Golf Course. Any overflow from this first basin ends up in a second retention basin within the Bay Course, 1,000 feet upstream of Lower Honoapi'ilani Road.

Maui Land & Pineapple Company, Inc., has initiated a water quality monitoring program to evaluate impacts of water quality in Honokahua and Napili Bays, which currently receive runoff and groundwater flow from the Kapalua Mauka community area. Appendix H contains the first assessment study of this program, conducted by Marine Research Consultants. The intent of the this first study was to develop a baseline set of conditions that can be used to evaluate the impact of Kapalua Mauka community on nearshore waters.

A conclusion of the study was that: "nutrients entering the Bay from both natural and man-induced activities do not appear to be causing any negative impacts to either water quality or biotic or biotic structure of Honokahua and Nāpili Bays." At the time samples where taken for the study, surface water was not present in the bays, but any nutrients present could have entered the bays via groundwater efflux.

Potential Impacts

Development of the Kapalua Mauka community is not expected to have a significant adverse effect on either the existing watershed, downstream properties, or coastal marine waters. Post-development runoff is expected to increase slightly from 1873 cfs to 1934 cfs. However, detention and desilting basins within the community site will maintain the existing flows and there will be no increase in runoff flowing from the site.

The present pattern of runoff flow will be maintained after build out of the community as existing drainage patterns will be integrated into the design of the subdivision and the expanded golf course. Surface runoff generated by the community will be minimized by the low density of the residential units and the increased permeable area from the addition of nine holes to the Village Golf Course.

In addition, water quality of the runoff from the site is expected to improve from the addition of the Kapalua Mauka community relative to the existing pineapple fields that comprise the majority of the site. This is because more chemicals are used on pineapple fields to control pests and regulate growth than are used on golf courses and residential lots. In addition, once residential landscaping is in place and the additional holes of the golf course are covered with grass and plants, soil runoff during rainstorms will be very low. In contrast, soil runoff from pineapple fields can be significant if heavy rains occur soon after a field is plowed.

Similarly, it has been shown that the greatest contribution of nutrients to groundwater from human activities in West Maui is from sugarcane and pineapple agriculture; golf course and resort and residential development provide a relatively small contribution (Soicher and Peterson 1997). Since the Kapalua Mauka community will replace pineapple agriculture in some areas of the site, the overall subsidies of nutrients delivered to the ocean via groundwater is expected to decrease.

As previously mentioned, Maui Land & Pineapple Company, Inc., has initiated a water quality monitoring program for Honokahua Bay and Nāpili Bay. The intent of the first study is to establish a baseline set of conditions that can be used to evaluate impacts to water quality in Honokahua Bay and Nāpili Bay, which will receive runoff and groundwater flow from the Kapalua Mauka area. In addition, results of the water quality assessment can be used to address the effects of groundwater withdrawal associated with the Kapalua Mauka community on the nearshore ecosystems within the two bays. Additional studies will be conduced on a periodic basis.

In 1990, Maui Land & Pineapple Company, Inc., instituted a similar water quality monitoring program to assess water chemistry characteristics of nearby Honolua Bay on a periodic schedule. The intent of the program was to establish a quantitative baseline of water chemistry constituents that could reveal if water quality in Honolua Bay was being affected by factors associated with human activity on land. Specifically the study was instituted because of the development of the Plantation Estates subdivision and the Plantation Estates Golf Course, both of which adjoin Honolua Stream.

The monitoring program encompassed twelve phases of monitoring over a duration of seven years, with the last survey conducted in 1997. The cumulative results of the surveys conclude that fertilizer nutrient input to Honolua Bay does not appear to have increased over the span of monitoring, and in fact appears to be decreasing. Further, the studies conclude that "nutrients entering the Bay from both natural and man induced activities do not appear to be causing any negative impacts to either water quality or biotic structure of Honolua Bay."

In May of 2001, the monitoring program was renewed and a new water quality study (Marine Research Consultants 2001) was conducted. During the four year interval between studies there were no major changes in land use in the Honolua Watershed. The May 2001 study concludes that "water quality within Honolua Bay cannot be considered in violation of State standards."

While runoff from the Kapalua Mauka community will flow into nearby Honokahua Bay and not directly into Honolua Bay, it is reasonable to conclude that given the similar type of development planned (residential uses and a golf course) similar impacts to nearshore waters can be expected. Hence, State water quality standards at Honokahua Bay are not expected to be exceeded as a result of the Kapalua Mauka community.

In addition, because all development is planned for the upland areas and not in the on-site gulches, no flood hazards are present on the areas planned for development.

Mitigation Measures

Runoff from the northeasterly portion of the community site will be collected by catch basins within the internal roads and parking lots. This runoff will then be directed into onsite detention and desilting facilities before being discharged into Honokahua Gulch.

Runoff on both sides of the unnamed gulch will be collected by catch basins and routed through detention basins onsite and then into the existing detention basin west of Pineapple Hill Estates within the Bay Golf Course.

All detention basins will be designed to suppress peak flow and serve as desilting basins to minimize the conveyance of waterborne silt and debris downstream. Detention basins will also maintain off-site runoff at or better than existing levels. All drainage improvements will be developed in accordance with applicable State Department of Health and County of Maui requirements.

Based on the slight increase in surface runoff expected from the new community, the expected improved water quality relative to the existing pineapple fields, and the engineering measures to be implemented, it is reasonable to conclude that properties and ecosystems downstream will not be adversely impacted by the development of the Kapalua Mauka community.

5.9.3 Water Facilities

Existing Conditions

Kapalua Resort is currently served by a dual water system for potable and non-potable water. Both systems are owned and operated by ~~Kapalua Water Company, Ltd., a subsidiary of~~ Maui Land & Pineapple Company, Inc., or its subsidiaries.

The source of Kapalua Resort's potable water is two deep wells located between elevations 768 and 796 feet above Mean Sea Level (MSL) approximately one-half mile southeast of the community site. These wells each have a capacity of 1.0 million gallons per day (MGD). A third well at the 800 foot elevation has been drilled and successfully tested, ~~and capped~~ but does not have a pump installed and is currently not in use. According to test results, ~~it too~~ this well also has a potential capacity of 1.0 MGD.

Water from the two operational wells is pumped into a 100,000 gallon glass-lined steel control tank at elevation 820 feet. It is then transmitted by gravity into a one million gallon reinforced concrete storage reservoir at elevation 428 MSL. From this storage reservoir water is conveyed to Kapalua Resort by means of a ~~12-inch~~ 16-inch line that runs along Office Road and Kapalua Drive. This line is augmented by a 12-inch line that runs along Village Road and Lower Honoapi'ilani Highway. The average daily demand on this potable water system in year 2000 was slightly under 500,000 gallons per day (gpd). The average daily demand on this potable water system between May of 2001 and April of 2002 was slightly under 600,000 gpd.

The source of non-potable irrigation water for Kapalua Resort is the Honolua Ditch. The Honolua Ditch has been providing agricultural irrigation water in the region since 1913. According to Maui Land & Pineapple Company, Inc., records, water flows in Honolua Ditch vary between a high of 60 MGD to a low of 5 MGD with an average daily flow of 26 MGD. From ~~this~~ the ditch water is conveyed to a 5.5 million gallon open reservoir within the Kapalua Mauka site at an elevation of 660 feet MS. This reservoir also serves as a source of water for fire protection. A series of water lines delivers water from the reservoir to the Kapalua Resort. Within the Resort non-potable water is used for golf course and landscape irrigation. The average daily demand for non-potable water for the period between July 2000 and July 2001 was 1,625,000 gpd. The average daily demand for non-potable water for the period between May 2001 and April 2002 was 1,900,00 gpd.

According to hydrological studies prepared for various projects in West Maui, groundwater in the region flows toward the shoreline and floats as a basal lens on brackish water eventually discharging in a narrow band along the coast. Hydrologist John Mink has estimated that the groundwater flow toward the shoreline ranges from 4.5 to 5.0 mgd per mile of coastline. The groundwater lens is unconfined and the water table increases parabolically until the basal lens meets the high level dike compartment aquifers of the rift zone. The groundwater head rises from near zero at the coastline to approximately 5 feet at a distance of about 11,000 feet inland. Consequently, the underlying groundwater head likely ranges from 3 to 5 feet.

Potential Impacts

The existing water sources (wells and Honolua Ditch) have the capacity to meet the potable and non-potable water demands of the Kapalua Mauka community. The community will require both potable water for residential units and non-potable water for golf course and other irrigation needs. Based on a total number of 690 residential units, the potable water demand for the Kapalua Mauka community is expected range between 250,000 to 350,000 gpd. Non-potable irrigation demand, including the expansion of the golf course to 27 holes, is expected to range from 900,000 to 1,000,000 gpd. No additional water beyond what currently flows to the Honolua Ditch is expected to be diverted from streams in the region as a result of the Kapalua Mauka community.

Approval from the Commission on Water Resource Management is not required for future water use because existing wells have already received approval and the water supply source is not located in a designated water management area.

Mitigation Measures

~~Kapalua Water Company, Ltd.~~ Maui Land & Pineapple Company, Inc., or its subsidiaries, will build, operate, and maintain new potable and non-potable water systems within the Kapalua Mauka community. For the potable system two storage tanks will be built because water from the exiting one million gallon reservoir at elevation 428 MSL is situated too low to adequately serve the Kapalua Mauka community and to provide water at adequate pressure levels. A half million (0.50) gallon storage tank will be constructed at an elevation of 820 feet. This tank will provide water at adequate pressure to consumers below the 700 foot elevation. Consumers above the 700 foot elevation will be served by the another tank at the 1310 foot elevation. A series of booster pumps will be installed to pump water to this upper tank.

A non-potable water distribution system will also be installed within the community for irrigation and fire protection using the existing 5.5 million gallon open reservoir at elevation of 660 feet MSL. Although this reservoir has sufficient capacity to meet the non-potable demands of the community, a new distribution system with booster pumps and additional open reservoirs or tanks will be needed to provide water to the areas above the existing reservoir. This new reservoir would be constructed at the 1,200 foot level and would have a capacity of approximately 2,150,000 gallons. Water for this reservoir will be pumped up from the first reservoir at elevation 660 feet. Fire hydrants will be installed at appropriate intervals along the internal roadways for accessibility of fire fighting apparatus.

To conserve water within the Kapalua Mauka community:

- Both potable and non-potable systems will be metered to discourage excessive use;
- Low-flow fixtures and devices will be used throughout the community pursuant to Maui County Code Section 16.20A.680;
- Single pass cooling will not be allowed pursuant to Maui County Code Section 14.21.20; and

- Best management practices designed to minimize infiltration and runoff from daily operations will be implemented.

To further conserve water resources the following water conservation measures will be considered: maintaining fixtures to prevent leaks, limiting irrigated turf area, and preventing over watering by automated systems.

In comments on the environmental impact statement preparation notice, the County of Maui Department of Water Supply mentioned the *West Maui Community Plan* objective to: "*Study the feasibility of integrating all regional water systems into a public water system to be managed and operated by the County.*" In their comments they stated:

> In order to achieve this, a plan for the eventual acquisition by the County of Maui of all private water systems within the region has to be developed. Integration of water systems may provide improved emergency back-up, reliability and system hydraulics. The Department of Water Supply seeks the cooperation of major land owners and private water system providers in the development of acceptable feasibility study framework of system integration.

Maui Land & Pineapple Company, Inc., will cooperate with the County of Maui Department of Water Supply in the development of an acceptable feasibility study framework for water system integration.

5.9.4 Wastewater Facilities

Existing Conditions

The sewer system within Kapalua Resort is owned, operated, and maintained by ~~Kapalua Land Company, Ltd.~~ Maui Land & Pineapple Company, Inc., or its subsidiaries. Currently, there is no sewer system within the Kapalua Mauka community site. All collection systems in the Kapalua Resort are located makai of Honoapi'ilani Highway.

There are two 15-inch sewer interceptor lines within the Kapalua Resort area. The first, located between 100 to 150 feet inland of the shoreline, receives wastewater from the Kapalua Bay Hotel, the Bay Villas, the Ironwoods, and other projects along the coastline. The second handles flows from the Ridge, Pineapple Hill, the Golf Villas, the Ritz Carlton Hotel, and the commercial and office buildings along Office Road.

Wastewater from Kapalua Resort is collected and directed into the County's sewer pump station No. 6 located in TMK 4-2-04:25. From this point, a series of County-owned pump stations, force mains, and gravity collectors on Lower Honoapi'ilani Road transport the wastewater for processing and disposal to the Lahaina Wastewater Reclamation Facility located north of Kā'anapali, mauka of the Honoapi'ilani Highway/Lower Honoapi'ilani Road intersection.

The Lahaina Wastewater Reclamation Facility has the capability of recycling up to 3.0 MGD of wastewater to R-1 quality. Current R-1 water use is 1.60 MGD. Near future committed R-1 water use is 0.5 MGD. Therefore there is a balance of 0.9 MGD of uncommitted R-1 water that could be produced at the Lahaina Wastewater Reclamation Facility. Wastewater that is not recycled is disposed of in injection wells at the Lahaina Wastewater Reclamation Facility site.

The Lahaina Wastewater Reclamation Facility has an average daily flow capacity of 9.00 MGD. The peak capacity is 19.8 MGD. According to the County of Maui Division of Wastewater Management, in September 2001 the average daily flow through the Lahaina Wastewater Reclamation Facility ~~is~~ was approximately 6.38 MGD. ~~The facility has a capacity of 9.00 MGD.~~ In March of 2002, the average daily flow through the facility was 5.10 MGD.

Potential Impacts

When fully developed the Kapalua Mauka community is projected to generate approximately 176,000 gallons of wastewater per day.

When the Lahaina Wastewater Reclamation Facility was constructed, Kapalua Land Company, Ltd., paid for an additional allocation of approximately 219,800 gpd in the new facility. Allowing for projects within the resort completed since then, Kapalua Land Company, Ltd., has approximately 184,000 gpd left in ~~their~~ this additional allocation. The remainder of capacity of the treatment facility has been allocated to Amfac and the State Housing and Community Development Corporation of Hawai'i (HCDCH) for the Villages for Leiali'i. However, by agreement, if HCDCH does not use their allocation by year 2006, their allocation reverts to the County. Also the transmission system between Kapalua and the Lahaina Wastewater Reclamation Facility is currently operating at approximately 50 percent of capacity. Therefore, ~~it is reasonable to conclude~~ project engineer Warren S. Unemori Engineering Inc., has concluded that the existing facilities have ample capacity to handle the additional average and peak wastewater flows that would be generated by the Kapalua Mauka Community.

In their comment letter on the draft environmental impact statement, the County of Maui Department of Public Works and Waste Management stated: "wastewater system capacity is currently available as of January 24, 2002."

Mitigation Measures

~~Kapalua Land Company, Ltd.,~~ Maui Land & Pineapple Company, Inc., or its subsidiaries will build, operate, and maintain a new sewer system within the Kapalua Mauka community. The sewer system for the central portion of the community will be connected to the existing gravity interceptor on Office Road. Sewer from the ridge west of the unnamed gulch along the western boundary will be piped across Honoapi'ilani Highway and connected to the sewer system in Pineapple Hill Phase II. The gravity collector for Pineapple Hill Phase II is connected to the County's gravity interceptor on Lower Honoapi'ilani Road, approximately 2,000 feet makai of Pineapple Hill Phase II. The easterly portion of the Kapalua Mauka community adjacent to the Plantation Estates Golf Course will be directed into the existing pump station near D.T. Fleming Park.

All wastewater plans will conform to applicable provisions of the State Department of Health's Administrative Rules, Chapter 11-62, "Wastewater Systems."

5.9.5 Solid Waste Facilities

Existing Conditions

Currently, significant levels of solid waste are not being generated on the Kapalua Mauka Community site from the current agricultural and golf course land uses. Most green waste generated from the golf course is recycled as mulch or soil amendments. Pineapple fields on the site are either fallow or cultivated in limited areas, and thus do not generate significant waste.

Potential Impacts

With development of the Kapalua Mauka community there will be solid waste generated during construction and after development.

Wastes generated by site preparation will primarily consist of vegetation, rocks and debris from clearing and grubbing. Construction waste will consist of waste lumber, concrete, and other building materials.

The County of Maui's Solid Waste Division estimates that households on Maui generate approximately 55 pounds of solid waste per week. Using this estimate, after build-out and sales of all 690 units in 20 years, total waste from all households in the Kapalua Mauka community would be approximately 37,950 pounds per week. However, because of the resort residential nature of the community, not all units are expected to be occupied on a full time basis, so this rough estimate is extremely high even if waste from the clubhouse facility is factored in.

Mitigation Measures

The Kapalua Resort is an active participant in recycling programs and intends to continue its participation with the addition of the Kapalua Mauka community.

As much as practical, construction plans will specify the use of products with recycled content (such as steel, concrete aggregate fill, drywall, carpet, and glass tile) and the use of locally produced products (such as plastic lumber, hydromulch, soil amendments, and glass tile).

During the construction phase, whenever practical, solid wastes will be minimized and recycled. ~~It will be recommended to contractors that a job-site recycling plan should be developed and, as~~ much as possible, construction and demolition waste should be recycled. With their comment letter on the draft environmental impact statement, the Department of Business, Economic Development and Tourism—Energy Resources and Technology Division provided a booklet titled "A Contractor's Waste Management Guide" which is included with the comment letters received in this final environmental impact statement.

During construction green waste can be recycled and used on-site. Wood wastes may also be processed on-site, if practical, depending on the type of wood and the ability to chip the wood on-site. Cardboard and metal may be recycled off-site if practical. The remaining types of wastes such as drywall may be recycled if a local recycling vendor is available. Otherwise, ~~these~~ construction wastes will be disposed in the County's ~~central landfill in Pu'unene~~ construction and demolition landfill near Mā'alaea. Other wastes that cannot be recycled will be disposed in the County's central landfill in Pu'unēnē.

Provisions for recycling, such as collection systems and space for bins for recyclables, may also be incorporated into the built Kapalua Mauka community. After the community is occupied by residents, to the extent practical, wastes such as aluminum, paper, newspaper, glass, and plastic containers will be recycled. Green waste may be processed on-site. Waste that cannot be recycled or incorporated into on-site green waste processing will be disposed of in the County's central landfill in Pu'unēnē. The community will be serviced by a private refuse collection agency contracted by the homeowner's association. Waste associated with commercial activities such as the golf clubhouse will also be recycled when practical.

5.9.6 Electrical and Communication Systems

Existing Conditions

The main electrical, telephone, and cable television (CATV) overhead transmission lines are located on the mauka side of Honoapi'ilani Highway fronting the Kapalua Mauka community site. Maui Electric Company also has a substation adjacent to the community site west of Honokeana Gulch. Electricity for West Maui is provided by Maui Electric Company from its Mā'alaea Power Plant. This facility has a normal generating capacity of 196.5 megawatts. The islandwide generating capacity of Maui Electric Company, including power they buy from Hawaiian Commercial & Sugar is 246.5 megawatts.

Telephone service to the project area is provided by Verizon Hawaii.

Cable television service (CATV) is provided to the Kapalua area via Hawaiian Cablevision.

Potential Impacts

Based on current uses at Kapalua, Maui Electric Company, Ltd., estimates instantaneous peak power demand to range between 4500 kilowatts and 6900 kilowatts when the Kapalua Mauka community is fully built out. To meet this demand, it is likely that the electrical substation located west of Honokeana Gulch will have to be up-sized.

Verizon Hawaii is planning to construct a universal equipment facility in Kapalua in 2002. When completed this facility will be able to handle between 2,000 to 3,000 more customers in Kapalua.

Electrical, telephone, and CATV distribution systems for the community will be extended underground to each development module from the existing overhead transmission and distribution mains located on the mauka side of Honoapi'ilani Highway. The distribution system will be installed along the interior roads. Localized, non-glare, street and walkway lighting will also be included.

Mitigation Measures

Energy efficient and conservation measures to reduce the maximum electrical demand will be considered for implementation into the Kapalua Mauka Community where feasible. These measures may include power factor corrections, the use of energy efficient pumps, and scheduling certain types of loads to run during off-peak hours whenever practical.

Further efforts to minimize energy consumption may include inclusion of select items from the "Hawaiian Design Strategies for Energy Efficient Architecture" (Energy Division of the State Department of Business, Economic Development and Tourism) and "Guidelines for Sustainable Building Design in Hawai'i" (Office of Environmental Quality Control 1999) into the Project's design guidelines.

In their comment letter on the draft environmental impact statement, the Department of Business, Economic Development, and Tourism—Energy Resources, and Technology Division recommended energy efficient design practices and technologies similar to those used in the "BuiltGreen" energy efficient home in Wai'anae on O'ahu. They further recommended the following methods and technologies that could be considered during the design phase of the Kapalua Mauka community:

- Use of shading, orientation, and use of naturally ventilated areas to reduce cooling load;
- Maximum use of day lighting;
- Use of high efficiency compact fluorescent lighting;
- Use of high wattage metal halide lighting for sports and recreational areas;
- Exceed the State's Model Energy Code;
- Technologies such as solar water heating systems, roof insulation, radiant barriers, and energy efficient windows;
- Use of photovoltaics for parking lot lighting;
- Use of landscaping for dust control and to minimize heat gain; and
- Use of photovoltaics, fuel cells, and other renewable energy resources.

Residents of the project can also reduce home energy consumption through the use of the energy conservation measures listed below.

- Locating buildings to minimize the head loads and to effectively use trade winds for indoor and outdoor living and recreational spaces;
- Use of high-efficiency light sources and ballasts for indoor and outdoor lighting purposes;

- Use of high-efficiency refrigerators; washers and dryers, and ranges;
- Use of high-efficiency air conditioners;
- Use of heat pump and solar water heating systems; and
- Facilitating energy saving opportunities through innovative architectural design of buildings.

5.10 PUBLIC SERVICES

Overview

As discussed in section 5.8, the de facto population of the Kapalua Mauka community is estimated to be approximately 840 persons at any given time. This is less than half the population a community of this size would generate as a typical housing project oriented to full-time residents. Because most of the population will be visitors using their second homes, pressure on government services and funds will be less that a community of full-time residents, as visitors typically do not rely on the full range of government services that full-time residents expect. However, property owners at Kapalua Mauka, even if they are not full-time residents, will pay property taxes (on high value property) on a full-time basis, and excise taxes when they purchase good and services on the island.

During the 20-year build out and sales period the Kapalua Mauka community is projected to generate approximately $72.9 million in taxes for the County of Maui; and approximately $101.9 million for the State of Hawai'i. After build out annual taxes generated from the community are projected to be approximately $5.6 million for the County and approximately $5.2 million for the State. In no year will the State or the County suffer a revenue shortfall due to the Kapalua Mauka community (Hallstrom 2001).

Further, the implications of the originally proposed 750 residential units and the subsequent residents were taken into consideration when Project District 2 was included within the *West Maui Community Plan* during the 1992 plan update. According to the Plan: "the update process incorporated technical studies and assessments." These included a "Public Facilities and Service Assessment" that identified "public facilities and services (e.g., schools, parks, police and fire protection, and hospital and solid waste disposal services), and their limits and opportunities in high-growth community plan regions." The Plan also states "the update process was driven by the work of the Lahaina Citizens Advisory Committee (CAC) which met a total of 17 times during a 225-day deliberation process to identify, formulate and recommend appropriate revisions to the Lahaina Community Plan." Thus, the implications of the development of Project District 2 have been considered and given a thorough public review during the community plan update process.

5.10.1 Schools

Existing Conditions

Public schools in West Maui include:

- Kamehameha III Elementary (grades K-5). Located in Lahaina, makai of Front Street. A 1998 Department of Education (DOE) report ("Lahainaluna Complex Development Plan 1997-2017 " Department of Education 1998) states: "The present facilities should be able to accommodate the enrollment projected for the next six years."

- Nahienaena Elementary (grades K-5). Located in Lahaina on Niheu Street. The school is approximately 13 years old. Future capital improvement projects as described in the "Lahainaluna Complex Development Plan 1997-2017" call for a new administration/library facility.

- Lahaina Intermediate (grades 6-8). Located in Lahaina on Lahainaluna Road. Established in 1979, Lahaina Intermediate School is the only public intermediate school in West Maui. Future capital improvement projects being proposed are a new administration building, a library facility, and a classroom building to accommodate increased enrollment. The 1998 DOE report (Department of Education 1998) states: "Additional classroom facilities will be considered when the housing developments produce more enrollment for the school."

- Lahainaluna High School (grades 9-12). Located on approximately 100 acres of land at the end of Lahainaluna Road, about 2 miles above Lahaina. The school serves an area of about 20 miles of coastal communities from Olowalu to Kapalua. The 1998 DOE report (Department of Education 1998) states: "The Facilities Branch and Maui District will need to monitor the residential developments in the school's service boundary area for additional classroom facilities on the campus."

Potential Impacts

The full-time resident population at Kapalua Mauka is estimated to reach 341 persons after build-out in 20 years (The Hallstrom Group 2001). This population is estimated to include approximately 17 school-age children (The Hallstrom Group 2001). The low amount of school-age children is based upon two factors. First, because of the resort-residential nature of the community, only 20 percent of the homes are expected to be used by full-time residents. This estimate is supported by various mid to upscale resort projects throughout the state, including the existing Kapalua Resort, Kā'anapali, Wailea, Mauna Lani, and Hualālai. Second, the average household size of the full-time residents is projected to be 3.1 persons for single-family homes, and 2.2 persons for multi-family units, with most residents being adults.

In addition, the potential impact of the Kapalua Mauka community on public schools will be lessened because the community is targeted toward upper income buyers, and statewide statistics indicate virtually all school-age children from upper income bracket households attend private schools.

Mitigation Measures

The description for Project District 2 in the *West Maui Community Plan* allocates six acres within Project District 2 for an elementary school. However, in their comment letter on the draft environmental impact statement the Department of Education states: "The Department of Education does not anticipate that a school site will be needed in the Kapalua region." ~~While the~~ As such, the ~~current~~ concept plan for the Kapalua Mauka community does not provide for a school site.~~, Maui Land & Pineapple Company, Inc., is willing to designate a school site at another location on its West Maui property if the State Department of Education determines that there is sufficient demand.~~ During development of the community Maui Land & Pineapple Company, Inc., will ~~also~~ be subject to the Department of Education's fair share requirements for new school facilities. In their letter, the Department of Education further states:

> . . . our requirement would be cash-based. The current fair cash requirement is $1,011 per unit. This amount would be due as each unit closes and would thus not require an upfront payment by the developer. Funds collected from this project will be used for capital improvements program projects in the Lahainaluna High School complex, which includes Lahainaluna High, Lahaina Intermediate, Princess Nahienaena Elementary, and King Kamehameha III Elementary Schools.

The State Department of Education's "Lahainaluna Complex Development Plan 1997-2017" (Department of Education, 1998), which projects school capital improvements projects over a 20-year planning time frame, does not specify a new elementary school on the Kapalua Mauka community site or in the Kapalua area.

5.10.2 Police Protection

Existing Conditions

Kapalua Resort operates its own security service within the Kapalua Resort area. With officers on 24-hour patrol, a dispatcher, and several security vehicles, the Kapalua Resort Security Service has the ability to respond to a variety of police-related calls.

The closest police station is located at Wahikuli within the Lahaina Civic Center. This facility was built in the early 1970s and serves the entire West Maui district. The district is divided into beats with patrolmen assigned to each watch per beat. With an increased visitor population, additional beat personnel are necessary to accommodate additional calls. The department is monitoring the number of calls and fluctuations in visitor population to determine the most efficient way to provide police services for both the resident and transit populations.

Potential Impacts and Mitigative Measures

In the County of Maui Police Department comment letter on the Kapalua Mauka Draft Environmental Impact Statement the police officer reviewing the document stated: "I see no potential traffic or safety problems arising from this project"

The Kapalua Mauka community will impact police services by increasing the resident and de facto population in the region. However, relative to the total population of the region, the population increase from the Kapalua Mauka community is not expected to significantly impact the need for public police services. Kapalua Resort's private security service also will be extended to include Kapalua Mauka community.

5.10.3 Fire Protection

Existing Conditions

Fire protection services for the Kapalua Region are provided by the Nāpili Fire Station and the Lahaina Fire Station in the Lahaina Civic and Recreation Center.

The Nāpili Fire Station is located approximately one half mile from the Kapalua Mauka community site near the intersection of Honoapi'ilani Highway and Nāpilihau Street. Presently, there is a staff of 15 firefighters operating three shifts of 5 firefighters on each shift, and one pumper truck. Backup from the Lahaina Station (if required) is approximately 10 minutes.

The Lahaina fire station has one 1,250 gallon pumper truck with a crew of nine fire fighters per 24-hour shift. In addition, there is one ladder truck (75-foot aerial ladder, 1,500 gpm apparatus). The station is operating at near capacity because of its large service area. Emergency access is difficult when traffic congestion on Honoapi'ilani Highway impacts response time.

Potential Impacts and Mitigative Measures

The Kapalua Mauka community will increase the residential population and the number of structures in the service area, and therefore increase the need for fire protection services. However, relative to the total population of the region, the population increase from the Kapalua Mauka community is not expected to significantly impact the need for fire protection services.

5.10.4 Recreation Facilities

Existing Conditions

The West Maui region also has numerous land-based and coastal related recreational areas including 17 county parks and three State beach parks. The following major public parks are available in the region:

- Hanaka'ō'ō Beach Park;
- Wahikuli Beach Park;

- Wahikuli State Wayside Park;
- Māla Beach Park;
- Kelawea Park;
- Paunau Park;
- Malu'ulu O Lele Park; and
- Nāpili Park.

Potential Impacts

The Kapalua Mauka community is not expected to have a significant impact on regional recreation facilities. The full-time resident population at Kapalua Mauka is estimated to reach 341 persons after build-out in 20 years and the total de facto resident population is projected to be, on average, 840 persons (The Hallstrom Group 2001). However, because of the resort nature of community, the majority of the population is expected to make extensive use of the on-site recreation facilities, including the community's golf course, tennis courts, and related amenities. The community will also include extensive pedestrian, jogging, and bike trails.

In addition, relative to its existing condition as pineapple fields with limited access, the Kapalua Mauka community will not be gated and will provide increased access to mauka trails.

Mitigative Measures

Approximately 134 acres of the Kapalua Mauka community will remain in permanent open space that may be enjoyed by community residents and all Maui residents as passive parks. In addition, the golf course and related recreational amenities will provide open space, scenic vistas, and opportunities for both active and passive uses of the area. The community will also have extensive landscape buffers and will be designed to foster a pedestrian-oriented environment with bike and pedestrian pathways connecting to the rest of Kapalua Resort, makai of the Honoapi'ilani Highway. Further, Maui Land & Pineapple Company, Inc., will comply with the requirements of Section 18.16.320 of the Maui County Code pertaining to park dedication requirements for subdivisions.

The *West Maui Community Plan*, proposes two additional parks within the West Maui region:

- The Nāpili regional park between the Honoapi'ilani Highway and the Lower Honoapi'ilani Road and adjacent to the Kapalua Bay Golf Course comprising an area of approximately 50 acres; and
- Māhinahina regional park on approximately 50 acres of land below the Kapalua/West Maui Airport.

The parcel specified in the *West Maui Community Plan* for the Nāpili regional park (TMK 4-3-01: 05) is owned by the State of Hawai'i and is primarily a natural drainage gulch with sloping topography unsuitable for a regional park, as typical regional park amenities such as soccer or baseball fields would require extensive grading or fill which may make development of the park unfeasible and pose potential drainage problems.

In the time since the *West Maui Community Plan* was adopted in 1996, the County of Maui has built the Nāpili Park on a four-acre parcel (TMK 4-3-18: 41) adjoining the State-owned parcel specified in the *West Maui Community Plan* for the Nāpili regional park (TMK 4-3-01:05). The existing park includes play fields, parking, and comfort stations. It is proposed to be expanded on an additional four-acre parcel (TMK 4-3-18: 40). This expansion is proposed to include hard courts and additional open space and parking.

Maui Land & Pineapple Company, Inc., supports the development of the Nāpili Park at its existing location. In fact, Maui Land & Pineapple Company, Inc., was instrumental in the creation of this park, as it granted the eight acres for the Nāpili Park to the County of Maui in 1997 and agreed to relocate its employee housing planned for the site south to Kapua.

As part of the proposed land exchange between the State of Hawai'i and Maui Land & Pineapple Company, Inc., (see section 2.1.3), Maui Land & Pineapple Company, Inc., is also proposing to obtain the State-owned parcel (TMK 4-3-01: 05) between Honoapi'ilani Highway and the Lower Honoapi'ilani Road and adjacent to the Kapalua Bay Golf Course that was proposed as a portion of the Nāpili regional park in the *West Maui Community Plan*. If Maui Land & Pineapple Company, Inc., obtains this site, they intend to maintain the area as open space and create a mauka-makai pedestrian and bicycle trail on the Kapalua side of the gulch. This open space pedestrian and bicycle trail would supplement the existing Nāpili Park, essentially creating an extension of the existing park. In addition, Maui Land & Pineapple Company, Inc., would build and maintain the pedestrian and bicycle trail and maintain the open space without cost to the County of Maui.

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6.0 Relationship to Land Use Plans, Policies, & Controls for the Affected Area

6.0 RELATIONSHIP TO THE LAND USE PLANS, POLICIES, AND CONTROLS FOR THE AFFECTED AREA

This section discusses the relationship of the proposed Kapalua Mauka community to State and County land use plans, policies, and controls for the West Maui region.

6.1 STATE OF HAWAI'I

6.1.1 Environmental Impact Statement Law, Chapter 343, Hawai'i Revised Statutes

Compliance with Chapter 343, HRS is required as described earlier in Section 1.1.2.

6.1.2 State Land Use Law, Chapter 205, Hawai'i Revised Statutes

The State Land Use Law (Chapter 205, Hawai'i Revised Statutes (HRS)), establishes the State Land Use Commission (LUC) and gives this body the authority to designate all lands in the State into one of four districts: Urban, Rural, ~~Agriculture~~ Agricultural, or Conservation.

The entire 925-acre site of the Kapalua Mauka community is currently within the State Agricultural district (Figure 5).

Discussion: To accommodate the uses proposed within the Kapalua Mauka community, landowner Maui Land & Pineapple Company, Inc., will seek to reclassify approximately ~~450~~ 511 acres of the site to the Urban district and another approximately ~~341~~ 280 acres of the site to the Rural district (Figure 5). Approximately 134 acres will remain in the Agricultural district. Lands remaining in the Agricultural District are primarily the gulches and natural drainageways of the site and no development is proposed for these areas.

The area proposed for the Urban district (approximately ~~450~~ 511 acres) is roughly the area that is currently designated as Project District 2 in the *West Maui Community Plan*. According to the Administrative Rules governing Chapter 205, HRS (Title 15, Subtitle 3, Chapter 15, Hawai'i Administrative Rules), the Urban district, "shall include lands characterized by 'city like' concentrations of people, structures, streets, urban level of services and other related land uses." Because this area is proposed to include smaller lot sizes (approximately 10,000 square feet), multi-family units, and a golf course clubhouse and related recreational amenities, the Urban district would be appropriate.

The area proposed for the Rural district (approximately ~~341~~ 280 acres), would surround the Urban district lands on three sides and is envisioned to provide a transition area from the urban uses at the core of the community to the agricultural areas surrounding the site. This rural area would contain single-family home sites ranging in size from a minium of a half acre to up to three acres. Small-scale agricultural activities may be allowed on the larger parcels, including orchards, plant nurseries, and other horticultural activities. According to the Administrative Rules governing Chapter 205, HRS (Title 15, Subtitle 3, Chapter 15, Hawai'i Administrative Rules), standards for the Rural district, include: "Activities or uses as characterized by low-density residential lots of not less than

one-half acre and a density of not more than one single-family dwelling per one-half acre in areas where 'city like' concentration of people, structures, streets, and urban level of services are absent, and where small farms are intermixed with the low-density residential lots."

In comments on the environmental impact statement preparation notice, the State Land Use Commission questioned whether incremental districting or separate dockets would be more appropriate, rather than reclassifying the entire area to the Urban and Rural districts at one time. This is not feasible or desirable because landowner Maui Land & Pineapple Company, Inc., will first seek a community plan amendment to the *West Maui Community Plan* to include the entire 925-acre Kapalua Mauka community site as part of Project District 2 (currently 450 acres of the site is designated as Project District 2). Once the entire site is part of Project District 2, it would be desirable for the Land Use Commission to redistrict the land in conformance with the Community Plan. In addition, infrastructure requirements for the Kapalua Mauka community will be designed and constructed to serve the needs of the entire community. Without assurance that the entire community could be built as planned, it would not be feasible for landowner Maui Land & Pineapple Company, Inc., to proceed with the large scale infrastructure improvements needed for the community.

6.2 COUNTY OF MAUI

Relevant land use plans and ordinances of the County of Maui that pertain to the Kapalua Mauka community include the General Plan, the *West Maui Community Plan*, and the *Maui County Code*.

6.2.1 General Plan

The Kapalua Mauka community implements many of the objectives and policies of the *General Plan of the County of Maui 1990 Update*. As required by the County of Maui Charter, the *General Plan of the County of Maui* sets forth the desired sequence, patterns, and characteristics of future development. This is accomplished through long-range objectives focusing on the social, economic, and environmental effects of development coupled with specific policies designed to implement the objectives.

Specific general plan objectives and policies applicable to the Kapalua Mauka community are discussed below.

Population

> Objective 1: *To plan the growth of resident and visitor population through directed and managed growth plans so as to avoid social, economic, and environmental disruptions.*
>
> > Policy b: *Manage population growth so that the County's economic growth will be stable and the development of public and private infrastructures will not expand beyond growth limits specified in the appropriate community plans or negatively impact our natural resources.*

Discussion: As proposed, the Kapalua Mauka community would be 925 acres. Approximately 450 acres of the Kapalua Mauka community site is already designated as Project District 2 in the *West*

6.0 RELATIONSHIP TO THE LAND USE PLANS, POLICIES, AND CONTROLS FOR THE AFFECTED AREA

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CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

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one-half acre and a density of not more than one single-family dwelling per one-half acre in areas where 'city like' concentration of people, structures, streets, and urban level of services are absent, and where small farms are intermixed with the low-density residential lots."

In comments on the environmental impact statement preparation notice, the State Land Use Commission questioned whether incremental districting or separate dockets would be more appropriate, rather than reclassifying the entire area to the Urban and Rural districts at one time. This is not feasible or desirable because landowner Maui Land & Pineapple Company, Inc., will first seek a community plan amendment to the *West Maui Community Plan* to include the entire 925-acre Kapalua Mauka community site as part of Project District 2 (currently 450 acres of the site is designated as Project District 2). Once the entire site is part of Project District 2, it would be desirable for the Land Use Commission to redistrict the land in conformance with the Community Plan. In addition, infrastructure requirements for the Kapalua Mauka community will be designed and constructed to serve the needs of the entire community. Without assurance that the entire community could be built as planned, it would not be feasible for landowner Maui Land & Pineapple Company, Inc., to proceed with the large scale infrastructure improvements needed for the community.

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Specific general plan objectives and policies applicable to the Kapalua Mauka community are discussed below.

Population

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>
> > Policy b: *Manage population growth so that the County's economic growth will be stable and the development of public and private infrastructures will not expand beyond growth limits specified in the appropriate community plans or negatively impact our natural resources.*

Discussion: As proposed, the Kapalua Mauka community would be 925 acres. Approximately 450 acres of the Kapalua Mauka community site is already designated as Project District 2 in the *West*

Maui Community Plan. As stated in the Plan, the intent of Project District 2 is to provide, within the context of Kapalua Resort, a mix of recreational activities including an existing golf course (with possible expansion to 27 holes), a clubhouse, pro shop, restaurants and bars, tennis courts, swimming pool, and other related recreational amenities and commercial services. The Plan also specifies that the Project District 2 is to include 750 residential units integrated with, and complementary to, the recreational facilities.

The proposed Kapalua Mauka community will extend beyond the current Project District 2 area of 450 acres, however, the number of residential units will not exceed 690—sixty units less than specified in the *West Maui Community Plan.* The resulting community will be far less dense than what is currently envisioned and the actual community growth and the required regional infrastructure needs will not exceed what has been established in the *West Maui Community Plan,* which has a community planning horizon of 20 years.

The implications of the impacts of 750 residential units were taken into consideration when Project District 2 was included within the *West Maui Community Plan* during the 1992 plan update. According to the Plan: "the update process incorporated technical studies and assessments." These included: 1) a Socio-Economic Forecast; 2) a Land Use Forecast; 3) an Infrastructure Assessment; and 4) a Public Facilities and Service Assessment. These studies were used to understand potential future conditions, needs, and impacts. The Plan also states "the update process was driven by the work of the Lahaina Citizens Advisory Committee (CAC). This 14 member panel met a total of 17 times during a 225-day deliberation process to identify, formulate and recommend appropriate revisions to the Lahaina Community Plan." Thus, the implications of the development of Project District 2 have been comprehensively considered and given a thorough public review during the community plan update process.

Infrastructure needs for the community have also been anticipated by landowner Maui Land & Pineapple Company, Inc. As discussed in section 5.9.3, water systems for both potable and non-potable water are owned by ~~Kapalua Water Company, a subsidiary of~~ Maui Land & Pineapple Company, Inc. These systems have adequate capacity for the Kapalua Mauka community. In addition, a private wastewater system will be developed and connected to the County's Lahaina Wastewater Treatment Facility. The Lahaina Wastewater Treatment Facility has adequate capacity to handle the expected amount of wastewater from the community (see section 5.9.4).

Maui Land & Pineapple Company, Inc., is also committed to paying its pro rata fair share of the costs of regional improvements to Honoapi'ilani Highway. The community will further be subject to the Department of Education's fair share requirements for new school facilities. ~~In addition, Maui Land & Pineapple Company, Inc., is willing to designate a school site on its West Maui property, if required, to meet the *West Maui Community Plan* guideline for a six-acre school site, when the Department of Education determines the need and a location for a new school in the area.~~ In comments on the draft environmental impact statement the Department of Education stated that they do not anticipate the need for a school site in the Kapalua region and that their requirements for the community would be cash-based.

Further, the Kapalua Mauka community will provide a reasonable and beneficial use of the land in keeping with the existing Kapalua Resort community. Consistent with Kapalua Resort's environmental sensitivity and quality standards for development, the proposed development of the land will be sensitive to the areas's natural topographic features, scenic amenities, and other resources.

Land Use

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

Policy b: *Provide and maintain a range of land use districts sufficient to meet the social, physical, environmental and economic needs of the community.*

Policy c: *Identify and preserve significant historic and cultural sites.*

Discussion: The Kapalua Mauka community will be consistent with the nearby land uses of the Kapalua Resort and will be designed in a manner sensitive to the environment. Archaeological surveys have been conducted for the community site (see Section 5.1) and all significant historical and cultural sites recommended for preservation will be preserved. While the community site will change from agricultural to urban and rural uses, there will still be vast amounts of agricultural land in the region. The community will be of similar or better quality as the existing Kapalua Resort area, thereby retaining the overall character and ambiance of the resort area.

All three of the Resort's golf courses are Certified Audubon Cooperative Sanctuaries. To receive this designation the courses must meet stringent environmental standards set fourth by Audubon International for environmental planning, water conservation, habitat enhancement, public involvement, integrated pest management, and water quality management. The proposed expansion of the Village Golf Course on the community site is expected to meet the same high standards. Landscape improvements will create a more diverse set of living spaces that may benefit certain bird and plant species.

~~In addition, in 1996 Kapalua became the first resort in the world to be certified by Audubon International under the Audubon Heritage program. In this process, every aspect of the resort was evaluated, from waste management to educational programs, cultural and natural preservation, wildlife protection and land conservation. The Kapalua Mauka community, as part of the Kapalua Resort, is expected to meet the same high standards.~~

Objective 2: *To use the land within the County for the social and economic betterment of the county's residents.*

Policy a: *Mitigate environmental conflicts and enhance scenic amenities, without having a negative impact on natural resources.*

Policy b: *Encourage land use patterns that foster a pedestrian oriented environment to include such amenities as bike paths, linear parks, landscaped buffer areas, and mini parks.*

Policy c: *Encourage land use methods that will provide a continuous balanced inventory of housing types in all price ranges.*

Discussion: The Kapalua Mauka community will provide short and long-term employment and economic benefits that will enhance the social and economic stability of the West Maui region and the County of Maui (see section 5.8). Some of these benefits include:

- Total wages generated over the build out of the community of approximately $291.6 million;
- Long-term stability for labor, including an estimated 4,990 "worker years" of direct on-site employment and an additional 2,495 "worker years" of off-site employment during build out (A "worker year" is the amount of time one full-time worker can work in one year);
- An estimated 226 permanent jobs and $6.2 million in annual wages from community operations and maintenance; and
- More that $49.6 million per year in discretionary expenditures infused into the island economy from community residents and guests.

Further, the community will be designed to complement the site's natural attributes, mitigate environmental conflicts, and enhance scenic amenities. Low density residential units will be integrated with the topography. Approximately 134 acres will remain in permanent open space with no development in gulches and ravines. The golf course will provide additional open space. Natural drainage ways will be preserved. In total, the community will be designed to minimize negative environmental impacts.

The community will also be designed to foster a pedestrian-oriented environment. More urban-like land uses such as multi-family units will be within the core of the community as will be other amenities such as the golf course clubhouse. Surrounding the more urban areas will be larger rural lots and single-family homes, providing a transition to the nearby agricultural lands. The community will have extensive open space and landscape buffers along with bike and pedestrian pathways connecting to the rest of Kapalua Resort, makai of the Honoapi'ilani Highway.

Finally, while the Kapalua Mauka community will help to satisfy the demand for resort homes within the Kapalua Resort, landowner Maui Land & Pineapple Company, Inc., will comply with County of Maui requirements for affordable housing. As per the Maui County Housing Policy, "Prior to the filing of a building permit application for a residential housing project . . . or prior to granting of final subdivision approval, the applicant or developer shall execute an affordable housing agreement which shall set forth the detailed terms and conditions of compliance with the housing policy." As such, information regarding how Maui Land & Pineapple Company, Inc., proposes to satisfy the County's affordable housing requirement will be included with the subdivision application for the Kapalua Mauka community.

Maui Land & Pineapple Company, Inc., has a strong history of providing affordable housing for their employees and has complied with all requirements for affordable employee housing previously imposed as conditions of developing the existing Kapalua Resort. Completed West Maui projects include Nāpilihau Planned Development (174 units, in partnership with the State) and Honokeana Subdivision Phase I (38 units). Maui Land & Pineapple Company, Inc., also donated 13.5 acres of land in West Maui for the County Hale Noho Subdivision (which contains 72 homes built by the County).

In conjunction with its Upcountry operations, Maui Land & Pineapple Company, Inc., has provided affordable employee housing in Hāli'imaile (176 units and 15 units) and in Makawao at the Pu'u Koa Subdivision (47 units).

In May of 2002, Maui Land & Pineapple Company, Inc., ~~will start~~ started development of Kapua Village Subdivision, a new 45-lot employee subdivision project in West Maui. Maui Land & Pineapple Company, Inc., is developing this subdivision on their own accord, as a benefit for their employees . ~~Depending on still pending County of Maui affordable housing requirements, this subdivision may satisfy, or partially satisfy, the affordable housing requirements for the Kapalua Mauka community~~ and is not receiving any County affordable housing credits for the project. These lots will be sold to employees at prices significantly below market prices.

All totaled, Maui Land & Pineapple Company, Inc., has developed (independently or in partnership with the State) 450 affordable employee housing units on Maui. They have also donated land to the County for County-built affordable housing. Further, in 2002, they will provide an additional 45 affordable lots in West Maui for employees at prices below market.

Objective 3: *To preserve lands that are well suited for agricultural pursuits.*

Policy a: *Protect prime agricultural lands for competing nonagricultural land uses.*

Policy 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.*

Discussion: With the closure of Pioneer Mill in Lahaina there are currently vast amounts fallow agricultural land in the West Maui region. In addition, statewide an enormous amount of land has been released from plantation agriculture (over 305,900 acres since 1968). Despite repeated attempts to diversify agricultural crops in Hawai'i, the release of land from plantation agriculture has far outpaced the demand for land for diversified crops (an increase of about 38,500 acres over the same period). In short, the limiting factor to the growth of diversified agriculture in Hawai'i is not the land supply, but rather the size of the market for those crops that can be grown profitably in Hawai'i (Decision Analysts Hawaii, Inc., 2001).

Maui Pineapple Company, Ltd., (a subsidiary of Maui Land & Pineapple Company, Inc.) currently cultivates pineapple on approximately 169 acres of the Kapalua Mauka community site, however about 500 to 585 acres of the 925-acre site are well-suited for growing low-elevation crops.

Development of the Kapalua Mauka community will require that the land currently in pineapple cultivation (approximately 169 acres) be withdrawn from agricultural use. This amounts to 1.9 percent of the 9,100 acres currently being farmed by Maui Pineapple Company, Ltd. Maui Pineapple Company, Ltd., is currently downsizing its operations and much of the downsizing will occur in West Maui because of the comparatively long trucking distance to the cannery and packing plant in Kahului. With or without the withdrawal of 169 acres for the Kapalua Mauka community, Maui Pineapple Company, Ltd., will retain sufficient land to meet its lowered production targets.

An agricultural impact analysis prepared for this environmental impact statement (see section 4.4 and Appendix B) concludes that the Kapalua Mauka Community will not have an adverse impact on Maui Pineapple Company, Ltd. In fact, the Kapalua Mauka community could benefit Maui Pineapple Company, Ltd., and contribute toward its long-term survival because the community will strengthen the profitability of the parent company (Maui Land & Pineapple Company, Inc.), and a portion of these profits could be used, if necessary, to help carry Maui Pineapple during lean years.

Environmental

Objective 1: *To preserve and protect the County's unique and fragile environmental resources.*

Policy a: *Preserve for present and future generations, the opportunity to experience the natural beauty of the islands.*

Policy b: *Preserve scenic vistas and natural features.*

Policy c: *Support programs to reduce air, land and water pollution.*

Policy d: *Support programs to protect rare and endangered species and programs which will enhance their habitat.*

Discussion: The Kapalua Mauka community will preserve and protect the County's environmental resources in several ways. The rural character and low-density design of the community will preserve the open space nature of the site. Residential uses and other development within the Kapalua Mauka community will maintain the same high standards established throughout the Kapalua Resort. Although the topography is gently rolling in some areas, the portions of the community planned for residential uses are located on relatively flat areas currently cultivated in pineapple. To the extent possible, improvements will conform to the contours of the land, limiting the need for extensive grading. New landscaping will increase the botanical diversity of the area and maintain the dominate view of green vegetated areas. When practical, exiting trees will be preserved and integrated in the community landscaping. Appropriate engineering measures will be undertaken to preserve existing drainage ways and retain site runoff at existing levels.

Kapalua's trendsetting conservation programs, based on the Hawaiian ahupua'a model of caring for resources from the mountains to the sea, include partnership arrangements with the State of Hawai'i, The Nature Conservancy of Hawai'i, and Audubon International; the development of a code of environmental code of ethics; marketing enrichment travel packages with partial funds going to benefit The Nature Conservancy; and resort-wide dedication of all properties to the ideal of preserving the unique Hawaiian environment and cultural heritage of which Kapalua is a part.

In addition, all three of the Resort's golf courses are Certified Audubon Cooperative Sanctuaries. To receive this designation the courses must meet stringent environmental standards set fourth by Audubon International for environmental planning, water conservation, habitat enhancement, public involvement, integrated pest management, and water quality management. The proposed expansion of the Village Golf Course on the community site is expected to meet the same high standards and landscape improvements throughout the community will create a more diverse set of living spaces that may benefit certain bird and plant species.

~~Further, in 1996 Kapalua became the first resort in the world to be certified by Audubon International under the Audubon Heritage program. In this process, every aspect of the resort was evaluated, from waste management to educational programs, cultural and natural preservation, wildlife protection and land conservation. The Kapalua Mauka community, as part of the Kapalua Resort, is expected to meet the same high standards.~~

<u>Objective 2</u>: *To use the County's land-based physical and ocean-related coastal resources in a manner consistent with sound environmental planning practice.*

<u>Policy a</u>: *Preserve, enhance and establish traditional and new environmentally sensitive access opportunities for mountain and ocean resources.*

<u>Policy b</u>: *Evaluate all land-based development relative to its impact on the County's land and ocean ecological resources.*

Discussion: The community is not expected to have a significant adverse effect on either the existing watershed, downstream properties, or coastal marine waters; it will be designed to complement the site's natural attributes and mitigate environmental conflicts. Natural drainage ways will be preserved. Post-development runoff is expected to increase slightly, however, detention and desilting basins within the community site will maintain the exiting flows and there will be no increase in runoff flowing from the site (for more information on drainage of the site see Section 5.9.2).

~~Because the community will not be gated (as some other resort residential communities in Hawai'i are) it will provide increased access to mauka trails relative to the existing limited access pineapple fields currently at the site.~~ Relative to the existing agricultural use of the land, in which the entire area is gated, the establishment of the Kapalua Mauka community will provide increased access to the immediate lands of the site and will provide for easier access to trails in gulches and the upper mauka regions of West Maui. Consistent with the existing Kapalua Resort, the overall Kapalua Mauka Community is not planned to be gated. Public access will be allowed on the community streets, however, some of the individual neighborhoods may be gated. It has not been determined where these individual neighborhoods would be located within the site or at what phase they would be built. For more information on trails and access see Section 5.3.

<u>Cultural Resources</u>

<u>Objective 1</u>: *To preserve for present and future generations the opportunity to know and experience the arts, culture and history of Maui County.*

<u>Policy b</u>: *Encourage the recordation and preservation of all cultural and historic resources, to include culturally significant natural resources.*

<u>Policy c</u>: *Encourage programs to restore, maintain and interpret significant cultural districts, sites and artifacts in both natural and museum settings.*

Discussion: Archaeological surveys of the Kapalua Mauka community site were completed in 1998 and 2001. The 1998 survey recommends preservation of three historic properties. The 2001 archaeological survey recommends preservation of 37 historic properties. Section 5.1 contains summaries of these surveys; the full surveys are included in Appendix F-1 and Appendix F-2.

All significant historical and cultural sites recommended for preservation in the surveys will be preserved. In addition, Maui Land & Pineapple Company, Inc., and all of its subcontractors will comply will all state and county laws and rules regarding the preservation of cultural and historic sites should any be found during construction.

In addition to the archaeological surveys, the cultural resources of the region were investigated and recorded by researching the area's historical background and conducting interviews of individuals recognized as knowledgeable with the area. This research, conducted by Xamanek Researches (see section 5.2 and Appendix G), did not identify any cultural practices that may be affected by the Kapalua Mauka community. Presently the only known culturally significant sites are the archaeological features that have been identified by the archaeological surveys for the area.

Economic Activity

General Objective 1: *To provide an economic climate which will encourage controlled expansion and diversification of the County's economic base.*

Policy a: *Maintain a diversified economic environment compatible with acceptable and consistent employment.*

Discussion: The Kapalua Mauka community will enhance the economic environment and stimulate economic diversification relative to the present agricultural use of the property. Some of the economic benefits of the community include:

- During the 20-year build out and sales period the Kapalua Mauka community is projected to generate approximately $72.9 million in taxes for the County of Maui; and approximately $101.9 million for the State of Hawai'i;
- After build out annual taxes generated from the community are projected to be approximately $5.6 million for the County and approximately $5.2 million for the State;
- Total wages generated over build out are estimated to be $291.6 million;
- An estimated 4,990 "worker years" of direct on-site employment and an additional 2,495 "worker years" of off-site employment during build out (A "worker year" is the amount of time one full-time worker can work in one year);
- An estimated 226 permanent jobs and $6.2 million in annual wages from community operations and maintenance; and

- More that $49.6 million per year in discretionary expenditures infused into the island economy from community residents and guests.

Visitor Industry Objective 1: *To encourage exceptional and continuing quality in the development of visitor industry facilities.*

Visitor Industry Objective 2: *To control the development of visitor facilities so that it does not infringe upon the traditional social, economic and environment values of our community*

Policy a: *Limit visitor industry development to those areas identified in the appropriate community plans, and to the development of projects within those areas which are in conformance with the goals and objectives of those plans.*

Policy b: *Require that new developments contribute their fair share to infrastructural costs.*

Policy f: *Encourage the use of local manpower in the construction of visitor facilities, and the use of local manpower at facilities at all employment levels including management in the operation of those facilities.*

Policy g: *Locate buildings so as to retain scenic vistas.*

Policy h: *Relate visitor industry development to housing opportunities for employees.*

Discussion: Kapalua Mauka community is consistent with the intent of the *West Maui Community Plan* which envisions recreational and residential uses within Project District 2. While the proposed Kapalua Mauka community will extend beyond the current Project District 2 area of 450 acres, the number of residential units will not exceed 690—sixty units less than specified in the *West Maui Community Plan*. To conform the additional area of the Kapalua Mauka community with the *West Maui Community Plan*, landowner Maui Land & Pineapple Company, Inc., will seek a community plan amendment.

The Kapalua Mauka community will be designed to conform to, and even exceed, the high standards for residential and recreational facilities now existing in the Kapalua Resort area. Landowner Maui Land & Pineapple Company, Inc., will provide private systems for both water and wastewater and will contribute its fair share contribution for improvements to Honoapi'ilani Highway.

Besides construction-related jobs during build out, it is estimated that the community will create 226 permanent new jobs and $6.2 million in annual wages, providing employment opportunities at all levels including management, operations, and maintenance.

Because of the rural character and low-density of much of the community, looking mauka from Honoapi'ilani Highway, the open space character of the site will remain intact, but visually change from pineapple fields to low-density residential and golf course land uses. In places house sites will be visible, but because of the relatively large lot sizes, there will be substantial open space between houses. The dominate view from Honoapi'ilani Highway will still be of green vegetated areas.

While the Kapalua Mauka community will help to satisfy the demand for resort homes within the Kapalua Resort, landowner Maui Land & Pineapple Company, Inc., will comply with County of Maui requirements for affordable housing. As per the Maui County Housing Policy, "Prior to the filing of a building permit application for a residential housing project . . . or prior to granting of final subdivision approval, the applicant or developer shall execute an affordable housing agreement which shall set forth the detailed terms and conditions of compliance with the housing policy..." As such, information regarding how Maui Land & Pineapple Company, Inc., proposes to satisfy the County's affordable housing requirement will be included with the subdivision application for the Kapalua Mauka community.

Maui Land & Pineapple Company, Inc., has a strong history of providing affordable housing for their employees and has complied with all requirements for affordable employee housing previously imposed as conditions of developing the existing Kapalua Resort. Completed West Maui projects include Nāpilihau Planned Development (174 units, in partnership with the State) and Honokeana Subdivision Phase I (38 units). Maui Land & Pineapple Company, Inc., also donated 13.5 acres of land in West Maui for the County Hale Noho Subdivision (which contains 72 homes built by the County).

In conjunction with its Upcountry operations, Maui Land & Pineapple Company, Inc., has provided affordable employee housing in Hāli'imaile (176 units and 15 units) and in Makawao at the Pu'u Koa Subdivision (47 units).

In May of 2002, Maui Land & Pineapple Company, Inc., ~~will start~~ started development of Kapua Village Subdivision, a new 45-lot employee subdivision project in West Maui. Maui Land & Pineapple Company, Inc., is developing this subdivision on their own accord, as a benefit for their employees ~~. Depending on still pending County of Maui affordable housing requirements, this subdivision may satisfy, or partially satisfy, the affordable housing requirements for the Kapalua Mauka community~~ and is not receiving any County affordable housing credits for the project. These lots will be sold to employees at prices significantly below market prices.

All totaled, Maui Land & Pineapple Company, Inc., has developed (independently or in partnership with the State) 450 affordable employee housing units on Maui. They have also donated land to the County for County-built affordable housing. Further, in 2002, they will provide an additional 45 affordable lots in West Maui for employees at prices below market.

Housing and Urban Design

<u>Housing Objective 1</u>: *To provide a choice of attractive, sanitary and affordable homes of all our residents.*

<u>Policy b</u>: *Encourage the construction of housing in a variety of price ranges and geographic locations.*

<u>Policy f</u>: *Encourage large land owners in the context of new projects to provide land and/or housing for their employees.*

Discussion: Maui Land & Pineapple Company, Inc., has a strong history of providing affordable housing for their employees and will comply with County of Maui requirements for affordable housing in conjunction with the Kapalua Mauka community. As per the Maui County Housing Policy, "Prior to the filing of a building permit application for a residential housing project . . . or prior to granting of final subdivision approval, the applicant or developer shall execute an affordable housing agreement which shall set forth the detailed terms and conditions of compliance with the housing policy. . ." As such, information regarding how Maui Land & Pineapple Company, Inc., proposes to satisfy the County's affordable housing requirement will be included with the subdivision application for the Kapalua Mauka community.

All totaled, Maui Land & Pineapple Company, Inc., has developed (independently or in partnership with the State) 450 affordable employee housing units on Maui. They have also donated land to the County for County-built affordable housing. Further, in 2002, they will provide an additional 45 affordable lots in West Maui for employees at prices below market.

Maui Land & Pineapple Company, Inc., has complied with all requirements for affordable employee housing previously imposed as conditions of developing the existing Kapalua Resort. Completed West Maui projects include Nāpilihau Planned Development (174 units, in partnership with the State) and Honokeana Subdivision Phase I (38 units). Maui Land & Pineapple Company, Inc., also donated 13.5 acres of land in West Maui for the County Hale Noho Subdivision (which contains 72 homes built by the County).

In addition, in conjunction with its Upcountry operations, Maui Land & Pineapple Company, Inc., has provided affordable employee housing in Hāli'imaile (176 units and 15 units) and in Makawao at the Pu'u Koa Subdivision (47 units).

In May of 2002, Maui Land & Pineapple Company, Inc., ~~will start~~ started development of Kapua Village Subdivision, a new 45-lot employee subdivision project in West Maui. Maui Land & Pineapple Company, Inc., is developing this subdivision on their own accord, as a benefit for their employees . ~~Depending on still pending County of Maui affordable housing requirements, this subdivision may satisfy, or partially satisfy, the affordable housing requirements for the Kapalua Mauka community~~ and is not receiving any County affordable housing credits for the project. These lots will be sold to employees at prices significantly below market prices.

> Urban Design Objective 1: *To see that all developments are well designed and are in harmony with their surroundings.*
>
> > Policy a: *Require that appropriate principles of urban design be observed in the planning of all new developments.*

Discussion: The Kapalua Mauka community will be designed to conform to and even exceed the high standards for residential and recreational facilities now existing in the Kapalua Resort area. The community will be integrated into the surrounding area through a site plan sensitive to the neighboring land uses and the topography. In addition, the community will be master planned to ensure the appropriate use of materials, colors, site design standards, and landscaping. Community covenants and design standards will implemented and enforced to maintain appropriate community character over time.

> Objective 2: *To encourage developments which reflect the character and the culture of Maui County's people.*

Policy a: *Establish urban design guidelines and standards which will reflect the unique traditional architectural values of each community plan area.*

Policy b: *Encourage community design which establishes a cohesive community.*

Policy c: *Encourage the establishment of continuous green areas, bike-paths, active and passive recreation areas and mini-parks in new subdivision development.*

Discussion: The design of Kapalua Mauka community will be carried out with the high standards typical of the Kapalua Resort. Design guidelines and covenants will encourage cohesiveness and ensure that the traditional architectural values of the region are incorporated within the new community. The Kapalua Mauka community will improve the overall character and culture of the area through the creation of a neighborhood focused around active and passive recreational opportunities.

The community will also be designed to foster a pedestrian-oriented environment. Urban-like land uses such as multi-family units will be within the core of the community as will be other amenities such as the golf course clubhouse. Surrounding the urban areas will be larger rural lots and single-family homes, providing a transition to the nearby agricultural lands. The community will have extensive open space and landscape buffers along with bike and pedestrian pathways connecting to the rest of Kapalua Resort, makai of the Honoapi'ilani Highway.

Transportation

Objective 2: *To develop a program for anticipating and enlarging the local street and highway systems in a timely response to planned growth.*

Policy b: *Ensure that transportation facilities are anticipated and programmed for construction in order to support planned growth.*

Policy d: *Support Maui County's street tree plan and encourage landscape planting, irrigation and maintenance programs along all public highways and rights-of-ways.*

Discussion: A Traffic Impact Assessment Report (TIAR) prepared for the Kapalua Resort area (including the Kapalua Mauka Community) concludes "the proposed PD-2 Development and the build out of the Kapalua Resort can be accommodated by the Honoapi'ilani Highway corridor between Kapalua and Honokōwai." However, Maui Land & Pineapple Company, Inc., is committed to paying its pro rata fair share of the costs of regional improvements to Honoapi'ilani Highway.

Approximately 450 acres of the Kapalua Mauka property is designated as Project District 2 in the *West Maui Community Plan.* The proposed Kapalua Mauka community will extend beyond the current Project District 2 area of 450 acres, however, the number of residential units will not exceed 690—sixty units less than specified in the *West Maui Community Plan.* The resulting community will be far less dense than what is currently envisioned and the actual community growth and the required regional infrastructure needs will not exceed what has been established in the *West Maui Community Plan,* which has a community planning horizon of 20 years. To conform the additional area of the Kapalua Mauka community with the *West Maui Community Plan,* landowner Maui Land & Pineapple Company, Inc., will seek a community plan amendment.

The implications of the traffic impacts of 750 residential units were taken into consideration when Project District 2 was included within the *West Maui Community Plan* during the 1992 plan update. According to the Plan: "the update process incorporated technical studies and assessments." These included an "Infrastructure Assessment" that identified "infrastructure (e.g., roadways, drainage, water, telephone, and electrical systems) limits and opportunities in high-growth community plan regions." The Plan also states "the update process was driven by the work of the Lahaina Citizens Advisory Committee (CAC). This 14 member panel met a total of 17 times during a 225-day deliberation process to identify, formulate and recommend appropriate revisions to the Lahaina Community Plan." Thus, the traffic impacts of the development of Project District 2 have been considered and given a thorough public review during the community plan update process.

For more information on traffic impacts see Section 5.4 and the TIAR in Appendix I.

Water

Objective 1: *To provide an adequate supply of potable water and irrigation water to meet the needs of Maui County's residents.*

Policy b: *Meet or exceed Federal quality standards for the potable water supply.*

Policy d: *Monitor growth activities throughout Maui County in order that development of new water sources is concurrent with approval of new developments.*

Policy e: *Support the Board of Water Supply in its determination of future water needs consistent with the General Plan, Community Plans and the growth management strategy.*

Objective 2: *To make efficient use of our ground, surface and recycled water sources.*

Policy a: *Reclaim and encourage the productive use of wastewater discharges in areas where such use will not threaten the integrity of ground water sources.*

Policy e: *Maximize use of existing water sources by expanding storage capabilities.*

Policy g: *Promote water conservation practices to make the most efficient use of existing water resources.*

Policy h: *Support the establishment of potable groundwater use priorities which prohibit the use of potable water for the irrigation of golf courses, golf driving ranges parks and landscaped open space.*

Discussion: As discussed in Section 5.9.3, existing water systems for both potable and non-potable water in the Kapalua area are owned by ~~Kapalua Water Company, a subsidiary of~~ Maui Land & Pineapple Company, Inc., or its subsidiaries. These systems have adequate capacity to meet the needs of the Kapalua Mauka community. ~~Kapalua Water Company, Ltd.~~ Maui Land & Pineapple Company, Inc., or its subsidiaries will build, operate, and maintain new potable and non-potable water storage and distribution systems within the Kapalua Mauka community. Fire hydrants also will be installed at appropriate intervals along the internal roadways for accessibility of fire fighting apparatus.

Both potable and non-potable systems will be metered to discourage excessive use. In addition, low-flow fixtures and devices will be used throughout the community pursuant to Maui County Code Section 14.21.20. Additional water conservation techniques to be implemented are discussed in Section 5.9.3.

Liquid and Solid Waste

Objective 1: *To provide efficient, safe and environmentally sound systems for the disposal and reuse of liquid and solid waste.*

Policy a: *Explore new waste disposal methods that are safe, economical, environmentally sound, and aesthetically pleasing, and that minimize the disposal of wastes in landfills.*

Policy d: *Develop comprehensive and publicly acceptable methods of recycling solid and liquid waste.*

Policy e: *Encourage and promote public awareness to reduce, reuse, recycle and compost waste materials.*

Discussion: ~~Kapalua Land Company, Ltd.~~ Maui Land & Pineapple Company, Inc., or its subsidiaries will build, operate, and maintain a new sewer system within the Kapalua Mauka community. This system will connect to Kapalua Resort's existing privately owned and maintained sewer system. The existing system connects to the Lahaina Wastewater Reclamation Facility, north of Kā'anapali, which has a capacity of 9 million gallons per day. ~~Current flow into the Reclamation Facility from all of West Maui is 6.38 million gallons per day.~~ According to the County of Maui Division of Wastewater Management, in September 2001 the average daily flow through the Lahaina Wastewater Reclamation Facility was approximately 6.38 MGD; in March of 2002, the average daily flow through the facility was 5.10 MGD. When fully developed in 20 years, the Kapalua Mauka community is projected to generate approximately 176,000 gallons of wastewater per day. For more information on wastewater facilities see Section 5.9.4.

The Kapalua Resort is an active participant in recycling programs and intends to continue its participation with the addition of Kapalua Mauka community. To the extent practical, wastes such as aluminum, paper, newspaper, glass, and plastic containers will be recycled. Green waste may be processed on-site. Waste that cannot be recycled or incorporated into on-site green waste processing will be disposed of in the County's central landfill in Pu'unēnē. The community will be serviced by a private refuse collection agency contracted by the homeowner's association. Waste associated with commercial activities such as the golf clubhouse will also be recycled when practical.

Energy

Objective 1: *To make Maui County more self-sufficient in its need for non-renewable energy and more efficient in its use of energy.*

Discussion: Energy efficiency and conservation measures will be implementation into the Kapalua Mauka Community where feasible. These measures may include power factor corrections, the use of energy efficient pumps, and scheduling certain types of loads to run during off-peak hours whenever practical.

Further efforts to minimize energy consumption may include inclusion of items from the "Hawaiian Design Strategies for Energy Efficient Architecture" (Energy Division of the State Department of Business, Economic Development and Tourism) and "Guidelines for Sustainable Building Design in Hawai'i" (Office of Environmental Quality Control 1999) into the Project's design guidelines. Additional energy conservation strategies are discussed in Section 5.9.6.

Public Utilities and Facilities

> Objective 1: *To anticipate and provide public utilities which will meet community needs in a timely manner.*

Discussion: Electrical, telephone, and CATV distribution systems for the Kapalua Mauka community will be extended underground to each development module from the existing overhead transmission and distribution mains located on the mauka side of Honoapi'ilani Highway. The distribution system will be installed along the interior roads. Localized, non-glare, street and walkway lighting will also be included.

Current main electrical, telephone, and cable television (CATV) overhead transmission lines are located on the mauka side of Honoapi'ilani Highway fronting the Kapalua Mauka community site. Maui Electric Company also has a substation adjacent to the community site west of Honokeana Gulch.

> Objective 2: *To improve the quality and availability of public facilities throughout Maui County.*
>
> > Policy d: *Encourage the development of public facilities which will be architecturally and ecologically compatible with their surroundings and foster community development.*

Discussion: All utility lines within the Kapalua Mauka community will be placed underground, resulting in aesthetically pleasing vistas and landscapes that will be architecturally and ecologically compatible with the surrounding area.

Recreation and Open Space

> Objective 1: *To provide high-quality recreational facilities to meet the present and future needs of our residents of all ages and physical ability.*
>
> > Policy b: *Maintain recreational facilities for both active and passive pursuits.*
> >
> > Policy c: *Maintain the natural beauty of recreational areas.*

Discussion: Approximately 134 acres of the Kapalua Mauka community will remain in permanent open space that may be enjoyed by community residents and all Maui residents as passive parks. In addition, the golf course and related recreational amenities will provide open space, scenic vistas, and opportunities for both active and passive uses of the area. The community will also have extensive landscape buffers and will be designed to foster a pedestrian-oriented environment with bike and pedestrian pathways connecting to the rest of Kapalua Resort, makai of the Honoapi'ilani Highway.

As part of the proposed land exchange between the State of Hawai'i and Maui Land & Pineapple Company, Inc., (see section 2.1.3), Maui Land & Pineapple Company, Inc., is also proposing to obtain the State-owned parcel (TMK 4-3-01: 05) between Honoapi'ilani Highway and the Lower Honoapi'ilani Road and adjacent to the Kapalua Bay Golf Course that was proposed as a portion of the Nāpili regional park in the *West Maui Community Plan*. If Maui Land & Pineapple Company, Inc., obtains this site, they intend to maintain the area as open space and create a mauka-makai pedestrian and bicycle trail on the Kapalua side of the gulch. This open space pedestrian and bicycle trail would supplement the existing, adjacent Nāpili Park, essentially creating an extension of the existing park. In addition, Maui Land & Pineapple Company, Inc., would build and maintain the pedestrian and bicycle trail and maintain the open space without cost to the County of Maui.

6.2.2 West Maui Community Plan

The *West Maui Community Plan* is one of nine community plans for Maui County. It reflects current and anticipated conditions in the West Maui region and advances planning goals, objectives, policies, and implementation considerations as a decision-making guide in the region through the year 2010. The *West Maui Community Plan* provides specific recommendations addressing the goals, objectives, and policies contained in the General Plan, while still recognizing the values and unique attributes of the West Maui region. The goals, objectives, policies, and implementing actions of the *West Maui Community Plan* applicable to the Kapalua Mauka community are discussed below.

LAND USE

Goal

An attractive, well-planned community with a mixture of compatible land uses in appropriate areas to accommodate the future needs of residents and visitors in a manner that provides for the stable social and economic well-being of residents and the preservation and enhancement of the region's open space areas and natural environmental resources.

Objectives and Policies

2. *Preserve and enhance the mountain and coastal scenic vistas and open space areas of the region.*
3. *Ensure that appropriate lands are available to support the region's present and future agricultural activities.*

4. *Establish an appropriate supply of urban land within the region to meet the needs of the community over the next 20 years. The Community Plan and its map shall*

define the urban growth limits for the region and all zoning requests and/or proposed land uses and developments shall be consistent with the West Maui Community Plan and its land use Map.

5. *Preserve the current State Conservation District and the Current State Agricultural District boundaries in the planning region, in accordance with this Community Plan and its land use map. Lands north of Kapalua and south of Puamana to the region's district boundaries should ensure the preservation of traditional lifestyles, historic properties, agriculture, recreational activities and open space.*

10. *Provide and maintain parks and beach access for the present and future needs of residents and visitors. For the areas outside of Lahaina town, establish or expand pars and public shoreline areas to include but not limited to the following:*

    a. *The proposed Nāpili regional park between the Honoapi'ilani Highway and the Lower Honoapi'ilani Road and adjacent to the Kapalua Bay Golf Course comprising an area of approximately 50 acres.*

Discussion: The Kapalua Mauka community will contribute toward the stable economic and social base of the West Maui region. The new community will be a thoughtful expansion of the Kapalua Resort with all land uses, infrastructure, and amenities integrated to create a functional community that provides increased housing for visitors and residents. The low density of the community, combined with strict design requirements will preserve and enhance open space and mountain and coastal scenic vistas.

As proposed, the Kapalua Mauka community would be 925 acres. Approximately 450 acres of the Kapalua Mauka community site is already designated as Project District 2 in the *West Maui Community Plan.* (Figure 6) As stated in the Plan, the intent of Project District 2 is to provide, within the context of Kapalua Resort, a mix of recreational activities including an existing golf course (with possible expansion to 27 holes), a clubhouse, pro shop, restaurants and bars, tennis courts, swimming pool, and other related recreational amenities and commercial services. The Plan also specifies that the Project District 2 is to include 750 residential units integrated with, and complementary to, the recreational facilities.

The proposed Kapalua Mauka community will extend beyond the current Project District 2 area of 450 acres, however, the number of residential units will not exceed 690—sixty units less than specified in the *West Maui Community Plan.* The resulting community will be far less dense than what is currently envisioned and actual community growth and the required regional infrastructure needs will not exceed what has been established in the *West Maui Community Plan,* which has a community planning horizon of 20 years.

To maintain consistency with the *West Maui Community Plan*, before amending the Project District 2 boundary and seeking a change in zoning, landowner Maui Land & Pineapple Company, Inc. will seek a community plan amendment to expand Project District 2 from 450 acres to 925 acres.

Urban uses within the Kapalua Mauka community will be contained to roughly the area already designated as Project District 2, while the additional surrounding lands will be designated rural and left in agriculture. To accommodate the urban and rural uses, after the community plan amendment is approved, landowner, Maui Land & Pineapple Company, Inc., will seek a State Land Use District Boundary Amendment from the State Land Use Commission. ~~To include the total area of the proposed Kapalua Mauka community as part of Project District 2, Maui Land & Pineapple Company, Inc., will seek a community plan amendment to expand Project District 2 from 450 acres to 925 acres.~~ A change in zoning will then be sought from the County of Maui.

Creation of the Kapalua Mauka community will require a portion of the site to be to be removed from agriculture. However, with the closure of Pioneer Mill in Lahaina there are now vast amounts fallow agricultural land in the West Maui region. Maui Pineapple Company, Ltd., (a subsidiary of Maui Land & Pineapple Company, Inc.) currently cultivates pineapple on approximately 169 acres of the 925-acre Kapalua Mauka community site, but about 500 to 585 acres of the site are considered well-suited for growing low-elevation crops.

Development of the Kapalua Mauka community will require that the land currently in pineapple cultivation (approximately 169 acres) be withdrawn from agricultural use. This amounts to 1.9 percent of the 9,100 acres currently being farmed by Maui Pineapple Company, Ltd. An agricultural impact analysis prepared for this environmental impact statement (see section 4.4 and Appendix B) concludes that the Kapalua Mauka Community will not have an adverse impact on Maui Pineapple Company, Ltd. In fact, the Kapalua Mauka community could benefit Maui Pineapple Company, Ltd., and contribute toward its long-term survival because the community will strengthen the profitability of the parent company (Maui Land & Pineapple Company, Inc.), and a portion of these profits could be used, if necessary, to help carry Maui Pineapple during lean years. So removing a small amount of Maui Land & Pineapple Company, Inc.'s land from agriculture for the Kapalua Mauka community will actually help Maui Pineapple Company, Ltd., to continue agricultural production in other areas of West Maui and Maui.

As part of the proposed land exchange between the State of Hawai'i and Maui Land & Pineapple Company, Inc., (see section 2.1.3), Maui Land & Pineapple Company, Inc., is also proposing to obtain the State-owned parcel (TMK 4-3-01: 05) between Honoapi'ilani Highway and the Lower Honoapi'ilani Road and adjacent to the Kapalua Bay Golf Course that was proposed as a portion of the Nāpili regional park in the *West Maui Community Plan*. If Maui Land & Pineapple Company, Inc., obtains this site, they intend to maintain the area as open space and create a mauka-makai pedestrian and bicycle trail on the Kapalua side of the gulch. This open space pedestrian and bicycle trail would supplement the existing, adjacent Nāpili Park, essentially creating an extension of the existing park. In addition, Maui Land & Pineapple Company, Inc., would build and maintain the pedestrian and bicycle trail and maintain the open space without cost to the County of Maui.

ENVIRONMENT

Goal

A clean and attractive physical, natural and marine environment in which man-made developments on or alterations to the natural and marine environment are based on sound environmental and ecological practices, and important scenic and open space resources are preserved and protected for public use and enjoyment.

Objectives and Policies

2. *Preserve agricultural lands and open space with particular emphasis on natural coastal areas along major highways.*

3. *Protect the quality of nearshore and offshore waters. Monitor outfall systems, streams and drainage ways and maintain water quality standards. Continue to investigate, and implement appropriate measures to mitigate, excessive growth and proliferation of algae in nearshore and offshore waters.*

4. *Emphasize land management techniques such as natural landscaping, regular maintenance of streams and drainage ways and siltation basins, avoidance of development in flood-prone areas, and other measures that maintain stream water quality. Whenever feasible, such management techniques should be used instead of structural solutions, such as building artificial stream channels or diversion of existing natural streams.*

5. *Encourage soil prevention measures and the installation of siltation basins to minimize downstream sedimentation and degradation of nearshore and offshore water quality.*

6. *Integrate stream channels, gulches and other areas deemed unsuitable for development into the region's open space system for the purposes of safety, open space relief, greenways for public use and visual separation. Existing development of these stream channels, gulches and other areas shall be maintained and shall not be expanded. Drainage channels and siltation basins should not be considered for building sites, but used, rather, for public open space.*

   The following major streams and gulches, as named on the United States Geologic Survey topographic maps (Lahaina and Honolua, Hawai'i, 7.5 minute series, 1:24,000 scale), are to be kept as open space:

   h. *Nāpili Stream (2-3)*
   i. *Nāpili Stream (3-4)*
   j. *Honokahua Stream*
   k. *Mokupe'a Gulch*

8. *Promote public/private initiative in the maintenance, and, where appropriate, landscaping of drainageways.*

9. *Promote recycling programs to reduce solid waste disposal in landfills*

10. *Encourage park, golf course, landscape and agricultural uses of treated effluent. Plan for wastewater reuse in the design of new parks, golf course, and open spaces.*

13. *Promote the planting of trees and other landscape planting to enhance streetscapes and the built environment.*

15. *Promote drainage and stormwater management practices that prevent flooding and protect coastal water quality.*

Discussion: The Kapalua Mauka community will be master-planned to minimize environmental disturbance and provide a quality environmental setting. The rural character and low-density design of the community will preserve the open space nature of the site. Residential and other uses within the community will maintain the same high standards established throughout the Kapalua Resort.

The portions of the community planned for residential uses are located on relatively flat areas currently cultivated in pineapple; there will be no development in gulches or stream channels. Scenic vistas and natural features will be preserved. To the extent possible, improvements will conform to the contours of the land limiting the need for extensive grading. New landscaping will increase the botanical diversity of the area and maintain the dominate view of green vegetated areas. When practical, exiting trees will be preserved and integrated in the community landscaping.

The community is not expected to have a significant adverse effect on either the existing watershed, downstream properties, or coastal marine waters; it will be designed to complement the site's natural attributes and mitigate environmental conflicts. Nāpili Stream (2-3), Nāpili Stream (4-5), Honokahua Stream, Mokupe'a Gulch, and other natural drainage ways will be preserved and kept as privately maintained open space. Post-development runoff is expected to increase slightly, however, detention and desilting basins within the community site will maintain the exiting flows and there will be no increase in runoff flowing from the site (for more information on drainage of the site see section 5.9.2).

Kapalua's trendsetting conservation programs, based on the Hawaiian ahupua'a model of caring for resources from the mountains to the sea, include partnership arrangements with the State of Hawai'i, The Nature Conservancy of Hawai'i, and Audubon International; the development of a code of environmental code of ethics; marketing enrichment travel packages with partial funds going to benefit The Nature Conservancy; and resort-wide dedication of all properties to the ideal of preserving the unique Hawaiian environment and cultural heritage of which Kapalua is a part.

In addition, all three of the Resort's golf courses are Certified Audubon Cooperative Sanctuaries. To receive this designation the courses must meet stringent environmental standards set fourth by Audubon International for environmental planning, water conservation, habitat enhancement, public involvement, integrated pest management, and water quality management. The proposed expansion of The Village Golf Course on the community site is expected to meet the same high standards. In addition, landscape improvements throughout the community will create a more diverse set of living spaces that may benefit certain bird and plant species.

~~Further, in 1996, Kapalua became the first resort in the world to be certified by Audubon International under the Audubon Heritage program. In this process, every aspect of the resort was evaluated, from waste management to educational programs, cultural and natural preservation, wildlife protection and land conservation. The Kapalua Mauka community, as part of the Kapalua Resort, is expected to meet the same high standards.~~

Finally, Kapalua Resort is an active participant in recycling programs and intends to continue its participation with the addition of Kapalua Mauka community. To the extent practical, wastes such as aluminum, paper, newspaper, glass, and plastic containers will be recycled. Green waste may be processed on-site. Waste that cannot be recycled or incorporated into on-site green waste processing will be disposed of in the County's central landfill in Pu'unēnē. The community will be serviced by a private refuse collection agency contracted by the homeowner's association.

ECONOMIC ACTIVITY

Goal

A diversified economy that provides a range of stable employment opportunities for residents, allows for desired commercial services for the community, and supports the existing visitor and agricultural industries, all in a manner that will enhance both the community's quality of life and the environment.

Objectives and Policies

1. *Promote a diversified economic base which offers long term employment to West Maui residents, and maintains overall stability in economic activity in the areas of:*

    a. *Visitor accommodations.*
    b. *Visitor-related service/commercial services.*
    c. *Recreation-related service/commercial services.*
    d. *Resident-related service/commercial services.*
    e. *Light industrial activities, including diversification into "clean" industries.*
    f. *Agriculture.*

2. *Provide for the preservation and enhancement of agriculture.*

    a. *Maintain the land acreage required to sustain present and future agricultural operations and open space.*
    b. *Prevent urbanization of agricultural lands to the greatest extent possible.*
    c. *Encourage maintenance and development of water sources for agricultural activities which do not conflict with domestic demand for potable water.*
    d. *Discourage use of agricultural lands for non-agricultural purposes.*

4. *Maintain a stable and viable visitor industry.*

    a. *Limit visitor facilities to the existing planned resorts of Kā'anapali and Kapalua as designated on the land use map and coordinate future growth with development of adequate infrastructure capacity.*

Discussion: The Kapalua Mauka community is the long-planned mauka extension of Kapalua Resort located on lands mauka of the Honoapi'ilani Highway surrounding The Village Golf Course. It is the logical extension of the Kapalua Resort. The community will complement the existing facilities in Kapalua by providing high quality residential ownership opportunities for existing and new Maui residents. It will also provide for a range of stable employment opportunities for residents and will support the existing visitor industry in a manner that will enhance the community's quality of life and the environment.

The Kapalua Mauka community will be designed to conform to, and even exceed, the high standards for residential and recreational facilities now existing in the Kapalua Resort area. Landowner Maui Land & Pineapple Company, Inc., will provide private systems for both water and wastewater and will contribute its fair share contribution for improvements to Honoapi'ilani Highway.

The Kapalua Mauka community will enhance the economic environment and stimulate economic diversification relative to the present agricultural use of the property. Some of the economic benefits of the community include:

- During the 20-year build out and sales period the Kapalua Mauka community is projected to generate approximately $72.9 million in taxes for the County of Maui; and approximately $101.9 million for the State of Hawai'i;
- After build out annual taxes generated from the community are projected to be approximately $5.6 million for the County and approximately $5.2 million for the State;
- Total wages generated over build out are estimated to be $291.6 million;
- An estimated 4,990 "worker years" of direct on-site employment and an additional 2,495 "worker years" of off-site employment during build out (A "worker year" is the amount of time one full-time worker can work in one year);
- An estimated 226 permanent jobs and $6.2 million in annual wages from community operations and maintenance; and
- More that $49.6 million per year in discretionary expenditures infused into the island economy from community residents and guests.

Creation of the Kapalua Mauka community will require a portion of the site to be to be removed from agriculture. However, with the closure of Pioneer Mill in Lahaina, there are now vast amounts fallow agricultural land in the West Maui region. In addition, statewide an enormous amount of land has been released from plantation agriculture (over 305,900 acres since 1968). Despite repeated attempts to diversify agricultural crops in Hawai'i, the release of land from plantation agriculture has far outpaced the demand for land for diversified crops (an increase of about 38,500 acres over the same period). In short, the limiting factor to the growth of diversified agriculture in Hawai'i is not the land supply, but rather the size of the market for those crops that can be grown profitably in Hawai'i (Decision Analysts Hawaii, Inc., 2001).

Maui Pineapple Company, Ltd., (a subsidiary of Maui Land & Pineapple Company, Inc.) currently cultivates pineapple on approximately 169 acres of the 925-acre Kapalua Mauka community site, but about 500 to 585 acres of the site are considered well-suited for growing low-elevation crops.

Development of the Kapalua Mauka community will require that the land currently in pineapple cultivation (approximately 169 acres) be withdrawn from agricultural use. This amounts to 1.9 percent of the 9,100 acres currently being farmed by Maui Pineapple Company, Ltd. Maui Pineapple Company, Ltd., is currently downsizing its operations and much of the downsizing will occur in West Maui because of the comparatively long trucking distance to the cannery and packing plant in Kahului. With or without the withdrawal of 169 acres for the Kapalua Mauka community, Maui Pineapple Company, Ltd., will retain sufficient land to meet its lowered production targets.

An agricultural impact analysis prepared for this environmental impact statement (see section 4.4 and Appendix B) concludes that the Kapalua Mauka Community will not have an adverse impact on Maui Pineapple Company, Ltd. In fact, the Kapalua Mauka community could benefit Maui Pineapple Company, Ltd., and contribute toward its long-term survival because the community will strengthen the profitability of the parent company (Maui Land & Pineapple Company, Inc.), and a portion of these profits could be used, if necessary, to help carry Maui Pineapple during lean years.

So while the *West Maui Community Plan* calls for the preservation and enhancement of agriculture and discouraging the use of agricultural lands for non agricultural purposes, removing a small amount of Maui Land & Pineapple Company, Inc.'s land from agriculture for the Kapalua Mauka community will actually help Maui Pineapple Company, Ltd., to continue agricultural production in other areas of West Maui and Maui.

CULTURAL RESOURCES

Goal

To preserve, protect and restore those cultural resources and sites that best represent and exemplify the Lahaina region's pre-contact, Hawaiian Monarchy, missionary and plantation history.

Objectives and Policies

1. *Preserve and protect significant archaeological, historical and cultural resources that are unique in the State of Hawai'i and Island of Maui.*

3. *Encourage and protect traditional shoreline and mountain access, cultural practices and rural/agricultural lifestyles. Ensure adequate access to our public shoreline areas for public recreation, including lateral continuity.*

4. *Establish programs to restore, maintain and interpret significant cultural districts, site and artifacts in both natural and museum settings.*

5. *Promote district cultural resources as identifying characteristic of the region*

6. *Ensure that new projects or developments address potential impacts on archaeological, historical, and cultural resources and identify all cultural resources located within the project area as part of initial studies. Further require that all proposed activity adequately mitigate potential adverse impacts on cultural resources.*

8. *Support public and private efforts to inventory, evaluate and register historic and archaeological sites to expand the public's knowledge of the region's cultural resources.*

10. *Ensure that site identification and interpretation is not damaging to any historical or archaeological sites.*

Implementing Actions

3. *Identify specific historical or archaeological sites for protection and interpretation.*

Discussion: Archaeological surveys of the Kapalua Mauka community site were completed in 1998 and 2001. The 1998 survey recommends preservation of three historic sites. The 2001 archaeological survey recommends preservation of 37 historic sites. Section 5.1 contains summaries of these surveys; the full surveys are included in Appendix F-1 and Appendix F-2.

All historical and cultural sites recommended for preservation in the surveys will be preserved. In addition, Maui Land & Pineapple Company, Inc., and all of its subcontractors will comply will all state and county laws and rules regarding the preservation of cultural and historic sites should any be found during construction.

In addition to the archaeological surveys, the cultural resources of the region were investigated and recorded by researching the area's historical background and conducting interviews of individuals recognized as knowledgeable with the area. This research, conducted by Xamanek Researches (see section 5.2 and Appendix G), did not identify any cultural practices that may be affected by the Kapalua Mauka community. Presently the only known culturally significant sites are the archaeological features that have been identified by the archaeological surveys for the area.

HOUSING

Goal

A sufficient supply and choice of attractive, sanitary and affordable housing accommodations for a broad cross section of residents.

Objectives and Policies

1. *Accommodate the 20-year housing needs of the planning region.*

3. *Coordinate the planning, design and construction of public infrastructure improvements with major residential projects that have an affordable housing component.*

6 *Promote efficient housing designs in order to reduce residential home energy consumption.*

Discussion: The Kapalua Mauka community will increase housing opportunities in the West Maui region by satisfying the demand for resort homes within the Kapalua Resort. In addition, Maui Land & Pineapple Company, Inc., will comply with County of Maui requirements for affordable housing. As per the Maui County Housing Policy, "Prior to the filing of a building permit application for a residential housing project . . . , or prior to granting of final subdivision approval, the applicant or developer shall execute an affordable housing agreement which shall set forth the detailed terms and conditions of compliance with the housing policy...". As such, information regarding how Maui Land & Pineapple Company, Inc., proposes to satisfy the County's affordable housing requirement will be included with the subdivision application for the Kapalua Mauka community.

~~In fact,~~ Maui Land & Pineapple Company, Inc., has a strong history of providing affordable housing for their employees. All totaled, Maui Land & Pineapple Company, Inc., has developed (independently or in partnership with the State) 450 affordable employee housing units on Maui. They have also donated land to the County for County-built affordable housing. Further, in 2002, they will provide an additional 45 affordable lots in West Maui for employees at prices below market.

Maui Land & Pineapple Company, Inc., has complied with all requirements for affordable employee housing previously imposed as conditions of developing the existing Kapalua Resort. Completed West Maui projects include Nāpilihau Planned Development (174 units, in partnership with the State) and Honokeana Subdivision Phase I (38 units). Maui Land & Pineapple Company, Inc., also donated 13.5 acres of land in West Maui for the County Hale Noho Subdivision (which contains 72 homes built by the County).

In addition, in conjunction with its Upcountry operations, Maui Land & Pineapple Company, Inc., has provided affordable employee housing in Hāli'imaile (176 units and 15 units) and in Makawao at the Pu'u Koa Subdivision (47 units).

In May of 2002, Maui Land & Pineapple Company, Inc., ~~will start~~ started development of Kapua Village Subdivision, a new 45-lot employee subdivision project in West Maui. Maui Land & Pineapple Company, Inc., is developing this subdivision on their own accord, as a benefit for their employees . ~~Depending on still pending County of Maui affordable housing requirements, this subdivision may satisfy, or partially satisfy, the affordable housing requirements for the Kapalua Mauka community~~ and is not receiving any County affordable housing credits for the project. These lots will be sold to employees at prices significantly below market prices.

Design guidelines and covenants within the Kapalua Mauka community will encourage efficient housing designs to reduce energy consumption. Energy efficient and conservation measures to reduce electrical demand will be considered for implementation into the Kapalua Mauka Community. These measures may include power factor corrections, the use of energy efficient pumps, and scheduling certain types of loads to run during off-peak hours whenever practical.

Further efforts to minimize energy consumption may include inclusion of items from the "Hawaiian Design Strategies for Energy Efficient Architecture" (Energy Division of the State Department of Business, Economic Development and Tourism) and "Guidelines for Sustainable Building Design in Hawai'i (Office of Environmental Quality Control 1999) into the Project's design guidelines.

Both potable and non-potable systems will be metered to discourage excessive use. Water efficient devices will be used for irrigation and encouraged for residences.

URBAN DESIGN

Goal

An attractive and functionally integrated urban environment that enhances neighborhood character, promotes quality design at the resort destinations of Kā'anapali and Kapalua, defines a unified landscape planting and beautification theme along major public roads and highways, watercourses, and at major public facilities, and recognizes the historic importance and traditions of the region.

Objectives and Policies for the West Maui Region in General

1. *Enhance the appearance of major public roads and highways in the region.*
2. *Maintain a high level of design quality for West Maui resort destination areas.*
3. *Improve pedestrian and bicycle access within the region.*
4. *Establish, expand and maintain parks, public facilities and public shoreline areas outside of Lahaina town.*
5. *Integrate stream channels and gulches into the region's open space system for the purposes of safety, open space relief, greenways for pubic use and visual separation. Drainage channels and siltation basins should not be used for building sites, but, rather for public open space. Drainage channel rights-of-way and easements may also be used for pedestrian walkways and bikeway facilities.*
8. *Maintain shrubs and trees at street intersections for adequate sight distance.*
9. *Save and incorporate healthy mature trees in the landscape planting plans of subdivisions, roads or any other construction or development.*
10. *Incorporate drought-tolerant plant species in future landscape planting.*
12. *Existing and future public rights-of-ways along roads and parks shall be planted with appropriate trees, turfgrass and ground covers.*
14. *Require all future subdivisions, construction projects and developments to comply with the Maui County Planting Plan.*
15. *Emphasize contrasting earth-tone color schemes for buildings and avoid bright or garish colors.*

Discussion: The Kapalua Mauka community will be designed to conform to and even exceed the high standards for residential and recreational facilities now existing in the Kapalua Resort area. The community will be integrated into the surrounding area through a site plan sensitive to the neighboring land uses and the topography. In addition, the community will be master planned to ensure the appropriate use of materials, colors, site design standards, and landscaping. Design guidelines and covenants will encourage cohesiveness and ensure that the traditional architectural values of the region are incorporated within the new community.

The community will be designed to complement the site's natural attributes, mitigate environmental conflicts, and enhance scenic amenities. Low density residential units will be integrated with the topography. Natural gulches and drainage ways will be incorporated into the overall landscape and open space of the community with approximately 134 acres remaining in permanent open space. The golf course will provide additional open space. Whenever practical, landscaping will include the use of native and indigenous plants and drought-tolerance species. Exiting trees will be preserved and integrated in the community landscaping. The community's border along Honoapi'ilani Highway will be enhanced with landscaped buffers and entrance features.

The community will also be designed to foster a pedestrian-oriented environment. Urban-like land uses such as multi-family units will be within the core of the community as will be other amenities such as the golf course clubhouse. Surrounding the urban areas will be larger rural lots and single-family homes, providing a transition to the nearby agricultural lands. The community will have extensive open space and landscape buffers along with bike and pedestrian pathways connecting to the rest of Kapalua Resort, makai of the Honoapi'ilani Highway.

In addition, as part of the proposed land exchange between the State of Hawai'i and Maui Land & Pineapple Company, Inc., (see section 2.1.3), Maui Land & Pineapple Company, Inc., is also proposing to obtain the State-owned parcel (TMK 4-3-01: 05) between Honoapi'ilani Highway and the Lower Honoapi'ilani Road and adjacent to the Kapalua Bay Golf Course that was proposed as a portion of the Nāpili regional park in the *West Maui Community Plan*. If Maui Land & Pineapple Company, Inc., obtains this site, they intend to maintain the area as open space and create a mauka-makai pedestrian and bicycle trail on the Kapalua side of the gulch. This open space pedestrian and bicycle trail would supplement the existing, adjacent Nāpili Park, essentially creating an extension of the existing park. In addition, Maui Land & Pineapple Company, Inc., would build and maintain the pedestrian and bicycle trail and maintain the open space without cost to the County of Maui.

INFRASTRUCTURE

Goal

Timely and environmentally sound planning, development, and maintenance of infrastructure systems which serve to protect and preserve the safety and health of the region's residents, commuters, and visitors through the provision of clean water, effective waste disposal and efficient transportation systems which meets the needs of the community.

Transportation

Objectives and Policies

5. *Promote residential communities that provide convenient pedestrian and bicycle access between residences and neighborhood commercial areas, parks and public facilities, in order to minimize use of the automobile.*

Discussion: The community will be designed to foster a pedestrian-oriented environment to minimize the use of automobiles within the community. Urban-like land uses such as multi-family units will be within the core of the community as will be other amenities such as the golf course clubhouse. Surrounding the urban areas will be larger rural lots and single-family homes, providing a transition to the nearby agricultural lands. The community will have extensive open space and landscape buffers along with bike and pedestrian pathways connecting to the rest of Kapalua Resort, makai of the Honoapi'ilani Highway.

Water and Utilities

Objectives and Policies

1. *Protect ground water resources in the region.*

5. *Study the feasibility of integrating all regional water systems into a public water system to be managed and operated by the County.*

7. *Coordinate expansion of and improvements to water system to coincide with the development of residential expansion areas.*

8. *Promote water conservation and education programs.*

9. *Encourage the installation of underground electrical, telephone and cable television lines.*

Discussion: As discussed in Section 5.9.3, existing water systems for both potable and non-potable water in the Kapalua area are owned by ~~Kapalua Water Company, a subsidiary of~~ Maui Land & Pineapple Company, Inc. These systems have adequate capacity to meet the needs of the Kapalua Mauka community.

~~Kapalua Water Company, Ltd.~~ Maui Land & Pineapple Company, Inc., or its subsidiaries will build, operate, and maintain new potable and non-potable water storage and distribution systems within the Kapalua Mauka community. In comments on the environmental impact statement preparation notice, the County of Maui Department of Water Supply mentioned the community plan objective to: *"Study the feasibility of integrating all regional water systems into a public water system to be managed and operated by the County."* In their comments, they stated:

> In order to achieve this, a plan for the eventual acquisition by the County of Maui of all private water systems within the region has to be developed. Integration of water systems may provide improved emergency back-up, reliability and system hydraulics. The Department of Water Supply seeks the cooperation of major land owners and private water system providers in the development of acceptable feasibility study framework of system integration.

Maui Land & Pineapple Company, Inc., will cooperate with the County of Maui Department of Water Supply in the development of an acceptable feasibility study framework for water system integration.

Both potable and non-potable systems will be metered to discourage excessive use. In addition, low-flow fixtures and devices will be used throughout the community pursuant to Maui County Code Section 14.21.20. Fire hydrants also will be installed at appropriate intervals along the internal roadways for accessibility of fire fighting apparatus.

All Electrical, telephone, and CATV lines within the Kapalua Mauka community will be underground.

<u>*Liquid and Solid Waste*</u>

Objectives and Policies

2. *Reduce the disposal of solid waste in landfills though expanded recycling programs and the provision of convenient drop-off facilities.*

Implementing Actions

2. *Design and construct improvements to expand the capacity of the Lahaina Wastewater Treatment Plant consistent with the West Maui Community Plan.*

Discussion: The Kapalua Resort is an active participant in recycling programs and intends to continue its participation with the addition of Kapalua Mauka community. To the extent practical, wastes such as aluminum, paper, newspaper, glass, and plastic containers will be recycled. Green waste may be processed on-site. Waste that cannot be recycled or incorporated into on-site green waste processing will be disposed of in the County's central landfill in Pu'unēnē. The community will be serviced by a private refuse collection agency contracted by the homeowner's association.

~~Kapalua Land Company, Ltd.~~ Maui Land & Pineapple Company, Inc., or its subsidiaries will build, operate, and maintain a new sewer system within the Kapalua Mauka community. This system will connect to Kapalua Resort's existing privately owned and maintained sewer system. The existing system connects to the Lahaina Wastewater Reclamation Facility, north of Kā'anapali, which has a capacity of 9 million gallons per day. ~~Current flow into the Reclamation Facility from all of West Maui is 6.38 million gallons per day.~~ According to the County of Maui Division of Wastewater Management, in September 2001 the average daily flow through the Lahaina Wastewater Reclamation Facility was approximately 6.38 MGD; in March of 2002, the average daily flow through the facility was 5.10 MGD. When fully developed in 20 years, the Kapalua Mauka community is projected to generate approximately 176,000 gallons of wastewater per day. For more information on wastewater facilities see Section 5.9.4.

<u>Drainage</u>

Objectives and Policies

1. *Construct and maintain, as needed, desilting basins along major drainage channels*

2. *Insure that new developments will not result in adverse flooding conditions for downstream properties by requiring onsite retention facilities for stormwater run-off generated by the development.*

Discussion: As a master-planned community, Kapalua Mauka will integrate all aspects of land use, infrastructure, and amenities necessary to create a functional community. The community is not expected to have a significant adverse effect on either the existing watershed, downstream properties, or coastal marine waters; it will be designed to complement the site's natural attributes and mitigate environmental conflicts. Natural drainage ways will be preserved. Post-development runoff is expected to increase slightly, however, detention and desilting basins will maintain the exiting flows and there will be no increase in runoff flowing from the site (for more information on drainage of the site see Section 5.9.2). Design of the community will adhere to all state and county regulations regarding drainage and runoff so that there will be no adverse flooding conditions for downstream properties.

<u>Energy</u>

Objectives and Policies

1. Promote energy efficiency as the energy resource of first choice and seek to increase energy efficiency in all sectors in the community.

4. Promote energy conservation and education programs

5. Support energy efficient technologies in conjunction with new urban development and encourage efficient building design and site development practices

Discussion: Energy efficiency and conservation measures will be implementation into the Kapalua Mauka Community where feasible. These measures may include power factor corrections, the use of energy efficient pumps, and scheduling certain types of loads to run during off-peak hours whenever practical.

Further efforts to minimize energy consumption may include inclusion of items from the "Hawaiian Design Strategies for Energy Efficient Architecture" (Energy Division of the State Department of Business, Economic Development and Tourism) and "Guidelines for Sustainable Building Design in Hawai'i" (Office of Environmental Quality Control 1999) into the Project's design guidelines. Additional energy conservation strategies are discussed in Section 5.9.6.

SOCIAL INFRASTRUCTURE

Goal

Develop and maintain an efficient and responsive system of public services which promotes a safe, healthy, and enjoyable lifestyle, and offers opportunities for self improvement and community well being.

Recreation and Open Space

Objectives and Polices

1. *Provide adequate community-oriented park facilities including facilities for field and court games, children's play, and picnicking within, or adjacent to, existing and future residential areas at the following existing or planned park sites:*

   a. Waine'e area near the existing swimming pool and youth center.
   b. Major residential projects.
   c. Nāpili.

4. *Establish adequate public access to suitable mauka recreational areas for hiking, camping, nature study, and other back county leisure time activities, based on a mountain access study.*

Implementing Actions

7. *Plan, design and construct a regional park at Nāpili*

Discussion: Approximately 134 acres of the Kapalua Mauka community will remain in permanent open space that may be enjoyed by community residents and all Maui residents as passive parks. In addition, the golf course and related recreational amenities will provide open space, scenic vistas, and opportunities for both active and passive uses of the area. The community will also have extensive landscape buffers and will be designed to foster a pedestrian-oriented environment with bike and pedestrian pathways connecting to the rest of Kapalua Resort, makai of the Honoapi'ilani Highway.

The parcel specified in the *West Maui Community Plan* for the Nāpili regional park (TMK 4-3-01: 05) is owned by the State of Hawai'i and is primarily a natural drainage gulch with sloping topography unsuitable for a regional park, as typical regional park amenities such as soccer or baseball fields would require extensive grading or fill which may make development of the park unfeasible and pose potential drainage problems.

In the time since the *West Maui Community Plan* was adopted in 1996, the County of Maui has built the Nāpili Park on a four-acre parcel (TMK 4-3-18: 41) adjoining the State-owned parcel specified in the *West Maui Community Plan* for the Nāpili regional park (TMK 4-3-01:05). The existing park includes play fields, parking, and comfort stations. It is proposed to be expanded on an additional four acre parcel (TMK 4-3-18: 40). This expansion is proposed to include hard courts and additional open space and parking.

Maui Land & Pineapple Company, Inc., supports the development of the Nāpili Park at its existing location. In fact, Maui Land & Pineapple Company, Inc., was instrumental in the creation of this park, as it granted the eight acres for the Nāpili Park to the County of Maui in 1997 and agreed to relocate its employee housing planned for the site south to Kapua.

As part of the proposed land exchange between the State of Hawai'i and Maui Land & Pineapple Company, Inc., (see section 2.1.3), Maui Land & Pineapple Company, Inc., is also proposing to obtain the State-owned parcel (TMK 4-3-01: 05) between Honoapi'ilani Highway and the Lower Honoapi'ilani Road and adjacent to the Kapalua Bay Golf Course that was proposed as a portion of the Nāpili regional park in the *West Maui Community Plan*. If Maui Land & Pineapple Company, Inc., obtains this site, they intend to maintain the area as open space and create a mauka-makai pedestrian and bicycle trail on the Kapalua side of the gulch. This open space pedestrian and bicycle trail would supplement the existing Nāpili Park, essentially creating an extension of the existing park. In addition, Maui Land & Pineapple Company, Inc., would build and maintain the pedestrian and bicycle trail and maintain the open space without cost to the County of Maui.

Education

Objectives and Policies

1. *Ensure adequate school facilities and educational opportunities within the region*

6. *Provide for additional elementary schools at Nāpilihau and in conjunction with major residential developments.*

Implementing Actions

2. *Coordinate with the State Department of Education plans for future residential development, so that facilities are planned and constructed in a timely manner.*

Discussion: The description for Project District 2 in the *West Maui Community Plan* allocates six acres within Project District 2 for an elementary school. However, in their comment letter on the draft environmental impact statement the Department of Education states: "The Department of Education does not anticipate that a school site will be needed in the Kapalua region." ~~While the~~ As such, the ~~current~~ concept plan for the Kapalua Mauka community does not provide for a school site.~~, Maui Land & Pineapple Company, Inc., is willing to designate a school site at another location on its West Maui property if the State Department of Education determines that there is sufficient demand.~~ During development of the community Maui Land & Pineapple Company, Inc., will ~~also~~ be subject to the Department of Education's fair share requirements for new school facilities. In their letter, the Department of Education further states:

> ... our requirement would be cash-based. The current fair cash requirement is $1,011 per unit. This amount would be due as each unit closes and would thus not require an upfront payment by the developer. Funds collected from this project will be used for capital improvements program projects in the Lahainaluna High School complex, which includes Lahainaluna High, Lahaina Intermediate, Princess Nahienaena Elementary, and King Kamehameha III Elementary Schools.

It should be noted that the State Department of Education's "Lahainaluna Complex Development Plan 1997-2017" (Department of Education, 1998), which projects school capital improvements projects over a 20-year planning time frame, does not specify a new elementary school on the Kapalua Mauka community site or in the Kapalua area.

It should also be noted that the Kapalua Mauka community is not expected to have a significant amount of school aged children. The full-time resident population at Kapalua Mauka is estimated to reach 341 persons after build-out in 20 years (The Hallstrom Group 2001). This population is estimated to include approximately 17 school-age children (The Hallstrom Group 2001). The low amount of school-age children is based upon two factors. First, because of the resort-residential nature of the community, only 20 percent of the homes are expected to be used by full-time residents. This estimate is supported by various mid to upscale resort projects throughout the state, including the existing Kapalua Resort, Kāʻanapali, Wailea, Mauna Lani, and Hualālai. Second, the average household size of the full-time residents is projected to be 3.1 persons for single-family homes, and 2.2 persons for multi-family units, with most residents being adults.

In addition, the potential impact of the Kapalua Mauka community on public schools will be lessened because the community is targeted toward upper income buyers, and statewide statistics indicate virtually all school-age children from upper income bracket households attend private schools.

Planning Standards

The *West Maui Community Plan* also contains planning standards that provide specific guidelines or measures for development and design. The following apply to the Kapalua Mauka community:

1 *LAND USE STANDARDS*

a. *All zoning and land use approvals shall be consistent with the West Maui Community Plan and its land use policies.*

b. *Limit multi-family and single-family residential, business commercial, and industrial uses to areas designated for such purposes on the Community Plan Land Use Map*

2. *PROJECT DISTRICT STANDARDS*

PROJECT DISTRICT 2 (Kapalua Mauka) approximately 450 acres

This project district is generally defined by the Honokahua Stream to the east, State of Hawaiʻi lands to the west and various topographical features as identified on the West Maui Community Land Use Map. This project district is intended to provide, within the context of the Kapalua resort, a mix of recreational activities including an existing golf course (with possible expansion to 27 holes), a clubhouse, pro shop, restaurants and bars, tennis courts, swimming pool and other related recreational amenities and commercial services. The project district also includes 750 residential units (with an overall average density of 5 units/acre) in a mixture of single-family and multi-family uses integrated with and complementary to the recreational facilities mentioned above. Spatial allocations are as follows:

Golf Course, Open Space and Roadways ....261 acres
Commercial ....5 acres
Residential ....144 acres
Parks, open space, and buffer zones ....34 acres
Elementary School ....6 acres

Discussion: Originally envisioned in the *West Maui Community Plan* as a 450-acre, 750 residential unit community, the proposed expanded Project District 2 (Kapalua Mauka) decreases the number of housing units to 690 while expanding the area of Project District 2 to approximately 925 acres. The resulting community will be far less dense than what is currently envisioned in the *West Maui Community Plan* which has a community planning horizon of 20 years. Therefore actual growth and the required infrastructure demands will not exceed what has been established. ~~To include the total area of the proposed Kapalua Mauka community as part of Project District 2 with the *West Maui Community Plan*, landowner Maui Land & Pineapple Company, Inc., will seek a community plan amendment to expand Project District 2 from 450 acres to 925 acres.~~ To maintain consistency with the *West Maui Community Plan*, before amending the Project District 2 boundary and seeking a change in zoning, landowner Maui Land & Pineapple Company, Inc., will seek a community plan amendment to expand Project District 2 from 450 acres to 925 acres.

Urban uses within the Kapalua Mauka community will be contained to roughly the area already designated as Project District 2, while the additional surrounding lands will be designated rural and left in agriculture. To accommodate the urban and rural uses, after the community plan amendment is approved, landowner, Maui Land & Pineapple Company, Inc., will seek a State Land Use District Boundary Amendment from the State Land Use Commission. A change in zoning will then be sought from the County of Maui to maintain consistency with the community plan.

The implications of the impacts of 750 residential units were taken into consideration when Project District 2 was included within the *West Maui Community Plan* during the 1992 plan update. According to the Plan: "the update process incorporated technical studies and assessments." These included: 1) a Socio-Economic Forecast; 2) a Land Use Forecast; 3) an Infrastructure Assessment; and 4) a Public Facilities and Service Assessment. These studies were used to understand potential future conditions, needs, and impacts. The Plan also states "the update process was driven by the work of the Lahaina Citizens Advisory Committee (CAC). This 14 member panel met a total of 17 times during a 225-day deliberation process to identify, formulate and recommend appropriate revisions to the Lahaina Community Plan." Thus, the implications of the development of Project District 2 have been comprehensively considered and given a thorough public review during the community plan update process.

Infrastructure needs for the community have also been anticipated by landowner Maui Land & Pineapple Company, Inc. As discussed in Section 5.9.3, water systems for both potable and non-potable water are owned by ~~Kapalua Water Company, a subsidiary of~~ Maui Land & Pineapple Company, Inc., or its subsidiaries. These systems have adequate capacity for the Kapalua Mauka community. In addition, a private wastewater system will be developed and connected to the County's Lahaina Wastewater Treatment Facility. The Lahaina Wastewater Treatment Facility has adequate capacity to handle the expected amount of wastewater from the community (see Section 5.9.4). Maui Land & Pineapple Company, Inc., is also committed to paying its pro rata share of the costs of regional improvements to Honoapi'ilani Highway.

The description for Project District 2 in the *West Maui Community Plan* allocates six acres within Project District 2 for an elementary school. However, in their comment letter on the draft environmental impact statement the Department of Education states: "The Department of Education does not anticipate that a school site will be needed in the Kapalua region." ~~While the~~ As such, the ~~current~~ concept plan for the Kapalua Mauka community does not provide for a school site.~~, Maui Land & Pineapple Company, Inc., is willing to designate a school site at another location on its West Maui property if the State Department of Education determines that there is sufficient demand.~~ During development of the community Maui Land & Pineapple Company, Inc., will ~~also~~ be subject to the Department of Education's fair share requirements for new school facilities. In their letter, the Department of Education further states:

> ... our requirement would be cash-based. The current fair cash requirement is $1,011 per unit. This amount would be due as each unit closes and would thus not require an upfront payment by the developer. Funds collected from this project will be used for capital improvements program projects in the Lahainaluna High School complex which includes Lahainaluna High, Lahaina Intermediate, Princess Nahienaena Elementary, and King Kamehameha III Elementary Schools.

It should be noted that the State Department of Education's "Lahainaluna Complex Development Plan 1997-2017" (Department of Education, 1998), which projects school capital improvements projects over a 20-year planning time frame, does not specify a new elementary school on the Kapalua Mauka community site or in the Kapalua area.

The Kapalua Mauka community will provide a reasonable and beneficial use of the land in keeping with the existing Kapalua Resort community. Consistent with Kapalua Resort's environmental sensitivity and quality standards for development, the proposed community will be sensitive to the areas's natural topographic features, scenic amenities, and other resources.

6.2.3 Maui County Code

6.2.3.1 Community Plan Amendment

As discussed above, the Kapalua Mauka community will require an amendment to the *West Maui Community Plan* to expand the current Project District 2 from 450 acres to approximately 925 acres. Despite the increase in area, the entire Project District will only contain 690 units, a decrease of 60 units from the 750 units currently specified for Project District 2 in the *West Maui Community Plan*. Maui County Code Section 2.80A.060 specifies procedures for revisions or amendments of community plans. This environmental impact statement is being prepared in partial fulfillment of these requirements. All other requirements will also be satisfied.

6.2.3.2 County of Maui Zoning

The Kapalua Mauka community site currently covers portions of several parcels that ultimately will be consolidated and resubdivided (see Section 2.1.1). These parcels, their zoning, and community plan designations are as follows:

TMK	Zoning	Community Plan Designation
4-2-01: 1 (portion)	Agriculture, Interim	Agriculture, Conservation, Project District
4-2-05: 50 (portion)	Agriculture	Agriculture
4-2-05: 51	Agriculture	Agriculture
4-3-01: 6 (portion)	Agriculture, Interim	Agriculture, Open Space
4-3-01: 7 (portion)	Agriculture, Interim	Agriculture, Open Space
4-3-01: 8 (portion)	Agriculture, Interim	Agriculture, Open Space

Concurrent with the processing of the community plan amendment to designate the entire 925-acre Kapalua Mauka community site to Project District 2, landowner Maui Land & Pineapple Company, Inc., will seek to obtain the appropriate project district zoning designations as specified in Chapter 19.45 of the Maui County Code.

Project district development is intended to provide a flexible and creative planning approach, rather than specific land use designations, for quality developments. Project district processing involves three phases as follows:

Phase 1: Preparation and adoption of a Project District Zoning Ordinance by the County Council.

Phase 2: Preparation of a Project District Site Plan and adoption of this plan by the County Planning Commission.

Phase 3: Preparation and submittal of the Final Site Plans to the Planning Director for final review and approval.

Landowner Maui Land & Pineapple Company, Inc., will obtain all required County of Maui land use entitlements in accordance with all applicable requirements of the Maui County Code.

6.2.3.3 Applicability of the County of Maui Agricultural District Ordinance (Chapter 19.30A, Maui County Code)

In their comment letter on the Kapalua Mauka Draft Environmental Impact Statement, the County of Maui Department of Planning requested that the applicability of the County of Maui Agricultural District Ordinance (Chapter 19.30A, Maui County Code) should be addressed in the Final EIS. Specifically, Section 19.30A.020 of the Ordinance states:

> *Agricultural lands that meet at least two of the following criteria should be given the highest priority for retention in the agricultural district:*
>
> A. *Agricultural Lands of Importance to the State of Hawai'i (ALISH);*
> B. *Lands not classified by the ALISH system whose agricultural land suitability, based on soil, topographic, and climatic conditions, supports the production of agricultural commodities, including, but*

not limited to coffee, taro, watercress, ginger, orchard and flower crops and non-irrigated pineapple. In addition, these lands shall include lands used for intensive animal husbandry, and lands in agricultural cultivation in five of the ten years immediately preceding the date of approval of this chapter; and

C. *Lands which have seventy-five percent or more of their boundaries contiguous to lands within the agricultural district.*

Although the lands of the Kapalua Mauka community site meet two of the above criteria, the site should be rezoned to uses suitable for resort residential and recreational uses within the Project District classification for the following reasons:

1. Substantial Compliance with the *West Maui Community Plan.* Approximately 450 acres of the Kapalua Mauka community site is already designated as Project District 2 in the *West Maui Community Plan.* As stated in the Plan, the intent of Project District 2 is to provide, within the context of Kapalua Resort, a mix of recreational activities including an existing golf course (with possible expansion to 27 holes), a clubhouse, pro shop, restaurants and bars, tennis courts, swimming pool, and other related recreational amenities and commercial services. The Plan also specifies that the Project District 2 is to include 750 residential units integrated with, and complementary to, the recreational facilities.

   The uses currently proposed for the Kapalua Mauka community are what is called for in the Community Plan, with two primary exceptions: 1) the number of residential units would be reduced from 750 units to 690 units; and 2) the area of the community would be expanded from 450 acres to 925 acres. Because less homes would be allocated over a larger area, the resulting community will be far less dense than what is currently envisioned in the *West Maui Community Plan* which has a community planning horizon of 20 years. Therefore actual residential growth and the required infrastructure demands for Project District 2 will be less than what has been anticipated in the *West Maui Community Plan.*

   To maintain consistency with the *West Maui Community Plan,* before increasing the area of the Project District 2 and seeking a change in zoning, landowner Maui Land & Pineapple Company, Inc., will seek a community plan amendment to expand Project District 2 from 450 acres to 925 acres.

   In addition, the Kapalua Mauka community site is contiguous with the existing Kapalua Resort. While Maui Land & Pineapple Company, Inc., has vast land holdings in the West Maui region and conceivably could develop a resort residential community on other West Maui lands, this is not a practical alternative because:

   A. Since 450 acres of the site are already designated as Project District 2 in the *West Maui Community Plan,* the idea of expanding the Kapalua Resort on that location is consistent with the Plan and has been considered by the community and County of Maui during the community plan update process.

B. Selecting an alternative location not contiguous to the existing resort area would essentially create an entirely new resort area in the West Maui region, which would be contrary to the *West Maui Community Plan*, which states in part, "Limit visitor facilities to the existing planned resorts of Kā'anapali and Kapalua . . ."

C. From a planning perspective, it is logical to group resort uses in proximity to one another, so alternative locations not contiguous with the exiting Kapalua Resort would not follow generally recognized planning principles.

2. Continuation of Agriculture in West Maui. While the establishment of the Kapalua Mauka community will require a portion of the site to be to be removed from agriculture, Maui Pineapple Company, Ltd., (a subsidiary company of Maui Land & Pineapple Company, Inc.) currently has over 9,000 acres on Maui in active agricultural production. Approximately 169 acres at the site of the Kapalua Mauka Community are in active pineapple cultivation. This amounts to 1.9 percent of the total area currently being farmed by Maui Pineapple Company, Ltd. In addition, with the closure of Pioneer Mill in Lahaina there are currently vast amounts of fallow agricultural land in the West Maui region. Statewide, an enormous amount of land has been released from plantation agriculture (over 305,900 acres since 1968) and remains largely uncultivated open space.

An agricultural impact study (see Section 4.4 and Appendix B) concludes that the Kapalua Mauka community will not have an adverse impact on Maui Pineapple Company, Ltd. The study further concludes the Kapalua Mauka community could benefit Maui Pineapple Company, Ltd., and contribute toward its long term survival because the community will strengthen the profitability of the parent company and a portion of these profits could be used, if necessary, to help offset Maui Pineapple Company, Ltd., losses during years that pineapple or related agricultural businesses are not profitable.

6.2.4 Special Management Area

The site of the Kapalua Mauka community is not within the Special Management Area (SMA) as defined by the County of Maui, and therefore does not require a Special Management Area Use Permit.

6.3 APPROVALS AND PERMITS

An preliminary list of permits and approvals required for the proposed project is presented below.

Required Permits and Approvals

Permit/Approval	Responsible Agency
Chapter 343, HRS compliance	County of Maui Planning Department Office of Environmental Quality Control
Community Plan Amendment	County of Maui Planning Department/County Council
State Land Use District Boundary Amendment	Land Use Commission
Project District Phase I/Change in Zone	County of Maui Planning Department/Maui Planning Commission (public hearing in West Maui)/County Council
Project District Phase II	County of Maui Planning Department/Maui Planning Commission (public hearing in West Maui)
Project District Phase III	County of Maui Planning Department
Subdivision Approval	County of Maui Department of Public Works and Waste Management
Grading/Building Permits	County of Maui Department of Public Works and Waste Management
NPDES Permit	State Department of Health
Permit to Perform Work within a State Highway Right-of-way	State Department of Transportation
Permit for Discharge into the State Drainage System	State Department of Transportation
Permit for Connection into the State Drainage System	State Department of Transportation
Compliance with Chapter 6E, HRS	State Historic Preservation Division
ADA Accessibility	Disability and Communication Access Board

7.0 Alternatives to the Proposed Action

7.0 ALTERNATIVES TO THE PROPOSED ACTION

In compliance with the provisions of Title 11, Department of Health, Chapter 200, Environmental Impact Statement Rules, Section 11-200-17(f), the following is a discussion of the alternatives to the proposed Kapalua Mauka community. The possible alternatives to the proposed plan, including the "no-action" alternative, have been investigated to identify other potential land uses which might be appropriate on the property relative to existing environmental and social/ economic conditions.

7.1 NO ACTION ALTERNATIVE

The "no action" alternative would make no changes to the Kapalua Mauka community site; the property would remain vacant of any additional improved uses. If the Kapalua Mauka community were not developed on the site, the existing land uses would change, as Maui Pineapple is currently phasing out pineapple cultivation in the north areas of West Maui. Without development of the community, the existing fields in pineapple cultivation would eventually become fallow.

The no action alternative would not respond to the need for additional housing in the West Maui region. As stated in Section 2.2, a market study prepared for the Kapalua Mauka community forecasts the West Maui region will require 4,650 to 7,240 new housing units over the next twenty years. While there have been up to 5,300 units proposed for the region (excluding the Kapalua Mauka community), at Pu'ukoli'i Village, on State lands (Villages at Leiali'i), and elsewhere, these projects have not shown any activity in over a decade. It is unlikely these proposed developments will provide new inventory to meet the potential market needs in the near to mid-term. While estimated prices of units within the Kapalua Mauka community will be affordable to only 10 to 15 percent of the resident population, this segment will still require approximately 465 to 724 new units over the next 20 years.

The no action alternative would also not be consistent with the *West Maui Community Plan*, which designates 450 acres of the Kapalua Mauka community site as "Project District 2." According the Plan, the intent of Project District 2 is "to provide, within the context of Kapalua Resort, a mix of recreational activities including an existing golf course (with possible expansion to 27 holes), a clubhouse, pro shop, restaurants and bars, tennis courts, swimming pool and other related recreational amenities and commercial services." The Plan further states "the project district also includes 750 residential units (with an overall average density of 5 units/acre) in a mixture of single-family and multi-family uses integrated with and complementary to the recreational facilities mentioned above." While the proposed 925-acre Kapalua Mauka community will extend beyond the current Project District 2 area of 450 acres, the number of residential units will not exceed 690—sixty units less than specified in the *West Maui Community Plan*.

In addition, the no action alternative would not meet the project objectives to:

- Provide an appropriate and sensitive use of the land in context with Maui's environmental, social, and economic needs;
- Provide for the logical and long-planned expansion of the Kapalua Resort; and

- Develop a high-quality resort residential and recreation community that respects the rural character and natural beauty of the land.

Finally, the no action alternative would deny the State, County, and general public of the potential public benefits associated with the Kapalua Mauka community. Some of these benefits include:

- Generation of new tax revenues that would exceed the expenditures necessary to support the development, resulting in a net fiscal benefit to the County and State;

- Creation of employment opportunities in the construction industry, on-site after completion, and off-site due to the community's general contributions to Maui's economy; and

- New capital investment and spending adding to the Maui economy.

7.2 CURRENT PROJECT DISTRICT 2 ALTERNATIVE

Approximately 450 acres of the 925-acre Kapalua Mauka community site is currently designated as Project District 2 in the *West Maui Community Plan*. As envisioned in the Community Plan, the 450-acre Project District 2 is intended to provide a mix of recreational activities and include 750 residential units.

As currently proposed, the Kapalua Mauka community would occupy approximately 925 acres, but would include only include only 690 units. This means less units would be distributed over more area, making the Kapalua Mauka community far less dense that what is envisioned for Project District 2 in the *West Maui Community Plan*.

If the current 450-acre Project District 2 was not expanded to 925 acres and developed as described in the *West Maui Community Plan* with 750 units, a more densely developed community with less open space would result. This also would not preclude the remaining 475 acres of the proposed Kapalua Mauka community site from being developed at a later date. Under this scenario the area could contain far more residential units than what is currently proposed.

This alternative would meet the project objective of providing for the logical and long-planned expansion of the Kapalua Resort. However, because of the more urban nature of this higher density alternative, it would not allow for a sensitive design to preserve the rural character of the site and would likely result in increased environmental impacts. Thus it would be less likely to meet the project objectives to:

- Provide an appropriate and sensitive use of the land in context with Maui's environmental, social, and economic needs

- Develop a high-quality resort residential and recreation community that respects the rural character and natural beauty of the land

7.3 AGRICULTURAL SUBDIVISION ALTERNATIVE

The majority of the proposed community site is a portion of a single parcel of approximately 4739 acres (TMK 4-2-01: 1). The county zoning of this parcel is agricultural and interim. Under the Maui County Agricultural District ordinance (Chapter 19.30A, Maui County Code), this entire parcel could be subdivided into approximately 170 agricultural lots of various sizes. Of the allowable lots, approximately 64 agricultural lots could be included within the 925-acre Kapalua Mauka community site. However, the economic feasibility and market demand of this alternative is questionable.

Small agricultural lots would most likely be marketed to farmers desiring to cultivate diversified crops, since the more traditional Hawai'i crops of pineapple and sugar cane are not usually grown profitably on a small scale basis. The range of crops that may be grown profitably on the site is indicated by the crops that are being grown commercially elsewhere in West Maui. In addition to pineapple, these crops include papaya, coffee, seed corn, sweet corn, and alfalfa. Small test plots of lychee, rambutan, longan, mandarin orange, and kava are also being cultivated (Decision Analysts Hawaii, Inc., 2001).

While attempts are being made to diversify agriculture in Hawai'i, there are several limiting factors affecting profitably. These include:

- 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.
- High transportation costs increase the cost of importing agricultural supplies and equipment and, for export crops, shipping produce to market.
- For a number of crops, consumption volumes in Hawai'i are too small to support large, efficient 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 can be done locally because these farms incur lower costs for land, labor, supplies, fertilizer, pest control, equipment, etc. Furthermore, many mainland and foreign farms benefit from large volumes and economies of scale.
- Fruit-fly infestations prevent exports of many crops, or require expensive treatment.
- For certain crops, special hybrids adapted to Hawai'i's subtropical climate are yet to be developed.

In addition, a vast amount of land has been released from plantation agriculture (over 305,900 acres since 1968), and this release of land has far outpaced the demand for land for diversified crops (an increase of about 38,500 acres over the same period) (Decision Analysts Hawaii, Inc., 2001).

In short, the limiting factor to the growth of diversified agriculture in Hawai'i is not the land supply, but rather the size of the market for those crops that can be grown profitably in Hawai'i.

For these reasons, it is questionable as to whether there would be a large market for agricultural lots in West Maui. This agricultural subdivision alternative would also not meet the project objective of providing for the logical and long-planned expansion of the Kapalua Resort. Further, with the questionable market demand for an agricultural subdivision in the region, this alternative would also not meet the project objective of providing an appropriate and sensitive use of the land in context with Maui's environmental, social, and economic needs.

7.4 ALTERNATIVE OF POSTPONING ACTION PENDING FURTHER STUDY

The alternative of postponing action pending further study may allow some of the goals of the project to be met eventually (such as developing a high-quality resort residential and recreation community that respects the rural character and natural beauty of the land), however this alternative is not necessary, for the following reasons:

1) This ~~draft~~ final environmental impact statement and its related technical studies ~~seek to~~ provide a thorough evaluation of the project impacts. ~~If deemed necessary, further studies can be incorporated into the final environmental impact statement.~~

2) Entitlement processing for the Kapalua Mauka community will include a State Land Use District Boundary Amendment, a County Community Plan Amendment, and County Project District Processing. All of these steps provide for public input and comments, as well as opportunities for decision makers to ask for more information or further study.

3) Approximately 450 acres of the Kapalua Mauka site is designated as Project District 2 in the *West Maui Community Plan*. As stated in the Plan, the intent of Project District 2 is to provide, within the context of Kapalua Resort, a mix of recreational activities including an existing golf course (with possible expansion to 27 holes), a clubhouse, pro shop, restaurants and bars, tennis courts, swimming pool, and other related recreational amenities and commercial services. The Plan also specifies that the Project District 2 is to include 750 residential units integrated with, and complementary to, the recreational facilities.

   The proposed Kapalua Mauka community will extend beyond the current Project District 2 area of 450 acres, however, the number of residential units will not exceed 690—sixty units less than specified in the *West Maui Community Plan*. The resulting community will be far less dense than what is currently envisioned and the actual community growth and the required regional infrastructure needs will not exceed what has been established in the *West Maui Community Plan*, which has a community planning horizon of 20 years.

   The implications of the impacts of 750 residential units were taken into consideration when Project District 2 was included within the *West Maui Community Plan* during the 1992 plan update. According to the Plan: "the update process incorporated technical studies and assessments." These included: 1) a Socio-Economic Forecast; 2) a Land Use Forecast; 3) an Infrastructure Assessment; and 4) a Public Facilities and Service Assessment. These studies were used to understand potential future conditions, needs, and impacts. The Plan also states "the update process was driven by the work of the Lahaina Citizens Advisory Committee (CAC). This 14 member panel met a total of 17 times during a 225-day deliberation process to identify, formulate and recommend appropriate revisions to the Lahaina Community Plan." Thus, the implications of the development of Project District 2 have been comprehensively considered and given a thorough public review during the community plan update process.

For the above reasons, postponing action for further study is not a reasonable alternative, is not necessary, and would delay the objective of providing for the logical and long-planned expansion of the Kapalua Resort.

7.5 ALTERNATIVE LOCATIONS

Maui Land & Pineapple Company, Inc., has vast land holdings in the West Maui region (approximately 23,000 acres). These lands stretch from south of the West Maui Airport around the northern tip of West Maui to past Nākālele Point. While it is possible that the Kapalua Mauka community could be located at another location on other land owned by Maui Land & Pineapple Company, Inc., this alternative is not desirable for the following reasons:

1) Other sites would not be directly contiguous to the existing Kapalua Resort, and thus would not meet the objective of providing for the logical and long-planned expansion of the Kapalua Resort.

2) From a planning perspective, it is logical to group resort uses in proximity to one another, so sites away from the exiting Kapalua Resort would not follow generally recognized planning principles. Selecting an alternative location not contiguous to the existing resort area would essentially create an entirely new resort area in the West Maui region.

3) Approximately 450 acres of the 925-acre Kapalua Mauka community site is currently designated as Project District 2 in the *West Maui Community Plan*. Therefore the idea of expanding the Kapalua Resort on that location is consistent with the *West Maui Community Plan* and has been considered by the community and County of Maui during the community plan update process.

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8.0 Contextual Issues

8.0 CONTEXTUAL ISSUES

A summary of key issues within the context of the overall Kapalua Mauka community is presented in this section.

8.1 RELATIONSHIP BETWEEN THE SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The majority of the Kapalua Mauka community site is in limited pineapple cultivation or fallow fields. Portions of the site are being used for 16 holes of the Village Golf Course, pasture lands, and open space (gulches). Maui Pineapple has stated that pineapple cultivation on the property is being scaled back because of the long trucking distances to its pineapple cannery in Kahului. Because of this, without the development of the Kapalua Mauka community, the majority of the property would soon become abandoned pineapple lands. Besides residential and recreational uses, no other potential uses of the property have been identified.

The site possesses physical attributes desirable as amenities in a low-density, master-planned, resort community. These attributes include a superior location with regard to views, slope, climate, and proximity to an established, world-class resort. The studies performed in the preparation of this environmental impact statement indicate that the Kapalua Mauka community will be compatible with, and will enhance, the existing environment. Specific measures will be employed to mitigate potential adverse environmental impacts (as discussed in Sections 4 and 5) in the design, construction, and long-term operation of the community.

The Kapalua Mauka community, as described in this document, will maintain the same high standards established at the Kapalua Resort. The principal long-term environmental benefit of the community is the productive use of the property for low-density residential and recreational uses. Because of the rural, low-density design of much of the community, looking mauka from Honoapi'ilani Highway, the open space character of the site will remain intact, but visually change from pineapple fields to low-density residential and golf course uses. In places, house sites will be visible, but because of the relatively large lot sizes, there will be substantial open space between houses. The community is designed with higher density uses toward the interior of the site, with larger rural lots around the edges serving as a transition to the remaining agricultural fields. The dominate view from Honoapi'ilani Highway will still be of green vegetated areas.

Short-term uses and long-term productivity consists of the community's construction phases and residential and recreational uses after build out. Short-term construction impacts can be mitigated while they occur. The proposed long-term land uses will generate substantial economic benefits, as detailed in Section 5.8. Long-term benefits to the environment will, on balance, be positive if proposed mitigation measures are implemented. The physical attributes of the property are appropriate for the land uses proposed. Through careful site planning, the Kapalua Mauka community will blend with the environment and will be an attractive addition to the Kapalua Resort and the West Maui region.

Based on the foregoing it can be concluded that the proposed action will not foreclose future options, narrow the range of beneficial uses, or pose long-term risks to health or safety.

8.2 CUMULATIVE AND SECONDARY IMPACTS

Cumulative and secondary impacts are impacts that may result from other reasonably foreseeable actions within the area, regardless of who initiates the action. To assess the cumulative and secondary impacts of the Kapalua Mauka community in context with other projects, the *West Maui Community Plan* was used as the basis of reasonably anticipated development in the area.

According to the introduction of the *West Maui Community Plan*, the plan "reflects current and anticipated conditions in West Maui and advances planning goals, objectives, policies and implementation considerations to guide decision-making in the region through the year 2010." The plan further states: "Implementation of the goals, objectives and policies contained in the Community Plan are defined through specific implementing actions . . . implementing actions as well as broader policy recommendations are effectuated through various processes, including zoning, capital improvements program, and the County budgeting process."

In addition to Project District 2 (Kapalua Mauka) the *West Maui Community Plan* designates three other project districts in West Maui:

Project District 1 (Kapalua) (approximately 220 acres)

Project District 1 is within the Kapalua Resort, makai of Honoapi'ilani Highway. According to the plan: "The project district is intended to provide a mixture of visitor-oriented facilities, including hotel accommodations, single-family and multi-family residences, and supporting commercial services within an open-space setting organized around a central village core . . . Visitor accommodations should not exceed 1050 rooms. The residential component should be limited to 900 units in a mixture of single-family and multi-family densities."

Project District 1 has received the necessary approvals to proceed and several projects have been completed within the district, including the Ritz Carlton, Kapalua Hotel with 550 rooms. Kapalua Land Company, Ltd., the developer of the Kapalua Resort, is currently planning on greatly reduced densities for remainder of the Project District 1 area, with less visitor accommodations and residential units than what is specified in the *West Maui Community Plan*.

Project District 3 (Kā'anapali-North Beach Mauka) (approximately 310 acres)

According to the plan: "The North Beach Mauka project involves land at the northern extension of the Kā'anapali Resort mauka of Honoapi'ilani Highway . . . This project is intended to provide, within the context of the Kā'anapali Resort, a mixture of residential and visitor-oriented residential, commercial and recreational uses . . . The project district's 1200 residential units will be characterized by a variety of single-family and multi-family product types. Amenities such as parks, gardens, golf activities, and other recreational activities or attractions will be included to provide open space within the project district."

Project District 3 is proposed to be included as part of Amfac's Kā'anapali 2020 project, which includes over 4,300 acres mauka of Honoapi'ilani Highway near Kā'anapali. A community-based planning effort for this project has been taking place over a three year period and a final plan has not been selected yet. It has been proposed that the 1,700 affordable units planned for Pu'ukoli'i Village (see below), as well as cluster and other affordable housing units, may be included in a final plan.

After a final plan is chosen, it is estimated that permit processing may take four to five years before any building can begin. A draft environmental impact statement for the project is expected to be completed by December 2002.

Project District 4 (Weinberg Property) (approximately 24 acres)

According to the Plan: "This project district involves approximately 24 acres bounded by Kahoma Stream, Front Street, Kenui Street, and Honoapi'ilani Highway. The project district is intended to provide a mixture of commercial/business and multi-family and senior citizen residential uses."

The *West Maui Community Plan* does not specify the amount of commercial or residential uses proposed for Project District 4. Currently the landowners are studying uses for the property but have no immediate plans to apply for any development permits.

In addition to the project districts, the *West Maui Community Plan* also recognizes two major master-planned affordable housing developments in the West Maui region.

The Villages at Leiali'i

The Villages at Leiali'i, an affordable housing project proposed by the State Housing Finance Development Corporation, would be located mauka of Honoapi'ilani Highway in the vicinity of the Lahaina Civic Center and Wahikuli Terrace. When complete, it is proposed to comprise an area of approximately 1,120 acres and include approximately 4,813 housing units developed in phases, an 18-hole golf course, two elementary school sites, neighborhood business commercial uses, and church, child care, recreational/park, and other public uses. Legal issues have stalled this project for several years.

Pu'ukoli'i Village

Pu'ukoli'i Village, which is now proposed to be included as part of Amfac's Kā'anapali 2020 project on land mauka of the north extension of the Kā'anapali Resort and mauka of Honoapi'ilani Highway, is proposed to include 1,700 housing units. As described in the *West Maui Community Plan*, other proposed uses may include neighborhood commercial areas, hospital/emergency medical facilities, a child care center, a church, elderly housing, an elementary school and a community park. As stated above, a final plan for the Kā'anapali 2020 project has not been chosen, and it is estimated that permit processing may take four to five years before any building can begin. A draft environmental impact statement for the Kā'anapali 2020 project is expected to be completed by December 2002.

Cumulative and secondary impacts resulting from these projects, along with the Kapalua Mauka community, are likely to include increased population and traffic and greater demands on public infrastructure systems and services. It also could be expected that the community character of the region may change as more people live in the area.

Because of the resort residential nature and the anticipated low population of the Kapalua Mauka community (see Section 5.8.1.1), the Kapalua Mauka community will place less strain on infrastructure and public services than other similar-sized developments with full-time, year-round populations. In addition, tax revenues from the Kapalua Mauka community are expected to contribute to State and County revenues in excess of the costs incurred to the State and the County, and thus contribute to the overall State and the County tax base (see Section 5.8.2).

The Kapalua Mauka community already has paid for an additional allocation for wastewater in the Lahaina Wastewater Reclamation Facility (see Section 5.9.4) and will be providing their own source of potable and non potable water (see Section 5.9.3), and thus will not place additional burdens on the County for these resources or be competing with other projects.

Regarding traffic, it is important to note that all of the large-scale projects proposed in the West Maui region are planned to be built in phases. For example, the Kapalua Mauka community is projected to be built over a 20-year period, with an average of approximately 40 units per year. This will allow improvements, such as the Lahaina Bypass, to be built over a period of time, concurrently with, or ahead of demand. According to the recently released Final Supplemental Environmental Impact Statement for the Lahaina Bypass, construction on the Bypass is projected to start in late 2004. Further, the provision of increased housing in the West Maui region will allow people employed in West Maui to live in the area, reducing the need for commuting from other parts of Maui.

With increased housing and population the community character of West Maui will change. This has already been occurring gradually and is especially noticeable as the areas of Lahaina and Kā'anapali become more urbanized. With the closure of Pioneer Mill and vast areas of land formerly used for sugar cultivation now fallow, additional change is inevitable. The challenge facing political decision makers, business leaders, and the community in general is how to manage this inevitable change to maintain the attributes that make West Maui unique. Potentially, there is the opportunity to create a "critical mass" in which the goods, services, and facilities essential for a thriving community are present and provide opportunities for people to live, work, and play in West Maui without having to commute daily to and from Wailuku, Kahului, Kīhei, Upcountry, or other areas of Maui.

Finally, while the *West Maui Community Plan* has anticipated the projects described in this section, it is not likely that all will be built, or built with as many units as currently envisioned. Any proposed development will be subject to regulatory review to ensure compliance with applicable land use policies. In addition to conformance with the *West Maui Community Plan*, proposed projects must have the appropriate State land use designation, the appropriate County zoning, and comply with other applicable regulatory review and approval procedures to ensure the project will not have major adverse effects on infrastructure, public services, and the natural or socio-economic environment, or result in adverse cumulative and secondary impacts. Potential impacts associated with any specific proposed development must be addressed before any regulatory approvals are granted. Thus decision makers will be able to analyze successive cumulative and secondary impacts as specific projects are proposed. In this respect, the regulatory review process is anticipated to identify and address any long-term, cumulative and secondary impacts associated with any proposed development.

8.3 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The development of the Kapalua Mauka community, including expanding the Village Golf Course to 27 holes and an additional clubhouse, would result in the irreversible and irretrievable commitment of certain natural and fiscal resources. Major resource commitments include the 925-acre site and the money, construction materials, non-renewable resources, labor, and energy required for the community's completion. The impacts represented by the commitment of these resources, however, should be weighed against the positive socio-economic benefits that could be derived from the community versus the consequences of either taking no action or pursuing another less beneficial use of the property.

8.4 PROBABLE ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED

Land Use Character. Land uses in the West Maui region are undergoing gradual changes as major agricultural crops traditionally grown in the region, such as sugar cane and pineapple, can no longer be profitably grown. Lands mauka of Lahaina, which were once vibrant green with sugar cane, are now brown, abandoned fields. While productive uses for the vast amount of this fallow agricultural land have not been decided, some areas will invariably be rezoned for residential uses. The Kapalua Mauka Community, with its low-density residential and recreational uses, would contribute to this gradual transition in land uses.

Visual Resources. Because of the rural character and low-density of much of the Kapalua Mauka community, looking mauka from Honoapi'ilani Highway, the open space character of the site will remain intact, but visually change from pineapple fields to low-density residential and golf course land uses. In places houses will be visible, but because of the relatively large lot sizes, there will be substantial open space between houses. The community is designed with higher density uses toward the interior of the site, with larger rural lots around the edges serving as a transition to the remaining agricultural fields. The dominate view from Honoapi'ilani Highway will still be of green vegetated areas.

Traffic Impacts. As discussed in Section 5.4, the Traffic Impact Assessment Report (TIAR) for the Kapalua Resort area (including the Kapalua Mauka community) concludes "the proposed PD-2 Development and the build out of the Kapalua Resort can be accommodated by the Honoapi'ilani Highway corridor between Kapalua and Honokōwai." While the additional traffic can be accommodated, the Kapalua Mauka community will contribute to the cumulative traffic impacts of the region. However, the community will not reach full build out for 20 years, and many traffic improvements may be in place by then, including the Lahaina Bypass Highway.

Solid Waste. As detailed in section 5.9.5, there will be solid waste generated during construction and after development of the Kapalua Mauka community. Kapalua Resort actively encourages recycling, however, solid waste that cannot be recycled will be disposed in the County's central landfill in Pu'unēnē.

Electrical Power. Maui Electric Company. Ltd., estimates electrical power demand to range between 4500 kilowatts and 6900 kilowatts when the Kapalua Mauka community is fully built out in 20 years. To lessen this demand, energy efficient and conservation measures will be considered. These measures may include power factor corrections, the use of energy efficient pumps, and scheduling certain types of loads to run during off-peak hours whenever practical. Further efforts to minimize energy consumption may include inclusion of items from the "Hawaiian Design Strategies for Energy Efficient Architecture" (Energy Division of the State Department of Business, Economic Development and Tourism) and "Guidelines for Sustainable Building Design in Hawai'i (Office of Environmental Quality Control 1999) into the Project's design guidelines.

Air Quality. In the short term, construction of the Kapalua Mauka community will unavoidably contribute to air pollutant concentrations due to fugitive dust releases at construction areas, however, appropriate mitigative measures including frequent watering of exposed surfaces will help to establish controls. Over the long-term, an air quality modeling analysis of estimated community related traffic indicates that even during worst-case conditions predicted concentrations of pollutants will remain within national and state standards.

Noise. In the short term, construction of the Kapalua Mauka community will generate short-term noise impacts. The dominate noise sources during construction will most likely be earth moving equipment such as bulldozers and diesel trucks. Noise from construction activities must comply with all federal and state noise control regulations. Traffic-generated noise due to the development of the Kapalua Mauka community is predicted to be imperceptible to people with normal hearing, and no traffic noise mitigation measures are planned. However, because total traffic noise from Honoapi'ilani Highway could impact nearby residences, new residences should be constructed at least 75 feet from the highway.

8.4.1 Rational for Proceeding with the Kapalua Mauka Community Notwithstanding Unavoidable Effects

In light of the above mentioned unavoidable effects, the Kapalua Mauka community should be developed because the relatively minor negative impacts of the community will be offset by substantial positive impacts, including:

- The community will provide for responsible stewardship of the land, such as keeping approximately 134 acres in permanent open space, allowing for increased access to mauka trails, increasing habitat for botanical resources, and providing for preservation of archaeological resources;
- Because the community will have less residential units than previously proposed, required regional infrastructure needs will not exceed what has been projected and planned for in the *West Maui Community Plan*;
- The existing drainage patterns of the site will not be significantly altered and will be integrated into the design of the community;
- During the 20-year build-out and sales period the Kapalua Mauka community is projected to generate approximately $72.9 million in taxes for the County of Maui; and approximately $101.9 million for the State of Hawai'i;
- After build out annual taxes generated from the community are projected to be approximately $5.6 million for the County and approximately $5.2 million for the State;

- Total wages generated over the build-out period are projected to be approximately $291.6 million;

- Community operations and maintenance are projected to create an estimated 226 permanent jobs and $6.2 million in annual wages;

- The community will provide long-term stability for labor creating an estimated 4,990 "worker years" of direct on-site employment and an additional 2,495 "worker years" of off-site employment during build out (a "worker year" is the amount of time one full-time worker can work in one year); and

- Community residents and guests are projected to infuse more that $49.6 million per year in discretionary expenditures into the island economy.

8.5 UNRESOLVED ISSUE

Land Exchange. As discussed in Section 2.1.3, Maui Land & Pineapple Company, Inc., is currently in discussions with the State of Hawai'i to obtain State-owned parcels (TMKs 4-3-01: 6 and 4-3-01: 7, 4-3-01: 8) adjoining the majority of the Kapalua Mauka community site through a land exchange. If obtained from the State, approximately 60 acres from these parcels will be included in the Kapalua Mauka community. The remainder of the land will be left in permanent open space, to be owned and maintained by Maui Land & Pineapple Company, Inc.

The State-owned lands are a narrow strip almost entirely surrounded by Maui Land & Pineapple Company, Inc., lands. The land is primarily a gulch with only the upper ridges suitable for agriculture or other uses. Maui Land & Pineapple Company, Inc., currently leases the State-owned land (State Lease S-5978,) and uses the farmable portions for pineapple cultivation. The upper ridges on the north side of the gulch currently in pineapple production are the lands Maui Land & Pineapple Company, Inc., seeks to include as part of its Kapalua Mauka community and as part of the current entitlement processing.

On July 27, 2001, the Board of Land and Natural Resources authorized Maui Land & Pineapple Company, Inc., to include portions of TMKs 4-3-01: 6 and 4-3-01: 7, 4-3-01: 8 (totaling approximately 60 acres) in the entitlement processing for the proposed Kapalua Mauka Community while negotiating the land exchange.

From a planning perspective it is logical for Maui Land & Pineapple Company, Inc., to obtain the State-owned land and include portions of it as part of the Kapalua Mauka community. Should the State retain ownership and Maui Land & Pineapple Company, Inc., proceeds with the development of its land only, the State-owned land will become an isolated strip of land between a residential development and a gulch with limited potential agricultural or other uses. In addition, when a suitable property is found for the land exchange, the property obtained by the State in the exchange will be of equal or greater value than the current land and may be contiguous to other State land.

If a land exchange between Maui Land & Pineapple Company, Inc., and the State of Hawai'i cannot be negotiated, Maui Land & Pineapple Company, Inc., intends to proceed with the Kapalua Mauka community without the State-owned lands. This would reduce the area of the Kapalua Mauka community by approximately 60 acres (approximately six percent), so that the Kapalua Mauka community site would then be approximately 865 acres. It is not expected that the number of residential units (690) would change because of this reduction in area, however, lot sizes in some areas may be somewhat smaller. Residential density would change from approximately 0.7 units per acre to approximately 0.8 units per acre. The golf course layout may change somewhat and the amount of open space could also change slightly.

9.0 Agencies, Organizations, and Individuals Consulted in the Preparation of the Draft EIS

9.0 AGENCIES, ORGANIZATIONS, AND INDIVIDUALS CONSULTED IN THE PREPARATION OF THE DRAFT EIS

The preparation of ~~this~~ the draft EIS involved communicating with federal, state, and county agencies, and individuals, private companies, and community organizations, including the following:

9.1 COUNTY OF MAUI

Mayor James "Kimo" Apana
Councilmember Alan M. Arakawa
Councilmember Jo Anne Johnson
Councilmember Wayne Nishiki
Councilmember Charmaine Tavares
Department of Fire Control
Department of Housing and Community Concerns
Department of Parks and Recreation
Department of Planning
Department of Planning—Building Permits Division
Department of Planning—Land Use and Codes
Department of Planning—Long Range Division
Department of Public Works and Waste Management
Department of Water Supply
Maui Burial Council
Maui Cultural Resources Commission
Police Department

9.2 STATE OF HAWAI'I

Department of Accounting and General Services
Department of Agriculture
Department of Business, Economic Development and Tourism
Department of Business, Economic Development and Tourism—Business Resource Center
Department of Business, Economic Development and Tourism—Energy Resources & Technology Division
Department of Business, Economic Development and Tourism—Land Use Commission
Department of Business, Economic Development and Tourism—Office of Planning
Department of Defense
Department of Education
Department of Hawaiian Homelands
Department of Health
Department of Health—Office of Hazard Evaluation and Emergency Response
Department of Land and Natural Resources
Department of Land and Natural Resources—Commission on Water Resource Management
Department of Land and Natural Resources—Land Division
Department of Land and Natural Resources—Maui Office

Department of Land and Natural Resources—State Historic Preservation Division
Department of Transportation
Housing and Community Development Corporation of Hawaii
Office of Environmental Quality Control
Office of Hawaiian Affairs
Office of the Legislative Reference Bureau
Representative Joseph Souki
Senator Jan Yagi Buen
University of Hawai'i Environmental Center
University of Hawai'i Environmental Water Resources Center

9.3 FEDERAL

U.S. Army Engineer Division
U.S. Department of Agriculture Natural Resources Conservation Service
U.S. Department of the Interior, Fish and Wildlife Services

9.4 INDIVIDUALS, PRIVATE COMPANIES, AND COMMUNITY ORGANIZATIONS

AMFAC
Arvidson, John
Arvidson, Virginia
BJ's Chicago Pizzeria
Brown, Courtney
Butler, Mark
Casco, Janis
Carr, Jeannie
Carty, John
Craven, Terry
Buchanan, Buck
D'Enbeau, Madelyn
Ezekiela, Kalua
Jenkins, Mitch
Johnson, Jim
Hansson, K. Shell
Harlacher, Kimo
Hawaii's Thousand Friends
Hui Alanui O Makena
Kā'anapali Estate Coffee
Kapalua Bay Hotel
Kapalua Realty
Lahaina News
Lahaina Restoration Foundation
Lowson, Laurie
Management Consultants of Hawaii, Inc.
Maui Electric Company
Maui Tomorrow
Moore, Chris
Na Kūpuna O Maui
Nowell, Jack
Patty Peterson Interiors
Pluta, Joseph
Quayle, Henry
Rothman, Ken
Saliba, Andrea
Sakamoto Properties
Sierra Club
The Maui News
The Ritz Carlton Hotel
Whaler Realty
West Maui Senior Citizen's Group
West Maui Taxpayers Association
Withhalm, Kimi

Various Associations of Apartment Owners (AOAOs), including:

- Kapalua Resort Association
- Nāpilihau Association
- Pineapple Hill at Kapalua
- The Bay Villas
- The Golf Villas
- The Ironwoods
- The Ridge at Kapalua

10.0 List of Preparers

10.0 LIST OF PREPARERS

The EIS has been prepared by PBR HAWAII, 1001 Bishop Street, Pacific Tower, Suite 650, Honolulu, Hawai'i 96813. The staff involved in the preparation of this document included:

Thomas S. Witten, ASLA	President
Thomas Schnell, AICP	Planner/Project Manager
Angela Ellis	Planner
Dan Dzakowic	Cartography
Kanai'a Nakamura	Graphic Design
Dionne Talia	Production
Corrie Uehara	Production

Several key technical consultants were employed to provide specific assessment of environmental factors for this project. These consultants, their company affiliation, and their specialty are listed below:

Name	Firm	Area of Expertise
David Adams	D. L. Adams Associates, Ltd.	Noise Assessment
Phil Bruner		Faunal Studies
Winona P. Char	Char and Associates	Botanical Studies
Steve Dollar	Marine Research Consultants	Marine Water Quality Studies
Walter M. Fredericksen	Xamanek Researches	Archaeology/Cultural Impacts
James E. Hallstrom	Hallstrom Appraisal Group	Economic/Fiscal Research
Hallett Hammatt, Ph.D.	Cultural Surveys of Hawaii	Archaeology
Chris Kimura	CHK Planning	Cartography
Kenneth M. Nagata		Biological Studies
Barry Neal	B.D. Neal & Associates	Air Quality Assessment
Bruce Plasch	Decision Analysts Hawaii Inc.	Agricultural Impact Assessment
Warren S. Unemori	Warren S. Unemori Engineering	Civil Engineering
Wayne Yoshioka	Parsons Brinckerhoff Quade & Douglas	Traffic Impact Analysis

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11.0 References

11.0 REFERENCES

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12.0 Comments on the Environmental Impact Statement Preparation Notice & Responses

12.0 COMMENTS ON THE ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE AND RESPONSES

The Environmental Impact Statement Preparation Notice was sent to the following agencies, organizations, and individuals. Where indicated the agency, organization, or individual submitted comments.

	AGENCY	EISPN Mail Date	Date of Comments
	STATE		
1	Department of Accounting and General Services	8/23/01	9/5/01
2	Department of Agriculture	8/23/01	
3	Department of Business Economic Development and Tourism	8/23/01	
4	Department of Business Economic Development and Tourism — Energy Resources & Technology Division	8/23/01	
5	Department of Business Economic Development and Tourism — Land Use Commission	8/23/01	9/17/01
6	Department of Business Economic Development and Tourism — Office of Planning	8/23/01	9/18/01
7	Department of Defense	8/23/01	
8	Department of Education	8/23/01	9/18/01
9	Department of Hawaiian Home Lands	8/23/01	9/17/01
10	Department of Health	8/23/01	10/3/01
11	Department of Land and Natural Resources	8/23/01	
12	Department of Land and Natural Resources State Historic Preservation Division	8/23/01	
13	Department of Transportation	8/23/01	10/22/01
14	Kahului Public Library	8/23/01	
15	Lahaina Public Library	8/23/01	
16	Maui Community College Library	8/23/01	
17	Office of Environmental Quality Control	8/23/01	9/21/01
18	Office of Hawaiian Affairs	8/23/01	9/17/01
19	Representative Joseph Souki	8/23/01	
20	Senator Jan Yagi Buen	8/23/01	

	AGENCY	EISPN Mail Date	Date of Comments
21	University of Hawai'i Environmental Center	8/23/01	
22	University of Hawai'i Water Resources Research Center	8/23/01	
	FEDERAL		
23	US Fish and Wildlife Service	8/23/01	
	COUNTY OF MAUI		
24	Councilmember Jo Ann Johnson	8/23/01	
25	Councilmember Wayne Nishiki	8/27/01	
26	Department of Parks and Recreation	8/23/01	8/27/01
27	Department of Planning	8/23/01	11/29/01
28	Department of Planning — Building Permits	9/7/01	
29	Department of Public Works and Waste Management	8/23/01	12/13/01
30	Department of Water Supply	8/23/01	9/10/01
	PRIVATE ORGANIZATIONS AND INDIVIDUALS		
31	Maui News	8/23/01	
32	Madelyn D'Enbeau		9/21/01

The following pages contain comment letters received and responses.

BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810

WAYNE H. KIMURA
COMPTROLLER

MARY ALICE EVANS
DEPUTY COMPTROLLER

SEP - 6 2

LETTER NO. (P)1586.1

SEP - 5 2001

Mr. Tom Schnell
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Mr. Schnell:

Subject: Kapalua Mauka
Environmental Impact Statement Preparation Notice (EISPN)

Thank you for the opportunity to review the EISPN for the subject project.

The project does not impact any of the Department of Accounting and General Services projects or existing facilities. Therefore, we have no comments to offer.

Should you have any questions, please have your staff call Mr. Allen Yamanoha of the Planning Branch at 586-0488.

Sincerely,

GORDON MATSUOKA
Public Works Administrator

AY:mo
c: Mr. Raynor Minami, DOE Facilities w/EISPN Report
Ms. Ann T. Cua, County of Maui Planning Dept.
Ms. Genevieve Salmonson, OEQC

PBR HAWAII

LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

Honolulu Office
1001 Bishop Street
Pacific Tower, Suite 650
Honolulu, Hawaii 96813

Hilo Office

Wailuku Office
2123 Kaohu Street

December 21, 2001

Mr. Gordon Matsuoka
Public Works Administrator
State of Hawaii
Department of Accounting and General Services
P.O. Box 119
Honolulu, Hawaii 96810

SUBJECT: ENVIRONMENTAL ASSESSMENT/ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE FOR KAPALUA MAUKA, PROJECT DISTRICT 2, WEST MAUI, MAUI

Dear Mr. Matsuoka:

Thank you for your letter dated September 5, 2001, concerning the Environmental Assessment/Environmental Impact Statement Preparation Notice for Kapalua Mauka, Project District 2, in West Maui. We note that you have no comments at this time.

We appreciate your participation in the review of the Environmental Assessment/ Environmental Impact Statement Preparation Notice.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Project Manager

cc: Mr. Robert McNatt/Maui Land and Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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BENJAMIN J. CAYETANO
GOVERNOR

ANTHONY J.H. CHING
EXECUTIVE OFFICER

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM
LAND USE COMMISSION
P.O. Box 2359
Honolulu, HI 96804-2359
Telephone: 808-587-3822
Fax: 808-587-3827

September 17, 2001

Mr. Tom Schnell
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Mr. Schnell:

Subject: Environmental Impact Statement Preparation Notice ("EISPN")
Project Name: Kapalua Mauka
Applicant: Maui Land and Pineapple Company, Inc.
TMK Nos: 4-2-001: 001 portion
4-3-001: 006 portion, 007 portion, and 008 portion
Island: Lahaina, Maui

We have reviewed the subject EISPN forwarded by your transmittal dated August 23, 2001, for the development of residential, commercial, golf course, various roadways, and open space on approximately 925 acres at Lahaina, Maui.

Based upon our review of the subject EISPN, we have the following comments:

1. In regard to Section 1.8, Identification of Agencies/Individuals Consulted, we recommend that the following agencies be included in the review of the Draft Environmental Impact Statement ("DEIS"):

Federal Agencies
- Natural Resource Conservation Service, United States Department of Agriculture
- U.S. Army Corps of Engineers, Department of the Army

State of Hawaii
- Historic Preservation Division, Department of Land and Natural Resources ("DLNR")
- The Commission on Water Resource Management, DLNR

- Office of Planning, Department of Business, Economic Development and Tourism ("DBEDT")
- Housing and Community Development Corporation of Hawaii, DBEDT
- Department of Health
- Office of Hawaiian Affairs

County of Maui
- Any community or non-profit organization and any local native Hawaiian civic clubs or similar organizations within the project area that may be impacted by the project.

Non-governmental organizations
- Sierra Club
- Other organizations with established interests in cultural, environmental, and community concerns, such as Life of the Land or Hawaii's Thousand Friends.

2. In regard to Section 2.1 Background Information, we recommend that the DEIS include notation of LUC Docket No. A84-577/Hawaiian Airlines Inc., which reclassified 55 acres from the Agricultural District to the Urban District for the Kapalua Airport, located within a mile from the southern portion of the project area.

3. In regard to Sections 2.3, Phasing, and 2.4, Development Timetable and Preliminary Costs, we recommend that the DEIS include more specific development timetables for the placement of the golf course, single-family and multi-family residential units, and rural residential units. The aforementioned sections provide a general development timetable of twenty years and phasing of residential units as needed.

4. In regard to Section 3.1.2, Chapter 205, Hawaii Revised Statutes, the Applicant should clarify in the DEIS if incremental districting is or is not feasible in the proposed reclassification of project lands in the Agricultural District. With the 20-year time frame and vague information on project phasing, either incremental districting or separate dockets may be more appropriate.

5. The Applicant should provide assessment of the cumulative impact of the project with its proposed increases in residential units and resort support amenities to existing or approved residential and like projects in the region. The increase of 690 residential units alone would prompt interests in cumulative impacts affecting infrastructure, socio-economic issues, and housing market issues.

6. We reserve further comments on the proposed project in the review of the DEIS.

Thank you for the opportunity to provide comment on the subject EISPN.

Should you require clarification or further assistance in this matter, please contact Russell Kumabe of my staff at (808) 587-3822.

Sincerely,

ANTHONY J.H. CHING
Executive Officer

c: OEQC
County of Maui Planning Department

PBR HAWAII

December 21, 2001

Mr. Anthony J. H. Ching,
Executive Officer
State of Hawaii
Department of Business, Economic Development & Tourism
Land Use Commission
P.O. Box 2359
Honolulu, Hawaii 96804

SUBJECT: ENVIRONMENTAL ASSESSMENT/ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE FOR KAPALUA MAUKA, PROJECT DISTRICT 2, WEST MAUI, MAUI

Dear Mr. Ching:

Thank you for your letter dated September 17, 2001, concerning the Environmental Assessment/Environmental Impact Statement Preparation Notice for Kapalua Mauka, Project District 2, in West Maui. We offer the following responses to your comments.

1. As suggested the following agencies will be included in the review of the draft environmental impact statement:

   - Natural Resource Conservation Service, United States Department of Agriculture
   - U.S. Army Corps of Engineers, Department of the Army
   - Historic Preservation Division, Department of Land and Natural Resources
   - The Commission on Water Resource Development, Department of Land and Natural Resources
   - Office of Planing, Department of Business, Economic Development and Tourism
   - Housing and Community Development Corporation of Hawaii, Department of Business, Economic Development and Tourism
   - Department of Health
   - Office of Hawaiian Affairs
   - Community and non-profit organizations and local native Hawaiian civic clubs or similar organization within the project area that may be impacted by the project
   - Sierra Club
   - Other organizations with established interests in cultural, environmental, and community concerns

2. The draft EIS will include notation of LUC Docket No. A84-577/Hawaiian Airlines Inc., which reclassified 55 acres from the Agricultural District to the Urban District for the Kapalua Airport.

Mr. Anthony J. H. Ching
SUBJECT: ENVIRONMENTAL ASSESSMENT/ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE FOR KAPALUA MAUKA, PROJECT DISTRICT 2, WEST MAUI, MAUI
December 21, 2001
Page 2

3. The draft EIS will include a more specific development timetable.

4. The draft EIS will discuss the feasibility of incremental districting in the proposed reclassification of project lands in the Agricultural District.

5. The draft EIS will provide an assessment of the cumulative impact of the project with its proposed residential units and resort amenities to existing or approved residential and like projects in the region.

We appreciate your participation in the review of the Environmental Assessment/ Environmental Impact Statement Preparation Notice.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Project Manager

cc: Mr. Robert McNatt/Maui Land and Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

SEP 20 01

BENJAMIN J. CAYETANO
GOVERNOR
SEIJI F. NAYA, Ph.D.
DIRECTOR
SHARON S. NARIMATSU
DEPUTY DIRECTOR
DAVID W. BLANE
DIRECTOR, OFFICE OF PLANNING

OFFICE OF PLANNING
235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824

Ref. No. 9202

September 18, 2001

Mr. Tom Schnell
PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813

Subject: Kapalua Mauka, Lahaina, Island of Maui, Tax Map Key 4-2-01 (portion); 4-3-01:6 (portion); 4-3-01:7 (portion); and 4-3-01: 8 (portion)

Dear Mr. Schnell:

The Office of Planning has reviewed the Environmental Assessment (EA)/Environmental Impact Statement Preparation Notice (EISPN) for the proposed Kapalua Mauka project and offers the following comments for consideration of material to be included into the Draft Environmental Impact Statement (DEIS).

The Kapalua Land Company Ltd. is proposing to develop a 925-acre parcel of land on the slopes above the Kapalua Resort and mauka of the Honoapiilani Highway. The Kapalua Mauka project would enlarge the existing Village Golf Course and add a golf clubhouse with restaurant and other recreational amenities. The proposed project also includes 510 single and multi family homes and approximately 180 rural residential homesites, all overlooking the golf course and gulches that divide the property in mauka-makai directions.

The Kapalua Land Company will ask the State Land Use Commission (LUC) for a District Boundary Amendment to reclassify 450 acres of the project's land from Agricultural to Urban and 341 acres from Agricultural to Rural. The balance would remain in the Agricultural district.

Maui Land and Pineapple Co. Inc. owns all of the land in the Kapalua Mauka project except for approximately 60 acres of State land. The State land runs along the entire southern boundary of the project, from Honoapiilani Highway up to the project's highest elevation. The State of Hawaii has authorized a land exchange for those parcels.

The Kapalua Mauka project will also require an amendment to the *West Maui Community Plan* (1996) which presently designates 450 acres of the proposed project area as Project District 2 (PD2). Project District 2 was intended to provide a mixture of recreational activities and 750 units of single and multi family housing. The Kapalua Land Company proposes to increase the area of PD2 by 475 acres but currently only plans for 690 units of housing.

The additional 475 acres proposed for an expanded Project District 2 would include 341 acres for 180 rural residential homesites (to be reclassified into the State's Rural district), and additional open land.

The EISPN indicates that 10 technical studies will be conducted for the DEIS. They will include Agricultural Impact Assessment; Air Quality Study; Archaeological Reconnaissance Survey; Botanical Survey; Cultural Impact Assessment; Engineering Assessment (preliminary); Faunal Survey; Noise Assessment Study; Social/Economic/Fiscal Impacts and Traffic Impact Analysis Report.

In reviewing the EA/EISPN there is very little descriptive material on the Kapalua community where the proposed project is located. Other developments in the Kapalua Resort are named, but there is no sense of the population, or population density, of the existing community. It would be beneficial to discuss the number of residential units; number of additional residential units anticipated in the area, number of permanent, year-round residents; quantity of transient accommodations; and other socioeconomic factors. There is also no information on who is expected to live in Kapalua Mauka.

This lack of information is seen most clearly in the one aspect of the Kapalua Mauka plan that is inconsistent with the West Maui Community Plan designation of PD2: the overlooking of the spatial allocation of six acres for an elementary school. The EA/EISPN states the proposed community would demand less of government services than other similar developments. For example, its preliminary economic impact analysis determined that "it is typical in Hawaii for this income class to send their children to private schools, thus not having an affect on public school services." This leads to two obvious questions: What income class? Why were there no other references to the analysis in the EA/EISPN?

The EA/EISPN fails to identify any acreage allocated for an elementary school. The EA/EISPN says the DEIS will include an evaluation of the number of children within the Kapalua Mauka community requiring school services. However the evaluation should cover the number of children who would eventually be residing in the service area designated by the West Maui Community Plan for a new elementary school.

The West Maui Community Plan also refers to a 50-acre Napili regional park that is planned adjacent to the Kapalua Bay Golf Course, below the Honoapiilani Highway. A large

public facility in such proximity to the Kapalua Mauka project should generate some type of comment in a DEIS regarding impacts on traffic, access, and noise.

The EA/EISPN indicates that in the future, 60 agricultural lots may be developed outside of the Kapalua Mauka project, but within the planning area for Kapalua's remaining mauka agricultural lands. There are currently no plans for residential developments on this agricultural land. If there is any serious thought to farming this adjacent acreage, the Kapalua Mauka DEIS should discuss access and other impact issues of farming, residential and recreation activities in close proximity.

The EA/EISPN fails to discuss how much agricultural activity the Kapalua Land Co. envisions taking place on the 184 rural residential lots. Design guidelines, covenants, and unified landscape plans will encourage cohesiveness and traditional architectural values, but will they allow for the types of activities the Rural district was designed to fulfill? Is the Rural district classification really appropriate for what is being planned?

There are at least two references in the EA/EISPN to the landowner providing certain infrastructure needs "until connections to public infrastructure facilities are feasible". It is difficult to review a proposed project when it is not clearly stated which infrastructure requirements will eventually be met by public facilities.

The Kapalua Resort is currently served by both potable and non-potable water systems owned by a subsidiary of the landowner but the EA/EISPN is not clear how the necessary, additional potable water will be generated for Kapalua Mauka or who will own and operate the system.

The EA/EISPN leaves the same sort of ambiguity in discussing wastewater facilities. There are descriptions of existing systems owned and operated by the landowner, but no mention of whether the plans call for using the existing systems or relying on public facilities.

The Kapalua Mauka project expects to direct runoff into the Honokohau Gulch and an unnamed gully. The EA/EISPN says runoff from the unnamed gully is emptied into a retention basin and any overflow goes into a second retention basin. The EA/EISPN states twice that the use of retention basins is a viable option for controlling surface runoff until it can be "discharged off-site or allowed to infiltrate into the ground". There is no reference to where the off-site runoff is discharged, nor is there any further explanation for what would seem to be the larger volume of runoff going into Honokohau Gulch.

The DEIS should include information on the quality of marine life in nearshore waters particularly at the mouth of the Honokohau Gulch.

The reliance on the Kapalua Mauka area's gulches brings up one other related issue. In addition to the Honokohau Gulch and unnamed gully, there are two Napili Streams and Mokupea Gulch in the project area. The EA/EISPN is clear that maintenance of the gulches and gullies will be the responsibility of the landowner. However there needs to be some clarity on whether the landowner intends to maintain both sides of the Napili gulch since it appears it will only own the north side while the State will retain ownership of the south side.

The DEIS will include a discussion of archaeological resources and the cultural impact of the Kapalua Mauka project. It should make some further reference to the Honokahua Plantation Cemetery, its maintenance, how public access to the cemetery is currently managed and how it will be facilitated in the future.

Thank you for the opportunity to comment. Should you have any questions, please call Heidi Meeker at 587-2802.

Sincerely,

David W. Blane, AICP
Director
Office of Planning

c: Ms. Ann T. Cua, County of Maui Planning Department
State of Hawaii Office of Environmental Quality Control

PBR HAWAII

December 21, 2001

Mr. David W. Blane, AICP
Director
State of Hawaii
Department of Business, Economic Development & Tourism
Office of Planning
P.O. Box 2359
Honolulu, Hawaii 96804

SUBJECT: ENVIRONMENTAL ASSESSMENT/ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE FOR KAPALUA MAUKA, PROJECT DISTRICT 2, WEST MAUI, MAUI

Dear Mr. Blane:

Thank you for your letter dated September 18, 2001, concerning the Environmental Assessment/Environmental Impact Statement Preparation Notice for Kapalua Mauka, Project District 2, in West Maui. We offer the following responses to your comments.

1. As an overall general response to your comments regarding the failure of the environmental assessment/environmental impact statement (EISPN) to address specific details of the Kapalua Mauka community, please understand that the EISPN serves as a preliminary examination of the potential impacts of the community. More complete details will be included in the draft environmental impact statement, which will contain numerous technical studies on specific areas.

2. The draft environmental impact statement will include more descriptive information on the Kapalua Mauka community, including the number of residential units, number of additional residential units anticipated in the area, number of permanent, year-round residents, quantity of transient accommodations, and other socioeconomic factors.

3. You are correct in pointing out that the description for Project District 2 in the *West Maui Community Plan* allocates six acres within Project District 2 for an elementary school. While the current concept plan for the Kapalua Mauka community does not provide for a school site, Maui Land and Pineapple Company, Inc. is willing to designate a school site at another location on its West Maui property if the State Department of Education determines that there is sufficient demand. During development of the community Maui Land and Pineapple Company, Inc. will also be subject to the Department of Education's fair share requirements for new school facilities.

The draft environmental impact statement will include a complete socioeconomic study that estimates the expected number of school aged children expected in live in the Kapalua Mauka community.

Regarding your assertion that: "the evaluation should cover the number of children who would eventually be residing in the service area designated by the West Maui Community Plan for a new elementary school" Please note, the State Department of Education's "Lahainaluna Complex Development Plan 1997-2017" (Department of Education, 1998), which projects school capital improvement projects over a 20-year planning time frame, does not specify a new elementary school on the Kapalua Mauka community site or in the Kapalua area.

4. Regarding the traffic impacts of the proposed regional park in Napili that is planned adjacent to the Kapalua Bay Golf Course, the draft environmental impact statement will include a complete traffic impact analysis report that covers the entire Kapalua Resort area, including the Kapalua Mauka community.

5. Regarding your concerns about farming on adjacent lands, the draft environmental impact statement will include a complete agricultural impact study, which includes recommendations on the impact of farming on nearby residential areas. Also please note that the Kapalua Resort has operated for over 20 years in close proximity to Maui Pineapple Company's pineapple cultivation operations.

6. Regarding the appropriateness of the Rural district classification sought for a portion of the Kapalua Mauka community, the community will be in compliance with Section 205-2(c), Hawaii Revised Statues and Section 15-15-21 Hawaii Administrative Rules, Title 15, Department of Business, Economic Development, and Tourism, Subtitle 3, State Land Use Commission. In addition, the State Land Use Commission will review appropriateness of the land use designations sought for the Kapalua Mauka community when landowner Maui Land and Pineapple Company Inc. applies for a State Land Use District Boundary Amendment.

7. Regarding infrastructure needs for the Kapalua Mauka community, the draft environmental statement will include a complete engineering report, which will include details on private infrastructure systems and infrastructure requirements that will connect to public facilities.

8. Regarding runoff resulting from the Kapalua Mauka community, the draft environmental impact statement will include a complete drainage report, prepared by the project engineer.

One note of clarification: the EISPN (and subsequently your letter) made reference to runoff being directed to Honokohau Gulch. This was incorrect in the EISPN; the gulch named should have been Honokahua Gulch. This mistake will be corrected in the draft environmental statement.

9. The draft environmental impact statement will include a discussion on the quality of marine life in near shore waters.

10. Landowner Maui Land and Pineapple Company, Inc. intends to maintain both sides of Napili gulch if the land is obtained from the State. In the proposed land exchange mentioned in the EISPN, Maui Land and Pineapple Company, Inc. is seeking to obtain the entire gulch area, although only about 60 acres will be included in the Kapalua Mauka community. The remainder of the area will remain undeveloped. These points will be clarified in the draft environmental impact statement.

11. Finally, the draft environmental impact statement will include an archaeological study and a cultural impact assessment. In particular, reference will be made to the Honokahua Plantation Cemetery, its maintenance, and how public access is currently managed and how it will be facilitated in the future.

We appreciate your participation in the review of the Environmental Assessment/Environmental Impact Statement Preparation Notice.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Project Manager

cc: Mr. Robert McNatt/Maui Land and Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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BENJAMIN J. CAYETANO
GOVERNOR

PAUL G. LeMAHIEU, Ph.D.
SUPERINTENDENT

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

OFFICE OF THE SUPERINTENDENT

SEP 19 2

September 18, 2001

Mr. Tom Schnell
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, Hawai'i 96813

Dear Mr. Schnell:

Subject: Kapalua Mauka EISPN

The Department of Education (DOE) notes that the proposed project is subject to DOE's fair-share requirements. Please continue to keep us apprised of this project as it advances through the entitlement process.

If you have any questions, please call Mr. Sanford Beppu at 733-4862.

Very truly yours,

Paul G. LeMahieu

Paul G. LeMahieu, Ph.D.
Superintendent of Education

PLeM:hy

cc: A. Suga, DAS
J. Min, Maui County Planning Dept.

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

PBR HAWAII

December 21, 2001

Ms. Patricia Hamamoto, Superintendent
Department of Education
P.O. Box 2360
Honolulu, Hawaii 96804

SUBJECT: ENVIRONMENTAL ASSESSMENT/ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE FOR KAPALUA MAUKA, PROJECT DISTRICT 2, WEST MAUI, MAUI

Dear Ms. Hamamoto:

We have received the Department of Education's letter dated September 18, 2001, concerning the Environmental Assessment/Environmental Impact Statement Preparation Notice for Kapalua Mauka, Project District 2, in West Maui. We note the Department's comment that the proposed Kapalua Mauka Community is subject to the Department of Education's fair-share requirements.

We would like to bring to your attention that the *West Maui Community Plan* designates six acres within Project District 2 for an elementary school. However we note that Department of Education's "Complex Development Plan, Lahainaluna Complex 1997-2017," which covers DOE capital improvement projects in the West Maui region over a 20-year planning period, does not specify a new school site on the Project District 2 site or in the Kapalua area. Our current conceptual plan does not include a school site within the Project District 2 site. Please advise us of any changes to the Complex Development Plan, Lahainaluna Complex 1997-2017" that may require a school site in the Kapalua region. We look forward to working with your facility planners on this issue.

We appreciate your participation in the review of the Environmental Assessment/ Environmental Impact Statement Preparation Notice and will keep you apprized of the Kapalua Mauka community as it advances through the entitlement process.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Project Manager

cc: Mr. Robert McNatt/Maui Land and Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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RAYNARD C. SOON
CHAIRMAN
HAWAIIAN HOMES COMMISSION

JOBIE M. K. M. YAMAGUCHI
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P.O. BOX 1879
HONOLULU, HAWAII 96805

September 17, 2001

Mr. Tom Schnell
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, HI 96813

Dear Mr. Schnell:

Subject: Kapalua Mauka, Environmental Assessment, TMK 4-2-1:01 por., 4-3-1:06 por., 4-3-1:07 por., and 4-3-1:08 por., Lahaina, Maui, Dated August, 2001

Thank you for the opportunity to review the subject application. The Department of Hawaiian Home Lands has no comment to offer.

If you have any questions, please call Daniel Ornellas of our Planning Office at 586-3836.

Aloha,

Raynard C. Soon, Chairman
Hawaiian Homes Commission

CC: Maui Land and Pineapple Company, Inc.
County of Maui Planning Department
Office of Environmental Quality Control

PBR
HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
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WAILUKU OFFICE
2123 KAOHU STREET
WAILUKU, HAWAII 96793-2204
TEL: (808) 242-2878
FAX: (808) 242-2902
E-MAIL: [illegible]

December 19, 2001

Mr. Raynard C. Soon, Chairman
Hawaiian Homes Commission
State of Hawaii
Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, Hawaii 96805

SUBJECT: ENVIRONMENTAL ASSESSMENT/ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE FOR KAPALUA MAUKA, PROJECT DISTRICT 2, WEST MAUI, MAUI

Dear Mr. Soon:

Thank you for your letter dated September 17, 2001, concerning the Environmental Assessment/Environmental Impact Statement Preparation Notice for Kapalua Mauka, Project District 2, in West Maui. We note that you have no comment to offer.

We appreciate your participation in the review of the Environmental Assessment/ Environmental Impact Statement Preparation Notice.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Project Manager

cc: Mr. Robert McNatt/Maui Land and Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

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

BRUCE S. ANDERSON, Ph.D., M.P.H.
DIRECTOR OF HEALTH

In reply, please refer to:
File:
kapaula/epo

October 3, 2001

Mr. Tom Schnell
PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813

Dear Mr Schnell:

Subject: Kapaula Mauka

Thank you for allowing us to review and comment on the subject proposal. We do not have any comments at this time.

Sincerely,

GARY GILL
Deputy Director
Environmental Health Administration

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

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Fax: (808) 242-2902

December 21, 2001

Mr. Gary Gill, Deputy Director
Environmental Health Administration
State of Hawaii
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

SUBJECT: ENVIRONMENTAL ASSESSMENT/ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE FOR KAPALUA MAUKA, PROJECT DISTRICT 2, WEST MAUI, MAUI

Dear Mr. Gill:

Thank you for your letter dated October 3, 2001, concerning the Environmental Assessment/Environmental Impact Statement Preparation Notice for Kapalua Mauka, Project District 2, in West Maui. We note that you have no comments at this time.

We appreciate your participation in the review of the Environmental Assessment/ Environmental Impact Statement Preparation Notice.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Project Manager

cc: Mr. Robert McNatt/Maui Land and Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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BENJAMIN J. CAYETANO
GOVERNOR

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

BRIAN K. MINAAI
DIRECTOR

DEPUTY DIRECTORS
GLENN M. OKIMOTO
JADINE Y. URASAKI

IN REPLY REFER TO:
HWY-PS
2.4322

9C 242

OCT 22 2001

Mr. Tom Schnell
PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813

Dear Mr. Schnell:

Subject: Environmental Impact Statement Preparation Notice (EISPN), Kapalua Mauka (Project District 2), Maui Land and Pineapple Company, Inc., Lahaina, Maui, TMK: 4-2-01: 1 por.; 4-3-01: 6 por.; 4-3-01: 7 por.; and 4-3-01: 8 por.

Thank you for the opportunity to review the subject notice.

We have the following comments and recommendations:

1. A drainage report must be submitted for our review and approval. The report should include existing conditions and post development conditions. Calculations for detention basins and other drainage structures must be included in the report. There must be no impact on the State Highway, no additional stormwater runoff in the right-of-way and no diversion of runoff at the State Highway.

2. A Traffic Impact Analysis Report (TIAR) must be submitted for our review and approval. It must analyze the access intersections with Honoapiilani Highway, regional traffic capacity and recommend mitigation measures based on full buildout.

3. A map and text should clearly identify the present access(es) and proposed accesses on the mauka and makai sides of Honoapiilani Highway.

4. Sight distance requirements for the proposed accesses must be shown on the plans and must meet State Highway standards.

5 A written application is required for any change to the existing highway access. An administrative cost and consideration are charged for any changes to vehicular access rights to the State Highway. The applicant should be advised to contact the Highways Division, Right of Way Branch at (808) 692-7325 for more information.

6. If additional accesses are approved, all intersections must be provided with right-turn deceleration lanes and left-turn storage and deceleration lanes.

7. The applicant should have his consultants work with the Highway Division to determine if a setback from the existing highway rights-of-way line is needed for future widening of the highway. If and when needed, the applicant shall dedicate to the State the land needed for the future highway widening.

8. The applicant should be required to contribute its pro rata share of the cost of regional improvements to Honoapiilani Highway.

9. All required improvements to the State Highway must meet current State standards and be planned, designed and constructed at no cost to the State.

10. Plans for construction within the State Highway right-of-way must be submitted for our review and approval.

If you have any questions, please contact Ronald Tsuzuki, Head Planning Engineer, Highways Division, at 587-1830.

Very truly yours,

Brian K Minaai

BRIAN K. MINAAI
Director of Transportation

PBR HAWAII

December 21, 2001

Brian Minaai,
Director of Transportation
State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813

SUBJECT: ENVIRONMENTAL ASSESSMENT/ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE FOR KAPALUA MAUKA, PROJECT DISTRICT 2, WEST MAUI, MAUI

Dear Mr. Minaai:

Thank you for your letter dated October 22, 2001, concerning the Environmental Assessment/Environmental Impact Statement Preparation Notice for Kapalua Mauka, Project District 2, in West Maui. We offer the following responses to your comments.

1. A drainage report will be submitted for your review and approval at the appropriate time.

2. A Traffic Impact Analysis Report will be included with the Draft EIS and made available for your review and approval.

3. The Draft EIS will contain a map and text clearly identifying the present and proposed accesses on the mauka and makai sides of Honoapiilani Highway.

4. Sight distance requirements that meet State Highway standards will be shown on appropriate plans.

5. A written application will be prepared and submitted for the proposed changes to the existing highway accesses.

6. All accesses will be provided with right-turn deceleration lanes and left-turn storage decelerations lanes.

7. The applicant and the applicant's consultants will work with the Highways Division to determine if a setback for the existing highway rights-of-way line is needed for future widening of the highway.

8. The applicant will contribute its pro rata fair share of the cost of regional improvements to Honoapiilani Highway that is based on a fair share assessment of all property owners who use the highway.

9. All improvements to the State Highway required for direct access to the Kapalua Mauka community will meet State standards and will be planned, designed, and constructed at no cost to the State.

10. Plans for construction within the State Highway right-of-way will be submitted for the Department of Transportation's review and approval.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Project Manager

cc: Mr. Robert McNatt/Maui Land and Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
235 SOUTH BERETANIA STREET
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186

GENEVIEVE SALMONSON
DIRECTOR

SEP 4

September 21, 2001

Mr Robert M. McNatt
Maui Land and Pineapple Company, Inc.
P.O Box 187
Kahului, Hawai'i 96732

Ms. Ann Cua
Planning Department, County of Maui
250 South High Street
Wailuku, Hawai'i 96793

Mr. Tom Schnell
PBR Hawaii
1001 Bishop Street, Pacific Tower, Suite 650
Honolulu, Hawai'i 96813

Dear Messrs McNatt & Schnell, and Ms. Cua:

Thank you for your submittal of a final environmental assessment and environmental impact statement preparation notice for Kapalua Mauka Project District 2, TMK: 4-2-01: 1 (portion), 4-1-01: 6 (portion), 4-3-01: 7 (portion); and, 4-3-01: 8 (portion), in the district of Lahaina. We have reviewed the documents and submit the following comments for your consideration and response in the draft environmental impact statement.

1. HAZARD EVALUATION FROM PAST AGRICULTURAL USE: Please consult with the Office of Hazard Evaluation and Emergency Response of the Department of Health and assess any possible hazards on the project site due to the past use of agricultural soil fumigants and other agricultural pesticides.
2. GUIDELINES FOR SUSTAINABLE BUILDING DESIGN IN HAWAI'I: We ask that you consider implementing some of the techniques discussed in the enclosed guidelines for sustainable building design.
3. USE OF RECYCLED GLASS IN CONSTRUCTION PROJECTS. To promote the use of recycled materials in-state, section, we respectfully ask that you consider the use of glass-asphalt aggregate ("glasphalt") in the design of roads for the subdivision
4. INDIGENOUS AND POLYNESIAN INTRODUCED PLANTS FOR USE IN PUBLIC LANDSCAPING. We ask that you consider the use of native, indigenous and polynesian introduced plants in your landscaping.
5. DEVELOPMENT TIMETABLE: Please include a timetable for development of the project.

Thank you for the opportunity to comment. If there are any questions, please call Leslie Segundo, Environmental Health Specialist, at (808) 586-4185.

Sincerely,

Genevieve Salmonson

GENEVIEVE SALMONSON
Director

Enclosures

Guidelines for Sustainable Building Design in Hawai`i

A planner's checklist

(Adopted by the Environmental Council on October 13, 1999)

__Introduction__
Hawai`i law calls for efforts to conserve natural resources, promote efficient use of water and energy and encourage recycling of waste products. Planning a project from the very beginning to include sustainable design concepts can be a critical step toward meeting these goals.

The purpose of the state's environmental review law (HRS Ch. 343) is to encourage a full, accurate and complete analysis of proposed actions, promote public participation and support enlightened decision making by public officials. The Office of Environmental Quality Control offers the following guidelines for preparers of environmental reviews under the authority of HRS 343 to assist agencies and applicants in meeting these goals.

These guidelines do not constitute rules or law. They have been refined by staff and peer review to provide a checklist of items that will help the design team create projects that will have a minimal impact on Hawai`i's environment and make wise use of our natural resources. In a word, projects that are *sustainable*.

A sustainable building is built to minimize energy use, expense, waste, and impact on the environment. It seeks to improve the region's sustainability by meeting the needs of Hawai`i's residents and visitors today without compromising the needs of future generations. Compared to conventional projects, a resource-efficient building project will:

I. Use less energy for operation and maintenance
II. Contain less *embodied* energy (e.g. locally produced building products often contain less *embodied* energy than imported products because they require less energy-consuming transportation.)
III. Protect the environment by preserving/conserving water and other natural resources and by minimizing impact on the site and ecosystems
IV. Minimize health risks to those who construct, maintain, and occupy the building
V. Minimize construction waste
VI. Recycle and reuse generated construction wastes

VII. Use resource-efficient building materials (e.g. materials with recycled content and low embodied energy, and materials that are recyclable, renewable, environmentally benign, non-toxic, low VOC (Volatile Organic Compound) emitting, durable, and that give high life cycle value for the cost.)

VIII. Provide the highest quality product practical at competitive (affordable) first and life cycle costs.

In order to avoid excessive overlapping of items, the checklist is designed to be read in totality, not just as individual sections. This checklist tries to address a range of project types, large scale as well as small scale. Please use items that are appropriate to the type and scale of the project.

Although this list will help promote careful and sensitive planning, mere compliance with this checklist does not confirm sustainability. Compliance with and knowledge of current building codes by users of this checklist is also required.

TABLE OF CONTENTS

I. Pre Design

___1. Hold programming team meeting with client representative, Project Manager, planning consultant, architectural consultant, civil engineer, mechanical, electrical, plumbing (MEP) engineer, structural engineer, landscape architect, interior designer, sustainability consultant and other consultants as required by the project. Identify project and sustainability goals. Client representatives and consultants need to work together to ensure that project and environmental goals are met.

___2. Develop sustainable guideline goals to insert into outline specifications as part of the Schematic Design documents. Select goals from the following sections that are appropriate for the project.

___3. Use Cost-Benefit Method for economic analysis of the sustainability measures chosen. (Cost-Benefit Method is a method of evaluating project choices and investments by comparing the present and life cycle value of expected benefits to the present and life cycle value of expected costs.)

___4 Include "Commissioning" in the project budget and schedule. (Building "Commissioning" is the process of ensuring that systems are designed, installed, functionally tested, and capable of being operated and maintained in accordance with specifications that meet the owner's needs, and recognize the owner's financial and operational capacity. It improves the performance of the building systems, resulting in energy efficiency and conservation, improved air quality and lower operation costs. *Refer to Section IX.*)

II. Site Selection & Site Design

A. Site Selection

___1. Analyze and assess site characteristics such as vegetation, topography, geology, climate, natural access, solar orientation patterns, water and drainage, and existing utility and transportation infrastructure to determine the appropriate use of the site.

___2. Whenever possible, select a site in a neighborhood where the project can have a positive social, economic and/or environmental impact.

___3. Select a site with short connections to existing municipal infrastructure (sewer lines, water, waste water treatment plant, roads, gas, electricity, telephone, data communication lines and services). Select a site close to mass transportation, bicycle routes and pedestrian access.

B. Site Preparation and Design

___1 Prepare a thorough existing conditions topographic site plan depicting topography, natural and built features, vegetation, location of site utilities and include solar information, rainfall data and direction of prevailing winds. Preserve existing resources and natural features to enhance the design and add aesthetic, economic and practical value. Design to minimize the environmental impact of the development on vegetation and topography.

__2. Site building(s) to take advantage of natural features and maximize their beneficial effects. Provide for solar access, daylighting and natural cooling. Design ways to integrate the building(s) with the site that maximizes and preserves positive site characteristics, enhances human comfort, safety and health, and achieves operational efficiencies.

__3. Locate building(s) to encourage bicycle and pedestrian access and pedestrian oriented uses. Provide bicycle and pedestrian paths, bicycle racks, etc. Racks should be visible and accessible to promote and encourage bicycle commuting.

__4. Retain existing topsoil and maintain soil health by clearing only the areas reserved for the construction of streets, driveways, parking areas, and building foundations. Replant exposed soil areas as soon as possible. Reuse excavated soils for fill and cut vegetation for mulch.

__5. Grade slopes to a ratio of less than 2 : 1 (run to rise). Balance cut and fill to eliminate hauling. Check grading frequently to prevent accidental over excavation.

__6. Minimize the disruption of site drainage patterns. Provide erosion and dust controls, positive site drainage, and siltation basins as required to protect the site during and after construction, especially, in the event of a major storm.

__7. Minimize the area required for the building footprint. Consolidate utility and infrastructure in common corridors to minimize site degradation, and cost, improve efficiency, and reduce impermeable surfaces.

__8. For termite protection, use non toxic alternatives to pesticides and herbicides, such as Borate treated lumber, Basaltic Termite Barrier, stainless steel termite barrier mesh, and termite resistant materials.

III. Building Design

__1. Consider adaptive re-use of existing structures instead of demolishing and/or constructing a new building. Consult the State Historic Preservation Officer for possible existing historic sites that may meet the project needs.

__2. Plan for high flexibility while designing building shell and interior spaces to accommodate changing needs of the occupants, and thereby extend the life span of the building.

__3. Design for re-use and/or disassembly. (For recyclable and reusable building products, see Section VII).

__4. Design space for recycling and waste diversion opportunities during occupancy.

__5. Provide facilities for bicycle and pedestrian commuters (showers, lockers, bike racks, etc.) in commercial areas and other suitable locations.

__6. Plan for a comfortable and healthy work environment. Include inviting outdoor spaces, wherever possible. *(Refer to Section VIII.)*

__7. Provide an Integrated Pest Management approach. The use of products such as Termi-mesh, Basaltic Termite Barrier and the Sentricon "bait" system can provide long term protection from termite damage and reduce environmental pollution.

__8. Design a building that is energy efficient and resource efficient. *(See Sections IV, V, VII.)* Determine building operation by-products such as heat gain and build up, waste/gray-water and energy consumption, and plan to minimize them or find alternate uses for them.

__9. For natural cooling, use

a. Reflective or light colored roofing, radiant barrier and/or insulation, roof vents
b. Light colored paving (concrete) and building surfaces
c. Tree Planting to shade buildings and paved areas
d. Building orientation and design that captures trade winds and/or provides for convective cooling of interior spaces when there is no wind.

IV. Energy Use

__1. Obtain a copy of the State of Hawai'i Model Energy Code (available through the Hawai'i State Energy Division, at Tel. 587-3811). Exceed its requirements. (Contact local utility companies for information on tax credits and utility-sponsored programs offering rebates and incentives to businesses for installing qualifying energy efficient technologies.)

__2. Use site sensitive orientation to :

a. Minimize cooling loads through site shading and carefully planned east-west orientation.
b. Incorporate natural ventilation by channeling trade winds.
c. Maximize daylighting.

__3. Design south, east and west shading devices to minimize solar heat gain.

__4. Use spectrally selective tints or spectrally selective low-e glazing with a Solar Heat Gain Coefficient (SHGC) of 0.4 or less.

__5. Minimize effects of thermal bridging in walls, roofs and window systems.

__6. Maximize efficiencies for lighting, Heating, Ventilation, Air Conditioning (HVAC) systems and other equipment. Use insulation and/or radiant barriers, natural ventilation, ceiling fans and shading to avoid the use of air conditioning whenever appropriate.

__7. Eliminate hot water in restrooms when possible.

__8. Provide tenant sub-metering to encourage utility use accountability.

__9. Use renewable energy. Use solar water heaters and consider the use of photovoltaics and Building Integrated Photovoltaics (BIPV).

__10. Use available energy resources such as waste heat recovery, when feasible.

A. Lighting

___1. Design for at least 15% lower interior lighting power allowance than the Energy Code.
___2. Select lamps and ballasts with the highest efficiency, compatible with the desired level of illumination and color rendering specifications. Examples that combine improved color rendering with efficient energy use include compact flourescents and T8 flourescents that use tri-phosphor gases.
___3. Select lighting fixtures which maximize system efficacy and which have heat removal capabilities
___4. Reduce light absorption on surfaces by selecting colors and finishes that provide high reflectance values without glare.
___5. Use task lighting with low ambient light levels.
___6. Maximize daylighting through the use of vertical fenestration, light shelves, skylights, clerestories, building form and orientation as well as through translucent or transparent interior partitions. Coordinate daylighting with electrical lighting for maximum electrical efficiency.
___7 Incorporate daylighting controls and/or motion activated light controls in low or intermittent use areas.
___8 Avoid light spillage in exterior lighting by using directional fixtures.
___9 Minimize light overlap in exterior lighting schemes.
___10. Use lumen maintenance procedures and controls.

B. Mechanical Systems

___1. Design to comply with the Energy Code and to exceed its efficiency requirements.
___2 Use "Smart Building" monitor/control systems when appropriate.
___3 Utilize thermal storage for reduction of peak energy usage.
___4. Use Variable air volume systems to save fan power.
___5. Use variable speed drives on pumping systems and fans for cooling towers and air handlers.
___6. Use air-cooled refrigeration equipment or use cooling towers designed to reduce drift.
___7. Specify premium efficiency motors.
___8. Reduce the need for mechanical ventilation by reducing sources of indoor air pollution. Use high efficiency air filters and ultraviolet lamps in air handling units. Provide for regular maintenance of filtration systems. Use ASHRAE standards as minimum
___9. Locate fresh air intakes away from polluted or overheated areas. Locate on roof where possible. Separate air intake from air exhausts by at least 40 ft.
___10. Use separate HVAC systems to serve areas that operate on widely differing schedules and/or design conditions.
___11. Use shut off or set back controls on HVAC system when areas are not occupied.
___12. Use condenser heat, waste heat or solar energy. (Contact local utility companies for information on the utility-sponsored Commercial and Industrial Energy Efficiency

Programs which offer incentives to businesses for installing qualifying energy efficient technologies.)
___13. Evaluate plug-in loads for energy efficiency and power saving features.
___14. Improve comfort and save energy by reducing the relative humidity by waste reheat, heat pipes or solar heat.
___15. Minimize heat gain from equipment and appliances by using:
   a. Environmental Protection Agency (EPA) Energy Star rated appliances.
   b. Hoods and exhaust fans to remove heat from concentrated sources.
   c. High performance water heating that exceeds the Energy Code requirements.
___16. Specify HVAC system "commissioning" period to reduce occupant exposure to Indoor Air Quality (IAQ) contaminants and to maximize system efficiency.

V. Water Use

A. Building Water

___1. Install water conserving, low flow fixtures as required by the Uniform Plumbing Code.
___2. If practical, eliminate hot water in restrooms.
___3. Use self closing faucets (infrared sensors or spring loaded faucets) for lavatories and sinks.

B. Landscaping and Irrigation

(See Section VI.)

VI. Landscape and Irrigation

___1. Incorporate water efficient landscaping (xeriscaping) using the following principles:
   a. <u>Planning, Efficient irrigation</u>: Create watering zones for different conditions. Separate vegetation types by watering requirements. Install moisture sensors to prevent operation of the irrigation system in the rain or if the soil has adequate moisture. Use appropriate sprinkler heads.
   b. <u>Soil analysis/improvement</u>: Use (locally made) soil amendments and compost for plant nourishment, improved water absorption and holding capacity.
   c. <u>Appropriate plant selection</u>: Use drought tolerant and/or slow growing hardy grasses, native and indigenous plants, shrubs, ground covers, trees, appropriate for local conditions, to minimize the need for irrigation.
   d. <u>Practical turf areas</u>: Turf only in areas where it provides functional benefits.

e. <u>Mulches</u>: Use mulches to minimize evaporation, reduce weed growth and retard erosion.

Contact the local Board of Water Supply for additional information on xeriscaping such as efficient irrigation, soil improvements, mulching, lists of low water-demand plants, tours of xeriscaped facilities, and xeriscape classes.

___2. Protect existing beneficial site features and save trees to prevent erosion. Establish and carefully mark tree protection areas well before construction.

___3. Limit staging areas and prevent unnecessary grading of the site to protect existing, especially native, vegetation.

___4. Use top soil from the graded areas, stockpiled on the site and protected with a silt fence to reduce the need for imported top soil.

___5. Irrigate with non-potable water or reclaimed water when feasible. Collect rainwater from the roof for irrigation.

___6. Sub-meter the irrigation system to reduce water consumption and consequently water and sewer fees. Contact the local county agency to obtain irrigation sub-metering requirements and procedures. Locate irrigation controls within sight of the irrigated areas to verify that the system is operating properly.

___7. Use pervious paving instead of concrete or asphalt paving. Use natural and man-made berms, hills and swales to control water runoff.

___8 Avoid the use of solvents that contain or leach out pollutants that can contaminate the water resources and runoff. Contact the State of Hawai'i Clean Water Branch at 586-4309 to determine whether a NPDES (National Pollutant Discharge Elimination System) permit is required.

___9. Use Integrated Pest Management (IPM) techniques. IPM involves a carefully managed use of biological and chemical pest control tactics. It emphasizes minimizing the use of pesticides and maximizing the use of natural process

___10. Use trees and bushes that are felled at the building site (i.e. mulch, fence posts). Leave grass trimmings on the lawn to reduce green waste and enhance the natural health of lawns.

___11. Use recycled content, decay and weather resistant landscape materials such as plastic lumber for planters, benches and decks.

VII. Building Materials & Solid Waste Management

A. Material Selection and Design

___1. Use durable products.

___2. Specify and use natural products or products with low embodied energy and/or high recycled content. Products with recycled content include steel, concrete with glass,

drywall, carpet, etc. Use ground recycled concrete, graded glass cullet or asphalt as base or fill material.

___3. Specify low toxic or non-toxic materials whenever possible, such as low VOC (Volatile Organic Compounds) paints, sealers and adhesives and low or formaldehyde-free materials. Do not use products with CFCs (Chloro-fluoro-carbons).

___4 Use locally produced products such as plastic lumber, insulation, hydro-mulch, glass tiles, compost.

___5. Use advanced framing systems that reduce waste, two stud corners, engineered structural products and prefabricated panel systems.

___6 Use materials which require limited or no application of finishing or surface preparation. (i.e. finished concrete floor surface, glass block and glazing materials, concrete block masonry, etc.).

___7. Use re-milled salvaged lumber where appropriate and as available. Avoid the use of old growth timber.

___8. Use sustainably harvested timber.

___9. Commit to a material selection program that emphasizes efficient and environmentally sensitive use of building materials, and that uses locally available building materials. (A list of Earth friendly products and materials is available through the Green House Hawai'i Project. Call Clean Hawai'i Center, Tel. 587-3802 for the list.)

B. Solid Waste Management, Recycling and Diversion Plan

___1. Prepare a job-site recycling plan and post it at the job-site office.

___2. Conduct pre-construction waste minimization and recycling training for employees and sub-contractors.

___3 Use a central area for all cutting.

___4. Establish a dedicated waste separation/diversion area. Include Waste/Compost/Recycling collection areas and systems for use during construction process and during the operational life cycle of the building.

___5. Separate and divert all unused or waste cardboard, ferrous scrap, construction materials and fixtures for recycling and/or forwarding to a salvage exchange facility. Information on "Minimizing C&D (construction and demolition) waste in Hawai'i" is available through Department of Health, Office of Solid Waste Management, Tel. 586-4240.

___6. Use all green waste, untreated wood and clean drywall on site as soil amendments or divert to offsite recycling facilities.

___7. Use concrete and asphalt rubble on-site or forward the material for offsite recycling.

___8 Carefully manage and control waste solvents, paints, sealants, and their used containers. Separate these materials from C&D (construction and demolition) waste and store and dispose them of them carefully.

___9. Donate unused paint, solvents, sealants to non-profit organizations or list on HIMEX (Hawai'i Materials Exchange). HIMEX is a free service operated by Maui Recycling

Group, that offers an alternative to landfill disposal of usable materials, and facilitates no-cost trades. See web site, www.himex.org.

__10. Use suppliers that re-use or recycle packaging material whenever possible.

VIII. Indoor Air Quality

__1. Design an HVAC system with adequate supply of outdoor air, good ventilation rates, even air distribution, sufficient exhaust ventilation and appropriate air cleaners.

__2. Develop and specify Indoor Air Quality (IAQ) requirements during design and contract document phases of the project. Monitor compliance in order to minimize or contain IAQ contaminant sources during construction, renovation and remodeling.

__3. Notify occupants of any type of construction, renovation and remodeling and the effects on IAQ.

__4. Inspect existing buildings to determine if asbestos and lead paint are present and arrange for removal or abatement as needed.

__5. Supply workers with, and ensure the use of VOC (Volatile Organic Compounds)-safe masks where required.

__6. Ensure that HVAC systems are installed, operated and maintained in a manner consistent with their design. Use UV lamps in Air Handling Units to eliminate mold and mildew growth. An improperly functioning HVAC system can harbor biological contaminants such as viruses, bacteria, molds, fungi and pollen, and can cause Sick Building Syndrome (SBS).

__7. Install separate exhaust fans in rooms where air polluting office equipment is used, and exhaust directly to the exterior of the building, at sufficient distance from the air intake vents.

__8. Place bird guards over air intakes to prevent pollution of shafts and HVAC ducts.

__9. Control indoor air pollution by selecting products and finishes that are low or non-toxic and low VOC emitting. Common sources of indoor chemical contaminants are adhesives, carpeting, upholstery, manufactured wood products, copy machines, pesticides and cleaning agents.

__10. Schedule finish application work to minimize absorption of VOCs into surrounding materials e.g. allow sufficient time for paint and clear finishes to dry before installing carpet and upholstered furniture. Increase ventilation rates during periods of increased pollution.

__11. Allow a flush-out period after construction, renovation, remodeling or pesticide application to minimize occupant exposure to chemicals and contaminants.

IX. Commissioning & Construction Project Closeout

__1. Appoint a Commissioning Authority to develop and implement a commissioning plan and a preventative maintenance plan. Project Manager's responsibilities must include coordination of commissioning activities during project closeout.

__2. Commissioning team should successfully demonstrate all systems and perform operator training before final acceptance.

__3. Provide flush-out period to remove air borne contaminants from the building and systems.

__4. Provide as-built drawings and documentation for all systems. Provide data on equipment maintenance and their control strategies as well as maintenance and cleaning instructions for finish materials.

X. Occupancy and Operation

A. General Objectives

__1. Develop a User's Manual for building occupants that emphasizes the need for Owner/Management commitment to efficient sustainable operations.

__2. Management's responsibilities must include ensuring that sustainability policies are carried out.

B. Energy

__1. Purchase EPA rated, Energy Star, energy-efficient office equipment, appliances, computers, and copiers. (Energy Star is a program sponsored by U.S. Dep. Of Energy. Use of these products will contribute to reduced energy costs for buildings and reduce air pollution.)

__2. Institute an employee education program about the efficient use of building systems and appliances, occupants impact on and responsibility for water use, energy use, waste generation, waste recycling programs, etc.

__3. Re-commission systems and update performance documentation periodically per recommendations of the Commissioning Authority, or whenever modifications are made to the systems.

C. Water

__1. Start the watering cycle in the early morning in order to minimize evaporation.

__2. Manage the chemical treatment of cooling tower water to reduce water consumption.

D. Air

__1. Provide incentives which encourage building occupants to use alternatives to and to reduce the use of single occupancy vehicles.

__2. Provide a location map of services within walking distance of the place of employment (child care, restaurants, gyms, shopping).
__3. Periodically monitor or check for indoor pollutants in building.
__4. Provide an IAQ plan for tenants, staff and management that establishes policies and documentation procedures for controlling and reporting indoor air pollution. This helps tenants and staff understand their responsibility to protect the air quality of the facility.

E. Materials and Products

__1. Purchase business products with recycled content such as paper, toners, etc.
__2. Purchase Furniture made with sustainably harvested wood, or with recycled and recycled content materials, which will not off gas VOC's.
__3. Remodeling and painting should comply with or improve on original sustainable design intent.
__4. Use low VOC, non-toxic, phosphate and chlorine free, biodegradable cleaning products.

F. Solid Waste

__1. Collect recyclable business waste such as paper, cardboard boxes, and soda cans.
__2. Avoid single use items such as paper or Styrofoam cups and plates, and plastic utensils.

XI. Resources

Financing. Energy Efficiency in Buildings. U.S. Department of Energy, DOE/EE-0152, May, 1998 (Call Tel.1-800-DOE-EREC or visit local office)

Building Commissioning: The Key to Quality Assurance. U.S. Department of Energy, DOE/EE-0153, May, 1998 (Call Tel.1-800-DOE-EREC or visit local office)

Guide to Resource-Efficient Building in Hawaii. University of Hawai'i at Manoa, School of Architecture and Energy, Resources and Technology Division, Department of Business, Economic Development and Tourism, October 1998. (Call Tel. 587-3804 for publication)

Hawaii Model Energy Code. Energy, Resources and Technology Division, Department of Business, Economic Development and Tourism, November 1997 (Call Tel. 587-3810 for publication)

Photovoltaics in the Built Environment: A Design Guide for Architects and Engineers. NREL Publications, DOE/GO #10097-436, September 1997 (Call Tel.1-800-DOE-EREC or visit local office)

Building Integrated Photovoltaics: A Case Study. NREL Publications #TP-472-7574, March 1995 (Call Tel.1-800-DOE-EREC or visit local office)

Solar Electric Applications: An overview of Today's Applications. NREL Publications, DOE/GO #10097-357, Revised February, 1997 (Call Tel.1-800-DOE-EREC or visit local office)

Green Lights: An Enlightened Approach to Energy Efficiency and Pollution Prevention. U.S. Environmental Protection Agency, Pacific Island Contact Office (Call Tel. 541-2710 for publication.)

Healthy Lawn, Healthy Environment. U.S. Environmental Protection Agency, Pacific Island Contact Office. (Call Tel. 541-2710 for this and related publications)

How to Plant a Native Hawaiian Garden. Office of Environmental Quality Control (OEQC), Department of Health, State of Hawai'i (Call Tel. 586-4185 for publication)

Buy Recycled in Hawai'i. Clean Hawai'i Center, Energy, Resources and Technology Division, Department of Business, Economic Development and Tourism, November 1997. (Call Tel. 587-3802 for publication)

Hawai'i Recycling Industry Guide and other recycling and reuse related fact sheets. Clean Hawai'i Center, Energy, Resources and Technology Division, Department of Business, Economic Development and Tourism, July 1999. (Call Tel. 587-3802 for publication)

Minimizing Construction and Demolition Waste. Office of Solid Waste Management, Department of Health and Clean Hawai'i Center, Energy, Resources and Technology Division, Department of Business, Economic Development and Tourism, February 1998. (Call Tel. 586-4240 for publication)

Contractor's Waste Management Guide and Construction and demolition Waste Management Facilities Directory. Clean Hawai'i Center, Energy, Resources and Technology Division, Department of Business, Economic Development and Tourism, 1999. (Call Tel. 587-3802 for publication)

Waste Management and Action: Construction Industry. Department of Health, Solid and Hazardous Waste Branch (Call Tel. 586-7496 for publication)

Business Guide For reducing Solid Waste. U.S. Environmental Protection Agency, Pacific Island Contact Office, Tel. 541-2710 (Call for publication)

The Inside Story: A Guide to Indoor Air Quality. U.S. Environmental Protection Agency, Pacific Island Contact Office, Tel. 541-2710 (Call for this and related publications.) Additional information is available from the American Lung Association, Hawai'i, Tel. 537-5966

Selecting Healthier Flooring Materials. American Lung Association and Clean Hawai'i Center, February 1999. (Call Tel. 537-5966 x307)

Office Paper Recycling: An Implementation Manual. U.S. Environmental Protection Agency, Pacific Island Contact Office, Tel. 541-2710 (Call for publication.)

Acknowledgments

OEQC and the Environmental Council would like to thank Allison Beale, Gary Gill, Nick H. Huddleston, Gail Suzuki-Jones, Purnima McCutcheon, Virginia B. MacDonald, Steve Meder, Ramona Mullahey, Thomas P. Papandrew, Victor Olgay, Howard Tanaka, and Howard Wiig for their assistance with this project.

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

WM. FRANK BRANDT, FASLA
Chairman

THOMAS S. WITTEN, ASLA
President

R. STAN DUNCAN, ASLA
Executive Vice-President

RUSSELL Y.J. CHUNG, ASLA
Executive Vice-President

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Wailuku, Hawai'i 96793-2204
Tel: (808) 242-2878
Fax: (808) 242-2902
E-Mail: pbrmaui@hawaii.net

December 21, 2001

Ms. Genevieve Salmonson, Director
State of Hawaii
Office of Environmental Quality Control
235 Beretania Street, Suite 702
Honolulu, Hawaii 96813

SUBJECT: ENVIRONMENTAL ASSESSMENT/ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE FOR KAPALUA MAUKA, PROJECT DISTRICT 2, WEST MAUI, MAUI

Dear Ms. Salmonson:

Thank you for your letter dated September 21, 2001, concerning the Environmental Assessment/Environmental Impact Statement Preparation Notice for Kapalua Mauka, Project District 2, in West Maui. We offer the following responses to your comments.

1. As requested, we have consulted with the Office of Hazard Evaluation and Emergency Response of the Department of Health to assess any possible hazards on the project site due to past use of agricultural soil fumigants and other agricultural pesticides. Please see the attached letter from Office of Hazard Evaluation and Emergency Response.

2. The draft EIS will suggest implementation of some of the techniques discussed OEQC's "Guidelines for Sustainable Design in Hawaii."

3. The draft EIS will suggest the use of glass-asphalt aggregate ("glasphalt") in the design of roads for the Kapalua Mauka community.

4. Native, indigenous, and Polynesian introduced plants will be used in the landscaping of the Kapalua Mauka community where appropriate and feasible.

5. A development timetable will be included in the draft EIS.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Project Manager

cc: Mr. Robert McNatt/Maui Land and Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning

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PBR HAWAII

October 31, 2001

Ms. Liz Galvez
Office of Hazard Evaluation and Emergency Response
Department of Health,
State of Hawaii
919 Ala Moana Boulevard Room 201
Honolulu, Hawaii 96814

SUBJECT: PAST USE OF AGRICULTURAL SOIL FUMIGANTS AND OTHER AGRICULTURAL PESTICIDES ON LAND PARCELS IN THE KAPALUA REGION OF MAUI

Dear Ms. Galvez:

PBR HAWAII is assisting Maui Land and Pineapple Company Inc., in the process of planning an expansion of the Kapalua resort in the West Maui region of Maui. The expansion area is proposed on the following TMKs (also see the attached site plan and TMK map):

TMK 4-2-01: 1 (portion)
TMK 4-2-05: 50 (portion)
TMK 4-2-05: 51
TMK 4-3-01: 6 (portion)
TMK 4-3-01: 7 (portion)
TMK 4-3-01: 8 (portion)

In August of this year PBR HAWAII prepared an environmental impact statement preparation notice (EISPN) for the proposed expansion. In their comment letter on the EISPN, the Office of Environmental Quality Control (OEQC) requested we consult with the Office of Hazard Evaluation and Emergency Response and assess any possible hazards on the project site due to the past use of agricultural soil fumigants and other agricultural pesticides.

Would you please check your files and database to see if there is any record of potential problems on the site? Also, would you please provide a written reply even if you have no record of potential problems?

Please contact me if you have any questions. Thank you for your assistance in this matter.

Sincerely,

PBR HAWAII

Tom Schnell, AICP

Attachments

ENV. RESPONSE BRANCH ID:808-586-7537 OCT 30'01 14:35 No.005 P.01

REQUEST TO ACCESS A GOVERNMENT RECORD

DATE: October 31, 2001

TO: Hazard Evaluation & Emergency Response Office (Fax: 586-7537)

FROM: Tom Schnell/PBR Hawaii
Name or Alias
1001 Bishop Street, Pacific Tower, Suite 650, Honolulu HI 96813
Contact Information
521-5631, Fax: 523-1402

Although you are not required to provide any personal information, you should provide enough information to allow the agency to contact you about this request. The processing of this request may be stopped if the agency is unable to contact you. Therefore, please provide any information that will allow the agency to contact you (name or alias, telephone or fax number, mailing address, e-mail address, etc.).

I WOULD LIKE THE FOLLOWING GOVERNMENT RECORD:

Describe the government record as specifically as possible so that it can be located. Try to provide a record name, subject matter, date, location, purpose, or name of persons to whom the record refers, or other information that could help the agency identify the record. A complete and accurate description of the government record you request will prevent delays in locating the record. Attach a second page if needed.

Please see attached letter.

I WOULD LIKE: (please check one or more of the options below)

☐ To inspect the government record.

☒ A copy of the government record: (Please check one of the options below.) See the back of this page for information about fees that you may be required to pay for agency services to process your record request. Note: Copying and transmission charges may also apply to certain options.

- ☐ Pick up at agency (date and time): ______
- ☒ Mail
- ☐ Fax (toll free and only if available)
- ☐ Other, if available (please specify): ______

☐ If the agency maintains the records in a form other than paper, please advise in which format you would prefer to have the record.

☐ Electronic ☐ Audio ☐ Other (please specify): ______

☐ Check this box if you are attaching a request for waiver of fees in the public interest (see waiver information on back).

SEE BACK FOR IMPORTANT INFORMATION

OFFICIAL USE ONLY:

Office Manager ______ Date ______

OIP 1 Rev. 3/20/01

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

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

BRUCE S. ANDERSON, Ph.D., M.P.H.
DIRECTOR OF HEALTH

In reply, please refer to:
HEER OFFICE

01-372-KK

November 30, 2001

Tom Schnell, AICP
PBR HAWAII
1001 Bishop Street
Pacific Tower, Suite 650
Honolulu, Hawaii 96813-3429

Subject: REQUEST FOR PUBLIC INFORMATION, Land Parcels in the Kapalua Region of Maui

Dear Mr. Schnell:

The Hazard Evaluation and Emergency Response (HEER) Office does not have any information pertaining to the above subject site.

Please be advised that the absence of the information on reports of spills or releases does not absolve the owner from future clean up liabilities under the Resource Conservation and Recovery Act (RCRA) or the Comprehensive, Environmental Response, Compensation, and Liability Act (CERCLA), as amended, the Hawaii Environmental Response Law, as amended, or any other applicable state or federal regulations.

If you have any questions, please contact the HEER Office at (808) 586-4249. In addition, you are welcome to visit our web site at http:www.state.hi.us/health/eh/heer.

Sincerely,

Keith E. Kawaoka, Office Manager
Hazard Evaluation and Emergency Response Office

PHONE (808) 594-1888

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

FAX (808) 594-1865

HRD01/266

September 17, 2001

Mr. Tom Schnell
PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, HI 96813

Subject: Environmental Impact Statement Preparation Notice-Kapalua Mauka

Dear Mr. Schnell:

Thank you for the opportunity to comment on the above referenced project.

OHA is concerned about the land ownership issue as addressed in this preparation notice. The notice indicates that sixty acres of the proposed community site is on portions of State-owned parcels which Maui Land and Pineapple Company, Inc. will obtain through a land exchange. As these parcels are part of the public land trust, exchanges of these lands must be in accordance with the purposes of the trust; the extent to which the proposed development is one of the public trust's purposes is not established in this document.

Otherwise, we look forward to reviewing the draft environmental impact statement, particularly the archaeological surveys and the cultural impact statement. If you have any questions, please contact Sharla Manley, policy analyst at 594-1944.

Sincerely,

Colin C. Kippen, Jr.
Deputy Administrator

CK: sam
cc: Board of Trustees
Clyde Namu'o, Administrator
Maui CAC

PBR HAWAII

December 21, 2001

Mr. Colin C. Kippin, Jr.
Deputy Administrator
State of Hawai'i
Office of Hawaiian Affairs
711 Kapi'olani Blvd., Suite 500
Honolulu, Hawai'i 96813

SUBJECT: ENVIRONMENTAL ASSESSMENT/ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE FOR KAPALUA MAUKA, PROJECT DISTRICT 2, WEST MAUI, MAUI

Dear Mr. Kippin:

Thank you for your letter dated September 17, 2001, concerning the Environmental Assessment/Environmental Impact Statement Preparation Notice (EISPN) for Kapalua Mauka, Project District 2, in West Maui.

In your letter, you note that the Office of Hawaiian Affairs is concerned about the proposed land exchange mentioned in the EISPN between the State of Hawai'i and Maui Land and Pineapple Company, Inc. With this land exchange, Maui Land and Pineapple Company, Inc. is seeking to obtain approximately 191 acres of State-owned land (TMKs 4-3-01: 6, 4-3-01: 7, and 4-3-01: 8).

The State-owned lands are a narrow strip almost entirely surrounded by Maui Land and Pineapple Company, Inc. lands. This State-owned land is primarily a gulch, with only the upper ridges suitable for agriculture or other uses. Approximately 60 acres on the upper north ridge of the gulch are proposed to be included in the Kapalua Mauka community site. The gulch area will remain undeveloped.

From a planning perspective, it is logical for Maui Land and Pineapple Company, Inc. to obtain the State-owned land. Should the State retain ownership and Maui Land and Pineapple Company, Inc., proceeds with the development of its land only, the State-owned land will become an isolated strip of land between a residential development and a gulch with limited potential for agricultural or other uses. In addition, when a suitable property is found for the land exchange, the property obtained by the State in the exchange will be of equal or greater value than the current land and may be contiguous to other State land.

Because of the location, topography, and configuration, the State-owned land proposed to be exchanged is not suitable for use for one of the ceded land trust purposes. However, one or more trust purposes will be satisfied by this exchange because the land for which the State-owned land will be exchanged will either be usable for one of the specified trust purposes or will generate income that can be used for trust purposes.

At the present time, Maui Land and Pineapple Company, Inc. and the State of Hawai'i have not agreed upon a suitable parcel for the exchange and the issue remains unresolved. If a land exchange between Maui Land and Pineapple Company, Inc. and the State of Hawai'i cannot be negotiated, Maui Land and Pineapple Company, Inc. intends to proceed with the Kapalua Mauka community without the State-owned lands.

We appreciate your participation in the review of the Environmental Assessment/ Environmental Impact Statement Preparation Notice.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Project Manager

cc: Mr. Robert McNatt/Maui Land and Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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DEPARTMENT OF
PARKS AND RECREATION
COUNTY OF MAUI

1580-C KAAHUMANU AVENUE WAILUKU, HAWAII 96793

JAMES "KIMO" APANA
Mayor

FLOYD S. MIYAZONO
Director

ELIZABETH D. MENOR
Deputy Director

(808) 270-7230
FAX (808) 270-7934

August 27, 2001

Mr. Tom Schnell
PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813

Dear Mr. Schnell:

SUBJECT: KAPALUA MAUKA

Thank you for the opportunity to review the Environmental Impact Statement Preparation Notice for the subject project. At this time, we have no comments on the proposed action.

Please contact me or Mr. Patrick Matsui, Chief of Parks Planning and Development, at (808) 270-7387 if there are any questions.

Sincerely,

Floyd S. Miyazono

FLOYD S. MIYAZONO
Director

c: Patrick Matsui, Chief of Planning and Development
Ms. Ann T. Cua, County of Maui Planning Department
Office of Environmental Quality Control

PBR HAWAII

Wm. Frank Brandt, FASLA
Chairman

Thomas S. Witten, ASLA
President

R. Stan Duncan, ASLA
Executive Vice President

Russell Y.J. Chung, ASLA
Executive Vice President

James Leonard, AICP
Managing Director
Hilo Office

Vincent Shigekuni
Senior Associate

Grant Murakami, AICP
Associate

December 21, 2001

Mr. Floyd S. Miyazono, Director
Department of Parks and Recreation
County of Maui
1580-C Kaahumanu Avenue
Wailuku, Hawaii 96793

SUBJECT: ENVIRONMENTAL ASSESSMENT/ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE FOR KAPALUA MAUKA, PROJECT DISTRICT 2, WEST MAUI, MAUI

Dear Mr. Miyazono:

Thank you for your letter dated August 27, 2001, concerning the Environmental Assessment/Environmental Impact Statement Preparation Notice for Kapalua Mauka, Project District 2, in West Maui. We note that you have no comments at this time.

We appreciate your participation in the review of the Environmental Assessment/Environmental Impact Statement Preparation Notice.

Sincerely,

PBR HAWAII

Tom Schnell

Tom Schnell, AICP
Project Manager

cc: Mr. Robert McNatt/Maui Land and Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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JAMES "KIMO" APANA
Mayor
JOHN E. MIN
Director
CLAYTON I. YOSHIDA
Deputy Director

COUNTY OF MAUI
DEPARTMENT OF PLANNING

November 29, 2001

Mr. Tom Schnell
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Mr. Schnell:

RE: **Kapalua Mauka**
Environmental Impact Statement Preparation Notice

The Planning Department (Department) has reviewed the above Environmental Impact Statement Preparation Notice (Notice). The project will be seeking a Community Plan Amendment, District Boundary Amendment, Change in Zoning, and Project District Approvals. Authorization from the State of Hawaii (State) must be obtained for the portions of the project site owned by the State. In reviewing the table of approvals and permits being sought for the project, we would like to clarify that the Phase I and II Project District applications will require a public hearing with the Maui Planning Commission in West Maui . The Phase III application will only require administrative review and approval by the Department.

The Notice indicates that a variation of housing types will be provided as part of the subdivision project. There is no mention, however, of an affordable component to the project or plans to provide a percentage of affordable housing within the West Maui Community Plan region. The issue of affordable housing should be addressed.

The project plans call for the removal of a 6-acre school site. A discussion of the factors involved in the removal of the 6-acre site should be provided.

Thank you for your cooperation. If you have any questions, please contact Ms. Ann Cua, Staff Planner, of this office at 270-7735.

Very truly yours,

JOHN E. MIN
Planning Director

JEM:ATC:smb
c: Clayton Yoshida, AICP, Deputy Planning Director
OEQC (Office of Environmental Quality Control)
Ann Cua, Staff Planner
Project File
General File
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December 21, 2001

Mr. John E. Min, Director
County of Maui
Department of Planning
250 South High Street
Wailuku, Hawaii 96793

SUBJECT: ENVIRONMENTAL ASSESSMENT/ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE FOR KAPALUA MAUKA, PROJECT DISTRICT 2, WEST MAUI, MAUI

Dear Mr. Min:

Thank you for your letter dated November 29, 2001, concerning the Environmental Assessment/Environmental Impact Statement Preparation Notice for Kapalua Mauka, Project District 2, in West Maui. We offer the following responses to your comments.

1. The Board of Land and Natural Resources has authorized Maui Land and Pineapple Company, Inc. to include approximately 60 acres of State-owned land in the entitlement processing for the proposed Kapalua Mauka Community. The authorization letter will be included with the appropriate entitlement applications.

2. The table of approvals and permits in the draft environmental impact statement will be corrected to clarify that the Project District Phase I and II applications will require a public hearing with the Maui Planning Commission in West Maui and the Phase III application will only require administrative review and approval by the Planning Department.

3. The issue of affordable housing will be addressed in the draft environmental impact statement. Maui Land and Pineapple Company, Inc. will comply with County of Maui requirements for affordable housing. In fact, Maui Land and Pineapple Company, Inc. has a strong history of providing affordable housing for their employees and has complied with all requirements for affordable employee housing previously imposed as conditions of developing the existing Kapalua Resort.

   Completed West Maui projects include Nāpilihau Planned Development (174 units, in partnership with the State) and Honokeana Subdivision Phase I (38 units). Maui Land and Pineapple Company, Inc., also donated 13.5 acres of land in West Maui for the County Hale Noho Subdivision (which contains 72 homes built by the County).

   In conjunction with its Upcountry operations, Maui Land and Pineapple Company, Inc. has provided affordable employee housing in Haliimaile (176 units and 15 units) and in Makawao at the Puu Koa Subdivision (47 units).

   In 2002, Maui Land and Pineapple Company, Inc. will start development of Kapua Villages Subdivision, a new 45-lot employee subdivision project in West Maui. Maui Land and Pineapple Company, Inc. is developing this subdivision on their own accord, as a benefit for their employees. Depending on still pending County of Maui affordable housing requirements, this subdivision may satisfy, or partially satisfy, the affordable housing requirements for the Kapalua Mauka community.

   All totaled, Maui Land and Pineapple Company, Inc. has developed (independently or in partnership with the State) 450 affordable employee housing units on Maui. They have also donated land to the County for County-built affordable housing. Further, in 2002, they will provide an additional 45 lots in West Maui for employees.

4. The description for Project District 2 in the *West Maui Community Plan* allocates six acres within Project District 2 for an elementary school. While the current concept plan for the Kapalua Mauka community does not provide for a school site, Maui Land and Pineapple Company, Inc. is willing to designate a school site at another location on its West Maui property if the State Department of Education determines that there is sufficient demand. During development of the community, Maui Land and Pineapple Company, Inc. will also be subject to the Department of Education's fair share requirements for new school facilities.

   It should be noted that the State Department of Education's "Lahainaluna Complex Development Plan 1997-2017" (Department of Education, 1998), which projects school capital improvement projects over a 20-year planning time frame, does not specify a new elementary school on the Kapalua Mauka community site or in the Kapalua area.

We appreciate your participation in the review of the Environmental Assessment/Environmental Impact Statement Preparation Notice.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Project Manager

cc: Mr. Robert McNatt/Maui Land and Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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DAVID C. GOODE
Director

MILTON M. ARAKAWA, A.I.C.P.
Deputy Director

Telephone: (808) 270-7845
Fax: (808) 270-7955

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS AND WASTE MANAGEMENT
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

RALPH NAGAMINE, L.S., P.E.
Land Use and Codes Administration

Wastewater Reclamation Division

LLOYD P.C.W. LEE, P.E.
Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

Solid Waste Division

December 13, 2001

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DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

MEMO TO: JOHN E. MIN, PLANNING DIRECTOR

FROM: for DAVID GOODE, DIRECTOR OF PUBLIC WORKS AND WASTE MANAGEMENT

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE
KAPALUA MAUKA
TMK: (2) 4-2-001:001, 4-3-001:006, 007, 008

We have reviewed the subject application and have the following comments:

1. Wastewater system capacity is currently available as of September 13, 2001. The developer shall furnish a letter from Kapalua Land Company designating a portion of its wastewater allocation for this project at the time of building permit plan check.

2. Provide discussion and calculations (sewer impact study) to substantiate that the existing wastewater system is adequate to serve this project.

3. Wastewater contribution calculations are required before building permit is issued.

4. Developer is not required to pay assessment fees for this area at the current time.

5. Developer is required to fund any necessary off-site improvements to collection system and wastewater pump stations.

6. Plans should show the installation of an advance riser at each lot.

7. Indicate on the plans the ownership of each easement (in favor of which party). Note: County will not accept sewer easements that traverse private property.

8. Provide updated master plan for drainage and traffic for our review.

9. Off-street parking, loading spaces and landscaping shall be provided per Maui County Code, Chapter 19.36.

10. Public Law 101-336, Americans with Disabilities Act – Title III, require all places of public accommodation and commercial facilities be accessible to people with disabilities.

11. The proposed subdivision shall comply with the provisions of the subdivision ordinance and construction of improvements shall comply with the provisions of the grading ordinance and the drainage rules.

If you have any questions regarding this memorandum, please call Milton Arakawa at Ext. 7845.

MA:jso
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December 21, 2001

Mr. David Goode, Director
Department of Public Works and Waste Management
County of Maui
200 South High Street
Wailuku, Hawaii 96793

Dear Mr. Goode:

Subject: Environmental Assessment/Environmental Impact Statement Preparation Notice for Kapalua Mauka, Project District 2, West Maui, Maui.

Thank you for your letter dated December 13, 2001, concerning the Environmental Assessment/Environmental Impact Statement Preparation Notice for Kapalua Mauka, Project District 2, in West Maui. We offer the following responses to your comments.

1. Maui Land and Pineapple Company Inc., will provide a letter designating a portion of its wastewater allocation at the time of building permit plan check.

2. Discussion and calculations to substantiate that the existing wastewater system is adequate will be included in the draft environmental impact statement (DEIS). The DEIS will include a preliminary engineering report from the project engineer, Warren S. Unemori Engineering Inc.

3. Wastewater contribution calculations will be provided before the building permit is issued.

4. We acknowledge that the developer is not required to pay assessment fees for this area at the current time.

5. We acknowledge that the developer is required to fund any off-site improvements to collection system and wastewater pump stations.

6. The appropriate plans will show the installation of an advance riser at each lot.

7. The ownership of each easement will be indicated on the appropriate plans.

8. An updated drainage master plan and an traffic impact analysis report (TIAR) will be included in the draft EIS and provided for your review.

9. Off street parking, loading spaces, and landscaping will be provided per Chapter 19.36, Maui County Code.

10. All places of public accommodation and commercial facilities will be accessible to people with disabilities, as per Public Law 101-336, Americans with Disabilities Act, Title III.

11. The Kapalua Mauka community will comply with the provisions of the subdivision ordinance and construction of improvements will comply with the provisions of the grading ordinance and the drainage rules.

We appreciate your participation in the review of the Environmental Assessment/ Environmental Impact Statement Preparation Notice.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Project Manager

cc: Mr. Robert McNatt/Maui Land and Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-7109
Telephone (808) 270-7816 • Fax (808) 270-7833

September 10, 2001

PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu HI 96813
Attention: Mr. Tom Schnell

RE Environmental Impact Statement Preparation Notice (EISPN) - Kapalua Mauka
TMK# (2) 4-2-01:1(por), 4-3-01:6(por), 4-3-01:7(por), and 4-3-01:8(por)

Dear Mr. Schnell:

Thank you for the opportunity to review the above-mentioned document. The Department of Water Supply has the following comments:

The subject property is currently outside of the DWS service area. We understand that this project will be developed within a 20-year planning period. The 1996 West Maui Community Plan lists policies and objectives for water and utilities. One of these objectives include, "Study the feasibility of integrating all regional water system into a public water system to be managed and operated by the County". In order to achieve this, a plan for the eventual acquisition by the County of Maui of all private water systems within the region has to be developed. Integration of water systems may provide improved emergency back-up, reliability and system hydraulics. The Department of Water Supply seeks the cooperation of major land owners and private water system providers in the development of acceptable feasibility study framework for system integration.

Using system standards, the proposed project would use about 1,647,000 gallons per day(gpd). The EA/EIAPN material states that the Kapalua Water Company Ltd. owns and operates three potable water wells and a non-potable water system which serve the Kapalua Resort. We understand that the availability of potable and non-potable water within the Kapalua Mauka Community will be discussed further in the draft EIS.

The applicant will be required to provide domestic, fire, and irrigation calculations according to standards. Fire demand is determined by fire flow calculations performed by a licensed engineer. The approved fire flow calculation method for use is the "Guide for Determination of Required Fire Flow" - Insurance Service Office, 1974.

The project is located in the Maui County Planting Plan - Plant Zones 4 & 5. We encourage the applicant to utilize appropriate native and non invasive species and avoid the use of potentially invasive plants. Native plants adapted to the area, conserve water and protect the watershed from degradation due to invasive alien species. Attached is a list of appropriate plants for the zones as well as potentially invasive plants to avoid.

To further conserve water resources, we encourage the applicant to consider the following water conservation measures:

<u>Eliminate Single-Pass Cooling</u>: Single-pass, water-cooled system should be eliminated per Maui County Code Subsection 14.21.20. Although prohibited by code, single-pass water cooling is still manufactured into some models of air-conditioners, freezers, and commercial refrigerators.

<u>Utilize Low-Flow Fixtures and Devices:</u> Maui County Code Subsection 16.20A.680 requires the use of low-flow water fixtures and devices in faucets, showerheads, urinals, water closets and hose bibs. Water conserving washing machines, ice-makers and other units are also available.

<u>Maintain Fixtures to Prevent Leaks:</u> A simple, regular program of repair and maintenance can prevent the loss of hundreds or even thousands of gallons a day. Refer to the attached handout, "The Costly Drip". The applicant should establish a regular maintenance program.

<u>Limit Irrigated Turf</u>. Limit irrigated turf to 25% or less of total landscaped area.. Low-water use shrubs and ground covers can be equally attractive and require substantially less water that turf.

<u>Prevent Over-Watering By Automated Systems:</u> Provide rain-sensors on all automated irrigation controllers. Check and reset controllers at least once a month to reflect the monthly changes in evapotranspiration rates at the site. As an alternative, provide the more automated, soil-moisture sensors on controllers.

In order to protect the surface water and groundwater quality, DWS recommends that the applicant utilize Best Management Practices (BMPs) designed to minimize infiltration and runoff from daily operations We have attached sample BMPs for principle operations for reference Additional information is available from the State Department of Health.

Should you have any questions, please contact our Water Resources and Planning Division at 270-7199.

Sincerely,

D R Craddick

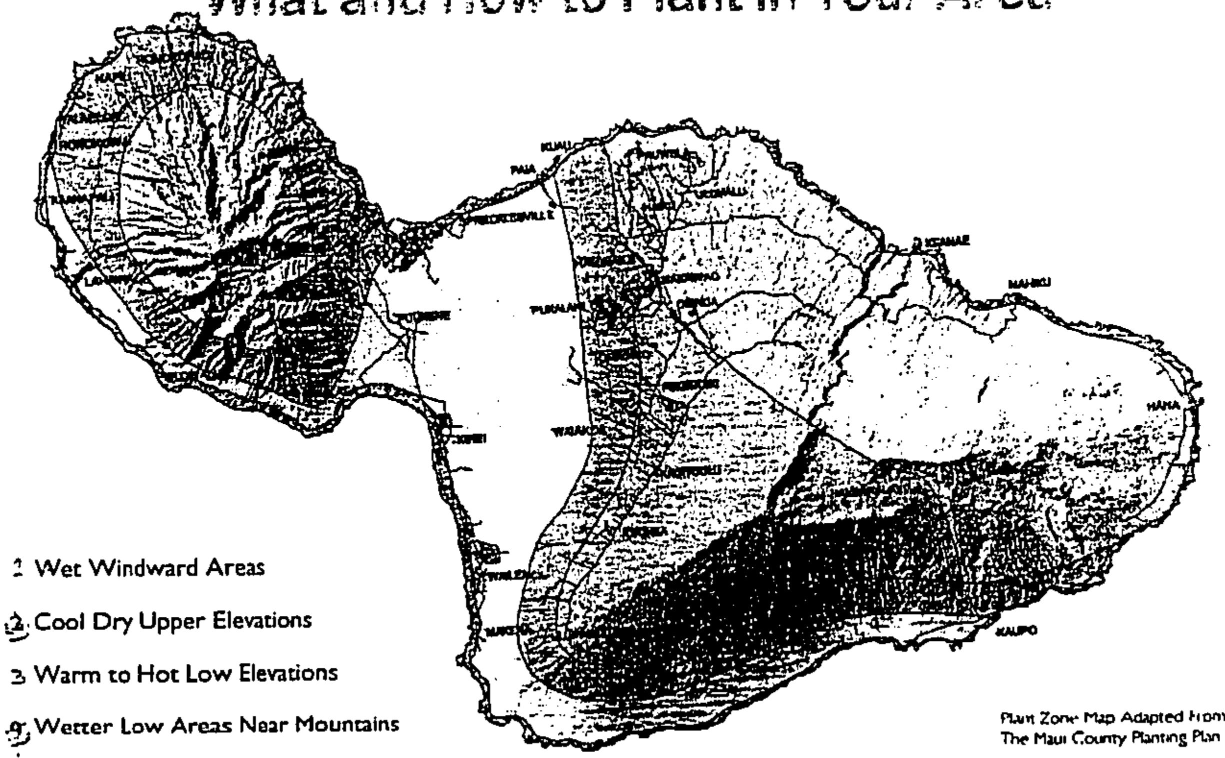
David Craddick
Director

eam

c: engineering division
applicant, with attachments:
"The Costly Drip"
Maui County Planting Plan-Plant Zones 4 & 5 "Saving Water in the Yard. What & How to Plant in Your Area"
BMPs for Erosion Prevention and Sediment Control During Construction from the Residential and Commercial Control Programs. WERF 1998

Saving Water in The Yard

What and How to Plant in Your Area



1 Wet Windward Areas

2 Cool Dry Upper Elevations

3 Warm to Hot Low Elevations

4 Wetter Low Areas Near Mountains

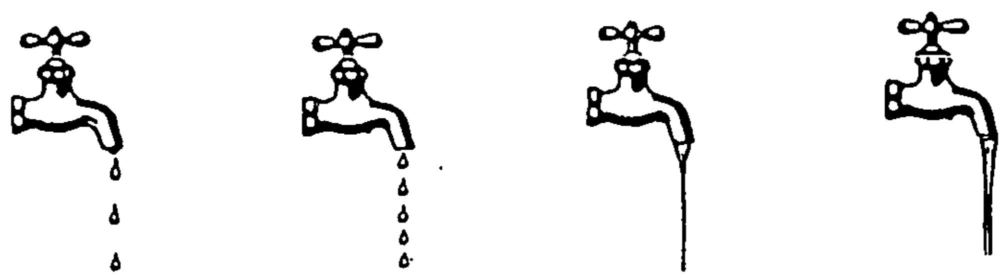
5 Windward Coastal Salt Spray Zones

Plant Zone Map Adapted From The Maui County Planting Plan

Tips From The Maui County Department of Water Supply

By Water All Things Find Life

"THE COSTLY DRIP"



Slowly Dripping Spigot Wastes 15 Gallons a day.	1/32" Leak Wastes 25 Gallons a day.	1/16" Stream Wastes 100 Gallons a Day.	1/8" Stream Wastes 400 Gallons a day.

Blue

Zone 4

Zone-specific Native and Polynesian plants for Maui County

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Sh	Artemisia mauiensis var. diffusa	Maui wormwood, 'ahinahina	2'	3'	1,000' to higher	Dry to Medium
Sh	Bidens hillebrandiana ssp. hillebrandiana	ko'oko'olau	1'	2'	sea to 1,000'	Dry to Wet
Sh	Bidens menziesii ssp. menziesii	ko'oko'olau	1'	3'		
Sh	Bidens micrantha ssp. micrantha	ko'oko'olau	1'	3'		
Sh	Cordyline fruticosa	ti, ki	6'			
Sh	Dianella sandwicensis	'uki	2'	2'	1,000' to higher	Dry to Medium
Sh	Lipochaeta lavarum	nehe	3'	3'	sea to 3,000'	Dry to Medium
Sh	Osteomeles anthyllidifolia	'ulei, eluehe	4'	6'	sea to 3,000'	Dry to Medium
Sh	Scaevola sericea	naupaka, naupaka-kahakai	6'	8'	sea to 1,000'	Dry to Medium
Sh	Solanum nelsonii	'akia, beach solanum	3'	3'	sea to 1,00'	Dry to Medium
Sh	Styphelia tameiameiae	pukiawe	6'	6'	1,000' to higher	Dry to Medium
Sh	Vitex rotundifolia	pohinahina	3'	4'	sea to 1,000'	Dry to Medium
Sh	Wikstroemia uva-ursi kauaiensis kauaiensis	'akia, Molokai osmanthus				
Sh - Tr	Broussonetia papyrifera	wauke, paper mulberry	8'	6'	sea to 1,000'	Dry to Medium
Sh - Tr	Myoporum sandwicense	naio, false sandalwood	10'	10'	sea to higher	Dry to Medium
Sh - Tr	Nototrichium sandwicense	kulu'i	8'	8'	sea to 3,000'	Dry to Medium
Sh-Tr	Dodonaea viscosa	'a'ali'i	6'	8'	sea to higher	Dry to Medium
Tr	Acacia koa	koa	50' - 100'	40' - 80'	1,500' to 4,000'	Dry to Medium
Tr	Aleurites moluccana	candlenut, kukui	50'	50'	sea to 3,000'	Medium to Wet
Tr	Calophyllum inophyllum	kamani, alexandrian laurel	60'	40'	sea to 3,000'	Medium to Wet
Tr	Canthium odoratum	Alahe'e, 'ohe'e, walahe'e	12'	8'	sea to 3,000'	Dry to Medium
Tr	Charpentiera obovata		15'			
Tr	Cordia subcordata	kou	30'	25'	sea to 1,000'	Dry to Wet
Tr	Diospyros sandwicensis	lama	12'	15'	sea to 3,000'	Dry to Medium
Tr	Hibiscus furcellatus	'akiohala, hau-hele	8'			
Tr	Metrosideros polymorpha var. macrophylla	ohi'a lehua	25'	25'	sea to 1,000'	Dry to Wet
Tr	Morinda citrifolia	indian mulberry, noni	20'	15'	sea to 1,000'	Dry to Wet

Blue

Zone 4

Zone-specific Native and Polynesian plants for Maui County

TYPE: F Fern G Grass Gr Ground Cover Sh Shrub P Palm S Sedge Tr Tree V Vine

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
F	Psilotum nudum	moa, moa kula	1'	1'	sea to 3,000'	Dry to Wet
F	Sadleria cyatheoides	'ama'u, ama'uma'u				
G	Colubrina asiatica	'anapanapa	3'	10'	sea to 1,000'	Dry to Wet
G	Eragrostis monticola	kalamalo	1'	2'	sea to 3,000'	Dry to Medium
G	Eragrostis variabilis	'emo-loa	1'	2'	sea to 3,000'	Dry to Medium
G	Fimbristylis cymosa ssp. spathacea	mau'u'aki'aki fimbristylis	0.5'	1'	sea to 1,000'	Dry to Medium
Gr	Chamaesyce celastroides var. lorifolia	'akoko	2'	3'	sea to 1,000'	Dry to Medium
Gr	Ipomoea tuboides	Hawaiian moon flower, 'uala	1'	10'	sea to 3,000'	Dry to Medium
Gr	Jacquemontia ovalifolia ssp. sandwicensis	pa'u o hi'iaka	0.5'	6'	sea to 1,000'	Dry to Medium
Gr	Lipochaeta integrifolia	nehe	1'	5'	sea to 1,00'	Dry to Medium
Gr	Peperomia leptostachya	'ala'ala-wai-nui	1'	1'	sea to 3,000'	Dry to Medium
Gr	Plumbago zeylanica	'ilie'e	1'			
Gr	Sida fallax	'ilima	0.5'	3'	sea to 1,000'	Dry to Medium
Gr	Tephrosia purpurea var. purpurea	'auhuhu	2'	2'	sea to 1,000'	Dry to Medium
Gr - Sh	Hibiscus calyphyllus	ma'o hau hele, Rock's hibiscus	3'	2'	sea to 3,000'	Dry to Medium
Gr - Sh	Lipochaeta rockii	nehe	2'	2'	sea to 3,000'	Dry to Medium
Gr - Sh	Lipochaeta succulenta	nehe	2'	5'	sea to 1,000'	Dry to Wet
P	Cocos nucifera	coconut, niu	100'	30'	sea to 1,000'	Dry to Wet
P	Pritchardia arecina	lo'ulu, hawane	40'	10'	1,000' to 3,000'	Dry to Wet
P	Pritchardia forbesiana	lo'ulu	15'			
P	Pritchardia hillebrandii	lo'ulu, fan palm	25'	15'	sea to 1,000'	Dry to Wet
S	Mariscus javanicus	marsh cypress, 'ahu'awa	0.5'	0.5'	sea to 1,000'	Dry to Medium
Sh	Argemone glauca var. decipiens	pua kala	3'	2'	sea to 3,000'	Dry to Medium
Sh	Artemisia australis	'ahinahina	2'	3'	sea to 3,000'	Dry to Medium

Purple

Zone 5

Zone-specific Native and Polynesian plants for Maui County

TYPE: F Fern G Grass Gr Ground Cover Sh Shrub P Palm S Sedge Tr Tree V Vine

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
G	Colubrina asiatica	'anapanapa	3'	10'	sea to 1,000'	Dry to Wet
G	Eragrostis variabilis	'emo-loa	1'	2'	sea to 3,000'	Dry to Medium
G	Fimbristylis cymosa ssp. spathacea	mau'u'aki'aki fimbristylis	0.5'	1'	sea to 1,000'	Dry to Medium
Gr	Boerhavia repens	alena	0.5'	4'	sea to 1,000'	Dry to Medium
Gr	Chamaesyce celastroides var. laehiensis	'akoko	2'	3'	sea to 1,000'	Dry to Medium
Gr	Cressa truxillensis	cressa	0.5'	1'	sea to 1,000'	Dry to Medium
Gr	Heliotropium anomalum var. argenteum	hinahina ku kahakai	1'	2'	sea to 1,000'	Dry to Medium
Gr	Jacquemontia ovalifolia ssp. sandwicensis	pa'u o hi'iaka	0.5'	6'	sea to 1,000'	Dry to Medium
Gr	Lipochaeta integrifolia	nehe	1'	5'	sea to 1,00'	Dry to Medium
Gr	Sesuvium portulacastrum	'akulikuli, sea-purslane	0.5'	2'	sea to 1,000'	Dry to Wet
Gr	Sida fallax	'ilima	0.5'	3'	sea to 1,000'	Dry to Medium
Gr	Tephrosia purpurea var. purpurea	'auhuhu	2'	2'	sea to 1,000'	Dry to Medium
Gr - Sh	Hibiscus calyphyllus	ma'o hau hele, Rock's hibiscus	3'	2'	sea to 3,000'	Dry to Medium
Gr - Sh	Lycium sandwicense	'ohelo-kai, 'ae'ae	2'	2'	sea to 1,000'	Dry to Medium
P	Cocos nucifera	coconut, niu	100'	30'	sea to 1,000'	Dry to Wet
P	Pritchardia hillebrandii	lo'ulu, fan palm	25'	15'	sea to 1,000'	Dry to Wet
S	Mariscus javanicus	marsh cypress, 'ahu'awa	0.5'	0.5'	sea to 1,000'	Dry to Medium
Sh	Argemone glauca var. decipiens	pua kala	3'	2'	sea to 3,000'	Dry to Medium
Sh	Artemisia australis	'ahinahina	2'	3'	sea to 3,000'	Dry to Medium
Sh	Bidens hillebrandiana ssp. hillebrandiana	ko'oko'olau	1'	2'	sea to 1,000'	Dry to Wet
Sh	Bidens mauiensis	ko'oko'olau	1'	3'	sea to 1,000'	Dry to Medium
Sh	Chenopodium oahuense	'aheahea, 'aweoweo	6'		sea to higher	Dry to Medium
Sh	Dianella sandwicensis	'uki	2'	2'	1,000' to higher	Dry to Medium
Sh	Gossypium tomentosum	mao, Hawaiian cotton	5'	8'	sea to 1,000'	Dry to Medium

Blue

Zone 4

Zone-specific Native and Polynesian plants for Maui County

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Tr	Nestegis sandwicensis	olopua	15'	15'	1,000' to 3,000'	Dry to Medium
Tr	Pandanus tectorius	hala, puhala (HALELIST)	35'	25'	sea to 1,000'	Dry to Wet
Tr	Pleomele auwahiensis	halapepe	20'			
Tr	Rauvolfia sandwicensis	hao	20'	15'	sea to 3,000'	Dry to Medium
Tr	Santalum ellipticum	coastal sandalwood, 'ili-ahi	8'	8'	sea to 3,000'	Dry to Medium
Tr	Sophora chrysophylla	mamane	15'	15'	1,000' to 3,000'	Medium
Tr	Thespesia populnea	milo	30'	30'	sea to 3,000'	Dry to Wet
V	Alyxia oliviformis	maile	Vine		sea to 6,000'	Medium to Wet

DO NOT PLANT THESE PLANTS !!!

Common name	Scientific name	Plant family
	Jasminum fluminense	Oleaceae
	Arthrostema ciliatum	Melastomataceae
	Dissotis rotundifolia	Melastomataceae
	Erigeron karvinskianus	Asteraceae
	Eucalyptus robusta	Myrtaceae
	Hedychium gardnerianum	Zingiberaceae
	Juncus planifolius	Juncaceae
	Lophostemon confertus	Myrtaceae
	Medinilla cumingii	Melastomataceae
	Medinilla magnifica	Melastomataceae
	Medinilla venosa	Melastomataceae
	Melastoma candidum	Melastomataceae
	Melinis minutiflora	Poaceae
	Olea europaea	
	Oxyspora paniculata	Melastomataceae
	Panicum maximum	Poaceae
	Paspalum urvillei	Poaceae
	Passiflora edulis	Passifloraceae
	Phormium tenax	Agavaceae
	Pinus taeda	Pinaceae
	Prosopis pallida	Fabaceae
	Pterolepis glomerata	Melastomataceae
	Rhodomyrtus tomentosa	Myrtaceae
	Schefflera actinophylla	Araliaceae
	Syzygium jambos	Myrtaceae
Australian blackwood	Acacia melanoxylon	Mimosaceae
Australian tree fern	Cyathea cooperi	Cyatheaceae
Australian tree fern	Sphaeropteris cooperi	Cyatheaceae
Beggar's tick, Spanish needle	Bidens pilosa	Asteraceae
California grass	Brachiaria mutica	Poaceae
Chinese banyon, Maylayan banyon	Ficus mirocarpa	Moraceae
Chinese violet	Asystasia gangetica	Acanthaceae
Christmasberry, Brazilian pepper	Schinus terebinthifolius	Anacardiaceae
Formosan koa	Acacia confusa	Mimosaceae
German ivy	Senecio mikanioides	Asteraceae
Japanese honeysuckle	Lonicera japonica	Caprifoliaceae
Koster's curse	Clidemia hirta	Melastomataceae
Lantana	Lantana camara	Verbenaceae
Mauritius hemp	*Furcraea foetida*	Agavaceae
Mexican ash, *tropical ash*	Fraxinus uhdei	Oleaceae
Mexican tulip poppy	Hunnemannia fumariifolia	Papaveraceae
Mules foot, *Madagascar tree fern*	Angiopteris evecta	Marattiaceae
New Zealand laurel, karakaranut	Corynocarpus laevigatus	Corynocarpaceae
New Zealand tea	Leptospermum scoparium	Myrtaceae
Pampas grass	Cortaderia jubata	Poaceae
Panama rubber tree, Mexican rubber tree	Castilloa elastica	Moraceae
Shoebutton ardisia	Ardisia elliptica	Myrsinaceae
banana poka	Passiflora mollissima	Passifloraceae

Purple

Zone 5

Zone-specific Native and Polynesian plants for Maui County

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Sh	Hedyotis spp.	au, pilo	3'	2'	1,000' to 3,000'	Dry to Wet
Sh	Lipochaeta lavarum	nehe	3'	3'	sea to 3,000'	Dry to Medium
Sh	Osteomeles anthyllidifolia	'ulei, eluehe	4'	6'	sea to 3,000'	Dry to Medium
Sh	Scaevola sericea	naupaka, naupaka-kahakai	6'	8'	sea to 1,000'	Dry to Medium
Sh	Senna gaudichaudii	kolomana	5'	5'	sea to 3,000'	Dry to Medium
Sh	Solanum nelsonii	'akia, beach solanum	3'	3'	sea to 1,00'	Dry to Medium
Sh	Vitex rotundifolia	pohinahina	3'	4'	sea to 1,000'	Dry to Medium
~~Sh~~	~~Wikstroemia uva-ursi kauaiensis kauaiensis~~	~~'akia, Molokai osmanthus~~				
Sh - Tr	Myoporum sandwicense	naio, false sandalwood	10'	10'	sea to higher	Dry to Medium
Sh-Tr	Dodonaea viscosa	'a'ali'i	6'	8'	sea to higher	Dry to Medium
Tr	Aleurites moluccana	candlenut, kukui	50'	50'	sea to 3,000'	Medium to Wet
Tr	Calophyllum inophyllum	kamani, alexandrian laurel	60'	40'	sea to 3,000'	Medium to Wet
Tr	Cordia subcordata	kou	30'	25'	sea to 1,000'	Dry to Wet
Tr	Hibiscus furcellatus	'akiohala, hau-hele	8'			
Tr	Morinda citrifolia	indian mulberry, noni	20'	15'	sea to 1,000'	Dry to Wet
Tr	Pandanus tectorius	hala, puhala (HALELIST)	35'	25'	sea to 1,000'	Dry to Wet
Tr	Thespesia populnea	milo	30'	30'	sea to 3,000'	Dry to Wet
V	Ipomoea pes-caprae	beach morning glory, pohuehue	1'			

Selection

As a general rule, it is best to select the largest and healthiest specimens. However, be sure to note that they are not pot-bound. Smaller, younger plants may result in a low rate of plant survival.[1] When selecting native species, consider the site they are to be planted in, and the space that you have to plant. For example: Mountain species such as koa and maile will not grow well in hot coastal areas exposed to strong ocean breezes. Lowland and coastal species such as wiliwili and Kou require abundant sunshine and porus soil. They will not grow well with frequent cloud cover, high rainfall and heavy soil.

Consider too, the size that the species will grow to be. It is not wise to plant trees that will grow too large.[2] Overplanting tends to be a big problem in the landscape due to the underestimation of a species' height, width or spread.

A large, dense canopied tree such as the kukui is a good shade tree for a lawn. However, it's canopy size and density of shade will limit what can be planted in the surrounding area. Shade cast by a koa and ohia lehua is relatively light and will not inhibit growth beneath it.

Keep seasons in mind when you are selecting your plants. Not all plants look good year round, some plants such as ilima will look scraggly after they have flowered and formed seeds. Avoid planting large areas with only one native plant. Mixing plants which naturally grow together will ensure the garden will look good all year round.[3] Looking at natural habitats helps to show how plants grow naturally in the landscape.

When planting an area with a mixed-ecosystem, keep in mind the size and ecological requirements of each plant. Start with the hardiest and most easily grown species, but allow space for fragile ones in subsequent plantings.

Acquiring natives

Plants in their wild habitat must be protected and maintained. It is best and easiest to get your plants from nurseries (see list), or friend's gardens. Obtain proper permits from landowners and make sure you follow a few common sense rules:

- collect sparingly from each plant or area.
- some plants are on the state or Federal Endangered Species list. Make sure you get permits (see app. A,B)

[1] K. Nagata, P.6

[2] K. Nagata, P.9

[3] Nagata, P.9

DO NOT PLANT THESE PLANTS !!!

Common name	Scientific name	Plant family
	Jasminum fluminense	Oleaceae
	Arthrostema ciliatum	Melastomataceae
	Dissotis rotundifolia	Melastomataceae
	Erigeron karvinskianus	Asteraceae
	Eucalyptus robusta	Myrtaceae
	Hedychium gardnerianum	Zingiberaceae
	Juncus planifolius	Juncaceae
	Lophostemon confertus	Myrtaceae
	Medinilla cumingii	Melastomataceae
	Medinilla magnifica	Melastomataceae
	Medinilla venosa	Melastomataceae
	Melastoma candidum	Melastomataceae
	Melinis minutiflora	Poaceae
	Olea europaea	
	Oxyspora paniculata	Melastomataceae
	Panicum maximum	Poaceae
	Paspalum urvillei	Poaceae
	Passiflora edulis	Passifloraceae
	Phormium tenax	Agavaceae
	Pinus taeda	Pinaceae
	Prosopis pallida	Fabaceae
	Pterolepis glomerata	Melastomataceae
	Rhodomyrtus tomentosa	Myrtaceae
	Schefflera actinophylla	Araliaceae
	Syzygium jambos	Myrtaceae
Australian blackwood	Acacia melanoxylon	Mimosaceae
Australian tree fern	Cyathea cooperi	Cyatheaceae
Australian tree fern	Sphaeropteris cooperi	Cyatheaceae
Beggar's tick, Spanish needle	Bidens pilosa	Asteraceae
California grass	Brachiaria mutica	Poaceae
Chinese banyon, Maylayan banyon	Ficus microcarpa	Moraceae
Chinese violet	Asystasia gangetica	Acanthaceae
Christmasberry, Brazilian pepper	Schinus terebinthifolius	Anacardiaceae
Formosan koa	Acacia confusa	Mimosaceae
German ivy	Senecio mikanioides	Asteraceae
Japanese honeysuckle	Lonicera japonica	Caprifoliaceae
Koster's curse	Clidemia hirta	Melastomataceae
Lantana	Lantana camara	Verbenaceae
Mauritius hemp	Furcraea foetida	Agavaceae
Mexican ash, tropical ash	Fraxinus uhdei	Oleaceae
Mexican tulip poppy	Hunnemannia fumariifolia	Papaveraceae
Mules foot, Madagascar tree fern	Angiopteris evecta	Marattiaceae
New Zealand laurel, karakaranui	Corynocarpus laevigatus	Corynocarpaceae
New Zealand tea	Leptospermum scoparium	Myrtaceae
Pampas grass	Cortaderia jubata	Poaceae
Panama rubber tree, Mexican rubber tree	Castilloa elastica	Moraceae
Shoebutton ardisia	Ardisia elliptica	Myrsinaceae
banana poka	Passiflora mollissima	Passifloraceae

Soil

Once you have selected your site and the plants you wish to establish there, you must look at the soil conditions on the site. Proper soil is necessary for the successful growth of most native plants, which preform poorly in hard pan, clay or adobe soils. If natives are to be planted in these types of soil, it would be wise to dig planting holes several times the size of the rootball and backfill with 50-75% compost.[4] A large planting hole ensures the development of a strong root system. The plant will have a headstart before the roots penetrate the surrounding poor soil.[5]

It is recommended that native plants not be planted in ground that is more dense than potting soil. If there is no alternative, dig a hole in a mound of soil mixed with volcanic cinder which encourages maximum root development. Fill the hole with water, if the water tends to puddle or drain too slowly, dig a deeper hole until the water does not puddle longer than 1 or 2 minutes.[6] Well-drained soil is one of the most important things when planting natives as you will see in the next section.

Irrigation

Most natives do very poorly in waterlogged conditions. Do not water if the soil is damp. Water when the soil is dry and the plants are wilting. Once established, a good soaking twice a week should suffice. Deep soaking encourages the development of stronger, and deeper root systems. This is better than frequent and shallow watering which encourage weaker, more shallow root systems.

The following is a watering schedule from Kenneth Nagata's Booklet, *How To Plant A Native Hawaiian Garden*:

WATER REQUIREMENT	WATERING FREQUENCY
Heavy	3x / week
Moderate	2x / week
Light	1x / week

Red clay soils hold more water for a longer period of time than sandy soils do. If your area is very sunny or near a beach, things will dry out faster. Even in the area of one garden, there are parts that will need more or less water. Soils can vary and amount of shade and wind differ. After plants are established (a month or two for most plants, up to a year for some trees), you can back off watering.

[4] Nagata, p. 6

[5] Nagata, p. 8

[6] Nagata, p. 8

Automatic sprinkler systems are expensive to install and must be checked and adjusted regularly. Above-ground systems allow you to monitor how much water is being put out, but you lose a lot due to malfunctioning of sprinkler heads and wind. The most efficient way to save water and make sure your plants get enough water, is to hand-water. This way you are getting our precious water to the right places in the right amounts.[7]

Fertilizer

An all-purpose fertilizer 10-10-10 is adequate for most species. They should be applied at planting time, 3 months later, and 6 months thereafter. Use half the dosage recommended for ornamentals and pay special attention to native ferns which are sensitive to strong fertilizers. Use of organic composts and aged animal manures is suggested instead of chemical fertilizers. In addition, use of cinders for providing trace minerals is strongly recommended.[8]

Natives are plants which were here hundreds of years before the polynesians inhabited the Hawaiian Islands. They were brought here by birds, or survived the harsh ocean conditions to float here. They are well-adapted to Hawaii's varying soil and environmental conditions. This is why they make prime specimens for a xeriscape garden. However, natives will not thrive on their own, especially under harsh conditions. On the other hand, like any other plant, if you over-water and over-fertilize them, they will die. Follow the instructions given to you by the nursery you buy the plant from, or from this booklet. Better yet, buy a book (suggested readings can be found in the bibliography in the back of this pamphlet), read it, and learn more about native plants. I guarantee that you will be pleased with the results.

[7] Bornhorst, p. 19-20

[8] Nagata, p. 6

Propagation

There are many ways to propagate and plant-out native Hawaiian species. One of the most thourough and helpful book is Heidi Bornhorst's book, *Growing Native Hawaiian Plants*. The easiest, and best way to obtain natives for the novice gardener is to get them from a reputable nursery (see appendix c). That way all you will have to do is know how to transplant (if necessary) and plant-out when you are ready. These are the two methods I have listed here.

Transplanting

1. Use pots that are one size bigger than the potted plant is in
2. Get your potting medium ready

Good potting medium is a ½, ½ mixture of peat moss and perlite. If the plant is from a dry or coastal area, add chunks of cinder or extra perlite. If it is a wet forest species, add more peat moss or compost. Be aware that peat moss is very acidic and certain plants react severely to acidity.

If the plant is to eventually be planted into the ground, make a mix of equal parts peat moss, perlite, and soil from the area in which the plant is to be planted. Slow-release fertilizer can be mixed into the potting medium.

3. Once pots, potting medium, fertilizer and water are ready, you can begin re-potting.

Keep the plant stem at the same depth it was in the original pot. Avoid putting the plant in too large a pot, as the plant may not be able to soak up all the water in the soil and the roots may drown and rot.

Mix potting medium and add slow-release fertilizer at this time. Pre-wet the medium to keep dust down and lessen shock to the plant. Put medium in bottom of pot. Measure for the correct depth in the new pot. Make sure there is from ½ to 2 inches from the top of the pot so the plant can get adequate water. Try to stand the plant upright and center the stem in the middle of the pot.

Water the plant thoroughly after transplanting. A vitamin B-1 transplanting solution can help to lessen the transplant shock. Keep the plant in the same type of environment as it was before, sun or shade. If roots were broken, trimm off some of the leaves to compensate for the loss.[9]

Planting out

1. Plant most native Hawaiian plants in a sunny location in soil that is well-drained.
2. Make the planting hole twice as wide as the root ball or present pot, and just as deep.

If the soil is clay-like, and drains slowly, mix in some coarse red or bland cinder, coarse perlite or coarse compost. Place some slow-release fertilizer at the bottom of the hole.

3. Carefully remove the plant from the container and place it in the hole.

The top of the soil should be at the same level as the top of the hole, if it is too high or too low, adjust the soil level so that the plant is at the right depth.

4. Water thoroughly after you transplant.

Mulch

Most natives cannot compete with weeds, and therefore must be weeded around constantly in order to thrive. Mulch is a practical alternative, which discourages and prevents weeds from growing.

Hawaii's hot, humid climate leads to the breaking down of organic mulches. Thick organic mulches such as wood chips and leaves, may also be hiding places for pests.

Stone mulches are attractive, permanent and can help to improve soil quality. Red or black cinder, blue rock chips, smooth river rocks and coral chips are some natural choices.[10] Macadamia nut hulls are also easy to find and can make a nice mulch.[11]

Never pile up mulch right next to the stem or trunk of a plant, keep it a few inches away.

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[9] Bornhorst, p.20-21

[10] Bornhorst, p. 24

[11] Nagata, p. 7

PLACES TO SEE NATIVES ON:

The following places propagate native Hawaiian plants from seeds and/or cuttings. Their purpose is to protect and preserve these native plants. Please contact them before going to view the sites, they can provide valuable information and referral to other sources.

Maui:

1. Hoolawa Farms, P.O. Box 731, Haiku, Hawaii, 96708	572-4835
2. The Hawaiian Collection, 1127 Manu St., Kula, Hawaii, 96790	878-1701
3. Kula Botanical Gardens, RR 4, Box 228, Kula, Hawaii, 96790	878-1715
4. Maui Botanical Gardens, Kanaloa Avenue across from stadium	243-7337
5. Kula Forest Reserve, access road at the end of Waipouli Rd. Call the Maui District Forester	984-8100
6. Wailea Point, Private Condominium residence, 4000 Wailea Alanui, public access points at Four Seasons Resort or Polo Beach	875-9557
7. Kahanu Gardens, National Tropical Botanical Garden, Alau Pl, Hana, Hawaii, 96713	248-8912
9. Kahului Library Courtyard, 20 School Street, Kahului, Hawaii	873-3097

ZONES

The Maui County Planting Plan has compiled a system of 5 zones of plant growth for Maui County. The descriptions of zones and maps for these zones are as follows:

Zone 1:
Wet areas on the windward side of the island. More than 40 inches of rain per year. Higher than 3,000 feet.

Zone 2:
Cool, dry areas in higher elevations (above 1,000 feet). 20 to 40 inches of rain per year.

Zone 3:
Low, drier areas, warm to hot. Less than 20 inches of rain per year. Sea level to 1,000 feet.

Zone 4:
Lower elevations which are wetter due to proximity of mountains. 1,000 to 3,000 feet.

Zone 5:
Salt spray zones in coastal areas on the windward side.

These zones are to be used as a general guide to planting for Maui County. In addition to looking at the maps, read the descriptions of the zones and decide which zone best fits your area. Plants can be listed in more than one zone and can be planted in a variety of conditions. For best results, take notes on the rainfall, wind, sun and salt conditions of your site. Use the zones as a general guide for selection and read about the plants to decide which best fits your needs as far as care and or function.

PLACES TO BUY NATIVES ON:

Maui:

1.	Hoolawa Farms P O Box 731 Haiku HI 96708 The largest and best collection of natives in the state. They will deliver, but it's worth the drive to go and see! Will propagate upon request	575-5099
2.	Kula : Nursery Many natives in stock Get most of their plants from Hoolawa Farms They take special requests	878-2551
3.	Kihei Garden and Landscape	244-3804
4.	Kihana Nursery, Kihei	879-1165
5.	The Hawaiian Collection Specialize in Sandalwood propagation Will propagate special requests	878-1701

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EPA

Guidance Specifying Management Measures For Sources Of Nonpoint Pollution In Coastal Waters

Issued Under the Authority of
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Reauthorization Amendments of 1990

measured sediment loading rates associated with construction activities found across the United States. As seen in Table 4-14, erosion rates from natural areas such as undisturbed forested lands are typically less than one ton/acre/year, while erosion from construction sites ranges from 7.2 to over 1,000 tons/acre/year.

Table 4-14. Erosion and Sediment Problems Associated With Construction

Location	Problem	Reference
United States	Sediment loading rates vary from 36.5 to 1,000 ton/ac/yr. These are 5 to 500 times greater than those from undeveloped land. Approximately 600 million tons of soil erodes from developed sites each year. Construction site sediment in runoff can be 10 to 20 times greater than that from agricultural lands.	York County Soil and Water Conservation District, 1990
Franklin County, FL	Sediment yield (ton/ac/yr): forest < 0.5; rangeland < 0.5; tilled 1.4; construction site 30; established urban < 0.5	Franklin County, FL
Wisconsin	Erosion rates range from 30 to 200 ton/ac/yr (10 to 20 times those of cropland).	Wisconsin Legislative Council, 1991
Washington, DC	Erosion rates range from 35 to 45 ton/ac/yr (10 to 100 times greater than agriculture and stabilized urban land uses).	MWCOG, 1987
Anacostia River Basin, VA, MD, DC	Sediment yields from portions of the Anacostia Basin have been estimated at 75,000 to 132,000 ton/yr.	U.S. Army Corps of Engineers, 1990
Washington	Erosion rates range from 50 to 500 ton/ac/yr. Natural erosion rates from forests or well-sodded prairies are 0.01 to 1.0 ton/ac/yr.	Washington Department of Ecology, 1989
Anacostia River Basin, VA, MD, DC	Erosion rates range from 7.2 to 100.8 ton/ac/yr.	USGS, 1978
Alabama North Carolina Louisiana Oklahoma Georgia Texas Tennessee Pennsylvania Ohio Kentucky	1.4 million tons eroded per year. 6.7 million tons eroded per year. 5.1 million tons eroded per year. 4.2 million tons eroded per year. 3.8 million tons eroded per year. 3.5 million tons eroded per year. 3.3 million tons eroded per year. 3.1 million tons eroded per year. 3.0 million tons eroded per year. 3.0 million tons eroded per year.	Woodward-Clyde, 1991

ESC plan. Erosion controls have distinct advantages over sediment controls. Erosion controls reduce the amount of sediment transported off-site, thereby reducing the need for sediment controls. When erosion controls are used in conjunction with sediment controls, the size of the sediment control structures and associated maintenance may be reduced, decreasing the overall treatment costs (SWRPC, 1991).

3. Management Measure Selection

This management measure was selected to minimize sediment being transported outside the perimeter of a construction site through two broad performance goals: (1) reduce erosion and (2) retain sediment onsite, to the extent practicable. These performance goals were chosen to allow States and local governments flexibility in specifying practices appropriate for local conditions.

While several commentors responding to the draft (May 1991) guidance expressed the need to define "more measurable, enforceable ways" to control sediment loadings, other commentors stressed the need to draft management measures that do not conflict with existing State programs and allow States and local governments to determine appropriate practices and design standards for their communities. These management measures were selected because virtually all coastal States control construction activities to prevent erosion and sediment loss.

The measures were specifically written for the following reasons:

(1) Predevelopment loadings may vary greatly, and some sediment loss is usually inevitable;

(2) Current practice is built on the use of systems of practices selected based on site-specific conditions; and

(3) The combined effectiveness of erosion and sediment controls in systems is not easily quantified.

4. Erosion Control Practices

As discussed more fully at the beginning of this chapter and in Chapter 1, the following practices are described for illustrative purposes only. State programs need not require implementation of these practices. However, as a practical matter, EPA anticipates that the management measure set forth above generally will be implemented by applying one or more management practices appropriate to the source, location, and climate. The practices set forth below have been found by EPA to be representative of the types of practices that can be applied successfully to achieve the management measure described above.

Erosion controls are used to reduce the amount of sediment that is detached during construction and to prevent sediment from entering runoff. Erosion control is based on two main concepts: (1) disturb the smallest area of land possible for the shortest period of time, and (2) stabilize disturbed soils to prevent erosion from occurring.

■ *a. Schedule projects so clearing and grading are done during the time of minimum erosion potential.*

Often a project can be scheduled during the time of year that the erosion potential of the site is relatively low. In many parts of the country, there is a certain period of the year when erosion potential is relatively low and construction scheduling could be very effective. For example, in the Pacific region if construction can be completed during the 6-month dry season (May 1 - October 31), temporary erosion and sediment controls may not be needed. In addition, in some parts of the country erosion potential is very high during certain parts of the year such as the spring thaw in northern areas. During this time of year, melting snowfall generates a constant runoff that can erode soil. In addition, construction vehicles can easily turn the soft, wet ground into mud, which is more easily washed offsite. Therefore, in the north, limitations should be placed on grading during the spring thaw (Goldman et al., 1986).

h. *Cover or stabilize topsoil stockpiles.*

Unprotected stockpiles are very prone to erosion and therefore stockpiles must be protected. Small stockpiles can be covered with a tarp to prevent erosion. Large stockpiles should be stabilized by erosion blankets, seeding, and/or mulching.

i. *Use wind erosion controls.*

Wind erosion controls limit the movement of dust from disturbed soil surfaces and include many different practices. Wind barriers block air currents and are effective in controlling soil blowing. Many different materials can be used as wind barriers, including solid board fence, snow fences, and bales of hay. Sprinkling moistens the soil surface with water and must be repeated as needed to be effective for preventing wind erosion (Delaware DNREC, 1989); however, applications must be monitored to prevent excessive runoff and erosion.

j. *Intercept runoff above disturbed slopes and convey it to a permanent channel or storm drain.*

Earth dikes, perimeter dikes or swales, or diversions can be used to intercept and convey runoff above disturbed areas. An earth dike is a temporary berm or ridge of compacted soil that channels water to a desired location. A perimeter dike/swale or diversion is a swale with a supporting ridge on the lower side that is constructed from the soil excavated from the adjoining swale (Delaware DNREC, 1989). These practices should be used to intercept flow from denuded areas or newly seeded areas to keep the disturbed areas from being eroded from the uphill runoff. The structures should be stabilized within 14 days of installation. A pipe slope drain, also known as a pipe drop structure, is a temporary pipe placed from the top of a slope to the bottom of the slope to convey concentrated runoff down the slope without causing erosion (Delaware DNREC, 1989).

k. *On long or steep, disturbed, or man-made slopes, construct benches, terraces, or ditches at regular intervals to intercept runoff.*

Benches, terraces, or ditches break up a slope by providing areas of low slope in the reverse direction. This keeps water from proceeding down the slope at increasing volume and velocity. Instead, the flow is directed to a suitable outlet, such as a sediment basin or trap. The frequency of benches, terraces, or ditches will depend on the erodibility of the soils, steepness and length of the slope, and rock outcrops. This practice should be used if there is a potential for erosion along the slope.

l. *Use retaining walls.*

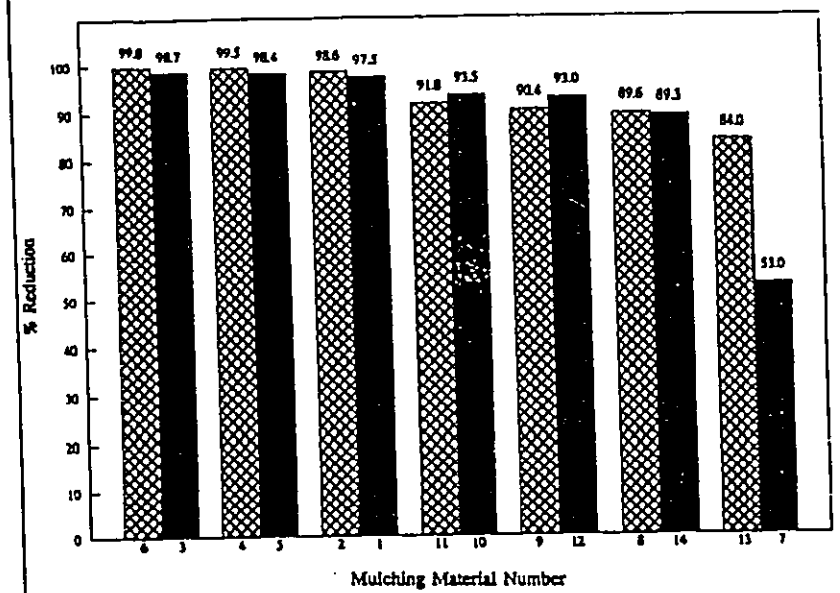
Often retaining walls can be used to decrease the steepness of a slope. If the steepness of a slope is reduced, the runoff velocity is decreased and, therefore, the erosion potential is decreased.

m. *Provide linings for urban runoff conveyance channels.*

Often construction increases the velocity and volume of runoff, which causes erosion in newly constructed or existing urban runoff conveyance channels. If the runoff during or after construction will cause erosion in a channel, the channel should be lined or flow control BMPs installed. The first choice of lining should be grass or sod since this reduces runoff velocities and provides water quality benefits through filtration and infiltration. If the velocity in the channel would erode the grass or sod, then riprap, concrete, or gabions can be used.

n. *Use check dams.*

Check dams are small, temporary dams constructed across a swale or channel. They can be constructed using gravel or straw bales. They are used to reduce the velocity of concentrated flow and, therefore, to reduce the erosion in



Mulch Material	Characteristics
1	100% wheat straw/top net
2	100% wheat straw/two nets
3	70% wheat straw/30% coconut fiber
4	70% wheat straw/30% coconut fiber
5	100% coconut fiber
6	Nylon monofilament/two nets
7	Nylon monofilament/rigid/bonded
8	Vinyl monofilament/flexible/bonded
9	Curled wood fibers/top net
10	Curled wood fibers/two nets
11	Antiwash netting (jute)
12	Interwoven paper and thread
13	Uncrimped wheat straw – 2,242 kg/ha
14	Uncrimped wheat straw – 4,484 kg/ha

Figure 4-6. Actual soil loss reductions for different mulch treatments (adapted from Harding, 1990).

r. Use sodding.

Sodding permanently stabilizes an area. Sodding provides immediate stabilization of an area and should be used in critical areas or where establishment of permanent vegetation by seeding and mulching would be difficult. Sodding is also a preferred option when there is a high erosion potential during the period of vegetative establishment from seeding.

s. Use wildflower cover.

Because of the hardy drought-resistant nature of wildflowers, they may be more beneficial as an erosion control practice than turf grass. While not as dense as turfgrass, wildflower thatches and associated grasses are expected to be as effective in erosion control and contaminant absorption. Because thatches of wildflowers do not need fertilizers, pesticides, or herbicides, and watering is minimal, implementation of this practice may result in a cost savings (Brash et al., undated). In 1987, Howard County, Maryland, spent $690.00 per acre to maintain turfgrass areas, compared to only $31.00 per acre for wildflower meadows (Wilson, 1990).

A wildflower stand requires several years to become established; maintenance requirements are minimal once the area is established (Brash et al., undated).

5. Sediment Control Practices[4]

As discussed more fully at the beginning of this chapter and in Chapter 1, the following practices are described for illustrative purposes only. State programs need not require implementation of these practices. However, as a practical matter, EPA anticipates that the management measure set forth above generally will be implemented by applying one or more management practices appropriate to the source, location, and climate. The practices set forth below have been found by EPA to be representative of the types of practices that can be applied successfully to achieve the management measure described above.

Sediment controls capture sediment that is transported in runoff. Filtration and detention (gravitational settling) are the main processes used to remove sediment from urban runoff.

a. Sediment Basins

Sediment basins, also known as silt basins, are engineered impoundment structures that allow sediment to settle out of the urban runoff. They are installed prior to full-scale grading and remain in place until the disturbed portions of the drainage area are fully stabilized. They are generally located at the low point of sites, away from construction traffic, where they will be able to trap sediment-laden runoff.

Sediment basins are typically used for drainage areas between 5 and 100 acres. They can be classified as either temporary or permanent structures, depending on the length of service of the structure. If they are designed to function for less than 36 months, they are classified as "temporary"; otherwise, they are considered permanent structures. Temporary sediment basins can also be converted into permanent urban runoff management ponds. When sediment basins are designed as permanent structures, they must meet all standards for wet ponds.

b. Sediment Trap

Sediment traps are small impoundments that allow sediment to settle out of runoff water. Sediment traps are typically installed in a drainageway or other point of discharge from a disturbed area. Temporary diversions can be

[4] Adapted from Goldman (1986).

erodible areas, maximizing the distance eroded material must travel before reaching the drainage system, and locating roads away from sensitive areas may be used to reduce erosion.

Table 4-15 contains the available cost and effectiveness data for some of the erosion controls listed above. Information on the effectiveness of individual nonstructural controls was not available. All reported effectiveness data assume that controls are properly designed, constructed, and maintained. Costs have been broken down into annual capital costs, annual maintenance costs, and total annual costs (including annualization of the capital costs).

b. Sediment Control Practices

Regular inspection and maintenance are needed for most erosion control practices to remain effective. The effectiveness of sediment controls will depend on the size of the construction site and the nature of the runoff flows. Sediment basins are most appropriate for drainage areas of 5 acres or greater. In smaller areas with concentrated flows, silt traps may suffice. Where concentrated flow leaves the site and the drainage area is less than 0.5 ac/100 ft of flow, filter fabric fences may be effective. In areas where sheet flow leaves the site and the drainage area is greater than 0.5 acre/100 ft of flow, perimeter dikes may be used to divert the flow to a sediment trap or sediment basin. Urban runoff inlets may be protected using straw bales or diversions to filter or route runoff away from the inlets.

Table 4-16 describes the general cost and effectiveness of some common sediment control practices.

c. Comparisons

Figure 4-7 illustrates the estimated TSS loading reductions from Maryland construction sites possible using a combination of erosion and sediment controls in contrast to using only sediment controls. Figure 4-8 shows a comparison of the cost and effectiveness of various erosion control practices. As can be seen in Figure 4-8, seeding or seeding and mulching provide the highest levels of control at the lowest cost.

Table 4-16. ESC Quantitative Effectiveness and Cost Summary for Sediment Control Practices

Practice	Design Constraints or Purpose	Percent Removal of TSS	Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Sediment basin	Minimum drainage area = 5 acres, maximum drainage area = 100 acres	Average: 70% Observed range: 55% - 100% References: Schueler, 1990; Engle, BW and Jarrett, AR, 1990; Baumann, 1990	2	Less than 50,000 ft^3 storage Average: $0.60 per ft^3 storage ($1,100 per drainage acre[c]) Range: $0.20 - $1.30 per ft^3 Greater than 50,000 ft^3 storage Average: $0.3 per ft^3 storage ($550 per drainage acre[c]) Range: $0.10 - $0.40 per ft^3 References: SWRPC, 1991	Average: 25% Range: 25% References: Denver COG cited in SWRPC, 1991; SWRPC, 1991	Less than 50,000 ft^3 storage $0.40 per ft^3 storage $700 per drainage acre[b] Greater than 50,000 ft^3 storage $0.20 per ft^3 storage $900 per drainage acre[c]
Sediment trap	Maximum drainage area = 5 acres	Average: 60% Observed range: (-7%) - 100% References: Schueler, et al., 1990; Tahoe Regional Planning Agency, 1989; Baumann, 1990	1.5	Average: $0.60 per ft^3 storage ($1,100 per drainage acre[c]) Range: $0.20 - $2.00 per ft^3 References: Denver COG cited in SWRPC, 1991; SWRPC, 1991; Goldman, 1986	Average: 20% Range: 20% References: Denver COG cited in SWRPC, 1991; SWRPC, 1991	$0.70 per ft^3 storage $1,300 per drainage acre[c]
Filter Fabric Fence	Maximum drainage area = 0.5 acre per 100 feet of fence. Not to be used in concentrated flow areas.	Average: 70% Observed range: 0% - 100% sand: 80% - 99% silt-loam: 50% - 80% silt-clay-loam: 0% - 20% References: Munson, 1991; Fisher et al., 1984; Minnesota Pollution Control Agency, 1989	0.5	Average: $3 per lin ft ($700 per drainage acre[c] Range: $1 - $8 per lin ft References: Wisconsin DOT cited in SWRPC, 1991; SWRPC, 1991; Goldman, 1986; Virginia, 1991; NC State, 1990	Average: 100% Range: 100% References: SWRPC, 1991	$7 per lin ft $850 per drainage acre[c]

4-78
III. Construction Activities

Table 4-15. (Continued)

Practice	Design Constraints or Purpose	Percent Removal of TSS	Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Mulch	Temporary stabilization of disturbed area.	Observed range: sand: (20% slope / 50% slope) wood fiber @ 1500 lb/ac: 50-60% / 0-20% wood fiber @ 3000 lb/ac: 50-85% / 50-70% straw @ 3000 lb/ac: 90-100% / 95% Silt-loam: (20% slope / 50% slope) wood fiber @ 1500 lb/ac: 20-60% / 40-60% wood fiber @ 3000 lb/ac: 60-90% / 60-70% straw @ 3000 lb/ac: 80-95% / 70-90% Silt-clay-loam: (10-30% slope / 30-50% slope) wood fiber @ 1500 lb/ac: 5% / – wood fiber @ 3000 lb/ac: 40% / -- jute netting: 30-60% / 30% straw @ 3000 lb/ac: 40-70% / 20-40% wood chips @ 10,000 lb/ac: 60-80% / 50-60% mulch blanket: 60-80% / 50-60% excelsior blanket: 60-80% / 50-80% multiple treatment (straw and jute): 90% / 90% References: Minnesota Pollution Control Agency, 1989; Kay, 1983 cited in Goldman, 1986	Straw mulch: 0.25 Wood fiber mulch: 0.33 Jute netting: 0.33 Straw and jute: 0.33	Straw mulch: Average: $1,700 per acre Range: $500 - $5,000 per acre References: Wisconsin DOT cited in SWRPC, 1991; Washington DOT, 1990; Virginia, 1980 Wood fiber mulch: Average: $1,000 per acre Range: $100 - $2,000 per acre References: Washington DOT, 1990; Virginia, 1980 Jute netting: Average: $3,700 per acre Range: $3,500-$4,100 per acre References: Washington DOT, 1990; Virginia, 1980 Straw and jute: Average: $5,400 per acre Range: $4,000-$9,100 per acre References: Washington DOT, 1990; Virginia, 1980	Average: NA[b] Range: NA References: None	Straw mulch: $7,500 per acre Wood fiber mulch: $3,500 per acre Jute netting: $12,500 per acre Straw and jute: $18,000 per acre

EPA-840-B-92-002 January 1993
Chapter 4

Table 4-15. (Continued)

Practice	Design Constraints or Purpose	Percent Removal of TSS	Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Vegetative Filter Strip	Must have sheet flow.	Average: 70% Observed Range: 20% - 80% References: Hayes and Hairston, 1983 cited in Casman, 1990; Dillaha et al., 1989, cited in Glick et al., 1991; Virginia Department of Conservation, 1987; Nonpoint Source Control Task Force, 1983 cited in Minnesota PCA, 1989; Schueler, 1987	2	Established from existing vegetation- Average: $0 Range: $0 References: Schueler, 1987 Established from sod- Average: $11,300 per acre Range: $4,500 - $48,000 per acre References: Schueler, 1987; SWRPC, 1991	Average: NA Range: NA References: None	NA

NA - Not available.
[a] Useful life estimated as length of construction project (assumed to be 2 years)
[e] For Total Annual Cost, assume Annual Maintenance Cost=20% of construction cost.
[b] Assumes trap volume = 1800 cf/ac (0.5 inches runoff per acre).
[c] Assumes drainage area of 0.5 acre per 100 feet of fence (maximum allowed).
[d] Assumes drainage area of 0.25 acre per 100 feet of barrier (maximum allowed).

B. Construction Site Chemical Control Management Measure

(1) Limit application, generation, and migration of toxic substances;

(2) Ensure the proper storage and disposal of toxic materials; and

(3) Apply nutrients at rates necessary to establish and maintain vegetation without causing significant nutrient runoff to surface waters.

1. Applicability

This management measure is intended to be applied by States to all construction sites less than 5 acres in area and to new, resurfaced, restored, and reconstructed road, highway, and bridge construction projects. This management measure does not apply to: (1) construction of a detached single family home on a site of 1/2 acre or more or (2) construction that does not disturb over 5,000 square feet of land on a site. (NOTE: All construction activities, including clearing, grading, and excavation, that result in the disturbance of areas greater than or equal to 5 acres or are a part of a larger development plan are covered by the NPDES regulations and are thus excluded from these requirements.) Under the Coastal Zone Act Reauthorization Amendments of 1990, States are subject to a number of requirements as they develop coastal NPS programs in conformance with this management measure and will have flexibility in doing so. The application of management measures by States is described more fully in *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance*, published jointly by the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce.

2. Description

The purpose of this management measure is to prevent the generation of nonpoint source pollution from construction sites due to improper handling and usage of nutrients and toxic substances, and to prevent the movement of toxic substances from the construction site.

Many potential pollutants other than sediment are associated with construction activities. These pollutants include pesticides (insecticides, fungicides, herbicides, and rodenticides); fertilizers used for vegetative stabilization; petrochemicals (oils, gasoline, and asphalt degreasers); construction chemicals such as concrete products, sealers, and paints; wash water associated with these products; paper; wood; garbage; and sanitary wastes (Washington State Department of Ecology, 1991).

The variety of pollutants present and the severity of their effects are dependent on a number of factors:

(1) The nature of the construction activity. For example, potential pollution associated with fertilizer usage may be greater along a highway or at a housing development than it would be at a shopping center development because highways and housing developments usually have greater landscaping requirements.

(2) The physical characteristics of the construction site. The majority of all pollutants generated at construction sites are carried to surface waters via runoff. Therefore, the factors affecting runoff volume,

local authorities if the development is near sensitive waterbodies. The addition of lime can also affect the pH of sensitive waters, making them more alkaline.

Improper fueling and servicing of vehicles can lead to significant quantities of petroleum products being dumped onto the ground. These pollutants can then be washed off site in urban runoff, even when proper erosion and sediment controls are in place. Pollutants carried in solution in runoff water, or fixed with sediment crystalline structures, may not be adequately controlled by erosion and sediment control practices (Washington Department of Ecology, 1991). Oils, waxes, and water-insoluble pesticides can form surface films on water and solid particles. Oil films can also concentrate water-soluble insecticides. These pollutants can be nearly impossible to control once present in runoff other than by the use of very costly water-treatment facilities (Washington Department of Ecology, 1991).

After spill prevention, one of the best methods to control petroleum pollutants is to retain sediments containing oil on the construction site through use of erosion and sediment control practices. Improved maintenance and safe storage facilities will reduce the chance of contaminating a construction site. One of the greatest concerns related to use of petroleum products is the method for waste disposal. The dumping of petroleum product wastes into sewers and other drainage channels is illegal and could result in fines or job shutdown.

The primary control method for solid wastes is to provide adequate disposal facilities. Erosion and sediment control structures usually capture much of the solid waste from construction sites. Periodic removal of litter from these structures will reduce solid waste accumulations. Collected solid waste should be removed and disposed of at authorized disposal areas.

Improperly stored construction materials, such as pressure-treated lumber or solvents, may lead to leaching of toxics to surface water and ground water. Disposal of construction chemicals should follow all applicable State and local laws that may require disposal by a licensed waste management firm.

3. Management Measure Selection

This management measure was selected based on the potential for many construction activities to contribute to nutrient and toxic NPS pollution.

This management measure was selected because (1) construction activities have the potential to contribute to increased loadings of toxic substances and nutrients to waterbodies; (2) various States and local governments regulate the control of chemicals on construction sites through spill prevention plans, erosion and sediment control plans, or other administrative devices; (3) the practices described are commonly used and presented in a number of best management practice handbooks and guidance manuals for construction sites; and (4) the practices selected are the most economical and effective.

4. Practices

As discussed more fully at the beginning of this chapter and in Chapter 1, the following practices are described for illustrative purposes only. State programs need not require implementation of these practices. However, as a practical matter, EPA anticipates that the management measure set forth above generally will be implemented by applying one or more management practices appropriate to the source, location, and climate. The practices set forth below have been found by EPA to be representative of the types of practices that can be applied successfully to achieve the management measure described above.

■ *a. Properly store, handle, apply, and dispose of pesticides.*

Pesticide storage areas on construction sites should be protected from the elements. Warning signs should be placed in areas recently sprayed or treated. Persons mixing and applying these chemicals should wear suitable protective clothing, in accordance with the law.

Post spill procedure information and have persons trained in spill handling on site or on call at all times. Materials for cleaning up spills should be kept on site and easily available. Spills should be cleaned up immediately and the contaminated material properly disposed of. Spill control plan components should include:

- Stop the source of the spill.
- Contain any liquid.
- Cover the spill with absorbent material such as kitty litter or sawdust, but do not use straw. Dispose of the used absorbent properly.

■ *g. Maintain and wash equipment and machinery in confined areas specifically designed to control runoff.*

Thinners or solvents should not be discharged into sanitary or storm sewer systems when cleaning machinery. Use alternative methods for cleaning larger equipment parts, such as high-pressure, high-temperature water washes, or steam cleaning. Equipment-washing detergents can be used, and wash water may be discharged into sanitary sewers if solids are removed from the solution first. (This practice should be verified with the local sewer authority.) Small parts can be cleaned with degreasing solvents, which can then be reused or recycled. Do not discharge any solvents into sewers.

Washout from concrete trucks should be disposed of into:

- A designated area that will later be backfilled;
- An area where the concrete wash can harden, can be broken up, and then can be placed in a dumpster; or
- A location not subject to urban runoff and more than 50 feet away from a storm drain, open ditch, or surface water.

Never dump washout into a sanitary sewer or storm drain, or onto soil or pavement that carries urban runoff.

■ *h. Develop and implement nutrient management plans.*

Properly time applications, and work fertilizers and liming materials into the soil to depths of 4 to 6 inches. Using soil tests to determine specific nutrient needs at the site can greatly decrease the amount of nutrients applied.

■ *i. Provide adequate disposal facilities for solid waste, including excess asphalt, produced during construction.*

■ *j. Educate construction workers about proper materials handling and spill response procedures. Distribute or post informational material regarding chemical control.*

December 21, 2001

Mr. David Craddick, Director
Department of Water Supply
County of Maui
P.O. Box 1109
Wailuku, Hawaii 96793

SUBJECT: ENVIRONMENTAL ASSESSMENT/ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE FOR KAPALUA MAUKA, PROJECT DISTRICT 2, WEST MAUI, MAUI

Dear Mr. Craddick:

Thank you for your letter dated September 10, 2001, concerning the Environmental Assessment/Environmental Impact Statement Preparation Notice for Kapalua Mauka, Project District 2, in West Maui. We offer the following responses to your comments.

1. Maui Land and Pineapple Company Inc., will cooperate with the County of Maui Department of Water Supply in the development of an acceptable feasibility study framework for private water system integration with the County's public system.

2. At the appropriate time in the permitting process the project engineer, Warren S. Unemori Engineering Inc., will provide domestic, fire, and irrigation calculations as required.

3. Native, indigenous, Polynesian introduced plants, and non-invasive species will be used in the landscaping of the Kapalua Mauka community where appropriate and feasible.

4. Low-flow fixtures and devices will be used throughout the Kapalua Mauka community pursuant to Maui County Code Section 16.20A.680 and single pass cooling will not be allowed pursuant to Maui County Code Section 14.21.20.

5. To further conserve water resources the following water conservation measures will be considered: maintaining fixtures to prevent leaks, limiting irrigated turf area, and preventing over watering by automated systems.

6. Best management practices designed to minimize infiltration and runoff from daily operations will be implemented.

We appreciate your participation in the review of the Environmental Assessment/ Environmental Impact Statement Preparation Notice.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Project Manager

cc: Mr. Robert McNatt/Maui Land and Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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MADELYN D'ENBEAU
1061 KOKOMO ROAD
HAIKU, HI 96708
575-2398

SEP 2 4 2

September 21, 2001

PBR Hawaii
Pacific Tower Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813
Attn: Tom Schnell

Dear Sir or Madam:

SUBJECT: KAPALUA MAUKA RESORT EXPANSION

Pursuant to the notice, which was published in the OEQC Bulletin on August 23, 2001, please consider this letter a request to become a consulted party on the above-entitled matter.

In addition please respond to the following comments regarding the environmental effects of the proposed action.

With respect to the socio-economic impacts of the Kapalua Mauka Expansion project, please respond to the following comments:

1. Second dwellings are permitted on rural zoned properties. These second dwellings could potentially double the density of the proposed rural residential component. Please address the potential impacts of the full build out (including accessory dwellings) of the rural residential component.
2. Vacation rentals are not permitted on rural zoned properties but are proliferating nevertheless. County resources are stretched to the limit I an effort to address these violations. What assurance is there that these properties will actually be residential in use as such use is defined in the Maui County Code?
3. What is the estimated population for the build out of the expansion project? Please indicate these figures by category: rural component,

single family, multifamily and address the impact of this increased population on all public services and facilities.

4. Resort areas on Maui tend to lack the socio economic diversity, which is necessary for a healthy community. Please indicate the price range of the properties to be offered in the development by category: rural component, single family, multifamily.
5. The general plan and relevant community plan require a mix of housing not only by housing type but also by cost and population served. Please address the failure of this project to comply with that requirement.
6. A commercial component will require employees. Please indicate the estimated number of workers who will be needed for the five-acre commercial project and for the golf course component.
7. A large new upscale community will require a large workforce to maintain and care for the needs of the new population. Please indicate the estimated number of workers estimated to be necessary to serve the owners of the upper end properties, including but not limited to lawn and garden maintenance, house cleaning, pool maintenance, personal trainers, beauticians, guard services, pet groomers, nanny services and so on.
8. What provision is made in this expansion project for affordable housing for this workforce?
9. What provision is made for the schooling of the workforce children?

I understand that at one time the applicant proposed an affordable housing project for the property, which would have provided housing for local families. With respect to this alternative use please provide the following information.

10. How many affordable housing units were planned for the property when the alternative use was proposed?
11. What were the affordability ranges? E.g. 80% of median income?
12. In what ways was this previously proposed affordable housing component linked to the development of the Kapalua Resort?
13. Were there at any time land use entitlement conditions related to the Kapalua Resort with respect to affordable housing, which have not been satisfied? Please include conditions that have been altered by governing authorities together with the dates and manner in which the alteration was done.

September 21, 2001
Page 3

I understand that when the community plan project districts for this area were combined, a group called the Mailepai Community Association agreed to support Kapalua's request and asked for certain considerations in exchange.

14. Please provide information about the history of the relationship between Mailepai Community Association and Kapalua Resort. Please include the terms and conditions that were agreed upon to resolve the issues with Mailepai Community Association.

Sincerely,

Madelyn D'Enbeau

Cc: County of Maui Planning Department, Office of Environmental Quality Control

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PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
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December 21, 2001

Ms. Madelyn D'Enbeau
1061 Kokomo Road
Haiku, Hawaii 96708

SUBJECT: ENVIRONMENTAL ASSESSMENT/ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE FOR KAPALUA MAUKA, PROJECT DISTRICT 2, WEST MAUI, MAUI

Dear Ms. D'Enbeau:

Thank you for your letter dated September 21, 2001, concerning the Environmental Assessment/Environmental Impact Statement Preparation Notice for Kapalua Mauka, Project District 2, in West Maui. We offer the following responses to your comments.

1. The Kapalua Mauka community will be limited to a total of 690 units, including any accessory dwellings. Please note this is 60 units less than specified in the West Maui Community Plan for Project District 2.

2. In developing properties in the Rural district, Maui Land & Pineapple Company, Inc. will comply with all requirements for the Rural district as defined in Chapter 205 (State Land Use Law), Hawaii Revised Statutes and Chapter 19.29 (Rural Districts), Maui County Code. After the properties are sold, individual owners are subject to the same requirements and must be held accountable for their actions.

3. The draft environmental impact statement will provide an estimate of the population for the Kapalua Mauka community. The draft environmental impact statement will also include a public cost/benefit assessment that will address the impact of the population on public services and facilities.

4. While specific prices have not been determined, it is estimated that prices will range from approximately $400,000 to over $1 million, depending on the type of unit and lot size.

5. The draft environmental impact statement will contain a complete discussion of the Kapalua Mauka community in relation to the County of Maui General Plan and the West Maui Community Plan. In addition, landowner Maui Land and Pineapple Company, Inc. will comply with all County of Maui requirements for affordable housing. Please see item 13 for more information.

6 -7. The draft environmental impact statement will include information on the estimated number of jobs created by the Kapalua Mauka community.

8. Landowner Maui Land and Pineapple Company Inc. will comply with all County of Maui requirements for affordable housing. Maui Land and Pineapple Company, Inc. has a strong history of providing affordable housing for their employees. Please see item 13 for more information.

9. The draft environmental impact statement will include a public cost/benefit assessment that will address the impact of the Kapalua Mauka community on public services and facilities.

10-12. Regarding your questions concerning previously proposed uses for the current Project District 2 area, an affordable housing project was not previously proposed for the property. In the 1983 Lahaina Community Plan, Project District 1A (an area of 275 acres) was designated on a portion of the area that is currently designated as Project District 2 in the current West Maui Community Plan. In addition, the 1983 Lahaina Community Plan designated an area of 200 acres as Project District 2 (Napilihau Mauka) mauka of Honoapiilani Highway between Napili Stream and Kaopala Gulch. During the process of updating the Lahaina Community Plan that began in 1992 (the name was changed to the West Maui Community Plan and it became effective in 1996) the area of the old Project District 2 was moved and combined with Project District 1A to form the new Project District 2 area of 450 acres that is designated on the current West Maui Community Plan. The Lahaina Community Plan did not mandate affordable housing on either the old Project District 1A or the old Project District 2 sites. In addition, landowner Maui Land and Pineapple never formally proposed an affordable housing project on either the old Project District 1A or the old Project District 2 sites.

13. Maui Land and Pineapple Company, Inc. has complied with all requirements for affordable or employee housing previously imposed as conditions of developing the existing Kapalua Resort. Completed West Maui projects include Nāpilihau Planned Development (174 units, in partnership with the State) and Honokeana Subdivision Phase I (38 units). Maui Land and Pineapple Company, Inc. also donated 13.5 acres of land in West Maui for the County Hale Noho Subdivision (which contains 72 homes built by the County).

In conjunction with its Upcountry operations, Maui Land and Pineapple Company, Inc. has provided affordable employee housing in Haliimaile (176 units and 15 units) and in Makawao at the Puu Koa Subdivision (47 units).

In 2002, Maui Land and Pineapple Company, Inc. will start development of Kapua Villages Subdivision, a new 45-lot employee subdivision project in West Maui. Maui Land and Pineapple Company, Inc. is developing this subdivision on their own accord, as a benefit for their employees. Depending on still pending County of Maui affordable housing requirements, this subdivision may satisfy, or partially satisfy, the affordable housing requirements for the Kapalua Mauka community.

All totaled, Maui Land and Pineapple Company, Inc. has developed (independently or in partnership with the State) 450 affordable employee housing units on Maui. They have also donated land to the County for County-built affordable housing. Further, in 2002, they will provide an additional 45 lots in West Maui for employees.

14. The Minority Landowners of Mailepai Hui Partition have asked Maui Land & Pineapple Company, Inc. for access easements, utility easements and access to Maui Land & Pineapple Company's private utilities over the years. Following are agreements that have been made:

a) Water Pipeline Easement for Term of Five Years between ML&P and Michael Kimo Harlacher dated 4/8/97. (TMK: 4-3-4:22)
b) Warranty Deed to County of Maui from ML&P for roadway Lot for Mailepai Hui Lands Subdivision (LUCA File No. 4.72 – Lot 51-C-14-B TMK: 4-3-3:02)
c) Maui Pineapple Company installed an electronic security gate on Hui Rd. C.

We appreciate your participation in the review of the Environmental Assessment/ Environmental Impact Statement Preparation Notice. We will send you a copy of the draft environmental impact statement when it is available.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Project Manager

cc: Mr. Robert McNatt/Maui Land and Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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13.0 Comments on the Draft Environmental Impact Statement & Responses

13.0 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT AND RESPONSES

The Kapalua Mauka Environmental Impact Statement was sent to the following agencies, organizations, and individuals. Where indicated the agency, organization, or individual submitted comments. Because the draft environmental impact statement was widely available at Maui libraries, comments were also received from some private organizations and individuals although a copy of the draft environmental impact statement was not sent to them.

	AGENCY	DEIS Mail Date	Date of Comments
	STATE		
1	Department of Accounting and General Services	1/8/02	1/22/02
2	Department of Agriculture	1/8/02	
3	Department of Business Economic Development and Tourism	1/8/02	
4	Department of Business Economic Development and Tourism — Business Resource Center	1/8/02	
5	Department of Business Economic Development and Tourism — Energy Resources & Technology Division	1/8/02	1/24/02
6	Department of Business Economic Development and Tourism — Land Use Commission	3/4/02	4/9/02
7	Department of Business Economic Development and Tourism — Office of Planning	1/8/02	2/19/02
8	Department of Defense	1/8/02	
9	Department of Education	1/8/02	1/24/02
10	Department of Hawaiian Home Lands	1/8/02	3/15/02
11	Department of Health	1/8/02	2/27/02
12	Department of Land and Natural Resources	1/8/02	2/19/02
13	Department of Land and Natural Resources — Commission on Water Resource Management	1/8/02	1/24/02
14	Department of Land and Natural Resources — Maui Office	1/23/02	2/15/02
15	Department of Land and Natural Resources — State Historic Preservation Division	1/8/02	
16	Department of Transportation	1/8/02	5/16/02
17	Hawai'i State Library (Main Branch)	1/8/02	
18	Housing and Community Development Corporation of Hawai'i	1/8/02	

	AGENCY	DEIS Mail Date	Date of Comments
19	Kahului Public Library	1/8/02	
20	Lahaina Public Library	1/8/02	
21	Maui Community College Library	1/8/02	
22	Office of Environmental Quality Control	1/8/02	2/07/02
23	Office of Hawaiian Affairs	1/8/02	1/29/02
24	Office of the Legislative Reference Bureau	1/8/02	
25	Representative Joseph Souki	1/8/02	
26	Senator Jan Yagi Buen	1/8/02	
27	University of Hawai'i Environmental Center	1/8/02	2/22/02
28	University of Hawai'i Hamilton Library	1/8/02	
29	University of Hawai'i Water Resources Research Center	1/8/02	
	FEDERAL		
30	US Army Engineer Division	1/8/02	1/29/02
31	US Department of Agriculture Natural Resources Conservation Service	1/8/02	1/31/02
32	US Fish and Wildlife Service	1/8/02	
	COUNTY OF MAUI		
33	Councilmember Jo Ann Johnson	1/8/02	2/19/02
34	Department of Fire Control	1/8/02	
35	Department of Housing and Human Concerns	1/8/02	2/06/02
36	Department of Parks and Recreation	1/8/02	
37	Department of Planning	1/8/02	3/14/02
38	Department of Planning — Long Range Division	5/20/02	
39	Department of Planning — Land Use and Codes	1/23/02	
40	Department of Public Works and Waste Management	1/8/02	2/15/02
41	Department of Water Supply	1/8/02	2/08/02
42	Maui Burial Council (Archaeological and Cultural Reports only)	2/27/02	
43	Maui Cultural Resources Commission (Archaeological and Cultural Reports only)	2/25/02	3/12/02
44	Police Department	1/8/02	1/29/02

	AGENCY	DEIS Mail Date	Date of Comments
	PRIVATE ORGANIZATIONS AND INDIVIDUALS		
45	Madelyn D'Enbeau	1/8/02	
46	K. Shell Hansson		2/21/02
47	Kimo Harlacher		2/15/02
48	Hawai'i's Thousand Friends	4/5/02	
49	Honolulu Advertiser	1/8/02	
50	Honolulu Star-Bulletin	1/8/02	
51	Hui Alanui O Makena	4/16/02	
52	Maui News	1/8/02	
53	Maui Tomorrow	1/17/02	
54	Na Kupuna O Maui (Archaeological and Cultural Reports sent 2/27/02, DEIS sent 4/5/02)	2/27/02 4/5/02	
55	Sierra Club	1/8/02	
56	West Maui Taxpayers Association		2/22/02

The following pages contain all comment letters received and responses.

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BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810

GLENN M. OKAMOTO
COMPTROLLER

MARY ALICE EVANS
DEPUTY COMPTROLLER

LETTER NO. (P)1033.2

JAN 22 2002

JAN 23 2002

Mr. Tom Schnell
PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813

Dear Mr. Schnell:

Subject: Kapalua Mauka (Project District 2)
Draft Environmental Impact Statement (EIS)

Thank you for the opportunity to review the Draft EIS for the subject project. The project does not impact any Department of Accounting and General Services' projects or existing facilities. Therefore, we have no comments to offer.

Should you have any questions, please have your staff call Mr. Allen Yamanoha of the Planning Branch at 586-0488.

Very truly yours,

GORDON MATSUOKA
Public Works Administrator

AY:jk
c: County of Maui, Planning Department
OEQC

PBR HAWAII

July 2, 2002

Mr. Gordon Matsuoka
Public Works Administrator
State of Hawaii
Department of Accounting and General Services
P.O. Box 119
Honolulu, Hawaii 96810

SUBJECT: **KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT**

Dear Mr. Matsuoka:

Thank you for your letter dated January 22, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement. We note that you have no comments at this time.

We appreciate your participation in the review of the Draft Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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DEPARTMENT OF BUSINESS,
ECONOMIC DEVELOPMENT, AND TOURISM

Energy, Resources, and Technology Division
235 South Beretania Street, Leiopapa A Kamehameha Bldg., 5th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804
Web site: www.hawaii.gov/dbedt/ert

BENJAMIN J. CAYETANO
Governor
SEIJI F. NAYA
Director
SHARON S. NARIMATSU
Deputy Director
DAVID W. BLANE
Director, Office of Planning

Telephone: (808) 587-3807
FAX: (808) 587-3820

January 24, 2002

PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813

Attn: Mr. Tom Schnell

Subject: Draft Environmental Impact Statement (DEIS)
Kapalua Mauka (Project District 2)
Tax Map Keys: 4-2-01: 1 (portion); 4-2-05: 50 (portion); 4-2-05: 51; 4-3-01: 6 (portion); 4-3-01: 7 (portion); and 4-3-01: 8 portion)

Thank you for the opportunity to comment on the DEIS for the Kapalua Mauka project which includes a golf course, condominiums, and single-family dwellings. Our comments are addressed to (1) State energy conservation goals, (2) energy saving design practices and technologies, and (3) recycling and recycled-content products.

(1) Energy conservation goals. Project buildings, activities, and site grounds should be designed with energy saving considerations. The mandate for such consideration is found in Chapter 344, HRS ("State Environmental Policy") and Chapter 226 ("Hawaii State Planning Act"). In particular, we would like to call to your attention HRS 226 18(c)(4) which includes a State objective of promoting all cost-effective energy conservation through adoption of energy-efficient practices and technologies.

The County of Maui does not have an Energy Code and we would suggest that you refer to the State's Model Energy Code for suggested improvements. We also suggest that you contact Maui Electric Company which may offer demand-side management rebates for energy efficient technologies.

(2) Energy saving design practices and technologies. In this project, we recommend that you specifically address energy efficient design practices and technologies similar to those used in the "BuiltGreen" energy efficient home in Waianae on Oahu.

Methods and technologies that could be considered during the design phase of the project include:

a. Use of site shading, orientation, and use of naturally ventilated areas to reduce cooling load;
b. Maximum use of day lighting;
c. Use of high efficiency compact fluorescent lighting;

d. Use of high wattage metal halide lighting for sports and recreational areas;
e. Exceed Model Energy Code requirements;
f. Technologies such as solar water heating systems, roof insulation, radiant barriers, and energy efficient windows
g. Use of photovoltaics for parking lot lighting;
h. Use of light color or "green" roofs;
i. Use of landscaping for dust control and to minimize heat gain to area; and
j. Use of photovoltaics, fuel cells and other renewable energy sources.

(3) Recycling and recycled-content products.
a. Develop a job-site recycling plan for the construction phase of the project and recycle as much construction and demolition waste as possible;
b. Incorporate provisions for recycling into the built project – a collection system and space for bins for recyclable;
c. Specify and use products with recycled-content such as: steel, concrete aggregate fill, drywall, carpet and glass tile; and
d. Specify and use locally produced products such as plastic lumber, hydromulch, soil amendment and glass tile.

Please refer to the attached *Guidelines for Sustainable Building Design In Hawaii: A planner's checklist* and *A Contractor's Waste Management Guide*" for additional information.

Sincerely,

Maurice H. Kaya
Energy, Resources, and Technology
Program Administrator

Attachments

c: Maui Land and Pineapple Co., Inc.
County of Maui Planning Department
OEQC

Guidelines for Sustainable Building Design in Hawai`i

A planner's checklist

(Adopted by the Environmental Council on October 13, 1999)

<u>Introduction</u>
Hawai`i law calls for efforts to conserve natural resources, promote efficient use of water and energy and encourage recycling of waste products. Planning a project from the very beginning to include sustainable design concepts can be a critical step toward meeting these goals.

The purpose of the state's environmental review law (HRS Ch. 343) is to encourage a full, accurate and complete analysis of proposed actions, promote public participation and support enlightened decision making by public officials. The Office of Environmental Quality Control offers the following guidelines for preparers of environmental reviews under the authority of HRS 343 to assist agencies and applicants in meeting these goals.

These guidelines do not constitute rules or law. They have been refined by staff and peer review to provide a checklist of items that will help the design team create projects that will have a minimal impact on Hawai`i's environment and make wise use of our natural resources. In a word, projects that are *sustainable*.

A sustainable building is built to minimize energy use, expense, waste, and impact on the environment. It seeks to improve the region's sustainability by meeting the needs of Hawai`i's residents and visitors today without compromising the needs of future generations. Compared to conventional projects, a resource-efficient building project will:

I. Use less energy for operation and maintenance
II. Contain less *embodied* energy (e.g. locally produced building products often contain less *embodied* energy than imported products because they require less energy-consuming transportation.)
III. Protect the environment by preserving/conserving water and other natural resources and by minimizing impact on the site and ecosystems
IV. Minimize health risks to those who construct, maintain, and occupy the building
V. Minimize construction waste
VI. Recycle and reuse generated construction wastes

VII. Use resource-efficient building materials (e.g. materials with recycled content and low embodied energy, and materials that are recyclable, renewable, environmentally benign, non-toxic, low VOC (Volatile Organic Compound) emitting, durable, and that give high life cycle value for the cost.)
VIII. Provide the highest quality product practical at competitive (affordable) first and life cycle costs.

In order to avoid excessive overlapping of items, the checklist is designed to be read in totality, not just as individual sections. This checklist tries to address a range of project types, large scale as well as small scale. Please use items that are appropriate to the type and scale of the project.

Although this list will help promote careful and sensitive planning, mere compliance with this checklist does not confirm sustainability. Compliance with and knowledge of current building codes by users of this checklist is also required.

<u>TABLE OF CONTENTS</u>

I. Pre Design

___1. Hold programming team meeting with client representative, Project Manager, planning consultant, architectural consultant, civil engineer, mechanical, electrical, plumbing (MEP) engineer, structural engineer, landscape architect, interior designer, sustainability consultant and other consultants as required by the project. Identify project and sustainability goals. Client representatives and consultants need to work together to ensure that project and environmental goals are met.

___2. Develop sustainable guideline goals to insert into outline specifications as part of the Schematic Design documents. Select goals from the following sections that are appropriate for the project.

___3. Use Cost-Benefit Method for economic analysis of the sustainability measures chosen. (Cost-Benefit Method is a method of evaluating project choices and investments by comparing the present and life cycle value of expected benefits to the present and life cycle value of expected costs.)

___4. Include "Commissioning" in the project budget and schedule. (Building "Commissioning" is the process of ensuring that systems are designed, installed, functionally tested, and capable of being operated and maintained in accordance with specifications that meet the owner's needs, and recognize the owner's financial and operational capacity. It improves the performance of the building systems, resulting in energy efficiency and conservation, improved air quality and lower operation costs. *Refer to Section IX.*)

II. Site Selection & Site Design

A. Site Selection

___1. Analyze and assess site characteristics such as vegetation, topography, geology, climate, natural access, solar orientation patterns, water and drainage, and existing utility and transportation infrastructure to determine the appropriate use of the site.

___2. Whenever possible, select a site in a neighborhood where the project can have a positive social, economic and/or environmental impact.

___3. Select a site with short connections to existing municipal infrastructure (sewer lines, water, waste water treatment plant, roads, gas, electricity, telephone, data communication lines and services). Select a site close to mass transportation, bicycle routes and pedestrian access.

B. Site Preparation and Design

___1. Prepare a thorough existing conditions topographic site plan depicting topography, natural and built features, vegetation, location of site utilities and include solar information, rainfall data and direction of prevailing winds. Preserve existing resources and natural features to enhance the design and add aesthetic, economic and practical value. Design to minimize the environmental impact of the development on vegetation and topography.

___2. Site building(s) to take advantage of natural features and maximize their beneficial effects. Provide for solar access, daylighting and natural cooling. Design ways to integrate the building(s) with the site that maximizes and preserves positive site characteristics, enhances human comfort, safety and health, and achieves operational efficiencies.

___3. Locate building(s) to encourage bicycle and pedestrian access and pedestrian oriented uses. Provide bicycle and pedestrian paths, bicycle racks, etc. Racks should be visible and accessible to promote and encourage bicycle commuting.

___4. Retain existing topsoil and maintain soil health by clearing only the areas reserved for the construction of streets, driveways, parking areas, and building foundations. Replant exposed soil areas as soon as possible. Reuse excavated soils for fill and cut vegetation for mulch.

___5. Grade slopes to a ratio of less than 2 : 1 (run to rise). Balance cut and fill to eliminate hauling. Check grading frequently to prevent accidental over excavation.

___6. Minimize the disruption of site drainage patterns. Provide erosion and dust controls, positive site drainage, and siltation basins as required to protect the site during and after construction, especially, in the event of a major storm.

___7. Minimize the area required for the building footprint. Consolidate utility and infrastructure in common corridors to minimize site degradation, and cost, improve efficiency, and reduce impermeable surfaces.

___8. For termite protection, use non toxic alternatives to pesticides and herbicides, such as Borate treated lumber, Basaltic Termite Barrier, stainless steel termite barrier mesh, and termite resistant materials.

III. Building Design

___1. Consider adaptive re-use of existing structures instead of demolishing and/or constructing a new building. Consult the State Historic Preservation Officer for possible existing historic sites that may meet the project needs.

___2. Plan for high flexibility while designing building shell and interior spaces to accommodate changing needs of the occupants, and thereby extend the life span of the building.

___3. Design for re-use and/or disassembly. (For recyclable and reusable building products, see Section VII).

___4. Design space for recycling and waste diversion opportunities during occupancy.

___5. Provide facilities for bicycle and pedestrian commuters (showers, lockers, bike racks, etc.) in commercial areas and other suitable locations.

___6. Plan for a comfortable and healthy work environment. Include inviting outdoor spaces, wherever possible. *(Refer to Section VIII.)*

___7. Provide an Integrated Pest Management approach. The use of products such as Termi-mesh, Basaltic Termite Barrier and the Sentricon "bait" system can provide long term protection from termite damage and reduce environmental pollution.

___8. Design a building that is energy efficient and resource efficient. *(See Sections IV, V, VII.)* Determine building operation by-products such as heat gain and build up, waste/gray-water and energy consumption, and plan to minimize them or find alternate uses for them.

___9. For natural cooling, use
- a. Reflective or light colored roofing, radiant barrier and/or insulation, roof vents
- b. Light colored paving (concrete) and building surfaces
- c. Tree Planting to shade buildings and paved areas
- d. Building orientation and design that captures trade winds and/or provides for convective cooling of interior spaces when there is no wind.

IV. Energy Use

___1. Obtain a copy of the State of Hawai'i Model Energy Code (available through the Hawai'i State Energy Division, at Tel. 587-3811). Exceed its requirements. (Contact local utility companies for information on tax credits and utility-sponsored programs offering rebates and incentives to businesses for installing qualifying energy efficient technologies.)

___2. Use site sensitive orientation to :
- a. Minimize cooling loads through site shading and carefully planned east-west orientation.
- b. Incorporate natural ventilation by channeling trade winds.
- c. Maximize daylighting.

___3. Design south, east and west shading devices to minimize solar heat gain.

___4. Use spectrally selective tints or spectrally selective low-e glazing with a Solar Heat Gain Coefficient (SHGC) of 0.4 or less.

___5. Minimize effects of thermal bridging in walls, roofs and window systems.

___6. Maximize efficiencies for lighting, Heating, Ventilation, Air Conditioning (HVAC) systems and other equipment. Use insulation and/or radiant barriers, natural ventilation, ceiling fans and shading to avoid the use of air conditioning whenever appropriate.

___7. Eliminate hot water in restrooms when possible.

___8. Provide tenant sub-metering to encourage utility use accountability.

___9. Use renewable energy. Use solar water heaters and consider the use of photovoltaics and Building Integrated Photovoltaics (BIPV).

___10. Use available energy resources such as waste heat recovery, when feasible.

A. Lighting

___1. Design for at least 15% lower interior lighting power allowance than the Energy Code.

___2. Select lamps and ballasts with the highest efficiency, compatible with the desired level of illumination and color rendering specifications. Examples that combine improved color rendering with efficient energy use include compact flourescents and T8 flourescents that use tri-phosphor gases.

___3. Select lighting fixtures which maximize system efficacy and which have heat removal capabilities

___4. Reduce light absorption on surfaces by selecting colors and finishes that provide high reflectance values without glare.

___5. Use task lighting with low ambient light levels.

___6. Maximize daylighting through the use of vertical fenestration, light shelves, skylights, clerestories, building form and orientation as well as through translucent or transparent interior partitions. Coordinate daylighting with electrical lighting for maximum electrical efficiency.

___7. Incorporate daylighting controls and/or motion activated light controls in low or intermittent use areas.

___8. Avoid light spillage in exterior lighting by using directional fixtures.

___9. Minimize light overlap in exterior lighting schemes.

___10. Use lumen maintenance procedures and controls.

B. Mechanical Systems

___1. Design to comply with the Energy Code and to exceed its efficiency requirements.

___2. Use "Smart Building" monitor/control systems when appropriate.

___3. Utilize thermal storage for reduction of peak energy usage.

___4. Use Variable air volume systems to save fan power.

___5. Use variable speed drives on pumping systems and fans for cooling towers and air handlers.

___6. Use air-cooled refrigeration equipment or use cooling towers designed to reduce drift.

___7. Specify premium efficiency motors.

___8. Reduce the need for mechanical ventilation by reducing sources of indoor air pollution. Use high efficiency air filters and ultraviolet lamps in air handling units. Provide for regular maintenance of filtration systems. Use ASHRAE standards as minimum.

___9. Locate fresh air intakes away from polluted or overheated areas. Locate on roof where possible. Separate air intake from air exhausts by at least 40 ft.

___10. Use separate HVAC systems to serve areas that operate on widely differing schedules and/or design conditions.

___11. Use shut off or set back controls on HVAC system when areas are not occupied.

___12. Use condenser heat, waste heat or solar energy. (Contact local utility companies for information on the utility-sponsored Commercial and Industrial Energy Efficiency

Programs which offer incentives to businesses for installing qualifying energy efficient technologies.)

__13. Evaluate plug-in loads for energy efficiency and power saving features.

__14. Improve comfort and save energy by reducing the relative humidity by waste reheat, heat pipes or solar heat.

__15. Minimize heat gain from equipment and appliances by using:

a. Environmental Protection Agency (EPA) Energy Star rated appliances.

b. Hoods and exhaust fans to remove heat from concentrated sources.

c. High performance water heating that exceeds the Energy Code requirements.

__16. Specify HVAC system "commissioning" period to reduce occupant exposure to Indoor Air Quality (IAQ) contaminants and to maximize system efficiency.

V. Water Use

A. Building Water

__1. Install water conserving, low flow fixtures as required by the Uniform Plumbing Code.

__2. If practical, eliminate hot water in restrooms.

__3. Use self closing faucets (infrared sensors or spring loaded faucets) for lavatories and sinks.

B. Landscaping and Irrigation

(See Section VI.)

VI. Landscape and Irrigation

__1. Incorporate water efficient landscaping (xeriscaping) using the following principles:

a. <u>Planning, Efficient irrigation</u>: Create watering zones for different conditions. Separate vegetation types by watering requirements. Install moisture sensors to prevent operation of the irrigation system in the rain or if the soil has adequate moisture. Use appropriate sprinkler heads.

b. <u>Soil analysis/improvement</u>: Use (locally made) soil amendments and compost for plant nourishment, improved water absorption and holding capacity.

c. <u>Appropriate plant selection</u>: Use drought tolerant and/or slow growing hardy grasses, native and indigenous plants, shrubs, ground covers, trees, appropriate for local conditions, to minimize the need for irrigation.

d. <u>Practical turf areas</u>: Turf only in areas where it provides functional benefits.

e. <u>Mulches</u>: Use mulches to minimize evaporation, reduce weed growth and retard erosion.

Contact the local Board of Water Supply for additional information on xeriscaping such as efficient irrigation, soil improvements, mulching, lists of low water-demand plants, tours of xeriscaped facilities, and xeriscape classes.

__2. Protect existing beneficial site features and save trees to prevent erosion. Establish and carefully mark tree protection areas well before construction.

__3. Limit staging areas and prevent unnecessary grading of the site to protect existing, especially native, vegetation.

__4. Use top soil from the graded areas, stockpiled on the site and protected with a silt fence to reduce the need for imported top soil.

__5. Irrigate with non-potable water or reclaimed water when feasible. Collect rainwater from the roof for irrigation.

__6. Sub-meter the irrigation system to reduce water consumption and consequently water and sewer fees. Contact the local county agency to obtain irrigation sub-metering requirements and procedures. Locate irrigation controls within sight of the irrigated areas to verify that the system is operating properly.

__7. Use pervious paving instead of concrete or asphalt paving. Use natural and man-made berms, hills and swales to control water runoff.

__8. Avoid the use of solvents that contain or leach out pollutants that can contaminate the water resources and runoff. Contact the State of Hawai'i Clean Water Branch at 586-4309 to determine whether a NPDES (National Pollutant Discharge Elimination System) permit is required.

__9. Use Integrated Pest Management (IPM) techniques. IPM involves a carefully managed use of biological and chemical pest control tactics. It emphasizes minimizing the use of pesticides and maximizing the use of natural process

__10. Use trees and bushes that are felled at the building site (i.e. mulch, fence posts). Leave grass trimmings on the lawn to reduce green waste and enhance the natural health of lawns.

__11. Use recycled content, decay and weather resistant landscape materials such as plastic lumber for planters, benches and decks.

VII. Building Materials & Solid Waste Management

A. Material Selection and Design

__1. Use durable products.

__2. Specify and use natural products or products with low embodied energy and/or high recycled content. Products with recycled content include steel, concrete with glass, drywall, carpet, etc. Use ground recycled concrete, graded glass cullet or asphalt as base or fill material.

___3. Specify low toxic or non-toxic materials whenever possible, such as low VOC (Volatile Organic Compounds) paints, sealers and adhesives and low or formaldehyde-free materials. Do not use products with CFCs (Chloro-fluoro-carbons).

___4. Use locally produced products such as plastic lumber, insulation, hydro-mulch, glass tiles, compost.

___5. Use advanced framing systems that reduce waste, two stud corners, engineered structural products and prefabricated panel systems.

___6. Use materials which require limited or no application of finishing or surface preparation. (i.e. finished concrete floor surface, glass block and glazing materials, concrete block masonry, etc.).

___7. Use re-milled salvaged lumber where appropriate and as available. Avoid the use of old growth timber.

___8. Use sustainably harvested timber.

___9. Commit to a material selection program that emphasizes efficient and environmentally sensitive use of building materials, and that uses locally available building materials. (A list of Earth friendly products and materials is available through the Green House Hawai'i Project. Call Clean Hawai'i Center, Tel. 587-3802 for the list.)

B. Solid Waste Management, Recycling and Diversion Plan

___1. Prepare a job-site recycling plan and post it at the job-site office.

___2. Conduct pre-construction waste minimization and recycling training for employees and sub-contractors.

___3. Use a central area for all cutting.

___4. Establish a dedicated waste separation/diversion area. Include Waste/Compost/Recycling collection areas and systems for use during construction process and during the operational life cycle of the building.

___5. Separate and divert all unused or waste cardboard, ferrous scrap, construction materials and fixtures for recycling and/or forwarding to a salvage exchange facility. Information on "Minimizing C&D (construction and demolition) waste in Hawai'i" is available through Department of Health, Office of Solid Waste Management, Tel. 586-4240.

___6. Use all green waste, untreated wood and clean drywall on site as soil amendments or divert to offsite recycling facilities.

___7. Use concrete and asphalt rubble on-site or forward the material for offsite recycling.

___8. Carefully manage and control waste solvents, paints, sealants, and their used containers. Separate these materials from C&D (construction and demolition) waste and store and dispose them of them carefully.

___9. Donate unused paint, solvents, sealants to non-profit organizations or list on HIMEX (Hawai'i Materials Exchange). HIMEX is a free service operated by Maui Recycling

Group, that offers an alternative to landfill disposal of usable materials, and facilitates no-cost trades. See web site, www.himex.org.

___10. Use suppliers that re-use or recycle packaging material whenever possible.

VIII. Indoor Air Quality

___1. Design an HVAC system with adequate supply of outdoor air, good ventilation rates, even air distribution, sufficient exhaust ventilation and appropriate air cleaners.

___2. Develop and specify Indoor Air Quality (IAQ) requirements during design and contract document phases of the project. Monitor compliance in order to minimize or contain IAQ contaminant sources during construction, renovation and remodeling.

___3. Notify occupants of any type of construction, renovation and remodeling and the effects on IAQ.

___4. Inspect existing buildings to determine if asbestos and lead paint are present and arrange for removal or abatement as needed.

___5. Supply workers with, and ensure the use of VOC (Volatile Organic Compounds)-safe masks where required.

___6. Ensure that HVAC systems are installed, operated and maintained in a manner consistent with their design. Use UV lamps in Air Handling Units to eliminate mold and mildew growth. An improperly functioning HVAC system can harbor biological contaminants such as viruses, bacteria, molds, fungi and pollen, and can cause Sick Building Syndrome (SBS).

___7. Install separate exhaust fans in rooms where air polluting office equipment is used, and exhaust directly to the exterior of the building, at sufficient distance from the air intake vents.

___8. Place bird guards over air intakes to prevent pollution of shafts and HVAC ducts.

___9. Control indoor air pollution by selecting products and finishes that are low or non-toxic and low VOC emitting. Common sources of indoor chemical contaminants are adhesives, carpeting, upholstery, manufactured wood products, copy machines, pesticides and cleaning agents.

___10. Schedule finish application work to minimize absorption of VOCs into surrounding materials e.g. allow sufficient time for paint and clear finishes to dry before installing carpet and upholstered furniture. Increase ventilation rates during periods of increased pollution.

___11. Allow a flush-out period after construction, renovation, remodeling or pesticide application to minimize occupant exposure to chemicals and contaminants.

IX. Commissioning & Construction Project Closeout

___1. Appoint a Commissioning Authority to develop and implement a commissioning plan and a preventative maintenance plan. Project Manager's responsibilities must include coordination of commissioning activities during project closeout.
___2. Commissioning team should successfully demonstrate all systems and perform operator training before final acceptance.
___3. Provide flush-out period to remove air borne contaminants from the building and systems.
___4. Provide as-built drawings and documentation for all systems. Provide data on equipment maintenance and their control strategies as well as maintenance and cleaning instructions for finish materials.

X. Occupancy and Operation

A. General Objectives
___1. Develop a User's Manual for building occupants that emphasizes the need for Owner/Management commitment to efficient sustainable operations.
___2. Management's responsibilities must include ensuring that sustainability policies are carried out.

B. Energy
___1. Purchase EPA rated, Energy Star, energy-efficient office equipment, appliances, computers, and copiers. (Energy Star is a program sponsored by U.S. Dep. Of Energy. Use of these products will contribute to reduced energy costs for buildings and reduce air pollution.)
___2. Institute an employee education program about the efficient use of building systems and appliances, occupants impact on and responsibility for water use, energy use, waste generation, waste recycling programs, etc.
___3. Re-commission systems and update performance documentation periodically per recommendations of the Commissioning Authority, or whenever modifications are made to the systems.

C. Water
___1. Start the watering cycle in the early morning in order to minimize evaporation.
___2. Manage the chemical treatment of cooling tower water to reduce water consumption.

D. Air
___1. Provide incentives which encourage building occupants to use alternatives to and to reduce the use of single occupancy vehicles.

___2. Provide a location map of services within walking distance of the place of employment (child care, restaurants, gyms, shopping).
___3. Periodically monitor or check for indoor pollutants in building.
___4. Provide an IAQ plan for tenants, staff and management that establishes policies and documentation procedures for controlling and reporting indoor air pollution. This helps tenants and staff understand their responsibility to protect the air quality of the facility.

E. Materials and Products
___1. Purchase business products with recycled content such as paper, toners, etc.
___2. Purchase Furniture made with sustainably harvested wood, or with recycled and recycled content materials, which will not off gas VOC's.
___3. Remodeling and painting should comply with or improve on original sustainable design intent.
___4. Use low VOC, non-toxic, phosphate and chlorine free, biodegradable cleaning products.

F. Solid Waste
___1. Collect recyclable business waste such as paper, cardboard boxes, and soda cans.
___2. Avoid single use items such as paper or Styrofoam cups and plates, and plastic utensils.

XI. Resources

<u>Financing: Energy Efficiency in Buildings.</u> U.S. Department of Energy, DOE/EE-0152, May, 1998 (Call Tel.1-800-DOE-EREC or visit local office)

<u>Building Commissioning: The Key to Quality Assurance.</u> U.S. Department of Energy, DOE/EE-0153, May, 1998 (Call Tel.1-800-DOE-EREC or visit local office)

<u>Guide to Resource-Efficient Building In Hawaii</u>. University of Hawai'i at Manoa, School of Architecture and Energy, Resources and Technology Division, Department of Business, Economic Development and Tourism, October 1998. (Call Tel. 587-3804 for publication)

<u>Hawaii Model Energy Code</u>. Energy, Resources and Technology Division, Department of Business, Economic Development and Tourism, November 1997 (Call Tel. 587-3810 for publication)

<u>Photovoltaics in the Built Environment: A Design Guide for Architects and Engineers.</u> NREL Publications, DOE/GO #10097-436, September 1997 (Call Tel.1-800-DOE-EREC or visit local office)

Building Integrated Photovoltaics: A Case Study. NREL Publications #TP-472-7574, March 1995 (Call Tel.1-800-DOE-EREC or visit local office)

Solar Electric Applications: An overview of Today's Applications. NREL Publications, DOE/GO #10097-357, Revised February, 1997 (Call Tel.1-800-DOE-EREC or visit local office)

Green Lights: An Enlightened Approach to Energy Efficiency and Pollution Prevention. U.S. Environmental Protection Agency, Pacific Island Contact Office (Call Tel. 541-2710 for publication.)

Healthy Lawn, Healthy Environment. U.S. Environmental Protection Agency, Pacific Island Contact Office. (Call Tel. 541-2710 for this and related publications)

How to Plant a Native Hawaiian Garden. Office of Environmental Quality Control (OEQC), Department of Health, State of Hawai'i (Call Tel. 586-4185 for publication)

Buy Recycled in Hawai'i. Clean Hawai'i Center, Energy, Resources and Technology Division, Department of Business, Economic Development and Tourism, November 1997. (Call Tel. 587-3802 for publication)

Hawai'i Recycling Industry Guide and other recycling and reuse related fact sheets. Clean Hawai'i Center, Energy, Resources and Technology Division, Department of Business, Economic Development and Tourism, July 1999. (Call Tel. 587-3802 for publication)

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A Contractor's Waste Management Guide

Best Management Practices and Tools for Job Site Recycling and Waste Reduction in Hawaii

Prepared by O'Brien & Company

for

The State of Hawaii, Department of Business, Economic Development, and Tourism's Clean Hawaii Center

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Table of Contents

Introduction

When we build, we do well when we are guided by the State motto:

"UA MAU KE EA O KA AINA I KA PONO"

(The life of the land is perpetuated in righteousness.)

A Contractor's Waste Management Guide provides practical methods contractors can use to practice responsible construction waste management in Hawaii. It contains checklists, tips, and tools for use in residential, commercial, and remodeling projects. While its primary focus is on job site construction practices, the *Guide* identifies opportunities to reduce waste through design, such as through material selection and specification. In particular the *Guide* provides specific ways to help you:

- Reduce the amount of construction waste generated.
- Divert waste from disposal
- Use recycled-content or salvaged building materials
- Use least-toxic buiding materials (to minimize hazardous waste)

The primary goal of the practices in this *Guide* is to protect against environmental degradation by reducing the amount of C&D waste disposed in Hawaii. However, many of the practices recommended in this *Guide* have the added benefit of saving you or your client money. Incorporating material efficiencies in design and operation can reduce the overall cost of materials. Job site recycling or reuse can save on disposal fees. In addition, waste reduction techniques can protect you from long term liability or other long-term costs.

Building With Vision

Worldwide, buildings are responsible for 12 percent of freshwater withdrawals, 25 percent of wood harvest, and 40 percent of material and energy flows. In Hawaii, we can help protect the water we drink, the air we breathe, and the natural beauty of our Islands by using resource-efficient construction methods, including job site waste reduction and recycling.

In particular, responsible construction waste management can more effectively utilize limited resources, help preserve a unique and fragile environment, and help protect a tourist economy that thrives on an aesthetically pleasing built and natural environment. By reducing the amount of construction and demolition C&D waste disposed in Hawaii, we work together to foster a sustainable environment and economy.

This *Guide* is a part of Clean Hawaii Center's efforts, in partnership with the construction industry, to promote resource-efficient construction. It focuses on one facet of resource-efficient construction. For more information about how to build with the environment in mind, we refer you to the *Guide to Resource-Efficient Building in Hawaii*, a publication of the Hawaii Advanced Building Technologies (HABiT) program.

Not Just for Contractors

Although this *Guide* is primarily for use by contractors, it is also useful for:

- Design Professionals—As a design professional, you play a key role in waste management. The *Guide* will help further your overall understanding of job site production processes, and Appendix G will provide guidance in using design specifications to reduce construction waste.
- Solid Waste Planners—As a solid waste planner, you will find this document useful to increase your understanding of current practices and as a tool in shaping future policies and programs.

How to Use The Guide

This *Guide* is organized as follows:

Fundamentals—The *Introduction, Start With A Plan*, the *Strategies* and *Developing Your Own Specifications* sections of *Appendix G, Appendix H (Resource List)*, and the *Glossary* cover the basics. You may want to take a look at these before you get into the "tools" provided in the guide, which include:

Checklists—The checklists provide specific actions for putting waste management practices in place. The body of the *Guide* provides three checklists for use by contractors in the field—one each for general practices, solid waste management, and hazardous waste management. Other checklists include *Appendix E*, a contractor's checklist for job site training, and the *Specification Options* design checklist of *Appendix G*.

Tips—You'll find these quick "pointers" in bordered boxes in the margin of the *Guide*. They provide additional helpful information related to specific topics, such as how to estimate the amount of waste you will generate for a project and how to make recycling convenient and efficient.

Case Studies—These illustrate successes and lessons learned with several "real-life" job site recycling and waste reduction programs in Hawaii and on the mainland. You'll find them throughout the Guide, in shaded boxes at the bottom of the page.

Forms—These are forms you can use to carry out checklist items such as performing a pre-project walk-thru (*Appendix A*), developing a job site waste management plans (*Appendix B*), performing a waste audit (*Appendix C*), and assessing the effectiveness of your waste management program (*Appendix F*).

Samples—These provide ideas for job site signage you can use to inform your field personnel and to market your program.

Start With A Plan

The Job Site Action Plan

Tips for a Cost-Effective Job-Site Action Plan

- Keep it simple
- Target only high-potential materials for recycling and reuse.
- Collect and recycle a specific material when the volume justifies it. This may vary with different phases of construction.
- Specify methods for storing and collecting recycled materials. Methods should be as convenient as disposal, protect materials from damage, and require no additional expense (such as container rental) if avoidable. For example, you may want to stockpile cardboard in a garage, use a roped-off area for metal, and use containers for wood

The purpose of the Job Site Action Plan is to help you incorporate the Three "R's" of effective construction waste management:

- ***Reduce*** (or "source reduction") means to prevent waste before it happens. It is highest on the construction waste management hierarchy because it has the most positive environmental impact. Many design and job site practices can significantly reduce waste and cost of materials on a construction project while requiring only slight modifications of standard procedures. One example is the use of efficient framing techniques that can reduce up to 20 percent of your wood framing material costs. Effective source reduction begins during design.

- ***Reuse*** means to reuse materials as much as possible in your construction project. This includes materials removed during demolition, scrap generated on site, and used materials or scraps from other jobs.

- ***Recycling*** means to separate recyclable materials from non-recyclable materials and supply them to a hauler or business so they can be processed and used to make new products. Another aspect of recycling is to "Buy Recycled." Buying building materials with recycled-content helps develop a market for the waste materials you recycle from your job site and "closes the loop."

Appendix B provides sample Job Site Action Plans (one for larger jobs and one for smaller jobs).

General Practices Checklist

Materials Selection & Purchase Options

Sourcing

- ☐ Choose suppliers who use reusable, recyclable, or recycled-content packaging. Let your suppliers know what you are looking for.
- ☐ As much as possible, arrange for "just-in-time" deliveries

Selection

- ☐ When possible, make sure recycled-content or resource-efficient building and landscaping materials are specified and installed.
- ☐ Substitute recycled-content or resource-efficient building and landscaping products as equivalents when cost-effective. See Appendix H for resources providing specific information on recycled-content materials available.
- ☐ Install recycled or reused materials and equipment.
- ☐ Select low-toxic alternatives to conventional materials whenever possible. Examples include organic fertilizers, low-toxic solvents, paints, sealants, and wood preservatives, rot-resistant woods, and pest- and water-proof plastic lumber. Other examples include formaldehyde-free sheathing, fiberglass, and low-mercury lighting fixtures.

A Tip on High Potential Recyclables

Demolition and re-modeling activities generate many materials that have high recycling potential. These materials include:

- Concrete
- Asphalt
- Concrete/asphalt rubble
- Drywall
- Metal (ferrous and non-ferrous)
- Wood
- Building components and specialty items
- Other (See Appendix A)

Waste Reduction Options

Pre-Project Walk-Thru (Demolition and Remodels Only)

- ☐ Prior to start of demolition or re-model, perform a walk-thru of the site with an experienced recycler/demolition or remodel contractor to identify high-potential recyclable materials. Appendix A provides a sample form to use for this walk-thru. (See "*Sourcing*" below for information on recyclers.)
- ☐ Use results of the walk-thru to develop your waste management plan. (Appendix B)

Signage

- ☐ Clearly mark material storage areas and post storage recommendations.
- ☐ Clearly mark areas for cutting, recycling and other waste management operations. See Appendix D for sample signage.
- ☐ Post the job site waste reduction plan (with waste reduction goals) in material storage area and other central locations, such as the job site trailer. Provide specific examples of ways to reduce or reuse waste materials generated on the job.

Training

- ☐ Use a meeting to inform on-site contractors, subcontractors, and laborers about the important of waste reduction (including reuse) and techniques that reduce waste. This meeting can be combined with other training meetings on recycling and site protection. Be sure to ask for ideas from participants. See Appendix E for a suggested checklist to use during the meeting.
- ☐ Provide positive incentives to crews to encourage waste reduction. Incentives. (For example: hats, T-shirts, pizza)
- ☐ Direct crews to make use of scraps and use less materials overall.

Good waste management goes hand in hand with an effective safety program.

With slight modifications, a clean, safe site can become a "waste-busting" site. The effective use of signage, education at weekly meetings, and incentives is a common thread throughout this Guide and is based on the safety program model.

A Tip on Incentives

Train forklift operators to help educate people in the proper way to handle recyclable materials.

Require people who mis-sort or mishandle recyclable materials to resort the materials themselves.

Charge a fee to individuals who continually contaminate loads.

Storage

- ☐ Store materials in a dry, protected place.
- ☐ Use manufacturers' recommendations for storage.

Operations

- ☐ Set up specific areas for cutting, recycling, and other waste management operations.
- ☐ Estimate as accurately as possible. Suppliers can often provide tips on estimating specific materials to help you avoid over-ordering.
- ☐ Prepare and use detailed take-offs and provide as a reference for crews.

A Case Study: The Kauai Resource Exchange & BuyBack Center

The Kauai Resource Exchange and BuyBack Center diverts used consumer goods from Kauai's public landfills and gives them new life through reconditioning, repair, and recycling. The Center itself was constructed as a waste management project. The complex was constructed with a combination of locally recycled materials, locally manufactured materials, and conventional building materials. Examples of this blending of "green" and conventional materials include:

- Retaining wall constructed from used tires, stacked and backfilled with crushed glass. (Over 1000 tires were used, saving the County an estimated $5000 in transport and disposal costs.)
- Ground cover made from crushed glass in lieu of gravel.
- Exterior walls of concrete masonry units manufactured on Kauai using local materials
- Roof framing system made from galvanized steel made from recycled scrap.

(Contact William Bess, AIA, Architects Kauai, phone 838-2880.)

A Tip on Residential Waste Generation Rates

Use the following ballpark figures to get a sense of how much construction waste may be generated on your jobs.

Material	Lbs./sq.ft.
Wood*	1 3-2.1
Drywall	1.0-1 2
Cardboard**	0 1-0 5
Metals	0 02-0 13
Other waste (plastic, shingles, etc.)	0 5-1 3
Total	3.0-5.2

*Range for wood waste depends on material used for wall sheathing, siding, trim, and roofing

**Range for cardboard depends on type of siding and whether windows, doors, and cabinetry are locally manufactured.

Source—*Residential Construction Waste Management, A Builder's Field Guide*

- ☐ Use quality tools and clean thoroughly between uses.
- ☐ Reuse materials whenever possible.
- ☐ Donate or sell reusable materials from your job.
- ☐ Use reusable form-work, such as steel and aluminum forms.
- ☐ Balance cut and fill.
- ☐ Reuse excavated soils and vegetation and grind landclearing wood and stumps for reuse on-site as fill or mulch.
- ☐ Preserve existing native vegetation and reuse as landscaping.
- ☐ Donate unused existing vegetation for use as landscaping.
- ☐ Use transplanted native vegetation if available.
- ☐ If you must use hazardous products, keep their wastes separate from C&D waste, and dispose of them properly.

Job Site Recycling Options

Signage

- ☐ Post waste reduction goals in material storage areas and other central locations, such as the job site trailer. Provide specific examples of significant ways to reduce or reuse waste materials generated on-site.
- ☐ Prominently display your progress in meeting recycling goals, both for both public visibility and to keep site crews updated. See Appendix D for sample signage.

Training

- ☐ For demolition only—Conduct a pre-demolition briefing to inform demolition contractors of salvage/recycling goals identified by the pre-project walk-thru. Emphasize the importance of sorting and avoiding mixing of demolition waste.
- ☐ Use a meeting to inform on-site contractors, subcontractors, and laborers about the importance of recycling, the types of materials that can be recycled, potentially hazardous materials, and any restrictions. This meeting can be combined with other training meetings on waste reduction and site protection. Be sure to ask for ideas from participants. See Appendix E for a suggested checklist to use during the meeting.
- ☐ Provide positive incentives to crews to encourage recycling. (For example: hats, T-shirts, pizza)

A Tip on Volume to Weight Conversions

Material
Conversion Rate

Wood
300 lbs /cu yd.
5.7 cu yd /ton

Cardboard (loose)
30-100 lbs /cu yd.
20-50 cu yd /ton

Drywall
400 lbs /cu yd.
5 cu yd /ton

Mixed waste
350 lbs /cu yd.
5 7 cu yd /ton

Source—*Residential Construction Waste Management, A Builder's Field Guide*

Sourcing

- ☐ Refer to *Minimizing Construction & Demolition Waste* (available from the Department of Business, Economic Development, and Tourism, Clean Hawaii Center, phone 587-3802, to identify recycling services on Oahu. For facilities on neighboring islands, see Appendix H.

Cleanup & Disposal Options

Sourcing

- ☐ Reduce your liability by using only responsible haulers who deliver the materials generated at your site to properly permitted facilities. Verify this by requiring receipts.

Site Maintenance & Cleanup

- ☐ Regularly clean around storage and recycling bins.
- ☐ Manage bins to minimize leakage or spillage.
- ☐ Use only storage bins that are watertight, rodent-proof, and easily cleaned.
- ☐ Do not burn, bury or otherwise dispose of rubbish and waste materials on project site.
- ☐ Ensure *all* wastes are removed from the site upon completion of the project.
- ☐ Restrict the use of water for cleanup where sweeping is sufficient.
- ☐ Properly dispose of treated wood waste through a certified landfill or municipal solid waste incinerator. Do not burn scraps of treated wood on-site or as kindling in a wood stove or fireplace.

A Case Study: *The Liholani Golf Village Job Site-Recycling Program*

The Liholani Golf Village development in Pukalani, Maui comprises 26 housing units on a condominiumized property of 3 5 acres A project of the Smith Development Company and Dilloway Construction Company, construction began in early September 1998 At the time of this writing, the Maui Recycling Group is midway through a pilot program to investigate the feasibility of on-site, source-separation recycling for residential construction sites

Preliminary data indicate that the project is exceeding its goals—approximately 25 percent of the total weight of waste generated is being diverted, and actual hauling costs are well under budget The project is also experiencing unanticipated efficiencies in construction process, attributed to the convenient placement of the recycling tipsters.

Based on projected totals, savings for tipping costs for drywall alone (at $37 00 per ton) are $1,110 This is approximately equivalent to the original bid for recycling services This savings alone offsets the cost of recycling (Contact Jeff Stark, Maui Recycling Group, phone 579-9109)

Solid Waste Management Checklist

Tips to Reduce

- Avoid damage. Train crews to handle and store materials properly.
- Avoid contamination. Train site crews to separate materials properly and avoid mixing recyclable and non-recyclable materials.
- Use materials efficiently. Encourage site crews to make use of scraps and use less materials overall.
- Estimate as accurately as possible. The more accurate, the less waste. Suppliers can often provide tips on estimating specific materials.
- Purchase precut and prefab components.
- Choose strong materials and exploit structural advantages.
- Purchase high-grade materials. These will get more use and generate less waste.
- Reduce packaging waste. Use suppliers who take back packaging.
- Coordinate just in time deliveries.

Source—The *Recycling Plus Program manual.*

Materials Selection & Purchase Options

Selection

- ☐ Consider used building materials. Most used building materials can be installed provided they do not act as structural components or otherwise compromise safety. Materials purchased at salvage yards usually cost only 10 percent to 50 percent of the cost of new materials. For best results, the use of salvaged materials should be incorporated during design.
- ☐ If you are involved in building design, use standard dimensions to reduce wasted lumber, drywall, and other materials.
- ☐ Use recycled concrete as aggregate for fill or to make new concrete.
- ☐ Use recycled aggregate containing crushed brick, concrete block, or glass cullet.
- ☐ Use compost and mulch in landscaping.
- ☐ Use crushed/ground gypboard as a soil amendment.
- ☐ Use cold-formed steel framing. Select steel framing with a minimum of 25 percent recycled-content. (Caution: Use galvanized steel and assemble with good quality connectors to prevent corrosion.)
- ☐ Use engineered lumber products.
- ☐ Use concrete in the foundation with flyash content up to 30 percent.
- ☐ Use lightweight concrete in the foundation made with pumice and perlite from expanded volcanic materials.
- ☐ Use insulation with recycled-content. Examples include cellulose, fiberglass, expanded polystyrene (EPS or rigid foam), and mineral wool.
- ☐ Install materials that can be recycled, such as low-mercury lighting fixtures.
- ☐ Use locally-produced, recycled-content finishes, where available. Examples include cabinet pulls, glass blocks, and tiles manufactured from recycled glass.
- ☐ Use durable finishes.
- ☐ Use recycled gypsum board.
- ☐ Use plastic lumber for exterior applications such as fences, benches, decking, docks, retaining walls, picnic tables, and landscape borders.
- ☐ Use counter tops and cabinets constructed from recycled material.
- ☐ Use recycled-content or recyclable carpet and carpet pads.
- ☐ Use recycled-content ceramic tile.
- ☐ Use recycled-content ceiling tiles.

Sourcing

- ☐ Use suppliers who use less packaging, such as cardboard, plastic shrink wrap, Kraft paper, wood pallets or frames, and metal bands.
- ☐ Use suppliers who take their packaging back after delivery.
- ☐ If the building design calls for a non-standard dimensions (try to avoid), and you have sufficient dry storage, order in bulk from a supplier who will produce the dimension for you.

Tips to Reuse

- Use salvaged materials from other jobs.
- Reuse job-site materials such as concrete forms and site fencing.
- For temporary construction, use methods that allow for reuse, such as screws rather than nails.
- Reuse scrap on site.
- In demolition and renovation jobs, plan to salvage. Donate or sell salvaged materials.
- Allow for local scavenging, if it is not a site safety issue.

Source—The *Recycling Plus Program manual.*

Waste Reduction

Training and Enforcement

- ☐ Require or encourage solid waste reduction in subcontractor agreements.
- ☐ Provide reminders at safety or other regular meetings of the project's waste reduction goals. Use these meetings to report progress, discuss problems, and discuss specific actions that can be taken. See Appendix E for a suggested checklist to use during the meeting.

Operations

- ☐ Set up a central area for cutting and storage of scraps for reuse. Studies of construction sites with a centralized cutting area show total waste from the sites were reduced by as much as 15 percent.
- ☐ Avoid throw-away equipment. Clean and maintain properly to get the full life out of the equipment. Examples of reusable equipment include construction fences, tarps, and refillable propane tanks.
- ☐ Set up labeled bins for different sized nails, screws, and other fasteners to reduce wasted hardware. Provide weather protection for bins.
- ☐ Maintain a dedicated area for recycling metals, cardboard, drywall, wood, and other recyclable waste.
- ☐ Sell or give away any untreated wood scraps.
- ☐ Divert other untreated wood scrap to a composting facility.
- ☐ Keep treated wood scraps separate from other C&D waste.
- ☐ Save larger treated wood scraps and re-use on a future project. Be sure to protect from the weather.
- ☐ Create a board-by-board take-off from your order list and provide as cut list to framer.
- ☐ Reuse materials used to build temporary structures. To make reuse easier, use assembly methods that make dismantling convenient (for example, fasten with screws instead of nails).
- ☐ Reuse small or warped pieces of dimensional lumber as blocking, bracing, shims, back framing, or form stakes. (Store in a central cutting and storage area.)

- ☐ Donate or sell reusable items from your job. Contact HIMEX (Hawaii Materials Exchange, phone 808-586-4240 or web site www.himex.org) or other non-profit organizations regarding donated materials.
- ☐ Move materials leftover from job to job.

Application—Termite Control

Termite control is an issue key to waste reduction because termites represent a significant threat to the integrity of the building structure. Repairs are not only expensive, but often generate large amounts of waste that cannot be recycled or reused. Methods of termite control include ground treatment, both chemical and non-chemical, wood treatment, preventive design and construction strategies, and regular maintenance measures. Here are some specific, environmentally-preferred actions for termite-prevention:

- ☐ Thoroughly remove all roots when clearing vegetation.
- ☐ Inspect lot for termites when clear.
- ☐ Keep the site and work area clear of all organic debris, wood scraps, cardboard, and paper.
- ☐ Frequently inspect site for signs of termite activity.
- ☐ Use materials that are impervious or unattractive to termites such as concrete, masonry, steel, and plastic lumber. (Caution: When using steel, use galvanized steel and assemble with good quality connectors to prevent corrosion.)
- ☐ If wood is used, use only wood with adequate chemical treatment. Use the least toxic method suitable for the application. (If possible, use borate-treated or other non-toxic treated lumber, which has higher recycling potential.)
- ☐ Keep drainage flow routed away from building by using appropriate grading and roof and site drainage systems. Use french drains or mini-dry wells when appropriate.
- ☐ Provide easy access for termite inspection by the owner.
- ☐ Install a 4-inch basalt termite barrier (BTB) around, and in some cases, below footings and beneath all slab on grade construction.
- ☐ Protect the BTB protective layer during construction. Dirt and wood dust can mix with the basalt and diminish its effectiveness as a termite barrier.
- ☐ Install a non-chemical termite control system. An example uses marine grade stainless steel screen as a physical termite barrier around the building perimeter.
- ☐ Use concrete in place of wood or concrete masonry units (CMUs) for building foundations.
- ☐ Fill all cracks in concrete foundations that are larger than 1/32-inch in foundations to eliminate avenues for termites.
- ☐ If CMUs are used, fill shrinkage cracks in the grout to eliminate termite entry points, especially around slab pipe penetrations. If

unsealed, these points provide termites with entry opportunities.

- ☐ Use copper or galvanized metal termite pans to separate foundations from wooden structures.
- ☐ Treat field cuts and drill holes with a brush-on wood treatment such as copper naphthenate. (CCA treated wood only.)
- ☐ Keep plantings at least 24 inches from the building perimeter.

Application—Advanced Framing

- ☐ Use wood-saving advanced framing techniques, including one or more of the following:
  - Drywall stops or clips for backing eliminate the need for extra studs, for example, where one wall abuts another, or where two walls intersect at corners. A box of clips cost about $160 and supplies three average homes
  - Two-stud corners. With two-stud corners, drywall clips spaced two feet apart can provide back-up for interior finish materials.
  - Insulated headers. Insulated headers reduce thermal transfer (bridging) found in standard construction using solid wood headers for exterior window and door openings.
  - 24-inch on-center framing. (Because there's more room for insulation, your customer will also benefit from greater energy-efficiency.) Refer to the Uniform Building Code for stud sizing requirements. When using this method, apply plywood on a horizontal axis (making the system similar to roof assembly) to eliminate "wavy" walls. This has been shown to provide structural integrity while reducing wood use by 15 percent.

(For more information on advanced framing, see *Advanced Framing Techniques, Troubleshooting and Structural Design*, Journal of Light Construction, Richmond, VT: Phone 1-800-375-5981)

A *Case Study*: The Moanalua Terrace Demolition Project

On a recent military housing upgrade project, Transcend, Inc., subcontractor to Harper Construction, removed 516 homes, complete with concrete slabs, floors, roofs, masonry block walls, and existing trees and vegetation. The $90 million demolition took approximately six months to complete. Nearly 80,000 tons of material was diverted, saving approximately $800,000 in landfill fees. The material recycled comprised:

- 45,000 tons of concrete, crusted on site and used as aggregate for utilities
- 2,700 tons of scrap iron, rebar, and 300 tons of non-ferrous copper aluminum
- 3,500 tons of trees and vegetation, ground and converted into fuel
- 7,500 tons of cold plain and A/C for use as road base
- 20,000 tons of fill material used to grade and improve agricultural land.

Also salvaged were electrical switches, panels, and breakers (shipped to Los Angeles, CA), power poles, doors, and water heaters

The new design housing features termite-resistant steel construction using waste-saving, prefabricated walls (Contact Jeff Harper, Harper Construction Company, phone 422-1931)

Job Site Recycling Options

In Hawaii, you can recycle concrete, asphalt, wood (clean lumber and green waste), cardboard, and metals.

Some companies, such as scrap metal dealers, will pay for recyclable material. Others charge fees to accept or pick up recyclables, but still generally less than fees for landfill disposal. Be aware that recyclers have specifications for the types and grades of materials they accept. To avoid wasted effort, call first to find about their requirements. See the directory in *Minimizing Construction & Demolition Waste* for a list of haulers and recycling businesses.

Tips on Recycling

- Look for a member of your staff/crew who has high interest in recycling. Most recycling plans succeed if someone in the company takes responsibility for the program.
- Work through your trade association. A job-site recycling committee can provide the forum for information/options you might otherwise miss.
- You may feel that any cost savings recycling tipping will not cover the extra time required for separation. Keep in mind that extra time spent on recycling normally decreases as the crews and subcontractors get used to a new system of waste management.
- Avoiding contamination is the key to successful recycling. Be sure that your idea of a "clean" load is the same as your recyclers.

Source—The *Recycling Plus Program* manual.

Planning

- ☐ Identify materials that can be recycled cost-effectively in your area, and target them in your plan.
- ☐ Prepare a job site recycling plan and post it on-site.
- ☐ Set a measurable goal for recycling. For example, "We will attempt to recycle 50 percent of the waste generated on this job."

Signage

- ☐ Clearly mark recycling areas and containers (interior and exterior) to prevent contamination. Make sure the signage provides information on what is acceptable. (For example, "No, wood with paint," "Yes, wood with nails.") See Appendix D for sample signage.

Training and Enforcement

- ☐ Include a requirement to recycle as much as possible in all subcontractor agreements. Identify target materials, those that are cost-effectively recycled in the project area.
- ☐ Inform new personnel where the recycling containers are located and which materials are recyclable.
- ☐ Periodically check recycling and garbage bins for mis-sorted materials. Provide training to people who are mis-sorting recyclable materials or ask your superintendent or safety manager to inform them.
- ☐ Provide reminders at safety or other regular meetings of the project's waste reduction goals. Use these meetings to review where, when, and how materials will be source separated and collected, report progress, discuss problems, and discuss specific actions to take. Also use these meetings to exchange ideas as to how to accomplish this with highest efficiency. See Appendix E for a suggested checklist to use during the meeting.
- ☐ Track and promote recycling results. See Appendix D for sample signage to use to advertise your success.

Tips for Making Recycling Convenient and Efficient

- Provide clear, easy-to-read signs on bins. (Bilingual or pictorial, if appropriate)
- Provide signs for bins that are also sturdy and removable so that they can be quickly removed and re-attached as bins are changed out.
- Avoid contamination of recyclables by making sure there's a convenient trash receptacle near recycling bins.
- Avoid unnecessary pickups (and charges) by making sure containers are full and packed down before starting to use empty or half-full ones.

Source—The *Recycling Plus Program* manual.

Sourcing

- ☐ Evaluate your options for transporting recycled materials to appropriate facilities. Local options are provided in the *Minimizing Construction & Demolition Waste* directory. Options include:
  - Garbage Hauler—Your hauler may provide bins and pick-up for certain materials.
  - In-House Recycling—You work with individual recyclers, arrange bins and pick-up and/or self-haul
  - Subs Recycling—Sub-contractors work with individual recycler, arrange bins, pick-up, or self-haul.
- ☐ Maintain regular contact with your haulers or recycling service providers to make sure you benefit from cost savings and buy-back opportunities.

Operations

- ☐ Locate trash and recycling containers close to each other, making it convenient to recycle.
- ☐ Use your waste disposal bills and recycling receipts to determine your progress towards your recycling goals. Your hauler should be able to provide you with a summary of the results. Advertise your success!
- ☐ Divert untreated wood waste to a composting facility. On average, about 25 percent of discarded construction material is dimensional lumber and another 10 percent is waste from manufactured wood products.
- ☐ Keep treated wood scraps separate from other C&D waste.

A *Case Study*: Using Waste Audits to Improve Your Recycling Program

Fletcher Wright Construction saved $70,000 through recycling and waste reduction during the construction of two new Microsoft Campus office buildings in Redmond, Washington. The general contractor used periodic waste audits to check and "tweak" recycling operations.

Using an audit form similar to Appendix C, project managers were able to identify problems, including instances where recyclables were being thrown in the dumpster instead of the recycling bin, and trash was thrown into the recycling bin. The project's safety manager conducted the audits on a weekly basis as part of his regular routine. The audit helped raise awareness and demonstrated that the general contractor was serious about recycling.

A more in-depth waste audit on one dumpster by an environmental building consultant hired for the project revealed that *nearly 70 percent* of its contents were recyclable! Slides of the materials, shown at a job site pizza meeting, motivated the crew to "do better." Later that week, the crew set up areas for metals and cardboard. The recycling contractor estimates that after this audit, recycling increased between 5 and 10 percent.

(Contact: Kathleen O'Brien, O'Brien & Company, phone 206-842-8995.)

A Tip for Job Site Recycling

You will want to target only high potential materials in your Job Site Action Plan. These are the materials you generate the most volume of, that have the most market value (and as a result can be successfully recycled in the job site area), and can be most easily source-separated.

- ☐ Save larger treated wood scraps and reuse on a future project. Be sure to protect from the weather.
- ☐ Properly dispose of treated wood waste through a certified landfill or municipal solid waste incinerator. Do not burn scraps of treated wood on-site or as kindling in a wood stove or fireplace.
- ☐ Recycle cardboard. Most volume occurs during the finish phase of the project, when electrical and mechanical fixtures are being installed. Depending on the market, cardboard can represent a buy-back opportunity.
- ☐ Recycle metal scraps. In addition to high-value copper, other metals are now being recycled, some representing buy-back opportunities. Separated metals have a higher value than mixed metals.
- ☐ Recycle drywall. Recycling fees for drywall are slightly less than disposal fees at local landfill facilities. Items that could be considered contaminants include paint, joint compound, screws, lath and plaster, or moisture. If your drywall subcontractor handles his or her own waste, work with the sub to develop a recycling program.
- ☐ Reuse site-generated concrete/asphalt rubble.
- ☐ Divert reusable waste materials, such as fixtures, to a salvage exchange facility, such as HIMEX (Hawaii Materials Exchange), phone 808-586-4240 or web site www.himex.org. The directory in *Minimizing Construction & Demolition Waste* also lists other agencies that accept donations of used building materials.

Cleanup & Disposal Options

- ☐ See General Practices

A Case Study: Island Demo, Inc., Honolulu's C&D Transfer Station

At the this time, Island Demo Inc is Oahu's only City- and County-permitted C&D debris facility transfer station. Disposal of C&D at Island Demo undergoes 27 percent reduction by weight from low technology segregation and recycling methods, reducing the amount of material destined for the landfill. Materials recovered/diverted comprise:

- Cement aggregated (16%)
- Metal (7%)
- Miscellaneous hardware, fittings, fixtures (3%)
- Paper (1%)

(Contact John Mike Leary, phone 839-5522.)

Hazardous Waste Management Checklist

Contractors and subcontractors are responsible for knowing whether materials or items they use are hazardous and or may be considered hazardous waste when disposed. Common job site materials that can become hazardous waste include paints and other finishes, solvents, adhesives, and oils. Other hazardous waste items might include vehicle batteries and other petroleum products such as gasoline, diesel, or kerosene. Hazardous materials must be treated with special care to avoid contamination of other non-hazardous materials as well as the site itself.

To determine if a material or item is potentially hazardous waste:

- Check label and shipping papers
- Look for words such as hazardous, danger, caustic or corrosive (dissolves skin, metal or other materials), flammable or ignitable (catches fire easily) carcinogenic (causes cancer); and toxic or poisonous (harms people and animals) A list of hazardous waste and criteria are found in Hawaii Administrative Rules (HAR) Title 11 Chapter 26
- Check the material safety data sheet (MSDS) the manufacturer must prepare for the product Ask your supplier for a copy
- For questions and additional information including fact sheets and flyers, call the Hazardous Waste Program Office at 586-4225

> **A Tip on Generator Classifications**
>
> Most builders meet the State's definition of a Conditionally Exempt Small Quantity Generator (CESQG) A CESQG generates no more than 220 pounds of hazardous waste per month (about half of a 55-gallon drum) and never accumulates more than 2,200 pounds CESQGs must send their waste to a site permitted to manage hazardous waste There are fewer regulations and less paperwork required for CESQGs
>
> If you generate more than 220 pounds, you are classified as a Small or Large Quantity Generator (SQG or LQG) and must contract to have your hazardous waste sent to a site permitted to manage hazardous waste There are more regulations that SQGs and LQGs must follow, including obtaining an EPA ID number and tracking of the waste from "cradle to grave"

Material Selection and Purchase Options

Selection

- ☐ Substitute less or non-toxic materials for toxic products when cost-effective. Examples include formaldehyde-free sheathing and fiberglass, and low-mercury fluorescent tubes, which are not classified as hazardous waste. Other examples are organic fertilizers, low-toxic wood preservatives, rot-resistant woods, and pest- and water-proof plastic lumber.
- ☐ Avoid toxic wood treatment with arsenic compounds such as CCA (copper chromium arsenic compound) and ACZA (ammoniac copper zinc arsenate). Select less toxic treatments such as borate (Hi-Bor) and ACQ (alkaline copper quartenary). These less toxic treatment may also render the products more recyclable.
- ☐ Use less pesticides and fertilizers and install a landscaping scheme that will require less of these polluting substances. A low-maintenance landscaping scheme uses less of these toxic substances *and* uses less water for maintenance.
- ☐ Use water-based instead of oil-based solvents, paints, and sealants.
- ☐ Purchase and use low-toxic or non-toxic cleaners for the job.
- ☐ Purchase and use less toxic form releasers
- ☐ Avoid chlorinated solvents Consider using citrus-based solvents

Sourcing

- ☐ Ask suppliers for MSDS as a routine part of purchasing materials that have been identified as potentially hazardous. Inform your suppliers that you prefer cost-effective least-toxic alternatives.

- ☐ Check with your local supplier for low or non-toxic alternatives.

To determine your status as a regulated hazardous waste generator:

- At the start of the project, work with your owner and any subcontractors to determine the types and amounts of hazardous waste likely to be generated during the project Will any of the potentially responsible parties (owner, general contractor, sub-contractors) be a regulated generator (CESQG or SQG)?
- If so, determine who should accept the responsibility for the designation as the generator. This designee is often the person who pays for hauling—normally the general contractor. However, other factors such as the number and nature of other ongoing projects, may make indicate that designating the owner or a sub-contractor(s) is more prudent and cost-effective
- Once the designation is agreed upon, the general contractor should contact both the MSW landfill and the C&D landfill to discuss the landfill's waste screening requirements This will identify any additional requirements of the landfill that must be met
- For assistance, contact the Hazardous Waste Program Office at 586-4225.

Waste Reduction Options

Signage

- ☐ Post signage to remind field personnel of the goal to reduce hazardous waste on the project. See Appendix D for sample signage.

Training

- ☐ Provide reminders at safety or other regular meetings of the project's waste reduction goals. Use these meetings to report progress, discuss problems, and discuss specific actions. See Appendix E for a suggested checklist to use during the meeting.

> **A Tip on Liability**
>
> Builders can reduce their liability exposure by requiring their painting subcontractor to show proof of proper disposal or to switch to more benign paints, stains, caulks, and solvents

Operations

- ☐ Label hazardous waste containers properly to avoid mixing incompatible wastes or contaminating clean materials.
- ☐ Avoid overstocking hazardous materials.
- ☐ Adopt a "first-in, first-out" policy to prevent raw materials from becoming out-dated.
- ☐ Store wastes separately to avoid contamination.
- ☐ Reject vendor samples you don't need.
- ☐ Reuse spent solvent for cleaning.
- ☐ Donate extra paint to someone who can use it. List large quantities with the HIMEX (Hawaii Materials Exchange), phone 808-586-4240 or web site www.himex.org The directory in *Minimizing Construction & Demolition Waste* also lists other agencies that accept donations of used building materials.
- ☐ Dispose of non-recyclable hazardous waste at legally permitted facilities.
- ☐ Require and retain receipts to document proper disposal/recycling of all hazardous materials.

Tips for Reducing Hazardous Waste

- Use cleaners wisely—use heavy duty, more toxic) cleaners only for heavy duty jobs.
- Buy only the amount of product that you need. Use up the products or give leftovers to someone who will.
- Inspect containers upon receipt, and reject leaking or damaged containers.
- Adopt a "first-in, first out" policy to prevent raw materials from becoming obsolete.
- Label hazardous waste containers properly to avoid mixing incompatible wastes or contaminating clean materials.
- Control access to storage areas and routinely inspect containers
- Be prepared to respond promptly to spills
- Reuse solvents. Allow solids to settle, then pour off the clear top layer and reuse it. Solids can also be strained from spent solvents using many different types of paper or cloth filters. Note: The solids so removed (settled or strained) are often hazardous waste
- Recycle all recyclable hazardous wastes, such as used motor oil

Job Site Recycling Options

Training

- [ ] Provide reminders at safety or other regular meetings of the potential to recycle hazardous waste. Use these meetings to report progress, discuss problems, and suggest specific actions. See Appendix E for a suggested checklist to use during the meeting.

Operations

- [ ] Recycle as much as possible. Consult the *Minimizing Construction & Demolition Waste* directory for businesses and facilities that accept hazardous waste for recycling.
- [ ] Recycle fluids, such as oil or antifreeze and vehicles removed from vehicles at approved facilities.
- [ ] Recycle solvents from paint gun washers.

Cleanup and Disposal Options

Operations

- [ ] Follow manufacturers' recommendations for the disposal of paints, stains, and other controlled materials.
- [ ] Dry latex paint in the can, and remove the lid before discarding in covered dumpsters.
- [ ] After reusing solvents, dispose of them as hazardous waste.
- [ ] Keep hazardous waste separate. Do not mix different wastes.
- [ ] Promptly dispose of hazardous items and waste materials not identified for recycling or reuse.

Sourcing

- [ ] Dispose hazardous waste through a permitted facility (as required).

Safety & Control

Storage

- [ ] Control access to hazardous material storage areas, and routinely inspect containers for signs of deterioration. Store hazardous waste left on site in waste containers that are in good condition and suitable for the waste (as required by law).
- [ ] Clearly label hazardous waste containers.
- [ ] Store volatile liquids, including fuels and solvents, in closed containers.

A Tip on Penalties for Improper Disposal

Contractors, beware of low disposal bids! Haulers who are convicted of improper disposal of solid waste face fines from the State of up to $1000 per day. If the waste included hazardous waste, the potential liability is even more severe and far-reaching.

Unpermitted landfills that accept hazardous waste for dumping are in violation of EPA hazardous waste regulations and solid waste regulations. These regulations encompass the "cradle-to-grave" process of the material, making the project owner and general contractor vulnerable to EPA liability actions, including fines exceeding $500,000 and costs for clean-up and remediation.

Operations

- [ ] Do not clean rollers and brushes in sinks, lawns, catch basins. Painting companies should comply with Department of Health regulations. See *Reducing & Managing Painting Contractor Wastes*. (See Appendix H).
- [ ] All vehicles and equipment used during construction should be fueled off-site or at a designated fueling pad. Any on-site fueling area must be constructed with proper containment and safety features.
- [ ] Properly maintain vehicles and equipment to reduce gaseous pollutant emissions and fluid leakage.
- [ ] Inspect containers upon delivery. Reject leaking or damaged containers.

Appendix A—Pre-Project Walk-Thru (Demolitions and Re-Models)

Use this form to identify materials and estimated quantities for salvage and recycling for demolition and re-modeling projects.

Material	Est. Qty.	S, R, D (Note 1)	Salvage/ Recycling or Disposal Co.	Est. Tons (Note 2)	Comments
Drywall					
Concrete					
Wood					
Ferrous Metal					
Non-ferrous Metal					
Glass					
Asphalt					
C/A Rubble					
Mixed loads (trash, plastic, packaging)					
Landclearing debris					
Cardboard					
Building Components/Specialty Items (list):					

Note 1—Indicate S (Salvage), R (Recycle), or D (Dispose)

Note 2—Average volume-to-weight conversions are:

Mixed Waste	5.7 yds/ton
Wood	6.7 yds/ton
Cardboard	20 yds/ton
Drywall	4 yds/ton
Rubble	1.4 yds/ton

Appendix B—Job Site Waste Management Action Plans

Includes:

1. *Job Site Waste Management Action Plan for Large Jobs*
2. *Job Site Recycling Plan for Smaller Jobs*

Job-Site Waste Management Action Plan Form for Large Jobs

Project Name: ______________ City and County: ______________

Recycling Site Coordinator: ______________ Date: ______________

REDUCE, REUSE AND BUY RECYCLED ACTION ITEMS

1. ______________
2. ______________
3. ______________
4. ______________
5. ______________

RECYCLING GOAL - To recycle ____% of waste generated on the site.

RECYCLING SERVICE PROVIDERS AND TARGETED MATERIALS.
Action Items ☐ Evaluate Cost and Services Offered ☐ Service Provider Agreements in Place

Company #1 ______________ Company #2 ______________

Materials	Peak Generation *	Mtls. Recipient **	Materials	Peak Generation *	Mtls. Recipient **
☐ Wood			☐ Wood		
☐ Metal			☐ Metal		
☐ Cardboard			☐ Cardboard		
☐ Drywall			☐ Drywall		
☐ ______			☐ ______		
☐ ______			☐ ______		

* Point in project (week, phase, dates) when most volume will be generated in material category.
** Only applicable if you are handling all recycling activities with in-house staff.

RECYCLING OPERATIONS - Consult Planning Sections for more information.

Action ***	Who/What/When
☐ Choose bins/collection methods	
☐ Order bins - oversee delivery	
☐ Site bins/collection sites for optimum convenience	
☐ Label/sign bins/collection sites	
☐ Sort or process wood	
☐ Sort or process metal	
☐ Sort or process drywall	
☐ Sort or process cardboard	
☐ Sort or process ______ (material)	
☐ Sort or process ______ (material)	
☐ Schedule material pickups/dropoffs	
☐ Document material pickups/dropoffs	

*** Depending on the service option you choose, action items may be the responsibility of your field personnel, your hauler, a full-service recycling contractor, or your subcontractors

Job-Site Waste Management Action Plan Form for Large Jobs

COMMUNICATION ACTION ITEMS - Check only items you plan to use.

Action	Who/What/When	Completed
☐ Complete Job Site Action Plan		☐
☐ Hold Orientation/Kick-off Meeting		☐
☐ Mention Program & Progress in Weekly Job Site Meetings		☐
☐ Use Implementation Checklist		☐
☐ Post Goals/Progress (Signage)		☐
☐ Post Targeted Materials (Signage)		☐
☐ Distribute Tip Sheets for Job Site Personnel		☐
☐ Distribute Subcontractor Kit with Tip Sheets		☐
☐ ______		☐

MOTIVATION ACTION ITEMS - Check only items you plan to use.

Action	Who/What/When	Completed
☐ Use Formal Agreements Committing Subs to Program		☐
☐ Fork-Lift Operators Police Site		☐
☐ Require Mis-Sorters to Re-Sort Bin		☐
☐ Charge Individuals Contaminating Bins		☐
☐ Provide Stickers, T-shirts, or Hats		☐
☐ Public Recognition of Participating Subs		☐
☐ Serve Refreshments at Meetings		☐
☐ Award T-shirts (if not used as Incentives)		☐
☐ Letters of Recognition		☐
☐ Awards Luncheon		☐
☐ ______		☐

EVALUATION ACTION ITEMS - Check only items you plan to use.

Action	Who/What/When	Completed
☐ Perform Short Form Waste Audit ("Know What's In Your Dumpster", Appendix C)		☐
☐ Perform Mid-Course Assessment		☐
☐ Perform Monthly Cost and Materials Tracking		☐
☐ Perform Final Evaluation		☐
☐ ______		☐

PROGRAM BENCHMARKS - 10 STEPS

Action	Who/What/When	Completed
☐ Develop Job Site Action Plan		☐
☐ Ensure Buy-In of Field Personnel and Subs		☐
☐ Implement Your Plan On-Site		☐
☐ Implement Communication Action Items		☐
☐ Implement Motivational Action Items		☐
☐ Evaluate/Track Progress		☐
☐ Reward Successes		☐
☐ Incorporate Improvements in Company Program		☐
☐ Develop a Plan for Your Next Project		☐

Recyclable Materials

What material will you target?	Condition of material*	How will it be handled on site?	Who will haul it?	Where will it be taken?
☐ Wood				
☐ Cardboard				
☐ Ferrous metal				
☐ Non-ferrous metal				
☐ Drywall				
☐ Concrete / Asphalt Rubble				
☐ Other				

**Check with your recycler or hauler to see if any specifications or conditions exist regarding the material being recycled. Examples include size restrictions and non-acceptable materials (for example, treatments, finishes, or fasteners).*

Action Items

- ☐ Complete this Job Site Recycling Plan and post on site.
- ☐ Commit subcontractors to recycle in Subcontractor Agreement.
- ☐ Keep subcontractors and workers aware and informed of Recycling Program.
- ☐ Require individuals to properly sort recyclables and hold them responsible for mis-sorted loads.
- ☐ Track and promote recycling results.

Follow these procedures to maximize recycling at your job site.

- ☐ Separate and recycle wood, cardboard, metal, drywall and other recyclable materials.
- ☐ Make sure both interior containers and exterior recycling dumpsters are convenient and clearly labeled
- ☐ Train new personnel where the recycling containers are located and which materials are recyclable.
- ☐ Move trash and recycling containers close to each other, making it convenient to recycle.
- ☐ Store materials to prevent loss from damage.
- ☐ Check recycling and garbage bins daily for mis-sorted materials.
- ☐ Provide training to people who are mis-sorting recyclable materials or ask your superintendent or safety manager to inform them.
- ☐ Identify large quantities of waste that are not being recycled, and ask your superintendent if they can be recycled.

Appendix C—Know What's in Your Dumpster

The most effective waste reduction programs will include some method of monitoring the program while the project is in progress. This appendix provides a waste audit form that you can use to get feedback about how well the program is working. It will help you know whether you are recycling all you can or whether appreciable amounts of recyclables are ending up in the dumpster.

Project Name______________________ Date ______________

On-Site Recycling Coordinator ______________

Major Subcontractors On site: ______________ ______________

______________ ______________ ______________

______________ ______________ ______________

1. Indicate the volume of each garbage and recycling container on site and indicate the percent full in the following chart. Then indicate the three bins to be used for the audit.

Container	Cubic Yds	Percent Full	Audit
Garbage Receptable # 1			
Garbage Receptable # 2			
Garbage Receptable # 3			
Garbage Receptable # 4			
Wood Recycling Container			
Metal Recycling Container			
Cardboard Recycling Container			
Other Recycling Container ( )			
Other Recycling Container ( )			
TOTAL WASTE (CY)			

2. Estimate the percentage and amount of recyclables ending up in one garbage receptacle and the percentage and amount of mis-sorted materials in two recycling bins.

Material Types	Garbage Receptacle Show % &CY of recyclable materials		Recycling Container Show % &CY of mis-sorted materials		Recycling Container Show % &CY of mis-sorted materials	
	% of total	CY (approx)	% of total	CY (approx)	% of total	CY (approx)
Wood						
OCC cardboard						
Gypsum						
Metal						
Asphalt paving						
Concrete (includes block)						
Bricks						
Composition shingles						
Plastic (#1 and #2)						
Other recyclable						
Other recyclable						
Garbage (waste not targeted)						
Total	100%	CY	100%	CY	100%	CY

Know What's in Your Dumpster

3. Mark the areas you feel need attention to help you meet the project's recycling goals.

- ☐ Lack of space to place containers
- ☐ Lack of close-by work containers
- ☐ Lack of toters to carry materials to bins
- ☐ Materials not recyclable
- ☐ Recycling bins are not available (list material types): ______________ ______________ ______________
- ☐ Pick-ups not frequent enough
- ☐ Pick-ups too frequent
- ☐ Recycler not responsive
- ☐ Costs prohibitive
  - ______________ Hauler
  - ______________ Labor
  - ______________ Space
  - ______________ Bin
- ☐ Job schedule is prohibitive
- ☐ In-house crew not knowledgeable
- ☐ In-house crew not responsive
- ☐ Subs not knowledgeable
- ☐ Subs not cooperative
- ☐ Other______________

4. Waste Reduction—Below is a list of actions you can take to prevent waste generation on site. Mark the practices currently being used with a (C) and those you plan to implement on this project with a (P).

_____ Use less material

_____ Prevent materials damage during handling

_____ Store materials properly

_____ Make use of scraps

_____ Avoid contaminating waste with toxic materials

_____ Plan to salvage

_____ Reuse salvaged materials

_____ Sell or donate salvaged materials

_____ Reduce packaging waste

_____ Order in bulk

_____ Coordinate just-in-time deliveries

_____ Use products with recycled-content

_____ Use accurate materials estimating procedures

_____ Use precut and prefab components

_____ Reduce toxic materials use

_____ Choose strong materials and exploit structural advantage

_____ Use high grade materials

_____ Other: ______________

Other Comments:

____

____

____

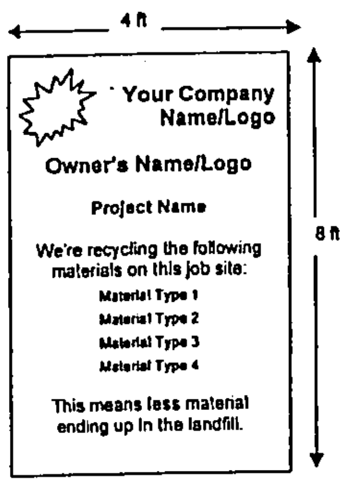
____

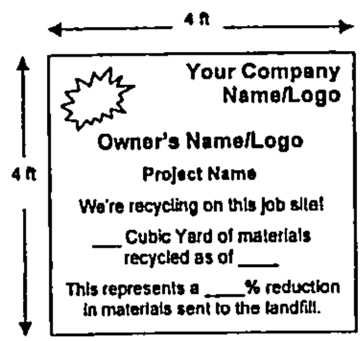
____

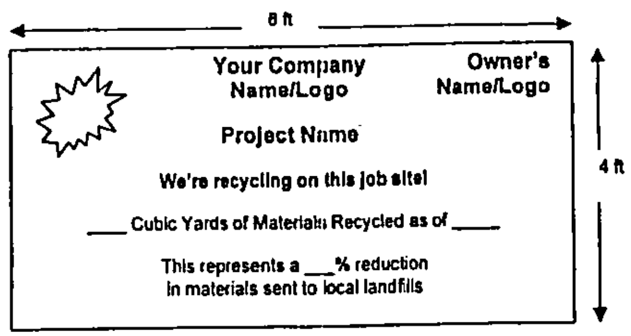
____

____

Appendix D—Sample Job Site Signage







Here are some ideas for "Targeted Materials Definitions" signage. Check all categories that apply and post prominently on the job site trailer or on/near recycling bins. These signs should be large enough to be visible from a distance.

OK to Recycle WOOD that is:

- ☐ Painted or Stained
- ☐ Pressure Treated
- ☐ Laminated
- ☐ Engineered (contains glue or other non-wood materials)
- ☐ Contaminated with nails or screws
- ☐ No longer useful for any purpose on the job site.
- ☐ ____________

✓ Only Checked Categories Apply.

OK to Recycle DRYWALL that is:

- ☐ Painted
- ☐ Contaminated with joint compound
- ☐ Contaminated with nails or screws
- ☐ Contaminated with lath and plaster
- ☐ Wet
- ☐ No longer useful for any purpose on the job site
- ☐ ____________

✓ Only Checked Categories Apply.

OK to Recycle CARDBOARD that is:

- ☐ Waxed
- ☐ Broken down (flat)
- ☐ Wet
- ☐ Contaminated with metal banding or strapping
- ☐ No longer useful for any purpose on the job site.
- ☐ ____________

✓ Only Checked Categories Apply.

OK to Recycle METAL that is:

- ☐ Ferrous (iron and steel) such as rebar, misc iron
- ☐ Non-ferrous, such as aluminum siding, gutters, brass, copper, nickel, and stainless steel
- ☐ No longer useful for any purpose on the job site
- ☐ ____________

✓ Only Checked Categories Apply.

Appendix E—Job Site Training Checklist

Here are some items to cover during job site training sessions to get a quick assessment of your recycling progress.

- ☐ As of ____________ (date), what percentage of our "waste" are we recycling?
- ☐ Does everyone know what materials are being recycled on this job?
- ☐ Does everyone know what materials are acceptable for recycling? (Refer to posted definitions for targeted materials.)
- ☐ What's in the garbage and shouldn't be? (Refer to waste audits, including slides if you have them).
- ☐ Does everyone know where different materials go? (Refer to signs, color codes, or other means of determining collection sites.)
- ☐ How can we reduce waste in the first place? (Refer to job personnel and subcontractor tip sheets.)
- ☐ Does anyone have any suggestions for improving our operations?

Tips for Site Crews

- ☐ Make sure recycling containers are full before using empty or half-full ones.
- ☐ Make sure bins are as close as possible to where material is being generated.
- ☐ Use bins that suit the site. For example:
  - **cranable**: for multi-story buildings
  - **smaller or mobile**: for quick-moving or hard-to-get-at projects
  - **sectioned with dividers**: for smaller quantities or hard-to-get-at projects

Appendix F—How Well Did You Do?

Here are two worksheets that you can use to see how much money you are saving through your recycling efforts, one for small jobs and one for large jobs. You can also purchase software that will perform these calculations for you. One software package, the *Business Recycling Cost Model*, automatically calculates your savings, provides a cost-benefit analysis for waste-prevention activities, and evaluates the effect of substituting materials, using data that you enter. (For more information, see Appendix H—Resources.)

You will notice that the *estimated* cost savings will be fairly modest in terms of your overall budget. This is because current C&D disposal fees in Hawaii ($25 per ton) are relatively inexpensive. In addition, the cost differential between disposal and recycling in Hawaii is not significant. This situation is not one you can count on, however. Builders in other parts of the U.S. have experienced "sticker shock" when faced with sharp increases in tipping fees that occurred almost overnight. You can prevent this by making waste reduction a part of your everyday practice.

For small jobs especially, the *actual* cost savings are likely to be primarily the result of source reduction strategies such as efficient framing design, careful take-offs, and centralized cutting. You can estimate material cost savings by comparing material purchase receipts to those from similar projects you completed using conventional methods. For example, you may see a drop of 10% or more in your budget for framing materials by using an efficient framing design. Since most building materials are imported to Hawaii, this could represent substantial savings, and increased profit margin.

How Well Did You Do?—Small Jobs

The formula below is a guide for determining how well you did overall in reducing the amount of material used as well as wasted. Based on research conducted around the country, it is estimated that the amount of waste coming off conventionally built single-family homes in the U.S. can be as much as 5 pounds per square foot. Any source reduction strategies you incorporate, in addition to job site recycling, will reduce the amount of waste you must dispose.

The formula helps you determine roughly *how much material you saved* from the landfill by comparing your actual disposal costs to your disposal costs if you were generating waste at the rate of 5 pounds per square foot.

For small jobs, *actual* cost savings are likely to be primarily the result of source reduction strategies such as efficient framing design, careful take-offs, and centralized cutting.

________ Your project square footage	Multiplied by 5/2000 (avg. weight of waste, in tons, generated per sq.ft.)	= ________ tons avg. waste typically generated for projects this size
________ Tons Avg. waste typically generated (from row above)	Multiplied by $25 (cost per ton to dump waste in your county)	= $ ________ avg. disposal cost for projects this size
$ ________ avg. disposal cost (from row above)	Minus ________ Your *actual* disposal costs	= $ ________ your savings
$ ________ your savings (from row above)	Divided by $25 ________	= ________ tons tons of material you saved through recycling and waste reduction

Calculate Your Savings for Recycling—Large Jobs[1]

1. Determine how much you would have paid if you had not recycled:

How much material did you dispose *and* recycle? ________ Tons
(weight will be on bills and receipts. (See conversion tips on page 7 to convert from volume to weight for recycled materials.)

Multiply this amount by the tipping fee per ton X $ ________ per ton

Cost if you had disposed entire amount, with no recycling = $ ________

2. Determine how much it cost you for waste management, including recycling:

Total fees for disposal and recycling $ ________
(Check vendor bills and receipts)

Add estimate for any *extra* labor costs due to recycling (may not be applicable) + $ ________
(Estimate 1 to 2 extra hours per project week times the labor rate. Will vary depending on phase of job. Some weeks will be minimal.)

Add estimate for any *extra* rental costs for recycling containers or equipment + $ ________
(May be included in bills)

Add estimate for any *extra* trucking costs for recycling + $ ________
(May not be applicable)

Subtract any revenues for recycling - $ ________
(May be applicable for some materials, such as metals)

Cost for waste management, including recycling = $ ________

3. Compare cost of disposal vs. a waste management program, including recycling:

Cost without recycling $ ________

Minus cost with recycling - $ ________

That's Your Savings! = $ ________

[1] You can estimate your savings beforehand by:
- estimating the amounts of waste you typically generate (see your previous disposal bills)
- estimating how much material you will be recycling (by type)
- calculating the cost (fees) of recycling those materials
- estimating other recycling costs (labor, containers/equipment, trucking)
- estimating revenues from recycling
- and using the same method above for calculating the savings

Appendix G—Using Specifications to Reduce Construction Waste

Introduction

Increasingly, architects preparing project specifications are including provisions waste reduction, reuse, recycling, and use of recycled-content building materials. Between 50 and 80 percent of construction waste is reusable or recyclable, and specifications for waste management can help ensure project managers will efficiently manage these resources.

This appendix provides information about ways that project specifications can be used to reduce construction waste. Although project specifications are developed by design professionals during the design phase, contractors frequently have input in their development. Contractors may also want to include some of these ideas in requests for changes and substitution. You can also include some of these in your subcontractor agreements.

Strategies

Proven strategies in developing effective specifications for construction waste management are:

1. *Using bid alternates*—Requiring submission of bid alternates for undertaking specific reduction/recycling/reuse measures as an alternative to landfilling waste. This option allows the owner to determine whether these alternative measures are economically feasible.
2. *Requiring waste reduction/recycling/reuse/use of recycled-content to the extent practical*—This option uses language that requires waste reduction, reuse, recycling, and use of recycled-content materials to the fullest extent possible. The effectiveness of this approach can be strengthened with additional requirements for tracking and reporting and verbal encouragement at pre-project and project progress meetings.
3. *Requiring a construction waste management plan*—This option requires the successful bidder to submit a construction waste management plan for approval by the owner. The specifier can choose which items must be included in the draft, and the parties can negotiate prior to agreeing upon a final plan.
4. *Requiring recycling/reuse/use of specific items*—Another option foregoes the waste management plan and instead directly specifies that certain items will be recycled, reused, and certain resource efficient (including recycled-content) materials will be used.
5. *Subtracting waste costs and substituting a waste manager*—With this approach, each subcontractor is required to include a line item in their bid for disposal costs. This amount is subtracted from the final bid, and an independent waste manager is hired to handle all waste management.

Strategies 2 through 5 have been used in published case studies that demonstrate the waste minimization effectiveness of the approach used at reduced or unchanged costs.[1] Numerous case studies document the successful use of recycled-content and other resource efficient building materials

[1] For more information and case studies, contact Triangle J Council of Governments, phone (919) 549-0551, fax (919) 549-9390.

Specification Options

Here are some ways to use your bid documents to get results:

Source Reduction

- ☐ **Take-Offs:** Require detailed take-offs. In addition to acting as an order list for building materials, a detailed take-off will identify the intended location and use in the structure. This reduces the risk of unplanned and potentially wasteful cuts.
- ☐ **Tools, Equipment, Supplies:** Include a goal to use good quality (durable) and/or reusable tools equipment, and supplies. For example, concrete forms can be reused, as can durable site fencing, tarp, and temporary barriers and controls.
- ☐ **Supplier Packaging:** Minimize packaging waste by requiring provisions for returnable or reduced packaging in supply agreements, particularly for items purchased in large quantities. Seek bulk packaging.
- ☐ **Waste Management Plan:** Require provision of a waste management plan that incorporates source reduction during build-out. It would describe:
  - Waste audit (required for remodels and demolition).
  - Source reduction goals.
  - The means to be used to track progress towards those goals.
  - The method to be used for communicating those goals to field personnel and subcontractors (such as inclusion in subcontractor agreements and training at safety meetings).
- ☐ **Materials Storage:** Require proper storage of materials (including hazardous materials) to avoid damage and outdating.
- ☐ **Termite Control.** Require specific, environmentally-preferred actions for termite-prevention.

Recycling

- ☐ **Waste Audit.** For remodels and demolitions, provision for performance of a waste audit to identify high potential recyclable materials.
- ☐ **Waste Management Plan:** Require provision of a waste management plan that incorporates recycling during build-out. It would describe:
  - The types of materials that will be generated during construction in significant amounts, and that can be recycled cost-effectively.
  - Recycling goals. Reasonable recycling goals based on current field research include:
    - 20% for remodeling waste
    - 40% for new construction waste
    - 50% for demolition waste
  - The means to be used to track progress towards those goals, including providing tonnage of materials disposed/recycled and associated savings
  - The method to be used for communicating goals to field personnel and subcontractors (such as inclusion in subcontractor agreements and training at safety meetings).

Recycled-Content and Salvaged Building Materials

- ☐ **Recycled-Content Materials:** Set a goal for the use of recycled-content in the building, such as: "Use at least five materials that have x% of post-consumer or recycled-content." Alternatively or in addition, specify particular building materials with recycled-content. Examples of building material options that meet industry standards and include recycled-content are:
  - Expansion Joint Filler—available with 100% post-consumer content (newspaper).
  - Concrete Aggregate—locally produced to specifications from concrete waste.
  - Compost—locally produced from processed yard, food, and other organic waste.
  - Carpet and Pad—commercial grades available with up to 100% recycled plastic; also available with recovered fibers from recycled textiles.
  - Steel Framing—all steel framing includes a minimum of 25% recycled-content. Some framing systems are targeting much higher levels of recycled-content.
  - Plastic lumber—manufactured in Hawaii from recycled milk jugs and soda bottles.
  - Insulation—cellulose, polystyrene, fiberglass, and mineral wool insulation include varying amounts of recycled-content.
  - Ceramic Tile—available in various recycled-contents (up to 70 percent).
  - Ceiling Tiles—typically include significant amounts of recycled fiber and/or mineral waste.
  - Drywall—available with recycled gypsum.
  - Floor Tile—ceramic tiles, rubber, and vinyl tiles are available with recycled-content.
  - Cabinet pulls, glass blocks, and glass tiles—manufactured in Hawaii from recycled glass.
  - Paint—available with recycled or reworked (from mis-tints) content for both primer and finish coat.
  - Glass Cullet—use as fill or filter medium; see DOT specifications.
  - Playground Surfacing—available with 100% recycled rubber.
  - Parking Stops—available with 100% recycled plastic.
  - Roofing—shingles, tiles, and panels are available with a variety of recycled materials, including plastic, rubber, metal, fiber, and flyash slag.
- ☐ **Salvaged Materials:** These materials may be available from the existing structure (if applicable) or an outlet for used building materials or architectural salvage. Some commonly salvaged materials are:
  - Landscaping materials
  - Concrete, brick, masonry (as site furnishings)
  - Finishes, such as tile, carpet, millwork (trim and flooring), and cabinets
  - Dimensional lumber, timbers
  - Windows, doors, and associated hardware
  - Electrical fixtures and lamps (subject to code approval)
  - Sinks, bathtubs, and accessories
  - Broken concrete and asphalt from demolition (can be used as fill per DOT specifications) or for retaining walls at project site or other building sites)
  - Insulation
  - Appliances

Resource-Efficient Materials

- ☐ **Steel framing.** Specify cold-formed steel framing with a minimum of 25 percent recycled-content.
- ☐ **Wood-Efficient Materials:** Set a goal for the use of wood-efficient materials in the building. Examples include:
  - Engineered wood products, such as I-beams, LVL, finger-jointed studs and trims.
  - Wood products produced from fast-growing species or particle board, produced from shavings.
- ☐ **Certified Wood Products:** Wood products produced from sustainably harvested timber. (Certified sustainably harvested timber is locally available.)
- ☐ **Durable Materials:** Set a goal for the use of durable materials in the building. Examples include:
  - Metal roofing
  - Linoleum sheet flooring
- ☐ **Standard Dimension Materials:** Set a goal for the use of materials available in standard sizes and/or provide modular dimensioning. Both structural and non-structural options (including finishes) are available. Design to accommodate these standard dimensions.
- ☐ **Locally-Produced Materials:** Set a goal for the use of locally produced materials. This will save on the energy used to transport the material from manufacturing site to building site.
- ☐ **Low Maintenance and Easily Replaced Materials:** Set a goal for the use of materials that require less maintenance or are easily replaced or repaired. For example, carpet tiles, which can be selectively replaced in high-wear areas, are an option that saves money and resources. A durable finish that requires no coating is another option.
- ☐ **Other Emerging Product Selection Criteria:** As technology develops, there may be other criteria that can be used in your design and specifications to determine environmental preferability. For example, the issue of recyclability is one area being investigated. The additional resources listed are updated from time to time and should include information about additional criteria you may use.
- ☐ **Post-Occupancy Purchases:** For building materials selected for resource-efficient criteria, require the provision of information (including MSDSs and other product literature) to owner's representatives for post-occupancy replacements.

Developing Your Own Specifications

Several resources are available for use in developing your own project waste management specifications, including generic specifications such as WasteSpec[2] and Green Spec.[3] In practice, waste management specifications are often derived from a number of sources. You will likely find the best approach is to develop a set of generic specifications suited to your types of projects and location, which you can then adapt for individual project use.

Two sample waste management specifications follow: a the Job Site Waste Reduction Specification section of waste management specifications developed by the Natural Resources Defense Council (NRDC) and a Department of the Navy Guide Specification for waste management.

[2] To order WasteSpec ($28.00), contact the Triangle J Council of Governments, PO Box 12276, Research Triangle Park, NC 27709. Phone (919) 549-0551, fax (919) 549-9390.

[3] To order Green Spec, contact Siegel & Strain Architects, 1295 59th Street, Emeryville, California, Phone (510) 547-8092; email info@siegelstrain.com.

WASTE MANAGEMENT SPECIFICATIONS — GENERAL PROVISIONS

The sample specification that follows is adapted from *Solid Resources Management Specification: Contractor Guidelines and Requirements for Reuse, Salvage, and Recycling of Construction, Demolition, and Landclearing Materials*, courtesy of the City of Los Angeles Integrated Solid Waste Management Office (213-847-4321). Additional provisions were adapted from *Waste Reduction and Recycling Demonstration Project Final Report*, submitted to Seattle Solid Waste Utility by O'Brien & Company. To order this specification on disk, call NRDC at 415-777-0220 and ask for the Wood-Use Efficiency Department.

Job-Site Waste Reduction Specification

1. DESCRIPTION

1.1 This section includes procedures for ensuring optimal diversion of solid resources generated by the Work within the limits of the Construction Schedule, Contract Sum, and available materials, equipment, and products.

1.1.1 Assembly Bill 939, California Solid Waste Management Act, requires that localities throughout the state develop source reduction, reuse, recycling, and composting programs to reduce the tonnage of solid waste disposed of in landfills by 50 percent by the year 2000. Construction, demolition, and landclearing debris generated by the development are among the materials targeted by [city] to achieve these diversion rates, and the Developer supports these initiatives.

1.1.2 The Contractor shall participate in promoting efforts of the Developer or its representative to create a resource-efficient and environmentally sensitive Project and to effect optimum control of solid waste and recoverable resources generated in the Work.

1.1.3 The Developer has adopted recycled product procurement policies and the Contractor shall use products with post-consumer recycled content to the greatest extent feasible. Refer to the most recent issue at the date of bid of *A Resource Guide to Recycled-Content Construction Products*, published by the Los Angeles Integrated Solid Waste Management Office (call 213-847-1444 to obtain a copy).

1.2 Related Sections: Documents affecting work of this Section include, but are not necessarily limited to, the following Contract Specifications:

- Site Clearing, 02230
- Demolition, 02220
- Asbestos Removal, 13280
- Earthwork, 02300

2. DEFINITIONS

2.1 Class III landfill: A landfill that accepts non-hazardous resources such as household, commercial, and industrial waste resulting from construction, remodeling, repair, and demolition operations. A Class III landfill must have a solid waste facilities permit from the California Integrated Waste Management Board (CIWMB) and is regulated by the Local Enforcement Agency (LEA).

2.2 Construction and demolition waste: Includes all non-hazardous solid resources resulting from construction, remodeling, alterations, repair, and demolition operations.

2.3 Disposal. Acceptance of solid wastes at a legally operating facility for the purpose of landfilling. Includes Class III landfills and inert fills.

2.4 Inert backfill site: A location, other than inert fill or other disposal facility, to which inert materials are taken for the purpose of filling an excavation, shoring, or other soils engineering operation.

2.5 Inert fill: A facility that can legally accept inert waste such as asphalt and concrete exclusively for the purpose of disposal.

2.6 Inert solids/inert waste: Non-liquid solid resources including, but not limited to, soil and concrete, that do not contain hazardous waste or soluble pollutants at concentrations in excess of water-quality objectives established by a regional Water Board pursuant to Division 7 (Section 13000 et seq.) of the California Water Code and do not contain significant quantities of decomposable solid resources.

2.7 Mixed debris: Commingled recyclable and non-recyclable materials generated at the construction site.

2.8 Mixed debris recycling facility: A solid resources processing facility that accepts commingled construction and demolition debris for the purpose of recovering reusable and recyclable materials and disposing of the non-recyclable residual materials.

2.9 Permitted waste hauler: A company that possesses a valid and current permit from the [name] County Department of Public Health to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal in the [name] County.

2.10 Recycling: The process of sorting, cleansing, treating, and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating, or thermally destroying solid waste.

2.10.1 On-site recycling: Sorting and processing materials for use in an altered form in the Work (e.g., concrete is crushed for use as base for a parking lot on the site).

2.10.2 Off-site recycling: Hauling materials to a location off the Project site for use in an altered form in the manufacture of a new product.

2.11 Recycling facility: An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of a new product. Depending on the types of materials accepted and operating procedures, a recycling facility may or may not be required to have a Solid Waste Facilities permit from the CIWMB or be regulated by the LEA.

2.12 Reuse: Making new use of a material without altering its form.

2.13 Salvage: Recovery of materials for on-site reuse or to sell or donate to a third party.

2.14 Source-separated materials: Materials that are sorted at the site of generation by individual material type for the purpose of reuse or recycling, e.g., demolished concrete that is separated at the Project site for delivery to a base course recycling facility.

2.15 Solid waste: Materials that have been designated as non-recyclable and are discarded for the purposes of disposal.

2.16 Transfer station: A facility that can legally accept solid wastes for the purpose of temporarily storing the materials for reloading onto other trucks and transporting to a landfill for disposal, or recovering some materials for reuse or recycling. Transfer stations must be permitted by the CIWMB and regulated by the LEA.

3. SUBSTITUTIONS

Should the Contractor desire to use procedures, materials, equipment, or products which meet the requirements of these specifications but are more environmentally sensitive, the Contractor shall submit these substitutions in accordance with Substitutions and "Or Equal" Submittal of the General Requirements.

4. SOLID RESOURCES MANAGEMENT PLAN

4.1 Contractor shall conduct a site assessment and estimate the types and quantities of materials under the Work that are anticipated to be feasible for source separation for recycling or reuse, either on-site or off-site, and shall note the procedures intended for a recycling, reuse, and salvage program. Refer to the most recent issue of *Construction and Demolition Waste Recycling Guide*, and *Wood You Recycle?*, published by the Los Angeles Integrated Solid Waste Management Office, for a partial list of facilities that accept these materials for recycling.

4.2 After award of Contract and prior to the commencement of the Work, the Developer or its representative shall schedule and attend a meeting with the Contractor to discuss the Contractor's proposed Solid Resources Management Plan. Not more than 20 working days after the meeting, the Contractor shall draft and submit to the Developer or its representative a written Solid Resources Management Plan, formatted as shown in Attachment A. This Plan shall be submitted to allow the Developer or its representative and the Contractor an opportunity to develop a mutual understanding regarding the recycling, reuse, and recycled-content procurement programs and shall include, but not be limited to, the following:

- Contractor and project identification information
- Types of solid resource materials and wastes that will be produced
- Materials to be salvaged, reused, and recycled, both on-site and off-site
- Procedures to be used
- Estimated quantities of materials
- Names and locations of salvage, reuse, and recycling facilities/sites
- Names and locations of waste disposal facilities/sites

4.3 Incorporating the review and comments of the Developer or its representative, Contractor shall revise and resubmit the Solid Resources Management Plan. The Developer/representative's review and comment on the Solid Resources Management Plan will not otherwise relieve the Contractor of responsibility for adequate and continuing control of pollutants and other environmental protection measures.

5. RECYCLING, REUSE, AND SALVAGE PROCEDURES

5.1 Recycling, Reuse, and Salvage Facilities

The most recent issues of *Construction and Demolition Waste Recycling Guide* and *Wood You Recycle?*, published by the Los Angeles Integrated Solid Waste Management Office, are incorporated herein by reference. For more information, contact the L.A. Integrated Solid Waste Management Office, Room 1450 City Hall East, 200 N. Main St., Los Angeles, CA 90012, 213-847-1444; fax 213-847-3054. These guides are updated regularly.

5.2 Development and Implementation of Procedures

Based upon the Contract Documents, the Contractor's Solid Resources Management Plan, estimated quantities of materials, and availability of salvage, reuse, and recycling facilities, Contractor shall develop and implement procedures to reuse, salvage, and recycle materials to the greatest extent feasible. Procedures shall include source-separated recycling as well as mixed recycling efforts. On-site recycling shall be considered.

5.3 Salvage and Reuse

5.3.1 Contractor shall perform a site pre-assessment, identify materials that are feasible for salvage, and determine requirements for site storage and transportation to salvage facilities. A salvage/reuse program shall be implemented to the greatest extent feasible. A partial list of facilities is included in the most recent issue of *Construction and Demolition Waste Recycling Guide*, published by the Los Angeles Integrated Solid Waste Management Office.

5.3.2 Where practicable and cost-effective, wood shall be carefully dismantled and sold to a reuser, salvage dealer, or wood recycler. Fixtures, furnishings, and equipment shall be removed from the facility intact and sold or donated to an appropriate organization. Any additional items (e.g., windows and doors), when feasible, shall be salvaged, source-separated, and taken to a recycling company, materials exchange, or similar facility.

5.3.3 The following salvage options shall be considered at a minimum:

- California Materials Exchange (CALMax) — a free program sponsored by the CIWMB designed to help businesses find markets for materials that traditionally would be discarded. To obtain a current listing, call 916-255-2369 or 800-553-2962.
- LA Shares — a non-profit materials exchange that accepts excess reusable materials from private donors and distributes them to various non-profit organizations throughout the City. 213-485-1097
- Habitat for Humanity Los Angeles (HFH-LA) — a non-profit housing organization that rehabilitates and builds housing for low income families. HFH-LA sites requiring donated materials vary. 213-975-9757.

5.4 Source-Separated Recycling

5.4.1 The Contractor shall develop and implement a program to include on-site separation, to the greatest extent feasible, of the following materials:

- Asphalt
- Brick
- Cardboard
- Concrete, concrete block, masonry, rocks, and rubble
- Dirt (clean dirt will be taken to a clean fill site)
- Drywall (source-separated and recycled or ground and used as soil amendment on-site)
- Metal, ferrous and non-ferrous (including HVAC equipment, fasteners, piping, chillers, generators, boilers, doors, aluminum paneling)
- Wood
- Green materials (e.g., tree trimmings)

5.4.2 Recycling plans shall estimate the amount of recyclable materials to be used on-site in the Work and include a program for off-site recycling of any excess material that cannot be used in the Work.

5.4.3 Each recycling facility or waste processor has requirements as to the way materials must be prepared to be accepted and to what degree materials can be contaminated. The Contractor shall provide separate containers or enclosures to facilitate its own recycling efforts and those of Subcontractors in order to meet those requirements and to meet specifications identified in the Contract Documents. A separate container shall be provided for non-recyclable, non-reusable trash.

5.4.4 Subcontractors shall be required to recycle the above materials, follow source separation requirements for each material, and use the appropriate on-site container/enclosure for each material.

5.4.5 Separation arrangements are subject to approval of the Developer or its representative.

5.5 Mixed Debris Recycling

Contractor shall develop and implement a program for commingled recycling of construction and demolition materials that cannot be feasibly source-separated. Such materials shall be legally transported to a mixed recycling facility. These facilities are listed in the most recent issue of *Construction and Demolition Waste Recycling Guide*, published by the Los Angeles Integrated Solid Waste Management Office.

5.6 Waste Disposal

5.6.1 Using a permitted waste hauler or its own trucking services, the Contractor shall legally transport non-recyclable, non-reusable materials to a transfer station or disposal facility that can legally accept the materials for the purpose of disposal.

5.6.2 The Contractor shall not burn, bury, or otherwise dispose of solid waste on the project job site.

5.7 Hauling

5.7.1 Contractor shall arrange for delivery of materials, by a permitted waste hauler or using its own trucks, to facilities that can legally accept construction and demolition materials for purpose of reuse, recycling, or disposal.

5.7.2 Prior to delivering materials, Contractor shall familiarize itself with the specifications for acceptance of construction and demolition materials at recycling facilities. The most recent issue of *Construction and Demolition Waste Recycling Guide*, published by the Los Angeles Integrated Solid Waste Management Office, includes a partial list of these facilities.

6. MATERIALS TRACKING FORM

6.1 To each application for progress payment submitted to the Developer or its representative, the Contractor shall attach a Materials Tracking Form; a sample is shown as Attachment B. The Materials Tracking Form shall quantify all materials generated in the Work and document their disposition (salvage, reuse, recycling, or disposal) as specified herein.

6.2 The Materials Tracking Form shall identify materials sent to:

- Source-separated recycling facilities
- Mixed debris recycling facilities
- Class III landfills (including inert materials accepted as daily cover)
- Inert fills
- Inert backfill sites other than inert fills
- Other diversion sites (specify)

6.3 Contractor shall complete each Materials Tracking Form as described below.

6.3.1 Fill in the project title; project work order number; progress payment number; name of company submitting the Materials Tracking Form; the printed name, signature, and daytime phone number of the person completing the form; the beginning and ending dates of the period covered; and the date that the form is completed.

6.3.2 Report disposal/recycling either in tons or in cubic yards: if scales are available at facility, report in tons; otherwise, report in cubic yards. Indicate zero (0) if there is no quantity to report for a type of material.

6.3.3 Indicate locations to which materials are delivered.

6.3.4 Attach to the form legible copies of weigh tickets, receipts, invoices, or other documents that specifically identify the Project generating the materials. Said documents must be from sites and/or facilities that can legally accept the materials for purposes of reuse, recycling, or disposal.

6.4 Failure to submit the Materials Tracking Form and supporting documentation may render the application for progress payment incomplete and delay progress payments.

7. REVENUE

Revenues or other savings obtained from recycled, reused, or salvaged materials shall accrue to Contractor unless otherwise noted in the Contract Documents.

406 mstd #46

NAVY

DEPARTMENT OF THE NAV	NFGS-01572A
NAVAL FACILITIES	30 September 1998
ENGINEERING COMMAND	------------------------------
GUIDE SPECIFICATION	Superseding NFGS-01572 (06/97)

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01572

WASTE MANAGEMENT

09/98

-- End of Section Table of Contents --

DEPARTMENT OF THE NAVY	NFGS-01572A
NAVAL FACILITIES	30 September 1998
ENGINEERING COMMAND	
GUIDE SPECIFICATION	Superseding NFGS-01572 (06/97)

NFGS-01572A

WASTE MANAGEMENT

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DEPARTMENT OF THE NAV	NFGS-01572A
NAVAL FACILITIES	30 September 1998
ENGINEERING COMMAND	
GUIDE SPECIFICATION	Superseding NFSG-01572 (06/97)

SECTION 01572

WASTE MANAGEMENT
09/98

NOTE: This guide specification requires implementation of a waste management program for recycling non-hazardous construction and demolition debris. It is intended to reduce the amount of waste requiring landfill disposal and to promote more efficient use of construction materials.

NOTE: This revision "A" to NFGS-01572 revalidates the issue dated 30 June 1997.

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Construction and Demolition Waste

Solid wastes such as building materials, packaging and rubble resulting from construction, remodeling, demolition and repair of buildings/facilities, paving and infrastructure.

1.1.2 Recyclable Materials

Products and materials that can be recovered and remanufactured into a new product. Recyclable materials include, but are not limited to, the following:

a. Metals (ferrous and non-ferrous), including banding, metal studs, ductwork, piping

b. Asphaltic concrete paving

c. Portland cement concrete

d. Land clearing debris including trees and plant materials

e. Native rock and granular fill

f. Gypsum products

g. Paper and cardboard

h. Wood products, including structural, finish, crates and pallets

i. Brick and masonry

j. Carpet and padding

k. Plastics

l. Copper wiring

m. Mechanical and electrical products and equipment

1.1.3 Recycling Facility

A business that specializes in collecting, handling, processing, distributing, or remanufacturing waste materials generated by demolition and new construction projects, into products or materials that can be used for this project or by others.

1.1.4 Salvage and Reuse

Existing usable product or material that can be saved and reused in some manner on the project site. Materials that can be salvaged and reused must comply with the applicable technical specifications and include, but are not limited to, the following:

a. Dimensional lumber and other wood products

b. Structural steel

c. Soil

d. Masonry products

1.1.5 Salvage for Resale

Existing usable product or material that can be saved and removed intact (as is) from the project site to another site for resale to others without remanufacturing.

1.1.6 Trash

Product or material unable to be salvaged for resale, salvaged and reused, returned, or recycled.

1.1.7 Waste Materials

Product or material that can be salvaged for resale, salvaged and reused, returned to vendors, or recycled.

1.2 SUBMITTALS

****

NOTE: Where a "G" in submittal tags follows a submittal item, it indicates Government approval for that item. Add "G" in submittal tags for items deemed sufficiently critical, complex, or aesthetically significant to merit approval by the Government. Submittal items not designated with a "G" will be approved by the QC organization.

****

Submit the following in accordance with Section 01330, "Submittal Procedures."

1.2.1 SD-08 Statements

a. Waste Management Plan G

1.3 CONSTRUCTION WASTE MANAGEMENT

1.3.1 General Intent

The Contractor shall use all means available to divert to the greatest extent practical and economically feasible, construction and demolition waste from landfills and incinerators.

1.3.2 Construction Waste Management Operations

Take a pro-active, responsible role in management of construction waste and require all subcontractors, vendors, and suppliers to participate in the effort. Establish a construction waste management program that includes the following categories:

a. Minimizing Packaging Waste

b. Salvage and reuse

c. Salvage for resale or donation

d. Recycling

e. Disposal

Salvage and reuse is a better waste management method than recycling because little or no reprocessing is necessary, thus less pollution is created when items are reused in their original form. Therefore, a diligent effort shall be made to salvage and reuse products and materials. Waste materials that cannot be salvaged and reused, and have value as being recyclable, shall be recycled. Only trash shall be transported to a landfill or incinerator. The Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling construction waste for this project. Revenues or other savings obtained for recycling or returns shall accrue to the Contractor.

1.3.3 Construction Waste Management Plan

Perform a waste analysis to determine the types and quantity of construction waste anticipated and identify salvage for resale, salvage and reuse, recycling and disposal options available. Within 30 days after contract award and prior to performing any demolition work, submit a Waste Management Plan for review and approval. The Waste Management Plan shall include the following:

a. Project waste analysis.

b. Projected cost of disposing of all trash and waste materials as if there would be no salvage or recycling on this project.

c. Name, address and phone number for each landfill or incinerator facility to be utilized.

d. Tipping fee for each landfill or incinerator.

e. A list of waste materials that will be salvaged for resale, salvaged and reused, and recycled.

f. Identification of each recycling facility to be utilized.

g. Anticipated net cost savings determined by subtracting the cost of separating and recycling from the following:

1. Savings due to reuse of demolished materials.

2. Revenue from the sale of salvaged and recycled materials.

3. Landfill or incinerator tipping fees saved due to diversion of materials to recycling.

h. Description of the method to be employed in recycling waste materials and description of the method that will be used to protect recycled materials from contamination.

i. Description of the means of transportation of recyclable materials and the destination of the materials.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PROGRAM IMPLEMENTATION AND MONITORING

Implement and maintain, for the duration of the project, the construction waste management program. Establish a method of monitoring and documenting the program, and submit a periodic report with each application for payment that includes the following:

a. Amount (by weight) and type of waste materials disposed of in a landfill or incinerator, the tip fee per ton, and the total cost of disposal including transportation costs, container rental costs, etc.

b. Amount (by weight) and type of materials salvaged for sale, salvaged for reuse, and recycled. Provide destination, means of transportation, cost of transportation and handling, tipping fee savings and revenue generated for each material.

c. Cost savings due to salvaging, reusing, and recycling materials.

3.1.1 Hazardous Materials/Hazardous Wastes

If any non-acceptable materials such as hazardous materials or hazardous wastes are encountered, notify the Contracting Officer.

3.2 SALVAGE AND REUSE

Encourage the practice of efficient waste management when, sizing, cutting, and installing products and materials.

3.3 SEPARATION OF RECYCLABLE WASTE MATERIALS

Provide the necessary containers and bins, to facilitate the waste management program, that are clearly and appropriately marked. Prevent contamination of recyclable materials from incompatible products and materials. Separate construction waste at the project site by one of the following methods:

a. Source Separated Method: Waste products and materials, that are recyclable, are separated from trash and sorted into appropriately marked separate containers and then transported to the respective recycling facility for further processing. Trash is transported to a landfill or incinerator.

b. Co-Mingled Method: All construction waste is placed into a single container and then transported to a recycling facility where the recyclable materials are sorted and processed and the remaining trash is transported to a landfill or incinerator.

c. Other methods proposed by the Contractor and approved by the Contracting Officer.

****

NOTE: Suggestions for improvement of this specification will be welcomed using the Navy "Change Request Forms" subdirectory located in SPECSINTACT in Jobs or Masters under "Forms/Documents" directory or DD Form 1426. Suggestions should be forwarded to:

Officer In Charge
Seabee Logistics Center
NAVFAC 150/SLC 15E
4111 San Pedro Street
Port Hueneme, CA 93043-4410

FAX: (805) 985-6465/982-5196 or DSN 551-5196

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-- End of Section --

Appendix H—Resource List

General References

Business Recycling Cost Model, software that can help you evaluate what to recycle, what it means to the "bottom line," cost-benefit analysis for waste-prevention activities, and evaluate effect of substituting materials. The software includes: software, manual, technical assistance through an 800 phone number, and case studies. The cost is $99.00 plus $5.00 shipping up to three copies. (A free demo is available). To order, call 360-897-9533.

Guide to Resource-Efficient Building in Hawaii, A publication of Hawaii Advanced Building Technologies Program. Available from the State Department of Business, Economic Development & Tourism, Clean Hawaii Center, call 587-3802.

Buy Recycled and Resource-Efficient Building Materials

Business Guide to Waste Prevention, Recycling, and Buying Recycled-Content Products. City and County of Honolulu, Department of Environmental Services, Refuse Division, Recycling Office. 527-5335.

Earth-friendly Products and Materials—A list of materials available through the Green House Hawaii Project. Call Clean Hawaii Center, phone 587-3802, to obtain the current list.

The Green House Hawaii Project. An exhibit of building materials and systems designed to promote an awareness of the resource-efficient, water-conserving, and waste-reducing products and systems currently available. A partnership of the A.I.A.-Honolulu and the University of Hawaii School of Architecture with support from the State Office of Solid Waste Management, Clean Hawaii Center, American Lung Association, the Honolulu City and County Recycling Office, and others. For more information, call Gail Suzuki-Jones at 524-0620.

Where to Buy Recycled Products and Recycling Services in Hawaii Guide. State Department of Business, Economic Development & Tourism, Clean Hawaii Center, phone 587-3802.

Recycling and Waste Reduction

Business Guide to Waste Prevention, Recycling, and Buying Recycled-Content Products. City and County of Honolulu, Department of Environmental Services, Refuse Division, Recycling Office. 527-5335.

Environmental Services in Hawaii 1997 Directory. Hawaii State Department of Health, Solid and Hazardous Waste Branch, phone 586-4226.

Hazardous Waste Minimization News Vol. 6, No. 1, Spring 1997 (Construction). Hawaii State Department of Health, Solid and Hazardous Waste Branch, phone 586-4226.

Hazardous Waste Minimization News Vol. .5, No.1, Spring 1996 (Fluorescent Light Disposal). Hawaii State Department of Health, Solid and Hazardous Waste Branch, phone 586-4226.

Minimizing Construction & Demolition Waste. February 1998. Published jointly by the State of Hawaii, Department of Health, Office of Solid Waste Management; State of Hawaii, Department of Business, Economic Development and Tourism (DBEDT), Clean Hawaii Center; Environmental Building Coalition of Hawaii; Building Industry Association of Hawaii; and the General Contractors Association of Hawaii. Contains a directory of C&D Waste Management Facilities on Oahu. Call DBEDT for a copy, 586-4240.

Recycling Plus Program Manual. Produced by Clean Washington Center with O'Brien & Company and Fletcher Wright Construction (for commercial or other large-scale projects). Manual includes Field Guide and Subcontractors Kit, camera-ready art and forms for customizing your own recycling program. Based on a traditional safety program approach. Available through DBEDT, call 586-4240.

Reducing & Managing Painting Contractor Wastes. Hawaii State Department of Health, Solid & Hazardous Waste Branch, phone 586-4226.

Residential Construction Waste Management, A Builder's Field Guide—How to Save Money and Landfill Space, published by the National Association of Home Builders (NAHB) Research Center, 400 Prince George's Boulevard, Upper Marlboro, Maryland 220774. (301) 249-4000. www.nahbrc.com.

The Hawaii Guide to Alternatives and Disposal of Household Hazardous Waste. Hawaii State Department of Health, Solid & Hazardous Waste Branch, phone 586-4226.

Waste Minimization in Action #12: Construction Industry. Hawaii State Department of Health, Solid and Hazardous Waste Branch, phone 586-4226.

Waste Minimization in Action #2a: Painting Contractor's Bulletin Hawaii State Department of Health, Solid and Hazardous Waste Branch, phone 586-4226.

Neighbor Island C&D Recyclers and Landfills

(Note: for facilities on Oahu, see the Clean Hawaii Center publication *Minimizing Construction & Demolition Waste).* Also contact HIMEX (Hawaii Materials Exchange, phone 808-586-4240 or web site www.himex.org.

KAUAI

Facility	Phone	Services
Kauai Nursery and Landscaping Puhi	Lelan Nishek 808-245-7747	Green waste, clean lumber, new drywall, some scrap metal
Garden Island Disposal Nawiliwili	Dean Kawasaki 808-245-2372 Genevieve Salmonson 808-842-3602	Cardboard
Puhi Auto Recycling Puhi (under construction)	Troy Tanigawa 808-241-6880	Scrap metal

MAUI

Facility	Phone	Services
Maui Scrap Metal Waikapu	Roger Apana 808-244-0305	Scrap metal and cardboard
Maui Composting Puunene	Tim Gunter 808-877-0403	Green waste and new drywall
Eko Systems Central Maui Landfill	Rubens Da Fonseca 808-283-5019	Green waste (at Central Maui Landfill) and clean lumber
Campaign Recycle Waikapu	Charles Davidson 808-244-0722	Green waste and clean lumber
De Coite C&D Landfill Maalaea	Richard De Coite 808-871-7496	C&D waste

HAWAII

Facility	Phone	Services
Hawaii Metals Recycling Hilo Landfill	Jim Bannigan III 808-682-5810	Scrap metal
Renew Hawaii Hilo Landfill	Andrea Alonzo 808-963-6850	Green waste
Hilo Business Service Hilo	Margaret Pahio 808-959-1436	Cardboard
Environmental Recycling Kono	Michael Allen 808-935-9328	Cardboard

Glossary

Best Management Practices (BMPs)	Defined by the U.S. Environmental Protection Agency as "the use of materials, processes or practices that reduce or eliminate the creation of pollutants or wastes at the source. It includes practices that reduce the use of hazardous materials, energy, water, or other resources, and practices that protect natural resources through conservation or more efficient use.
Construction and Demolition (C&D) waste	For the purposes of this guide, C&D waste includes all non-hazardous solid wastes resulting from construction, remodeling, renovation, and demolition activities. The regulatory definition of construction waste includes concrete, drywall, masonry, roofing, siding, structural metal, wire, insulation, and other building material; and plastics, Styrofoam, twine, baling and strapping materials, can buckets, and other packaging materials and containers. It also includes sand, rocks, and dirt that are used in construction. In no event shall construction waste include dangerous or extremely hazardous waste or any kind of garbage, sewerage waste, animal carcasses, or asbestos.
Hazardous Waste	A waste that is solid or liquid material with certain properties that could pose dangers to human heal, property, or the environment.
Landfill	Disposal facility at which solid waste is permanently placed in or on land as permitted by the jurisdictional health department and other appropriate agencies, accepting non-hazardous waste including non-recycled construction, remodeling, repair, and demolition debris.
Recycling	Either source separation or the processing of solid waste mechanically or by hand to segregate materials for sale or reuse. Materials that can be removed through recycling include, but are not limited to, mixed paper, newsprint, cardboard, aluminum, glass, plastics, chemicals, oil, wood, compostable organics (food and yard/land clearing debris), ferrous metal, and inorganics (rubble and inert material). Recycling does not include combustion of solid waste or preparation of fuel from solid waste.
Recycling Facility	An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of a new product. Recycling facilities have their own specifications for accepting materials.
Reuse	Making use of a material without altering its form
Salvage	Recovery of materials for on-site reuse or donation to a third party
Source-separated materials	Materials that are sorted at the site by material for the purpose of reuse or recycling.

PBR HAWAII

Honolulu Office
1001 Bishop Street
Pacific Tower, Suite 650
Tel: (808) 521-5631
Fax: (808) 523-1402

Hilo Office

Wailuku Office

July 2, 2002

Mr. Maurice H. Kaya
Program Administrator
State of Hawaii
Department of Business, Economic Development & Tourism
Energy, Resources, and Technology Division
P.O. Box 2359
Honolulu, Hawaii 96804

SUBJECT: **KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT**

Dear Mr. Kaya:

Thank you for your letter dated January 24, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement (EIS).

Thank you for calling attention to State energy conservation goals, energy saving design practices and technologies, and recycling and recycling-content products. Although the draft EIS contained several references and specific recommendations for energy efficiency and recycling, your further suggestions and recommendations are welcome and will be incorporated into the Final EA.

We appreciate your participation in the review of the Draft Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM
LAND USE COMMISSION
P.O. Box 2359
Honolulu, HI 96804-2359
Telephone: 808-587-3822
Fax: 808-587-3827

ANTHONY J.H. CHING
EXECUTIVE OFFICER

April 9, 2002

✓Mr. Tom Schnell
PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813-3429

Mr. Robert M. McNatt
Maui Land and Pineapple Co., Inc.
P. O. Box 187
Kahului, Hawaii 96732

Dear Messrs. Schnell and McNatt:

Subject: Kapalua Mauka (Project District 2) Draft Environmental Impact Statement (DEIS)

We have reviewed the subject DEIS forwarded by your letter of transmittal dated March 4, 2002, and have the following comments:

1) The Agricultural District is incorrectly referenced as the "Agriculture" District throughout the DEIS.

2) Clarification should be provided as to how the project components will be specifically impacted in the event the proposed land exchange with the State of Hawaii cannot be negotiated. Will the number/type/layout of residential units change? Will the golf course layout or the amount of open space be affected?

3) We understand that a petition for district boundary amendment to reclassify approximately 450 acres and 341 acres from the Agricultural District to the Urban District and Rural District, respectively, will be filed with our office in the near future. The applicant should clarify why the Rural Residential component of the project is planned for areas proposed to be reclassified to both

the Rural and Urban Districts. Are there differences within said component to warrant inclusion to different districts? Clarification should also be provided as to the basis for locating a portion of the expanded golf course in the Rural District instead of the Urban District. We note that golf courses are not a permissible use within the Rural District.

We suggest that prior to filing said petition, the applicant work closely with my staff to ensure the orderly processing of the petition.

We have no further comments to offer at this time. Thank you for the opportunity to comment on the subject DEIS. Please feel free to contact Bert Saruwatari of my office at 587-3822, should you require clarification or any further assistance.

Sincerely,

Anthony J.H. Ching

ANTHONY J. H. CHING
Executive Officer

c: OEQC
County of Maui Department of Planning

July 2, 2002

Mr. Anthony J. H. Ching,
Executive Officer
State of Hawaii
Department of Business, Economic Development & Tourism
Land Use Commission
P.O. Box 2359
Honolulu, Hawaii 96804

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Mr. Ching:

Thank you for your letter dated April 9, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement (EIS). We offer the following responses to your comments.

1) Thank you for bringing to our attention that the Agricultural District is incorrectly referenced as the "Agriculture" District in the draft EIS. The Final EIS will be revised to correctly refer to the Agricultural District.

2) As stated in Section 1.2.8 and Section 8.4 of the Draft EIS, if a land exchange between Maui Land & Pineapple Company, Inc., and the State of Hawai'i cannot be negotiated, Maui Land & Pineapple Company, Inc., intends to proceed with the Kapalua Mauka community without the State-owned lands. This would reduce the area of the Kapalua Mauka community by approximately 60 acres (approximately six percent), so that the Kapalua Mauka community site would then be approximately 865 acres. It is not expected that the number of residential units (690) would change because of this reduction in area, however, lot sizes in some areas may be somewhat smaller. Overall project density would change from approximately 0.7 units per acre to approximately 0.8 units per acre. The golf course layout may change somewhat and the amount of open space could also change slightly. The Final EIS will be revised to include this information.

3) In the Final EIS the conceptual master plan will be revised to exclude the Rural Residential component of the Kapalua Mauka community from the Urban District. The plan will also be revised so that the golf course is entirely within the Urban District.

We look forward to working with you and your staff to ensure orderly processing of the petition for the required district boundary amendment and will contact your staff before filing the petition.

We appreciate your participation in the review of the Draft Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

Attachments

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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DEPARTMENT OF BUSINESS,
ECONOMIC DEVELOPMENT & TOURISM

OFFICE OF PLANNING
235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
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BENJAMIN J. CAYETANO, GOVERNOR
SEIJI F. NAYA, Ph.D., DIRECTOR
SHARON S. NARIMATSU, DEPUTY DIRECTOR
DAVID W. BLANE, DIRECTOR, OFFICE OF PLANNING

Telephone (808) 587-2846
Fax (808) 587-2824

FEB 2 0 2002

Ref. No. P-9372

February 19, 2002

Mr. Tom Schnell
PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813

Dear Mr. Schnell:

Subject: Kapalua Mauka, Lahaina, Island of Maui, Tax Map Key 4-2-01 (portion); 4-3-01:6 (portion); 4-3-01:7 (portion); 4-3-01:8 (portion); 4-2-05:50 (portion); and 4-2-05:51

The Office of Planning (OP) of the Department of Business, Economic Development & Tourism (DBEDT) has reviewed the Draft Environmental Impact Statement (DEIS) for the proposed Kapalua Mauka project and offers the following comments for consideration. OP appreciates your detailed letter of December 21, 2001, in response to questions and comments raised after reviewing of the Kapalua Mauka Environmental Assessment (EA)/Environmental Impact Statement Preparation Notice (EISPN).

The Kapalua Land Company Ltd. is proposing to develop 925 acres of land on the slopes above the Kapalua Resort and mauka of the Honoapiilani Highway. Regarding the tax map keys of the property in the project area, the DEIS identifies two parcels that were not previously listed in the EA/EISPN, although it appears that the project's boundaries and total area have not changed. If there has been a change, the differences should be noted.

The proposed Kapalua Mauka project includes approximately 510 single and multi family homes and 180 rural residential home sites that overlook the golf course and gulches that divide the property in mauka-makai directions. The project would enlarge the Village Golf Course that now exists on site and may include a golf clubhouse with a golf pro shop, restaurant and other recreational amenities.

The Kapalua Land Company will ask the State Land Use Commission (LUC) for a District Boundary Amendment to reclassify 450 acres from Agricultural to Urban and 341 acres from Agricultural to Rural. The remaining acreage in the project would continue to be classified Agricultural.

Maui Land and Pineapple Co. Inc. is negotiating with the State to acquire by land exchange three of the six parcels that make up the proposed Kapalua Mauka project. The State land runs along the entire southern boundary of the project, from Honoapiilani Highway up to the project's highest elevation. The State of Hawaii has authorized an exchange for the parcels. If the exchange is completed, approximately 60 acres of the former State land would be incorporated into the project and the balance of 131 acres of former State lands would remain in agriculture or open space and be maintained by Maui Land and Pineapple Co.

The Kapalua Mauka project will also require an amendment to the *West Maui Community Plan* (1996) which presently designates 450 acres of the proposed project area as Project District 2 (PD2). Project District 2 was intended to provide a mixture of recreational activities and 750 units of single and multi-family housing. The Kapalua Land Company proposes to increase the area of PD2 by 475 acres, but only plans for a total of 690 units of housing.

The additional 475 acres proposed for an expanded Project District 2 would include 341 acres for 180 rural residential homesites (to be reclassified into the State's Rural district), and additional open land.

After review of the DEIS, OP requests additional information on certain issues of concern and offers recommendations on others. OP also intends to identify a broader concern over the project's claims of serving as a transition to neighboring land uses and will discuss questions of access within and through the project's own boundaries.

Drainage

The DEIS concludes that runoff from the project will not adversely impact the watershed, downstream areas, or nearshore waters because detention and desilting basins will limit the amount of water flow into the ocean at Honokahua Bay. The conclusion is also based on a water-monitoring program conducted at Honolua Bay, just east of Honokahua. The program found no impact on the waters of Honolua Bay during the development and first 11 years of the Plantation Estates housing and golf course, which is adjacent to the Kapalua Mauka project. Maui Land and Pineapple Co. is doing the Honolua Bay monitoring.

In your correspondence of December 2001, you stated that the DEIS would include a discussion on the quality of marine life in nearshore waters. The DEIS only appears to briefly address the findings of the Honokahua Bay monitoring program.

With minimal effort, Maui Land and Pineapple Co. can extend its ongoing monitoring program to cover Honokahua Bay as well as Honolua Bay. The program would gather baseline data on Honokahua prior to construction, throughout the development phase, and through the project's build out. Rather than trying to conclude that what happens in one bay can reasonably be expected to happen in a neighboring bay, a monitoring program can determine the actual impacts.

The Honokahua Historic District

There is an "occupied plantation residence" overlooking the tenth tee of the Village Golf Course that is one of several features that was included in the Honokahua Historic District (District) (site 1591). The features, which include stables, offices and churches, were identified as representing the area's ranching and plantation era. The District is on the State Inventory of Historic Places, but is not included in the State or National Registers of Historic Places. While most of the District is makai of the Kapalua Mauka project, the house at the 10th tee is in the project area.

After identifying the house, the DEIS and the consultant's report treat it as a non-site. The 1997 archaeology consultant recommends trimming away the northwest corner of the District to exclude the area that is now a golf course, but never mentions the house.

The EIS should clarify the current status of the 10th tee plantation house and future plans for the house. If it is to remain as an occupied house, does it become one of the 690 housing units in Kapalua Mauka? It would be helpful to know how experts rate the historic value of the house.

The Napili Regional Park

The West Maui Community Plan proposes the Napili Regional Park on approximately 50 acres of land between the Honoapiilani Highway and the Lower Honoapiilani Road and just west of the Kapalua Bay Golf Course. The Kapalua Mauka DEIS reveals that the Maui Land and Pineapple Company is in negotiations with the State of Hawaii to acquire a parcel of land that includes most of the proposed Park.

The DEIS states that if Maui Land and Pineapple receives the parcel, it will maintain the land as open space and create a mauka-makai pedestrian and bicycle trail.

It appears that Maui Land and Pineapple would prefer not to have a regional park adjacent to its Kapalua properties. After reviewing the Kapalua Mauka EA/EIS, we raised questions about the traffic, noise, and access impacts of the park on the proposed project. The response indicated that traffic impacts of the park would be included in the traffic analysis of the DEIS. However, the traffic analysis makes no reference to the park or any proposed access to the park off Honoapiilani Highway or Lower Honoapiilani Road.

None of the documents supporting the proposed Kapalua Mauka project identify land that Maui Land and Pineapple would give to the State in exchange for the four parcels of State land the Company wants. It is important to know the Company's intentions, as they are proposing to remove a regional park that was anticipated to provide the general public with various recreational opportunities. Although the Company would leave the area as open space, it does not serve the same function as a regional park.

Transition and Access

The most often repeated phrase in the DEIS on Kapalua Mauka is how the proposed project serves as a "transition". It is difficult to determine the nature of this transition and the end product.

The DEIS describes the project as being a golf course surrounded by 510 units of urban district housing, further encompassed by 180 rural lots. It is explained that this design offers a gentle transition to neighboring land uses. On the Honolua boundary of the project is the Plantation Estates and Golf Course, which appears to be identical in density to the proposed rural lots in Kapalua Mauka. On the Napili side of the project there is no description of land use beyond the Napili gulch, which is the project's property boundary. There is no description of the current or anticipated use of the land mauka to the project.

Although the agricultural consultant's report refers to a papaya operation and cattle grazing nearby, it never identifies where they are located. The report does state that no homes will be less than 1,000 feet downwind of pineapple cultivation and no less than 300 feet upwind of pineapple. It is difficult to determine where pineapple is actually growing.

The DEIS claims the project was specifically designed to serve as a transition to its surroundings, but never really identifies adjacent activities, including whether agricultural operations use the project's roads for access, or whether fallow or soon-to-be-fallow fields might impact drainage through the project.

It would be helpful if the proposed plans for Kapalua Mauka described what type of "small-scale agricultural activities" it will permit in its rural areas. Would it include raising fowl, livestock, or stabling horses?

The DEIS makes no further reference to the 60 agricultural lots that were being considered in the EA/EISPN for areas outside of the Kapalua Mauka project, but within the Kapalua area.

The DEIS should further explain the amount of public access that will be permitted through the project. The DEIS states that the project will not be a gated community, although individual neighborhoods may be gated. The suggestion is made that public access will be more extensive after development than was available when the property was in pineapple cultivation. But what happens if the "neighborhoods" that offer the best access to mauka or gulch lands become gated communities?

There are a number of references as to how the proposed project will improve access to mauka trails, but the DEIS makes no reference to the actual existence of such trails. Would the project actually allow hunters to park on neighborhood streets early in the morning and permit them to walk through the area to get to trail heads? Can public access be allowed on the trails that go through the gulches where the historic sites are simply "placed in 'as is' preservation"?

Eight residents familiar with the Kapalua area were interviewed to gain a better understanding of early land use and settlement patterns. The generalized findings from the interviews indicated that local residents "all felt they could access Kapalua lands if they wanted to or needed to". The residents knew about the lo'i (agricultural terraces) in the gulches and felt they should be preserved and "access to visit the sites should be granted to those interested". Most of the residents said they had hunted in the area and felt that "as long as they could hunt there, if they wanted to, it was alright." The interviews indicate a perception that access will continue, but plans for access are not directly addressed.

There seems to be a disconnect between stating that there will be access to mauka trails and then failing to acknowledge the existence of the trails. That also applies to the statement that the project will not be a gated community, but could be a community of gated neighborhoods.

Clearly there is some hint of exclusivity in controlling public access. Current access to the Honokahua Camp Cemetery is by special request through the golf course management. Pig hunters must apply for entrance permits. Although there are no requests to farm the lo'i in the gulches, the landowner prefers not to grant entry permits to people who want to visit the lo'i. How will access be managed once the project area is divided into neighborhoods?

The Kapalua Land Co. is proposing to build a luxury residential development that includes as a unique feature: large, rural, single family homes that ring the outer edges of the development. Its rationale is that this less intense land use is more compatible or provides a better transition to neighboring properties. However, the DEIS does not explain uses on the adjacent property. At the same time, the plans for Kapalua Mauka also stress an abundance of open space and public access, but seem to be vague on how the public can actually use that space.

Thank you for the opportunity to comment. Should you have any questions, please call Heidi Meeker at 587-2802.

Sincerely,

David W. Blane, AICP
Director
Office of Planning

c: Anthony Ching, Land Use Commission

PBR

July 2, 2002

Mr. David W. Blane, AICP
Director
State of Hawaii
Department of Business, Economic Development & Tourism
Office of Planning
P. O. Box 2359
Honolulu, Hawaii 96804

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Mr. Blane:

Thank you for your letter dated February 19, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement (EIS). We offer the following responses to your comments.

Drainage

In response to your concerns about runoff from the Kapalua Mauka community into nearby ocean waters, Maui Land & Pineapple Company Inc., has initiated a water quality monitoring program for Honokahua Bay and Nāpili Bay, which are downstream from the Kapalua Mauka community. The first water quality study has been conducted and the results of this study will be included in the Final EIS. The intent of this first study is to establish a quantitative baseline of water chemistry constituents that could reveal if water quality in Honokahua Bay and Nāpili Bay will be affected by factors associated with the Kapalua Mauka community. As the development of the Kapalua Mauka community progresses, additional water quality studies of Honokahua Bay and Nāpili Bay will be conducted on a periodic schedule.

As discussed in the Draft EIS, a similar water quality monitoring program was implemented in 1990 for nearby Honolua Bay when Maui Land & Pineapple Inc., developed the Plantation Estates subdivision and the Plantation Estates Golf Course, both of which were developed on former pineapple land. Results of monitoring at Honolua Bay conclude that "nutrients entering the Bay from both natural and man induced activities do not appear to be causing any negative impacts to either water quality or biotic structure of Honolua Bay." Given the similar type of development planned (residential uses and a golf course) similar impacts to nearshore waters within Honokahua Bay and Nāpili Bay are expected.

The Honokahua Historic District

You are correct in pointing out that there is a former plantation residence overlooking the tenth tee of The Village Golf Course and that this is one of several features originally included in the Honokahua Historic District (site 1591). The archaeological firm that conducted the archaeological survey for the area (Cultural Surveys Hawaii) recommended "the boundary of the site 50-50-01-1591 be redrawn as to exclude the many acres of golf course land that is no longer relevant to the pineapple plantation era." After reviewing the archaeological study, the State Historic Preservation Division, in their 1998 letter (included in Appendix F-1 of the Draft EIS), concluded: "The golf course located in the NW corner of the subject property lies within the boundaries of State Site 1591 (the Honokahua Historic District), but contains no significant historic sites today." Thus both the consultant archaeologist and the State Historic Preservation Division agree that the golf course area and the plantation residence are not significant to the Honokahua Historic District.

In addition to the archaeologist's and the Historic Preservation Division's determination that the plantation house is not a significant feature of the Honokahua Historic District, extensive remodeling in the 1980s may have eroded any remaining historic integrity of the house. Current plans are to raze the house, therefore it would not become one of the 690 housing units in Kapalua Mauka. This will be clarified in the final EIS.

The Nāpili Regional Park

In the time since the West Maui Community Plan was adopted in 1996, the County of Maui has built Nāpili Park on a four-acre parcel (TMK 4-3-18: 41) adjoining the State-owned parcel specified in the *West Maui Community Plan* for the Nāpili regional park (TMK 4-3-01:05). The existing park includes play fields, parking, and comfort stations. The park is proposed be expanded on a four acre parcel (TMK 4-3-18: 40) owned by the County. This expansion is proposed to include hard courts and additional open space and parking.

Maui Land & Pineapple Company Inc., supports the development of the Nāpili Park at its existing location. In fact, Maui Land & Pineapple Company Inc., was instrumental in the creation of this park as Maui Land & Pineapple Company Inc., granted the eight acres for the Nāpili Park to the County of Maui in 1997 and agreed to relocate its employee housing planned for the site south to Kapua.

The State-owned parcel specified in the West Maui Community Plan for the Nāpili regional park (Parcel 5) is primarily a natural drainage gulch with sloping topography unsuitable for a regional park, as typical regional park amenities such as soccer or baseball fields would require extensive grading or fill which may make development of the park unfeasible and pose potential drainage problems.

Maui Land & Pineapple Company Inc., is negotiating with the State of Hawaii to acquire Parcel 5 (and other parcels mauka of Honoapi'ilani Highway adjacent to the Kapalua Mauka community site). If Maui Land & Pineapple Company Inc., obtains Parcel 5 they intend to maintain the land as an open space linear park and create a mauka-makai pedestrian and bicycle trail on the Kapalua side of the gulch. This linear park would supplement the Nāpili Park, essentially creating an extension of the existing park. In addition, Maui Land & Pineapple Company Inc., would build and maintain the pedestrian and bicycle trail and maintain the open space without cost to the County of Maui.

Maui Land & Pineapple Company Inc., is currently in the process of identifying land that would be acceptable to the State in exchange for Parcel 5 and the other State parcels adjacent to the Kapalua Mauka community site. An apprisal for the State-owned land has been prepared, and any Maui Land & Pineapple Company Inc., land proposed for the exchange will equal or exceed the value of the State-owned parcels.

Because Nāpili Park was in place in place at the time the traffic counts were conducted for the Traffic Impact Analysis Report (TIAR) in the Draft EIS, the traffic generated by the park during the time periods analyzed is included in the TIAR analysis. The park is on Mahia Street, which intersects with Honoapi'ilani Highway at an unsignalized intersection. While the operation of the Mahia Street intersection was not specifically analyzed in the TIAR, according to the traffic consultant who prepared the TIAR, the Mahia Street intersection is expected to operate similar to the proposed south access to the Kapalua Mauka community site (which will intersect with Honoapi'ilani Highway). These intersections are projected to operate a level of service (LOS) C or better under projected year 2020 peak hour conditions. LOS C is considered an acceptable level of service for peak hour conditions.

Transition and Surrounding Uses

The Kapalua Mauka community is designed with higher density residential and commercial uses, such as condominiums, single-family homes on smaller lots, and the golf course club house, forming a concentrated core of the community in the center of the site and close to Honoapi'ilani Highway. Larger lots will be located in the periphery of this core, extending around the core to the north and south and mauka (east). We view this decreasing density as a transition from more urban uses, to rural, to the surrounding agricultural lands.

The Plantation Estates, to the north of the Kapalua Mauka community, is compatible with this transition of density. It is within the State Agricultural district and on land zoned Agriculture by the County of Maui. In compliance with all Maui County zoning regulations in place at the time the area was developed, all lots within Plantation Estates are two acres or greater. So in practicality Plantation Estates continues the gradual decrease in density radiating out from the Kapalua Mauka community core and furthers the goal of providing a transition to other, less intense land uses.

Section 2.1.4 of the Draft EIS discusses land uses surrounding the Kapalua Mauka community, including land uses on the Nāpili side of the community, such as the nearby Kapalua West Maui Airport, approximately one mile south. In this section it is also stated: 1) "Lands to the south include open space gulches, pineapple fields, and fallow agricultural areas;" 2) "Kā'anapali Resort is located approximately three miles south from the community site via Honoapi'ilani Highway;" and 3) "The town of Lahaina is approximately four miles south."

As stated in the agricultural consultant's report, Maui Pineapple has a two-acre papaya farming operation near the Kapalua Mauka community. The report did not mention this operation is located near the golf maintenance facility in Honokahua Gulch. About 43 acres outside of the Kapalua Mauka community site are used for the occasional grazing of cattle and horses. While the report did mention this operation is outside the community site, it did not mention that the actual location is above the mauka community boundary in the open grassy fields that are not planted in pineapple. These details will be included in the Final EIS.

The Draft EIS also contains photographs and numbered photograph indexes so that it can clearly be determined where pineapple is growing.

When the Kapalua Mauka community is established, agricultural operations on surrounding lands will not use the community's roads to access agricultural fields. Regarding drainage impacts through the community from fallow or soon-to-be fallow agricultural fields, as an experienced land steward of over 23,000 acres in West Maui, landowner Maui Land & Pineapple Company, Inc., will take all necessary actions to safeguard the Kapalua Mauka community from drainage impacts from agricultural fields. Drainage issues are discussed in Section 5.8.2 of the Draft EIS and a Preliminary Drainage Report is also included in Appendix K-2. Further drainage studies will be conducted as planning for the community progresses.

<u>Agricultural Uses</u>

Small-scale agricultural activities that may be permitted in the rural areas of the Kapalua Mauka community include orchards, plant nurseries, and other horticultural activities. Rasing fowl and other livestock would not be permitted, although stabling of horses and equestrian activities are being considered at this time. These points will be clarified in the final EIS.

<u>Agricultural Lots</u>

The plan for the 60 agricultural lots that was mentioned in the Environmental Assessment/ Environmental Impact Statement Preparation Notice (EA/EISPN) is currently being reassessed, and therefore was not included in the Draft EIS. Under this plan, density for some additional agricultural lots outside the Kapalua Mauka community site will be allocated as part of the consolidation and resubdivision process that will be done to establish the Kapalua Mauka community as a separate parcel under the conditions of Chapter 19.30A of the Maui County Code ("the Ag Ordinance").

Briefly, the 925-acre Kapalua Mauka community site is situated on six separate lots of record. Three of these are large lots owned by Maui Land & Pineapple Company Inc. The other three are smaller lots currently owned by the State of Hawaii, but Maui Land & Pineapple Company Inc. would like to obtain these lots through the previously mentioned land exchange. All of the lots are zoned either Agriculture or Interim.

To create the Kapalua Mauka Community site, the three existing parcels owned by Maui Land & Pineapple Company, Inc., will be consolidated and then resubdivided into four newly configured parcels. One of these will be approximately 865-acres and will be the bulk of the Kapalua Mauka community site. When the State-owned parcels are obtained, approximately 60 acres from these parcels will be added to the Kapalua Mauka community site for a total of 925 acres.

Since a majority of the area of the lots are zoned Agriculture, the consolidation and resubdivision is subject to the conditions of the Ag Ordinance, which severely limits the number of lots that can be subdivided from a parcel in the Agriculture zone. Following the Ag ordinance, the number of allowable lots that could be created will be allocated to the three large remaining large lots. The large lots will not be further subdivided at this time, but future subdivision will be limited to the density allocated to each lot.

<u>Access</u>

Maui Land & Pineapple Company Inc., grants requests for access to its West Maui lands. Managing over 23,000 acres of land in West Maui is a difficult task that involves continuous monitoring of who accesses the land. Some unauthorized persons entering Maui Land & Pineapple Company Inc., land have been known to harm the environment or conduct illegal activities. Therefore, Maui Land & Pineapple Company Inc., has developed a permit system to help monitor access to its land.

In 2001, Maui Land & Pineapple Company Inc., issued over 150 permits to access its West Maui lands. Nearly half of these requests where for gathering or harvesting (49%), while other requests were for hunting (11%), fishing (11%), research (14%), recreation (11%), or other activities (4%). Visitors granted access are given a key to a specific gate and must return the key within an allotted time.

Currently access to the Kapalua Mauka community site is restricted due to the ongoing agricultural operations in the area. The area is fenced and gated, however, access is allowed with a permit.

Access to any trials that may be present on immediate Kapalua Mauka community site is currently limited due to the agricultural operations. Pineapple cultivation areas are sectioned into fields with dirt roads providing access to each field. Trails mauka of the Kapalua Mauka community site may be present, but are not marked or mapped. Unmapped roads and trails are also present within the gulches of the site.

Mr. David W. Blane, AICP
SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT
July 2, 2002
Page 6

Access to any trails that may be present on the site or in the area will not be limited by the development of the Kapalua Mauka community. Relative to the existing agricultural use of the land, in which the entire area is gated, the establishment of the Kapalua Mauka community will make the area more accessible.

Consistent with the existing Kapalua Resort, the overall Kapalua Mauka Community is not planned to be gated. Public access will be allowed on the community streets, however, some of the individual neighborhoods may be gated. It has not been determined where these individual neighborhoods would be located within the site or at what phase they would be built. In any case, any gated neighborhood will not be so extensive as to block access to mauka trials that may be identified. In addition, access within any gated neighborhood would not be so restricted as to prohibit anyone with a legitimate reason from accessing an area.

In regard to hunters parking on neighborhood streets early in the morning and then walking through the community to get to trail heads, Kapalua Resort and Maui Land & Pineapple Company Inc., will provide reasonable accommodation for parking, and walking within the community will be allowed. Kapalua Resort and Maui Land & Pineapple Company Inc., will specify any special conditions when access permits are granted.

Maui Land & Pineapple Company Inc., does not discriminate against those wishing to visit any site, particulary any lo'i. Based on oral interviews it was indicated that taro was historically farmed in the area, however, the specific location of the lo'i is not known. In fact, the consulting archaeologists for the Kapalua Mauka community did not find any lo'i within the project area. Additionally, no requests have been made in recent times to access lo'i in any of the valleys near or within the Kapalua Mauka community site.

The Final EIS will include a new section on trails and access.

We appreciate your participation in the review of the Draft Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

[redacted]
PATRICIA HAMAMOTO
INTERIM SUPERINTENDENT

OFFICE OF THE SUPERINTENDENT

JAN 29 2002

January 24, 2002

Mr. Tom Schnell
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, Hawai'i 96813

Dear Mr. Schnell:

Subject: Kapalua Mauka Draft EIS

The Department of Education has no additional comment on the subject project. Our earlier comments are enclosed for your reference.

Thank you for the opportunity to respond. If you have any questions, please call Mr. Sanford Beppu at 733-4862.

Very truly yours,

Patricia Hamamoto
Superintendent

PH:hy

Enclosure

FACILITIES' COPY

BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

OFFICE OF THE SUPERINTENDENT

January 9, 2002

Mr. Tom Schnell
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, Hawai'i 96813

Dear Mr. Schnell:

Subject: Kapalua Mauka EISPN

This letter is in response to your letter dated December 21, 2001 regarding the Kapalua Mauka fair-share requirement.

The Department of Education does not anticipate that a school site will be needed in the Kapalua region. Therefore, our requirement would be cash-based. The current fair-share cash requirement is $1,011 per unit. This amount would be due as each unit closes and would thus not require an upfront payment by the developer. Funds collected from this project will be used for capital improvements program projects in the Lahainaluna High School complex which includes Lahainaluna High, Lahaina Intermediate, Princess Nahienaena Elementary, and King Kamehameha III Elementary Schools.

If you have any questions, please call Mr. Sanford Beppu at 733-4862.

Very truly yours,

Patricia Hamamoto

Patricia Hamamoto
Superintendent

PH:hy(5d) 4h

cc: A. Suga, OBS
G. Ueoka, MDO

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

PBR HAWAII

June 25, 2002

Ms. Patricia Hamamoto, Superintendent
Department of Education
P.O. Box 2360
Honolulu, Hawaii 96804

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Ms. Hamamoto:

Thank you for your letters (dated January 9 and January 24, 2002), concerning the Environmental Assessment/Environmental Impact Statement Preparation Notice and the Draft Environmental Impact Statement for Kapalua Mauka.

As per your January 9, 2002 letter we acknowledge that the Department of Education does not anticipate a school site will be needed in the Kapalua region. We therefore are not planning a school site within the Kapalua Mauka (Project District 2) community site. We further acknowledge that the Department of Education's requirement would be cash-based and the current fair-share cash requirement is $1,011 per unit as per the terms described in your letter

As per your January 24, 2002 letter we acknowledge that you have no additional comments at this time.

We appreciate your participation in the review of the Environmental Assessment/Environmental Impact Statement Preparation Notice and the Draft Environmental Impact Statement for Kapalua Mauka and will keep you apprized of the Kapalua Mauka community as it advances through the entitlement process.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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BENJAMIN J. CAYETANO
GOVERNOR
STATE OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P.O. BOX 1879
HONOLULU, HAWAII 96805

RAYNARD C. SOON
CHAIRMAN
HAWAIIAN HOMES COMMISSION

JOBIE M. K. M. YAMAGUCHI
DEPUTY TO THE CHAIRMAN

MAR 1 4 2002

March 15, 2002

Mr. Tom Schnell
PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, HI 96813

Dear Mr. Schnell:

Subject: Kapalua Mauka (Project District 2), TMK 4-2-01:1, Lahaina, Maui, Hawaii, Dated December 2001

Thank you for the opportunity to review the subject application. The Department of Hawaiian Home Lands has no comment to offer.

If you have any questions, please call Daniel Ornellas of our Planning Office at 586-3836.

Aloha,

Raynard C. Soon, Chairman
Hawaiian Homes Commission

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

June 25, 2002

Mr. Raynard C. Soon, Chairman
Hawaiian Homes Commission
State of Hawaii
Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, Hawaii 96805

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Mr. Soon:

Thank you for your letter dated March 15, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement (EIS). We note that you have no comment to offer.

We appreciate your participation in the review of the Draft Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
PO BOX 3378
HONOLULU, HAWAII 96801

BRUCE S. ANDERSON, Ph.D., M.P.H.
DIRECTOR OF HEALTH

MAR - 4 2002

In reply, please refer to:
File:

02-016/epo

February 27, 2002

Mr. Tom Schnell, Project Consultant
PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813

Dear Mr. Schnell:

Subject: Draft Environmental Impact Statement (DEIS)
Kapalua Mauka Development Project (District 2), Maui, Hawaii
Tax Map Key: 4-2-01: 01; 4-2-05: 50; 4-2-05: 51; 4-3-01: 6; 4-3-01: 7; and 4-3-01: 8

Thank you for the opportunity to review and comment on the subject proposal. The DEIS was routed to the various branches of the Environmental Health Administration. We have the following comments.

Clean Air Branch (CAB)

Fugitive Dust Control:

There is a significant potential for fugitive dust emissions during all phases of construction activities. In addition, the fairly strong wind conditions and close proximity to existing residential establishments and major thoroughfare may create dust problems. Therefore, it is recommended that a dust control management plan be developed which identifies and addresses activities having a potential to generate fugitive dust. Implementation of adequate dust control measures during all phases of construction is warranted.

Construction activities must comply with provisions of Hawaii Administrative Rules, Chapter 11-60.1, "Air Pollution Control," Section 11-60.1-33, Fugitive Dust.

The contractor should provide adequate measures to control dust from the road areas and during the various phases of construction. These measures include, but are not limited to:

a. Planning the different phases of construction, focusing on minimizing the amount of dust generating materials and activities, centralizing on-site vehicular traffic routes, and locating potentially dusty equipment in areas of the least impact;

b. Providing an adequate water source at the site prior to start up of construction activities;

c. Landscaping and rapid covering of bare areas, including slopes, starting from the initial grading phase;

d. Controlling of dust from shoulders and access roads;

e. Providing adequate dust control measures during weekends, after hours, and prior to daily start-up of construction activities; and

f. Controlling of dust from debris being hauled away from project site.

If you have any questions, please contact the Clean Air Branch at (808) 586-4200.

Noise, Radiation and Indoor Air Quality (NRIAQ) Branch

All project activities shall comply with the Administrative Rules of the Department of Health, Chapter 11-46, Community Noise Control.

If you have any questions, please contact the Noise, Radiation and Indoor Air Quality Branch at (808) 586-4701.

Sincerely,

GARY GILL
Deputy Director
Environmental Health Administration

c: CAB
NRIAQ

PBR HAWAII

June 25, 2002

Mr. Gary Gill, Deputy Director
Environmental Health Administration
State of Hawaii
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

SUBJECT: **KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT**

Dear Mr. Gill:

Thank you for your letter dated February 27, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement (EIS). We offer the following responses to your comments.

1. We agree that implementation of adequate dust control measures during all phases of construction is warranted. A dust control management plan will be developed which identifies and addresses activities having a potential to generate fugitive dust.

2. As noted in the draft EIS, all construction activities will comply with the provisions of Hawai'i Administrative Rules, Chapter 11-60.1, "Air Pollution Control," Section 11-60.1-33, Fugitive Dust.

3. The suggestions in your letter regarding contractors providing adequate measures to control dust from the road areas during various phases of construction will be incorporated into the final EIS.

4. All activities will comply with the Administrative Rules of the Department of Health, Chapter 11-46, Community Noise Control.

We appreciate your participation in the review of the Draft Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
P.O. BOX 621
HONOLULU, HAWAII 96809

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND DIVISION
STATE PARKS
WATER RESOURCE MANAGEMENT

February 19, 2002 FEB 2 2 2002

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LD-NAV

PBR Hawaii
Tom Schnell, AICP
Project Manager
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96720

Dear: Mr. Schnell

SUBJECT:
Review: Draft Environmental Impact Statement
Applicant: Maui Land and Pineapple Company, Inc.
Consultant: PBR Hawaii
Authority: County of Maui Department of Planning
Project: Kapalua Mauka (Project District 2)
Location: Kapalua, Lahaina, Maui, Hawaii
TMK: 2nd/4-2-1: por. 1; 4-2-5: por. 50; 4-2-5: 51
4-3-1: por. 6; 4-3-1: por. 7 and 4-3-1: por 8

This is a follow-up to our letter (Ref.: KAPAHULAMAUKA.RCH) to you dated February 13, 2002, pertaining to the subject matter.

Attached herewith is a recently received copy of the Land Division Maui District Land Office comment.

The Department of Land and Natural Resources has no other comment to offer.

Should you have any questions, please contact Nick Vaccaro of the Land Division Support Services Branch at 587-0438.

Very truly yours,

HARRY M. YADA
Acting Administrator

c: Maui District Land Office

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
54 South High Street, Room 101
Wailuku, Hawaii 96793-2198

February 15, 2002

Ref: KAPAHULAMAUKA.COM

MEMORANDUM

TO: Mr. Harry Yada, Acting Administrator
Land Division

FROM: Jason Koga J. Koga
District Land Agent

SUBJECT: Draft Environmental Assessment, Kapalua Mauka (Project District 2), Maui Land and Pineapple Company, Inc., TMK: 4-2-01:por. 01, 4-2-05:por. 50 and por. 51, 4-3-01:por. 06, por. 07 and por.08

The narrow strip of gulch land along the southern boundary of the Kapalua Maui project, consisting of TMK: (2) 4-3-01:03, 05, 06, 07 and 08 is owned by the State of Hawaii. The Parcels are categorized as Section 5 (b) lands of the Hawaii Admissions Act (ceded lands) and are subject to the following current uses:

Parcel 03	Executive Order 3277 to County of Maui for sediment basin purposes
Parcel 05	Revocable Permit 5978 to Maui Land & Pineapple ("ML&P) for pineapple cultivation, and Grant of Easement (LOD S-27587) to Kipa Hui Partnership for drainage.
Parcel 06	Revocable Permit 5978 to ML&P for pineapple cultivation, and Executive Order 3733 to the County of Maui, Board of Water Supply for well site together with roadway and waterline easements.
Parcel 07	Revocable Permit 5978 to ML&P for pineapple cultivation, and Grant of Easement (LOD S-15557) to Baldwin Packers, Limited (now ML&P) for an underground tunnel for the Honokohau Ditch.
Parcel 08	Revocable Permit 5978 to ML&P for pineapple cultivation, and Executive Order 3733 to the County of Maui, Board of Water Supply for well site together with roadway and waterline easements.

Electrical/telephone transmission line easements also appear to affect Parcels 05, 06, 07 and 08. This Office also understands that the County of Maui has plans for a park taking approximately 2.529 acres of Parcel 05.

The Department of Land and Natural Resources is currently negotiating a land exchange with ML&P involving Parcels 05, Portion of 06 not including the well site, 07 and Portion of 08 not including the well site. Regardless of the outcome of the exchange negotiations, any roadway and drainage plans for the development should take all encumbrances and easements into account as well as the capacity of the County's retention basin.

The Maui District Land Office has no other comments on the Draft EIS. Thank you for allowing us to review and comment on the subject matter.

c: Maui Board Member
Central Files
District Files

FEB 15 2002

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
P.O. BOX 621
HONOLULU, HAWAII 96809

February 13, 2002

LOG/701/418/106
KAPAHULAMAUKA.RCM

LD-NAV

PBR Hawaii
Tom Schnell, AICP
Project Manager
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96720

Dear: Mr. Schnell

SUBJECT:
Review: Draft Environmental Impact Statement
Applicant: Maui Land and Pineapple Company, Inc.
Consultant: PBR Hawaii
Authority: County of Maui Department of Planning
Project: Kapalua Mauka (Project District 2)
Location: Kapalua, Lahaina, Maui, Hawaii
TMK: 2nd/4-2-1: por. 1; 4-2-5: por. 50; 4-2-5: 51; 4-3-1: por. 6; 4-3-1: por. 7 and 4-3-1: por 8

Thank you for the opportunity to review and comment on the subject Draft Environmental Impact Statement.

A copy of the subject document was transmitted to the following Department of Land and Natural Resources' Divisions for their review and comment:

- Division of Aquatic Resources
- Division of Forestry and Wildlife
- Division of State Parks
- Commission on Water Resource Management
- Land Division Engineering Branch
- Land Division Planning and Technical Services
- Land Division Maui District Land Office

Attached is a copy of the Commission on Water Resource Management and Land Division Engineering Branch comments.

The Department of Land and Natural Resources has no other comment to offer. Should you have any questions, please contact Nick Vaccaro of the Land Division Support Services Branch at 587-0438.

Very truly yours,

HARRY M. YADA
Acting Administrator

c: Maui District Land Office

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

BENJAMIN J. CAYETANO

GILBERT S. COLOMA-AGARAN
BRUCE S. ANDERSON
MEREDITH J. CHING
CLAYTON W. DELA CRUZ
BRIAN C. NISHIDA
HERBERT M. RICHARDS, JR.
LINNEL T. NISHIOKA

RECEIVED
LAND DIVISION
24 A 8 01
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

January 22, 2002

TO: Mr. Harry Yada, Acting Administrator
Land Division

FROM: Linnel T. Nishioka, Deputy Director
Commission on Water Resource Management (CWRM)

SUBJECT: Kapalua Mauka Expanded PD2

FILE NO.: KAPAHULAMAUKA.COM

Thank you for the opportunity to review the subject document. Our comments related to water resources are marked below.

In general, the CWRM strongly promotes the efficient use of our water resources through conservation measures and use of alternative non-potable water resources whenever available, feasible, and there are no harmful effects to the ecosystem. Also, the CWRM encourages the protection of water recharge areas, which are important for the maintenance of streams and the replenishment of aquifers.

[X] We recommend coordination with the county government to incorporate this project into the county's Water Use and Development Plan.

[ ] We recommend coordination with the Land Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

[ ] We are concerned about the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

[ ] A Well Construction Permit and/or a Pump Installation Permit from the Commission would be required before ground water is developed as a source of supply for the project.

[ ] The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit from the Commission would be required prior to use of this source.

[ ] Groundwater withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.

[X] We are concerned about the potential for degradation of instream uses from development on highly erodible slopes adjacent to streams within or near the project. We recommend that approvals for this project be conditioned upon a review by the corresponding county's Building Department and the developer's acceptance of any resulting requirements related to erosion control.

[ ] If the proposed project includes construction of a stream diversion, the project may require a stream diversion works permit and amend the instream flow standard for the affected stream(s).

[ ] If the proposed project alters the bed and banks of a stream channel, the project may require a stream channel alteration permit.

[X] OTHER:

The site is subject to high erodability, and the EIS supports erosion mitigation measures, which will be essential to protect resource values. The projections for water use fall within the County guidelines of reasonableness, and the plan indicates support for several kinds of water conservation practices. The projected demands are scaled back from an earlier version, and are supported by existing infrastructure.

If there are any questions, please contact Charley Ice at 587-0251.

DLNR-LAND DIVISON
ENGINEERING BRANCH

COMMENTS

LD/NAV/ LOG106
Ref.: KAPAHULAMAUKA.COM

COMMENTS

We confirm that the project site, according to FEMA Community Panel Numbers 15003 0138 B and 15003 0139 B, dated June 1, 1981, is located in Zone C (No Shading). This is an area of minimal flooding.

However, if further studies determined that the project site is within the Flood Zone, the project site must comply with rules and regulations of the National Flood Insurance Program (NFIP) and all applicable County Flood Ordinances. If there are questions regarding the NFIP, please contact the State Coordinator, Sterling Yong, of the Department of Land and Natural Resources at 587-0248. If there are questions regarding flood ordinances, please contact the applicable County representative.

In Figure 10, of the Draft Environmental Impact Statement, Flood Insurance Rate Map # 150003 0138 B should be added as one of the sources.

The following are comments to the Preliminary Engineering and Drainage Reports:

1. According to Section 5.82 of the Draft EIS and the Preliminary Engineering Report (Appendix K-1), there are two primary drainageways (Honokahua Gulch and an unnamed gulch) through the project site. However, the Preliminary Drainage Report (Appendix K-2) indicates that there are four gulches, which bisect the property. Please clarify.

2. According to the Preliminary Engineering Report (Appendix K-1) Section 3.3 Drainage, 72% of the existing on-site runoff flows to Honokahua Gulch and the remaining 28% flows to an unnamed gulch to the west. It also states that the 28% flowing to the unnamed gulch would deposit into a detention basin located west of Pineapple Hill and mauka of fairways no. 11 and 12 of the Bay Course. However, neither the Preliminary Drainage Report nor the drainage area maps indicate this phenomenon. Please clarify how the 72/28 split was determined.

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PBR HAWAII

June 25, 2002

Mr. Harry M. Yada,
Acting Administrator
Department of Land and Natural Resources, Land Division
P. O. Box 621
Honolulu, Hawaii 96809

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Mr. Yada:

Thank you for your letters dated February 13 and 19, 2002, (Ref.: KAPALUAMAUKA.RCM and KAPALUAMAUKA.RCM2) concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement (EIS).

Attached to your February 13, 2002, letter were comments from the Commission on Water Resource Management and the DLNR Land Division Engineering Branch. Attached to your February 19, 2002 letter were comments from the DLNR Land Division Maui District Land Office. We acknowledge that you have no other comments to offer beyond the comments from these divisions.

This letter addresses the comments of the DLNR Land Division Engineering Branch and the DLNR Land Division Maui District Land Office. Responses to comments from Commission on Water Resource Management are provided in a separate letter, a copy of which is attached with this letter.

Response to Comments from the DLNR Land Division Engineering Branch

We offer the following responses to comments from the DLNR Land Division Engineering Branch.

Thank you for confirming that the Kapalua Mauka community site is located in Zone C, an area of minimal flooding.

If further studies determine the community site is within the Flood Zone, the Kapalua Mauka community will comply with the rules and regulations of the National Flood Insurance Program and all applicable county flood ordinances.

In the Final EIS, Figure 10 will be revised to include a notation citing Flood Insurance Rate Map # 150003 0138B as one of the sources.

Regarding comments on the Preliminary Engineering and Drainage Reports:

1. The Preliminary Engineering Report and Section 5.8.2 of the Draft EIS discuss two drainage ways (Honokahua Gulch and an unnamed gulch) running through the Kapalua Mauka community. This is correct.

   The reference to four gulches in the Preliminary Drainage Report is incorrect. The two additional gulches mentioned in the Drainage Report actually are two fairly shallow gullies between Honokahua Gulch and the unnamed gulch. These gullies are located within Drainage Area 2 of Exhibit 5 (see attached) of the Drainage Report. This will be corrected in the Preliminary Drainage Report included with the Final EIS.

2. The 72/28 split of the drainage area was determined as follows. Referring to Exhibit 5 (attached) of the Drainage Report, Areas 1 and 2 comprise contributory drainage areas of approximately 667 acres. This represents ± 72% (667/925 = 72%) of the Kapalua Mauka community site. Presently runoff from this area flows toward and into Honokahua Gulch. Area 3, containing an area of approximately 258 acres, or ± 23% (258/925 = 28%), of the site drains into the unnamed gulch. The 72/28 split is based on contributory drainage areas and not on volume of runoff. This will be clarified in the Final EIS and in the Preliminary Engineering Report included with the Final EIS.

<u>Response to Comments from the DLNR Land Division Maui District Land Office</u>

We offer the following responses to comments from the DLNR Land Division Maui District Land Office.

Thank you for providing information regarding the current uses on the state-owned parcels comprising the narrow strip of gulch land along the southern boundary of the existing Kapalua Resort and the proposed Kapalua Mauka community (TMK 4-3-01: 03, 05, 06, 07, and 08).

You are correct in stating the Department of Land and Natural Resources is currently negotiating a land exchange with Maui Land & Pineapple, Company Inc., involving parcels 05, a portion of 06 not including a well site, 07, and a portion of 08 not including a well site. Discussion of the land exchange is provided in several sections of the Draft EIS and will also be included in the Final EIS.

We concur that regardless of the outcome of the land exchange negotiations, any roadway and drainage plans for the Kapalua Mauka community will take into account all encumbrances and easements, as well as the capacity of the County's retention basin.

We appreciate the participation of the Department of Land and Natural Resources in the review of the Draft Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

attachments

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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June 25, 2002

Ms. Linnel T. Nishioka, Deputy Director
State of Hawaii
Department of Land and Natural Resources
Commission on Water Resource Management
P.O. Box 621
Honolulu, Hawaii 96809

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Ms. Nishioka:

Thank you for your letter dated January 24, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement (EIS). We offer the following responses to your comments.

1. Maui Land & Pineapple Company Inc., will coordinate with the Maui County to incorporate the Kapalua Mauka community into the County's Water Use and Development Plan. In comments on the Environmental Impact Statement Preparation Notice (EISPN) the County of Maui Department of Water Supply requested Maui Land & Pineapple Company Inc., to cooperate in the development of an acceptable feasibility study framework for private water system integration with the County's public system. Maui Land & Pineapple Company Inc., will comply with this request, which is noted in the Draft Environmental Assessment.

2. We acknowledge concerns regarding the potential for degradation of instream uses from development on highly erodible slopes adjacent to streams within or near the Kapalua Mauka community. Maui Land & Pineapple Company Inc., will comply with all applicable federal, State, and County regulations and rules relating to erosion control. Before issuance of a grading permit by the County of Maui, the final erosion control plan and best management practices necessary for the required NPDES permit will be completed.

3. Thank you for acknowledging: 1) the site is subject to high erodability, and the draft EIS supports erosion mitigation measures, which are essential to protect resource values; 2) the projections for water use fall within the County guidelines of reasonableness and the draft EIS indicates support for several kinds of water conservation practices; and 3) the projected demands are scaled back from an earlier version and are supported by existing infrastructure.

We appreciate your participation in the review of the Draft Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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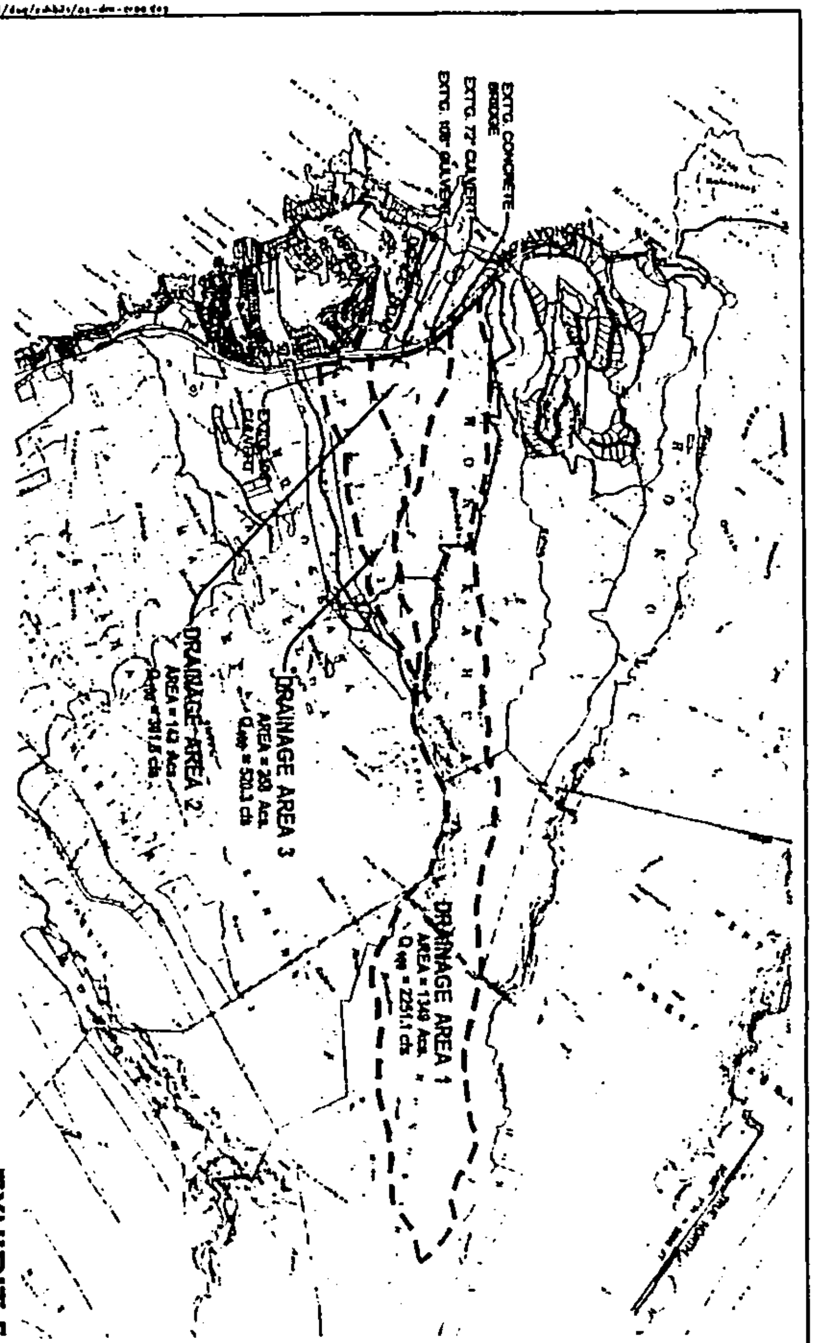

EXHIBIT 5

BENJAMIN J. CAYETANO

GILBERT S. COLOMA-AGARAN
BRUCE S. ANDERSON
MEREDITH J. CHING
CLAYTON W. DELA CRUZ
BRIAN C. NISHIDA
HERBERT M. RICHARDS, JR
LINNEL T. NISHIOKA

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

JAN 2 8 2002

January 24, 2002

Mr. Tom Schnell
PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, HI 96813

Dear Mr. Schnell:

SUBJECT: Kapalua Mauka Expanded PD2

Thank you for the opportunity to review the subject document. Our comments related to water resources are marked below.

In general, the CWRM strongly promotes the efficient use of our water resources through conservation measures and use of alternative non-potable water resources whenever available, feasible, and there are no harmful effects to the ecosystem. Also, the CWRM encourages the protection of water recharge areas, which are important for the maintenance of streams and the replenishment of aquifers.

[X] We recommend coordination with the county government to incorporate this project into the county's Water Use and Development Plan.

[ ] We recommend coordination with the Land Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

[ ] We are concerned about the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

[ ] A Well Construction Permit and/or a Pump Installation Permit from the Commission would be required before ground water is developed as a source of supply for the project.

[ ] The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit from the Commission would be required prior to use of this source.

[ ] Groundwater withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.

[X] We are concerned about the potential for degradation of instream uses from development on highly erodible slopes adjacent to streams within or near the project. We recommend that approvals for this project be conditioned upon a review by the corresponding county's Building Department and the developer's acceptance of any resulting requirements related to erosion control.

Mr. Tom Schnell
Page 2
January 24, 2002

[ ] If the proposed project includes construction of a stream diversion, the project may require a stream diversion works permit and amend the instream flow standard for the affected stream(s).

[ ] If the proposed project alters the bed and banks of a stream channel, the project may require a stream channel alteration permit.

[X] OTHER:

The site is subject to high erodability, and the EIS supports erosion mitigation measures, which will be essential to protect resource values. The projections for water use fall within the County guidelines of reasonableness, and the plan indicates support for several kinds of water conservation practices. The projected demands are scaled back from an earlier version, and are supported by existing infrastructure.

If there are any questions, please contact Charley Ice of the Commission staff at 587-0251.

Sincerely,

LINNEL T. NISHIOKA
Deputy Director

CI:ss

PBR HAWAII

Planning
Landscape Architecture
Environmental Studies

Wm. Frank Brandt, FASLA
Chairman

Thomas S. Witten, ASLA
President

R. Stan Duncan, ASLA
Executive Vice-President

Russell Y.J. Chung, ASLA
Executive Vice-President

James Leonard, AICP
Managing Director
Hilo Office

Vincent Shigekuni
Senior Associate

Grant Murakami, AICP
Associate

June 25, 2002

Ms. Linnel T. Nishioka, Deputy Director
State of Hawaii
Department of Land and Natural Resources
Commission on Water Resource Management
P.O. Box 621
Honolulu, Hawaii 96809

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Ms. Nishioka:

Thank you for your letter dated January 24, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement (EIS). We offer the following responses to your comments.

1. Maui Land & Pineapple Company Inc., will coordinate with the Maui County to incorporate the Kapalua Mauka community into the County's Water Use and Development Plan. In comments on the Environmental Impact Statement Preparation Notice (EISPN) the County of Maui Department of Water Supply requested Maui Land & Pineapple Company Inc., to cooperate in the development of an acceptable feasibility study framework for private water system integration with the County's public system. Maui Land & Pineapple Company Inc., will comply with this request, which is noted in the Draft Environmental Assessment.

2. We acknowledge concerns regarding the potential for degradation of instream uses from development on highly erodible slopes adjacent to streams within or near the Kapalua Mauka community. Maui Land & Pineapple Company Inc., will comply with all applicable federal, State, and County regulations and rules relating to erosion control. Before issuance of a grading permit by the County of Maui, the final erosion control plan and best management practices necessary for the required NPDES permit will be completed.

3. Thank you for acknowledging: 1) the site is subject to high erodability, and the draft EIS supports erosion mitigation measures, which are essential to protect resource values; 2) the projections for water use fall within the County guidelines of reasonableness and the draft EIS indicates support for several kinds of water conservation practices; and 3) the projected demands are scaled back from an earlier version and are supported by existing infrastructure.

We appreciate your participation in the review of the Draft Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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BENJAMIN J. CAYETANO
GOVERNOR

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

BRIAN K. MINAAI
DIRECTOR

DEPUTY DIRECTORS
JEAN L. OSHITA
JADINE Y. URASAKI

IN REPLY REFER TO
HWY-PS
2.5889

MAY 16 2002

Mr. Tom Schnell
PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813

Dear Mr. Schnell:

Subject: Draft Environmental Impact Statement, Kapalua Mauka (Project District 2), Maui Land and Pineapple Company, Inc., Lahaina, Maui, TMK: 4-2-01: 1 (por.), 4-2-05: 50 (por.), 4-2-05: 51, 4-3-01: 6 (por.), 4-3-01: 7 (por.), and 4-3-01: 8 (por.)

Thank you for the opportunity to comment on the subject DEIS and for extending the dateline from February 22 to March 8, 2002.

We have the following comments:

1. Appendix K-2, the Preliminary Drainage Report, should be revised as follows:

   a. Provide a hydrology study for each drainage area or crossing;

   b. Run HEC-RAS to analyze bridge or culvert hydraulics based on hydrology study. HEC-RAS should provide:

      i. Water surface profile

      ii. Cross-sections with water surface at that section

      iii. Headwater depth and elevation at entrance of bridge or culvert

      iv. Plan showing the stationing from which study was done and locations of the cross-sections

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HWY-PS 2.5889

c. Run HEC-RAS for predevelopment and post development for each bridge or culvert crossing

d. Provide a table showing comparisons between pre- and post development.

2. In Section 5.3, Roadways and Traffic, all proposed and existing intersections with Honoapiilani Highway must have right turn deceleration lanes and left turn storage and deceleration lanes planned, designed and constructed at no cost to the State.

3. In Section 5.3, the traffic signal assumed at the Office Road intersection with Honoapiilani Highway must be planned, designed and constructed when warranted. The applicant should be responsible for monitoring the traffic in coordination with the State Highways Maui District Office and conducting timely warrant studies.

4. All required improvements in the State Highway right of way must be designed and constructed to current State standards and at no cost to the State.

5. Section 1.2.4, Required Permits and Approvals, should include permits for construction in the State Highway right of way.

6. In Section 12.0, Comments on the EISPN and Responses, the response to our comment number 8 does not reflect our fair share philosophy, which is based on the proportion of additional traffic generated by the development compared to the total traffic on that regional segment of the highway. It is not assessed on all property owners who use the highway.

If you have any questions, please contact Ronald Tsuzuki, Head Planning Engineer, Highways Division, at 587-1830.

Very truly yours,

Brian K. Minaai
BRIAN K. MINAAI
Director of Transportation

c: Ann T. Cua, County of Maui Planning Department, OEQC

June 25, 2002

Mr. Brian Minaai
Director of Transportation
State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Mr. Minaai:

Thank you for your letter dated May 16, 2002 (Ref.: HWY-PS 2.5889) concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement (EIS). We offer the following responses to your comments.

1) Since the Kapalua Mauka community is in the conceptual planning stage, it would be premature to revise the Preliminary Drainage Report as requested in your letter because not enough details regarding the final site plan are available to produce accurate data. Therefore the Preliminary Drainage Report will be revised as requested when the subdivision plan is finalized.

2) All proposed and existing intersections with Honoapi'ilani Highway will have right turn deceleration lanes and left turn storage and deceleration lanes planned, designed, and constructed at no cost to the State. This will be clarified in the Final EIS.

3) The traffic signal assumed at the intersection of Office Road and Honoapi'ilani Highway will be planned, designed, and constructed when warranted. Maui Land & Pineapple Company Inc., will be responsible for monitoring the traffic in coordination with the State Highways Maui District Office and conducting timely warrant studies. This will be clarified in the Final EIS.

4) All required improvements to the State Highway right of way will be designed and constructed to current State standards and at no cost to the State. This will be clarified in the Final EIS.

5) Section 1.2.4, Section 3.2.4, and Section 6.3 of the Final EIS will be revised to indicate that a permit is required for construction in the State Highway right of way.

6) Maui Land & Pineapple Company Inc., will contribute its pro rata share of the cost of regional improvements to Honoapi'ilani Highway based on the proportion of additional traffic generated by the Kapalua Mauka community compared to the total traffic on that regional segment of the highway as required by other property owners.

We appreciate the participation of the Department of Transportation in the review of the Draft Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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BENJAMIN J. CAYETANO
GOVERNOR

GENEVIEVE SALMONSON
DIRECTOR

FEB 2 0 2002

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
235 SOUTH BERETANIA STREET
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186

February 7, 2002

Mr. Robert M. McNatt
Maui Land and Pineapple Company, Inc.
P.O. Box 187
Kahului, Hawai'i 96732

Ms. Ann Cua
Planning Department, County of Maui
250 South High Street
Wailuku, Hawai'i 96793

Mr. Tom Schnell
PBR Hawaii
1001 Bishop Street, Pacific Tower, Suite 650
Honolulu, Hawai'i 96813

Dear Messrs. McNatt & Schnell, and Ms. Cua:

Thank you for your responses to our September 21, 2001, letter and for your submittal of a draft environmental impact statement preparation notice for Kapalua Mauka Project District 2, TMK: 4-2-01: 1 (portion); 4-3-01: 6 (portion); 4-3-01: 7 (portion); and, 4-3-01: 8 (portion), in the district of Lahaina. We have reviewed the document and submit the following comments for your consideration and point-by-point response in the draft environmental impact statement.

1. WATER: Please discuss in section 5.8.3 whether approval from the Commission for Water Resources Management may be required in the future for water use.
2. GUIDELINES FOR SUSTAINABLE BUILDING DESIGN IN HAWAI'I: Thank you for considering implementation of some of the techniques discussed in the guidelines for sustainable building design previously sent to you with our September 21, 2001, letter.
3. USE OF RECYCLED GLASS IN CONSTRUCTION PROJECTS. Thank you for considering the use of glass-asphalt aggregate ("glasphalt") in the design of roads for the subdivision, as stated in our September 21, 2001, letter.
4. INDIGENOUS AND POLYNESIAN INTRODUCED PLANTS FOR USE IN PUBLIC LANDSCAPING: Thank you for considering the use of native, indigenous and polynesian introduced plants in your landscaping as mentionned in our September 21, 2001, letter.
5. DEVELOPMENT TIMETABLE: Thank you for including a timetable for development of the project (Table 3, page 20).
6. IMPACT FEES: Please discuss the possible use of impact fees to fund infrastructure development (roads and traffic improvements in Lahaina).
7. CUMULATIVE AND SECONDARY IMPACTS: Please discuss other proposed developments in the region and the cumulative and indirect effects that this project and others may have on each other and the environment.

Thank you for the opportunity to comment. If there are any questions, please call Leslie Segundo, Environmental Health Specialist, at (808) 586-4185.

Sincerely,

GENEVIEVE SALMONSON
Director

Enclosures

July 2, 2002

Ms. Genevieve Salmonson, Director
State of Hawaii
Office of Environmental Quality Control
235 Beretania Street, Suite 702
Honolulu, Hawaii 96813

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Ms. Salmonson:

Thank you for your letter dated February 7, 2002 concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement (EIS). We offer the following responses to your comments.

Water

Approval from the Commission on Water Resource Management is not required for future water use because existing wells have already received approval and the water supply source is not located in a designated water management area. This will be clarified in the Final EIS.

Impact Fees

The use of impact fees could be a source of funding for infrastructure development, especially regional transportation improvements in West Maui.

In their letter on the Draft EIS, the State of Hawaii Department of Transportation has stated that it will require Maui Land & Pineapple Company Inc. pay a to pro rata share of the cost of regional improvements to Honoapi'ilani Highway. In addition, Chapter 14.62 of the Maui County Code establishes a framework for imposing impact fees for traffic and roadway improvements in West Maui. The law calls for the creation of the West Maui Transportation Plan. However, since Chapter 14.62 was enacted in 1988, this plan was never prepared. The West Maui Transportation Plan is essential to the establishment of impact fees because Chapter 14.62 requires: "A schedule for determining traffic impact fees shall be established by the west Maui transportation plan."

In 2002, the County of Maui hired a consultant to develop a transportation planning model that will help the County determine impact fees for new developments that generate traffic. This study will cover the entire island and may be used as the implementing action for Chapter 14.62 of the Maui County Code.

The Final EIS will include this information.

Cumulative and Secondary Impacts

The *West Maui Community Plan* recognizes two approved major master-planned affordable housing developments in the West Maui region: 1) The Villages at Leiali'i, which is to include 4,813 housing units to be developed by the State of Hawaii; and 2) Pu'ukoli'i Village, which is to include 1,700 housing units to be developed by Amfac. Although these projects have been stalled for a number of years, it is reasonable to assume that at least portions of the projects will be developed within the 20-year planning horizon of the *West Maui Community Plan.*

Amfac is also moving ahead on planning its Kaanapali 2020 project on over 4,300 acres of land mauka of Honoapiilani near Kaanapali. A final plan has not been chosen, but the project may include the 1,700 units proposed for Pu'ukoli'i Village, and may include cluster and other affordable housing units. A community-based planning effort for the project has taken over three years and the permit process is estimated to take an additional four to five years before any building can begin. A draft environmental impact statement for the project is expected to be completed by December 2002.

The Final EIS will discuss the Kapalua Mauka community in context with the cumulative and secondary impacts of these other projects.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land and Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning

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FEB 1 2 2002

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD 02/266B

January 29, 2002

Mr. Tom Schnell
PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813

Subject: Draft Environmental Impact Statement—Kapalua Mauka (Project District 2)

Dear Mr. Schnell,

Thank you for the opportunity to comment on the above referenced project. OHA offers the following comments on the project's cultural impacts.

ACCESS
The draft EIS states that individual neighborhoods may be gated. OHA requests that the final EIS address how these gates may hinder access to mauka trails.

LO'I
The cultural impact statement reveals that those who were consulted requested that the valley lo'i be preserved and that access to visit the sites should be granted. The draft EIS is silent on whether Kapalua intends to grant this request. The final EIS should ensure that Kapalua will hold the lo'i in trust for future generations who may chose to reopen them. OHA requests that the preservation and accessibility of the lo'i be addressed in the overall preservation plan for the entire 925 acres. OHA further requests that Kapalua provide us the opportunity to comment on the plan once a draft has been prepared.

SURFACE AND GROUNDWATER IMPACTS
An indirect cultural impact of the project is how surface and groundwater use by the project may impact Hawaiian cultural practices. The draft EIS indicates that waters from Honolua ditch will be expected to provide as much as 1 MGD for the expanded golf course. The document should indicate the extent to which the water used will be diverted from streams hosting traditional and customary practices. Further, hydrological data shows that the groundwater aquifer system contributes significantly to the nearshore area. Nearshore ocean resources and resource use are dependent upon an influx of fresh water because fresh water is an integral part of the live food pyramid and the growth of limu. The applicant should indicate whether increased pumpage would affect this discharge. If increased pumpage reduces groundwater flow discharges into the nearshore marine environment, Hawaiian gathering of food resources may be affected. The final EIS should address the impact of groundwater withdrawal for the project on the nearshore ecosystems and any cultural practices dependent on nearshore resources.

If you have any questions, please contact Sharla Manley, policy analyst at 594-1944, or e-mail her at sharlam@oha.org.

Sincerely,

Colin C. Kippen, Jr.

Colin C. Kippen, Jr.
Deputy Administrator

CK: sam

cc: Board of Trustees
Clyde W. Namu'o, Administrator
Maui CAC
Genevieve Salmonson, OEQC
Ann Cua, County of Maui Planning Department
Robert McNatt, Maui Land and Pineapple Company, Inc.

June 25, 2002

Mr. Colin C. Kippin, Jr.
Deputy Administrator
State of Hawai'i
Office of Hawaiian Affairs
711 Kapi'olani Blvd., Suite 500
Honolulu, Hawai'i 96813

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Mr. Kippin:

Thank you for your letter dated January 29, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement. We offer the following responses to your comments.

Access

Access to any trails or culturally significant sites that may be present in the area will not be limited by the development of the Kapalua Mauka community. Relative to the existing agricultural use of the land, in which the entire area is gated, the establishment of the Kapalua Mauka community will make the area more accessible.

Consistent with the existing Kapalua Resort, the overall Kapalua Mauka Community is not planned to be gated. Public access will be allowed on the community streets, however, some of the individual neighborhoods may be gated. It has not been determined where these individual neighborhoods would be located within the site or at what phase they would be built. In any case, any gated neighborhood will not be so extensive as to block access to mauka trials that may be identified. In addition, access within any gated neighborhood would not be so restricted as to prohibit anyone with a legitimate reason from accessing an area.

The Final EIS will contain a new section on trails and access.

Lo'i

Persons interviewed by Xamanek Researches for the cultural impact statement stated they are aware of the existence of lo'i in the area, but no lo'i were identified by the archaeological surveys conducted for the Kapalua Mauka community site. As stated above, access to any trails or culturally significant sites will not be limited by the development of the Kapalua Mauka community. In addition, since all archaeological sites will be placed in "as is" preservation and there will be no development in the gulches beyond necessary infrastructure, any lo'i that may be present will not be disturbed.

These points will be made in the Final EIS. In addition, preservation and accessibility of any lo'i existing on the site will be addressed in the overall preservation plan for the entire 925 acres. Once a draft preservation plan is prepared, OHA will be provided with an opportunity to comment on the plan.

Surface and Groundwater Impacts

Regarding water from Honolua Ditch, please note that this ditch has been providing agricultural irrigation water in the region since 1913. No additional water beyond what currently flows to the Ditch is expected to be diverted from streams in the region as a result of the Kapalua Mauka community. These points will be stated in the Final EIS.

In response to your concerns regarding the impacts to the near shore marine environment from increased pumping of water from wells, Maui Land & Pineapple Company, Inc., commissioned Marine Research Consultants to conduct a study investigating whether increased pumping of groundwater for the Kapalua Mauka community will reduce groundwater flows into the near shore marine environment and thus affect marine resources. The study concludes:

> There are several reasons why the withdraw of ground water from the proposed development will not likely result in alteration to biotic communities. First, the engineering estimates indicate that the project will remove only about 2% of the groundwater flux to the nearshore area, which is well within the natural variability of discharge. Secondly, results of the present study indicate that the nearshore region which is exposed to decreased salinity/increased nutrients is very narrow as a result of the typical physical mixing of water from wind and waves. Thirdly, the area has been subjected to increases in nutrient concentrations in groundwater from agricultural and resort development for decades. Pumpage of a small percentage of groundwater will serve to lower nutrient delivery to the near shore area, moving the system back toward the level that occurred prior to human activity on the shoreline.

Based on this conclusion, nearshore ecosystems and cultural practices dependent on nearshore resources are not expected to be impacted by the pumping of water from wells for the Kapalua Mauka community. The study will be referenced in, and included with, the Final EIS. A copy of the study is available upon request.

We appreciate your participation in the review of the Draft Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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UNIVERSITY OF HAWAI'I
ENVIRONMENTAL CENTER

February 22, 2002
RE: 0723

Mr. Robert M. McNatt
Maui Land and Pineapple Company, Inc.
P.O. Box 187
Kahului, Hawaii 96732

Dear Mr. McNatt:

Draft Environmental Impact Statement
Kapalua Mauka (Project District II)
Kapalua, Maui

The applicant, Maui Land and Pineapple Company, Inc. proposes the long-planned expansion of the Kapalua Resort around the Village Golf Course mauka of the Honoapi'ilani Highway in the Kapalua region of West Maui. This area already is designated as "Project District II" in the County of Maui's West Maui Community Plan and allows for a flexible and creative planning approach for quality developments. The proposed master plan includes 690 residential units on approximately 925 acres with a 20-year build out period. The master planned Kapalua Mauka community will consist of a variety of residential housing types, including multi-family dwellings and single-family home sites ranging in size from less than 10,000 square feet to over one acre.

This review was conducted with the assistance of Roger Babcock, Civil Engineering; Paul Ekern, Emeritus, Agronomy and Soil Science; and Dave Sims, Environmental Center.

General Comments

Overall, the Draft EIS appears to be well written and comprehensive in its approach to many issues. We commend the preparers of the document on their diligence in complying with the EIS rules. All required sections are included and most areas of concern are well addressed.

However, the inclusion of an overall West Maui map would facilitate a greater understanding and review of the area surrounding the project. There is mention of comparative aquatic conditions at nearby Honolua Bay but no map of this area is included in the DEIS.

Throughout the Draft EIS there is mention of alternative plans of action that will be implemented for unforeseen problems that may occur during construction. However, there is no discussion of how these unforeseen problems will be recognized and how alternative plans will be implemented and monitored. Will there be an authoritative, knowledgeable employee or agent who will monitor the site, recognize a problem, and implement correct actions if an unforeseen problem does appear?

The DEIS addresses the issue of wastewater treatment capacity availability which is apparently adequate based upon a previously purchased allocation at the Lahaina WWRF. The flow numbers given in the DEIS appear to be average daily flows, and it must be assumed that peak flows have been considered by the developer and the County Wastewater Division. The DEIS should indicate that adequate capacity is available for design peak flows.

In addition to concerns regarding reported adequacy of capacity at the Lahaina Waste Water Facility (LWWF), the DEIS does not mention where the discharged wastes from this facility are disposed, nor does it mention the method of discharge. Is the wastewater from the LWWF discharged via injection wells or through an ocean out fall? In either case, what is the environmental fate of the discharge? Are other future developments included in the West Maui Community Plan that would contribute to this discharge?

Runoff Due to the Grubbing Process

Our reviewers have noted concerns regarding potential residual soil contamination in the pineapple fields slated for conversion to residences, since the runoff travels directly to Honokahua Bay via the two gulches. In the DEIS there is no discussion of hazardous runoff that could occur while grubbing due to remnant agricultural chemicals. How intensively were these areas farmed? When were the last chemical applications made and what chemicals were used? If agricultural chemicals are present, what mitigating factors will be implemented to abate their entry into the gulches and ultimately into Honokahua Bay?

Non-potable Water

The water and wastewater facilities are privately owned and operated by Kapalua Water Company and Kapalua Land Company. The existing community and the proposed expansion both will have a dual pipe system with which to use non-potable water for uses such as irrigation of the golf course and common area landscaping. The source of non-potable water is the Honolua Ditch.

Mr. McNatt
February 22, 2002
Page 3

The DEIS does not address the issue of the long-term availability of the non-potable water supply. It is apparent that the existing three wells have insufficient capacity to serve the projected combined potable and non-potable water demands for all of the existing and expanded Kapalua community. Is the Lahaina area a special management district, and if so what quantity of water is allocated to Kapalua Resort? What is the current capacity and reliability of the Honolua ditch in the vicinity of Kapalua? Who owns the ditch? Was the use of recycled water from the Lahaina WWRF considered to partially or completely offset the use of ditch water? If not, why not? Wouldn't this be beneficial in terms of reducing diversions into the ditch and consequently restoring streamflows somewhere, as well as reducing wastewater disposal by other less-desirable means?

The DEIS should give at least the approximate size and locations of the necessary open reservoirs or tanks that will be needed for the non-potable water system for areas above the existing 5.5 million gallon reservoir located at 660 feet MSL. The new non-potable system components will have to be designed and located at elevations sufficient to provide adequate pressures for fire hydrants and irrigation systems.

Thank you for the opportunity to comment on this Draft Environmental Impact Statement.

Sincerely,

John T. Harrison, Ph.D.
Environmental Coordinator

cc: OEQC
County of Maui Planning Department
PBR Hawaii
James Moncur, WRRC
Roger Babcock
Dave Sims

PBR HAWAII

July 2, 2002

John T. Harrison, Ph.D.
Environmental Coordinator
University of Hawai'i Environmental Center
2550 Campus Road, Crawford 317
Honolulu, Hawai'i 96822

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Dr. Harrison:

Thank you for your letter dated February 22, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement (EIS). We appreciate your general comments regarding the overall preparation of the draft EIS. We offer the following responses to your comments.

General Comments

The Final EIS will include an overall West Maui map to facilitate a greater understanding and review of the area surrounding the Kapalua Mauka community.

The development of the Kapalua Mauka community will be monitored to ensure unforeseen problems during construction are dealt with in the most appropriate way. Supervisory employees of Maui Land & Pineapple Company Inc., and Kapalua Land Company Ltd., have many years experience in managing construction sites and are prepared to take corrective actions when necessary. In addition, the Kapalua Mauka community will be built in phases over a projected 20-year build out period, thus limiting large-scale problems and allowing for any problems first encountered to be pro-actively addressed in later phases.

The Lahaina Wastewater Reclamation Facility has a average daily flow capacity of 9.00 Million Gallons per Day (MGD). The peak capacity is 19.8 MGD. Project engineer Warren S. Unemori Engineering Inc., has concluded the Lahaina Wastewater Reclamation Facility has adequate capacity to handle the average and peak flows from the Kapalua Mauka community. This will be indicated in the Final EIS.

Wastewater from the Lahaina Wastewater Reclamation Facility that is not recycled is disposed of in injection wells at the Lahaina Wastewater Reclamation Facility site. This will be noted in the Final EIS.

Future developments included in the West Maui Community Plan region that would contribute to wastewater discharge include up to 5,300 housing units at Pu'ukoli'i Village (an AMFAC project mauka of Kaanapali) and the Villages at Leiali'i (a State Housing and Community Development Corporation of Hawai'i (HCDCH) project near the Lahaina Civic Center). As noted in the Draft EIS (Section 5.8.4, Wastewater Facilities), wastewater system capacity has been allocated to these projects, however, if HCDCH does not use their allocation by year 2006, their allocation reverts to the County. Further, while these projects have been in the planning stages for years, there has been no activity on either one in over a decade.

Runoff Due to the Grubbing Process

Currently pineapple is being cultivated on approximately 169 acres of the proposed Kapalua Mauka community site. Other areas are fallow pineapple fields, the existing Village Golf Course, pastureland, and open space gulches and ravines.

Fumigants and insecticides listed on the Maui Pineapple Company field maps for the cultivated areas include Telone II, Methyl Bromide, Nemacur, Diazinon, and Amdro. Herbicides used include Karmex, Hyvar X, Velpar, Roundup, atrizine, Ametryne, Fusilade, Assure, and Direxl. Fertilizers used for pineapple cultivation include nitrogen, potassium, iron, zinc, magnesium, Phosgard, and rock phosphate. Unlike other crops, fertilizers used for pineapple (with the exception of rock phosphate) are usually applied to the leaves, not the soil.

During the preparation of the Kapalua Mauka Draft Environmental Impact Statement, the State of Hawaii Department of Health Hazard Evaluation and Emergency Response (HEER) Office was contacted and asked to check their files and database to see of there were any reported records of possible hazards on the Kapalua Mauka community site due to the past use of agricultural soil fumigants or other agricultural pesticides. In response, HEER reported that they did not have any information pertaining to the site.

In response to concerns about runoff from the Kapalua Mauka community into nearby ocean waters, Maui Land & Pineapple Company Inc., has initiated a water quality monitoring program for Honokahua Bay and Napili Bay, which are downstream from the Kapalua Mauka community. The first water quality study has been conducted and the results of this study will be included in the Final EIS. The intent of this first study is to establish a quantitative baseline of water chemistry constituents that could reveal if water quality in Honokahua Bay and Napili Bay will be affected by factors associated with the Kapalua Mauka community. As the development of the Kapalua Mauka community progresses, additional water quality studies of Honokahua Bay and Napili Bay will be conducted on a periodic schedule.

A similar water quality monitoring program was implemented in 1990 for nearby Honolua Bay when Maui Land & Pineapple Inc., developed the Plantation Estates subdivision and the Plantation Estates Golf Course, both of which were developed on former pineapple land. Results of monitoring at Honolua Bay conclude that "nutrients entering the Bay from both natural and man induced activities do not appear to be causing any negative impacts to either water quality or biotic structure of Honolua Bay." Given the similar type of development planned (residential uses and a golf course) similar impacts to nearshore waters within Honokahua Bay and Napili Bay are expected.

Mitigative measures that will be implemented to abate soil erosion, runoff, and entry of chemicals into the gulches and ultimately Honokahua Bay and Napili Bay include:

- Limiting grading to less than 15 acres at one time.
- Landscaping exposed areas upon the completion of grading for each area and before commencement of grading in the next phase in compliance with the Maui County grading ordinance.
- Retaining existing ground cover as long as possible.
- Constructing drainage control features early.
- Using temporary area sprinklers in non-active construction areas when ground cover is removed.
- Providing a water truck on site during the construction period to provide for immediate sprinkling as needed.
- Using temporary berms and cut-off ditches, where needed, for control of erosion.
- Watering graded areas when construction activity for each day has ceased.
- Grassing or planting all cut and fill slopes immediately after grading work has been completed.
- Installing silt screens where appropriate.

All construction activities will comply with all applicable federal, State, and County regulations and rules for erosion control. Before issuance of a grading permit by the County of Maui, the final erosion control plan and best management practices necessary for the required NPDES permit will be completed.

Runoff from the community site will be collected by catch basins and will then be directed into onsite detention and desilting facilities. All detention basins will be designed to suppress peak flows and serve as desilting basins to minimize the conveyance of waterborne silt and debris downstream. Detention basins will also maintain off-site runoff at or better than existing levels. All drainage improvements will be developed in accordance with applicable State Department of Health and County of Maui requirements.

Water Issues

Kapalua is served by a dual water system As stated in the Draft EIS, the source of non-potable water for Kapalua Resort is Honolua Ditch; the source of potable water is three wells on Maui Land & Pineapple Company Inc., land mauka of the Kapalua Resort. Each of these wells has a capacity of 1.0 million gallons per day (MGD). Two of the wells have pumps installed and are in service; the third well does not have a pump and is currently not in service. The potable water from these wells is not intended for irrigation or other needs that can be satisfied with non-potable water from Honolua Ditch.

According to Maui Land & Pineapple Company Inc., water flows in Honolua Ditch vary between a high of 60 MGD to a low of 5 MGD with an average daily flow of 26 MGD. As discussed in the Draft EIS, non-potable irrigation demand of the Kapalua Mauka community, including the expansion of the golf course to 27 holes, is expected to range from 900,000 to 1,000,000 gpd. Within the existing Resort, the average daily demand for non-potable water for the period between May 2001 and April 2002 was approximately 1,900,00 gpd. All totaled, the existing

Kapalua Resort and the proposed Kapalua Mauka community are estimated to require approximately 2.9 MGD of non potable water.

Maui Land & Pineapple Company Inc., owns Honolua Ditch and the land encompassing the watershed that contributes to it. Through the Puu Kukui Nature Preserve, Maui Land & Pineapple Company Inc., works to preserve this watershed.

The Lahaina area is not a Special Water Management District.

The use of recycled water from the Lahaina Wastewater Reclamation Facility was considered to partially offset the use of Ditch water, unfortunately, the significant capital and operating costs to convey the recycled water from the Lahaina Wastewater Reclamation Facility to Kapalua, makes the use of recycled water impractical at this time. Because Kapalua is located approximately five miles northeast of the Lahaina Wastewater Reclamation Facility, capital costs would include installation of five miles of transmission line. In addition, since the Lahaina Wastewater Reclamation Facility is located at around the 40 foot elevation and Honolua Ditch is at around the 840 foot elevation, additional capital costs would be required for booster pumps, and operating costs would be incurred to keep the water flowing uphill. Currently water from Honolua Ditch flows by gravity from Kapalua toward Lahaina.

The Final EIS will provide the approximate size and location of the necessary open reservoir that will be needed for the non potable water system for areas above the existing 5.5 million gallon reservoir located at 660 feet mean sea level (MSL). The reservoir would be constructed at the 1,200 foot level and would have a capacity of approximately 2,150,000 gallons. Water for this reservoir will be pumped up from the first reservoir at elevation 660 feet. The size and elevation of this reservoir would provide adequate pressures for fire protection and irrigation systems.

We appreciate your participation in the review of the Draft Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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

REPLY TO ATTENTION OF

January 29, 2002

JAN 3 0 2002

Civil Works Technical Branch

Mr. Tom Schnell
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Mr. Schnell:

Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement (DEIS) for the Kapalua Mauka Project, Lahaina, Maui (TMKs 4-2-1: 1; 4-2-5: 50, 51; and, 4-3-1: 6-8). The following comments are provided in accordance with Corps of Engineers authorities to provide flood hazard information and to issue Department of the Army (DA) permits.

a. Page 18 of the DEIS states that the natural gulches and ravines of the site will not be developed except for necessary infrastructure. Any activity involving the discharge of dredged or fill material below the ordinary high water mark of Honokahua Stream or other streams, or into adjacent wetlands (if any), may require a DA permit. A determination of DA permit requirements can be provided once plans for activities within these areas are developed. For further information, please call Mr. Peter Galloway of our Regulatory Branch at (808) 438-8416 and refer to file number 200200158.

b. The flood hazard information provided on page 32 of the DEIS is correct.

A copy of this letter has also been furnished to Mr. Robert M. McNatt, Maui Land and Pineapple Company, PO Box 187, Kahului, Hawaii 96732; and, Ms. Ann Cua, County of Maui Planning Department, 250 South High Street, Wailuku, Hawaii 96793.

Sincerely,

James Pennaz, P.E.
Chief, Civil Works
Technical Branch

PBR HAWAII

June 25, 2002

Mr. James Pennaz, P.E.,
Chief, Civil Works Technical Branch
Department of the Army
U.S. Army Engineer District, Honolulu
Fort Shafter, Hawaii 96858-5440

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Mr. Pennaz:

Thank you for your letter dated January 29, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement.

We acknowledge that any activity involving the discharge of dredged or fill material below the ordinary high water mark of Honokahua Stream or other streams may require a Department of the Army permit. When developed, plans for activities within these areas will be forwarded to you for determination of Department of the Army permit requirements.

Thank you for verifying that the flood hazard information provided in the Draft EIS is correct.

We appreciate your participation in the review of the Draft Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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NRCS Natural Resources Conservation Service

USDA United States Department of Agriculture

P.O. Box 50004
Honolulu, HI 96850
Phone: 808-541-2600
FAX: 808-541-1335

Our People...Our Islands...In Harmony

January 31, 2002

FEB - 4 2002

Mr. Tom Schnell
PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813

Dear Mr. Schnell:

Subject: Draft Environmental Impact Statement (DEIS) – Kapalua Mauka (Project District 2), Lahaina, Maui, Hawaii

We have reviewed the above mentioned document and have no comments to offer at this time.

Thank you for the opportunity to review this document.

Sincerely,

KENNETH M. KANESHIRO
State Conservationist

Cc:
Ms. Ann T. Cua, Planning Department, County of Maui, 250 South High Street, Wailuku, Hawaii 96793
Office of Environmental Quality Control, 235 S. Beretania Street, Suite 702, Honolulu, Hawaii 96813

The Natural Resources Conservation Service works hand-in-hand with the American people to conserve natural resources on private lands.

AN EQUAL OPPORTUNITY EMPLOYER

June 25, 2002

Mr. Kenneth M. Kaneshiro
United States Department of Agriculture
Natural Resources Conservation Service
P.O. Box 50004
Honolulu, Hawaii 96850

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Mr. Kaneshiro:

Thank you for your letter dated January 31, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement. We note that you have no comments at this time.

We appreciate your participation in the review of the Draft Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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COUNTY COUNCIL
COUNTY OF MAUI
200 S. HIGH STREET
WAILUKU, MAUI, HAWAII 96793

Director of Council Services
Ken R. Fukuoka

February 19, 2002

FEB 25

Maui Land and Pineapple Company, Inc.
Attn: Mr. Robert M. McNatt
P. O. Box 187
Kahului, HI 96732

Dear Mr. McNatt:

SUBJECT: KAPALUA MAUKA RESORT EXPANSION COMMENTS TO DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS)

I have met with you previously on the subject of the Kapalua Mauka Resort Expansion and after reviewing the Draft EIS I am still concerned about the following issues that either have been inadequately addressed in the document or are in conflict with the community plan.

The expansion of the plan from 450 acres to 925 acres of primarily agricultural lands is extremely troublesome and does not conform to the West Maui Community Plan which clearly states the following:

> "Projects have been permitted that were inconsistent with the Community Plan and agriculturally designated lands are being used for other than agricultural purposes. Other specific problem areas include the inconsistency of zoning and that development has preceded infrastructural improvements."

In addition to these concerns, the issues that are not addressed or are contrary to the Community Plan are:

> "Water sources should be conserved and new sources need to be developed"

> "There is a need to develop a public transportation system"

> "It is important to provide a wider range of affordable housing choices in order to serve the full spectrum of residents (from single persons to large families"

> "to create a wider range of educational opportunities"

"The need to preserve and protect the cultural diversity and remaining rural lifestyles within the region."

I believe that the original Project District 2 did not encompass the Plantation Estates that was specified agriculture in the West Maui Community Plan. This area now contains only residential uses and golf course yet is still zoned agriculture, which is counter to the intent of the use of agricultural lands (see asterisk.above) This area encompasses over 200 acres and nowhere are the adverse impacts relating to residential development of agricultural land discussed.

Also, according to locals who frequent the waters, there has been a further degrading of the water quality in the Honolua Bay area and it is not known if this is caused by increased fertilization of the golf course and or irrigation of lush landscaped areas adjacent to homes. While the acreage for Plantation Estates does not appear to have been proposed in the Community Plan, it is now considered lost to agricultural activity and the total impact of lost agricultural land is not being addressed.

The proposed project district is a category which provides for a flexible and creative planning approach rather than specific land use designations for quality developments, the approach is supposed to develop a continuity in land use and designs while providing for a comprehensive network of infrastructural facilities and systems. A variety of uses as well as open space, parks and other project uses are intended.

Our county is presently required through ordinance to complete a West Maui Transportation Model and required traffic impact fee structure prior to the approval of any West Maui developments and this issue does not appear to be covered anywhere in the EIS.

Maui County is currently embarking on a smart growth initiative that promotes greater densities in housing and larger open space areas that are preserved and do not require development of urban infrastructure in rural areas. The costs to expand services to rural areas and maintain them, even though those areas generate income are cost shifting a financial burden to future taxpayers. Even with monies generated by initial development the costs cannot be accurately measured in "real" currency. The increasing consumption of more agricultural land for residential use is alarming and over 140 agriculture subdivision applications, covering thousands of acres, are currently in process at our Department of Public Works and Waste Management. This is only one more in a long succession of projects that truly does not reflect the theme of our West Maui Community Plan.

The loss of open space, rural character and visual appeal should not be valued only in terms of dollars and cents. The cost analysis performed by the Hallstrom Group is from the perspective of a former C. Brewer real estate analyst and appraiser and strictly conforms to a development driven perspective. The land's value lies in its ability to produce income, not in its mere existence as "open space." No study has been done on the aesthetic value of open space and the visitor valuation on these natural assets is largely ignored. These valuations should be included, and based on a past study done by the Trust for Public Lands, have the highest importance to our visitors

In an attached article from the Maui News "Pineapple was the origin of and is still the biggest revenue producer for Maui Land and Pineapple Company, the largest business with headquarters on Maui. In the profitable year of 1999 Maui Pine had revenue of more than $94 million. Last year, although the company still suffered losses because of higher costs, revenue popped back up to $97 million."

On a personal tour conducted by Wes Nohara, of MLP, I viewed firsthand the former AMFAC cane lands that MLP converted to pineapple production. With rocky slopes, the lack of adequate infrastructure specifically required for pine as well as less than ideal farming conditions, Mr. Nohara revealed that start-up costs were far greater than anticipated, which undoubtedly had an adverse impact on pine earnings for the year. Harvesting is also a challenge, yet the initial costs have been made and it appears that the land will begin generating income in the near future for MLP. To take higher quality lands in Project District 2 out of active pineapple production seems counterproductive when considering the costs associated with developing AMFAC's lower quality land for the same purpose.

If the viability of pineapple is to continue, the core issue of whether Maui Pine is going to increase it's conversion of agriculture land to development rather than continue active pineapple production or alternative crops will need to be addressed. The article attached, points out that the primary consideration for closure of pine operations in West Maui is the traffic issue and the competition between shipping space and visitors.

What the studies contained in the EIS do not address, is the inherent flaw in the theory that by increasing the rate of residential and resort development on the West side profitability can be improved. The very opposite effect is likely to occur. With increased visitor counts, greater numbers of cars on the roadway, as well as an increase in the competition for airline cargo space, MLP will be accelerating the rate at which pineapple production becomes less viable. They will be bringing about the worsening of conditions they presently assert are causing the greatest problems for their operations. This is a case of poor reasoning and certainly is not born out by any studies contained in their EIS.

An additional issue that appears to be missing from the equation is the acute housing shortage faced by West Maui's local workers. While this is discussed in some measure, the primary assertion is that by creating high-end housing and generating taxes, the monies will be available for affordable housing. What is not addressed is the overall shrinking inventory of available land that is causing a dramatic increase in the costs for the remaining land thereby making it impossible to acquire land at realistic prices on which to build homes or condominiums for locals. There does not appear to be a need to dedicate more lands to high-end "resort" housing that most of our residents cannot afford.

A recent condominium project at Napili Village was rapidly sold out even though prices were approaching $300,000. This indicates a desperate need for housing for our local families - a strong theme in West Maui's community plan that is not mirrored in the development of this project district. Only 10 to 15% of local families earning upwards of $150,000 per year would be able to live in this project, yet the primary employment for the development would be in lower paying service related jobs. The highest paying jobs in the course of this development are the short-term construction jobs paying an average of $55,000 and yet there is no housing for the workers.

At the present time over 50% of the local beach campers on Papalaua Beach Park (often referred to as homeless) are actively employed in the construction industry. They live in tents on the beach at night and work construction during the day. It is creating a serious health hazard, as well as a conflict between local beachgoers, visitors and those who enjoy weekend camping but can't find a spare area to pitch a tent. The construction industry is importing labor at an alarming rate and most recently a large renovation project at the Ritz Carlton was awarded to an off-island firm.

In all fairness, the Ritz does use crews who do this type of work for the hotel chain throughout the world, however the assertions in the economic study claim that local labor will benefit from these upscale developments. This is highly questionable since many of the renovations and high-end remodels are done for wealthy mainland residents who import entire crews and ship in large container loads of custom cabinetry and built-ins, as well as pricey custom ordered furnishings. This does not bode well for our local economy and is causing a growing unrest among local families and workers who struggle to compete with off-island firms with specialized skills and large crews who get in and out quickly, taking profits and wages off island with them. The hard costs for this type of luxury market when weighed against more moderately priced home or condo renovations/services do not seem to have their basis in reality.

The Kapalua area is known for it's high quality resort amenities and while the assertion is that there will be no impact on our highways, it is simply not realistic to expect that 690 homes, resort developments and the related improvements

needed for the area will not have an adverse impact on Honoapiilani Highway. All of those homes and places of employment involve large numbers of people. No further development (unless it is realistically priced housing for local people who work in the area) should be permitted until Honoapiilani Highway is moved more mauka of its present location. I cannot imagine what devastation the economy would face if the highway (already crowded with construction trucks, semis, flatbeds, service vehicles and delivery trucks) were further burdened with heavy construction vehicles over the next sixteen years. Honoapiilani Highway is the most inadequate and dangerous critical corridor in all of Hawaii!!!

In addition, we must have decent schools and adequate medical care for West Maui as well as Maui County in general. Maui Memorial Hospital has recently come under fire for inadequate staffing and may be unable to meet even current resident's needs. If certification is lost, our entire population faces a crisis unlike any we have faced in recent years. With loss of certification, we will face millions of dollars in lost revenues for Medicare/Medicaid recipients. Most upscale visitors and those who will likely be purchasing homes or condos will do so in upscale areas such as Kapalua. They demand the very best in services and will not tolerate an inadequate medical facility or the inability to be immediately transported in the event of an emergency to a substandard hospital. We have a problem with emergency transportation due to frequent highway closures and highway that is eroding into the sea. The serious issues plaguing our hospital and emergency care services must be resolved prior to adding further burdens to an already inadequate system.

The applicant's desire to put the six-acre school site in another area is very unfair to the Citizens Advisory Committee who worked on the Community Plan. The participants wanted to make certain that at least one school was placed in this area since it is near a large population base. Project District 2 is closer to Napili and large numbers of children who have to commute daily to Lahaina desperately need a school closer to where they live. It could possibly be a private school, such as the Cardin Academy that currently operates at a temporary site in Lahaina. This would also alleviate some of the traffic problems. While the EIS states that there will be minimal impacts on our school system, there is a need created by the workers who will serve the guests and residents who will be living at Kapalua Mauka. What about the needs of their employee's children? This is a social responsibility and should not be dismissed easily.

The projections for expenditures by high-end guests and owners who are here only for brief periods of time seem quite puzzling to me. The assertions made are that the owners of these units will not burden our infrastructure due to the short periods of time they spend here. However, when you consider the calculations for their projected financial benefit to the County for items such as restaurants, groceries, automobiles, gas, retail shopping, services, and so forth, how can these be as high as stated if the actual time spent on island is so short?

Can they show the calculation on their assumptions and the source of their information?

Sincerely,

Jo Anne Johnson
Councilmember

cc: County of Maui Planning Department
PBR Hawaii
Office of Environmental Quality Control

Afghan unrest
Peacekeepers shot at in Kabul
On Page A7

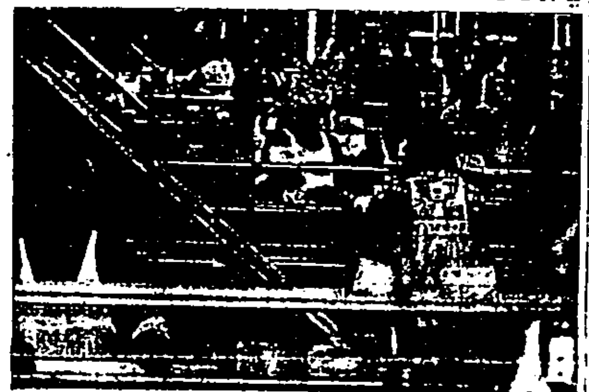
SUNDAY
February 17, 2002

The Maui

Good Morning!

Maui's Newspaper Since 1900

A MAKEOVER FOR MAUI PINE



Company begins shift toward fresh fruit sector

See PINEAPPLE

DOCUMENT CAPTURED AS RECEIVED

July 2, 2002

Councilmember Jo Anne Johnson
County Council
County of Maui
200 High Street
Wailuku, Hawai'i 96793

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Councilmember Johnson:

Thank you for your letter dated February 19, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement (EIS). We offer the following responses to your comments.

Conformance with the Community Plan

Regarding your comment: "The expansion of the plan from 450 acres to 925 acres of primarily agricultural land is extremely troublesome and does not conform the *West Maui Community Plan*," please note that *West Maui Community Plan* already designates 450 acres of the Kapalua Mauka community as "Project District 2" and that landowner Maui Land & Pineapple Company Inc., is having this EIS prepared in conjunction with seeking a community plan amendment to include the additional area of the proposed Kapalua Mauka community within Project District 2. According to the Community Plan, Project District 2:

. . . is intended to provide, within the context of the Kapalua Resort, a mix of recreational activities including an existing golf course (with possible expansion to 27 holes), a clubhouse, pro shop, restaurants and bars, tennis courts, swimming pool, and other related recreational amenities and commercial services. The project district also includes 750 residential units (with an overall average density of 5 units/acre) in a mixture of single-family and multi-family uses integrated with and complementary to the recreational facilities mentioned above. (Page 53)

The uses currently proposed for the Kapalua Mauka community are what is called for in the Community Plan, with two primary exceptions: 1) the number of homes would be reduced from 750 units to 690 units; and 2) the area of the community would be expanded from 450 acres to 925 acres. Because less homes would be allocated over a larger area, the resulting community will be far less dense than what is currently envisioned in the *West Maui Community Plan* which has a community planning horizon of 20 years. Therefore actual residential growth and the required infrastructure demands for Project District 2 will be less than what has been anticipated in the *West Maui Community Plan*.

THE MAUI NEWS—Sunday, February 17, 2002—A5

Pineapple

Continued from Page A1

After the proposed community plan amendment is approved, landowner Maui Land & Pineapple Company, Inc., will seek a State Land Use District Boundary Amendment from the State Land Use Commission to change the land use designation of the site from the current Agricultural District to the appropriate State Land Use districts. When the appropriate State Land Use districts are established, landowner Maui Land & Pineapple Company, Inc., will then seek a Change in Zoning and Project District approvals (Phases I to III) for the property.

Regarding your other concerns about the Kapalua Mauka community's compliance with the *West Maui Community Plan* the following information is provided:

- Water Sources. As discussed in Section 5.8.3 of the draft EIS, there are adequate water resources available in the region for the Kapalua Mauka community.

- Public Transportation. While the Community Plan states there is a need to develop a public transportation system, this is not a task that can be undertaken solely by a single landowner, and more appropriately may be a task to be undertaken by appropriate government agencies.

  As reported in the *Maui News* on May 3, 2002, the County of Maui has hired a consultant to look at the feasibility of starting a public transportation system on Maui. The study is scheduled to be completed by the end of the year. Another study is being done to develop a transportation planning model that will help the County determine impact fees for new developments that generate traffic.

  Currently Kapalua Resort operates a shuttle system for resort residents and guests that provides transportation within the resort and to and from the Kapalua/West Maui Airport. Service is provided "on call" from 6:00 AM to 11:00 PM. The shuttle service carries approximately 18,000 passengers per year. The service area of the shuttle system will be expanded to include the Kapalua Mauka community.

- Affordable Housing. Maui Land & Pineapple Company, Inc., will comply with County of Maui requirements for affordable housing. In fact, Maui Land & Pineapple Company, Inc., has a strong history of providing affordable housing for their employees and has complied with all requirements for affordable employee housing previously imposed as conditions of developing the existing Kapalua Resort. Completed West Maui projects include Nāpilihau Planned Development (174 units, in partnership with the State) and Honokeana Subdivision Phase I (38 units). Maui Land & Pineapple Company, Inc., also donated 13.5 acres of land in West Maui for the County Hale Noho Subdivision (which contains 72 homes built by the County).

  In conjunction with its Upcountry operations, Maui Land & Pineapple Company, Inc., has provided affordable employee housing in Hāli'imaile (176 units and 15 units) and in Makawao at the Pu'u Koa Subdivision (47 units).

  In May of 2002, Maui Land & Pineapple Company, Inc., started development of the Kapua Village Subdivision, a new 45-lot employee subdivision project in West Maui. Maui Land & Pineapple Company, Inc., is developing this subdivision on their own accord as a benefit for their employees and is not receiving any County affordable housing credits for the project. These lots will be sold to employees at prices significantly below market prices.

  In summary, Maui Land & Pineapple Company, Inc., has developed (independently or in partnership with the State) 450 affordable employee housing units on Maui. They have also donated land to the County for County-built affordable housing. Further, in 2002, they are providing an additional 45 affordable lots in West Maui for employees at prices below market.

- Educational Opportunities. While the Community Plan states there is a need to create a wider range of educational opportunities, this is not a task that can be undertaken solely by a single landowner and more appropriately may be a task to be undertaken by the State of Hawai'i or a private school.

  During the 20-year build out and sales period, the Kapalua Mauka community is projected to generate approximately $72.9 million in taxes for the County of Maui; and approximately $101.9 million for the State of Hawai'i. After build out, annual taxes generated from the community are projected to be approximately $5.6 million for the County and approximately $5.2 million for the State. A portion of this additional revenue could be used by government to create a wider range of educational opportunities.

  Further, while the description for Project District 2 in the *West Maui Community Plan* allocates six acres within Project District 2 for an elementary school, in their comment letter on the Kapalua Mauka draft environmental impact statement (see attached), the Department of Education states: "The Department of Education does not anticipate that a school site will be needed in the Kapalua region."

- Cultural Diversity and Rural lifestyles. The Kapalua Mauka community will serve to protect archaeological, cultural, and historic resources. As discussed in the Section 5.1 of the draft EIS, archaeological studies of the Kapalua Mauka community site have been conducted. The full studies are included in Appendices F-1 and F-2 of the draft EIS. All recommendations for preservation of archaeological sites provided in the survey reports and by the State Historic Preservation Division will be followed. A cultural impact study has also been conducted (See Section 5.2 and Appendix G of the draft EIS). This study did not identify any cultural practices that may be affected by the proposed Kapalua Mauka community.

  The Kapalua Mauka community will help to maintain rural lifestyles. Approximately 280 acres of the community is proposed to be placed in the State Rural district to provide

> a transition area from the more urban uses at the core of the community to the agricultural areas surrounding the site. This rural area would contain single-family home sites ranging in size from a minimum of a half acre to up to three acres. Small-scale agricultural activities will be allowed on the larger parcels, including orchards, plant nurseries, and other horticultural activities. According to the Administrative Rules governing the State Land Use Law (Chapter 205, HRS), standards for the Rural district, include: "Activities or uses as characterized by low-density residential lots of not less than one-half acre and a density of not more than one single-family dwelling per one-half acre in areas where 'city like' concentration of people, structures, streets, and urban level of services are absent, and where small farms are intermixed with the low-density residential lots." The Rural areas of the Kapalua Mauka community will be in conformance with this description.

__Plantation Estates__

The Kapalua Mauka community does not include Plantation Estates. You are correct in stating "the original Project District 2 did not encompass the Plantation Estates . . .". The proposed expansion of Project District 2 to include the entire 925 acre area of the Kapalua Mauka community also does not include Plantation Estates.

Because Plantation Estates is not part of the Kapalua Mauka community, and because Plantation Estates has already been developed, it was not discussed in the Kapalua Mauka Draft EIS. The concept plan included in the Draft EIS showed Plantation Estates in relation to the Kapalua Mauka community but was not meant to indicate that Plantation Estates was part of the Kapalua Mauka community; this will be clarified on the concept plan in the Final EIS.

__Honolua Bay Water Quality__

Maui Land & Pineapple Company Inc., has been monitoring the water quality of Honolua Bay for over a decade. Scientific water quality studies conducted over the course of this time conclude that "nutrients entering the Bay from both natural and man induced activities do not appear to be causing any negative impacts to either water quality or biotic structure of Honolua Bay." These studies further conclude that fertilizer nutrient input to Honolua Bay does not appear to have increased over the span of the monitoring period, and in fact appears to be decreasing.

The water quality studies began in 1990 when Maui Land & Pineapple Company, Inc., instituted a water quality monitoring program to assess water chemistry characteristics of Honolua Bay on a periodic schedule. The intent of the program was to establish a quantitative baseline of water chemistry constituents that could reveal if water quality in Honolua Bay was being affected by factors associated with human activity on land.

The first stage of the program encompassed twelve phases of monitoring over a duration of seven years, from 1990 to 1997. In May of 2001, the monitoring program was renewed and a new

water quality study was conducted. During the four year interval between studies there were no major changes in land use in the Honolua Watershed. The May 2001 study concludes that "water quality within Honolua Bay cannot be considered in violation of State standards." Continued monitoring, with the latest study being conducted in March of 2002, has reached the same conclusion. These studies will be referenced in, and included with, the Final EIS and copies of the studies are available upon request.

In addition to the water quality studies for Honolua Bay, this year, Maui Land & Pineapple Company Inc., initiated a water quality monitoring program for Honokahua Bay and Nāpili Bay, which are downstream from the Kapalua Mauka community. The first study has been conducted and the results of this study will be included in the Kapalua Mauka Final EIS. The intent of the study is to establish a quantitative baseline of water chemistry constituents that could reveal if water quality in Honokahua Bay and Nāpili Bay will be affected by factors associated with the Kapalua Mauka community.

__Project District Intent__

You are correct in pointing out that, as stated in Section 19.45 (B) of the Maui County Code:

> The intent of a project district development is to provide for a flexible and creative planning approach rather than specific land use designations, for quality developments. The planning approach would establish a continuity in land uses and designs while providing for a comprehensive network of infrastructural facilities and systems. A variety of uses as well as open space, parks, and other project uses are intended in accord with each individual project district objective.

The Kapalua Mauka community, as proposed, is in accord with this intent.

__Traffic Impact Fees__

Maui Land & Pineapple Company, Inc., is committed to paying its pro rata fair share of the costs of regional improvements to Honoapi'ilani Highway. In addition, all highway improvements required for direct access to the Kapalua Mauka community will meet required standards and will be planned, designed, and constructed at no cost to the State or County.

Regarding the traffic impact fee ordinance that you mention, Ordinance 1755 was passed in 1988 (and codified as Chapter 14.62 of the Maui County Code), but the West Maui Transportation Plan called for in the law was never prepared. The West Maui Transportation Plan is an essential element of the law as the law requires: "A schedule for determining traffic impact fees shall be established by the west Maui transportation plan." The County of Maui has recently hired a consultant to develop a transportation planning model that will help the County determine impact fees for new developments that generate traffic. This study will cover the entire island and may be used as the implementing action for Chapter 14.62 of the Maui County Code. The Final EIS will include this information.

While Chapter 14.62 states: ". . . new land development activities *should* [emphasis added] not be allowed to proceed without providing for necessary traffic improvements caused by such developments", it is clear the County Council has interpreted this as a guideline and not a requirement, as many development activities in West Maui have been approved since the enactment of Ordinance 1755 in 1988.

In addition, the implications of the regional traffic impacts of 750 residential units within Project District 2 were considered when Project District 2 was included within the *West Maui Community Plan* during the 1992 plan update. According to the Plan "the update process incorporated technical studies and assessments." These included an "Infrastructure Assessment" that identified "infrastructure (e.g., roadways, drainage, water, telephone, and electrical systems) limits and opportunities in high-growth community plan regions." The Plan also states "the update process was driven by the work of the Lahaina Citizens Advisory Committee (CAC). This 14 member panel met a total of 17 times during a 225-day deliberation process to identify, formulate and recommend appropriate revisions to the Lahaina Community Plan." Thus, the regional traffic impacts of the development of Project District 2 have been considered and given a thorough public review during the community plan update process.

The West Maui Community Plan and Infrastructure

As planned, the Kapalua Mauka community incorporates nearly all of the elements called for in the *West Maui Community Plan*'s description of Project District 2 (see page 1 of this letter and page 53 of the Plan), we therefore cannot agree with your contention on page 2 of your letter that the Kapalua Mauka community "...does not reflect the theme of our West Maui Community Plan."

It should also be noted that all infrastructure within the Kapalua Mauka community, including roads, drainage, water, and wastewater systems will be privately built and maintained, so infrastructure systems within the Kapalua Mauka community will not burden the County of Maui or current and future taxpayers.

In addition, the economic analysis/public cost benefit report prepared for the Kapalua Mauka community (Hallstrom 2001) and included with the Draft EIS concludes:

> The county of Maui will receive $79.9 million in real property tax receipts from the project over the 20-year study projection period, and an estimated 5.6 million per year thereafter. The county government operating costs associated with serving the subject, using a per capita basis, will total $18.9 million for the two decade timeframe, and be some $1.5 million on a stabilized basis. The county will enjoy a net revenue benefit (taxes less costs), totaling $53.9 million during the first 20 years of construction and use, and $4.1 million each year after build-out.

Value of Open Space and Commitment to Agriculture

As one of the largest landowners on Maui, Maui Land & Pineapple Company Inc., acknowledges the need to protect the scenic resources of Maui. The land has provided critical income to Maui Land & Pineapple Company Inc., for many years through pineapple cultivation and resort development. It could even be argued that the Kapalua Resort has played a vital role in defining Maui as a desirable resort destination. It would be counterproductive to endanger the very attributes that attract guests and visitors to Kapalua.

After researching the Trust for Public Lands study[1] mentioned in your letter, we found that the study provides many anecdotal examples of the value of open space and its impact on the economy, but does not provide an economic model for calculating the value of open space. In many of the examples discussed in the study the economic benefit of open space is the increased value of properties adjacent to the open space and the increase in property tax revenues from these properties.

The study also strongly advocates public acquisition of property to preserve open space. For example, on page 15 of the study it is stated:

> More and more state, county, and municipal voters are deciding the surest—and often the fairest—way to protect open space is to just buy it. Purchasing land or development rights as a way of guiding growth avoids expensive regulatory and legal battles while reimbursing landowners for the economic and other benefits the open space will bring the community.

The study further provides examples of how open space boosts local economies by attracting tourists and supporting outdoor recreation.

It is undeniable that tourists are attracted to Maui because of the island's natural beauty and recreational opportunities. Recognizing this fact, with Kapalua Resort, Maui Land & Pineapple Company Inc., has created a master-planned resort that skillfully integrates the natural beauty of the land with recreational opportunities such as golf, hiking, and ocean sports. Maui Land & Pineapple Company Inc., has also implemented numerous conservation programs and has established huge watershed areas, forest reserves, view corridors, and open space.

In 1992, Maui Land & Pineapple Company, Inc., via a conservation easement, dedicated over 8,000 acres of land to the Nature Conservancy of Hawai'i to create the Pu'u Kukui Preserve, the largest private preserve in Hawai'i. The preserve is home to native birds, extremely rare snail species, and contains 20 percent of Hawai'i's rare native plants.

In short, Maui Land & Pineapple Company Inc., has proven a worthy steward of its lands over the past century, and will continue this leadership.

1 "The Economic Benefits of Parks and Open Space" (1999) Trust for Public Lands. Available on the Trust for Public Lands website at www.tpl.org/

Today, Kapalua Resort is a crucial part of Maui Land & Pineapple Company Inc.'s program to maintain profitability and to provide investment, employment, and economic benefits to the community during the coming decades. Maui Land & Pineapple Company Inc., is also committed to long-term agricultural use of vast tracts of land on Maui. Meanwhile, many other large-scale agricultural companies in Hawai'i have gone out of business, leaving many people unemployed.

Maui Pineapple Company (a subsidiary company of Maui Land & Pineapple Company Inc.) currently has over 9,000 acres on Maui in active agricultural production. Approximately 169 acres at the site of the Kapalua Mauka Community are in active pineapple cultivation. This amounts to 1.9 percent of the total area currently being farmed by Maui Pineapple Company. In addition, with the closure of Pioneer Mill in Lahaina there are currently vast amounts of fallow agricultural land in the West Maui region. Statewide, an enormous amount of land has been released from plantation agriculture (over 305,900 acres since 1968) and remains largely uncultivated open space.

An agricultural impact study prepared for the Draft EIS (see Section 4.4 and Appendix B) concludes that the Kapalua Mauka community will not have an adverse impact on Maui Pineapple Company. The study further concludes the Kapalua Mauka community could benefit Maui Pineapple Company and contribute toward its long term survival because the community will strengthen the profitability of the parent company and a portion of these profits could be used, if necessary, to help offset Maui Pineapple Company losses during years that pineapple or related agricultural businesses are not profitable.

In 20 years, after build out of the Kapalua Mauka community, the landscape of the site will have changed from pineapple fields to low-density residential and golf course land uses. Houses will be visible in some areas, but because of the proposed rural character and low-density of much of the community, there will be substantial landscaped open space between houses. The community will be designed with higher density uses toward the interior of the site, with larger rural lots around the edges serving as a transition to the surrounding agricultural area.

__Affordable Housing__

As stated previously, Maui Land & Pineapple Company, Inc., has a strong history of providing affordable housing for their employees and has complied with all requirements for affordable employee housing previously imposed as conditions of developing the existing Kapalua Resort. All totaled, Maui Land & Pineapple Company, Inc., has developed (independently or in partnership with the State) 450 affordable employee housing units on Maui. They have also donated land to the County for County-built affordable housing. Further, this year, they are providing an additional 45 lots in West Maui for employees which are not as a result of any County or State mandated requirement.

The *West Maui Community Plan* also recognizes two approved major master-planned affordable housing developments in the West Maui region: 1) The Villages at Leiali'i which is to include 4,813 housing units to be developed by the State of Hawai'i; and 2) Pu'ukoli'i Village which is to include 1,700 housing units to be developed by AMFAC. According to the *West Maui Community Plan*, approvals for these projects provide that no less that 60 percent of the housing units will be in the affordable range.

Although neither of these projects have been developed for a variety of reasons, it is reasonable to assume that at least portions of these projects targeted at providing affordable housing for West Maui will be achieved in the 20-year planning horizon of the *West Maui Community Plan*.

__Traffic__

Section 5.3 of the Draft EIS discusses traffic and roadways. A complete Traffic Impact Analysis Report also is included in Appendix H of the draft EIS. This report does not assert that the Kapalua Mauka community will have no impact on Honoapiilani Highway. Rather, the report concludes "the proposed PD-2 Development and the build out of the Kapalua Resort [including the Kapalua Mauka Community] can be accommodated by the Honoapi'ilani Highway corridor between Kapalua and Honokōwai."

This conclusion is based on future traffic volumes consisting of three components: 1) traffic generated by the Kapalua Mauka community; 2) traffic generated by the build-out of the existing Kapalua Resort and Plantation Estates areas; and 3) regional traffic growth not associated with Kapalua. The *Maui Long-Range Land Transportation Plan* (February 1997) was used as a basis for the regional traffic growth component. The Kapalua Mauka community and the exiting Kapalua Resort and Plantation Estates area components were estimated using trip generation relationships documented in the Institute of Transportation Engineers (ITE) publication, *Trip Generation, 6th Edition*.

__Maui Memorial Hospital__

We hope that the problems concerning Maui Memorial Hospital's certification are resolved soon. We agree that this a serious problem facing all of Maui. However, maintaining Maui Memorial Hospital's certification more appropriately may be a task to be undertaken by the State of Hawai'i, since it is a State Hospital.

After the projected build out of the Kapalua Mauka community in 20 years, the full-time population is estimated to reach 341 persons and the de facto population is estimated to reach 840 persons at any given time. Some of the full-time residents will be relocating from other areas on the island, and some of the visitors will be drawn from other Maui resorts, so that the population of the Kapalua Mauka community will not be fully new to the island. It would be expected that people relocating from outside of Maui to the Kapalua Mauka Community would take health care considerations in to account before selecting Maui as their place of residence.

School Site

The description for Project District 2 in the *West Maui Community Plan* allocates six acres within Project District 2 for an elementary school. However, in their comment letter on the Kapalua Mauka draft environmental impact statement (see attached), the Department of Education states: "The Department of Education does not anticipate that a school site will be needed in the Kapalua region." In addition, the State Department of Education's "Lahainaluna Complex Development Plan 1997-2017" (Department of Education, 1998), which projects school capital improvements projects over a 20-year planning time frame, does not specify a new elementary school on the Kapalua Mauka community site or in the Kapalua area. As such, the concept plan for the Kapalua Mauka community does not provide for a school site.

During development of the Kapalua Mauka community, Maui Land & Pineapple Company, Inc., will be subject to the Department of Education's fair share contribution requirements for new school facilities. In their letter, the Department of Education further states:

> . . . our requirement would be cash-based. The current fair-share cash requirement is $1,011 per unit. This amount would be due as each unit closes and would thus not require an upfront payment by the developer. Funds collected from this project will be used for capital improvements program projects in the Lahainaluna High School complex which includes Lahainaluna High, Lahaina Intermediate, Princess Nahienaena Elementary, and King Kamehameha III Elementary Schools.

Furthermore, if and when a school is needed north of Lahaina, it would not be appropriate to locate it in a resort where land values are high and student generation rates are low. There will be more appropriate sites for schools south of Kapalua when the need is justified.

Economic Projections

The economic projections for the Kapalua Mauka community owner/user expenditures are discussed in the Economic Impact section of the Market Study, Economic Impact Analysis and Public Cost Benefit Assessment Report included in Appendix A of the Draft EIS. The methodology is based on analysis of per capita spending by visitors while on Maui.

According to the Department of Business, Economic Development, and Tourism (DBEDT), tourists spent approximately $10.1 billion in Hawai'i in 2001. The average per capita per day expenditure for visitors was about $170. While there are no statistics by the State or the counties by island, the economic consultant has estimated this by taking the DBEDT figures and allocating the amount to each island based on the number of visitor days and the relative cost of tourism infrastructure (lodging, meals, entertainment, etc.).

Maui was thus estimated to have tourist expenditures of $2.725 billion in 2001, about 27 percent of the State total. From this total, the tourist per capita spending on Maui was calculated to be approximately $225 per day. Of this, approximately 25 to 33 percent is spent on lodging. So

factoring out lodging, Maui tourist per capita "non-lodging" expenditures are about $150 to $170 per day. The upscale visitors expected at Kapalua Mauka were then estimated to spend at least 10 to 20 percent above the average, or approximately $185 per day.

The vacation home owner/user is essentially a visitor using a single family home, rather than a hotel or condominium, for their accommodations. At the Kapalua Mauka community these visitors would be at the upper-end of the economic scale with commensurately high discretionary spending habits, although some of this is off-set by having no on-going lodging costs. The economic projections have thus conservatively estimated the net expenditure into the Maui market will be similar to "average" per capita tourist spending statistics factoring out lodging.

Owing to the large proportion of vacation/second home ownerships expected in the Kapalua Mauka community, coupled with the expected low occupancy of these units, the effective daily population of the community will be significantly below that of a full-time residential development having the same number of units. The associated impacts on public infrastructure systems and public services, is also expected to be much less. So, relative to a standard residential development, the Kapalua Mauka community will provide greater capital investment into the Maui economy and pay higher property taxes while placing less strain on its infrastructure and public services.

We appreciate your participation in the review of the Draft Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

[redacted]
PATRICIA HAMAMOTO
SUPERINTENDENT

OFFICE OF THE SUPERINTENDENT

JAN 29 2002

January 24, 2002

Mr. Tom Schnell
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, Hawai'i 96813

Dear Mr. Schnell:

Subject: Kapalua Mauka Draft EIS

The Department of Education has no additional comment on the subject project. Our earlier comments are enclosed for your reference.

Thank you for the opportunity to respond. If you have any questions, please call Mr. Sanford Beppu at 733-4862.

Very truly yours,

Patricia Hamamoto

Patricia Hamamoto
Superintendent

PH:hy

Enclosure

FACILITIES' COPY

BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

OFFICE OF THE SUPERINTENDENT

January 9, 2002

Mr. Tom Schnell
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, Hawai'i 96813

Dear Mr. Schnell:

Subject: Kapalua Mauka EISPN

This letter is in response to your letter dated December 21, 2001 regarding the Kapalua Mauka fair-share requirement.

The Department of Education does not anticipate that a school site will be needed in the Kapalua region. Therefore, our requirement would be cash-based. The current fair-share cash requirement is $1,011 per unit. This amount would be due as each unit closes and would thus not require an upfront payment by the developer. Funds collected from this project will be used for capital improvements program projects in the Lahainaluna High School complex which includes Lahainaluna High, Lahaina Intermediate, Princess Nahienaena Elementary, and King Kamehameha III Elementary Schools.

If you have any questions, please call Mr. Sanford Beppu at 733-4862.

Very truly yours,

Patricia Hamamoto

Patricia Hamamoto
Superintendent

PH:hy(56) yh

cc: A. Suga, OBS
G. Ueoka, MDO

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

DEPARTMENT OF
HOUSING AND HUMAN CONCERNS
COUNTY OF MAUI

JAMES "KIMO" APANA
Mayor
ALICE L. LEE
Director
PRISCILLA P. MIKELL
Deputy Director

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

February 6, 2002

FEB 1 3 2002

Mr. Tom Schnell
PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813

Dear Mr. Schnell:

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2)

We have reviewed the draft Environmental Impact Statement for the subject project and would like to offer the following comments:

1. We will be recommending that approval of the change in zoning application be conditioned upon the applicant complying with the County Administration's Housing Policy (copy attached).

2. We have been informed by the Planning Department that the application for change in zoning has not been submitted as of this date, and we are hereby requesting that the application for change in zoning include detailed information on the number and type of units that will be developed.

3. We would like to know how the applicant proposes to satisfy the County's affordable housing requirement. Please include that information in the application for change in zoning.

Thank you for the opportunity to comment. Please call Ed Okubo of our Housing Division at (808) 270-7355 if you have any questions.

Very truly yours,

ALICE L. LEE
Director

ETO:hs

Attachment

c: Edwin Okubo w/attachment
Ann Cua (Planning Department) w/attachment

MAUI COUNTY
HOUSING POLICY

I. PURPOSE

The purpose of this policy is to enhance the public welfare by ensuring that housing needs of Maui County are addressed in accordance with the Maui County General Plan. It is the intent of this policy to encourage the provision of housing units which will meet the needs of income qualified households.

II. DEFINITIONS

1. "Affordable Sales Price" means the following:

For a single-family unit, the sales price for the one hundred and ten percent (110%) of the applicable median income, single-family category, established by the Department of Housing and Human Concerns' annual "Affordable Sales Price Guidelines" for the applicable island or community plan region;

For a multi-family unit, the sales price for the one hundred percent (100%) of the applicable median income, multi-family category, established by the Department of Housing and Human Concerns' annual "Affordable Sales Price Guidelines" for the applicable island or community plan region;

2. "Affordable Rental Price" means the monthly rental payment of income qualified households in the ninety percent (90%) of the applicable median income category, as established by the Department of Housing and Human Concerns' annual "Affordable Rental Price Guidelines" for the applicable island or community plan region.

3. "Director" means the Director of the Department of Housing and Human Concerns.

4. "Income Qualified Households" means the following:

For a rental unit - Means an individual or family having a gross annual income of not more than ninety percent (90%)of the applicable median family income and meeting the specific eligibility criteria which may be established by the County.

For multi-family unit - Means an individual or family having a gross annual income of not more than one hundred percent (100%) of the applicable median family

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MAYOR, COUNTY OF MAUI
MAY 4 2001

income and meeting the specific eligibility criteria which may be established by the County.

For single-family unit - Means an individual or family having a gross annual income of not more than one hundred ten percent (110%) of the applicable median family income and meeting the specific eligibility criteria which may be established by the County.

5. "Median Family Income" means the median family income, as established and published by the Director, for each of the Maui County islands of Maui, Molokai and Lanai, and the Hana Community Plan region.

6. "Multi-Family Unit" means a multi-family ownership unit that is affordable to an individual or family whose gross annual income does not exceed one hundred percent (100%) of the applicable median family income, as published by the Director.

7. "Rental Housing Unit" means a multi-family or single-family unit which is offered for rent in accordance with this policy, to income qualified households having a gross annual income which does not exceed ninety percent (90%) of the applicable median family income, as published by the Director.

8. "Residential Housing Project" means a project which provides ten (10) or more long-term residential housing units or lots.

9. "Single-Family Unit" means a single-family ownership unit that is affordable to an individual or family whose gross annual income does not exceed one hundred ten percent (110%) of the applicable medinn family income, as published by the Director.

III. APPLICABILITY

A. This policy shall apply to applications for County change in zoning which establish land use designations under which a residential housing project is developed. This trigger would enable the imposition of a housing condition on requests for change in zoning which currently allow for residential uses as permitted uses. Such condition may state that in the event any portion of a property which is the subject of the change in zoning request, is developed as a residential housing project, said project shall be subject to the provisions of the affordable housing policy. This policy may also be used as a guideline in instances where the administration receives requests for comments and/or review concerning other land-use related requests, such as State land use boundary amendments, where the County is called upon to effectuate an affordable housing requirement imposed by the State Land Use Commission.

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MAYOR

MAY 4 2000

B. This policy shall not apply to housing projects involving the use of County lands or funds, and shall not apply to projects processed pursuant to Chapter 201G, Hawaii Revised Statutes.

IV. AFFORDABLE HOUSING REQUIREMENTS

A. The applicant for a change in zoning pursuant to Section III of this policy, shall offer for sale or for rent, affordable housing units to income qualified households. The applicant may choose to provide either multi-family or single family units to satisfy this policy. The number of affordable units to be provided shall be calculated by multiplying the total number of units proposed in the residential housing project by 10 percent (i.e., 0.10). Thus, a residential housing project with 100 units proposed shall be required to provide a total of 10 affordable units.

The Director may reduce the total number of affordable units required to be provided if the residential housing project includes for sale, multi-family or single-family units which are affordable to individuals or families having a gross annual income of more than one hundred ten percent (110%), but not greater than one hundred forty percent (140%) of the applicable median family income. Such reduction shall be in accordance with the following equivalency guidelines.

Median Income Sales Price Range	*Equivalent Affordable Unit Factor*
111% to 120%	0.75
121% to 130%	0.5
131% to 140%	0.25

Thus, if an applicant for a 100 unit residential housing project having an affordable housing requirement of 10 affordable units, offers for sale one (1) unit priced in the 111% to 120% sales price category, the total number of affordable units required to be provided by the applicant shall be reduced by an equivalent of 0.75 unit, yielding a total affordable requirement of 9.25 units. Any fractional amount required may be satisfied by the equivalent pro-rata monetary contribution.

Affordable units shall be provided either within the residential housing project site or alternatively, within the same community plan region in which the proposed residential housing project is located. Units shall be sold at or below the applicable affordable sales price.

Details of sales pricing and marketing shall be defined in the affordable housing agreement, as described in Section V of this policy.

APPROVED:

MAYOR, COUNTY OF MAUI

MAY 4 2000

B. In lieu of providing affordable units, the applicant may choose to pay a monetary contribution. The monetary contribution shall be based upon the equivalent number of affordable units which would have otherwise been provided by the applicant (i.e., 10 percent of the total number of units proposed for the residential housing project). The monetary contribution shall be calculated by multiplying the affordable sales price by 20 percent (i.e., 0.20).

1. For residential housing projects proposing single-family units and/or lots only, the contribution shall be calculated by multiplying the affordable sales price for a single-family unit by 20 percent.

2. For residential housing projects proposing multi-family units, the contribution shall be calculated by multiplying the affordable sales price for a multi-family unit by 20 percent.

C. In lieu of providing affordable units, the applicant may also choose to provide land or in-kind services:

1. Provision of developable lands (i.e. lands physiographically usable for residential development) which may be used to address the housing needs of income qualified households and special housing target groups. Such lands may be used by the County of Maui or others acceptable to the County to develop resource centers for the homeless, day care centers for seniors or other types of projects which address the housing needs of income qualified households and special housing target groups. The appraised value of the land required shall not be less than the in-lieu monetary contribution amount which would otherwise have bee required under this policy.

2. Provision of other in-kind services which are approved by the Director. In-kind services may include the provision of infrastructure services to a proposed or existing affordable housing project, facility upgrades to existing affordable housing projects as approved by the Director. The value of in-kind services shall not be less than the in-lieu monetary contribution amount which would otherwise have been required under this policy and the estimated value of the proposed in-kind service.

V. AFFORDABLE HOUSING AGREEMENT

A. Prior to the filing of a building permit application for a residential housing project, as set forth herein, or prior to the granting of final subdivision approval, the applicant or developer shall execute an affordable housing agreement which shall set forth the detailed terms and conditions of compliance with the housing policy, which may include, but not be limited to:

APPROVED:
MAYOR, COUNTY OF MAUI
MAY 4 2000

1. Affordable sales periods for the affordable units;
2. Affordable sales prices for the affordable units;
3. Identification of the number, type and location of units;
4. Marketing process for the affordable units;
5. Eligibility criteria for income qualified households;
6. Provision for credits (including duration and assignment), as applicable; and
7. Terms and conditions relating to provision of in-lieu monetary contribution, land or in-kind services.

With regard to the affordable sales periods (item no. 1), the agreement shall specify offering durations, as well as procedures for the release of units from the affordable sales requirements should there be unsold units following the expiration of the sales periods.

VI. CREDITS

B. An applicant for a change in zoning under which a residential housing project may be developed may receive credits for affordable units if the number of affordable units provided exceeds the policy requirement set forth in Section IV. Such credits shall be subject to execution of an affordable housing agreement.

C. Credits for affordable housing units may be granted in advance of the filing of a change in zoning application under which a residential housing project may be developed. Such credits shall be approved by the Director and subject to the execution of an affordable housing agreement.

D. As warranted through case-by-case evaluation, the Director, may grant enhancement credits to provide incentives to applicants to offer rental units which are affordable to families having incomes 70% or lower than the median family income. Such enhancement credits shall be in accordance with the following guidelines.

Family Income Range	*Enhancement Credits*
61% to 70% of Median Income	2.5
up to 60% of Median Income	3

Thus, one (1) rental unit offered to families in the 61% to 70% median income range equals 2.5 enhancement credits, or 2.5 affordable units.

Any granting of approval for enhancement credits shall be subject to the execution of an affordable housing agreement.

APPROVED:
MAYOR, COUNTY OF MAUI
MAY 4 2000

June 25, 2002

Ms. Alice Lee, Director
Department of Housing and Human Concerns
County of Maui
200 South High Street
Wailuku, Hawaii 96793

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Ms. Lee:

Thank you for your letter dated February 6, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement (EIS). We offer the following responses to your comments.

1. We acknowledge that you will be recommending that approval of the change in zoning application be conditioned on compliance with the County Administration's Housing Policy.

2. As stated in the draft EIS, the Kapalua Mauka community will contain a maximum of 690 residential units that will include "a variety of residential housing types, including multi-family dwellings and single-family homesites ranging in size from less than 10,000 square feet to over one acre" (page 16). Approximately 510 units are proposed for the "Urban Residential" component of the community, which would be in the State Urban land use district. This district would contain both single-family and multifamily units. Approximately 180 units are proposed for the "Rural Residential" component of the community which would be in the State Rural district. In compliance with the requirements for the State Rural district, the "Rural Residential" area would contain single-family homesites ranging in size from a minimum of a half-acre to up to three acres.

   Because land use plans for the Kapalua Mauka community are currently in the conceptual stage, further details are not available at this at this time. More detailed land use plans, including a preliminary subdivision layout will be completed as part of the Project District Phase II application requirements.

3. Maui Land & Pineapple Company Inc., will comply with all County of Maui affordable housing requirements. As per the Maui County Housing Policy attached with your letter, "Prior to the filing of a building permit application for a residential housing project... or prior to granting of final subdivision approval, the applicant or developer shall execute an affordable housing agreement which shall set forth the detailed terms and conditions of compliance with the housing policy..." As such, information regarding how Maui Land & Pineapple Company Inc., proposes to satisfy the County's affordable housing requirement will be included with the subdivision application.

Please note that Maui Land & Pineapple Company, Inc., has a strong history of providing affordable housing for their employees and has complied with all requirements for affordable employee housing previously imposed as conditions of developing the existing Kapalua Resort. Completed West Maui projects include Nāpilihau Planned Development (174 units, in partnership with the State) and Honokeana Subdivision Phase I (38 units). Maui Land & Pineapple Company, Inc. also donated 13.5 acres of land in West Maui for the County Hale Noho Subdivision (which contains 72 homes built by the County).

In conjunction with its Upcountry operations, Maui Land & Pineapple Company, Inc., has provided affordable employee housing in Hāli'imaile (176 units and 15 units) and in Makawao at the Pu'u Koa Subdivision (47 units).

In May of 2002, Maui Land & Pineapple Company, Inc., started development of the Kapua Village Subdivision, a new 45-lot employee subdivision project in West Maui. Maui Land & Pineapple Company, Inc., is developing this subdivision on their own accord as a benefit for their employees and is not receiving any County affordable housing credits for the project. These lots will be sold to employees at prices significantly below market prices.

In summary, Maui Land & Pineapple Company, Inc. has developed (independently or in partnership with the State) 450 affordable employee housing units on Maui. They have also donated land to the County for County-built affordable housing. Further, in 2002, they will provide an additional 45 lots in West Maui for employees.

We appreciate your participation in the review of the Draft Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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JAMES "KIMO" APANA
Mayor
JOHN E. MIN
Director
CLAYTON I. YOSHIDA
Deputy Director

COUNTY OF MAUI
DEPARTMENT OF PLANNING

March 14, 2002

Mr. Tom Schnell
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Mr. Schnell:

RE: Kapalua Mauka
<u>Draft Environmental Impact Statement</u>

The Planning Department (Department) has reviewed the above Draft Environmental Impact Statement and requests that additional discussion be included as follows:

The West Maui Community Plan incorporates a number of Policies and Objectives. Pages 93 and 94 of the draft EIS discusses the project as it relates to the following Community Plan objective/policy:

Page 16
"Preserve the current State Conservation District and the current State Agricultural District Boundaries in the planning region, in accordance with this Community Plan and its land use map..."

The project does not comply with this community plan policy/objective. The EIS should include discussion on compliance with the policy/objective such as processing of a community plan amendment prior to amending the district boundary and change in zoning in order to maintain consistency with the community plan.

The EIS should also address the following community plan policies:

Page 26
2. "Provide for the preservation and enhancement of agriculture."
   a. Maintain the land acreage required to sustain present and future agricultural operations and open space.

   b. Discourage use of agricultural lands for non-agricultural purposes.

At the Cultural Resources Commission meeting on March 7, 2002, the applicant represented that pedestrian walkways and bikeways will be incorporated throughout the project. These bikeways and walkways should be discussed in the EIS. The West Maui Community Plan discusses this issue in a number of areas.

The EIS should address the applicability of the County's Agricultural District Ordinance, Chapter 19.30A.020, District Criteria, which states that Agricultural lands that meet at least two of the following criteria should be given the highest priority for retention in the agricultural district:

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

Thank you for your cooperation. If you have any questions, please contact Ms. Ann T. Cua, Staff Planner, of this office at 270-7735.

Very truly yours,

John E. Min

JOHN E. MIN
Planning Director

JEM:ATC:tlm

c: Clayton I. Yoshida, AICP, Deputy Planning Director
OEQC
Ann T. Cua, Staff Planner
Project File
General File
S:\ALL\ANN\kapaluamaukadrafteiscomments

PBR HAWAII

July 2, 2002

Mr. John E. Min
Planning Director
County of Maui
Department of Planning
250 South High Street
Wailuku, Hawai'i 96793

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Mr. Min:

Thank you for your letter dated March 14, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement (EIS). We offer the following responses to your comments.

<u>Compliance with the West Maui Community Plan</u>

The Final Environmental Impact Statement will be revised to clearly state that to maintain consistency with the *West Maui Community Plan*, before amending the Project District 2 boundary and seeking a change in zoning, landowner Maui Land & Pineapple Company Inc., first will seek a community plan amendment to expand Project District 2 from 450 acres to 925 acres.

The Final Environmental Impact Statement will also address the community plan polices pertaining to: 1) preservation and enhancement of agriculture; and 2) discouraging the use of agricultural lands for non-agricultural purposes.

<u>Pedestrian Walkways and Bikeways</u>

To reduce vehicle trips within the Kapalua Mauka community and the greater Kapalua Resort, the Kapalua Mauka community will be designed to foster a bicycle/pedestrian-oriented environment. More urban-like land uses such as multi-family units will be within the core of the community as will be other amenities such as the golf course clubhouse. Surrounding the more urban areas will be larger rural lots and single-family homes, providing a transition to the nearby agricultural lands. The community will have extensive open space and landscape buffers along with bike and pedestrian pathways connecting to the rest of Kapalua Resort, makai of the Honoapi'ilani Highway. A planned pedestrian/bike path underpass under Honoapi'ilani Highway will connect the mauka and makai resort areas and supplement two existing golf course cart underpasses presently used only for golf course circulation.

This information will be included in appropriate sections of the Final Environmental Impact Statement.

<u>Applicability of the County's Agricultural District Ordinance</u>

The Final Environmental Impact Statement will address the applicability of the County's Agricultural District Ordinance. Specifically, although the lands of the Kapalua Mauka community site meet two of the criteria of the Section 19.30A.020 pertaining to lands that should be given high priority for retention in the Agricultural District, the site should be rezoned to uses suitable for resort residential and recreational uses within the Project District classification for the following reasons:

1. <u>Substantial Compliance with the *West Maui Community Plan*.</u> Approximately 450 acres of the Kapalua Mauka community site is already designated as Project District 2 in the *West Maui Community Plan*. As stated in the Plan, the intent of Project District 2 is to provide, within the context of Kapalua Resort, a mix of recreational activities including an existing golf course (with possible expansion to 27 holes), a clubhouse, pro shop, restaurants and bars, tennis courts, swimming pool, and other related recreational amenities and commercial services. The Plan also specifies that the Project District 2 is to include 750 residential units integrated with, and complementary to, the recreational facilities.

   The uses currently proposed for the Kapalua Mauka community are what is called for in the Community Plan, with two primary exceptions: 1) the number of residential units would be reduced from 750 units to 690 units; and 2) the area of the community would be expanded from 450 acres to 925 acres. Because less homes would be allocated over a larger area, the resulting community will be far less dense than what is currently envisioned in the *West Maui Community Plan* which has a community planning horizon of 20 years. Therefore actual residential growth and the required infrastructure demands for Project District 2 will be less than what has been anticipated in the *West Maui Community Plan*.

   To maintain consistency with the *West Maui Community Plan*, before increasing the area of the Project District 2 and seeking a change in zoning, landowner Maui Land & Pineapple Company Inc., first will seek a community plan amendment to expand Project District 2 from 450 acres to 925 acres.

   In addition, the Kapalua Mauka community site is contiguous with the existing Kapalua Resort. While Maui Land & Pineapple Company, Inc., has vast land holdings in the West Maui region and conceivably could develop a resort residential community on other West Maui lands, this is not a practical alternative because:

   A. Since 450 acres of the site are already designated as Project District 2 in the *West Maui Community Plan*, the idea of expanding the Kapalua Resort on that location is consistent with the Plan and has been considered by the community and County of Maui during the community plan update process.

   B. Selecting an alternative location not contiguous to the existing resort area would essentially create an entirely new resort area in the West Maui region, which would be contrary to the *West Maui Community Plan*, which states in part, "Limit visitor facilities to the existing planned resorts of Kaanapali and Kapalua . . .

   C. From a planning perspective, it is logical to group resort uses in proximity to one another, so alternative locations not contiguous with the exiting Kapalua Resort would not follow generally recognized planning principles.

2. <u>Continuation of Agriculture in West Maui.</u> While the establishment of the Kapalua Mauka community will require a portion of the site to be to be removed from agriculture, Maui Pineapple Company (a subsidiary company of Maui Land & Pineapple Company Inc.) currently has over 9,000 acres on Maui in active agricultural production. Approximately 169 acres at the site of the Kapalua Mauka Community are in active pineapple cultivation. This amounts to 1.9 percent of the total area currently being farmed by Maui Pineapple Company. In addition, with the closure of Pioneer Mill in Lahaina there are currently vast amounts of fallow agricultural land in the West Maui region. Statewide, an enormous amount of land has been released from plantation agriculture (over 305,900 acres since 1968) and remains largely uncultivated open space.

   An agricultural impact study prepared for the Draft Environmental Impact Statement (see Section 4.4 and Appendix B of the Draft EIS) concludes that the Kapalua Mauka community will not have an adverse impact on Maui Pineapple Company. The study further concludes the Kapalua Mauka community could benefit Maui Pineapple Company and contribute toward its long term survival because the community will strengthen the profitability of the parent company and a portion of these profits could be used, if necessary, to help offset Maui Pineapple Company losses during years that pineapple or related agricultural businesses are not profitable.

The above information will be included in the Final Environmental Impact Statement.

We appreciate your review of the Draft Environmental Impact Statement and look forward to your review and acceptance of the Final Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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JAMES "KIMO" APANA
Mayor

JOHN E. MIN
Director

CLAYTON I. YOSHIDA
Deputy Director

COUNTY OF MAUI
DEPARTMENT OF PLANNING

March 12, 2002

M-K 1 4 2002

Mr. Tom Schnell
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Mr. Schnell:

RE: Maui County Cultural Resources Commission Comments on the Kapalua Mauka Project

At its regular meeting on March 7, 2002, the Maui County Cultural Resources Commission was presented with plans by Maui Land & Pineapple Company to develop the Kapalua Mauka project. The project includes expansion of the existing Project District 2 (Kapalua) from 45- acres to 925 acres. The original project district envisioned 750 residential units. The proposed master plan decreases the number of units to 690. This project is proposed to have a twenty 20 year build out period. The applicant represented that the 925 acres will be developed over a twenty (20) year period as follows:

Golf Course/Open Space - 260 acres
Commercial - 5 acres
Parks/Open Space - 213 acres
Residential - 144 acres
Rural - 300 acres

Two archaeological inventory surveys have been prepared for the subject property. The first survey, prepared by Cultural Survey's Hawaii in 1997 and revised in 1998 covered the original 450 acre project district site. A total of eight (8) archaeological sites were identified in this survey. These sites are scattered within the 450 acre area. The applicant indicated that they are presently working with the State Historic Preservation Division to further define the sites contained in "Site 1591" Only one of the many sites included in "Site 1591" are located within the project area. The remaining features/sites are outside of the project area. The applicant represented that all of the sites located within the 450 acre area will be preserved in place.

The second archaeological inventory survey, prepared by Xamanek Researches dated September 20, 2001, covers the remaining 475 acres. Thirty-eight (38) sites were identified in this study. These sites are located primarily within the gulch areas which provides a unique opportunity for preservation as the majority of these areas are undevelopable. The applicant represented that "in place preservation" is planned for all 38 sites within the 475 acre area.

The applicant's consultant also presented the cultural impact study prepared by Xamanek Researchers which provides background history as well as oral histories of various members of the community. The oral histories tell the stories of traditional uses and settlement patterns of an area.

Based on the overall presentation and representations made by the applicant and its archaeologist that all archaeological sites located on the subject property will be preserved in place, the CRC had no further comments to offer on the project.

Thank you for your cooperation. If you have any questions, please contact Ms. Ann T. Cua, Staff Planner, of this office at 270-7735.

Very truly yours,

JOHN E. MIN
Planning Director

JEM:ATC:tlm
c: Clayton I. Yoshida, AICP, Deputy Planning Director
Ann T. Cua, Staff Planner
Robert McNatt, Kapalua Land Company
CRC Members
Project File
General File
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JAMES "KIMO" APANA
Mayor

DAVID C. GOODE
Director

MILTON M. ARAKAWA, A.I.C.P.
Deputy Director

Telephone (808) 270-7845
Fax (808) 270-7955

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS AND WASTE MANAGEMENT
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

RALPH NAGAMINE, L.S., P.E.
Land Use and Codes Administration

Wastewater Reclamation Division

LLOYD P.C.W. LEE, P.E.
Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

Solid Waste Division

February 15, 2002

FEB 2 5 2002

Mr. Tom Schnell
PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813

Dear Mr. Schnell:

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT
KAPALUA MAUKA PROJECT DISTRICT 2
TMK: (2) 4-2-001:POR. OF 001
(2) 4-2-005:POR. OF 050, 051
(2) 4-3-001:POR. OF 006, POR. OF 007, AND POR. OF 008

We have reviewed the subject draft environmental impact statement and have the following comments:

1. Construction waste, if not recycled, goes to the C & D Landfill.
2. Wastewater system capacity is currently available as of January 24, 2002. The developer shall furnish a letter from Kapalua Land Company, Ltd. designating a portion of its wastewater allocation for this project at the time of building permit plan check.
3. Provide discussion and calculations (sewer impact study) to substantiate that the existing wastewater system is adequate to serve this project.
4. Wastewater contribution calculations are required before building permit is issued.

5. Developer is required to fund any necessary off-site improvements to collection system and wastewater pump stations.
6. Plans should show the installation of an advance riser at each lot.
7. Indicate on the plans the ownership of each easement (in favor of which party). Note: County will not accept sewer easements that traverse private property.
8. The wastewater system within this development will be privately owned and maintained.
9. The project shall comply with the provisions of Title 18, Maui County Code (MCC), Subdivisions, and Chapter 20.08, MCC, the grading ordinance.

If you have any questions regarding this memorandum, please call Milton Arakawa at 270-7845.

Sincerely,

DAVID GOODE
Director

MA:jso
S:\LUCA\CZM\Kapalua Mauka Project District 2.wpd

June 25, 2002

Mr. David Goode, Director
Department of Public Works and Waste Management
County of Maui
200 South High Street
Wailuku, Hawaii 96793

Dear Mr. Goode:

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your letter dated February 15, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement (EIS). We offer the following responses to your comments.

1. Thank you for pointing out that construction waste, if not recycled, goes to the construction and demolition (C & D) landfill. This will be noted in the final EIS.

2. Thank you for confirming that wastewater system capacity is currently available as of January 24, 2002. Maui Land & Pineapple Company Inc., will provide a letter designating a portion of its wastewater allocation at the time of building permit plan check.

3. Discussion and calculations to substantiate that the existing wastewater system is adequate are included the draft environmental impact statement, section 5.8.4. The DEIS also includes a preliminary engineering report, from project engineer Warren S. Unemori Engineering Inc., which discusses the existing capacity of the wastewater system,.

4. Wastewater contribution calculations will be provided before the building permit is issued.

5. We acknowledge that the developer is required to fund any off-site improvements to collection system and wastewater pump stations.

6. The appropriate plans will show the installation of an advance riser at each lot.

7. The ownership of each easement will be indicated on the appropriate plans.

8. You are correct in stating: "The wastewater system within this development will be privately owned and maintained."

FEB 2 6 2002

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-7109
Telephone (808) 270-7816 • Fax (808) 270-7833

February 8, 2002

Mr. Tom Schnell
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu HI 96813

RE Draft Environmental Impact Statement (DEIS) - Kapalua Mauka (Project District 2)
TMK#s - (2) 4-2-01:1(portion), 4-2-05:50(portion), 4-2-05:51, 4-3-01:6(portion), 4-3-01:7(portion), and 4-3-01:8(portion)

Dear Mr. McNatt:

Thank you for the opportunity to review the above-mentioned document. This letter supplements our comment letter dated September 10, 2001.

The application material states that although the existing systems have adequate capacity to meet the needs of the Kapalua Mauka community, the Kapalua Water Company, Ltd. will build, operate, and maintain new systems within the community in order to provide water at adequate pressure levels. For potable water, two (2) storage tanks will be constructed at elevations 820 ft and 1,310 ft to serve consumers below and above 700 ft, respectively. A series of booster pumps will be installed to pump water to the upper tank. For non-potable water, a new distribution system with booster pumps will be installed. In addition to these, fire hydrants will be installed at appropriate intervals along the internal roadways for accessibility of the fire fighting apparatus. Both systems will be metered to discourage excessive use. We recommend that the applicant build new systems according to standards.

We are pleased to note the company's willingness to cooperate with the department in the development of an acceptable feasibility study framework for the water system integration, the implementation of recommended water conservation measures and the utilization of best management practices (BMPs).

Should you have any questions, please contact our Water Resources and Planning Division at 270-7199.

Sincerely,

David Craddick
Director

c: engineering division
applicant, with attachment:
DWS comment letter dated Sept 10, 2001

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-7109
Telephone (808) 270-7816 • Fax (808) 270-7833

September 10, 2001

PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu HI 96813
Attention: Mr. Tom Schnell

RE Environmental Impact Statement Preparation Notice (EISPN) - Kapalua Mauka
TMK# (2) 4-2-01:1(por), 4-3-01:6(por), 4-3-01:7(por), and 4-3-01:8(por)

Dear Mr. Schnell:

Thank you for the opportunity to review the above-mentioned document. The Department of Water Supply has the following comments:

The subject property is currently outside of the DWS service area. We understand that this project will be developed within a 20-year planning period. The 1996 West Maui Community Plan lists policies and objectives for water and utilities. One of these objectives include, "Study the feasibility of integrating all regional water system into a public water system to be managed and operated by the County". In order to achieve this, a plan for the eventual acquisition by the County of Maui of all private water systems within the region has to be developed. Integration of water systems may provide improved emergency back-up, reliability and system hydraulics. The Department of Water Supply seeks the cooperation of major land owners and private water system providers in the development of acceptable feasibility study framework for system integration.

Using system standards, the proposed project would use about 1,647,000 gallons per day(gpd). The EA/EIAPN material states that the Kapalua Water Company Ltd. owns and operates three potable water wells and a non-potable water system which serve the Kapalua Resort. We understand that the availability of potable and non-potable water within the Kapalua Mauka Community will be discussed further in the draft EIS.

The applicant will be required to provide domestic, fire, and irrigation calculations according to standards. Fire demand is determined by fire flow calculations performed by a licensed engineer. The approved fire flow calculation method for use is the "Guide for Determination of Required Fire Flow" - Insurance Service Office, 1974.

The project is located in the Maui County Planting Plan - Plant Zones 4 & 5. We encourage the applicant to utilize appropriate native and non invasive species and avoid the use of potentially invasive plants. Native plants adapted to the area, conserve water and protect the watershed from degradation due to invasive alien species. Attached is a list of appropriate plants for the zones as well as potentially invasive plants to avoid.

To further conserve water resources, we encourage the applicant to consider the following water conservation measures:

Eliminate Single-Pass Cooling: Single-pass, water-cooled system should be eliminated per Maui County Code Subsection 14.21.20. Although prohibited by code, single-pass water cooling is still manufactured into some models of air-conditioners, freezers, and commercial refrigerators.

Utilize Low-Flow Fixtures and Devices: Maui County Code Subsection 16.20A.680 requires the use of low-flow water fixtures and devices in faucets, showerheads, urinals, water closets and hose bibs. Water conserving washing machines, ice-makers and other units are also available.

Maintain Fixtures to Prevent Leaks: A simple, regular program of repair and maintenance can prevent the loss of hundreds or even thousands of gallons a day. Refer to the attached handout, "The Costly Drip". The applicant should establish a regular maintenance program.

Limit Irrigated Turf: Limit irrigated turf to 25% or less of total landscaped area.. Low-water use shrubs and ground covers can be equally attractive and require substantially less water that turf.

Prevent Over-Watering By Automated Systems: Provide rain-sensors on all automated irrigation controllers. Check and reset controllers at least once a month to reflect the monthly changes in evapotranspiration rates at the site. As an alternative, provide the more automated, soil-moisture sensors on controllers.

In order to protect the surface water and groundwater quality, DWS recommends that the applicant utilize Best Management Practices (BMPs) designed to minimize infiltration and runoff from daily operations. We have attached sample BMPs for principle operations for reference. Additional information is available from the State Department of Health.

Should you have any questions, please contact our Water Resources and Planning Division at 270-7199.

Sincerely,

D R Craddick

David Craddick
Director

ewn

c: engineering division
applicant, with attachments:
"The Costly Drip"
Maui County Planting Plan-Plant Zones 4 & 5 "Saving Water in the Yard: What & How to Plant in Your Area"
BMPs for Erosion Prevention and Sediment Control During Construction from the Residential and Commercial Control Programs, WERF 1992

PBR HAWAII

June 25, 2002

Mr. David Craddick, Director
Department of Water Supply
County of Maui
P.O. Box 1109
Wailuku, Hawaii 96793

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Mr. Craddick:

Thank you for your letter dated February 8, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement.

Maui Land & Pineapple Company Inc., will build new water systems within the Kapalua Mauka community according to standards.

We appreciate your participation in the review of the Draft Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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JAMES "KIMO" APANA
MAYOR

OUR REFERENCE
YOUR REFERENCE

POLICE DEPARTMENT
COUNTY OF MAUI

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

THOMAS M. PHILLIPS
CHIEF OF POLICE

KEKUHAUPIO R. AKANA
DEPUTY CHIEF OF POLICE

January 29, 2002

Mr. Tom Schnell
PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, HI 96813

Dear Mr. Schnell:

SUBJECT: Kapalua Mauka (Project District 2)
TMK: 4-2-01: 1 (por); 4-2-05: 50 (por); 4-2-05: 51; 4-3-01: 6 (por); 4-3-01:7 (por); and 4-3-01: 8 (por)

Thank you for your letter of January 8, 2002, requesting comments on the above subject.

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

Very truly yours,

Assistant Chief Robert Tam Ho
for: Thomas M. Phillips
Chief of Police

Enclosure

c: John E. Min, Planning Department
Robert M. McNatt, Maui Land and Pineapple Co., Inc.

COPY

TO : THOMAS PHILLIPS, CHIEF OF POLICE, MAUI COUNTY

VIA : CHANNELS

FROM : ANSELM YAZAKI JR., POLICE OFFICER III, DISTRICT IV

SUBJECT : PROJECT: KAPALUA MAUKA (PROJECT DISTRICT 2)

A-4 1/30/02

Sir, the following TO/FROM is my review of the Kapalua Mauka (Project District 2).

On 011402 at 1530 hours I was assigned by Sergeant M. KINCAID to review the Draft Environmental Impact Statement submitted by PBR Hawaii. Upon reviewing the DEIS and surveying the proposed area for the project, I see no potential traffic or safety problems arising from this project.

A new traffic signal will be installed at the intersection of Honoapiilani Highway and Office Road to assist motorists in entering traffic from the Kapalua Mauka Project. With the installation of this traffic signal the potential for traffic or safety incidents will be minimized. I also advise that prior to any construction on the Kapalua Mauka Project, this traffic signal must be installed to prevent any problems from occurring. Further more, from my understanding the two other entry way and exit ways will be "T" intersections with the first near the south boundary of the community and the second will be off Honoapiilani Highway between Office Road and Plantation Drive. At this time I see no problems with the other entry and exit ways as traffic in the area is minimal.

NOTED BY: Sgt. M. Kincaid E55 ...

RESPECTFULLY SUBMITTED:

Anselm YAZAKI Jr. 0317
012202 @ 1500 hours.

Concur:
Capt. K. Hale
1/25/2K2

PBR HAWAII

June 25, 2002

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

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Chief Phillips:

Thank you for your letter dated January 29, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement.

We acknowledge that you see no potential traffic or safety problems arising from the Kapalua Mauka community. We also acknowledge that you advise that a traffic signal must be installed at the intersection of Honoapiilani Highway and Office Road prior to any construction.

We appreciate your participation in the review of the Draft Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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DOCUMENT CAPTURED AS RECEIVED

K. Skill Hanson
P.O. Box 1701
Lahaina Hi: 96767-1701
Feb. 21, 2002

Maui Land + Pineapple Co. Inc.
P.O. Box 187
Kahului Hi 96733-6687

Ref.: Kapalua mauka EIS Draft comments:

The plan now increased to include 925 acres of ag lands, does not conform with the West Maui Community Plan.

It appears facilitation of employee housing, schools, and area transportation is left to develop at chance.

Finally at seems infeasible to put heavily eroded areas like my own back yard's Honokeana under dangerously increased run offs, which already threaten to send the community's adjacent housing units down the drain!

Sincerely

P.S.

Being an adjacent home owner of Napilihau Community Association lot # 48 I should have recieved an invitation to comment on the Kapalua Mauka development plan before the draft was submitted.

Ref.: §11-200-15

K

July 10, 2002

K. Shell Hansson
P.O. Box 1701
Lahaina, Hawai'i 96767-1701

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear K. Shell Hansson:

Thank you for your letter dated February 21, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement (EIS). We offer the following responses to your comments.

Kapalua Mauka (Project District 2) is the long-planned extension of the Kapalua Resort mauka of Honoapi'ilani Highway. It was featured as an element of the 1983 *Lahaina Community Plan* (in a different configuration and then called Project District 1A) and is a prominent element of the current *West Maui Community Plan*, which was adopted in 1996.

As envisioned in the *West Maui Community Plan*, Project District 2 would be a 450-acre, 750 residential unit community within the context of the Kapalua Resort. The master plan for Project District 2 (Kapalua Mauka) currently proposed by Kapalua Resort decreases the number of housing units to 690 while expanding the area of Project District 2 to approximately 925 acres. Because less homes will be distributed over a larger area, the resulting community will be far less dense than what is currently envisioned in the *West Maui Community Plan*. In addition, actual growth and required infrastructure demands will not exceed what has already been envisioned in the *West Maui Community Plan*.

To include the total area of the proposed Kapalua Mauka community as part of Project District 2, landowner Maui Land & Pineapple Company, Inc., will seek a community plan amendment to expand Project District 2 from 450 acres to 925 acres. The Draft Environmental Impact Statement was prepared in partial fulfillment of the County requirements for a community plan amendment.

In addition to the community plan amendment, Maui Land & Pineapple Company, Inc., also must obtain, a State Land Use District Boundary Amendment, a Change in Zoning, and Project District approvals. All of these steps require public hearings and review.

Regarding employee housing, schools, and area transportation, these issues have not been "left to the developer at chance." It is important to note that all of the above steps will involve extensive State and County review, oversight, and approval, with the State and the County specifying conditions that must be met for the project to proceed. Further, the management of Kapalua Resort is cognizant of the various aspects of West Maui that make it such a desirable place to live and visit. It would be counterproductive for it to endanger the vary attributes that attract guests and home buyers by leaving critical infrastructure issues "to chance."

The Draft EIS includes specific studies estimating the number of employees that will be employed, the amount of school age children anticipated, and the traffic impacts expected. The Draft EIS also considers various other infrastructure needs such as drainage systems and systems for both potable and non-potable water and wastewater facilities. Maui Land & Pineapple Company, Inc., is also committed to paying its pro rata share of the costs of regional improvements to Honoapi'ilani Highway.

Maui Land & Pineapple Company, Inc., will also comply with County of Maui requirements for affordable housing in relation to the Kapalua Mauka community. In fact, Maui Land & Pineapple Company, Inc. has a strong history of providing affordable housing for their employees and has complied with all requirements for affordable employee housing previously imposed as conditions of developing the existing Kapalua Resort. Completed West Maui projects include Nāpilihau Planned Development (174 units, in partnership with the State) and Honokeana Subdivision Phase I (38 units). Maui Land & Pineapple Company, Inc., also donated 13.5 acres of land in West Maui for the County Hale Noho Subdivision (which contains 72 homes built by the County).

In conjunction with its Upcountry operations, Maui Land & Pineapple Company, Inc., has provided affordable employee housing in Hāli'imaile (176 units and 15 units) and in Makawao at the Pu'u Koa Subdivision (47 units).

In May of 2002, Maui Land & Pineapple Company, Inc., started development of Kapua Villages Subdivision, a new 45-lot employee subdivision project in West Maui. Maui Land & Pineapple Company, Inc. is developing this subdivision on their own accord, as a benefit for their employees even thought they have been told by the County of Maui Department of Housing and Human Concerns that this subdivision will not satisfy, or even partially satisfy, the affordable housing requirements for the Kapalua Mauka community.

In summary, Maui Land & Pineapple Company, Inc., has developed (independently or in partnership with the State) 450 affordable employee housing units on Maui. They have also donated land to the County for County-built affordable housing. Further, in 2002, they will provide an additional 45 lots in West Maui for employees.

Regarding increased runoff from the Kapalua Mauka community, preliminary engineering studies indicate post-development runoff is expected to increase slightly, however, detention and desilting basins within the community site will maintain the existing flows and there will be no increase in runoff flowing from the site. Existing drainage patterns will be integrated into the design of the community. Surface runoff generated will be minimized by the low density of the residential units and the increased permeable area from the additional area of the golf course. All improvements will be constructed in accordance with applicable State and County regulations.

In addition, water quality of the runoff from the site is expected to improve from the addition of the Kapalua Mauka community relative to the existing pineapple fields that comprise the majority of the site. This is because more chemicals are used on pineapple fields to control pests and regulate growth than are used on golf courses and residential lots. Further, once residential landscaping is in place and the additional area of the golf course is covered with grass and plants, soil runoff during rainstorms will be very low. In contrast, soil runoff from pineapple fields can be significant if heavy rains occur soon after a field is plowed.

Finally, regarding your concern about receiving an invitation to comment on the Kapalua Mauka development plan as per Section 11-200-15, Hawai'i Administrative Rules Title 11, Department of Health, Chapter 200, Environmental Impact Statement (EIS) Rules, this section requires consultation with appropriate agencies, citizen groups, and concerned individuals. We acknowledge that you are a concerned individual, however, unlike the County zoning requirements, the EIS rules do not specify that property owners within a certain distance of the site must receive advance notification. Please note, however, that in August of 2001, Kapalua Resort held a community meeting to present its current plans for Project District 2 and to gain community input. An invitation to attend this meeting was mailed to the Nāpilihau Community Association. Our records do not indicate that anyone from the Nāpilihau Community Association attended the meeting.

Please also note that as previously stated, Kapalua Resort still must obtain a Community Plan Amendment, a State Land Use District Boundary Amendment, a Change in Zoning, and Project District approvals. Applications for a Community Plan Amendment, a Change in Zoning, and Project District Phase I approval were filed with County of Maui Department of Planning on June 25, 2002. The Change in Zoning application requires notification of property owners within 500 feet of the parcels containing the Kapalua Mauka community site at the time of filing the application. If your property is within 500 feet of the parcels containing the Kapalua Mauka community site, you will have received a notification via certified mail postmarked June 25, 2002. Additionally, all of these approvals require public hearings and review. Notice of hearings for the Community Plan Amendment, a Change in Zoning, and Project District Phase I approval will be published in the *Maui News* at least 30 days in advance of the hearing

In short, planning for the Kapalua Mauka community is in the preliminary stage and there will be many additional opportunities for public review and comment. We look forward your continued participation as the planning progresses.

We appreciate your participation in the review of the Draft Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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KIMO HARLACHER
P.O. Box 10581
Lahaina, Maui Hawaii 96761 USA
Phone (808) 669-7592
Fax (808) 669-6446

FEB 2 0 2002

Maui Land & Pineapple
Director: Kapalua Expansion
P.O. Box 187
Kahului, HI 96732

February 15, 2002

Dear Sir

Re: CONCERNS ABOUT ML&P'S KAPALUA EXPANSION

The purpose of this letter is to express a concern with regard to the extension of the Kapalua Resort, the expansion of the project district to 925 acres mauka, and the impact this project may have on our adjacent agricultural community. Historically, ML&P as well as Kapalua Land Company have always been good neighbors, excellent stewards of their land as well as meticulous and detailed planners; it is therefore with confidence that these concerns will be reviewed and addressed accordingly.

Maile Pai (fast growing vine) is located in the same agricultural area as this proposed development, mauka of Honoapiilani Highway, and is comprised of seven individually owned agricultural lots. The proposed development and expansion would be certain to directly change the character of the productive agricultural lands in this region. Presently most of Kapalua's development has been makai of the highway while this is the first substantial project to be considered mauka of the highway. The specific concerns and those which the environmental impact statement does not clearly consider are:

1. The consumption of water. Already the majority of the home owners are on limited agricultural supply of water stipulated the Department of Water Supply. The impact of 690 additional on our limited agricultural water supply would most certainly have a negative impact. It is my understanding that the water source for this development would be the same source which at present is unable to regularly supply our water needs.

2. Soil erosion is a serious concern. Presently the roads servicing our property are prone to wash outs after rains. Often the siltation basins and flood control devices fail. The result of excess sedimentation run-off can be seen to leave a red sediment visible in the ocean directly below. Taking lands out of agricultural production and constructing 690 homes and related infrastructure on the mountainside is certain to have an immediate impact on soil erosion.

3. The impact of additional traffic in our immediate community.

4. Concerns on how solid waste from 690 homes are to be addressed.

5. The consumption of additional electricity in the area.

The above mentioned concerns have not been adequately addressed by the Environmental Impact Report, in particular regard as to how it affects our adjacent agricultural community. As mentioned earlier, a continued spirit of cooperation and communication between the owners, developers and related parties is a hopeful prospect. Please feel free to contact me at any time should you have any further questions.

Sincerely,

Kimo Harlacher

CC. Maui County Department of Planning, 250 S. High Street, Wailuku, HI 96793
Project Consultant-PBR Hawaii, 1001 Bishop Street, Pacific Tower, Suite 650, Honolulu, HI 96813
State Office of Environmental Quality Control, 235 S. Beretania St., Suite 707, Honolulu, HI 96813

PBR HAWAII

July 18, 2002

Mr. Kimo Harlacher
P.O. Box 10581
Lahaina, Hawaii 96761

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Mr. Harlacher:

Thank you for your letter dated February 15, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement (EIS). We offer the following responses to your comments.

1) Water. The water supply for the Kapalua Mauka community will not be the same as for the Maile Pai community. The Maile Pai community is served by the County of Maui Department of Water Supply, which restricts usage based on transmission infrastructure issues, not due to the lack of agricultural water. The Kapalua Mauka community will be served by Kapalua Water Company, Ltd.

As discussed in the Draft EIS (see Section 5.8.3), the source of the Kapalua Resort's potable water is three wells, each of which have a capacity of 1.0 million gallons per day. Two of the wells currently have pumps installed and are in service; the third well does not have a pump and is currently not in use. The source of non-potable water is the Honolua Ditch. The project engineer has projected that these existing sources have adequate capacity for the Kapalua Mauka community.

Because the water supply for the Kapalua Mauka community and the Maile Pai community are not the same, the use of water for the Kapalua Mauka community will not have a negative impact on the Maile Pai community.

2) Soil Erosion. We agree that soil erosion is a serious concern. Soil erosion and drainage issues, along with mitigation measures, are discussed in Section 4.3 and Section 5.8.2 of the Draft EIS. Briefly, grading of the Kapalua Mauka community site will be limited to less than 15 acres at one time in compliance with the County of Maui Grading Ordinance. Once residential landscaping is in place and any additional golf course holes are covered with grass and plants, soil runoff during rainstorms will be very low. In addition, runoff from the site will be directed into onsite detention facilities that will be designed to suppress peak flows and serve as desilting basins. Detention basins will also maintain off-site runoff at or better than existing levels and will be developed in accordance with all applicable State of Hawaii Department of Health and County of Maui requirements.

Further, in response to concerns about runoff from the Kapalua Mauka community into nearby ocean waters, Maui Land & Pineapple Company, Inc., has initiated a water quality monitoring program for Honokahua Bay and Nāpili Bay, which are downstream from the Kapalua Mauka community. The first water quality study has been conducted and the results of this study will be included in the Final EIS. The intent of this first study is to establish a quantitative baseline of water chemistry constituents that could reveal if water quality in Honokahua Bay and Nāpili Bay will be affected by factors associated with the Kapalua Mauka community. As the development of the Kapalua Mauka community progresses, additional water quality studies of Honokahua Bay and Nāpili Bay will be conducted on a periodic schedule. This information will be included in the final environmental impact statement.

3) Traffic. The draft EIS includes a traffic impact analysis report that concludes "the proposed PD-2 Development and the buildout of the Kapalua Resort [including the Kapalua Mauka Community] can be accommodated by the Honoapi'ilani Highway corridor between Kapalua and Honokōwai."

In addition, the Kapalua Mauka community is projected to be built gradually, over a 20-year period, with an average of 35 units per year. This will allow improvements, such as the Lahaina Bypass, to be built during the course of the Kapalua Mauka community build-out. According to the recently released Final Supplemental Environmental Impact Statement for the Lahaina Bypass, construction on the Bypass is projected to start in late 2004.

4) Solid Waste. As discussed in Section 5.8.5 of the Draft EIS, the County of Maui's Solid Waste Division estimates that households on Maui generate approximately 55 pounds of solid waste per week. Using this estimate, after build-out and sales of all 690 units in 20 years, total waste from all households in the Kapalua Mauka community would be approximately 37,950 pounds per week. However, because of the resort residential nature of the community, not all units are expected to be occupied on a full time basis, so this rough estimate is extremely high even if waste from the clubhouse facility is factored in.

The Kapalua Resort is an active participant in recycling programs and intends to continue its participation with the addition of the Kapalua Mauka community. After the Kapalua Mauka community is occupied by residents, to the extent practical, wastes such as aluminum, paper, newspaper, glass, and plastic containers will be recycled. Green waste may be processed on-site. Waste associated with commercial activities such as the golf clubhouse will also be recycled when practical. Waste that cannot be recycled or incorporated into on-site green waste processing will be disposed of in the County's central landfill in Pu'unēnē. The community will be serviced by a private refuse collection agency contracted by the homeowner's association.

5) Electricity. As discussed in Section 5.8.6 of the Draft EIS, based on current uses at Kapalua, Maui Electric Company estimates instantaneous peak power demand for the Kapalua Mauka community to range between 4500 kilowatts and 6900 kilowatts when the community is fully built out in 20 years. To meet this demand, it is likely that the electrical substation located west of Honokeana Gulch will have to be up-sized.

Energy efficient and conservation measures to reduce the maximum electrical demand will be considered for implementation into the Kapalua Mauka Community where feasible. These measures may include power factor corrections, the use of energy efficient pumps, and

scheduling certain types of loads to run during off-peak hours whenever practical. Residents will also be encouraged to design energy efficient homes.

We appreciate your acknowledgment regarding Maui Land & Pineapple Company, Inc., and Kapalua Land Company, Ltd., being good neighbors, excellent land stewards, and meticulous and detailed planners. Maui Land & Pineapple Company, Inc., and Kapalua Land Company, Ltd., also welcome continued cooperation and communication.

To date, Kapalua Land Company, Ltd., has held two public meetings to present its current plans for the Kapalua Mauka community (Project District 2) and gain community input. In addition, before any construction begins, Maui Land & Pineapple Company, Inc., still must obtain a Community Plan Amendment, a State Land Use District Boundary Amendment, a Change in Zoning, and Project District approvals. All of these steps require public hearings and review.

In short, planning for the Kapalua Mauka community is in the preliminary stage and there will be many additional opportunities for public review and comment. We look forward to your continued participation as the planning progresses.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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Main Identity

From: "Joseph Pluta" <pluta@maui.net>
To: <oeqc@health.state.hi.us>
Cc: "WMTA" <wmta@maui.net>
Sent: Friday, February 22, 2002 3:50 PM
Subject: Kapalua Mauka-Draft EIS commentary

Aloha Office of Environmental Quality Control:

My name is Joseph Pluta, president of the West Maui Taxpayers Association, WMTA, a non-profit 501 (c) (4) corporation. Our 5,000+ members which are mostly property owners in West Maui have a vital concern for adequate planning.

As an Association, we typically do not take any position on anyone's applications for development. Are primary concerns are that the appropriate agencies are ensuring that all infrastructure impacts on any proposed development are taken into consideration when processing developmental applications and submitting opinions or statements such as an Environmental Impact Statement.

With respect to developments in West Maui and zoning changes requested by Kapalua, we believe that very little information has been provided to the West Maui Community with respect to the impacts of the proposed zoning changes associated with future development at Kapalua. Quite to the opposite, the Kaanapali 2020 groups have been in ongoing community planning for over 12 months with numerous community informational meetings. This is more of what we would like to see with any and all proposed zoning changes as well.

We believe that the Community plans for West Maui, including traffic models, have been improperly ignored. We believe that developers who are submitting EIS reports on their projects may be too biased to objectively present all the pros and cons associated with their plans.

<u>The West Maui Taxpayers Association has been unanimous with their opinion that the existing infrastructure in West Maui is inadequate to support the existing development of West Maui.</u>

Any proposed zoning changes or developments in West Maui which do not make significant improvements to the existing infrastructure beyond their added impact should not be favorably considered. The only exception (s) to this may be with respect to affordable housing, adding schools or health care facilities which improve accessibility to area residents in West Maui isolated from access as they are only currently available in Central Maui.

Respectfully Submitted,

Joseph D. Pluta
President
West Maui Taxpayers Association
www.westmaui.org

TO: Maui Land & Pineapple Co., Inc.
P.O. Box 187
Kahului, HI 96732

County of Maui
Planning Dept.
250 S. High St.
Wailuku, HI 96793

PBR Hawaii
1001 Bishop St.
Pacific Tower, Ste. 650
Honolulu, HI 96813

FROM: OEQC

Forwarding this comment letter for your files. Comment was sent on February 22, 2002.

PBR

July 2, 2002

Mr. Joe Pluta, President
West Maui Taxpayers Association
Post Office Box 10388
Lahaina, Hawaii 96761

SUBJECT: KAPALUA MAUKA (PROJECT DISTRICT 2) DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Mr. Pluta:

Thank you for your e-mail communication dated February 22, 2002, concerning the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement (EIS). We offer the following responses to your comments.

Project District 2 is the long-planned extension of the Kapalua Resort mauka of Honoapi'ilani Highway. It was featured as an element of the 1983 *Lahaina Community Plan* (in a different configuration and then called Project District 1A) and is a prominent element of the current *West Maui Community Plan*, which was adopted in 1996. As such, up to this point, there has been years of extensive community input and debate as to the desirability of, need for, and location of the new community.

For example, the adoption of the current *West Maui Community Plan* was preceded by an update process that began in 1992. According to the Plan:

> The update process was driven by the work of the Lahaina Citizens Advisory Committee. This 14 member panel met a total of 17 times during a 225-day deliberation process to identify, formulate and recommend appropriate revisions to the then Lahaina Community Plan. The CAC carefully reviewed the 1982 version of the Community Plan, reshaping the plan to create a viable document which will serve the West Maui Region though the turn of the century. (*West Maui Community Plan*, page 2)

After the CAC's work, the Planning Department prepared the revised plan and forwarded it to the Planning Commission for public hearing and review. The plan was then sent to the County Council for further review and adoption. Since the Plan was not adopted until 1996, there were over four years of community and political debate leading up to its adoption. Thus, there has been substantial and lengthy discussion and debate over the Plan, including the expansion of Kapalua Resort within Project District 2, mauka of Honoapi'ilani Highway.

As envisioned in the *West Maui Community Plan*, Project District 2 would be a 450-acre, 750 residential unit community within the context of the Kapalua Resort. The master plan for Project District 2 currently proposed by landowner Maui Land & Pineapple Company Inc., decreases the number of housing units to 690 while expanding the area of Project District 2 to approximately 925 acres.

Because less homes will be distributed over a larger area, the resulting community will be less dense than what is currently envisioned in the *West Maui Community Plan*. Further, actual growth and the required infrastructure demands will not exceed what has already been anticipated in the *West Maui Community Plan*, which has a planning horizon of 20 years.

The implications of the impacts of 750 residential units were taken into consideration when Project District 2 was included within the *West Maui Community Plan* during the Community Plan update process from 1992 to 1996. According to the Plan: "the update process incorporated technical studies and assessments." These included: 1) a Socio-Economic Forecast; 2) a Land Use Forecast; 3) an Infrastructure Assessment; and 4) a Public Facilities and Service Assessment. These studies were used to understand potential future conditions, needs, and impacts, and as decision making tools of the CAC. Thus, the implications of the development of Project District 2 have been comprehensively considered and given a thorough public review during the community plan update process.

Infrastructure needs for the community have also been anticipated by landowner Maui Land & Pineapple Company, Inc. Water systems for both potable and non-potable water will be built, operated, and maintained by Maui Land & Pineapple Company, Inc. Current water sources have adequate capacity for the Kapalua Mauka community. In addition, a private wastewater system within the community will be built, operated, and maintained by Maui Land & Pineapple Company, Inc.. This system will be connected to the County's Lahaina Wastewater Treatment Facility, which as has adequate capacity to handle the expected amount of wastewater from the community. Maui Land & Pineapple Company, Inc., is also committed to paying its pro rata fair share of the costs of regional improvements to Honoapi'ilani Highway.

To assess the impacts of the Kapalua Mauka community, a draft environmental impact statement was prepared during 2001 and published in January 2002. The draft EIS contains numerous studies including a traffic impact analysis report that concludes "the proposed PD-2 Development and the buildout of the Kapalua Resort [including the Kapalua Mauka Community] can be accommodated by the Honoapi'ilani Highway corridor between Kapalua and Honokōwai."

In addition, the Kapalua Mauka community is projected to be built gradually, over a 20-year period, with an average of 35 units per year. This will allow improvements, such as the Lahaina Bypass, to be built during the course of the Kapalua Mauka community build-out. According to the recently released Final Supplemental Environmental Impact Statement for the Lahaina Bypass, construction on the Bypass is projected to start in late 2004.

The State Environmental Impact Statement Law (Chapter 343, Hawaii Revised Statutes) requires "applicants" (i.e., developers) to prepare environmental impact statements. There is then a 45-day public comment period, and a final environmental impact statement is then prepared. If all issues are satisfactorily addressed, the final environmental impact statement is then accepted by the responsible agency (in this case the County of Maui Department of Planning).

In commenting on the Kapalua Mauka (Project District 2) Draft Environmental Impact Statement, the University of Hawaii Environmental Center stated:

> Overall, the Draft EIS appears to be well written and comprehensive in its approach to many issues. We commend the preparers of the document on their diligence in complying with the EIS rules. All required sections are included and most areas of concern are well addressed.

The Final EIS is will be completed in the near future.

Regarding your concerns about lack of information provided to the community, please refer to the above discussion about the *West Maui Community Plan* update process. In addition, Kapalua Land Company Ltd., has briefed all of the homeowner associations in Kapalua several times over the past few years at individual association meetings and at the annual Kapalua Resort Association meeting.

Furthermore, while the draft EIS was being prepared, in August of 2001, Kapalua Land Company Ltd., held a community meeting to present its current plans for Project District 2 and gain community input. An invitation to attend this meeting was mailed to the West Maui Taxpayer's Association. Our records show that Vicki and James R. McCarthy, representing the West Maui Taxpayers Association, attended this meeting. We also note that you and Ezekiela Kalua attended our most recent meeting on June 25, 2002.

Before any construction begins, Maui Land & Pineapple Company Inc., still must obtain a Community Plan Amendment (to expand Project District 2 from 450 acres to 925 acres), a State Land Use District Boundary Amendment, a Change in Zoning, and Project District approvals. All of these steps require public hearings and review.

In short, planning for the Kapalua Mauka community is in the preliminary stage and there will be many additional opportunities for public review and comment. We look forward to continued participation from the West Maui Taxpayers Association as the planning progresses.

We appreciate your participation in the review of the Draft Environmental Impact Statement.

Sincerely,

PBR HAWAII

Tom Schnell, AICP
Associate

cc: Mr. Robert McNatt/Maui Land & Pineapple Company, Inc.
Ms. Ann T. Cua/County of Maui Department of Planning
Ms. Genevieve Salmonson/Office of Environmental Quality Control

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Appendix A

Market Study, Economic Impact Analysis and Public Cost / Benefit Assessment

Market Study, Economic Impact Analysis, and Public Cost/Benefit Assessment of the Proposed

KAPALUA MAUKA DEVELOPMENT

Kapalua Resort, Maui, Hawaii

THE HALLSTROM GROUP INC.
REAL ESTATE CONSULTANTS & APPRAISERS

December 7, 2001

Mr. Robert M. McNatt
Vice President
Land Planning and Development
Maui Land and Pineapple
Company, Inc.
P.O. Box 187
Kahului, Hawaii 96733

Market Study, Economic Impact Analysis, and Public Cost/Benefit Assessment of the Proposed Kapalua Mauka Development, Kapalua Resort, Maui, Hawaii

Dear Mr. McNatt:

At your request, we have completed a series of studies addressing the probable market standing of, and anticipated regional economic influence resulting from, the proposed "Kapalua Mauka" resort/residential development to be located adjacent to the existing Village Golf Course, mauka of Honoapiilani Highway, in the Kapalua Resort community, Maui, Hawaii.[1]

The current master plan, revised in July 2001, calls for 390 single-family homesites at an average density of 1.01 lots per acre, and 300 multi-family units constructed (many as detached or duplex residences) at a density of 5.00 units per acre. The master planned, mixed-use community would comprise approximately 925 total upland acres mauka of the existing resort. Also envisioned for the site are 134 acres of open space, parklands, and buffers; 300 acres of golf course and roadways including 25 golf holes (16 of which are currently in place); and a five-acre clubhouse facility.

The focus of our assignment was three-fold:

1. **Market Study.** To ascertain whether there will exist sufficient demand in the West Maui real estate market to successfully absorb the finished subject inventory in a timely manner given in-place and proposed competing development on the island.

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[1] The subject project/community encompasses "Project District 2" on land use maps, in consulting studies and is referred to at times within this report.

2. **Economic Impact Analysis.** To estimate the general and specific effects on the local economy which will result from the undertaking of the Kapalua Mauka project, including capital investment, employment during construction and on-going operations, resulting wages/income, business profits, population demographics, and end-user expenditures in the region.

3. **Public Cost/Benefit Assessment.** To quantify the impact on the public purse arising from the subject project in regards to primary tax/fee revenues which will be received by the State of Hawaii and Maui County versus the implied cost of providing governmental services to the development.

The pertinent results from our studies are presented within the following narrative report, which opens with an **Introduction and Study Conclusions**. The document is similar in investigation, analysis and presentation to our original September 1999 report.

The purpose of our study was to determine to what extent the regional market could support the absorption of the subject lands under conditions as of the study date, and its associated economic impacts on the island. The function of our report is to provide current market data, econometric analyses and informed conclusions within a narrative report format for use in land use reclassification petitions and for internal decision-making.

In completing our investigation program, we have re-inspected the subject property and its environs, researched a variety of real property market sectors, reviewed land use plans prepared by public agencies and private developers, interviewed knowledgeable parties active in the Maui economy, utilized published private and government databases and statistics, and complied policies, publications, and materials from a variety of sources.

All conclusions expressed herein are subject to the identified definitions of terms, limiting conditions, assumptions and certifications of The Hallstrom Group, Inc., in addition to any others specifically set forth in the narrative or on the tables. All work has been completed in conformance with the Code of Professional Ethics and Standards of Professional Appraisal Practice of the Appraisal Institute, and the Uniform Standards of Appraisal Practice (USPAP).

We have reached the following conclusions as of September 1, 2001 regarding the probable market standing and economic impact of the proposed Kapalua Mauka development at Kapalua Resort[1]:

[1] We have not considered the potential economic impacts arising from the September 11, 2001 terrorist attacks against the United States, which occurred after our effective study date. While the immediate impact of the incident on Maui County has been significant with westbound travel off more than ten percent and eastbound arrivals off upwards of 30 percent, most analysts predict Mainland recovery by early 2002; with Hawaii likely to follow reasonably thereafter.

- The subject property enjoys a superior, competitive location adjacent to an established, highly-regarded destination resort which has demonstrated strong appeal among resort/residential purchasers. The subject property is the long recognized natural expansion acreage for the existing Kapalua community, the makai portion of which is nearing build-out. By doubling the size of the project area, while lowering the unit count, the development will better fit the mauka orientation by providing for a diversity of transitional uses extending upslope from the intense makai resort, through residential subdivisions and rural lots to the mauka agricultural lands and conservation zones.

- Following an extended period from 1991 into 1996, when demand for available inventory and interest in further development was down significantly, the activity in the resort/residential homesite and condominium sectors recovered meaningfully by 1997; with the number of sales up; listing periods, down; and appreciation being seen for the first time in nearly a decade through the Year 2000. New product was well received and numerous new developments were being proposed. The onset of an economic slowdown in 2001, following the record-setting prior year, has affected the resort/residential sector to a minor degree. However, demand continues strong for new well-located units/lots in the better destination projects. Through the first half of the year, new projects have continued to be well-received at Wailea, Hualalai, Mauna Kea Beach and Kaanapali, with activity ranging from an unchanged pace of rapid absorption to declines of less than 25 percent. Resales have slowed to a greater degree, with the largest fall-off seen in projects having poorer locations or a lesser market standing.

- Kapalua Mauka will provide expansive views, golf course frontage and access to a full-line of resort amenities within an established, themed master plan of resident and second-homeowners. While the project will have exclusivity and privileges comparable with the finest off-water resort/residential inventory, it will not be gated or closed off from other members of the Maui communities. A variety of product types ranging from low density townhouses (with many being detached condominium residences) to rural agricultural-potential lots will be constructed in an effort to attract a broad spectrum of purchasers, with non-resident buyers and currently untapped market sectors within the resort, such as residents and seniors.

- Based on historic and prevailing trends, and the anticipated movements in the neighbor island resort/residential market, we estimate it will take approximately 10 to 13 years of exposure time to successfully absorb the 390 single-family lots proposed for the subject development. The 300 potential condominium units will require from seven to 11 years to sell-out.

- The construction period of the community (infrastructure and finished improvements) will stretch over some 14 years, and bring $470 million in capital investment to the island. It will create an estimated 4,990 "worker years" of direct on-site employment and an additional 2,495 worker years of off-site employment on Maui, generating $291.6 million in wages and upwards of $90 million in profits for local contractors, suppliers and clubhouse businesses over the initial two decades of project existence. The operation and maintenance of its components will contribute to an additional 226 permanent jobs in the local economy and $6.2 million in annual wages on a stabilized basis. The residents and guests will infuse more than $49.4 million per year in discretionary expenditures into the island economy.

- The State of Hawaii will receive an estimated $101.9 million in taxes and fees from the project during the initial 20-year development and use period, and an additional $5.2 million annually thereafter. The county of Maui will get some $72.9 million in taxes during the two-decade study timeframe, and $5.6 million per year following. In no year during the development period or stabilized operations will either the state or county suffer a revenue shortfall (costs exceeding receipts) due to the project.

We appreciate the opportunity to be of service to the Maui Land and Pineapple Company in regards to this prominent holding. Please contact us if further discussion or detail on the matters covered herein are required.

Respectfully submitted,

THE HALLSTROM GROUP, INC.

J. E. Hallstrom

James E. Hallstrom, Jr., MAI, CRE

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THE HALLSTROM GROUP INC.

REAL ESTATE CONSULTANTS & APPRAISERS

Market Study, Economic Impact Analysis, and Public Cost/Benefit Assessment of the Proposed

KAPALUA MAUKA DEVELOPMENT

Located at

Kapalua Resort, Maui, Hawaii

Prepared for

Mr. Robert M. McNatt
Vice President
Land Planning and Development
Maui Land and Pineapple Company, Inc.

October 2001

TABLE OF CONTENTS

Table of Contents (continued)

ADDENDA

INTRODUCTION

Encompassing approximately 925 acres in the northerly reaches of the West Maui resort corridor, the proposed Kapalua Mauka development is a master-planned, mixed-use residential, recreational and rural community. The project has been redesigned to lower densities thereby serving the continuing demand by visitors and residents for quality resort/residential housing opportunities while providing bands of transitional land uses between the more intense makai resort and the upslope agricultural and conservation lands.

The core of the holding is a 450-acre piece known as Project District 2, identified as the location for 750 residential lots/units within the West Maui Community Plan. The Project District is the long-planned and natural mauka expansion area for the existing Kapalua Resort, which is nearing build-out of its makai components. The current Kapalua Mauka master plan will contain 690 total units; or eight percent less than the community plan provides for.

The envisioned project will capitalize on a prime location having favorable climatic, view, access and recreational characteristics; building on the excellent reputation of the Kapalua master planned resort development. It will expand the regional visitor/investment industry in a lowered-intensity manner, provide additional housing opportunities, offer agricultural sized lots, enhance the island's economy, and contribute to state and county tax collections.

The development will transform a well-situated site from ravine-studded, agricultural and non-productive lands into a dynamic, low-density community offering modern resort/residential units, homesites and large rural lots that will meet expressed real property market demands while producing employment and tax dollars that will benefit the island's public and private financial base.

The purpose of our assignment was to analyze the proposed subject project in light of competitive, regional, prevailing and forecast economic/market conditions in order to answer four foundational study questions:

1. Is there sufficient market demand to absorb the various components of the Kapalua Mauka master plan during a

reasonable exposure period given competing developments and statewide/regional economic trends?

2. From a market perspective, will the subject be an appropriate use of the site relative to governmental land planning objectives, accepted master plan design characteristics, and the area environs?

3. What will be the general/specific and direct/indirect economic impacts on Maui resulting from the undertaking of the subject development through capital investments, jobs, wages, business revenues and profits, population, and resident/guest discretionary expenditures?

4. What will be the impact on the state and county "public purse" from the project in regards to costs of services required versus increased tax/fee receipts?

These issues were addressed through a comprehensive research and inquiry process utilizing data from market investigation, governmental agencies, various Hawaii-based media, industry spokespersons/sources, on-line databases, and published public and private documents.

The pertinent results of our assignment are highlighted in this narrative report. Our study findings are divided into eight chapters as follows:

Study Conclusions
Overview of the Subject Market Sector
The Proposed Kapalua Mauka Community
The Resort/Residential Condominium Market
The Resort/Residential Single-Family Homesite Market
Quantification of West Maui Resident Housing Demand
Market Study Correlation and Absorption Conclusions
Economic Impact Analysis
Public Cost/Benefit Assessment

For this analysis, we have been provided with Kapalua Mauka conceptual master plans, project descriptions, timetables and other analytical data prepared by PBR Hawaii, Inc. Additional source information regarding the subject was taken from the files of our past studies regarding the subject holding produced by PBR Hawaii, Inc. and Warren S. Unemori Engineering, Inc. Further materials included

in-house planning, consulting and marketing materials from Kapalua Land Company; and sales/listing and other on-line market data from Kapalua Realty.

The Kapalua Mauka property was inspected on several occasions during the past several years, and specifically for this assignment again in mid-2001.

STUDY CONCLUSIONS

Based on our inspection of the subject site, its environs and analysis of the historic and forecast West Maui real estate market, we have reached the following conclusions about the proposed Kapalua Mauka community:

The West Maui Region and Kapalua Resort

West Maui, generally, and Kapalua specifically, is among the most desirable resort/residential areas in the state, with an exceptional and diverse visitor plant, a quaint historic village offering a complete line of modern services, superior climate, a lush natural beauty and a variety of recreational resources. Kapalua Resort, a luxury destination development at the northerly end of the high demand Lahaina-Kapalua corridor, has enjoyed strong market demand over the past two decades.

The study area suffered from the early 1990s economic slump to a lesser degree than most Hawaii regions, maintaining a strong commercial base and competitive tourism levels. There has been meaningful economic activity over the past three-plus years, with West Maui showing measurable gains in the visitor industry from late 1996 through 2000 despite lingering effects statewide following the onset of the Asian economic crisis in late 1997. Visitor arrivals, expenditures and lodging statistics (rates and occupancies) all moved strongly upwards in 1998-2000 driven by U.S. West Coast travelers; the prime resort/residential user and purchaser demographic for West Maui.

In fact, 1998 through 2000 were among the best tourism years on record, with arrivals reaching above 2.4 million, total visitor days surpassing 10 million, and expenditures moving above $2.3 billion. However, resulting from recessionary influences in the U.S. and

Pacific Basin, the 1998-2000 vibrant upcycle was nominally stymied through August 2001. Arrivals were down only 0.6 percent in July of this year and barely one percent through the first eight months. Much of this slight loss was offset by extended length of stays and higher visitor expenditures. Prior to the date of this report, it was the second best tourism year on record.

The high recognition of the West Maui region coupled with a scarcity of developable land has consistently bouyed real estate prices since the mid-1970s. Following a decline in the early 1990s, investor/developer interest has again appeared across the real property spectrum. Regardless of Mainland conditions, virtually all sectors of the Maui market were in a quickly heating upcycle through summer 2001, with available inventory being rapidly absorbed (particularly in the residential market), and widespread appreciation. In fact, concerns over housing and anti-development issues were rising. Though some slowdown was noted in existing or less desirably located projects, new competitive and well-priced inventory continued to sell well.

The subject properties are well-located to benefit from the highly favorable mid to long-term market trends evident in West Maui, and represent the natural expansion area for the successful Kapalua Resort which is nearing build-out on the makai-phase of the project.

The Neighbor Island Resort/Residential Condominium Market

Condominium development during the late 1980s economic expansion was brisk though failing to match the activity level of a decade prior. The 1991-1996 recessionary period was especially difficult for resort/residential projects, as the units pre-sold during the up-cycle often could not be completed before the onset of the slump, resulting in huge buyer fall-out. It took many years (until the late 1990s) for the overhanging inventory to be fully absorbed, with some projects being converted to timeshare ownership to provide an economic return.

However, despite the problems in the sector during the early part of the last decade, demand increased beginning in late 1997 and early 1998, with a particularly strong surge evident in 1999-2000, that had absorbed virtually all available inventory by year-end. Vigor was being demonstrated for both on-water and interior units. New projects at Hualalai and at Kapalua (in pre-sale) were well-received and developer interest was evident at virtually all neighbor island resort communities.

The slow down of the economy over the past nine months, coupled with the drop in the stock market since May 2000, has limited absorption at some resort condominium projects, particularly those in lesser quality projects or in less prestigious destination communities. Yet, high-end units at Kapalua, South Kohala and Wailea resorts have all continued to achieve reasonable absorption velocity. As with other sectors, new competitive high-quality product was well received at levels only slightly off (less than 15 percent) from the prior year. Resales of existing units have slowed through August, and we estimate this sector is off by 10 to 30 percent in 2001, but still at levels well above the activity of the early to mid-1990s.

While it is difficult to assert the resort/residential condominium market continues in an upcycle as was apparent from 1997-2000, it was still healthy as of the study date, and a modestly recovering economy coupled with lower interest rates should re-spur the sector forward.

Over the past 29 years, a total of some 7,200 multi-family units have been constructed in the neighbor island destination resorts. New unit sales have averaged 243 per year since 1975, achieving peaks above 400 units annually in the late 1970s and 1988-1989. During the last five years, original sales have averaged about 100 per year (a figure dampened by the lack of new inventory).

Upper-end condominium development has evolved meaningfully in the past three years, with a new orientation towards low density "condominium residence"-type projects which are either detached (similar to a single-family home) or in buildings having four or fewer units. This product has met with relatively strong success on Maui in both premier locations (Makena Place) and moderate resorts (The Summit at Kaanapali). It is expected that portions of the Kapalua Mauka multi-family component will be of this type.

Resales have also picked up since the late 1990s, with some 590 in 2000, and with totals of 425 to 475 projected for this year based on activity through August. These levels are more than double the figures of five years ago. Over the past 29 years, there have been an average of about 957 resales of condominiums per year in the primary competitive neighbor island resorts, with a peak of 1,480 units sold in 1980. Since 1986, sales (original and resales) have averaged 817 units per year.

It is forecast that over the next 20 years a total of 4,850 new resort/residential condominium units will be needed in order to meet market demand levels. Of these, about 52 percent would be located on Maui, 43 percent on the Big Island, and seven percent elsewhere in the state.

A total of 10,046 additional competitive units are proposed for the Maui and West Hawaii projects, considered as being reasonably competitive in the study market sector. Only a fraction of these are likely to be built during the projection period (2002-2021).

The total mid-point demand for new units on Maui is anticipated to be about 2,500 units over the next two decades; the total probable competitive additional supply to be developed apart from the subject is about 1,850 units. The island market will have sufficient demand relative to probable supply to absorb the 300 subject units.

The Neighbor Island Resort/Residential Homesite Market

The resort/residential homesite market on the neighbor islands expanded dramatically in the late 1980s, particularly on Maui and the Big Island, moving from an afterthought of resort developers to a focal point of many communities. The onset of recession in 1991 slowed absorption of finished lots and subdivision of new product, and the sector did not begin to recover until 1997.

From late 1997 through 2000, the demand for resort homesites strengthened notably, reaching record levels of developer and purchaser interest throughout the neighbor island resort projects. Activity was up more than 250 percent in 1998-2000 over the previous six years. New developments at Hualalai, Wailea, Kaanapali, Mauna Lani, Mauna Kea Beach and South Kohala were all moderately to well-received, with older standing inventory also showing renewed activity. New projects at older and/or less exclusive resorts such as Keauhou, Waikoloa Beach and Princeville were less successful.

Prices, particularly for upper-end and near-water sites, moved to record levels (exceeding $3 to $5 million-plus for select shoreline parcels), with many subdivisions sold-out prior to infrastructure completion. 1999 and 2000 were easily the best years ever for resort homesites.

As with condominiums, economic and stock market instabilities of late 2000 and into 2001 have slowed absorption at some projects, but

quality exclusive lots continued to sell strongly during the first two quarters, and pre-sale commitments remained solid at the most competitive resorts. The decline in homesite activity (new and resale) was not as significant as for condominiums, but were below 2000 levels. As of the study date, near-term prospects, though stabilizing, were still in an upcycle, and mid- to long-term prospects continue to be highly favorable.

Since the mid-1970s, some 2,600 single-family lots have been developed in resort communities statewide. Of this total, 1,400 were subdivided from 1986 through 1991, with nearly 1,000 additional homesites added since 1996.

Over the past 15 years, demand has averaged nearly 160 new lots each year[1], with peaks surpassing 200 sales annually in the late 1980s and from 1998 through 2000, and a current rate of about 100 original sales per year. Since 1986, sales (original and resales) have averaged 129 per year in the resorts considered most competitive with the subject inventory.

Following a near-term economic recovery period, sales are expected to increase to 190 new resort/residential lot sales per year over the next three to five years, with approximately 43 percent of the activity focused on Maui, 52 percent to the Big Island, and seven percent to other destinations in the state. Some 4,100 competitive homesites will be required over the next 20 years in order to meet the projected market needs.

There are 5,405 lots preliminarily proposed for subdivision during the next two decades at leading Maui and Big Island resort projects that would be competitive with Kapalua Mauka inventory. An additional nearly 5,000 lots (mostly in off-water golf course development in West Hawaii) were forwarded during the 1980s, which have now been abandoned or placed on hold. As with condominium units, it is unlikely the majority of the proposed competitive lots will be developed during the 20-year study projection period.

The total demand for new resort homesites on Maui is anticipated to be about 1,750 lots. Apart from the subject, the competitive destination resort communities are planning a maximum of 1,742 total lots. However, we consider it unlikely more than 1,325 will be

[1] Excluding finished house and lot packages at Makena, South Kohala and other resorts.

subdivided over the next 20 years,[9] leaving a shortfall of some 425 competitive homesites. While major quality inventory additions are proposed elsewhere on Maui, they are not directly within the master planned, oceanfront destination resort communities which have proven most competitive.

We conclude there will be sufficient unmet demand in the Maui resort/residential homesite sector to absorb the 390 subject lots.

The West Maui Residential Market

West Maui has had an acute shortage of available housing units for several decades due to the scarcity of urban-potential land and public supporting infrastructure. Studies completed as part of federal, state and local public agencies indicate there is an unmet demand reaching from several hundred to as many as 5,000 housing units in the greater Lahaina area, with the U.S. Department of Housing and Urban Development opining in the late 1980s that the region was among the tightest housing markets in the nation.

While the recession from 1991 into 1995 squelched activity, the latent demand remained, and began to re-emerge with the onset of economic recovery during the late 1990s. Despite traffic issues and other infrastructure concerns, demand has stayed strong, particularly for rare affordable priced units, and has not been dampened significantly during the stability of 2001. There has been virtually no meaningful new inventory made available to meet expressed market needs in the past decade, and we forecast the region will require 4,650 to 7,240 new housing units over the next 20 years.

While there have been up to 5,300 standard residential units proposed for the area since the mid-1980s, at Puukolii Village, on state lands (Villages at Leialii), and elsewhere, these projects have shown no activity in nearly a decade. It is unlikely these proposed developments will provide meaningful new inventory to meet the potential market needs in the near to mid-term.

Even with the subject project attracting a share of Maui full-time residential demand, there is insufficient residential inventory to meetprobable/potential demand levels. While the assumed prices of the Kapalua Mauka units will be affordable to only 10 to 15 percent of

[9] Including an allowance for up to 500 lots of the proposed Wailea 670 project to be located mauka of Wailea Resort.

the resident population, this segment will still require some 465 to 724 new units over the next 20 years. The subject project has only to capture a fraction of this demand in order to achieve rapid absorption and be considered a viable source of new housing opportunities for local residents.

The Proposed Kapalua Mauka Development

Integrating a variety of low-intensity urban and rural residential land uses and amenities around an existing golf course to form a desirable resort/residential community, the Kapalua Mauka master plan represents an efficient design and is the highest and best use of the prominently located subject property. The 300 condominium units and 390 single-family homes will offer a selection of densities, views, frontages and access characteristics intended to attract vacation home owners and Maui residents.

From a market perspective, Kapalua Mauka will provide a variety of relatively low density use types within a quality setting, moving from the more intense existing makai resort upslope through residential subdivisions and rural lots to the mauka agricultural and forest lands. As such, it will serve as both an expansion area for the resort and provide for a transition from urban to conservation uses.

The Village Golf Course, which is the recreational focal point of the proposed development, is an 18-hole championship layout, with adjacent Golf Academy, that is among Maui's finest. Sixteen holes are on the subject site, with two holes, the existing clubhouse and the academy being located makai of Honoapiilani Highway. As part of Kapalua Mauka construction, the course will likely be modified and expanded to 27 holes.

About half of the condominiums and residences will have direct course frontage. Most of the units will have superior views, down slope across the makai resort acreage, the Pailolo Channel to Molokai, and the Auau Channel to Lanai. Sunset views will be available from much of the site. The cooler northerly off-water climate, preferred among residents and many long-term visitors, provides for lush growth in the gulches which traverse the site and contribute to its striking terrain.

Owners and guests will have access to the amenities of the Kapalua Resort, which contains two luxury hotels, three championship golf courses, two tennis centers, shopping village and three beach parks.

Subject Inventory Absorption Estimates

The holding and proposed development will be primarily competitive in the Maui resort/residential market, and within a greater sector including the upper-end West Hawaii projects.

We have quantified absorption rates using three techniques, all of which point to a reasonable sell-out period of circa eight to 15 years for the subject units.

The gross analysis method indicates there are insufficient competitive units to meet demand regardless of other factors. The residual method demonstrates that the probable levels of competing developments could all achieve a reasonable absorption level and there would still be remaining demand for the subject product. And the market shares method indicates the Kapalua Mauka units would be absorbed in a timely manner based on its competitive penetration in the market.

We estimate the 390 homesites will require 12 years to achieve sell-out under existing and forecast market conditions. The 300 condominium units will require approximately 8.5 years to reach total sell-out.

Table 1 provides a summary of our estimated division and mid-point absorption of the residential components of the Kapalua Mauka development under the assumption all 690 current proposed units are constructed; if lesser numbers are built, the absorption period would decrease.

Economic Impact of the Subject Development[5]

If built to the densities proposed, the project will generate some $1.14 billion in direct, new capital investment and spending into the Maui economy over its first two decades of existence. The unique characteristics of Kapalua provide an economic opportunity that otherwise might not occur. The $470.8 million of direct construction costs which will be spent over a 14-year build-out period, averaging $33.6 million per year, represents an up to 19 percent increase in construction and supply business activity over recent levels. On a stabilized basis after completion, maintenance/renovation workers, clubhouse employees, condominium staff, and other on- and off-site

[5] All dollar amounts contained in this report are based on constant, uninflated mid-year 2001 dollars.

TABLE 1

SUMMARY OF SUBJECT INVENTORY ABSORPTION CONCLUSIONS
Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii
Using Mid-Point Absorption Estimates

Sales Year	Single Family Homesites	Multi-Family Units	Annual Homes/Units Sold	Cumulative Homes/Units Sold
1	20	25	45	45
2	25	30	55	100
3	30	35	65	165
4	35	35	70	235
5	35	35	70	305
6	35	40	75	380
7	35	40	75	455
8	35	40	75	530
9	35	20	55	585
10	35		35	620
11	35		35	655
12	35		35	690
Totals	390	300	690	

Source: The Hallstrom Group, Inc.

positions will provide $6.2 million in wages each year, and resident/guest users of the project will spend $49.4 million annually in the local market.

A total of 4,990 worker/years of direct on-site employment will be created during the 20-year construction and operation study timeframe, along with an additional 2,495 worker/years in associated and indirect off-site employment. In post-development years, the project will directly provide the stabilized equivalent of 226 on- and off-site positions. The average number of jobs in the construction phase will be about 438 per year, equivalent to a .58 percent increase in overall island employment, and could lower unemployment in the construction trades by half.

Further, unlike a hotel or large condominium project which provides work for large contractors for a brief period of years, Kapalua Mauka will generate work for a diverse group of smaller contractors and trade workers over an extended timeframe.

Employee wages of $291.6 million will be paid out during the initial 20-year development and operation period, with a high of $24.8 million in Year 8. Wages of $6.2 million annually are projected on a stabilized basis for maintenance/repair, condominium staff, clubhouse employees and other on- and off-site workers.

The full-time resident population at Kapalua Mauka is estimated to reach 341 persons, with a maximum of 17 school-aged children. Second home users and guests are expected to add a daily average of 499 persons to the community, resulting in a de facto population of 840 persons for the project. The discretionary expenditures by these individuals is expected to reach $49.4 million annually at build-out. The total household income of full-time residents is forecast to reach a stabilized level of $39.2 million per year.

The expenditure of employee wages, business profits, and resident/guest discretionary funds into the Maui market will enhance hundreds of additional off-site, secondary/indirect jobs on the island, and generate several million dollars in additional wages.

The total direct, local economic impact to Maui (dollars flowing into the island market) is estimated to be $1.14 billion during the two decade construction and operation study period, and stabilize at $64.2 million annually thereafter. As these dollars move through the island market, they will have a multiplier effect increasing the economic

impact of Kapalua Mauka to Maui during its first 20 years to some $2.29 billion.

Public Cost/Benefit of the Subject Development

The county of Maui will receive $72.9 million in real property tax receipts from the project over the 20-year study projection period, and an estimated $5.6 million per year thereafter. The county government operating costs associated with serving the subject, using a per capita basis, will total $18.9 million for the two decade timeframe, and be some $1.5 million on a stabilized basis. The county will enjoy a net revenue benefit (taxes less costs), totaling $53.9 million during the first 20 years of construction and use, and $4.1 million each year after build-out.

The State of Hawaii will also show a positive net revenue benefit from Kapalua Mauka. The total gross tax revenues during the two-decade period will reach $101.9 million from income and gross excise taxes, and will stabilize at $5.2 million annually following build-out. State costs associated with the project on a per capita basis will be $56.7 million during the projection timeframe and $4.4 million per year subsequently. The state will experience a net profit of $45.2 million in the 20 years and a stabilized benefit of $819,150 annually after build-out.

In no year does either the county or the state suffer a revenue shortfall due to the subject project.

OVERVIEW OF THE SUBJECT MARKET SECTOR

Island of Maui

Maui, the second largest island in the Hawaiian chain, lies midway between Oahu and Hawaii. The island is often called the "Valley Island," because of its valley-like central isthmus stretching between two mountain masses. The island measures 25 miles from north to south, a maximum 38 miles from east to west, and contains 728 total square miles. The western shores of the island of Maui include approximately 20 miles of clean, accessible, sandy beaches.

The Kapalua Mauka site is located in the northwesterly quadrant of the volcanic-created island, within the coastal corridor of the West Maui mountains, approximately 25 miles from the county seat, interisland airport and harbor facilities at Wailuku/Kahului. The area is generally referred to as "West Maui," or the Lahaina vacation community. The region historically was used for sugar cane and pineapple cultivation. Over the past three decades, the coastal corridor has evolved into a major vacation and commercial community, and one of the most extensively developed tourism locales in the state outside of Waikiki. The primary draws of the area to tourists are the numerous picturesque bays and beaches along the shoreline, and a superior climate--among the most favorable in the islands.

Wailuku, the historical hub of island business, is the seat of government for Maui County, which includes the major islands of Maui, Molokai, Lanai, and Kahoolawe. Adjacent is Kahului, the headquarters for HC&S, the world's largest sugar plantation (and only major surviving Hawaii sugar operation), and the site of the primary transshipment facilities at Kahului Harbor and Kahului Airport. The Wailuku/Kahului central windward area of the island is the focus for Maui industrial activity, and the employment and resident population centers of the county outside the destination resorts. Sugar production has traditionally been the island's base industry; however, with the closure of Wailuku Mill and Pioneer Mill (Lahaina), alternative agricultural, commercial, and residential opportunities for the land are being pursued, with the tourism-oriented businesses of the leeward side of the island (West and South Maui) coming to dominate the economy and job market.

According to the Year 2000 U.S. census, the county has a resident population of some 128,094 persons, more than double the 1980 total of 62,823, and equating to a compounded annual growth rate of 3.67 percent over the past two decades. Outside the Wailuku/Kahului urban enclave, Kihei and Lahaina are the largest settlements, both of which have undergone dramatic growth in recent decades due to tourism economic and land use demands.

Population projections completed as part of the most recent Maui Community Plan Update call for the present island population of circa 120,000 to increase by ten percent, reaching 131,884 persons, by the Year 2010 under some of the alternatives. Such expansion would equate to a compounded annual growth rate of 0.95 percent.

Most of this growth is forecast to occur in the three "major" *Community Plan* regions of the island--West Maui, Wailuku-Kahului, and Kihei-Makena (which includes the subject).

Attracted by a thriving tourism plant, some 38,000-plus non-residents additionally populate the island each day--about 40 percent (15,000) in the West Maui study corridor. The capital expenditures associated with the development and operation of visitor-oriented facilities and services now comprise some 70 percent of the total island economy, and has a ripple effect throughout all governmental and private finances.

Notwithstanding a few minor stagnant periods focused in several submarkets during the early 1980s and from 1991 through late 1994, the Maui economy has generally "boomed" over the last two decades, growing at a long-term rate which places it among the more vibrant regions in the country. As Oahu before it, the island has successfully been transformed from a simple agrarian-based structure to a diversified service model founded on a widely recognized and well-established tourism industry.

A summary of historic and projected population and economic indicators for Maui is displayed on Table 2.

From the mid-1980s through summer 1990, the demand for real property development had been near or at record levels in all sectors. Beginning at the end of that year, the market became subdued due to looming recession and war concerns. This downturn, which affected virtually every sector in the statewide real estate market lasted until the fourth quarter of 1994, at which time tourism and residential markets began showing the most initial signs of recovery. Regardless of the extended economic setback, which affected Maui to a far lesser degree than the other islands, the most sensitive community real property issue remains how to manage long-term growth while encouraging economic vitality.

Despite a surge of preliminary development approvals for projects in central and southerly/leeward Maui during the last years of the economic expansion period ending in 1990-91, the final approvals and construction process for many projects proposed in the late-1980s were slowed during the 1990s by recessionary concerns and elected officials stressing "reasonable growth" planning viewpoints.

TABLE 2

SUMMARY OF POPULATION AND ECONOMIC INDICATORS FOR ISLAND OF MAUI
Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii

	Historic				Projected	
	1970	1980	1990	2000	2005	2010
Resident Population						
Past Census Totals	40,895	62,823	91,361	118,794		
Compounded Annual Growth Rate	%	4.39%	3.82%	2.66%		
Series MK Projections (1)					124,900	136,200
Compounded Annual Growth Rate					1.51%	1.75%
Community Update Plan Program (2)					120,342	131,884
Compounded Annual Growth Rate					1.56%	1.85%
Island-Wide Economic Indicators						
Job Count (1,2)	18,120	31,250	50,400	67,150	73,000	79,550
% Average Annual Change	%	7.25%	6.13%	3.32%	1.74%	1.79%
Ratio to Population	44.31%	49.74%	55.17%	56.53%	60.66%	60.32%
Visitor Expenditures (3)	$54.5	$400.6	$2,023.0	$2,360.0	$2,750.0	$3,200.0
% Average Annual Change	%	63.50%	40.50%	1.67%	3.31%	3.27%
Per Capita Income	$3,897	$9,916	$17,103	$25,300	$29,250	$33,600
% Average Annual Change	%	15.45%	9.26%	3.24%	3.12%	2.97%

(1) Adjusted from "Total Maui County" data to exclude Molokai, Lanai and Kalawao.
(2) "Unconstrained Forecast" from Maui County Community Plan Update Program.
(3) In millions of dollars.

Source: DBED, Various, and The Hallstrom Group, Inc.

Only with the onset of widespread economic recovery on the island since 1997 has there been a resurgent effort to actualize these stagnant projects. Maui Lani, which opened its golf course (the Dunes) in 1998, is now in sale of the first three residential products, and the Wailea 670 and Kapalua Mauka project district developments are again being pursued. New subdivisions have also been undertaken within Wailea, Kaanapali and Kapalua Resorts, and in Makena and Kihei.

Apart from cyclical market trends, the primary brake on long-term general urban development on the island continues to be a lack of fully approved lands and sufficient in-place supporting infrastructure. Politically and financially stressed governmental agencies are under pressure to require developer-financed improvements, collective contributions and other community benefits as a function of the approval process.

Even in the midst of the major stagnation experienced by the high-profile South and West Maui visitor-oriented and bulk acreage markets from 1991 through 1994, the Maui industrial and residential real estate sectors continued relatively upbeat.

Several central/windward subdivisions and multi-family projects early in the decade received hundreds of pre-sale applicants (indicative of the chronic housing shortage on the island), and Class A space at the Millyard, Piilani Business Park, and Maui Research and Technology Park also showed favorable acceptance. All sectors slowed by late 1992 and stayed subdued until beginning to show small signs of improvement in 1994-95.

Market activity continued gaining momentum over the next three years, but with no meaningful price appreciation evident. Significant upward movement in the residential sector began by late 1998, within available inventory being absorbed and prices increasing. The commercial and development site sectors are also starting to show signs of increasing activity, but widespread appreciation is not yet evident. Generally the upcycle has gained momentum over the last two years.

Vast potentially habitable areas of the island and significant water resources have historically been devoted to sugar cane cultivation. Until the past decade, the long-term viability of the sugar industry was unquestioned, and the business remained a major employer and tax payer. As a result, cane land was re-classified for alternative (urban) uses only after lengthy public agency reviews and negotiation with unions.

The impact of this policy, in the face of unmet resident housing needs and off-island capital driven, visitor-oriented land use demands, was large-scale appreciation in real estate prices (due to limited supply) and major dysfunction in the residential sector since the early 1970s.

Maui boasts the world's largest sugar plantation, which apparently remains economically productive and viable. However, there has been a shrinking of the Maui sugar industry over the past 15 years, with the recent closure of Pioneer Mill and associated plantation (Lahaina) and the Paia Mill, indicative of the industry's collapse. Alternative agricultural and mixed-urban uses for large tracts of land are the source of public debate. Diversified crops (macadamia nut, coffee, cocoa, floral products and others) are viewed as potential sources of agricultural land use and employment. Yet, developing consistent yields, secure markets and product acceptance requires many years; and absorption of sugar lands by other crops has proceeded slowly. Over the long term on a per acre basis, diversified crops offer significantly more employment and return potentials than sugar, benefit more from the Hawaii "name," and are less prone to outside destabilization. But it will take generations to absorb the vast plantation lands by alternative agricultural products.

Lack of an adequate worker pool, not employment opportunities, is a secondary limiting factor in the long-term Maui economy. The county has had one of the lowest unemployment rates in the nation, ranging from 2.2 to 8.5 percent over the last 20 years, and one of the highest incidence of multi-job workers. From the mid-1990s through 1998, unemployment was above six percent, dropping to 5.7 and 4.2 percent, respectively, in 1999 and 2000. The on-set of substantial economic growth over the past two years, much a result of a surging visitor industry, has again pushed the unemployment rate downward with it standing at 4.2 in August 2001. Development envisioned over the next decade could outstrip the potential employee base unless new housing opportunities (and underlying sites) are made available for quality, affordable unit construction.

The evident movement from "rapid" to "slow" growth stances in the community in the past several years is the latest continuation of a periodic cycle dating back to the "discovery" of Maui by tourists in the early 1970s. Since that time, economic considerations have driven the conflict.

In heated economic periods (such as the late 1970s and late 1980s), rapid development, low unemployment, and large in-migration fuels slow growth sentiment. Conversely, during recessionary episodes, as the job market weakens and capital investment wanes, the community has shown greater support for further and expedited growth.

Overall, we remain optimistic as to the extended prospects for the Maui economy and resident population base, with a generally sustained growth forecast over the next two decades (though moderate by historic standards).

The investment value represented by the existing resort, industrial, commercial and residential components of the real estate market is many billions of dollars, and serves as a strong foundation for the island's economy far exceeding the other neighbor islands and most tropical resort locales around the world. Maui has had the highest visitor satisfaction index of any major destination worldwide in recent years, and has been voted "America's favorite island" by numerous surveys. The island is continuing to be successful in its transition from an agrarian to urban economy and land use structure, and is attracting large numbers of entrepreneurs and new investment capital.

Base historical indicators support long-term conclusions favoring a vital and growing Maui economy, founded on a superior natural appearance and attraction which portends well for future growth.

Regional Description - The Lahaina District (West Maui)

Historically acclaimed as the playground of Hawaiian Alii (royalty), and westernized during the boisterous whaling days of the 1880s, the leeward coast of Maui is once again undergoing significant change. During the past three decades, the 40 mile oceanfront corridor stretching from Makena to Kapalua, encompassing Lahaina and the Kapalua, Kaanapali Beach, Wailea and Makena resorts, has been transformed from sleepy villages surrounded by sugarcane fields and livestock range to one of the world's most successful vacation areas--all resulting from the influx of tourist and investor capital.

The subject property is prominently located at the northerly end of this corridor.

The Lahaina District, comprising West Maui, is among the more heavily urbanized neighbor island communities. As shown on the chart below, the resident population of the study area has tripled during the last 30 years, and residential numbers would be significantly higher were sufficient product made available.

RESIDENT POPULATION OF LAHAINA DISTRICT (1)
1970 to 2000

Year	Residents	% Change (2)
1970	5,524	--
1980	10,284	6.41
1990	14,574	3.55
2000	17,798	2.02

(1) U.S. Census Bureau data. Lahaina District is comprised of Lahaina, Napali-Honokowai, Kaanapali and Kapalua CDPs.
(2) Compounded annual growth rate during each decade.

Recently released United States Census Bureau statistics for Maui County and the four CDPs in West Maui are contained in Addenda Exhibit 1 (**Table DP-1 - Profile of General Demographic Characteristics: 2000**). Over the past three decades, the compounded annual growth rate of the district has been at 3.98 percent.

Surveys have estimated that upwards of an additional 2,500 Maui residents would relocate to the area if housing, traffic and infrastructure problems were addressed.

Equally impressive has been the growth in the de facto population (including tourists) during the same period which expanded by more than 40 percent from 1980 through 2000, after increasing by nearly 300 percent over the previous decade. Last year, there are an average of about 15,000 visitors in West Maui each day, housed in some 9,500 hotel and condominium units, and directly creating demand for some 820,000 square feet of retail, restaurant and service businesses (excluding hotel commercial space).

While the first eight months of 2001 did not provide a continuation of the upcycle, it has been generally favorable nonetheless. According to PKF Hawaii, Maui occupancy rates were down less than one point from August 2000 (the smallest decline among the major islands in the state), and average rates were up a strong 8.61 percent to $223.20 nightly, best in the islands. Arrivals were down less than one percent

to West Maui through summer, but this factor was offset by extending length of visitor days and continuing strong spending. Regardless of any short-term concerns as of the study date, the effects of the pre-September 11, 2001 recession elsewhere had been nominalized and long-term prospects for West Maui are favorable.

The ten mile urban strand stretching close by the coastline from Puamana through Kapalua has been the economic engine which changed Maui from an isolated agrarian community to a world renown vacation destination boasting the finest in tourism infrastructure. While extensive quality development in the Kihei-Makena corridor in the 1980s placed that region in a competitive position with greater Lahaina, the South Maui area lacks the history and charm of West Maui.

Despite having very limited lands designated for urban uses, with agricultural and conservation holdings still dominating the land base, the subject region houses nearly one-quarter of all Maui jobs, generates upwards of $3 billion in economic activity annually, represents almost 30 percent of the island tax base, and more than 20 percent of countywide assessed real property value. More than 1,500 acres of the urban lands in the district remain undeveloped according to mid-decade county-sponsored studies, but infrastructure systems, traffic issues and Hawaiian ownership claims have limited inventory development.

With the sugar industry in the region now defunct, after years of declining importance, tourism dollars have made the entire Lahaina District virtually a single integrated destination project. Despite on-going efforts to plant some 1,500 acres of ex-sugar fields with pineapple crops, the region has inescapably moved further away from its historical standing as an outlying residential community supporting plantations.

This conflict between visitor and resident uses over a very limited available land base has created a dysfunctional real estate market, with tourist-oriented dollars overwhelming the local population. Property and finished unit prices have escalated over the past two decades with development and infrastructure priorities being dictated by off-shore investment; currently dominated by mainland (primarily West Coast) interests.

There is no doubt, the resident population in West Maui would be higher were it not for the competition in residential housing units between full-time resident and transient visitor demand. However, for a variety of reasons, including land costs, lack of infrastructure and community concerns, previous county administrations have restrained Lahaina growth in favor of increasing Wailuku, Kahului and Kihei populations.

Yet, the additional numbers of workers West Maui will require during the next two decades, the continuing decline of the sugar industry, and a heavily over-burdened transportation system leading into the area, require a change of planning directions. State, county and private planners now call for housing demands created by regional economic activity in West Maui to be met "in-district" instead of moving demand elsewhere on the island and generating further traffic congestion. While extensive plans have been forwarded by major private and public landowners over the past 15-plus years, as at Puukolii Villages, the Villages at Leialii (DHHL), and on other public and private holdings mauka of Lahaina, they have yet to provide inventory to meet demand. Given the lack of activity in these large-scale proposed developments over the past decade, they are unlikely to provide meaningful product in the near to mid-term. Smaller subdivisions and projects have been pursued elsewhere to address needs, but have had limited impact.

The proposed expansion areas of the Kaanapali Beach Resort will directly provide more than 4,000 new permanent employment opportunities, and additions to Kapalua Resort will add another several hundred. Most all of these jobs will be primarily filled by existing trade workers, and island residents coming of working age.

Many existing island residents would live in the highly desirable West Maui area regardless of their employment location, if sufficient housing were available and transportation issues were addressed.

The state has steadily expanded Honoapiilani Highway to four lanes in Lahaina and Kaanapali, and engineering for a mauka bypass highway continues to progress. Detailed discussions of transportation issues affecting the West Maui region and proposed subject development have been prepared by others.

As part of the periodic West Maui Community Plan Update analyses undertaken by Community Resources Inc. (in conjunction with others), development and employment models were constructed for use in projecting land use needs in the Lahaina District from 1990 to 2010 (and beyond). Their estimates called for upwards of 22,000

residents, 19,500 total jobs and 12,500 visitor units in the region by 2010.

Private estimates prepared based on maximum potential scenarios project the resident Lahaina District population could reach up to 35,000 by the Year 2020, nearly double the existing total, if unencumbered by infrastructure and land use shortages.

Historic and projected population and economic indicators for the Lahaina District (West Maui) statistics displayed on Table 3.

The West Maui region has among the most extensive visitor plant among the non-Waikiki locales, and is developed with quality restaurant, retail, recreational, and resort facilities. While areas adjacent to Kaanapali Beach Resort and Lahaina have become more urbanized in character, Kapalua Resort has maintained a low density rural master plan, more in keeping with the West Maui traditional standing as a relaxed vacation area.

The anchor destination developments are the Kaanapali Beach and Kapalua Resorts, two of the state's more desirable master-planned vacation communities. Freestanding condominium and single-family units line the six mile coastal strip between the projects.

Currently, more than 5,200 Maui residents are employed at Kaanapali Beach hotels, shops, restaurants, and service centers. The Kapalua Resort presently has about 1,400 employees.

In summary, the Lahaina District is within the second generational phase of urbanization; continuing its transition from an agricultural-based economy into an intensive destination/residential community. Foundational economic assets are in place to support demand, and the historically tight leash on mauka land development will likely be loosened over the long term.

Large agricultural/rural lots are being subdivided from the mauka feral cane lands at Launiupoko, and are being considered elsewhere. While regional diversified agriculture is still in its infancy and has questionable near- to mid-term viability, such rural developments do provide potentials for future cultivation and a limited agricultural resurgence.

Despite the minor economic downturn over the first two quarters of 2001, the West Maui real estate market remains in a generally positive condition, with highly favorable long-term prospects regardless of near-term infrastructure and land use concerns. It is widely considered as one of the world's foremost vacation areas, achieving exceptionally high room rates and occupancy levels, and would be a favored residential location were inventory made available. Demand for commercial, industrial, resort and residential land has shown substantial recovery after the early to mid-1990s downturn. Recently introduced light industrial/business lots in north Lahaina have been well received. The indicators achieved over the past two decades must be considered as indicative of the favorable long-term supply/demand quotient for real estate in the district.

The actual and perceived desirability of West Maui among visitors, residents and investors is strong, leading to a more intensive and stable economy than any other neighbor island district; approached only by West Hawaii.

Neighborhood Description - Kapalua Resort

Offering an exclusive and secluded environment of 750 acres surrounded by more than 23,000 acres of cultivated pineapple fields, Kapalua Resort was opened in 1975, a project of the Maui Land and Pineapple Company. The intent of the master-planned community was to provide a luxurious atmosphere removed from the increasingly congested greater Lahaina-Kaanapali area. In most respects, the quality of design and improvements has achieved those aims. The resort orients its marketing programs towards the upper-income traveler and second home investor.

Due to the vast surrounding holdings of its parent company, the resort (though having intense development adjacent southerly) is assured of maintaining its exclusivity and degree of isolation relative to most West Maui properties.

Located at the northerly leeward extreme of West Maui, the project is susceptible to periodic strong winds, and a generally wetter climate than the Kaanapali Resort, which is approximately five miles south along Honoapiilani Highway. The property is developed on the slopes and rolling coastal plane of the West Maui mountain foothills, with the shoreline areas being rock outcroppings studded with picturesque bays.

To date, improvements include two luxury-class hotels containing 644 total rooms, four condominium projects housing a total of 528 finished

TABLE 3

SUMMARY OF POPULATION AND ECONOMIC INDICATORS FOR LAHAINA DISTRICT
Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii

	Historic				Projected	
	1970	1980	1990	2000	2005	2010 (1)
Resident Population						
Past Census Totals	5,524	10,284	14,574	17,798		
Compounded Annual Growth Rate	%	6.41%	3.55%	2.02%		
Community Update Plan Program (1)					20,337	22,633
Compounded Annual Growth Rate					2.70%	2.16%
The Hallstrom Group Forecasts						
Maximum					20,500	22,500
Compounded Annual Growth Rate					[illegible]	[illegible]
Minimum					22,000	25,000
Compounded Annual Growth Rate					4.33%	2.59%
Regional Economic Indicators						
Estimated Job Count	3,500	9,875	14,731	16,400	17,680	19,500
% Average Annual Change	%	18.21%	4.92%	1.13%	1.56%	2.06%
Ratio to Population	63.36%	96.02%	101.08%	92.15%	86.24%	86.67%
Visitor Units	2,700	7,100	9,400	9,600	11,000	12,500
% Average Annual Change	%	16.30%	3.24%	0.21%	2.92%	2.73%
Daily Visitor Count	3,562	10,577	13,912	15,139	16,280	18,500
% Average Annual Change	%	19.69%	3.15%	0.88%	1.51%	2.73%
Annual Visitor Expenditures	$61,106,110	$386,060,500	$863,239,600	$1,243,306,800	$1,574,683,000	$2,194,562,500
% Average Annual Change	%	53.18%	12.36%	4.40%	5.33%	7.87%
Commercial/Industrial Space (2)	155,000	360,000	675,000	850,000	1,000,000	1,200,000
% Average Annual Change	%	13.23%	8.75%	2.59%	3.53%	4.00%

(1) "Unconstrained Forecast" from Maui County Community Plan Update Program.
(2) Estimated square footage for free-standing space outside hotels.

Source: DBED, Various, and The Hallstrom Group, Inc.

units, three exceptionally scenic 18-hole champion golf courses, 190 single-family lots, a ten court tennis garden, a 22,000-square-foot (gross leaseable area) shopping village, and several freestanding retail and restaurant buildings.

In order to insure its ambience, the resort is not seeking to achieve the density levels of Kaanapali or other West Maui properties, and is an example of a low-key or conservative resort more closely related to upscale West Hawaii resort master plans.

Ocean Frontage -- The resort enjoys shoreline along two excellent beaches, Kapalua Bay and D.T. Fleming Park, as well as strands in Oneloa Bay and other scattered areas. The focal beach of the resort is Kapalua Bay.

The Kapalua Bay beachfront, southerly adjacent to the existing hotel, is representative of the finest beaches in Maui, and experiences minimal wave action or currents, except during severe winter storms. As a popular public park, the beach area is subject to periodic congestion. The hotel has croquet courts and provides clinics in sailing, snorkeling, scuba, and windsurfing. The clarity of water in the bay typically approaches 100 feet visibility, and some fine diving grounds are within the resort. A complete line of ocean activities equipment is also made available at a charge.

D.T. Fleming Park (on the shores of Honokahua Bay) is also a superior white-sand beach, although mainly of an alluvial type (as opposed to the coral variety of Kapalua Bay). There are no significant off-shore coral reefs fronting the beach, however, excellent examples are situated along the headlands at either side of the bay. Because of this trait, and its northerly exposure, the beach is subject to extreme surf conditions during the winter (and periodically other) months. The area offers superior bathing potentials during most of the year. The Ritz Carlton Hotel offers beach activities on this popular beach, including volleyball and ocean sports.

The remainder of the resort ocean frontage is extremely rocky, with sea cliffs in some places in excess of 80 feet. The promontories permit excellent views for several of the condominium projects and the hotel. However, the shoreline is basically inaccessible except via a stairway fronting the Bay Villas, and a pathway near the Ironwoods condominium.

Climate -- Due to its more northerly location than Kaanapali Beach, the Kapalua Resort is subject to more frequent tradewind and stormy conditions, and slightly lower average temperatures than its southern neighbor. Yet, the climate is still generally good to superior, with many qualities (cool, low humidity, morning sun) that upper-income travelers typically find desirable.

View Planes -- The ocean views from the Kapalua resort are among the most desirable in the state. In addition to the makai scenes of the oceanfront bays and beaches, Molokai and Lanai Islands form a backdrop across the "Lahaina Roads" channels.

The mauka panoramas from Kapalua are substantially better than at most Hawaii resort developments, with the expansive pineapple fields and lush upper slopes of the West Maui mountains visible from many interior parcels.

Topography/Size -- The sloping topography of the resort is generally favorable, permitting ocean views from nearly all mauka locations. The shoreline bluffs permit a variety of view planes and design types.

The underlying geology is of volcanic ash, rock and organic media, sufficient in depth to permit extensive landscaping and golf courses without need to import soil.

Even with the low-key development thrust of the community, the existing 750 makai acres zoned for resort acreage appears sufficient for the initial development of an oceanfront resort. With Maui Land and Pineapple having extensive holdings surrounding Kapalua, including the subject lands, cohesive expansion could easily be undertaken. Of significant note, is that as a low-key luxury-oriented project, the critical mass level is different from that within an upscale resort such as Kaanapali, which is dependent upon greater numbers of guests and having a different marketing philosophy.

Archaeological/Other Points of Interest -- The most significant archaeological sites preserved within the existing resort development are the ancient Hawaiian burial grounds located on the headland between Oneloa and Makaluapuna Bays. Another point of interest is a small wooden missionary church located mauka adjacent to D.T. Fleming Beach Park.

Transportation/Access -- Being situated at the extreme end of Honoapiilani Highway, Kapalua has often congested access traits as evident throughout West Maui. Although, being at the proverbial end of the road, it has substantially less traffic congestion in the immediate vicinity.

THE PROPOSED KAPALUA MAUKA COMMUNITY

Site Description

The proposed subject development will encompass some 925 acres located in the northwest corner of the island of Maui, approximately 25 miles from the county seat at Wailuku. The triangular-shaped holding stretches upslope from Honoapiilani Highway, at circa the 100 foot elevation, nearly two miles to the 1,250-foot elevation. The property has about one mile of frontage along the highway.

The terrain of the site is an undulating land form created by the moderate downhill slope being cut by two major gulches. The result is a series of plateaus, upon which the majority of development will occur, rising above densely forested ravines.

The topography provides for extensive quality view planes both near and far; makai across the lower resort lands to the shoreline and ocean (Honokahua Bay and Paililo Channel), and mauka to the upper northerly slopes and conservation areas of the West Maui Mountains. Those areas of the site lacking a panoramic view will enjoy territorial scenes of lush growth.

Sixteen holes of the Village Golf Course are located on the subject, with the circuit beginning and ending at the clubhouse which is located on the makai side of the highway. The central and westerly plateaus are in pineapple production, and the rest of the site is forested.

The climate on the property is good to excellent, cooler and less humid then along the shoreline, with the terrain and vegetation helping to deflect the tradewinds which often sweep through the area. The upper elevations of the property are slightly wetter, though the rainfall difference is generally insignificant. It is the type of climate which embodies the typical off-water characteristics of Hawaii, and is well suited for full-time residents and second home purchasers who are the likely purchasers of the finished inventory.

To the west of the property are cultivated pineapple fields, feral lands and forest. To the east is the Kapalua Plantation development (golf course and large lot upscale homes). Mauka of the holding are pineapple fields and forest lands, and makai is the highway and oceanfront phase of Kapalua Resort.

The holding is the natural expansion area for the Kapalua Resort, the makai area of which is nearing build-out. It possesses the physical, climatic, view and proximity traits necessary to be competitive in the resort/residential sector.

Proposed Development

The proposed project would contain a series of single-family and multi-family development sites within designated urban, agricultural and rural zones of the holding.

The multi-family units, with many likely to be built as detached townhouse and patio home-style units are to be sited in the central/makai "core" area of the property. Project densities will likely range from three to ten units per acre, with an average of five per acre over the 60 net acres of parcels.

The single-family homesites will have average "urban" densities of up to 2.5 lots per acre and average "rural" levels at up to 0.85 lots per acre; averaging 1.42 building sites per acre, well below the intensities of virtually all other subdivisions in West Maui. The lots will surround the central golf course and multi-family components, and extend upslope. They will provide transitional use between the makai resort, highway and central project core and the up-mountain agricultural lands, and conservation districts.

Most of the homes, units and clubhouse will be accessed via an elongated U-shaped central roadway that intersects with the highway at either end. The main entrance will be an extension of Office Road, which is located near the center of the site's Honoapiilani Highway frontage. The primary arterial roadway will proceed mauka through the village core, running upslope, before running to makai and returning to the highway at the westerly edge of the site.

The rural section of the master plan at the easterly edge of the property will have a separate access road extending upslope from the highway, serving only the larger-size lots in the area.

Unlike many upscale resort/residential projects which are "members only" or gated to the general public, the current master plan provides for public access. This will allow Maui residents to visit upland/forest lands previously off-limits.

At completion, there will be up to a total of 25 golf holes on the property (linking to two holes makai of the highway), with about 434 total acres of golf course, open space, roadways and park land. The currently proposed master plan provides for the following uses and densities:

SUMMARY OF PROPOSED KAPALUA MAUKA MASTER PLAN		
Use	Acres	No. of Units
Golf Course, Open Space and Roadways	300	25 Holes
Clubhouse (Commercial)	5	25,000 Sq. Ft.
Parks/Open Space/Buffer	134	--
Single-Family Residential	85	208 Lots
Multi-Family Residential	60	300 Units
Rural Residential	341	182 Lots
Totals	925	690 Lots/Units
Overall Residential Site Density		1.42 Units Per Acre
Overall Project Area Density		0.75 Units Per Acre

Master plans invariably adapt in response to market trends during their implementation over a several decade period, and resorts typically do not build to full maximum densities. The revised version of the Project District 2/Kapalua Mauka master plan analyzed in this study reflects such evolutionary trends by decreasing the total number of units, lowering densities throughout, and providing large rural lots as a transition product leading into the upland, agricultural lands and forests.

Although final lot subdivision plans have not been completed as of the report date, we estimate that up to approximately 40 to 60 percent of the urban single-family homesites will have golf course frontage, as will more than half percent of the multi-family projects. Virtually all of the inventory will have expansive view panoramas.

The five-acre "secondary" clubhouse will serve as the focal point of the community, being at the core of the village and serving as the hub for access roadways and the limited on-site resident and guest activities. It is not anticipated the clubhouse would draw substantial numbers of non-golfers or non-resident/guests.

Master Plan Analysis

The current master plan for the Kapalua Mauka development will maximize the potential market penetration for the property by increasing product diversity. It is consistent with modern resort planning objectives, will provide a competitive environment for the finished inventory, and will serve as a natural, and needed foundation for land use transition from more intense mauka resort areas to low density rural and agricultural uses. In this regard, the project can serve as a trend-setter for West Maui which is typified by the need for transitional uses between makai urbanization and mauka reserves. Among the other features we consider most relevant from a market perspective:

- The golf courses and open spaces are integrated into the design as to maximize the frontage offered to abutting developable residential sites. This promotes a low density ambience, feelings of greater exclusivity and security, enhances view potentials, and helps achieve higher market acceptance. The courses also provide a greenbelt along the highway frontage throughout the community, a favorable street appeal and planning characteristic.

  Further, the golf holes are equitably divided between side hill and up/down slope layouts, contributing to the competitiveness and playability of the courses. The central location of the clubhouse will provide both an "anchor" for the community and easy access for residents and guests.

- The elongated residential pods will work in concert with the golf course design to maximize frontage and view characteristics, and also serve to limit the number of interior lots. The limited size of the pods will promote a variety of exclusive intimate subdivisions or developments, a marketing benefit, and an asset in construction efforts.

Having individualized projects will also decrease the economic exposure of the developers; as during slow periods, the amount of inventory overhang can be more readily controlled.

- The most intensive multi-family sites are focused around or proximate to the clubhouse, where these facilities can readily service the greatest number of individuals and create a desired (though contained) level of synergy.

The Kapalua Mauka master plan is an appropriate use of the subject property from a market demand and economic acceptance perspective based on a variety of criteria, including:

- It will convert economically, minimally productive and generally inaccessible agricultural and forested holding into an ungated, integrated development which will help in meeting quantified resort/residential and recreational needs in the region, while providing a lucrative economic stimulus to the island.

- It is within and consistent with the urban node encompassing the greater Kapalua destination resort and its less intensive, more rural character will provide a desirable transition from the existing Kapalua resort project to the upslope forest areas.

- The master plan of the development is well suited for the climate of the site, and will serve to attract second-home owners, residents, retirees, and investors which are traditionally drawn to the cooler elevations above near-ocean projects, and who are anticipated to comprise the significant portion of purchaser interest.

- The site has favorable frontage/exposure traits along Honoapiilani Highway, with relative ease of access to vital supporting facilities in Napili, Honokowai, Kaanapali and Lahaina, and is nearby the resort service and employment centers.

- Superior ocean, sunset and upslope panoramas would be available for most properties in the Kapalua Mauka

development, a highly desirable asset in the regional market.

- The subject will help fill a market niche (quality resort/residential homes and units) which we believe will be under-serviced in West Maui during the near and long term. A diversity of residential inventory is vital to a stable regional market.

- The large rural lots will provide product for which there is an emerging market demand, is in keeping with community desires to lessen upslope densities, and preserve potential agricultural uses over the long term.

- The majority of the low density, multi-family units will be constructed as "condominium residences" that are detached or constructed in smaller multi-plex buildings (four units or less).

- The lowered intensity of the revised development will maintain the integrity of the Kapalua resort community.

While reconciliation of the subject design with expressed land use guidelines is primarily the concern of others in the subject planning process, several market-based considerations are of note:

- A highway corridor inevitably invites urban development along its frontages, often of a high-intensity type intended to maximize exposure characteristics. The subject project will be markedly non-intensive, with golf holes and greenbelts fronting the right of way; a feature lacking along the substantial length of Honoapiilani Highway.

- The site (Project District No. 2) has long been planned for development with a total of 750 units, equivalent to a relatively low density of only 1.66 units per acre. The revised plan lowers the intensity even further, dropping the number of units by 60 (or 8.0 percent) and decreasing total project density to .75 units per acre (a decline of more than 50 percent).

- The proposed project will allow an effective expansion of the Kapalua Resort community, which is vital to the economic welfare of the West Maui region. Without this expansion acreage, the resort will have no further lands to develop in order to attract further residents/guests and their associated capital. Any alternative urbanized use of the subject property may prove nonhomogeneous with the existing resort and fail to enhance its standing.

THE RESORT/RESIDENTIAL CONDOMINIUM MARKET

Prior to last decade, condominiums were the focal point of resort/residential development on the neighbor islands. At times, particularly in the late 1970s, the market has become so heated the sector moved from the real property to the pure commodity realm, with pre-selling units being sold by lottery and reservation rights heavily traded.

Large, dense oceanfront projects were the norm (particularly in West Maui), with a major attraction for the investor/buyer being intense transient rental pool operations within the projects. These operations effectively transformed the development into a "hotel," a move which revolutionized the neighbor island lodging industry.

Rental pools typically offered a significantly greater return to the unit purchaser than long-term tenant leasing, and increased the exposure of the unit to potential re-sale investors.

Before the late 1980s, units solely for "second home" ownership were a rarity, and full-time resident owners almost non-existent. Despite their claims to "luxury," most condominium units were standard, intense visitor-oriented projects, that did not attract the full upper-end of the market, and few buyers wanted to be living in a virtual hotel situation, and many seemed to need the rental income to off-set debt service.

Only a select few in-resort projects, initially at Wailea and Kapalua then later on the Kohala Coast, offered the low-key, exclusive setting appealing to upper-income purchasers not driven by transient rental prospects.

For a variety of recessionary and tax reasons, the resort/residential condominium market slumped early in the 1980s. Spurred by the general hyper-activity in the real estate market late in the decade, the sector began to recover albeit in a markedly different form. Resort development became focused away from multi-family towards hotel, golf and (particularly) single-family projects.

Although some projects attempted to reach the higher-end purchasers by building larger, better finished "residences" within lower density projects (10 to 20 per acre) outside the standard "box car", hotel-feel concept, not all attempts were successful, particularly at the less competitive destination communities. The surge in Japanese investment late in the 1980s spurred acceptance for a period, and the number of units controlled by second (or third) home purchasers, meaning they were typically vacant and not in a rental pool, increased.

Partially from the enhanced quality/style of the units, and mostly from the vast pool of Asian capital, condominiums were beginning to evolve into a competitive project for single-family resort homes. While not experiencing the "feeding frenzy" demand of the late 1970s, the sector was nonetheless vibrant by the end of the up-cycle in 1988-90, with average prices at record highs, the quality of inventory at unmatched levels, and developer and purchase interest strong.

However, as with all sectors of the resort-oriented market, sales activity for condominium units dropped dramatically beginning in late 1990. Sales within the major resorts dropped by 75 percent from the peak of 1989 to the depth of 1992. Among the projects considered most competitive with the subject, sales dropped from 348 units (new and resale) in 1989 to only 86 in 1992. Among lesser quality or more poorly located products, many units were sold/leased for full-time, local residential housing, a further sign of a stumbling sector. The trend paralleled the movement seen within all resort-oriented markets during the some "bubble-bursting period, echoing the similar collapse of the sector in 1980-1981.

Recovery was slow in the sector until the late 1990s, then stimulated by an increasingly healthy visitor market, the absorption of overhanging inventory, the development of diverse new product, and a flood of western U.S. purchasers seeking "ultra-luxury" units in low-intensity golf-oriented resorts. By 1996, sales had doubled from four years earlier, but were still only half of the late 1980s.

The 1997 Asian economic crises caused sales to slump by 10 to 20 percent during that year, but activity rebounded strongly with 1998 through 2000 being the best period in a decade. At the resorts most competitive with the subject, sales again moved above the 300 units per year mark. The slowdown of recent months has depressed resale activities by upwards of 30 percent in some projects, and through August, the neighbor island resort condominium sector was on a pace for about 525 to 575 total sales (new and resales), or down about 20 percent from 2000. The upper-end "new" unit market does not appear to be as heavily impacted, with many pre-sale programs (such as the Uplands of Mauna Kea and Waiulu Villas at Hualalai) continuing to enjoy vibrant demand.

Overall the resort condominium market has historically been among the most cyclical in the state, with high demand and appreciation periods mixed with steep activity decline and soft price periods in a pattern stretching over six to ten years. Timing of inventory development has been the crucial factor in achieving rapid absorption. As such, it is essential to consider both near- and extended-term indicators when assessing demand for a project.

With most prime oceanfront in-resort sites developed, and others hampered by nearby intensive hotel development (considered as detrimental by many in today's market), resort condominium development has meaningfully evolved.

Whether called "condominium residences," "villas" or "detached town homes," the movement to smaller, low density, high amenitied, membership/resort privilege projects have moved to the forefront of the sector. The units range from multi-plexes (up to four units) to virtual single-family homes, built with central architectural designs, features, amenities, theme and exclusivity. Successful examples include all five of the projects (totaling 80 units) at Hualalai; the Uplands at Mauna Kea, a 57-unit community with duplex and single-family units; Coconut Grove at Kapalua Bay with 36 units in nine oceanfront buildings; and The Vintage at Kaanapali, a 73-unit detached condominium development. Prices for these units range from $925,000 to $2,300,000.

Many new projects are also adopting this concept, with several (such as Makena Place and Maluhia at Wailea) pushing the envelope even further towards single-family type development. Other "condominium residence" units are proposed or under construction at Kaanapali (The Summit), Waikoloa Beach (Kamalani Villas) and elsewhere. For off-

water multi-family sites, spacious residences not mere "units," featuring exclusive secure environments at the interior of resorts, fronting the golf course and having desirable views, are now the dominant design type.

This is keeping with changes in the buyer preference profiles. Rather than mere investors, most in-resort purchasers are now upper-income buyers not dependent upon unit rental income. Demographics have moved strongly towards second-home users, full-time residents, retirees, or other often childless households, who favor a low-key setting, a full-range of recreational amenities, more expansive landscaped grounds, and exclusivity apart from intensive transient populations.

While buyers are seeking access to the benefits of a resort, they do not wish to be constantly immersed in a dense resort atmosphere.

Retiree/senior purchasers are also moving strongly into the Hawaii resort/residential condominium market, particularly in older, less expensive projects. Historically this group has not been well represented in the state due to the lack of available services in/near resort communities (primarily geriatric-oriented medical facilities), the distance from mainland families, and the high cost of the island lifestyle.

However, with the slump in real estate prices during this decade, increased service development near many resort projects, and the familiarity of travelers with Hawaii, the number of retirees who are purchasing units is on the increase, and they represent a large scarcely tapped sector. Most of these buyers, from the West Coast, have been visiting the state for several decades (often with their children) and are middle to upper-income households.

They now represent a significant share of purchasers at Keauhou, Kaanapali Beach and Princeville.

In essence, the condominium purchaser of today is seeking the "feel" of a single-family residence for personal lifestyle gratification, not the "hotel" sought by buyers of years past for income return potentials.

Some of these newer generation projects have developed secondary rental pool operations. Generally, they are without or have a minimal front desk (often being administered from off-site) and with multi-day minimum stay requirements. Overall, they are conducted in an inconspicuous manner.

Without exception, all of the neighbor island in-resort condominium projects developed over the last 12 years have been designed in adherence to the low-key, residential-feel concept, a trend we anticipate to continue. In the newer projects, densities are at four to ten units per acre (instead of the 15 to 20-plus units per acre of prior developments).

A model site for such a resort/residential condominium development would have shoreline or golf course frontage, superior views, spacious units (averaging upwards to 1,600 square feet), sufficient size to permit amenity development in an unintensive setting, access to resort facilities, and an exclusive/secure environment. The units would be detached one or two-story townhouses, or built in duplex or four-plex buildings. The finish would be at or near the highest quality.

The proposed Kapalua Mauka multi-family component will embody these characteristics, and many are expected to be detached units.

The ability to recognize and adapt to ever-changing design requirements, and capitalize on positive timing in the market, have emerged as the two primary factors in successful condominium development. The revisions to the subject master plan in recent years is reflective of these market characteristics. And it is assumed further, future revisions may be needed to stay atop the market.

A total of some 7,100 condominium units have been offered in the major destination resort projects statewide to date. Within the resorts considered directly competitive with the subject property, there have been 2,285 total units constructed.

By early 1991, there were virtually no unsold units in any existing inventory or in projects then being marketed on a pre-sale basis. However, during the subsequent recession, the under-construction projects suffered significant fall-out among buyers having reservations in escrow, and numerous units (notably at Waikoloa Beach, Mauna Lani, and Keauhou) were completed but then stood vacant and unsold. Over the past five years nearly all of these units were either sold (at reduced prices) or absorbed in blocks for timeshare or transient uses. The overhanging supply has now been absorbed.

Generally, resort condominium units are among the highest-priced in the state, with recent "original" selling prices ranging from $318,000 to $2,500,000 (Coconut Grove at Kapalua Bay), and recent resale prices as high as $4,200,000 (Wailea Point Village). The reason for the higher-than-average prices obtainable in resort communities are two-fold: being in a resort, the project is better located with more proximate amenities and more homogeneous development types adjacent (relative to non-resort "strip" construction); and, destination resorts typically have higher standards (and restrictions) regarding improvements design and densities. The selling price disparity between physically comparable units within and outside a resort complex can be as much as $300,000 (or more).

The term "luxury" in regard to Hawaii condominiums had lost much of its credibility becoming a marketing catch-word for many overpriced units. The word began taking on a new definition with the recently constructed and proposed projects at Hualalai, Kapalua, and Mauna Kea which have a superior evident quality. Projects within resorts are, on an overall basis, usually of a better quality of design, material, and craftsmanship. Prior to the mid-1980s, the most favored unit types were one and two bedroom units; however, commensurate with the upscale move of recent years towards less intensive project development, larger two and three-bedroom units are predominant in newer developments.

In analyzing the marketing success of destination resort condominiums, a dilemma presents itself. Historically, demand is extremely cyclical, a function of general economic conditions. Periods of economic expansion, inflation and low-interest rates stimulated the market, while recession, evident non-appreciation, and high interest rates hampered the desirability of a resort unit as an investment tool. This trend began to change with specific projects targeted towards identified market segments of pent-up demand, particularly ultra-luxury units appealing to upper-income purchasers who are mostly economically independent of indicators. Such projects began to fare better during otherwise stagnant periods, minimizing cyclical demand.

The net effect is that while fewer numbers of resort condominium units may be successfully sold relative to the late 1970s, average selling prices have greatly increased strongly for new units.

Historic Development and Sales

We have completed an analysis of the seven major neighbor island resorts considered potentially competitive with the proposed subject inventory in regards to condominium development construction and sales history. The communities studied include:

1. Wailea
2. Kaanapali Beach
3. Kapalua
4. Mauna Lani
5. Mauna Kea Beach
6. Hualalai at Kaupulehu
7. Waikoloa Beach

Condominium development and sales for each of these destination resorts is summarized on Table 4.

Makena Resort was omitted as no in-resort units have been developed to date. The condominium development at Keauhou and Princeville Resorts were judged to be inferior (lacking in quality and appeal) to the proposed Kapalua Mauka developments.

However, the majority of these projects are not considered as being primarily competitive with the proposed subject development. Kaanapali Beach, despite its success with upland "detached residences" in its South Beach mauka area, is an aging, dense community which does not enjoy the exclusivity or quality of Kapalua and does not attract as upscale a demographic. Waikoloa Beach condominium development is also of a lesser grade in quality, with Kamalani being one of the few developments in the Maui and West Hawaii resorts showing limited market acceptance.

The five remaining destination resorts (including Kapalua) comprise the directly competitive sector for the proposed subject development, and we have focused on these projects.

General Demand Trends

Historic activity of resort condominium units must be viewed in two perspectives, offering diverse demand indicators.

The first perspective is the velocity original unit sales achieved only during the actual marketing period; pre-sale and following

TABLE 4

SUMMARY OF COMPETITIVE NEIGHBOR ISLAND RESORT/RESIDENTIAL CONDOMINIUM DEVELOPMENT & ACTIVITY
Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii

Development	Total Finished or In-Construction Units	Number of Projects	Recent Sales Price Range		Average Annual Sales	
			Low	High	Original Sales (1)	1/1986 through 12/2000 (2)
Wailea (3)	1,302	7	$235,000	$4,200,000	45.2	258.3
Kaanapali Beach (4)	1,535	10	$123,700	$1,485,000	26.2	251.8
Kapalua	564	5	$298,000	$2,275,000	148.0	51.1
Mauna Lani (5)	242	3	$590,000	$1,395,000	40.5	26.4
Hualalai @ Kaupulehu (6)	80	5	$825,000	$1,890,000	19.0	26.3
Mauna Kea Beach (7)	97	3	$550,000	$2,420,000	16.2	8.1
Waikoloa Beach (8)	464	4	$248,500	$725,000	26.2	13.7

Note: We have not included the Makena Surf and Na Hale O Makena (condominiums) or Makena Place "Residential Condominium", ultra-high quality projects located between Wailea and Makena Resorts.

(1) Average units sold yearly during original sales program.
(2) Average units sold yearly from January 1986 through year-end 2000, original and resales, or since unit sales began.
(3) Excludes Maluhia at Wailea detached 14 condominium homes currently beginning construction. Also excludes Wailea Beach Villas, a proposed 104-unit condominium in final approval stages.
(4) Includes the Summit at Kaanapali (55 units under construction) and the Vintage at Kaanapali (73 units) which are classified as one and two story "detached-home condominiums".
(5) Excludes the Villages currently beginning construction.
(6) Excludes The Hales at Ka Alalua (17 units) to be offered for pre-sale in early 2002.
(7) Excludes "The Bluffs" project which is fundamentally a single family project with some units/homes pre-built. Includes the Uplands multi (40 units) & single family homes (17) which were all sold as finished residences within "condominium-type" community.
(8) Excludes proposed Kamalani Villas.
Source: Various, and The Hallstrom Group, Inc.

construction (if necessary). Each project is considered individually, even though several may be undergoing sale concurrently. As condominium developers are generally very sensitive to market demand trends, marketing/constructing units only when there is a demonstrated probability of rapid absorption, the ratio of unit sales per marketing period year are rather high. Invariably, during the strong demand (or upward) portion of the cycle, units are quickly marketed, often in the course of days or months. However, in the stagnant or (downward) portion of the cycle, there remains an overhang of new units built by developers committed prior to the commencing of the slow period.

Analysis of destination resort industry condominium market based only on actual sales periods results in annual demand ranges from a low of 16.2 units at Mauna Kea Beach, to a high of 148 units per year at Kapalua. Weighted average market sales were just over 60 units annually.

Yet, this figure is not fully representative, because the activity has not been maintained consistently over time; the sales being the product of periodic development cycles. We have calculated original absorption trends using minimum marketing periods of one year, as all sales programs (even those achieving "one day sell-out") require extensive setup, pre-contacts, and closing times. A successful one month or less sales period is the result of a well-developed program.

The second perspective of resort condominium sales market activity is based on average original finished unit sales over time. In this analysis, demand is calculated based on the total number of units sold during the history of the individual resorts (the time lapse from the first condominium offering to the present).

This approach is founded on the assumption that developers are sensitive to the market, and will maximize the number of units constructed and offered over time if any measurable demand exists. The lack of offerings periodically is due to a weak market, which should also be reflected in making long-term demand calculations. In this respect, as often there are no new projects available (or only those having undesirable traits), the demand may be slightly misstated. However, we consider this method more appropriate than that employing the first perspective. According to this technique, yearly demand on a weighted basis for the analyzed resorts has been more than 100 units annually.

Because of the evolution that has occurred in this sector from a design and purchaser perspective, long-term demand figures (which have been highly cyclical) can be misleading. Since 1975, the average annual number of units sold on an original and resale basis in the identified projects has been at circa 1,000 units, with most activity occurring from 1975 through 1980. Over the following 15 years, the average sales per year was at 869 units. Since 1996 the average has been at nearly 800 per year.

The project-by-project sales trends for the developments within the directly (or primary) competitive resorts for the full years 1986-2000 are summarized on Table 5. As previously noted, demand in these resorts, particularly in new projects, remained relatively strong through the summer of 2001 despite recessionary concerns. This is evidenced by the level of activity and stability or commitment at The Uplands (Mauna Kea) and Waiulu Villas (Hualalai), and by strong interest in new inventory at Wailea, Hualalai and Kaanapali.

Projected Demand Trends

In consideration of this transformation in the market sector, and our analysis of demographic and economic factors, we have concluded the mid-point demand for additional resort/residential condominium units will be as shown in the chart below over the coming two decades:

NEIGHBOR ISLAND RESORT CONDOMINIUM NEW UNIT DEMAND (2002 through 2021)

	Average Annual Demand	Total Periodic Demand	Cumulative Demand
2002 to 2006	210	1,050	1,050
2007 to 2011	240	1,200	2,250
2012 to 2016	250	1,250	3,500
2017 to 2021	270	1,350	4,850

While the majority of demand has historically been oriented towards Maui (more than 60 percent to date), development is occurring in West Hawaii, but slowing on Kauai as quality land resources become scarce. Product on Lanai is very limited and non-competitive on Molokai. We anticipate the significant majority of future demand, about 95 percent, will be directed towards leeward Maui and West Hawaii. We anticipate sales will move from a Maui majority to a more equitable division between the two locations, say 55 percent to Maui and 45 percent to West Hawaii. The resulting demand for moderately-high quality to luxury condominium units within destination resort/residential communities on Maui is projected at 1,800 to 3,200 during the coming 20 years with a mid-point of 2,500, divided into five-year periods as follows:

ESTIMATED MAUI MID-POINT RESORT CONDOMINIUM DEMAND (2002 through 2021)	Average Annual Demand	Total Periodic Demand	Cumulative Demand
2002 to 2006	110	550	550
2007 to 2011	125	600	1,150
2012 to 2016	130	650	1,800
2017 to 2021	140	700	2,500

Proposed Supply Trends

As displayed on Table 6, the proposed supply of resort/residential condominium development in existing, potentially primary competitive destination resort communities on the neighbor islands is 10,046 units, of which only a fraction are likely to be built during the study period (2002 to 2021) based on historic and announced development trends. If all were constructed, this supply will out-pace demand levels statewide.

The number of units approved for Maui resorts total about 3,500. Of these proposed units, the large majority of those planned for Kaanapali Beach are within the North Beach Mauka development, which has yet to be fully approved at state and county levels. Makena has yet to build any condominium product within the resort community; although high quality product is appearing on northerly adjacent lands. Wailea, despite having approvals for about 1,750 additional units, does not have sufficient remaining lands to build this number in a competitive low density manner.

We estimate that on a reasonably optimistic basis no more than 1,850 relatively competitive units will be built on Maui over the next two decades outside of Kapalua Resort. This liberally includes 350 units at Makena (which has yet to build an in-resort project in nearly a quarter century of existence); 500 at Kaanapali Beach, many of which may

TABLE 5

SUMMARY OF ANNUAL UNIT SALES OF PRIMARY COMPETITIVE
DESTINATION RESORT/RESIDENTIAL CONDOMINIUM INVENTORY 1986 THROUGH 2000
Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii

Resort/Project	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Total	Annual Average
Kapalua																	
The Ironwoods	14	8	10	1	2	2	5	2	2	4	3	2	3	3	5	66	4.71
The Bay Villas	9	18	24	24	26	8	7	13	12	9	11	7	8	9	14	199	14.21
The Golf Villas	25	35	36	22	25	9	2	10	5	11	9	6	6	15	11	227	16.21
The Ridge	21	37	43	27	25	3	5	13	15	15	9	10	17	14	9	263	18.79
Coconut Grove															32	32	32.00
Total Resort Unit Sales	69	98	113	74	78	22	19	38	34	39	32	25	34	41	71	716	51.14
Wailea																	
Ekahi	33	20	29	36	28	3	7	7	11	12	13	12	16	20	16	263	18.79
Elua	24	9	19	18	14	3	9	11	9	6	15	9	12	13	11	184	13.14
Ekolu	26	20	41	19	35	5	3	7	9	17	17	14	16	20	15	264	18.86
Wailea Point Village	34	73	57	36	23	4	8	13	13	14	17	15	28	30	18	372	26.57
Grand Champions				112	107	7	6	16	12	12	15	11	17	22	5	316	31.56
Palms at Wailea					1	134	14	22	29	15	48	22	34	31	26	378	34.36
Wailea Fairway Villas														84	31	117	58.50
Total Resort Unit Sales	117	122	146	221	208	156	47	75	89	82	125	83	123	234	148	3,616	258.29
Mauka Kea Beach (1)																	
The Villas	5	7	2	4	1	0	3	3	0	3	0	5	8	9	6	56	3.73
The Uplands															57	57	57.00
Total Resort Unit Sales	5	7	2	4	1	0	3	3	0	3	0	5	8	9	63	113	8.07
Mauna Lani																	
The Islands (2)											4		2	5	6	17	N/A
Mauna Lani Point	11	35	47	30	8	3	11	8	10	9	5	9	14	17	19	236	16.86
Mauna Lani Terrace	6	3	11	19	5	5	6	1	6	6	8	5	9	14	12	116	8.29
Total Resort Unit Sales	17	38	58	49	13	8	17	9	16	15	17	14	25	36	37	369	26.36
Hualalai @ Kaupulehu																	
Golf Villas												10	10	4	7	31	7.75
Hillside Villas												8	2	2	4	16	4.00
Fairway Villas														10	5	15	7.50
Palm Villas														16	7	23	11.50
Waiulu Villas															20	20	20.00
Total Resort Unit Sales												18	12	32	43	105	26.25
Total Competitive Units Sales	198	265	319	348	300	186	86	125	139	139	174	145	202	342	305	4,862	345.77

(1) Does not include units at The Bluffs, which is fundamentally a single family development. But does include all Uplands "residence condominium" product.
(2) All units in project sold-out rapidly during pre-sale offering in 1990-91. However, all except 4 "fall-out" prior to completion of project and final closing.
Taken off market and sold in bulk to single purchaser in late 1997. Individual unit sales have occurred in recent years.

Source: Various realtors and on-line databases, and The Hallstrom Group, Inc.

never be approved; and it allows for 500 units at Wailea, even though there may be insufficient lands, and 500 more at Wailea 670 (mauka of the resort) which has not achieved final approvals. These units will be unable to meet projected demand, and even with the inclusion of the 300 Kapalua Mauka units, the sector would still be marginally undersupplied by 2021.

THE RESORT/RESIDENTIAL HOMESITE MARKET SECTOR

Until the mid-1980s, the resort/residential homesite market was considered as an incidental component within neighbor island destination communities, overshadowed by hotel, condominium, commercial, and amenity development.

By late in that decade, activity in this sector surged to the forefront of the resort-oriented market. Several factors contributed to the rapid emergence and success of this product type; most notably, the 1986 U.S. Tax Reform Act, the escalating financial status of individuals in the prime Hawaii purchaser markets of Japan and the West Coast, diversification of project orientation, and the higher profit/lower risk of subdivision relative to that offered through condominium or hotel development.

The result was a meteoric expansion of developer, investor, and purchaser interest in moderate to up-scale resort/residential homesites within neighbor island destination communities, with more than 1,000 subdivided between 1986 and 1990. The resort finished home market also dramatically enlarged.

Resort/residential homesites encompass a broad range in size (from 10,000 square feet to several acres, amenities, exclusivity and locational attributes. Many of the projects (particularly some subdivisions at Princeville, Keauhou, and in the northerly areas of Wailea) have a distinct residential feel with large numbers of full-time residents. In many respects, these are merely up-scale subdivisions within a greater resort community. Other developments possess a definite resort ambience as at Kapalua, Hualalai, Mauna Kea, and Mauna Lani.

Unlike finished condominium units which have undergone evolution across four decades and multi-generations, resort homesite subdivision

TABLE 6

SUMMARY OF PRIMARY PROPOSED NEIGHBOR ISLAND RESORT/RESIDENTIAL CONDOMINIUM DEVELOPMENT
Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii
Includes Only Master Planned Resort Communities In-Development

Project	Condominium Development To Begin	Condominium Units: Existing	Proposed/ Approved	Total
MAUI				
Wailea	Underway	1,302	1,750	3,052
Kaanapali Beach (1)	Underway	1,535	500	2,035
Kapalua	Underway	564	750	1,314
Makena	Pending	0	500	500
BIG ISLAND				
Mauna Kea Beach (2)	Underway	97	403	500
Mauna Lani	Underway	242	2,943	3,185
Waikoloa Beach	Underway	464	2,750	3,214
Hualalai @ Kaupulehu	Underway	80	450	530
TOTAL ALL PRIMARY PROJECTS		4,284	10,046	14,330
By Competitive Area				
Maui Only		3,401	3,500	6,901
Kohala Coast		883	6,546	7,429

(1) Proposed units will be part of North Beach Mauka increment. Total may range from 300 to 800 units. Not yet approved.
(2) Proposed units based on estimate of density of development parcels.

Source: Various, and The Hallstrom Group, Inc.

is relatively straight forward. The size, frontage, view and infrastructure may vary between resort/residential lots, but the most significant market determinant is the destination community in which it is located. The recognition, amenities and exclusivity of the master resort establish market acceptance pricing and appeal.

Privacy and exclusivity are focal points of the higher quality developments, with security gates, rock walls and extensive covenants regarding design, color, upkeep and use. Most projects have an extremely low occupancy factor with significant numbers of homes sitting vacant much of the time. Buyers are typically offered membership in a resort club providing use, credit and service privileges. In most resorts, home building occurs relatively rapidly after initial lot sales.

The only meaningful evolution in the resort/residential homesite market has been the appearance of a "membership community" subsector, discussed later in the chapter.

Historic Development and Sales

The attraction of the homesites beyond their inclusion in a resort are the strict building and maintenance covenants that are often lacking outside master planned communities, access to up-scale dining and shopping establishments, proximity to recreational opportunities (golf, tennis, beach), the enhanced security associated with a resort, and a typically greater price and demand stability than found in non-resort projects. For purchasers, name recognition is very important (as owning a Hawaii resort home has a definite status quotient), a factor lacking outside the resort communities except for those properties having direct beach frontage.

In the late 1980s, buyers were a mix of West Coast United States and Japanese purchasers. However, demand among Asians has dropped substantially during the past ten years, being replaced somewhat by a broader international clientele; although West Coast purchasers continue to dominate the sector.

Over the past several years the percentage of local resident buyers has increased in many resorts, interior/non-golf course fronting subdivisions at Wailea, and throughout the homesite projects at Keauhou and Princeville.

As with other resort property types, demand for lots and homes began to fall by 1991, after surging the previous four years with activity leveling off sharply (by nearly 80 percent) over the ensuing half decade. The dependency of the sector on Japanese, investor, and corporate purchasers groups, all heavily hit by the recession, exacerbated the trend.

In 1981, there were only 640 competitive neighbor island resort homesites, with total sales of only 54 lots during the year at prices ranging from $40,000 to $135,000--most towards the lower end of the spectrum.

Two decades later, the total number of prime homesites has increased to some 2,300, the majority developed during the 1987-91 period, with 418 original lot transactions recorded at the peak of the market in 1990. Selling prices now are typically in the range of $400,000 to $1 million, with oceanfront sites reaching above $6 million.

A long-term summary of the development and sales activity in the identified generally competitive neighbor island destination resort developments is shown on Table 7; included are both interior and on-water sites.

The resort/residential homesite subdivisions considered most competitive with the proposed subject inventory, and their sales from 1986 through 2000 are shown on Table 8. The number of sales and velocity overall has climbed steadily since 1994, and escalated rapidly after 1996. Data for the first eight months of 2001 showed a 10 to 30 percent fall-off in resale activity. Yet, new quality product and resales in premier resorts have continued strongly with limited inventory available. The emerging recession of early 2001 had not dampened the expectations of primary competitive homesite developers.

TABLE 8

SUMMARY OF ANNUAL HOMESITE (LOT) SALES OF PRIMARY COMPETITIVE DESTINATION RESORT/RESIDENTIAL SINGLE FAMILY LOT INVENTORY 1986 THROUGH 2000

Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii

Resort/Project	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Total	Annual Average
Kapalua																	
Kapalua Place				7	1	0	0	1	1	0	1	1	2	2	1	17	1.42
Pineapple Hill (I & II) (1)		57	61	21	22	5	5	8	4	11	5	11	12	14	27	263	18.79
Plantation Estates					28	2	2	12	1	3	3	3	9	6	4	73	6.64
Total Resort Lot Sales	0	57	61	28	51	7	7	21	6	14	9	15	23	22	32	321	22.93
Wailea																	
Fairway Homes	1	0	2	2	1	1	0	0	0	0	0	0	1	1	2	11	0.73
Wailea Kai	26	13	15	6	6	0	1	0	2	1	3	2	0	5	2	82	5.47
Wailea Golf Estates	16	17	12	9	3	2	2	1	0	0	0	1	2	3	1	69	4.60
Wailea Kialoa		45	66	28	23	2	4	4	6	3	3	5	5	6	4	204	14.57
Wailea Golf Vistas								1	1	8	0	6	9	12	4	41	5.13
Wailea Highlands												12	14	6	5	37	9.25
Palauli Estates									3	12	13	2	1	14	19	64	9.14
Total Resort Lot Sales	43	75	95	45	33	5	7	6	11	24	19	28	32	47	37	471	33.64
Mauna Kea Beach																	
The Fairways	2	13	9	11	6	2	1	0	1	1	0	1	2	4	4	57	3.80
The Bluffs												1	7	6	11	25	6.25
The High Bluffs															3	3	3.00
Total Resort Lot Sales	2	13	9	11	6	2	1	0	1	1	0	2	9	10	18	85	6.07
Mauna Lani																	
The Cape					14	1	1	1	0	0	3	1	2	2	2	27	2.45
The Point Estates				19	5	1	0	0	1	0	1	2	3	5	6	43	3.58
Champion Ridge					25	2	1	2	0	1	14	4	6	10	13	78	7.09
Black Sand 49														34	20	54	27.00
Total Resort Lot Sales	0	0	0	19	44	4	2	3	1	1	18	7	11	51	41	202	14.43
Hualalai @ Kaupulehu																	
K-1											4	7	2	4	5	22	4.40
K-2												15	11	4	6	36	9.00
A-1														15	5	20	10.00
Laurels Estates															19	19	19.00
Total Resort Lot Sales											4	22	13	23	35	97	24.25
Total Competitive Units Sales	45	145	165	103	134	18	17	30	20	40	50	73	81	147	149	1,148	99.85

(1) Includes 21 lots pre-sold at Pineapple Hill Estates II during 2000-01.
(2) Does not include The Uplands "condominium residential" product.

Source: Various Realtors and on-line databases, and The Hallstrom Group, Inc.

TABLE 7

SUMMARY OF COMPETITIVE NEIGHBOR ISLAND RESORT/RESIDENTIAL HOMESITE DEVELOPMENT & ACTIVITY

Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii

Development	Total Subdivided Lots	Range in Size (Sq. Ft.)	Current Price Range: Low	Current Price Range: High	Average Annual Sales: Original Sales (1)	Average Annual Sales: 1/1986 through 12/2000 (2)
Wailea (3)	506	10,000 to 23,500	$143,000	$1,700,000	24.2	33.7
Kaanapali Beach (4)	383	10,500 to 69,696	$158,500	$1,825,000	25.0	26.9
Kapalua	190	10,000 to 350,000	$419,000	$5,200,000	78.4	22.9
Mauna Lani (5)	105	15,000 to 83,000	$429,000	$6,800,000	25.4	14.4
Mauna Kea Beach (6)	109	20,000 to 57,000	$625,000	$3,625,000	2.5	6.1
Hualalai @ Kaupulehu	74	11,250 to 42,500	$800,000	$5,880,000	18.0	24.3
Waikoloa Beach (7)	32	15,000 to 45,000	$750,000	$4,200,000	1.0	1.0

Note: We have not included the "Kamaole" single family subdivision located between the Wailea and Makena Resorts. Seven lots (2.4 to 4.3 acres) currently in subdivision.

(1) Average lots sold yearly during original sales program.
(2) Average lots sold yearly from January 1986 through year-end 2000, original and resales, or since lot sales began.
(3) Does not include "One Wailea Place" subdivision to begin construction in 2002.
(4) Includes The Pinnacle, 33 large lots currently under-construction.
(5) Does not include Mauna Lani Golf Estates, scheduled to begin subdivision in 2002.
(6) Does not include single family "condominium-type" residences at The Uplands, which are accounted for in the resort/residential condominium analysis.
(7) Subdivision in construction and pre-sale.

Source: Various, and The Hallstrom Group, Inc.

General Demand Trends

Our analysis indicates the mid-point demand for new resort-quality homesites on the neighbor islands from 2002 through 2021 will be as follows:

NEIGHBOR ISLAND NEW RESORT/RESIDENTIAL HOMESITE DEMAND			
	Average Annual Demand	Total Periodic Demand	Cumulative Demand
2002 to 2006	190	950	950
2007 to 2011	188	940	1,890
2012 to 2016	210	1,050	2,940
2017 to 2021	232	1,160	4,100

As with condominium development, a significant portion of resort/residential homesite subdivision to date has occurred on Maui (with more than 20 percent of the competitive lots). Princeville on Kauai has contributed meaningfully in past years; however, Big Island resort developments in Kohala (specifically Mauna Kea Beach, Hualalai and Mauna Lani) will provide a substantial number of lots over time, as will the lesser competitive Waikoloa Beach and Keauhou resorts. Some demand is also being directed towards highly exclusive "membership" golf and estate projects in South Kona. As a result, the West Hawaii share will increase, and the Kauai share will drop due to scarcity of quality locations. The Maui share will also increase.

The substantial portion of future total demand (upwards of 95 percent) will likely flow to leeward Maui and West Hawaii, with about 45 percent of this amount, or between 1,400 and 2,200 total homesites, directed to Maui, divided into five-year periods as follows:

ESTIMATED MAUI MID-POINT RESORT SINGLE-FAMILY DEMAND (2002 through 2021)			
	Average Annual Demand	Total Periodic Demand	Cumulative Demand
2002 to 2006	81	407	407
2007 to 2011	80	396	803
2012 to 2016	90	451	1,254
2017 to 2021	99	495	1,749

General Supply Trends

Significant numbers of competitive, moderately-high to upscale single-family subdivisions are proposed for the neighbor islands over the coming two-plus decades, the majority in West Hawaii. A summary of the generally competitive approved projects are shown on Table 9. Only projects having makai connections were considered to be a strong alternative to the subject.

If all of the developments were built according to publicly-announced development plans (including long-term expansion areas), the total number of new homesites offered over the next 20-plus years would be 5,405, or equivalent to 132 percent of the indicated demand. Additionally, significant numbers of golf course fronting lot homesites have been considered at several other off-water, quasi-resort developments (with Wailea 670, mauka of Wailea Resort, being the most prominent potential Maui entry).

Beyond this large quantity of proposed development, both quality and likelihood of occurrence must be considered. We consider it highly unlikely that all of the projects will be built to maximum densities, particularly at Makena, Mauna Lani, Mauna Kea Beach, and Keauhou, or that all of the proposed communities will be constructed in a timely fashion.

On an overall basis, the sector has generally sufficient supply to meet indicated non-specific demand levels, but it is unlikely that enough competitive inventory will be developed to create as substantial an oversupply condition as the gross proposed unit numbers indicate. We anticipate supply and demand levels to be relatively in-sync in the critical Maui and West Hawaii regions during the projection period.

The "Membership Community" Homesite Subsector

At the peak of the resort/residential and golf course markets in the late 1980s, there was significant interest expressed by developers and purchasers in limited-size, private membership communities. The projects would be centered around championship golf courses and provide a full-range of resort quality amenities and services within large, exclusive, low-intensity developments. Access and use would be limited to members and guests.

Numerous freestanding communities were proposed on the neighbor islands, and many standard resorts began marketing homesites stressing a strong "membership" aspect within the greater resort.

Many of the proposed developments were not actualized due to recessionary effects of the early 1990s, capital difficulties, master plan changes, and sundry other causes. But the concept remained strong from a market perspective.

The success of the first two projects to offer this specific product type are Hualalai, a north Kona full-service resort; and Hokulia, a south Kona golf enclave, created widespread interest due to their rapid absorption, high prices and stable upper-income clientele. Over the past several years, numerous proposals have emerged for developments of this "membership" type at stand-alone sites and within existing resorts. The fundamental attractions of these projects are:

- An exceptional quality of the constituent facilities (particularly the golf course design).
- Highly restricted, low intensity, low rise, and low density development, creating scarcity of product and an environment of exclusivity.
- Community control of operational, club, architectural and land use issues.
- Sufficient space to insure isolation, open space/buffers and amenities, and limit negative future off-site influences.
- Restricted use of the course and amenities, to ensure easy access for members and guests without outside crowding influences.
- A pride of integrated ownership unavailable in a typical mixed-use resort environment.
- A marketing/promotional plan and on-site ambience which creates a feeling and reputation of special or privileged membership

TABLE 9

SUMMARY OF PRIMARY PROPOSED NEIGHBOR ISLAND RESORT/RESIDENTIAL SINGLE FAMILY DEVELOPMENT
Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii
Approved Projects Only (1)

Project	Residential Development Proposed To Begin	Single Family Homesites: Existing	Proposed/Approved	Total
MAUI COUNTY				
Wailea	Underway	506	182	688
Kaanapali Beach (2)	Underway	383	400	783
Kapalua (3)	Underway	190	410	600
Makena	Pending	0	750	750
BIG ISLAND				
Mauna Kea Beach (4)	Underway	109	125	234
Mauna Lani	Underway	105	1,400	1,505
Waikoloa Beach	Underway	32	768	800
Hualalai @ Kaupulehu	Underway	74	340	414
Kukio Beach (5)	Pending	0	500	500
Kohanaiki	On-Hold	0	380	380
Maniniowali	On-Hold	0	150	150
TOTAL ALL PRIMARY PROJECTS		1,399	5,405	6,804
By Competitive Area				
Maui Only		1,079	1,742	2,821
Kohala Coast Only (6)		320	2,633	2,953

(1) Only those potentially competitive projects having SLU and/or General Plan approvals.
(2) Assumes up to 150 additional lots within South Beach Mauka increment, and circa 250 in North Beach Mauka project, actual number may be from 0 to 500.
(3) Includes lots within subject Project District 2.
(4) Includes proposed non-condominium/finished residence inventory in South Kohala Resort.
(5) Initial infrastructure emplacement underway. Finished sites still several years out.
(6) Includes Mauna Kea Beach, Mauna Lani, Waikoloa Beach and Hualalai.

Source: Various, and The Hallstrom Group, Inc.

Virtually every major "standard" resort community on the neighbor islands has promoted exclusive "golf/member" homesite developments featuring larger lots one-half to two acres, special resort and course privileges, security gates. Absorption of the product in the most notable subdivisions has been strong, such as Wailea Highlands and Black Sand Beach. However, the speed of sales and average prices are lower than that at the true membership communities. The expansion of the membership community submarket is a natural evolution in the upper-end resort industry.

We anticipated this trend to continue until it constitutes upwards of 70 percent of the entire West Hawaii sector. However, the potential for competitive inventory on Maui is highly restricted due to the limited availability of developable land for such uses.

Market Summary

Despite the minor slowdown evident in the first two quarters of 2001, the expansion of the West Coast economy is in a long-term growth phase, and an increasing number of local resident purchasers should energize the sector over time. A variety of quality product is being proposed throughout the neighbor islands, with the "membership community" concept quickly becoming a major alternative to the "standard resort" inventory that has dominated the market since its inception.

The total demand for Maui resort/residential homesites over the next 20 years is about 1,750 lots. Given historic development trends, we forecast that about 1,350 homesites will be built in the three major Maui resorts, other than Kapalua, during the next two decades. This is an optimistic assumption in light of the limited acreage remaining for subdivision at Wailea, the lack of Makena development to date, the lack of approvals for Kaanapali North Beach Mauka, and the inclusion of 500 lots from the Wailea 670 project.

As of the study date, the near mid- and long-term prospects for the 390 lots comprising the Kapalua Mauka single-family homesite component remain favorable.

QUANTIFICATION OF WEST MAUI RESIDENT HOUSING DEMAND

Although the significant majority of purchasers at Kapalua Mauka will be second home/vacation users, the project will attract some existing or in-migrating Maui residents, attracted by the climate, beauty and facilities of the greater resort community. Our analysis at the home/lot buyers at Kaanapali Beach, Princeville, Keauhou and other resorts seeking to attract some full-time resident buyers indicates that up to 20 percent of the subject inventory could be absorbed by residents if priced and marketed competitively. The development of a quality private school in upper West Maui, as is currently being considered at Mauka Honokowai, would further enhance the demand characteristics for relocating Maui residents.

We have projected the demand for residential units in West Maui using standardized formulae employing population forecasts, household size trends, and other market-based factors as follows:

RP/AHS = TRUR X (1 + (VA + NRPA)) = TMUD

Where:

RP is the Resident Population

AHS is the Average Household Size

TRUR is the Total Resident Units Required

VA is a Vacancy Allowance

NRPA is a Non-Resident Purchaser Allowance

TMUD is a Total Market Unit Demand

Each of the variables in the formula is based on historic statistics compiled by the Federal Home Loan Bank, U.S. Census Bureau, State of Hawaii DBEDT, other recognized governmental sources, and researched market data.

These past and current indicators were translated into estimates based on temperate trending interpretations. Our emphasis was on letting the data "speak for itself" through our projections, as opposed to making large-scale adjustments for subjectively anticipated lifestyle or market evolutions.

In this regard, our forecasts are representative of moderate future housing requirements, and could be understated if some movements continue as strongly as in recent years; such as the trend towards smaller household sizes and an increasing influx of non-resident (foreign) purchasers into the market.

Additionally, as noted, public and private planners consider governmental population projections to be restrained relative to probable occurrence.

The "Total Market Unit Demand" conclusions resulting from equation application are intended to quantify the total number of residences which will be needed in the study region over a 20-year projection period (2002 through 2021) in order to manifest a reasonably stable market with all purchaser/tenant demand segments served.

Currently, it is well-recognized the West-Maui housing market is in an undersupplied condition, with exceptionally low vacancy rates and rapidly escalating prices over time. Stated governmental policy is to alleviate the unit shortage through increased densities of urban lands and development of feral or nominal agricultural lands at as rapid a pace as the infrastructure and community will bear.

The factors comprising our housing demand equation can be summarized as follows:

Resident Population (RP) -- This variable utilizes the island-wide population forecasts made by ourselves based on analysis of past state (Series 2020), county, and district forecasts. The concluded figures are comparable to levels projected in the draft Maui County Community Plan technical document prepared by Wilson Okamoto, Inc., et al.

Average Household Size (AHS) -- This factor was calculated using the data as provided by the above-cited sources and census figures. The 2000 census estimated the AHS in the Lahaina District was at 2.98 persons.

This figure represents a slight movement upwards (from 2.90-plus percent in the mid-1990s), which goes against general nationwide trends toward smaller households. The increase is

undoubtedly due to the lack of available housing units in the economically expanding community. The average size would be lower in the region were sufficient units made available.

Most Hawaii-oriented sociologists contend the movement to smaller household sizes will continue into the future, assuming enough units are built, until stabilizing at circa 2.5 persons statewide, factoring in longer life-spans, the influx of single persons attracted to the climate and employment opportunities in Maui, and the tendency towards fewer children.

We have forecast that the average household size level would stabilize in the Year 2021 from 2.76 to 2.80 persons, down meaningfully from current levels, but still well above most island locales.

Total Resident Units Required (TRUR) -- This figure is arrived at by dividing the subject area resident population (RP) by the average household size (AHS). It is indicative of the minimum number of residences which would be required to meet basic market needs, assuming there were no vacant units, none uninhabitable due to on-going repair or deleterious conditions, and none occupied by non-resident persons.

For a market to be considered stable (and nominally operative) with acceptable appreciation rates and quality lifestyle opportunities, allowances for such factors must be made.

Vacancy Allowance (VA) -- Federal, state, and local governments are on record calling West Maui one of the tightest residential market sectors in the nation, referring to the situation as "abysmal" in published reports, and expressing fears of a deteriorating economy and community structure unless major steps are taken to address this "acute shortage."

The undersupply condition is the primary reason West Maui housing prices are on average among the highest of any locale in the country.

According to HUD, the Urban Land Institute, and other sources, a "healthy" market has a minimum vacancy level of five to six percent of the total number of units in the inventory. This allows for uninhabitable units, units under repair, seasonal fluctuations, a transitional housing margin, a degree of mobility potential, and the ability to service periodic unanticipated population increases. A "slack" in unit occupancy also serves as a margin to cushion against hyper-appreciation during strong demand periods.

Given the history of the West Maui housing market and its continuing inability to keep an acceptable vacancy pool available, we believe it will be exceptionally difficult for the desirable vacancy allowance of five percent or more to be achieved on the island during the foreseeable future.

In our demand formula, we have tested vacancy rate allowances of three and five percent of the Total Resident Units Required figure.

Non-Resident Purchaser Allowance (NRPA) -- While most investors strongly desire to rent purchased units to residents in an effort to minimize debt service obligations, there are those who buy a Hawaii home or condominium for personal (family and friends) use, business reasons, or for periodic rental to non-resident "visitors."

These units are not available to meet resident housing demands and are effectively withdrawn from the inventory pool. An allowance must be made for these residences in the general community, which are not to be confused with those specifically intended for tourist-oriented transient rentals (i.e., within a condominium/hotel project in a vacation area).

On the neighbor islands and in Waikiki, there are many units in complexes or subdivisions designed for general residential use, which often sit vacant the vast majority of the time.

Our research indicates some neighbor island non-resort projects have upwards of 30 percent vacant investor-owned units/homes. In resort communities (particularly Mauna Kea Beach, Mauna Lani, and Wailea), up to 90-plus percent of selected complexes are so held.

The proximity of residential developments in West Maui to world-class resorts, beaches, and recreational opportunities, coupled with the superior views and climate throughout the region will draw significant interest from West Coast and Japanese purchasers over time despite efforts to restrict vital

units for local residential use only. Based on historic trends, the NRPA should be at a minimum of 20-plus percent in the Lahaina-Kapalua corridor. However, public policies and community pressure should serve to help in moderating this trend. We have, therefore, tested exceptionally conservative, non-resident allowances of four to six percent of total resident household demand.

Total Market Unit Demand (TMUD) -- The solution to our demand formula is quantified by adding the Vacancy Allowance (VA) and Non-Resident Purchaser Allowance (NRPA) to the Total Resident Units Required (TRUR) figure. This is the total number of units which will be needed in the study region in order to meet all reasonable market demands.

The application of the housing demand formula to the subject region is shown on Table 10.

Based on our analysis, the actualization of a healthy and stable housing market in the study area will require the construction of about 4,653 to 7,240 additional housing units in the Lahaina District by the Year 2021. The mid-point demand would be for 5,947 units, almost double the number of current housing units in the study region (5,951) concluded by the 2000 census.

Conversion of this estimate of gross demand into pricing equivalents was completed using available data from the U.S. Census, Maui Board of Realtors, and the U.S. Dept. of HUD.

Table 11 illustrates this striation of West Maui regional housing demand to 2021 into probable percentile demand by sales prices at current dollar levels. The figures correlate both historic actual buying trends and theoretical "affordability" quotients derived using government pricing criteria.

Inherently, demand is focused towards the lower- to middle-income groups who have difficulty competing in the competitive and high-priced marketplace. Upper-middle and above-income households at least have some limited purchase alternatives, although often in neighborhoods dominated by second-home (non-resident) buyers.

Although the subject inventory will be at or above the affordability/pricing levels of all but a maximum of 20 percent of the market demand, this still equates to 931 to 1,448 units being needed

TABLE 11

STRIATED PROJECTIONS OF HOUSING UNIT DEMAND
BY SELLING PRICE IN WEST MAUI 2002 TO 2021
Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii

Period	Periodic Demand (1) 2002 to 2006	2007 to 2011	2012 to 2016	2017 to 2021	Total Demand 2000-2020
1. Minimum Demand					
Less Than $215,000	366	254	243	237	1,099
Percent of Total Demand	25.00%	24.00%	23.00%	22.00%	23.62%
$215,000 to $375,000	439	317	317	323	1,396
Percent of Total Demand	30.00%	30.00%	30.00%	30.00%	30.00%
$375,000 to $525,000	366	275	285	301	1,227
Percent of Total Demand	25.00%	26.00%	27.00%	28.00%	26.38%
$525,000 to $800,000	219	159	159	161	698
Percent of Total Demand	15.00%	15.00%	15.00%	15.00%	15.00%
Over $800,000	73	53	53	54	233
Percent of Total Demand	5.00%	5.00%	5.00%	5.00%	5.00%
Total Market Demand	1,462	1,058	1,057	1,076	4,653
	100.00%	100.00%	100.00%	100.00%	100.00%
2. Maximum Demand					
Less Than $215,000	584	396	370	363	1,712
Percent of Total Demand	25.00%	24.00%	23.00%	22.00%	23.64%
$215,000 to $375,000	700	495	483	494	2,172
Percent of Total Demand	30.00%	30.00%	30.00%	30.00%	30.00%
$375,000 to $525,000	584	419	434	461	1,908
Percent of Total Demand	25.00%	26.00%	27.00%	28.00%	26.36%
$525,000 to $800,000	350	247	241	247	1,086
Percent of Total Demand	15.00%	15.00%	15.00%	15.00%	15.00%
Over $800,000	117	82	80	82	362
Percent of Total Demand	5.00%	5.00%	5.00%	5.00%	5.00%
Total Market Demand	2,334	1,649	1,609	1,648	7,240
	100.00%	100.00%	100.00%	100.00%	100.00%

(1) Assumes existing latent demand is spread evenly over projection period.

Source: Various and The Hallstrom Group, Inc.

TABLE 10

QUANTIFICATION OF HOUSING UNIT DEMAND FOR THE
LAHAINA COMMUNITY PLAN (WEST MAUI) AREA 2002 to 2021
Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii

	2002	2007	2012	2017	2021	Additional Units Required by 2021 (1)
Scenario One: Minimum Projections Using Low Population Estimates and Conservative Allowance Factors						
Resident Population	18,500	21,700	23,750	25,750	27,750	
Average Household Size	2.92	2.89	2.86	2.83	2.80	
Total Resident Units Required	6,336	7,509	8,304	9,099	9,911	
Vacancy Allowance (3% of resident unit demand)	190	225	249	273	297	
Non-Resident Purchaser Allowance (4% of resident unit demand)	253	300	332	364	396	
TOTAL MARKET UNIT DEMAND	6,779	8,034	8,885	9,736	10,604	4,653
Scenario Two: Maximum Projections Using High Population Estimates and Optimistic Allowance Factors						
Resident Population	18,500	23,600	26,800	29,800	32,800	
Average Household Size	2.92	2.88	2.84	2.80	2.76	
Total Resident Units Required	6,336	8,194	9,437	10,643	11,884	
Vacancy Allowance (5% of resident unit demand)	317	410	472	532	594	
Non-Resident Purchaser Allowance (6% of resident unit demand)	380	492	566	639	713	
TOTAL MARKET UNIT DEMAND	7,033	9,096	10,475	11,814	13,191	7,240

CONCLUDED HOUSING UNIT DEMAND RANGE

	Existing	2002-2006	2007-2011	2012-2016	2017-2022	Totals
MINIMUM DEMAND						
Periodic	828	1,255	851	850	869	4,653
Cumulative	828	2,083	2,934	3,785	4,653	
MAXIMUM DEMAND						
Periodic	1,082	2,063	1,379	1,339	1,378	7,240
Cumulative	1,082	3,145	4,524	5,863	7,240	
MID-POINT DEMAND						
Periodic	955	1,659	1,115	1,095	1,123	5,947
Cumulative	955	2,614	3,729	4,824	5,947	

(1) There were 5,951 housing units in the Lahaina District according to 2000 census. In 2002, the number is estimated to by 6,250 units, resulting in a latent market demand for a minimum of 828 units needed to achieve market stability.

Source: Various and The Hallstrom Group, Inc.

for the upper-income segment. And, with less than 5,300 total units (excluding the subject) proposed for the West Maui region, most at the lower to middle end of the price spectrum, there will be insufficient new inventory to service demand. Unless all of those projects proposed are built in a timely manner at maximum densities, which is highly unlikely, there will be a continuing shortfall of units under virtually all population growth alternatives.

Given the inability of Puukolii Village and the Villages at Leialii to provide meaningful inventory as planned (with an expected several thousand units to have been finished by 2001 according to original proposals), the probability of West Maui to be oversupplied with resident housing is unlikely over the next 20 years.

MARKET STUDY CORRELATION AND ABSORPTION CONCLUSIONS

Based on our analysis of the competitive neighbor island resort/residential sectors and the West Maui housing market, both of which continue to demonstrate a demand for additional units of the subject type within the study area, and our conclusion that the subject property has the necessary attributes to be competitive in the marketplace, we have quantified the probable market demand for the subject units over the coming two decades. This was accomplished by correlating statistical resort/residential housing "needs" and subjective competitive insights using three analytical methods:

- The Gross Analysis Method. This is both the simplest and most fundamentally insightful method. It is a mere comparison between demand (for additional units) and supply (proposed units) indicators. If there is more potential demand than potential units, it can be asserted there will be sufficient demand to absorb portions or all of the proposed subject units.

  As our market analysis demonstrated, without the 690 subject units, the supply of resort/residential units in West and South Maui will be insufficient to meet forecast regional requirements. If only approved, and likely to be developed units within competitive Maui resort communities that are reasonably moving forward are considered, the supply shortage would be some 1,075 total new units by 2021 without the subject inventory.

  This gross analysis indicates the subject units could be absorbed within a 12-year projection timeframe, regardless of any competitive advantage the inventory may have.

- The Residual Method. In this technique, all of the identified competitive approved projects in Maui destination resorts are placed on a time-line depicting the sales absorption anticipated by the developers, as evidenced by our market survey, or as can be reasonably assumed through historic activity. The analysis is applied in five-year increments. To the extent these projects fall short of the forecast periodic demand for units in the study region, or exceed the total demand, an undersupply or oversupply situation respectively exists.

  By accounting for the total of the units likely to be built in the competitive market over the next 20 years, it can be reasonably asserted the subject development will "capture" a significant portion of any residual demand. This approach is generally conservative, as it assumes the subject will capture only what is leftover after the other projects garner their anticipated share.

  The tabular presentation of this method for the subject condominium units is shown on Table 12. The single-family lot analysis is displayed on Table 13. These forecasts are for the most part supported by actual market experience at Kapalua, Kaanapali Beach and Wailea, as indicated by the charts below:

MAUI RESORT CONDOMINIUM UNIT ABSORPTION

Project	Year Sales Began	No. of Units Absorbed	Historic Avg. Annual Unit Absorption
Kaanapali Beach	1968	1,535	46.52
Wailea	1976	1,302	52.08
Kapalua	1977	564	23.50
Makena	--	0	0

TABLE 13

QUANTIFICATION OF SUBJECT UNIT DEMAND USING THE RESIDUAL METHOD BASED ON TOTAL DEMAND FOR RESORT/RESIDENTIAL SINGLE FAMILY LOTS IN MAUI DESTINATION RESORTS
Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii

USING MID-POINT DEMAND TRENDS AND OPTIMISTIC INVENTORY ADDITION ASSUMPTIONS

Project	TOTAL SINGLE FAMILY LOTS	Periodic Lot Absorption 2002-2006	2007-2011	2012-2016	2017-2021
Wailea Resort (1)	675	75	200	200	200
Market Share Percentage		30%	53%	53%	62%
Kaanapali Beach Resort	350	100	100	100	50
Market Share Percentage		40%	27%	27%	15%
Makena Resort	300	75	75	75	75
Market Share Percentage		30%	20%	20%	23%
Totals	1,325	250	375	375	325
Competitive Maui Lot Demand	1,750	407	396	451	495
Shortage or (Excess) Supply	425	157	21	76	170
Potential Residual Subject Lot Demand					
at 100% Capture Rate	424	157	21	76	170
at 95% Capture Rate	403	149	20	72	162
at 90% Capture Rate	382	141	19	68	153

(1) Including Wailea 670 project.

Source: Identified projects & The Hallstrom Group, Inc.

TABLE 12

QUANTIFICATION OF SUBJECT UNIT DEMAND USING THE RESIDUAL METHOD BASED ON TOTAL DEMAND FOR RESORT/RESIDENTIAL CONDOMINIUM UNITS IN MAUI DESTINATION RESORTS
Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii

USING MID-POINT DEMAND TRENDS AND OPTIMISTIC INVENTORY ADDITION ASSUMPTIONS

Project	TOTAL CONDOMINIUM UNITS	Periodic Unit Absorption 2002-2006	2007-2011	2012-2016	2017-2021
Wailea Resort (1)	1,000	250	250	250	250
Market Share Percentage		59%	53%	53%	53%
Kaanapali Beach Resort	500	125	125	125	125
Market Share Percentage		29%	26%	26%	26%
Makena Resort	350	50	100	100	100
Market Share Percentage		12%	21%	21%	21%
Totals	1,850	425	475	475	475
Competitive Maui Unit Demand	2,500	550	600	650	700
Shortage or (Excess) Supply	650	125	125	175	225
Potential Residual Subject Unit Demand					
at 95% Capture Rate	618	119	119	166	214
at 85% Capture Rate	553	106	106	149	191
at 75% Capture Rate	488	94	94	131	169

(1) Including Wailea 670 project.

Source: Identified projects & The Hallstrom Group, Inc.

MAUI RESORT SINGLE-FAMILY LOT ABSORPTION

Project	Year Sales Began	No. of Units Absorbed	Historic Avg. Annual Unit Absorption
Kaanapali Beach	1972	383	13.68
Wailea	1978	506	23.00
Kapalua	1987	190	14.62
Makena	–	0	0

Each of the identified sources of competitive additional supply are shown at the top of the tables along with the reasonably anticipated number of units we consider likely to be constructed in each primary resort community, and their periodic absorption over the projection period timeframe. The total periodic resort/residential unit or lot demand forecast is shown at the bottom of the table, with the resulting periodic over/under supply totals for each five-year period and the resulting residual demand level for the subject under several capture rate assumptions.

While it is likely that Kapalua Resort will capture virtually all of the remaining potential demand for resort/residential lots on Maui, after the shares received by Wailea, Makena and Kaanapali Beach resorts, there are several somewhat competitive smaller developments in South Maui that will garner some of the demand. The development of units/lots at Makena Place, Keauhou and One Palauea Place are timely examples of these limited alternative locations.

As part of the analysis, we have added units/lots likely to be absorbed within the Wailea 670 project, an upscale resort/residential development proposed for mauka lands above the existing resort. Wailea Resort proper (the makai beachfront community) is nearing build-out, and it is highly unlikely there remains sufficient quality sites to support an additional 1,750 condominium units and 182 homesites, as approved; particularly as land use has been focused towards lower density subdivision for the past decade. We have allowed for 500 condominium unit and 500 single-family lot sales within the Wailea 670 project during the study period, or more than 70 percent of the proposed inventory. These units

will be nominally less competitive, but are incorporated into the Wailea totals.

In no single period for either condominium units or single-family lots is there an oversupply situation. In every period during the updated two-decade projection timeframe demand will exceed supply without the subject inventory.

As all of the competitive units are accounted for in the model and an allowance is made for other choice projects, the Kapalua Mauka units should achieve a capture rate of the residual demand certainly approaching 95 percent. Therefore, according to the residual method, the 300 subject condominium units should be absorbed within a 8- to 11-year marketing period assuming they come on-line in about 2004. The subject single-family homesites would require about 15 to 18 years to be fully absorbed using this method.

Should the total number of units developed be less than the intensities identified (which is highly likely), the residual demand for the subject units will be greater and their absorption period shorter.

- The Market Shares Method accounts for the probable competitiveness of the subject residential product regardless of the total level of other inventory being offered. In essence, it is an estimate of how much of the total new resort/residential unit demand on Maui the subject could expect to achieve on an annual basis in light of its locational, pricing, and amenity characteristics.

This "pure competitiveness" technique is generally moderate to optimistic in application and requires some subjective variables, but is perhaps the most appropriate and "classic" approach.

This technique is suitable for the subject as it allows for the differentiation of absorption rates between single and multi-family unit types, according to their individual competitiveness. As there continues to be a stronger demand for single-family houses proportionate to multi-family units, and the subject has significantly fewer homes than units, it is likely the single-family inventory will achieve sell-out before the multi-family product.

Given the type, location and amenities of the proposed subject product and competitive market, we believe the condominium component could readily achieve a maximum annual market share of 30 to 38 percent of the total competitive demand on a stabilized basis after an extended market exposure and ramp-up period as the Kapalua Mauka community establishes itself in the "upland" resort sector. The estimated average market capture rate over the entire sell-out period would be 25.2 to 32.3 percent.

This capture rate, which is reasonable given historic sales standards and the competitiveness of the limited alternatives (Kaanapali and Wailea/Makena), would equate to a 28.3 percent share during a mid-point 8.53-year sell-out period. This equates to an average absorption of 35.2 units annually.

The single-family lot component would be anticipated to achieve maximum market shares of 40 to 48 percent of the entire Maui resort demand after a several year exposure period, assuming it began offering product circa 2004.

This level of market share, which would result in an average capture rate ranging from 38.9 to 42.8 percent of the total sector demand over the absorption timeframe, is imminently achievable, particularly if there are entitlement problems at Kaanapali North Beach Mauka or continued restrained development at Makena. The mid-point absorption period for homesites would be 11.12 years, with an average overall capture rate of 40.7 percent of the entire market, and sales of 35.1 homesites per year.

We consider these stabilized market share rates to be moderate based on the availability of competitive inventory (or limited/lack thereof). As shown in the residual method, during the subject sales period (beginning in 2004), there will be only a handful of projects competing for market shares, and just achieving a "fair split" of the demand (regardless of the superior competitiveness of the subject inventory) will generate capture rates at the projected levels.

Table 14 displays the subject condominium unit absorption forecasts. It is anticipated full sell-out will take from eight to about 9.5 years. Table 15 shows the absorption of the subject single-family lots using the market shares method. The

TABLE 14

PROJECTION OF SUBJECT CONDOMINIUM UNIT DEMAND
USING THE MARKET SHARES METHOD
Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii
Assuming 300 Multifamily Units with Sales Beginning in 2004

Scenario One: Using Conservative Market Share Rates

Sales Year	Annual Maui Resort Condominium Unit Demand	Effective Subject Share	Indicated Total Subject Absorption
1	110	20.00%	22
2	110	23.00%	25
3	110	24.00%	26
4	120	26.00%	31
5	120	28.00%	34
6	120	28.00%	34
7	120	29.00%	35
8	120	30.00%	36
9	130	30.00%	39
10	130	14.00%	18
Totals	1,190	25.22%	300

Scenario Two: Using Optimistic Market Share Rates

Sales Year	Annual Maui Resort Condominium Unit Demand	Effective Subject Share	Indicated Total Subject Absorption
1	110	29.00%	32
2	110	31.00%	34
3	110	33.00%	36
4	120	33.00%	40
5	120	35.00%	42
6	120	37.00%	44
7	120	38.00%	46
8	120	22.00%	26
Totals	930	32.29%	300

ANALYSIS MID-POINT

8.53	1,060	28.31%	300

Source: The Hallstrom Group, Inc.

TABLE 15

PROJECTION OF SUBJECT SINGLE FAMILY HOMESITE DEMAND USING THE MARKET SHARES METHOD

Market Study of the Proposed Kapalua Mauka Development

Kapalua, Maui, Hawaii

Assuming 390 Total Single Family Homesites with Sales Beginning in 2004

Scenario One: Using Conservative Market Share Rates

Sales Year	Annual Maui Resort Single Family Lot Demand	Effective Subject Share	Indicated Total Subject Absorption
1	81	35.00%	28
2	81	36.00%	29
3	81	37.00%	30
4	80	38.00%	30
5	80	40.00%	32
6	80	40.00%	32
7	80	40.00%	32
8	80	40.00%	32
9	90	40.00%	36
10	90	40.00%	36
11	90	40.00%	36
12	90	40.00%	36
Totals	1,003	38.87%	390

Scenario Two: Using Optimistic Market Share Rates

Sales Year	Annual Maui Resort Single Family Lot Demand	Effective Subject Share	Indicated Total Subject Absorption
1	81	42.00%	34
2	81	43.00%	35
3	81	44.00%	36
4	80	45.00%	36
5	80	48.00%	38
6	80	48.00%	38
7	80	48.00%	38
8	80	48.00%	38
9	90	48.00%	43
10	90	48.00%	43
11	90	11.00%	10
Totals	913	42.76%	390

ANALYSIS MID-POINT

11.12	958	40.72%	390

Source: The Hallstrom Group, Inc.

indicated time required for total sell-out is estimated at about 10.2 to 12.0 years.

Combined single and multi-family absorption is presented on Table 16. The effective combined (full-year) market share varies from 15.38 to 42.00 percent of the total Maui resort market on an annual basis,[6] with the overall aggregate market share achieved by the subject during the sales period being equal to about 29.03 percent of total competitive regional resort/residential demand. Full absorption will require approximately 10.2 to 12.0 years, with a mid-point of 11.12 years. The total annual absorption count of 62.05 units/lots per year is readily supported by the historic level of sales seen at similar-sized resort projects on Maui and elsewhere in the state.

Based on our analysis, we forecast the resort/residential units will be absorbed in an eight- to 15-year timeframe from initial offering, with the single-family units requiring about 12 years and the multi-family units about 8.5 years. Our mid-point absorption projections are shown on Table 17, and indicate a 12-year total sales period.

The average number of single-family homesites sold would be at 32.5 annually over a 12-year sales period (beginning circa 2004), and the average multi-family units would be at 35.3 over an 8.5-year sales program.

These conclusions could be understated if the diversity of inventory being offered at Kapalua Mauka create (or tap into) atypical demand sectors. The larger rural sites may attract less resort-oriented, upscale purchasers, some of whom may be interested in agricultural production. And the "detached residential condominiums," which are flourishing elsewhere on Maui and elsewhere, could further stimulate the absorption of the multi-family component if appropriately pursued.

[6] Excluding the final year of sales when the few remaining multi-family units are sold.

TABLE 16

SUMMARY OF SUBJECT PROJECTED DEMAND LEVELS
USING THE MARKET SHARES METHOD
Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii
Assuming 690 Units (Single and Multifamily) Beginning Sales in 2004

Scenario One: Using Conservative Market Share Rates

Sales Year	Total Competitive Maui Demand	Effective Subject Share	Indicated Total Subject Absorption
1	191	26.36%	50
2	191	28.51%	54
3	191	29.31%	56
4	200	30.80%	62
5	200	32.80%	66
6	200	32.80%	66
7	200	33.40%	67
8	200	34.00%	68
9	220	34.09%	75
10	234	23.16%	54
11	234	15.38%	36
12	234	15.38%	36
Totals	2,495	27.65%	690

Scenario Two: Using Optimistic Market Share Rates

Sales Year	Total Competitive Maui Demand	Effective Subject Share	Indicated Total Subject Absorption
1	191	34.51%	66
2	191	36.09%	69
3	191	37.66%	72
4	200	37.80%	76
5	200	40.20%	80
6	200	41.40%	83
7	200	42.00%	84
8	200	32.40%	65
9	220	19.64%	43
10	234	18.46%	43
11	234	4.23%	10
Totals	2,261	30.55%	691

ANALYSIS MID-POINT

11.12	2,378	29.03%	690

Source: The Hallstrom Group, Inc.

TABLE 17

SUMMARY OF SUBJECT INVENTORY ABSORPTION CONCLUSIONS
Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii
Using Mid-Point Absorption Estimates

Sales Year	Single Family Homesites	Multi-Family Units	Annual Homes/Units Sold	Cumulative Homes/Units Sold
1	20	25	45	45
2	25	30	55	100
3	30	35	65	165
4	35	35	70	235
5	35	35	70	305
6	35	40	75	380
7	35	40	75	455
8	35	40	75	530
9	35	20	55	585
10	35		35	620
11	35		35	655
12	35		35	690
Totals	390	300	690	

Source: The Hallstrom Group, Inc.

ECONOMIC IMPACT ANALYSIS

The development of the Kapalua Mauka community will result in significant expenditures that will favorably impact the Maui economy on both a direct and indirect basis, increasing the level of capital investment and capital flow in the region, which will in turn create employment and widen the tax base.

From a direct perspective, the proposed 690 resort/residential units, the 25,000-square-foot clubhouse, and revisions to the golf course, will create numerous construction, equipment operator and specialty trade jobs on- and off-site during the planning and emplacement of the infrastructure and building of the improvements.[7] After completion of the infrastructure, homes/units and facilities over an estimated 14-year total development period, there will be additional employment positions created by the finished residences (landscape, service, maintenance, and renovation needs in the course of their use), condominium staff, and the operating clubhouse/commercial component.

Numerous local businesses will enjoy significant profit opportunities arising for contracting companies constructing the improvements, and for local businesses which would supply a substantial portion of the materials needed in the building efforts.

The general island economy also will benefit from the subject development and its limited, upper-income population of residents and guests, which will spend large amounts of discretionary income in off-site shops, restaurants, and service establishments throughout Maui.

Indirectly, as these wages, profits, and expenditures move through the regional economy, they will have a ripple, or "multiplier," effect--increasing the amount of capital flowing to the entire community as a result of the subject.

[7] As with the other sections of this report, the economic impact analysis and public cost/benefit assessment (following) are based on a 690-unit build-out scenario as currently proposed. We note master plans are inherently subject to change during prolonged development periods with unit counts adapting to reflect market evolutions. Just as the present master plan has decreased the unit count by eight percent, future evolutions remain possible. To the extent a change in total units are built, the resulting economic, tax and benefit impacts associated with the subject would proportionately change (generally).

Construction, operational and other workers earning wages from Kapalua Mauka and associated off-site efforts will spend the majority of their income on discretionary expenses that support other island businesses. Much of this spending would be re-directed by these businesses to other island industries, and significant portions of these secondary profits would in turn be put back through the region's economic and tax structure.

These substantial direct and indirect economic impacts associated with the primary aspects of the proposed subject project, as quantified in the following sections, are all the result of the capital investment and entrepreneurship necessary to convert undeveloped and agricultural lands into a necessary expansion component of a premier resort/residential community upon which the local economy is vitally dependent. The Maui economy will be meaningfully stimulated by the capital investments and lifestyle requirements of home purchasers, and guests and users within the Kapalua Mauka development.

For modeling purposes, we have employed a standardized 20-year projection period, which includes two years of infrastructure development, 12 years of residential (and clubhouse) construction, and six years of stabilized "operations" as a fully-built community.

Capital Investment and Construction Costs

Kapalua Mauka will bring an estimated $470.8 million in direct development capital into Maui during the 14-year build-out period for the project. A breakdown of the basic expense items, their respective costs and expenditure over time are summarized on Table 18. All dollar figures expressed throughout our analysis, are uninflated, mid-Year 2001 dollars. To the extent there is inflation and appreciation during the projection period, our numbers would be understated.

Also shown are anticipated contractor and supplier profits flowing to local businesses as a result of the project. Not shown are any profits associated with the clubhouse operations.

Infrastructure cost estimates were extrapolated based on forecasts for the initial Project District 2 development scheme, prepared by Warren S. Unemore Engineering, Inc., of Wailuku in April 1999. Given the larger size of the project and additional mauka roadway, we have estimated the "backbone" components of the project at $20,000,000, up 33 percent from the prior figure. The average final subdivision cost was estimated at $100,000 per single-family homesite, and $24,500 for each multi-family unit.

Under the build-out scenario, the total basic and finish infrastructure would reach $69.35 million, which includes a $3 million allowance for the proposed golf course revisions. The backbone items, golf revisions, and initial parcel/lot final subdivision are estimated to require two years. The remaining finish subdivision costs would occur in three phases completed by the end of the eighth development year.

The market for this type of residence calls for home construction of about 3,000 square feet of finished floor space on average for each of the 270 residences. The construction will be "first class" (slightly below "luxury" or the highest quality) with an estimated cost of $210 per square foot, or an average of $630,000 for each home.

Significant site finishing will encompass the improvements. These grounds and landscaping items are estimated at $75,000 per house, and would include extension of utilities and services from subdivision mains to each building site, pools/decks, driveways and walks, plants, recreational and other amenities typical of this construction quality. The average total "turn key" cost for each single-family house would be $705,000, excluding the homesite.

Our analysis assumes the house lots will be built on forthwith by the purchasers, with the entire construction period lasting 12 years from Year 3 through Year 14 of the model. As our model is not sensitive to the effects of time on costs and other factors, the actual speed of the build-out would not affect the overall figures in the model. After build-out, maintenance, repairs and additions will continue to generate local investment on a stabilized annual basis. We estimate average home maintenance, landscaping and renovation costs at a minimum of $3,500 per home per year, and at $2,000 per condominium residence yearly.

Condominium construction is estimated at $250 per square foot (first-class in quality), with an average unit size of 1,600 square feet, or a total construction cost of $400,000 per unit. This amount includes on-site project amenity expenses. This reflects recent emerging trends towards larger "detached" units and multiplex construction having four or fewer units per building.

For analysis purposes, we have assumed the clubhouse site as being developed only to minor market level potentials serving basically just

TABLE 18

CONSTRUCTION COSTS AND CONTRACTOR AND SUPPLIER PROFIT ESTIMATES
Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii
In Constant Mid-Year 2001 Dollars

Development Year	1	2	3	4	5	6	7	8	9	10
Construction Costs (1)										
Infrastructure (2)	$23,000,000	$18,540,000		$10,197,000		$10,197,000		$7,416,000		
SFR Construction (3)			$14,100,000	$17,625,000	$21,150,000	$24,675,000	$24,675,000	$24,675,000	$24,675,000	$24,675,000
MF Construction (4)			$10,000,000	$12,000,000	$14,000,000	$14,000,000	$14,000,000	$16,000,000	$16,000,000	$16,000,000
Comm. Construction (5)			$6,500,000							
TOTAL CONSTRUCTION COSTS	$23,000,000	$18,540,000	$30,600,000	$39,822,000	$35,150,000	$48,872,000	$38,675,000	$48,091,000	$40,675,000	$40,675,000
CONTRACTOR'S PROFIT	$2,300,000	$1,854,000	$3,060,000	$3,982,200	$3,515,000	$4,887,200	$3,867,500	$4,809,100	$4,067,500	$4,067,500
SUPPLIER'S PROFIT	$690,000	$556,200	$1,224,000	$1,490,910	$1,406,000	$1,852,910	$1,547,000	$1,849,400	$1,627,000	$1,627,000

Development Year	11	12	13	14	15	16	17	18	19	20	Totals
Construction Costs (1)											
Infrastructure (2)											$69,350,000
SFR Construction (3)	$24,675,000	$24,675,000	$24,675,000	$24,675,000							$274,950,000
MF Construction (4)	$8,000,000										$120,000,000
Comm. Construction (5)											$6,500,000
TOTAL CONSTRUCTION COSTS	$32,675,000	$24,675,000	$24,675,000	$24,675,000							$470,800,000
CONTRACTOR'S PROFIT	$3,267,500	$2,467,500	$2,467,500	$2,467,500							$47,080,000
SUPPLIER'S PROFIT	$1,307,000	$987,000	$987,000	$987,000							$18,134,500

(1) Direct costs only. "Backbone" infrastructure ($20,000,000) and golf course revisions ($3,000,000) in Year 1. Final subdivision improvements (totaling $46,350,000) shown in three phases in years 2 through 8.
(2) Includes final lot subdivision for single family homesites, and multifamily pads, and common elements.
(3) Estimated average construction cost of $705,000 per home, 3,000 square feet at $210 per square foot, plus $75,000 for site work, landscaping and amenities.
(4) Estimated average construction cost of $400,000 per unit, 1,600 square feet at $250 per square foot, including site work, landscaping and amenities.
(5) 25,000 square foot clubhouse construction costs estimated at $6,500,000, including base building @ $150/sq. ft., building finish and interiors @ $100 per square foot, and sitework/landscaping/amenities @ $250,000.

Source: Various, and The Hallstrom Group, Inc.

the Kapalua Mauka community and golfers. The 25,000-square-foot clubhouse building (maximum size) is estimated to cost a total of $6,500,000, and to be built during Year 3 of the development period. This includes a base structure cost of $150 per square foot, an interior finish cost of $100 per square foot, and landscaping/amenities of $250,000. The storage and work areas are assumed to utilize approximately 10,000 square feet of the structure(s). Much of this would be less costly warehouse/greenhouse type construction.

The remaining 15,000 square feet of space will be used for the starter, pro shop/boutique, locker rooms, restaurant/bar, and possibly a village sundry store, all primarily intended to serve golfers and community resident/guests. Meaningful numbers of job opportunities would be created by the tenant businesses in this space. We note, the full development costs, upkeep and operational expenses of the additional nine holes of golf (if built), are not included in our analysis.

The subject undertaking represents a substantial boost for the Maui construction and supplier industries which were strained during the 1990s, and although recovering since, still lack the long-term stability in the trade fields seen 10-plus years ago. The overall scale of investment is equivalent to the construction efforts of one or two major hotel developments.

Kapalua Mauka will infuse an anticipated $33.6 million annually into the Maui building industry, during its build-out the equivalent of up to a 19 percent boost over recent yearly construction levels.

Although Maui weathered the recent recession better than most locales statewide, and employment in the depleted construction trades rose in the late 1990s and has been relatively stable since, there were emerging widespread concerns in the Hawaii economy prior to the events of September 11, 2001. Recovery efforts have been persistently hampered by lingering Asian monetary problems; the reduced asset values and earnings of major in-state companies; and the magnitude of investment capital and developer interest in undertaking major new projects. Despite the recent run-up in jobs to the highest level following nearly a decade of stagnation, there remain limited mid to long-term opportunities in construction employment. Many skilled tradesman have left the island or moved into other occupations, failing to pass their knowledge and experience onto the next generation of workers, damaging the long-term health of the foundational construction industry.

New construction on Maui is at circa $175 million per year, well-above the mid-1990 levels, but well below the average of $250.4 million annually in the late 1980s. Further, much of the historic resort construction work on Maui was directed to a limited number of large scale projects (hotels and condominiums) which would provide work for a period, but often resulted in unstable employment cycles. Kapalua Mauka could be a substantive component of the West Maui construction industry for an extended period, providing work to smaller contractors and trade workers whom are often overlooked by major project builders.

Employment Opportunities Created

Based on indicators provided by the construction of comparable sized projects and Hawaii industry averages, we have estimated the demand for on- and off-site, full-time equivalent employment positions associated with laying of initial infrastructure systems and building of the finished homes, and in providing continuing home services to the occupied residences.[8]

The employment opportunities created by the subject development will not be "new" jobs requiring new Maui residents but will be new opportunities for resident construction trade workers and local businesses.

It is assumed the off-site/indirect work created will be steered towards existing Maui supply, equipment providers, and other service companies, which despite the up-tick in the Maui economy over the past three years remain in a "lean" period following the massive development activity of the late 1980s.

According to the State of Hawaii Department of Labor and Industry Relations, the current number of jobs in the Maui construction industry is 2,850 positions (August 2001), the exact count from the same period in 1999, but well below the annual average of 3,350 jobs that existed during the late 1980s and the first two years of the 1990s. Overall, unemployment on the island of Maui is presently at 4.2 percent (through August 1, 2001), down several points from mid-

[8] Only additional jobs, wages, costs and revenues being created through on-site activity are shown. While the clubhouse commercial areas will support new business opportunities that have been included in our analysis, we have not reflected any additional positions or wages associated with another nine golf holes being added to the Village Course.

decade but not reaching the virtual full-employment figures of the past. The rate of joblessness in the building trades is estimated to be some 10 to 12-plus percent.

Kapalua Mauka will provide needed employment opportunities in the construction, supply and building support industries during an estimated 14-year site development and home construction period. The planning process, currently underway, is anticipated to require several years; on-site backbone and first phase subdivision infrastructure some 24 months, and home/unit construction about 12 years.[7]

Our employment estimates on are based on full-time "worker/years," although one worker/year (or circa 2,000 working hours) may be comprised of many employees involved in specialized tasks of a much shorter duration.

Estimates based on a 14-year period of project construction and six-year stabilization period. The associated number of employment opportunities created are displayed on the top of Table 19. Included are the full-time equivalent off-site and support employment opportunities which will be provided to Maui businesses as a result of the project.

Also shown are the maintenance/trade workers, landscaping, condominium staff, and other support/service providers which will be required to service the finished homes, units and community over time. The clubhouse will provide a minor, on-going component offering a variety of restaurant, lounge, pro shop/boutique, sundry retail and other employment positions.

The projections are founded on examples provided by various upscale projects undertaken in Hawaii over the past 15 years, and via formulae expressing relationships between "total worker wages/benefits and construction task costs" and "per square foot production and sales."

(7) We have not considered the effects of the proposed Lahaina/Kaanapali Bypass Highway (which have unfortunately bogged down) on the timing of entitlements or construction for the subject project. We have assumed highway construction will proceed in the near-term and/or other mitigative measures will be pursued to allow development of Kapalua Mauka to proceed in a reasonable manner providing for inventory development by 2004.

TABLE 19

EMPLOYEE JOB COUNT AND WAGE ESTIMATES
Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii
In Constant Mid-Year 2001 Dollars

Development Year	1	2	3	4	5	6	7	8	9	10
Worker Requirements (1)										
Infrastructure	90	80		50		50		30		
SFR Construction			90	113	135	158	158	158	158	158
MF Construction			69	83	96	96	96	110	110	110
Golf Course Revisions (2)	24									
Clubhouse Construction			45							
Commercial Tenants				38	38	38	38	38	38	38
Maint. & Condo. Staff			6	14	24	34	44	55	66	77
Off-Site Employees (3)	57	40	105	149	147	188	168	195	186	191
TOTAL EMPLOYMENT CREATED	171	120	315	446	440	564	504	586	557	573
Worker Wages										
Infrastructure	$4,995,000	$4,440,000	$0	$2,775,000	$0	$2,775,000	$0	$1,665,000	$0	$0
SFR Construction	$0	$0	$4,995,000	$6,243,750	$7,492,500	$8,741,250	$8,741,250	$8,741,250	$8,741,250	$8,741,250
MF Construction	$0	$0	$1,815,625	$4,578,750	$5,341,875	$5,341,875	$5,341,875	$6,105,000	$6,105,000	$6,105,000
Golf Course Revisions	$1,332,000	$0	$0	$0	$0	$0	$0	$0	$0	$0
Clubhouse Construction	$0	$0	$2,497,500	$0	$0	$0	$0	$0	$0	$0
Commercial Tenants	$0	$0	$0	$988,000	$988,000	$988,000	$988,000	$988,000	$988,000	$988,000
Maint. & Condo. Staff	$0	$0	$167,917	$373,750	$617,500	$882,917	$1,144,333	$1,430,000	$1,711,667	$1,993,333
Off-Site Employees	$1,710,000	$1,200,000	$3,153,125	$4,460,625	$4,395,000	$5,635,625	$5,038,750	$5,857,500	$5,570,000	$5,732,500
TOTAL ANNUAL WAGES PAID	$8,037,000	$5,640,000	$14,629,167	$19,419,875	$18,834,875	$24,364,667	$21,258,208	$24,786,750	$23,115,917	$23,560,083

(1) All job counts expressed as "full-time" equivalent positions.
(2) Several holes of the existing Village Course will be relocated, estimated cost $3,000,000.
(3) Includes all off-site jobs created by work efforts at the project; direct and indirect.

Source: Various, and The Hallstrom Group, Inc.

Infrastructure employment forecasts are taken from discussions with developers, review of project records and ratios of direct costs to job creation (assuming 25 percent of costs flow to wages, with an average wage of $55,500/year).[18]

Home construction is anticipated to require a total of 4.5 worker/years per house, including grounds and landscaping at .5 worker/years per house. Condominium unit construction is estimated at 2.75 worker/years per unit.

The finished improvements, grounds, and sites will require house and yard maintenance renovation/upgrade and condominium staff workers equaling some 98 worker/years annually, or one worker/year for every six houses and one for every eight multi-family units.

The golf course revisions were allocated at $3 million, creating a total impact of 24 worker/years during the relocation process.

The clubhouse construction will generate 45 worker/years of employment during development.

The clubhouse operations, though low-key, will require employees in the various operating components, particularly in the pro shop and restaurant/lounge. A conservative estimate of one employee per 400 square feet of floor space (very low for food service tenants) results in a permanent addition to the West Maui economy of about 38 positions.

Off-site employees were estimated at 50 percent of on-site workers, and are comprised of three groups:

- Numerous off-site building industry positions will also be enhanced by the Kapalua Mauka development, including such jobs as administration, office help, material providers, equipment maintenance and specialty tasks. Analysis of Maui County labor trends from 1980 through 1997 demonstrate a

[18] Construction site jobs run the range from $10 per hour for a day laborer to $50-plus per hour for specialized workers. According to the state Department of Labor and Industries, the average wage of a construction worker in Hawaii was at $28.36 per hour in 2000. We have employed an average of $55,500 per year, a figure in the probable spectrum as total work hours may vary, widely from the 2,000 per year average. In addition to wages, another $15,000 to $25,000 annually would be spent by employers on taxes, workers compensation, health benefits, specialty insurance, etc.

Table 19 (continued)

EMPLOYEE JOB COUNT AND WAGE ESTIMATES
Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii
In Constant Mid-Year 2001 Dollars

11	12	13	14	15	16	17	18	19	20	Total 1-20	Stabilized
										300	
158	158	158	158							1,755	
55										825	
										24	
										45	
38	38	38	38	38	38	38	38	38	38	646	38
85	96	107	113	113	113	113	113	113	113	1,395	113
168	146	151	154	75	75	75	75	75	75	2,495	75
503	437	453	462	226	226	226	226	226	226	7,485	226
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$16,650,000	
$8,741,250	$8,741,250	$8,741,250	$8,741,250	$0	$0	$0	$0	$0	$0	$97,402,500	
$3,052,500	$0	$0	$0	$0	$0	$0	$0	$0	$0	$45,787,500	
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,332,000	
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,497,500	
$988,000	$988,000	$988,000	$988,000	$988,000	$988,000	$988,000	$988,000	$988,000	$988,000	$16,796,000	$988,000
$2,210,000	$2,491,667	$2,773,333	$2,925,000	$2,925,000	$2,925,000	$2,925,000	$2,925,000	$2,925,000	$2,925,000	$34,275,417	$2,925,000
$5,032,500	$4,370,000	$4,532,500	$4,620,000	$2,257,500	$2,257,500	$2,257,500	$2,257,500	$2,257,500	$2,257,500	$74,853,125	$2,257,500
$20,024,250	$16,590,917	$17,035,083	$17,274,250	$6,170,500	$6,170,500	$6,170,500	$6,170,500	$6,170,500	$6,170,500	$291,594,042	$6,170,500

linkage equal to about 30 percent between the creation of on-site construction positions and direct off-site employment.

- Off-site support businesses, including contractor/retail/counter sales, fuel providers, shipping, storage and professional services will also benefit. A conservative job creation relationship of five to ten percent relative to on-site positions was used (or, one off-site support worker/year for each 10 to 20 on-site worker/years).

- Extrapolation of state Department of Business Economic Development and Tourism (DBEDT) data, along with indicators provided by other state agencies and First Hawaiian Bank studies, demonstrate that each Hawaii worker creates demand for services (and related employment) during and directly attributable to the work day at up to five to 15 percent ratio. These positions include food businesses, providers of tools and trade goods, payroll/financial and insurance businesses, medical requirements and other secondary indirect/off-site employment.

During the 14-year building period of the project, the number of worker/years created on- and off-site by the development varies from 120 to 586 positions annually, totaling 7,485 worker/years. Of this total, 4,990 worker/years (an annual average of 249.5 positions) are direct construction-oriented or continuing operational positions at Kapalua Mauka; and 2,495 are off-site worker requirements (an average of 124.8 per year).

On a stabilized basis, after the completion of construction, the project will generate some 226 permanent full-time equivalent employment opportunities--151 directly related to on-site activities, and 75 indirect positions throughout the island.

The annualized employment created during the 14-year subject development period represents about a 0.58 percent increase in total jobs available in Maui County (438 additional jobs per year to a current job count in August 2001 of 75,900), and could potentially lower unemployment in the construction industry by up to half.

Additional employment will be created by the discretionary expenditures of the resident/guests of the development. These monies spent into the Maui economy are forecast to reach $49.4 million per year on a stabilized basis (quantified in a subsequent section). Based

on DBEDT data stating each $75,000 to $100,000 spent creates one position, an additional 494 to 658 secondary jobs will emerge on the island.

Wage Income Generated

In accordance with on-line data provided by the state Department of Labor and Industry Relations (through August 2001), as tempered through our analysis, we have estimated the personal income (in the form of wages) which will flow to Maui workers as a result of the Kapalua Mauka project.

The 2001 average wage of a full-time infrastructure construction worker is estimated conservatively at $55,500 per year.[11] For home condominium unit and clubhouse trade construction workers, the average annual pay was also estimated at $55,500. Retail/restaurant personnel are assumed to be paid $26,000 per year on average ($13 per hour), in-home maintenance and grounds/landscape workers and condominium staff, are projected to also receive an average pay equivalent to $26,000 per year. Off-site building and support industry jobs were estimated to receive an average pay of $30,000 annually.

Overall during the 14-year construction period, the total average wages received will be at $18.2 million annually and $41,535 per worker/year.

Application of these wage estimates to the employment forecasts generates personal income (wage) projections directly resulting from subject development as shown at the bottom of Table 19. The wage figures are all presented in constant 2001 dollars, and will undoubtedly escalate over time in accordance with inflationary pressures.

In the first year of development, the "Total Annual Wages Generated" by the subject development effort would be $8,037,000, increasing to a high of $24,786,750, as the number of construction workers peak in Year 8. After completion of all construction by the end of the 14th year, the on-going clubhouse operational, home/yard maintenance, condominium staff, off-site and indirect employment associated with the built-out community would result in average annual wages of $6.17 million thereafter in uninflated 2001 dollars.

(11) Assumes some portions of work done by non-union workers. Union wages are typically 15 to 50 percent higher than non-union workers.

It was assumed there would be no net increase in golf course staff or workers despite the probable course revisions and expansion, which would likely generate more work hours if not more positions. Retail/restaurant personnel were conservatively estimated at one employee for every 400 square feet of leaseable area (total 38 employees for 15,000 square feet). The total wages of this group is $988,000 on a stabilized basis.

Over the first 20 years of the development and "operation," on- and off-site, direct and indirect worker wages would total $291.59 million, with 56.14 percent of this figure (or $163.7 million) directly attributable to on-site construction activity associated with the building of the project.

Development Costs as Profit Income

While the significant majority of the materials needed to build the subject homes must be imported to Maui, a portion of the construction costs spent in the development will flow to local businesses in the form of contractor profits and supplier profits.

Typically, within the industry net contractor profit margins are expected to be at 8 to 20 percent of total construction costs. We have used a conservative ten percent figure. Supplier profits were extrapolated at four percent of total costs (supplies/materials equate to 50 to 60 percent of total cost, with a profit margin for the supplier of six to eight percent).

Application of these estimates to the forecast development parameters of the subject project was shown on Table 18.

The total Contractor's Profit ranges from $1,854,000 to $4,887,200 per year, with a cumulative profit of $47.1 million over the construction period. The total annual Supplier's Profit ranges from a low of $556,200 to a high of $1,849,480, and equates to $18.1 million over the 14-year development timeframe.

Population, Income and Expenditures

The homes of Kapalua Mauka will be a collection of primary and second home residences, primarily comprised of the latter. These households and their guests will contribute to the Maui economy during the use of the subject estates in the form of discretionary expenditures and (for full-time residents) household income levels.

Table 20 displays our population, discretionary expenditures, and household income estimates for the subject project.

A maximum of 20 percent of the homes in the development are estimated to be used by full-time resident households, with the remaining 80 percent being second/vacation homes.

The overall ratio of full-time resident use of units/homes varies widely among resort communities statewide, ranging from less than three percent in several of the more upscale projects to as high as 40-plus percent in some subdivisions at Wailea and Keauhou. We consider the 20 percent mark to be indicative of the effort Maui Land and Pineapple will take to attract local purchasers, and that the Kapalua Mauka climate is considered superior to South Maui and elsewhere by many long-time residents.

In full-time, single-family residences, the average household size is forecast at 3.1 persons, so that by project build-out there will be 242 permanent residents added to the island total. For second/guest single-family homes, the average party size using the estate is estimated at 3.5 persons, with the house occupied about 20 percent of the time. By completion of development, this will create an average of 218 second-home users and their guests in the community in addition to the full-time residences.

We estimate only 15 percent of the multi-family units will house permanent residents, having an average household size of 2.2 persons. This will mean an additional 99 permanent island residents. The remaining 85 percent of the units estimated will be occupied 50 percent of the time, also with average size parties of 2.2 persons, or an average non-resident/guest population of 281 in the multi-family inventory.

The resident population will be 341 persons upon build-out, and the total de facto resident population of Kapalua Mauka upon completion of development will be, on average, 840 persons. Of the full-time residents, it is estimated approximately 17 will be in the juvenile school age group.

The population of the project will place significant discretionary expenditure dollars into the Maui economy. In light of the cost of the finished homes, the residents and other users will be in the top household income brackets with substantial available income for such spending. The vacation/guest orientation of the users will further contribute to the high amount of discretionary funds.

We estimate that full-time resident households will spend about 42 percent of their total income on local discretionary items based on the most recent data. The daily per capita spending by second-home users and guests in the Maui economy will be on average $185, above what the typical Maui visitor spends daily on non-lodging purchases (commensurate with the relative upscale subject project quality). This pays for all food, entertainment, household goods, locally purchased fixtures and furnishings, utilities, clothing and other daily items.

By build-out, the total resident/guest discretionary expenditures made by subject project users in the local market will be at $49.4 million annually on a stabilized basis, in 2001 dollars. During the 20-year development and stabilization model period, the total sum of these expenditures will be $640.7 million.

The total full-time resident income amount was quantified for use in estimating state income taxes to be paid. In order to conventionally qualify for a home or unit with prices generally ranging from over $500,000 to $1,600,000, as is likely at Kapalua Mauka, a household income of circa $150,000 to $500,000-plus per year is necessary. We have assumed a resident per capita income of $115,000. We recognize this amount could range widely upwards, and consider these projections moderate.

On a stabilized basis after build-out, the total annual full-time taxable resident income at the subject would be some $39.2 million. Much of the resident and virtually all of the guest expenditures will be "new" dollars on Maui, providing a true economic expansion.

Kapalua Mauka represents a real property capital investment in Maui of approximately $470.8 million dollars. Of this amount, $356.8 million will flow directly to local businesses and individuals in the form of wages and profits. All of these dollars will flow throughout the Maui economy. The vast majority of other construction costs will be spent on materials and supplies shipped from the mainland.

Summary of Direct, Local Economic Impacts

The various direct, local economic impacts which will flow to the subject region as a result of the subject development are summarized on Table 21.

TABLE 20

POPULATION, DISCRETIONARY EXPENDITURES AND RESIDENT INCOME ESTIMATES
Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii
In Constant Mid-Year 2001 Dollars

Development Year	3	4	5	6	7	8	9	10	11
Cumulative Residential Development									
Single Family Homes	20	45	75	110	145	180	215	250	285
Multifamily Units	25	55	90	125	160	200	240	280	300
Total Residential Units	45	100	165	235	305	380	455	530	585
Resident/Guest Population									
Single Family	24	53	89	130	171	212	254	295	336
Multifamily	32	70	114	158	202	253	304	354	380
Total De Facto Population (1)	55	123	202	288	374	465	557	649	716
Total Resident Population (2)	21	46	76	109	143	178	213	247	276
Estimated School Age Children	1	2	4	5	7	9	11	13	14
RESIDENT/USER DISCRETIONARY EXPENDITURES	$5,794,977	$7,292,403	$12,823,479	$17,006,224	$22,148,878	$27,683,295	$33,857,620	$38,511,945	$42,399,953
FULL-TIME RESIDENT INCOME	$2,374,750	$5,395,750	$8,763,000	$12,586,750	$16,410,500	$20,424,000	$24,437,500	$28,451,000	$31,705,500

Development Year	12	13	14	15	16	17	18	19	20
Cumulative Residential Development									
Single Family Homes	320	355	390	390	390	390	390	390	390
Multifamily Units	300	300	300	300	300	300	300	300	300
Total Residential Units	620	655	690	690	690	690	690	690	690
Resident/Guest Population									
Single Family	378	419	460	460	460	460	460	460	460
Multifamily	380	380	380	380	380	380	380	380	380
Total De Facto Population (1)	757	798	840	840	840	840	840	840	840
Total Resident Population (2)	297	319	341	341	341	341	341	341	341
Estimated School Age Children	15	16	17	17	17	17	17	17	17
RESIDENT/USER DISCRETIONARY EXPENDITURES	$44,731,643	$47,043,333	$49,365,823	$49,365,823	$49,365,823	$49,365,823	$49,365,823	$49,365,823	$49,365,823
FULL-TIME RESIDENT INCOME	$34,281,000	$36,494,500	$39,192,000	$39,192,000	$39,192,000	$39,192,000	$39,192,000	$39,192,000	$39,192,000

(1) Average daily resident and overnight guest population at project.
(2) Full-Time residents only.

Source: Various, and The Hallstrom Group, Inc.

In addition to those previously cited, the clubhouse operations will add direct economic benefits to the Maui community. We have estimated the gross sales/revenue of the clubhouse project will be some $8,625,000 per year on a stabilized basis. This assumes the additional nine holes would generate $1.875 million per year in green fees and the commercial components would add $6.75 million in gross sales ($450 per square foot annually).

The annual Total Base Economic Impact increases from $11,027,000 in Year 1 of the development effort to a high of $78,718,773 in Year 14 (in 2001 dollars). Over the two decade development and stabilization projection period, the total is $1.144 billion. Fueled by discretionary expenditures and employment associated with on-going clubhouse, and maintenance operations, and off-site effects, the estimated stabilized annual base impact thereafter is $64.16 million.

These dollars will be spent, then re-spent, on goods and services on the island, diminishing in impact on the local economy with each turnover as a portion flows off Maui for goods, services and financing commitments. First Hawaiian Bank studies have concluded the appropriate economic multiplier rates in Hawaii are from 1.2 to 3.5 times (or 20 to 250 percent) of the base impact amount. Mainland studies (by the Urban Institute and others) tend toward the upper end of this range, and reach multipliers as high as 4.0.

Due to the need to import more than 80-plus percent of supplies/goods used on Maui, the multiplier impact for the island is not as great as for mainland locales, particularly for construction-based expenditures. We have therefore tested multiplier rates at the mid-point of the market spectrum, ranging from 1.8 to 2.8 times. Or, each direct, local dollar spent creates another $.80 to $1.80 in additional direct, local economic activity.

Using a relatively conservative multiplier effect ratio of 2.0, the total overall direct impact on the Maui economy resulting from Kapalua Mauka would be $2.288 billion over the 20-year projection period (in constant 2001 dollars). On a stabilized annual basis thereafter, the overall impact would be at $128.3 million.

This is equivalent to one to two large size hotel operations.

TABLE 21

SUMMARY OF ECONOMIC IMPACTS ASSOCIATED WITH DEVELOPMENT
Market Study of the Proposed Kapalua Mauka Development
Kapalua, Maui, Hawaii
In Constant Mid-Year 2001 Dollars

Development Year	1	2	3	4	5	6	7	8	9	10
ANNUAL WAGES GENERATED	$8,037,000	$5,640,000	$14,629,167	$19,419,875	$18,834,875	$24,364,667	$21,258,208	$24,786,750	$25,115,317	$23,560,083
CONTRACTOR'S PROFIT	$2,300,000	$1,854,000	$3,060,000	$3,982,200	$3,515,000	$4,887,200	$3,867,500	$4,809,100	$4,067,500	$4,067,500
SUPPLIER'S PROFIT	$690,000	$556,200	$1,224,000	$1,490,910	$1,406,000	$1,852,910	$1,547,000	$1,849,480	$1,627,000	$1,627,000
CLUBHOUSE OPERATIONS (1)				$8,625,000	$8,625,000	$8,625,000	$8,625,000	$8,625,000	$8,625,000	$8,625,000
DISCRETIONARY EXPENDITURES			$3,284,577	$7,292,403	$12,023,479	$17,086,224	$22,148,970	$27,603,295	$33,057,620	$38,511,945
TOTAL BASE ECONOMIC IMPACT	$11,027,000	$8,050,200	$22,197,744	$40,810,388	$44,404,354	$56,816,001	$57,446,678	$67,673,625	$74,493,437	$76,391,528
Multiplier Effect Ratio	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
TOTAL OVERALL IMPACT	$22,054,000	$16,100,400	$44,395,487	$81,620,776	$88,808,708	$113,632,002	$114,893,357	$135,347,250	$148,986,873	$152,783,057

Development Year	11	12	13	14	15	16	17	18	19	Stabilized 20	Total 1-20
ANNUAL WAGES GENERATED	$20,024,250	$16,590,917	$17,035,083	$17,274,250	$6,170,500	$6,170,500	$6,170,500	$6,170,500	$6,170,500	$6,170,500	$291,594,042
CONTRACTOR'S PROFIT	$3,267,500	$2,467,500	$2,467,500	$2,467,500							$47,080,000
SUPPLIER'S PROFIT	$1,307,000	$987,000	$987,000	$987,000							$18,138,500
CLUBHOUSE OPERATIONS (1)	$8,625,000	$8,625,000	$8,625,000	$8,625,000	$8,625,000	$8,625,000	$8,625,000	$8,625,000	$8,625,000	$8,625,000	$146,625,000
DISCRETIONARY EXPENDITURES	$42,399,953	$44,721,643	$47,041,333	$49,365,023	$49,365,023	$49,365,023	$49,365,023	$49,365,023	$49,365,023	$49,365,023	$640,728,598
TOTAL BASE ECONOMIC IMPACT	$75,623,703	$73,392,059	$76,157,916	$78,718,773	$64,160,523	$64,160,523	$64,160,523	$64,160,523	$64,160,523	$64,160,523	$1,144,166,140
Multiplier Effect Ratio	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
TOTAL OVERALL IMPACT	$151,247,405	$146,784,118	$152,315,832	$157,437,545	$128,321,045	$128,321,045	$128,321,045	$128,321,045	$128,321,045	$128,321,045	$2,288,332,280

(1) Estimated at $1,875,000 per year for golf operations (15,000 rounds at $125 each), plus $6,750,000 in other sales (15,000 square feet at $450 in sales/square foot/year).

Source: Various, and The Hallstrom Group, Inc.

PUBLIC COST/BENEFIT ASSESSMENT

The purpose of this analysis is to delineate the direct areas in which the proposed subject residential development will potentially impact the sphere of public agency resources, and quantify (where possible) the costs of providing expanded services to the project, versus the economic benefits that accrue to the community through an increase in local and state tax payments.

Potential direct costs to governmental services and programs include:

-- Police Protection
-- Fire Protection
-- Infrastructure Services
-- Recreational Demands
-- Educational Needs
-- Infrastructure Costs
-- Various Other Services and Financial Commitments

Direct tax benefits to the state and county coffers will flow from three major sources:

-- Real Property Taxes
-- Gross Excise Tax Receipts
-- State Income Taxes

Some cost/benefit issues are considered as off-setting, or "a wash," as the cost of the services to the government is theoretically directly reimbursed in the form of user fees. Building permits and utility hook-up fees are two prime examples. Such items are excluded from this study.

A concern of this analysis is the integration of the subject project into the overall Maui governmental services plan on both an actual and per capita perspective.

From an actual public service cost perspective to Maui and the state, the 690 homes/units within Kapalua Mauka represent a fractional number of the regional inventory. Given the vast number of units on the island, and the relatively low usage expected at the subject, it is difficult to say that of themselves the subject improvements and users will create the need for expansion of existing public services.

The maximum total de facto population of the community (residents and guests) at build-out will be only 840 persons, or only 1.22 persons per unit. This is well less than half the population a project of this size would generate as a typical housing project oriented to full-time residents. And, most of the population is comprised of visitors/tourists who do not avail themselves of most state and county services, do not vote in local elections, and so pressure on governmental budgets are limited.

However, the need for additional services is a cumulative effect, each project, each resident or tourist adding a little bit to the community base until a "need threshold" is reached.

In regards to some services, the effective actual impact may not be apparent from a cost perspective, merely creating nominally greater demands which can be readily met through existing agencies and facilities without the need for additional workers or funds.

Our analysis of State of Hawaii and Maui County budgets indicate the actual effect of governmental services relating to Kapalua Mauka would not create the need to meaningfully expand additional county and state funding on Maui. It is probable any school age children would attend private schools (as is typical in Hawaii for this income class). The de facto population of 840 persons and their automobiles represent a relatively insignificant less than one-half a percent expansion to the total de facto island person and car population. Further, some of the full-time residents will be relocating from elsewhere on the island, and some of the visitors drawn from other Maui resorts, so that not even all of this small population movement will be fully new to the island.

As an alternative to actual cost estimates, which are inherently disparate as such estimates cannot provide for unexpected and/or atypical items, it is most common to project public costs on a per capita formula for a residential-based project.

Public Costs

We have based our governmental cost assessments for the subject on the per capita expenditures incurred by the State of Hawaii and Maui County in accordance with the de facto population area of the jurisdiction. This is founded on the principal that each individual on the island equitably benefits from all governmental costs, regardless of type or focus, with each new member of the community (whether resident, second home user or visitor) creating a proportionate new cost burden.

According to the State of Hawaii *Multi-year Program and Financial Plan and Executive Budget for the period 2001-2007 (Budget Period 2001-03)*, the state plans to spend a total of $7.278 billion on services, salaries, infrastructure, and financing in 2002. The total de facto population in the state on an average daily basis for that year is estimated to reach about 1,395,000 persons, including residents, tourists, and military personnel.

The anticipated per capita expenditure by the state in 2002 is thus $5,217, an increase of circa 22 percent from 1997. From 1979 to 2002, state costs will have increased at the rate of 5.69 percent annually compounded. We have estimated the 2002 state budget will provide expenditures of $5,217 per person in the de facto population base. This amount was multiplied by the subject population (as it grows in Years 3 through 14 while homes/units are built, stabilizing in Year 14 and thereafter), to arrive at a gross per capita cost to the state to service the subject.

It could be argued that there should be a division of costs between full-time residents and tourist or second-home user populations; however, we consider such highly speculative. While tourists may not avail themselves of every governmental service, they particularly enjoy the benefits brought to the general community (which is why they choose the area where they purchase a vacation home). Also, as the subject will have a mixture of population types, as does the general Maui population, this all inclusive analysis perspective seems appropriate.

In the first year of occupancy (Year 3 of our projection model), per capita state costs resulting from Kapalua Mauka would be $288,109, increasing to a stabilized level of $4,380,715 by Year 14 and beyond.

Analyzed on a similar basis, the county of Maui projects a budget for the island government of $307,962,647 for fiscal Year 2002, up meaningfully from previous years, according to the county budget information website.

The current de facto population Maui is some 176,594 persons (comprised of 128,094 residents and 48,500 visitors). The resulting de facto per capita county expenditure for 2002 is therefore anticipated to be $1,744.

The total county cost, on a constant dollar basis, associated with the Kapalua Mauka resident and guest population would be $96,312 in Year 3 of the project, escalating to $1,464,437 by total build-out and stabilization in Year 14, and annually thereafter.

Total Public Costs -- Based on our analysis, the reasonable gross annual cost to the public from the proposed subject project, expressed in 2001 dollars, would range from $384,421 effective at the end of Year 3 (at the commencement of residential occupancy) to a high of $5.85 million on a stabilized basis after project completion.

Over the 20-year study timeframe (from the beginning of infrastructure emplacement until all the homes are built in Year 14 and stable "operation" is reached throughout the community), the entire direct cost to the public purse resulting from implementation of the Kapalua Mauka master plan would be $75.62 million.

Public Benefits

Off-setting these public operating costs will be a variety of direct and indirect taxes, assessment and fees. Our analysis focuses on the three primary tax sources which Kapalua Mauka residents and users will pay to state and county funds; property taxes, income taxes and excise taxes.

Numerous other direct and indirect fees and taxes are paid by builders, businesses and property owners; however, these sources are considered secondary, and comprise minor amounts compared to the primary three.

Real Property Taxes -- Property taxes paid by landowners in the subject project were calculated using the 2001-2002 tax rates for both land and buildings, improved and unimproved.

Assessed values for the lots are based on an average sales price of $450,000, with the improvements assessment based on the development/construction costs of the finished homes ($705,000 on average). The assessed value of the land under each condominium unit was estimated at $70,000 and the improvements at $400,000. This may result in a slight understatement of assessments on the homes and units, as market value often exceeds reproduction expense.

It was assumed the land would be classified as residential, apartment or commercial and be taxed at the respective rates of $5.04, $5.04, and $6.89 annually per $1,000 of assessed value. The improvements would be classified as "single-family residential" with a tax rate of

$5.04 per $1,000 of assessment; "apartment" at $5.04 per $1,000; and "commercial" at $6.89 per $1,000 of assessed value.

Land taxes are based on an average unserviced value of $25,000 per acre for the entire 920 acres of the subject site in Year 1, increasing to $75,000 per acre in Year 2 as the backbone infrastructure is finished (total value of $69,000,000), and then being absorbed at market lot and building site prices beginning in Year 3 as the subdivision work is undertaken. The assessed values of the finished homes and units are added as of the year of their construction.

We have not included any additional real property taxes which may be associated with the revision/expansion of the existing Village Golf Course.

All real property value of the subject holding is assumed to be vested in the completed "salable" components and clubhouse, with no assessment placed against open spaces, roads, or other community systems.

The total real property tax to be paid to Maui County in 2001 dollars ranges from $115,920 in Year 1 of development, to a stabilized level of $5,571,652 for build-out from Year 14 and beyond. The aggregate taxes paid over the 20-year study timeframe will be $72.86 million.

State Income Tax -- The state will receive income taxes from three sources:

- the **wages of the workers** associated with the construction, maintenance, and operation of the Kapalua Mauka components;
- the **household income** of the development's full-time residents; and
- the **corporate profits** from contractors and suppliers serving the construction and maintenance phases of the development, and as generated by on-going clubhouse operations.[12]

[12] We have not included any profits which may result from transient rental pools in the multi-family projects, nor the profits of off-site businesses which provide services to the operating community.

According to DBEDT data, individual State of Hawaii income tax liability as a ratio to gross income has ranged from 5.62 to 5.80 percent during the past 15 years, with the more current figures tending toward the mid to upper-end of the range. We have employed an effective tax rate of 5.80 percent of gross income for individual workers and full-time residents.

The effective tax rate for the corporate income is estimated at 2.00 percent of gross operating profits, based on available DBEDT statistics.

The total income tax revenues to be received by the state are projected at $525,946 in the first year of construction increasing to a maximum level in Year 14 of $3,497,109 in constant 2001 dollars as construction is completed.

On a stabilized basis, after build-out, the resident incomes and wages of home/grounds maintenance workers, condominium staff, clubhouse personnel, and support businesses doing work on site, would pay an annual state income tax of $2,784,001.

Over the two-decade study period, the cumulative income taxes paid are estimated at $49.13 million.

We have not included any corporate income or other taxes which will be paid by Maui Land and Pineapple as a result of any profits from undertaking the Kapalua Mauka development, or from the secondary jobs created by the discretionary spending of residents/guests. Such items have the potential to be substantial contributions to the state coffers.

State Gross Excise Tax -- This 4.166 percent of expenditures tax was applied against:

- **the total estimated construction contract costs;**
- the **total gross sales of the retail/restaurant component** of the clubhouse (excluding golf); and
- the **discretionary expenditures of the resident population** of the subject.

The anticipated state excise tax receipts arising from the subject development grow from an estimated $958,180 in the first year of development to a peak of $3,658,246 in Year 10. Over the 20-year study period, the receipts total $52.77 million and stabilize at circa $2.48 million per year.

We have not included any excise tax revenues associated with the direct, local "multiplier effect" expenditures on Maui, or those created in the secondary market by resident/guest expenditures.

Total Public Benefits (Revenues) -- In constant 2001 dollars, the aggregate annual tax revenues flowing from the subject development range from:

- $115,920 to $5,571,652 per year for the county of Maui, stabilizing over time at the higher figure, totaling $72.86 million over the projection timeframe;
- $1,147,700 to $6,940,933 annually for the State of Hawaii, stabilizing at $5.2 million per year, and cumulatively at $101.9 over the 20-year projection period; and
- $1,495,460 to $12,512,585 per year for total primary source tax receipts (county and state), totaling $174.76 million for the first 20 years of the Kapalua Mauka community.

Correlation

Our public cost/benefit assessment is summarized on Table 22, which also contains the correlation of public service costs with the anticipated tax revenue benefits.

The net benefit (revenues less costs) to Maui County from the development of the subject increases from $115,920 in Year 1 to $4,107,215 in Year 14 and beyond, with an aggregate benefit of $53.92 million during the two-decade study period. The stabilized net benefit to the county will be $4.11 million annually.

The net benefit to the State of Hawaii ranges from a low of $819,150 to a high of $3,528,831, totaling a net gain of $45.23 million over the forecast timeframe. The stabilized net benefit is circa $819,150 annually.

The overall yearly net benefit to local governmental agencies (state and county) varies from $1.5 million to $6.7 million, with a

TABLE 12

PUBLIC COST/BENEFIT SUMMARY TABLE
Market Study, Economic Impact Analysis and Public Cost/Benefit Assessment
of the Proposed Project District 2 (Kapalua Mauka) Development
Kapalua, Maui, Hawaii
In Constant Mid-Year 2001 Dollars

Development Year	1	2	3	4	5	6	7	8	9	10
PUBLIC BENEFITS (Revenues)										
1. REAL PROPERTY TAXES										
Cumulative Assessed Values										
Improvements			$30,350,000	$59,975,000	$95,125,000	$133,800,000	$172,475,000	$213,150,000	$253,825,000	$294,500,000
Land	$23,000,000	$49,000,000	$75,867,000	$88,917,000	$104,517,000	$122,367,000	$140,217,000	$158,367,000	$176,517,000	$194,667,000
Total Assessed Value	$23,000,000	$49,000,000	$106,217,000	$148,892,000	$199,642,000	$256,167,000	$312,692,000	$371,517,000	$430,342,000	$489,167,000
TOTAL REAL PROPERTY TAXES	$115,920	$347,760	$716,977	$1,096,552	$1,547,527	$2,047,327	$2,547,127	$3,069,502	$3,591,877	$4,114,252
2. STATE INCOME TAXES										
Taxable Personal Income	$8,037,000	$5,640,000	$17,003,917	$24,715,625	$27,597,875	$36,951,417	$37,668,708	$45,210,750	$47,553,417	$52,011,083
Taxable Corporate Profits	$2,990,000	$2,410,200	$6,403,149	$8,073,198	$8,088,817	$10,515,437	$9,797,376	$11,695,975	$11,384,414	$12,040,933
Personal Taxes Paid	$466,146	$327,120	$986,227	$1,433,506	$1,600,677	$2,143,182	$2,184,785	$2,622,224	$2,758,098	$3,016,643
Corporate Taxes Paid	$59,800	$48,204	$128,063	$161,464	$161,776	$210,309	$195,948	$233,920	$227,728	$240,819
TOTAL STATE INCOME TAXES	$525,946	$375,324	$1,114,290	$1,594,970	$1,762,453	$2,353,491	$2,380,733	$2,856,143	$2,985,826	$3,257,462
3. STATE GROSS EXCISE TAX										
Taxable Transactions										
Construction Contracts	$23,000,000	$18,540,000	$30,600,000	$39,822,000	$35,150,000	$48,872,000	$38,675,000	$48,091,000	$40,675,000	$40,675,000
Commercial Operations			$8,625,000	$8,625,000	$8,625,000	$8,625,000	$8,625,000	$8,625,000	$8,625,000	$8,625,000
Discretionary Expenditures			$3,284,577	$7,292,403	$12,023,479	$17,086,224	$22,148,970	$27,603,295	$33,057,620	$38,511,945
Total Taxable Transactions	$23,000,000	$18,540,000	$42,509,577	$55,739,403	$55,798,479	$74,583,224	$69,448,970	$84,319,295	$82,357,620	$87,811,945
TOTAL STATE EXCISE TAXES	$958,180	$772,376	$1,770,949	$2,322,104	$2,324,565	$3,107,137	$2,893,344	$3,512,742	$3,431,018	$3,658,246
TOTAL GROSS PUBLIC REVENUES										
To Maui County (Item #1)	$115,920	$347,760	$716,977	$1,096,552	$1,547,527	$2,047,327	$2,547,127	$3,069,502	$3,591,877	$4,114,252
To State (Items #2 & 3)	$1,484,126	$1,147,700	$2,885,239	$3,917,074	$4,087,018	$5,460,628	$5,273,977	$6,368,885	$6,416,845	$6,915,707
AGGREGATE TAX REVENUES	$1,600,046	$1,495,460	$3,602,216	$5,013,626	$5,634,544	$7,507,955	$7,821,103	$9,438,387	$10,008,722	$11,029,959
PUBLIC COSTS (Expenses)										
State			$288,109	$639,995	$1,055,660	$1,502,105	$1,948,550	$2,427,992	$2,907,434	$3,386,876
County			$96,312	$213,945	$352,898	$502,141	$651,384	$811,658	$971,931	$1,132,205
TOTAL PUBLIC COSTS			$384,421	$853,941	$1,408,558	$2,004,246	$2,599,934	$3,239,649	$3,879,365	$4,519,081
TOTAL NET PUBLIC BENEFITS										
To State	$1,484,126	$1,147,700	$2,597,130	$3,277,078	$3,031,358	$3,958,524	$3,325,427	$3,940,893	$3,509,411	$3,528,831
To Maui County	$115,920	$347,760	$620,664	$882,607	$1,194,628	$1,545,186	$1,895,743	$2,257,844	$2,619,946	$2,982,047
AGGREGATE NET BENEFITS	$1,600,046	$1,495,460	$3,217,795	$4,159,685	$4,225,986	$5,503,709	$5,221,170	$6,198,737	$6,129,356	$6,510,878

Source: The Hallstrom Group, Inc.

cumulative 20-year "profit" figure of $49.1 million and a stabilized annual net benefit of $4.9 million.

In no single year do public coffers suffer a net loss.

CERTIFICATION

The undersigned do hereby certify that, to the best of our knowledge and belief, the statements of fact contained in this report are true and correct. It is further certified that the reported analyses, opinions, and conclusions are limited only by the reported assumptions and limiting conditions, and are our personal, impartial, and unbiased professional analyses, opinions, and conclusions. We further certify that we have no present or prospective interest in the property that is the subject of this report, and have no personal interest with respect to the parties involved. We have no bias with respect to the property that is the subject of this report or the parties involved with this assignment. Our engagement in this assignment was not contingent upon developing or reporting predetermined results. Our compensation for completing this assignment is not contingent upon the development or reporting of a predetermined value or direction in value that favors the cause of the client, the amount of the value opinion, the attainment of a stipulated result, or the occurrence of a subsequent event directly related to the intended use of this appraisal. The appraisal analyses, opinions, and conclusions were developed, and this report has been prepared, in conformity with the requirements of the Code of Professional Ethics and Standards of Professional Appraisal Practice of the Appraisal Institute, and the Uniform Standards of Professional Appraisal Practice. The use of this report is subject to the requirements of the Appraisal Institute relating to review by duly authorized representatives. The undersigned certify that they have made personal inspections of the property that is the subject of this report. No other persons provided significant real property appraisal assistance other than the undersigned.

TABLE 22
Contd.

PUBLIC COST/BENEFIT SUMMARY TABLE
Market Study, Economic Impact Analysis and Public Cost/Benefit Assessment
of the Proposed Project District 3 (Kapalua Mauka) Development
Kapalua, Maui, Hawaii
In Constant Mid-Year 2001 Dollars

Development Year	11	12	13	14	15	16	17	18	19	Stabilized 21	Total 1-20
PUBLIC BENEFITS (Revenues)											
1. REAL PROPERTY TAXES											
Cumulative Assessed Values											
Improvements	$327,175,000	$331,650,000	$376,525,000	$401,200,000	$401,200,000	$401,200,000	$401,200,000	$401,200,000	$401,200,000	$401,200,000	
Land	$211,617,000	$227,567,000	$243,117,000	$258,867,000	$258,867,000	$258,867,000	$258,867,000	$258,867,000	$258,867,000	$258,867,000	
Total Assessed Value	$538,792,000	$579,217,000	$619,642,000	$660,067,000	$660,067,000	$660,067,000	$660,067,000	$660,067,000	$660,067,000	$660,067,000	
TOTAL REAL PROPERTY TAXES	$4,546,327	$4,888,102	$5,229,877	$5,571,652	$5,571,652	$5,571,652	$5,571,652	$5,571,652	$5,571,652	$5,571,652	$72,860,687
2. STATE INCOME TAXES											
Taxable Personal Income	$51,729,750	$50,791,817	$53,731,583	$56,464,230	$45,362,500	$45,362,500	$45,362,500	$45,362,500	$45,362,500	$45,362,500	$787,284,297
Taxable Corporate Profits	$11,387,494	$10,546,097	$10,834,700	$11,103,363	$7,648,803	$7,648,803	$7,648,803	$7,648,803	$7,648,803	$7,648,803	$173,155,032
Personal Taxes Paid	$3,000,326	$2,943,931	$3,116,432	$3,275,043	$2,631,025	$2,631,025	$2,631,025	$2,631,025	$2,631,025	$2,631,025	$43,662,489
Corporate Taxes Paid	$227,750	$210,922	$216,694	$222,066	$152,975	$152,975	$152,976	$152,976	$152,976	$152,976	$5,463,119
TOTAL STATE INCOME TAXES	$3,228,075	$3,154,853	$3,333,126	$3,497,109	$2,784,001	$2,784,001	$2,784,001	$2,784,001	$2,784,001	$2,784,001	$49,125,604
4. STATE GROSS EXCISE TAX											
Taxable Transactions											
Construction Contracts	$32,675,000	$24,675,000	$24,675,000	$24,675,000	$0	$0	$0	$0	$0	$0	$470,800,000
Commercial Operations	$8,625,000	$8,625,000	$8,625,000	$8,625,000	$8,625,000	$8,625,000	$8,625,000	$8,625,000	$8,625,000	$8,625,000	$155,250,000
Discretionary Expenditures	$42,399,911	$44,721,643	$47,043,333	$49,365,023	$49,365,023	$49,365,023	$49,365,023	$49,365,023	$49,365,023	$49,365,023	$640,725,998
Total Taxable Transactions	$83,699,911	$78,021,643	$80,343,333	$82,665,023	$57,990,023	$57,990,023	$57,990,023	$57,990,023	$57,990,023	$57,990,023	$1,266,775,998
TOTAL STATE EXCISE TAXES	$3,486,940	$3,250,382	$3,347,185	$3,443,835	$2,415,864	$2,415,864	$2,415,864	$2,415,864	$2,415,864	$2,415,864	$52,773,996
TOTAL GROSS PUBLIC REVENUES											
To Maui County (Item #1)	$4,546,327	$4,888,102	$5,229,877	$5,571,652	$5,571,652	$5,571,652	$5,571,652	$5,571,652	$5,571,652	$5,571,652	$72,860,687
To State (Items #2 & 3)	$6,715,015	$6,407,235	$6,680,029	$6,940,913	$5,199,865	$5,199,865	$5,199,865	$5,199,865	$5,199,865	$5,199,865	$101,899,604
AGGREGATE TAX REVENUES	$11,261,342	$11,295,336	$11,909,906	$12,512,565	$10,771,517	$10,771,517	$10,771,517	$10,771,517	$10,771,517	$10,771,517	$174,760,290
PUBLIC COSTS (Expenses)											
State	$3,734,329	$3,948,791	$4,163,253	$4,380,715	$4,380,715	$4,380,715	$4,380,715	$4,380,715	$4,380,715	$4,380,715	$56,671,097
County	$1,248,355	$1,320,382	$1,392,410	$1,464,437	$1,464,437	$1,464,437	$1,464,437	$1,464,437	$1,464,437	$1,464,437	$18,944,680
TOTAL PUBLIC COSTS	$4,982,684	$5,269,173	$5,555,663	$5,845,152	$5,845,152	$5,845,152	$5,845,152	$5,845,152	$5,845,152	$5,845,152	$75,615,777
TOTAL NET PUBLIC BENEFITS											
To State	$2,980,687	$2,457,444	$2,516,776	$2,560,198	$819,150	$819,150	$819,150	$819,150	$819,150	$819,150	$45,228,507
To Maui County	$3,297,972	$3,567,719	$3,837,467	$4,107,215	$4,107,215	$4,107,215	$4,107,215	$4,107,215	$4,107,215	$4,107,215	$53,916,007
AGGREGATE NET BENEFITS	$6,278,659	$6,025,163	$6,354,243	$6,667,413	$4,926,365	$4,926,365	$4,926,365	$4,926,365	$4,926,365	$4,926,365	$99,144,514

The Appraisal Institute conducts programs of continuing education for their designated members. As of the date of this report, James E. Hallstrom, Jr. has completed the requirements of the continuing education program of the Appraisal Institute.

James E. Hallstrom, Jr., MAI, CRE
Hawaii State Certified
General Appraiser, CGA-178
Exp. Date December 31, 2001

Tom W. Holliday/snt
Tom W. Holliday

/as

4009CR01

ADDENDA

EXHIBIT I

Table DP-1. Profile of General Demographic Characteristics: 2000
Geographic Area: Maui County, Hawaii
[For information on confidentiality protection, nonsampling error, and definitions, see text]

Subject	Number	Percent	Subject	Number	Percent
Total population	128,094	100.0	**HISPANIC OR LATINO AND RACE**		
			Total population	128,094	100.0
SEX AND AGE			Hispanic or Latino (of any race)	10,050	7.8
Male	64,329	50.2	Mexican	2,968	2.3
Female	63,765	49.8	Puerto Rican	3,289	2.6
			Cuban	85	0.1
Under 5 years	8,579	6.7	Other Hispanic or Latino	3,808	3.0
5 to 9 years	9,079	7.1	Not Hispanic or Latino	118,044	92.2
10 to 14 years	9,330	7.3	White alone	40,918	31.9
15 to 19 years	8,658	6.8			
20 to 24 years	6,870	5.4	**RELATIONSHIP**		
25 to 34 years	17,723	13.8	Total population	128,094	100.0
35 to 44 years	21,881	17.1	In households	126,693	98.9
45 to 54 years	19,823	15.5	Householder	43,507	34.0
55 to 59 years	6,596	5.2	Spouse	22,154	17.3
60 to 64 years	4,907	3.8	Child	36,468	28.5
65 to 74 years	7,715	6.0	Own child under 18 years	26,564	20.7
75 to 84 years	5,272	4.1	Other relatives	13,485	10.5
85 years and over	1,642	1.3	Under 18 years	5,204	4.1
Median age (years)	36.8	(X)	Nonrelatives	11,081	8.7
			Unmarried partner	3,590	2.8
18 years and over	95,383	74.5	In group quarters	1,401	1.1
Male	47,728	37.3	Institutionalized population	605	0.5
Female	47,655	37.2	Noninstitutionalized population	796	0.6
21 years and over	91,039	71.1			
62 years and over	17,417	13.6	**HOUSEHOLD BY TYPE**		
65 years and over	14,629	11.4	Total households	43,507	100.0
Male	6,638	5.2	Family households (families)	29,899	68.7
Female	7,991	6.2	With own children under 18 years	14,361	33.0
			Married-couple family	22,154	50.9
RACE			With own children under 18 years	10,171	23.4
One race	99,610	77.8	Female householder, no husband present	5,200	12.0
White	43,421	33.9	With own children under 18 years	2,864	6.6
Black or African American	509	0.4	Nonfamily households	13,608	31.3
American Indian and Alaska Native	479	0.4	Householder living alone	9,538	21.9
Asian	39,728	31.0	Householder 65 years and over	2,738	6.3
Asian Indian	107	0.1			
Chinese	1,197	0.9	Households with individuals under 18 years	16,873	38.8
Filipino	21,804	17.0	Households with individuals 65 years and over	10,230	23.5
Japanese	12,928	10.1			
Korean	795	0.6	Average household size	2.91	(X)
Vietnamese	317	0.2	Average family size	3.41	(X)
Other Asian [1]	2,582	2.0			
Native Hawaiian and Other Pacific Islander	13,730	10.7	**HOUSING OCCUPANCY**		
Native Hawaiian	11,410	8.9	Total housing units	56,377	100.0
Guamanian or Chamorro	54	-	Occupied housing units	43,507	77.2
Samoan	208	0.2	Vacant housing units	12,870	22.8
Other Pacific Islander [2]	2,058	1.6	For seasonal, recreational, or occasional use	9,746	17.3
Some other race	1,743	1.4			
Two or more races	28,484	22.2	Homeowner vacancy rate (percent)	1.2	(X)
			Rental vacancy rate (percent)	7.2	(X)
Race alone or in combination with one or more other races: [3]					
			HOUSING TENURE		
White	62,660	48.9	Occupied housing units	43,507	100.0
Black or African American	1,272	1.0	Owner-occupied housing units	25,039	57.6
American Indian and Alaska Native	2,738	2.1	Renter-occupied housing units	18,468	42.4
Asian	61,148	47.7			
Native Hawaiian and Other Pacific Islander	33,019	25.8	Average household size of owner-occupied units	3.13	(X)
Some other race	5,874	4.6	Average household size of renter-occupied units	2.62	(X)

- Represents zero or rounds to zero. (X) Not applicable
[1] Other Asian alone, or two or more Asian categories.
[2] Other Pacific Islander alone, or two or more Native Hawaiian and Other Pacific Islander categories.
[3] In combination with one or more of the other races listed. The six numbers may add to more than the total population and the six percentages may add to more than 100 percent because individuals may report more than one race.

Source: U.S. Census Bureau, Census 2000.

EXHIBIT I

Table DP-1. Profile of General Demographic Characteristics: 2000
Geographic Area: Lahaina CDP, Hawaii
[For information on confidentiality protection, nonsampling error, and definitions, see text]

Subject	Number	Percent	Subject	Number	Percent
Total population	9,118	100.0	**HISPANIC OR LATINO AND RACE**		
			Total population	9,118	100.0
SEX AND AGE			Hispanic or Latino (of any race)	644	7.1
Male	4,738	52.0	Mexican	333	3.7
Female	4,380	48.0	Puerto Rican	113	1.2
			Cuban	1	-
Under 5 years	555	6.1	Other Hispanic or Latino	197	2.2
5 to 9 years	522	5.7	Not Hispanic or Latino	8,474	92.9
10 to 14 years	618	6.8	White alone	2,253	24.7
15 to 19 years	590	6.5			
20 to 24 years	592	6.5	**RELATIONSHIP**		
25 to 34 years	1,515	16.6	Total population	9,118	100.0
35 to 44 years	1,526	16.7	In households	9,105	99.9
45 to 54 years	1,272	14.0	Householder	2,599	28.5
55 to 59 years	498	5.5	Spouse	1,246	13.7
60 to 64 years	347	3.8	Child	2,222	24.4
65 to 74 years	539	5.9	Own child under 18 years	1,340	14.7
75 to 84 years	410	4.5	Other relatives	1,654	18.1
85 years and over	135	1.5	Under 18 years	633	6.9
Median age (years)	36.0	(X)	Nonrelatives	1,384	15.2
			Unmarried partner	188	2.1
18 years and over	7,041	77.2	In group quarters	13	0.1
Male	3,690	40.5	Institutionalized population	-	-
Female	3,351	36.8	Noninstitutionalized population	13	0.1
21 years and over	6,713	73.6			
62 years and over	1,286	14.1	**HOUSEHOLD BY TYPE**		
65 years and over	1,084	11.9	Total households	2,599	100.0
Male	493	5.4	Family households (families)	1,760	67.7
Female	591	6.5	With own children under 18 years	717	27.6
			Married-couple family	1,246	47.9
RACE			With own children under 18 years	520	20.0
One race	7,522	82.5	Female householder, no husband present	325	12.5
White	2,411	26.4	With own children under 18 years	127	4.9
Black or African American	31	0.3	Nonfamily households	839	32.3
American Indian and Alaska Native	28	0.3	Householder living alone	492	18.9
Asian	3,957	43.4	Householder 65 years and over	185	7.2
Asian Indian	4	-			
Chinese	88	1.0	Households with individuals under 18 years	992	38.2
Filipino	2,803	30.7	Households with individuals 65 years and over	783	30.0
Japanese	791	8.7			
Korean	34	0.4	Average household size	3.50	(X)
Vietnamese	80	0.9	Average family size	3.91	(X)
Other Asian [1]	157	1.7			
Native Hawaiian and Other Pacific Islander	896	9.8	**HOUSING OCCUPANCY**		
Native Hawaiian	660	7.2	Total housing units	3,027	100.0
Guamanian or Chamorro	-	-	Occupied housing units	2,599	85.9
Samoan	18	0.2	Vacant housing units	428	14.1
Other Pacific Islander [2]	218	2.4	For seasonal, recreational, or occasional use	322	10.6
Some other race	199	2.2			
Two or more races	1,596	17.5	Homeowner vacancy rate (percent)	0.4	(X)
			Rental vacancy rate (percent)	5.3	(X)
Race alone or in combination with one or more other races: [3]					
			HOUSING TENURE		
White	3,442	37.7	Occupied housing units	2,599	100.0
Black or African American	72	0.8	Owner-occupied housing units	1,393	53.6
American Indian and Alaska Native	177	1.9	Renter-occupied housing units	1,206	46.4
Asian	5,169	56.7			
Native Hawaiian and Other Pacific Islander	1,997	21.9	Average household size of owner-occupied units	4.05	(X)
Some other race	418	4.6	Average household size of renter-occupied units	2.87	(X)

- Represents zero or rounds to zero. (X) Not applicable
[1] Other Asian alone, or two or more Asian categories.
[2] Other Pacific Islander alone, or two or more Native Hawaiian and Other Pacific Islander categories.
[3] In combination with one or more of the other races listed. The six numbers may add to more than the total population and the six percentages may add to more than 100 percent because individuals may report more than one race.

Source: U.S. Census Bureau, Census 2000.

EXHIBIT I

Table DP-1. Profile of General Demographic Characteristics: 2000
Geographic Area: Kaanapali CDP, Hawaii
[For information on confidentiality protection, nonsampling error, and definitions, see text]

Subject	Number	Percent	Subject	Number	Percent
Total population	1,378	100.0	HISPANIC OR LATINO AND RACE		
			Total population	1,378	100.0
SEX AND AGE			Hispanic or Latino (of any race)	145	10.5
Male	728	52.7	Mexican	76	5.5
Female	650	47.3	Puerto Rican	4	0.3
			Cuban	2	0.1
Under 5 years	88	6.0	Other Hispanic or Latino	63	4.6
5 to 9 years	78	5.5	Not Hispanic or Latino	1,230	89.5
10 to 14 years	51	3.7	White alone	1,003	72.8
15 to 19 years	45	3.3			
20 to 24 years	30	2.2	RELATIONSHIP		
25 to 34 years	188	13.7	Total population	1,378	100.0
35 to 44 years	233	16.9	In households	1,375	100.0
45 to 54 years	261	19.0	Householder	537	39.1
55 to 59 years	108	7.8	Spouse	319	23.2
60 to 64 years	96	7.0	Child	260	18.9
65 to 74 years	132	9.6	Own child under 18 years	204	14.8
75 to 84 years	82	6.0	Other relatives	72	5.2
85 years and over	4	0.3	Under 18 years	13	0.9
Median age (years)	44.8	(X)	Nonrelatives	178	12.9
			Unmarried partner	24	1.7
18 years and over	1,151	83.7	In group quarters	-	-
Male	612	44.5	Institutionalized population	-	-
Female	539	39.2	Noninstitutionalized population	-	-
21 years and over	1,125	81.6			
62 years and over	285	20.7	HOUSEHOLD BY TYPE		
65 years and over	218	15.8	Total households	537	100.0
Male	128	9.3	Family households (families)	381	70.9
Female	90	6.5	With own children under 18 years	110	20.5
			Married-couple family	319	59.4
RACE			With own children under 18 years	87	16.2
One race	1,273	92.6	Female householder, no husband present	39	7.3
White	1,101	80.1	With own children under 18 years	22	4.1
Black or African American	13	0.9	Nonfamily households	156	29.1
American Indian and Alaska Native	2	0.1	Householder living alone	89	16.6
Asian	102	7.4	Householder 65 years and over	32	6.0
Asian Indian	6	0.4			
Chinese	18	1.3	Households with individuals under 18 years	121	22.5
Filipino	21	1.5	Households with individuals 65 years and over	156	29.1
Japanese	41	3.0	Average household size	2.56	(X)
Korean	7	0.5	Average family size	2.73	(X)
Vietnamese	3	0.2			
Other Asian [1]	6	0.4	HOUSING OCCUPANCY		
Native Hawaiian and Other Pacific Islander	28	2.0	Total housing units	1,775	100.0
Native Hawaiian	16	1.2	Occupied housing units	537	30.3
Guamanian or Chamorro	-	-	Vacant housing units	1,238	69.7
Samoan	2	0.1	For seasonal, recreational, or occasional use	1,205	67.9
Other Pacific Islander [2]	10	0.7			
Some other race	27	2.0	Homeowner vacancy rate (percent)	2.6	(X)
Two or more races	102	7.4	Rental vacancy rate (percent)	6.2	(X)
Race alone or in combination with one or more other races: [3]			HOUSING TENURE		
White	1,183	86.0	Occupied housing units	537	100.0
Black or African American	18	1.3	Owner-occupied housing units	416	77.5
American Indian and Alaska Native	6	0.4	Renter-occupied housing units	121	22.5
Asian	153	11.1			
Native Hawaiian and Other Pacific Islander	58	4.2	Average household size of owner-occupied units	2.58	(X)
Some other race	67	4.8	Average household size of renter-occupied units	2.48	(X)

- Represents zero or rounds to zero. (X) Not applicable.
[1] Other Asian alone, or two or more Asian categories.
[2] Other Pacific Islander alone, or two or more Native Hawaiian and Other Pacific Islander categories.
[3] In combination with one or more of the other races listed. The six numbers may add to more than the total population and the six percentages may add to more than 100 percent because individuals may report more than one race.

Source: U.S. Census Bureau, Census 2000.

EXHIBIT I

Table DP-1. Profile of General Demographic Characteristics: 2000
Geographic Area: Napili-Honokowai CDP, Hawaii
[For information on confidentiality protection, nonsampling error, and definitions, see text]

Subject	Number	Percent	Subject	Number	Percent
Total population	6,788	100.0	HISPANIC OR LATINO AND RACE		
			Total population	6,788	100.0
SEX AND AGE			Hispanic or Latino (of any race)	728	10.7
Male	3,502	51.6	Mexican	472	7.0
Female	3,286	48.4	Puerto Rican	61	0.9
			Cuban	3	-
Under 5 years	541	8.0	Other Hispanic or Latino	192	2.8
5 to 9 years	441	6.5	Not Hispanic or Latino	6,060	89.3
10 to 14 years	370	5.5	White alone	3,389	49.9
15 to 19 years	308	4.5			
20 to 24 years	423	6.2	RELATIONSHIP		
25 to 34 years	1,349	19.9	Total population	6,788	100.0
35 to 44 years	1,404	20.7	In households	6,788	100.0
45 to 54 years	1,028	15.1	Householder	2,629	38.7
55 to 59 years	307	4.5	Spouse	1,115	16.4
60 to 64 years	194	2.9	Child	1,567	23.1
65 to 74 years	259	3.8	Own child under 18 years	1,275	18.8
75 to 84 years	138	2.0	Other relatives	544	8.0
85 years and over	26	0.4	Under 18 years	213	3.1
Median age (years)	34.8	(X)	Nonrelatives	933	13.7
			Unmarried partner	258	3.9
18 years and over	5,244	77.3	In group quarters	-	-
Male	2,719	40.1	Institutionalized population	-	-
Female	2,525	37.2	Noninstitutionalized population	-	-
21 years and over	5,070	74.7			
62 years and over	530	7.8	HOUSEHOLD BY TYPE		
65 years and over	423	6.2	Total households	2,629	100.0
Male	210	3.1	Family households (families)	1,469	55.9
Female	213	3.1	With own children under 18 years	743	28.3
			Married-couple family	1,115	42.4
RACE			With own children under 18 years	516	19.6
One race	5,847	86.1	Female householder, no husband present	231	8.8
White	3,640	53.6	With own children under 18 years	158	6.0
Black or African American	49	0.7	Nonfamily households	1,160	44.1
American Indian and Alaska Native	29	0.4	Householder living alone	729	27.7
Asian	1,298	19.1	Householder 65 years and over	89	3.4
Asian Indian	3	-			
Chinese	61	0.9	Households with individuals under 18 years	845	32.1
Filipino	801	11.8	Households with individuals 65 years and over	316	12.0
Japanese	259	3.8	Average household size	2.58	(X)
Korean	56	0.8	Average family size	3.20	(X)
Vietnamese	39	0.6			
Other Asian [1]	89	1.3	HOUSING OCCUPANCY		
Native Hawaiian and Other Pacific Islander	549	8.1	Total housing units	4,681	100.0
Native Hawaiian	303	4.5	Occupied housing units	2,629	56.2
Guamanian or Chamorro	3	-	Vacant housing units	2,052	43.8
Samoan	11	0.2	For seasonal, recreational, or occasional use	1,704	36.4
Other Pacific Islander [2]	232	3.4			
Some other race	282	4.2	Homeowner vacancy rate (percent)	0.4	(X)
Two or more races	941	13.9	Rental vacancy rate (percent)	13.6	(X)
Race alone or in combination with one or more other races: [3]			HOUSING TENURE		
White	4,294	63.3	Occupied housing units	2,629	100.0
Black or African American	91	1.3	Owner-occupied housing units	1,128	42.9
American Indian and Alaska Native	145	2.1	Renter-occupied housing units	1,501	57.1
Asian	1,895	27.9			
Native Hawaiian and Other Pacific Islander	1,075	15.8	Average household size of owner-occupied units	2.92	(X)
Some other race	478	7.0	Average household size of renter-occupied units	2.32	(X)

- Represents zero or rounds to zero. (X) Not applicable.
[1] Other Asian alone, or two or more Asian categories.
[2] Other Pacific Islander alone, or two or more Native Hawaiian and Other Pacific Islander categories.
[3] In combination with one or more of the other races listed. The six numbers may add to more than the total population and the six percentages may add to more than 100 percent because individuals may report more than one race.

Source: U.S. Census Bureau, Census 2000.

EXHIBIT I

Table DP-1. Profile of General Demographic Characteristics: 2000
Geographic Area: Kapalua CDP, Hawaii
[For information on confidentiality protection, nonsampling error, and definitions, see text]

Subject	Number	Percent
Total population	467	100.0
SEX AND AGE		
Male	224	48.0
Female	243	52.0
Under 5 years	30	6.4
5 to 9 years	17	3.6
10 to 14 years	21	4.5
15 to 19 years	23	4.9
20 to 24 years	12	2.6
25 to 34 years	83	17.8
35 to 44 years	91	19.5
45 to 54 years	58	12.4
55 to 59 years	27	5.8
60 to 64 years	42	9.0
65 to 74 years	46	9.9
75 to 84 years	26	5.6
85 years and over	6	1.3
Median age (years)	41.7	(X)
18 years and over	385	82.4
Male	200	42.8
Female	185	39.6
21 years and over	365	78.2
62 years and over	97	20.8
65 years and over	78	16.7
Male	43	9.2
Female	35	7.5
RACE		
One race	395	84.6
White	277	59.3
Black or African American	2	0.4
American Indian and Alaska Native	-	-
Asian	53	11.3
Asian Indian	-	-
Chinese	1	0.2
Filipino	27	5.8
Japanese	19	4.1
Korean	-	-
Vietnamese	-	-
Other Asian [1]	6	1.3
Native Hawaiian and Other Pacific Islander	62	13.3
Native Hawaiian	50	10.7
Guamanian or Chamorro	-	-
Samoan	-	-
Other Pacific Islander [2]	12	2.6
Some other race	1	0.2
Two or more races	72	15.4
Race alone or in combination with one or more other races: [3]		
White	327	70.0
Black or African American	3	0.6
American Indian and Alaska Native	-	-
Asian	103	22.1
Native Hawaiian and Other Pacific Islander	118	25.3
Some other race	16	3.4

Subject	Number	Percent
HISPANIC OR LATINO AND RACE		
Total population	467	100.0
Hispanic or Latino (of any race)	16	3.4
Mexican	4	0.9
Puerto Rican	-	-
Cuban	1	0.2
Other Hispanic or Latino	11	2.4
Not Hispanic or Latino	451	96.6
White alone	274	58.7
RELATIONSHIP		
Total population	467	100.0
In households	467	100.0
Householder	186	39.8
Spouse	117	25.1
Child	97	20.8
Own child under 18 years	75	16.1
Other relatives	17	3.6
Under 18 years	6	1.3
Nonrelatives	50	10.7
Unmarried partner	29	6.2
In group quarters	-	-
Institutionalized population	-	-
Noninstitutionalized population	-	-
HOUSEHOLD BY TYPE		
Total households	186	100.0
Family households (families)	133	71.5
With own children under 18 years	47	25.3
Married-couple family	117	62.9
With own children under 18 years	36	19.4
Female householder, no husband present	8	4.3
With own children under 18 years	4	2.2
Nonfamily households	53	28.5
Householder living alone	24	12.9
Householder 65 years and over	8	4.3
Households with individuals under 18 years	51	27.4
Households with individuals 65 years and over	53	28.5
Average household size	2.51	(X)
Average family size	2.74	(X)
HOUSING OCCUPANCY		
Total housing units	831	100.0
Occupied housing units	186	22.4
Vacant housing units	645	77.6
For seasonal, recreational, or occasional use	457	55.0
Homeowner vacancy rate (percent)	2.4	(X)
Rental vacancy rate (percent)	71.1	(X)
HOUSING TENURE		
Occupied housing units	186	100.0
Owner-occupied housing units	120	64.5
Renter-occupied housing units	66	35.5
Average household size of owner-occupied units	2.35	(X)
Average household size of renter-occupied units	2.80	(X)

- Represents zero or rounds to zero. (X) Not applicable
[1] Other Asian alone, or two or more Asian categories
[2] Other Pacific Islander alone, or two or more Native Hawaiian and Other Pacific Islander categories
[3] In combination with one or more of the other races listed. The six numbers may add to more than the total population and the six percentages may add to more than 100 percent because individuals may report more than one race.

Source: U.S. Census Bureau, Census 2000.

THE HALLSTROM GROUP INC
REAL ESTATE CONSULTANTS & APPRAISERS

PROFESSIONAL BACKGROUND AND SERVICES

The Hallstrom Group, Inc. is a Honolulu based independent professional organization that provides a wide scope of real estate consulting services throughout the State of Hawaii with particular emphasis on valuation studies. The purpose of the firm is to assist clients in formulating realistic real estate decisions. It provides solutions to complex issues by delivering thoroughly researched, objective analyses in a timely manner. Focusing on specific client problems and needs, and employing a broad range of tools including after-tax cash flow simulations and feasibility analyses, the firm minimizes the financial risks inherent in the real estate decision making process.

The principals and associates of the firm have been professionally trained, are experienced in Hawaiian real estate, and are actively associated with the Appraisal Institute and the Counselors of Real Estate, nationally recognized real estate appraisal and counseling organizations.

The real estate appraisals prepared by The Hallstrom Group accomplish a variety of needs and function to provide professional value opinions for such purposes as mortgage loans, investment decisions, lease negotiations and arbitrations, condemnations, assessment appeals, and the formation of policy decisions. Valuation assignments cover a spectrum of property types including existing and proposed resort and residential developments, industrial properties, high-rise office buildings and condominiums, shopping centers, subdivisions, apartments, residential leased fee conversions, special purpose properties, and vacant acreage, as well as property assemblages and portfolio reviews.

Market studies are research-intensive, analytical tools oriented to provide insight into investment opportunities and development challenges, and range in focus from highest and best use determinations for a specific site or improved property, to an evaluation of multiple (present and future) demand and supply characteristics for long-term, mixed-use projects. Market studies are commissioned for a variety of purposes where timely market information, insightful trends analyses, and perceptive conceptual conclusions or recommendations are critical. Uses include the formation of development strategies, bases for capital commitment decisions, evidence of appropriateness for state and county land use classification petitions, fiscal and social impact evaluations, and the identification of alternative economic use/conversion opportunities.

APPRAISAL
VALUATION AND
MARKET STUDIES

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HAWAII 96813

PROFESSIONAL QUALIFICATIONS OF JAMES E. HALLSTROM, JR., MAI, CRE

Business Background

President	The Hallstrom Group, Inc. Honolulu, Hawaii (1980 - Present)
Former Senior Vice President and Treasurer	Hastings, Martin, Hallstrom and Chew, Ltd., Honolulu, Hawaii (1972-1980)
Former Real Property Appraiser and Analyst	Administration, Inc., a subsidiary of C. Brewer and Company, Limited Honolulu, Hawaii (1971-1972)
Former Senior Real Property Appraiser and Analyst	Opitz Realty, Madison, Wisconsin (1969-1971)

National Designations and Memberships

- CRE Designation (1998) - The Counselors of Real Estate
- MAI Designation (1976) - American Institute of Real Estate Appraisers
- SRPA Designation (1975) - Society of Real Estate Appraisers

The American Institute of Real Estate Appraisers (AIREA) and the Society of Real Estate Appraisers (SREA) consolidated in 1991, forming the Appraisal Institute (AI).

Education

- M.S. (Real Estate Appraisal and Investment Analysis) 1971, University of Wisconsin at Madison
- B.A. (Economics) 1969, Brigham Young University at Provo
- Additional numerous specialized real estate studies in connection with qualifying for national professional designations, and uninterrupted Continuing Education.
- Completed Continuing Education requirements with the Appraisal Institute through December 31, 2002.

Professional Involvement

- Former President and Officer for Hawaii AIREA and SREA Chapters
- Instructor for Society of Real Estate Appraisers Course 101, "Introduction to Appraising Real Property" and Course 201, "Principles of Income Property Appraising"
- Contributing author to the "Hawaii Real Estate Investor"
- Lecturer at many professional seminars and clinics.
- Appointed numerous times as an Arbitrator and Mediator.

Qualified Expert Witness

Federal and State Courts
State Land Use and County Hearings
Arbitration Proceedings

State of Hawaii Certification

Certified General Appraiser, License Number CGA-178, Exp. Date December 31, 2001

Community Service

Active registered member of the Boy Scouts of America; Director of Le Jardin Academy; former Advisory Board Member of the School of Business, Brigham Young University, Hawaii Campus; Director of Hawaii Reserves, Inc.

PROFESSIONAL QUALIFICATIONS OF THOMAS W. HOLLIDAY

Business Background

Senior Analyst	The Hallstrom Group, Inc. Honolulu, Hawaii
Former Staff Appraiser	Davis-Baker Appraisal Co. Avalon, Santa Catalina Island, California

Education

- B.A. (Communications/Journalism) 1978 California State University at Fullerton
- SREA Course 201- Principles of Income Property Appraising
- Numerous professional seminars and clinics
- Contributing author to Hawaii Real Estate Investor, Honolulu Star Bulletin

On January 1, 1991, the American Institute of Real Estate Appraisers (AIREA) and the Society of Real Estate Appraisers (SREA) consolidated, forming the Appraisal Institute (AI).

Appendix B

Agricultural Impact Study

KAPALUA MAUKA:
IMPACT ON AGRICULTURE

Decision Analysts Hawaii, Inc.

KAPALUA MAUKA:
IMPACT ON AGRICULTURE

PREPARED FOR:

Kapalua Land Company, Ltd.

PREPARED BY:

Decision Analysts Hawaii, Inc.

December 2001

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Contents

Executive Summary

Project Proposal

Kapalua Land Company, Ltd. (KLCL), a wholly owned subsidiary of Maui Land & Pineapple Company, Inc. (ML&P), proposes to implement the Kapalua Mauka, Project District 2 Conceptual Master Plan referred to in this Executive Summary as "the Project." The Project area includes fields of Maui Pineapple Company, Ltd. (Maui Pine), also a wholly owned subsidiary of ML&P.

The Project area encompasses 925 acres in West Maui mauka of the Honoapi'ilani Highway as it passes by the former settlement of Honokahua, now Kapalua. The proposed development includes 690 residential units comprised of homesites ranging from 10,000 square feet to a half-acre and larger, single-family homes, and multi-family homes. The Project will complement and be integrated with the following existing recreational and commercial amenities: the Village Golf Course, a clubhouse and pro shop, and restaurants.

Current use of the land includes 169 acres of pineapple fields and 150 acres (16 holes) of the 18-hole Village Golf Course. Surrounding and nearby uses include Kapalua Resort, Plantation Estates, golf courses, planted and fallow pineapple fields, diversified agriculture, cattle and horse grazing, open-space gulches and ravines, and Honoapi'ilani Highway.

Land Classifications

Currently, all of the Project area is in the State Agricultural District. Project implementation will require redistricting 450 acres to the Urban District and 341 acres to the Rural District, while 134 acres will remain in the Agricultural District.

At the County level, Kapalua Mauka, Project District 2 is included in the *West Maui Community Plan*, but at 450 acres.

Agricultural Conditions

About 500 to 585 acres (54% to 63%) of the Project area are suitable for growing low-elevation crops. This evaluation is based on the favorable soil conditions and ratings over much of the site, gently-sloping or moderately-sloping terrain over this same area, the mild sunny climate, available irrigation water, and good access.

Locational Advantages and Disadvantages

In terms of location, farmers in Kapalua would be reasonably competitive supplying the small Maui market. And compared to other farmers in Hawai'i, they would be reasonably competitive supplying mainland markets, as long as their products had long shelf-lives and so could be shipped by surface vessel.

However, compared to farmers on O'ahu, they would be at a disadvantage supplying the Honolulu market. Furthermore, they would be at a disadvantage supplying mainland markets if their products had short shelf-lives and so had to be shipped by air.

Impact on Maui Pine

The Project will require that 169 acres of land be withdrawn from pineapple cultivation, which amounts to 1.9% of the 9,100 acres currently being farmed by Maui Pine. Averaged over time, 169 acres yield about 3,245 tons of pineapple per year which, in turn, generates revenues of about $1.6 million per year. Employment associated with farming this amount of land and processing the pineapple amounts to about 20 workers receiving an annual payroll of $560,000

Maui Pine is downsizing its operations in response to global economic forces and trends and to capitalize on its competitive advantages. Much of the reductions in plantings will occur in West Maui because of the comparatively long trucking distance to the cannery and packing plant in Kahului. At the same time, Maui Pine is searching for additional fields in the Wailuku and Makawao Districts because of their proximity to Kahului.

Regarding cumulative impacts, the Project in combination with other recent and planned developments (about 200 acres of pineapple land) will not reduce cultivated acreage beyond the scheduled downsizing of Maui Pine's two plantations (a reduction of 2,200 acres). With or without the withdrawal of 169 acres for the Project, Maui Pine should retain sufficient land to meet its lowered production targets. In fact, Maui Pine will be left with an inventory of uncultivated fields in West Maui.

In view of these findings, the Project will have limited impact on Maui Pine and no mitigation measures are necessary. In fact, the Project could benefit Maui Pine and contribute to its long-term survival because the Project will contribute to the profitability of the parent company, and a portion of these profits could be used, if necessary, by ML&P to help support Maui Pine during lean years.

NUISANCE ISSUES

Nearby pineapple operations are not likely to cause significant nuisance problems because none of the new homes will be close to field operations. The nearest homes will be separated from pineapple operations by wide gulches: 1,000 feet or more for homes downwind of fields (based on prevailing trade winds), and 300 feet or more for homes upwind of fields.

IMPACT ON DIVERSIFIED AGRICULTURE

Diversified Farming

Only a small portion (2 acres) of Maui Pine's papaya crop is planted near the Project and none of it will be impacted by the Project. Moreover, Maui Pine will be phasing out papaya production in this area in order to consolidate all of its papaya crop mauka of Wahikuli in Lahaina. Thus, the Project will not adversely affect existing diversified-agriculture activities.

The Project commits 500 to 585 acres of good agricultural land to non-agricultural use, of which about 150 acres are already being used for a golf course. However, this commitment of land is not expected to adversely affect the growth of diversified agriculture in view of the vast amount of former plantation agriculture land that is now available on Maui and Statewide.

Ranching

About 43 acres outside the Project area are used for the occasional grazing of about 20 head of cattle and about 6 horses, an operation that provides benefits of controlling weeds and supplemental income for one person. This operation is expected to continue during and after Project development and until this grazing land is placed in a higher use. Thus, the Project will not adversely affect the grazing operation.

OFFSETTING BENEFITS

While the Project will result in the development of some good agricultural land, this loss to agriculture will be offset by the following benefits:

- A maximum of 690 new homes.
- Additional recreation amenities, including potential expansion of the Village Golf Course by 9 holes, a clubhouse building, open space, and mauka access to trails.
- Approximately 149 new jobs (versus 20 jobs supported by current pineapple operations in the Project area).
- Total payroll of approximately $3.2 million per year (versus $560,000. per year for pineapple operations).

CONSISTENCY WITH STATE AND COUNTY PLANS

State and County plans 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, Maui Pine should retain sufficient land and water to meet its lowered production targets. Thus, the Project will have limited impact on the economic viability of plantation agriculture. In fact, as previously indicated, the Project may enhance the survival of Maui Pine by contributing to the profitability of the parent company and its ability to support Maui Pine during lean years.

With regard to diversified agriculture, the Project will not adversely affect any existing operation, but it will reduce the availability of agricultural land by a small amount. However, because of the vast amount of land that has been released from plantation agriculture, ample agricultural land is available on Maui and other islands to accommodate the growth of diversified agriculture.

Thus, the Project will not conflict with the major thrust of the plantation-agriculture portions or the diversified-agriculture portions of State and County plans.

KAPALUA MAUKA: IMPACT ON AGRICULTURE

INTRODUCTION

Kapalua Land Company, Ltd. (KLC), a wholly owned subsidiary of Maui Land & Pineapple Company, Inc. (ML&P), proposes to implement the Kapalua Mauka, Project District 2 Conceptual Master Plan described in more detail below and referred to in this report as "the Project." The Project area includes fields of Maui Pineapple Company, Ltd. (Maui Pine), also a wholly owned subsidiary of ML&P.

Addressed below are the impacts of the Project on agriculture. The material covers general information on the Project, current and nearby land uses, State and County land classifications, the agricultural conditions of the site, locational advantages and disadvantages, historic and potential agricultural uses of the land, the impact of the Project on Maui Pine, a discussion of nuisance issues, the impact of the Project on diversified agriculture, benefits of the Project that would offset adverse agricultural impacts along with a comparison of benefits between an expanded golf course and pineapple operations, and consistency of the Project with State and County land-use plans. Three appendices provide additional information on the pineapple industry, Maui Pine, and Hawai'i's agricultural land market.

PROJECT LOCATION AND DESCRIPTION[1]

The Project area encompasses 925 acres in West Maui mauka of the Honoapi'ilani Highway as it passes by the former settlement of Honokahua, now Kapalua; it is bordered by Mokupea Gulch to the northeast and Napili 4-5 Gulch to the southwest. The Project area has a wide base bordering the highway and a narrow mauka end.

The proposed development includes 690 residential units comprised of homesites ranging from 10,000 square feet to a half-acre and larger, single-family homes, and multi-family homes. The Project will complement and be integrated with the following existing recreational and commercial amenities: the Village Golf Course, a clubhouse and pro shop, and restaurants.

The proposed land allocation for the Project is:[2]

Use	Acres
Golf course addition, open space and roadways	300
Clubhouse/Commercial	5
Parks, open space, buffer zones	134
Urban Residential	145
Rural Residential	341
Total	925

CURRENT AND NEARBY LAND USES

Current use of the land includes 169 acres of pineapple fields and 150 acres (16 holes) of the 18-hole Village Golf Course.[1,3] Surrounding and nearby uses include Kapalua Resort, Plantation Estates, golf courses, planted and fallow pineapple fields, diversified agriculture, cattle and horse grazing, open-space gulches and ravines, and Honoapi'ilani Highway.

LAND CLASSIFICATIONS

Currently, all of the Project area is in the State Agricultural District. Project implementation will require redistricting 450 acres to the Urban District and 341 acres to the Rural District, while 134 acres will remain in the Agricultural District.[1]

At the County level, Kapalua Mauka, Project District 2 is included in the *West Maui Community Plan*, but at 450 acres.[4] Implementation will require that the area be increased to 925 acres, and zoning changed to accommodate the Project.

AGRICULTURAL CONDITIONS

Soil Types

The land area contains eleven soil types which are categorized below by their quality as rated by the Soil Conservation Service, now known as the Natural Resources Conservation Service (NRCS).[5]

		Acres	NRCS Rating
Higher-Quality Soils			
AeB	Alaeloa silty clay, 3 to 7% slopes	4.1	IIe
KbB	Kahana silty clay, 3 to 7% slopes	20.9	IIe
Moderate-Quality Soils			
AeC	Alaeloa silty clay, 7 to 15% slopes	218.4	IIIe
HwC	Honolua silty clay, 7 to 15% slopes	108.9	IIIe
KbC	Kahana silty clay, 7 to 15% slopes	118.9	IIIe
KcC	Kalae silty clay, 7 to 15% slopes	38.7	IIIe
Lower-Quality Soils			
HwD	Honolua silty clay, 15 to 25% slopes	51.7	IVe
KbD	Kahana silty clay, 15 to 25% slopes	22.1	IVe
AeE	Alaeloa silty clay, 15 to 35% slopes	8.8	VIe
rRR	Rough broken land	308.6	VIIe
rRS	Rough broken and stony land	33.9	VIIs

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)

The 1972 Land Capability Grouping by the United States Department of Agriculture NRCS, rates soils according to eight levels, ranging from the highest classification level, I, to the lowest level, VIII.[5]

Approximately 25 acres (2.7%) are rated IIe (AeB and KbB), indicating that they have moderate limitations that reduce the choice of plants or require moderate conservation practices. The subclassification "e" indicates that the soils are subject to erosion.

Approximately 475 acres (51.3%) are rated IIIe (AeC, HwC, KbC and KcC). Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

About 74 acres (8%) are rated IVe (HwD and KbD). Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

About 9 acres (1%) are rated VIe (AeE). Class VI soils have severe limitations that make them generally unsuitable for cultivation and limit their use for commercial plant production.

The remaining 342 acres (37%) are rated VIIe (rRR) and VIIs (rRS). Class VII soils have very severe limitations that make them unsuitable for cultivation. The subclassification "s" indicates that they are extremely stony or rocky, or have an unfavorable texture.

Agricultural Lands of Importance in the State of Hawai'i (ALISH)

The ALISH ratings were developed in 1977 by the NRCS, the University of Hawai'i (UH) College of Tropical Agriculture and Human Resources, and the State of Hawai'i, Department of Agriculture.[6] This system classifies land into three 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 currently being 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 of importance to the production of crops.

Approximately 413 acres (44.6%) of the Project area are rated Prime, 172 acres (18.6%) are rated Other, and 340 acres (36.8%) are not rated.

Overall Productivity Rating (LSB Rating)

In 1972, the 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.[7]

Approximately 584 acres (63.1%) are rated C, 17 acres (1.8%) D, and 324 acres (35.1%) E. These ratings reflect the fact that these lands were not irrigated when they were evaluated in 1972. With irrigation, which is now the case, the lands that are rated C would be rated A (137 acres, or 14.8%) and B (447 acres, or 48.3%).

Summary Evaluation of Soil Quality

These three soil-rating systems indicate that about 500 to 585 acres (54% to 63%) of the Project area have soils that are good for cultivating crops (III or better under the SCS rating, Prime and Other under the ALISH rating, and C or better under the LSB rating).

Soil Characteristics and Slopes

Consistent with the above soil ratings, the better agricultural lands exhibit a number of favorable characteristics: they are good to well-suited for tillability, slopes are less than 15%, and the soils are fine in texture, not stony, more than 30 inches deep, and well-drained.[5,7]

Most of the lower-quality lands are located in gulches in areas having steep slopes (from 20% to over 80%). These lands are poorly suited for machine tillability, and some of the soils are rocky with variable soil depth.

Elevation

The elevation of the Project area ranges from about 130 feet above sea level to about 1,200 feet. Within this range of elevations, the land is suitable for crops that are generally referred to as "low-elevation crops," as opposed to "high-elevation crops" such as those being grown in Kula or Waimea on the Big Island.

Climatic Conditions

Like other farm areas in Hawai'i, West Maui has a mild *semi*tropical climate, which is due primarily to three factors: (1) Hawai'i's mid-Pacific location near the Tropic of Cancer, (2) the influence of surrounding warm ocean waters which vary little in temperature between the winter and summer seasons, and (3) the prevailing northeasterly tradewinds which bring air having temperatures that are close to those of the surrounding waters.

Solar Radiation

The Project area receives moderate sunshine, with the average daily insolation—as measured by calories per square centimeter—in the high 400s at the lower elevations, and in the low 400s at the upper elevations.[8]

Temperatures

Temperatures in the winter months (October through April) range from the low 60s (degrees Fahrenheit) to the mid-80s, while in the summer months (May through September) they range from the mid-70s to the high 80s.[3]

Rainfall

Average annual rainfall in the Project area is 30 to 60 inches per year, depending upon the elevation.[9] Unlike most tropical areas winter, rather than summer, is the rainy season in Hawai'i.

Winds and Storms

The Project area is exposed to prevailing northeasterly tradewinds that characteristically range from 20 to 30 mph. Storms are infrequent, occurring mostly from the south in the winter months during Kona weather.[3] Because of this exposure to strong tradewinds and occasional storms, many crops require windbreaks to protect them from wind and salt damage.

Irrigation Water

To supplement rainfall, ML&P supplies water from Honolua Ditch to irrigate fields in the region.[3] In recent years, however, drought conditions have reduced availability of the ditch water. Overall, however, the demand for irrigation water from Honolua Ditch has decreased (except during drought conditions) since the sugar operations closed down at Pioneer Mill.

Road Access

The fields are reached via plantation roads that connect to Honoapi'ilani Highway to the south.

Summary

About 500 to 585 acres (54% to 63%) of the Project area are suitable for growing low-elevation crops. This evaluation is based on the favorable soil conditions and ratings over much of the site, gently-sloping or moderately-sloping terrain over this same area, the mild sunny climate, available irrigation water, and good access.

LOCATIONAL ADVANTAGES AND DISADVANTAGES

West Maui Market

Kapalua is a good location for growing crops to supply grocery markets, restaurants, and hotels in West Maui. While the West Maui market is significant, it is comparatively small: in 2000, there were about 18,000 residents and about 9,800 rooms to house visitors.[10,11]

Maui Island Market

Farmers located at Kapalua are at a slight disadvantage in servicing the Maui Island market compared to farmers in Central Maui who are closer to the major markets and to Kahului which is the island's commercial, industrial, distribution and transportation center. The trucking distance from Kapalua to Kahului is about 31 miles versus about 4 miles from Waihe'e, about 11 miles from Kula and Pukalani, 12 miles from Makawao, and about 14 miles from Haiku.

While the Maui island market is much larger than the West Maui market, it is still comparatively small: in 2000, Maui had about 117,800 residents and about 17,500 rooms to house visitors.[10,11]

Honolulu Market

Farmers located at Kapalua are at a disadvantage competing against farmers on O'ahu in supplying the Honolulu market due to the long trucking distance from Kapalua to Kahului and the interisland shipping costs, delays and extra handling. Comparing barge and air-cargo service, 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.

However, the Honolulu market is comparatively large: in 2000, O'ahu had about 876,200 residents and about 36,300 rooms to house visitors.[10,11]

Mainland Market

Compared to Hawai'i, the mainland market is enormous: in 2000, the U.S. had a total population of 281.4 million people.[10] In supplying this market with products that can be carried by container ship because they have long shelf-lives (e.g., canned fruit), farmers located in Kapalua are competitive with farmers on O'ahu and other islands, except for the long trucking distance to Kahului. 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.[12]

In the case of fresh products that must be shipped by air to the mainland because of their short shelf-lives, farmers located at Kapalua are at a disadvantage compared to farmers on O'ahu. This is because most mainland air cargo is shipped via Honolulu International Airport. Compared to farmers on O'ahu, farmers in Kapalua would encounter the long trucking distance to Kahului, and additional costs, delays and handling for interisland air-cargo service and for transferring the fresh products from small interisland aircraft to large overseas aircraft. Direct air-cargo shipments from Maui to the mainland is the preferred choice, but the Kahului runway is too short to allow departure of wide-bodied aircraft with a full load of passengers and cargo in the hold, and relatively few flights provide direct service.

Summary

In terms of location, farmers in Kapalua are reasonably competitive supplying the small Maui market. And compared to other farmers in Hawai'i, they are competitive 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 supplying the Honolulu market. Furthermore, they are at a disadvantage supplying mainland markets if their products had short shelf-lives and so had to be shipped by air.

HISTORIC AND POTENTIAL AGRICULTURAL USES

Since about 1912, the better agricultural lands found within the Project area were used for growing pineapple, although some of this land is now used for a golf course.[1] Before 1912, the lands were used for grazing.

Given current market conditions and, depending upon the skill of the farmer and on specific site conditions (e.g., the microclimate of a particular field), the range of crops that might be grown profitably on the Project site is indicated by the crops that are being grown commercially elsewhere in West Maui. In addition to pineapple, these crops include papaya, coffee, seed corn, and alfalfa. In addition, small test plots of lychee, rambutan, longan, mandarin orange and kawa are being cultivated.[3]

PINEAPPLE OPERATIONS

The Project will require that 169 acres of land be withdrawn from pineapple cultivation. Discussed below is the impact of such a withdrawal on Maui Pine.

The Pineapple Industry and Maui Pine

Background information on the pineapple industry and on Maui Pine is presented in Appendices A and B, respectively. As discussed in these Appendices, the pineapple industry had its commercial start in Hawai'i at the turn of the twentieth century and, by 1915, was Hawai'i's second largest industry behind sugar. The industry reached its zenith in Hawai'i in the late 1950s, and has been contracting ever since. Over time, the cultivation and canning of pineapple has shifted and continues to shift to countries having low labor rates, principally countries in Asia, Mexico, Central America, South America, and Africa.

In Hawai'i, all of the canneries eventually were closed, as well as all of the pineapple plantations on the Neighbor Islands—with the single exception of the plantation and cannery operated by Maui Pine. Currently, only three major pineapple companies remain: Maui Pine on Maui, and Dole and Del Monte on O'ahu. Dole and Del Monte grow for the fresh market, taking advantage of the superior air-cargo and surface shipping from Honolulu to the mainland.

In response to global economic forces and trends and to capitalize on its competitive advantages, and following the lead of Dole and Del Monte, Maui Pine is shifting more of its production to the fresh market subject to the transportation limitations, shifting some production outside Hawai'i, and downsizing its Maui operations by about 24% (about 2,200 acres). A large portion of the downsizing will include its Honolua Plantation fields in West Maui—largely because of the comparatively long trucking distance to the cannery and packing plant in Kahului. At the same time, Maui Pine is searching for additional fields in the Wailuku and Makawao Districts because of their proximity to Kahului.

Affected Acreage and Economic Activity[3]

The 169 acres needed to accommodate the Project amount to 1.9% of the 9,100 acres currently being farmed by Maui Pine. Averaged over time (i.e., averaged over a full crop cycle), 169 acres yield about 3,245 tons of pineapple per year (at about 19.2 tons per acre per year) which, in turn, generates revenues of about $1.6 million per year ($491 per ton). Employment associated with farming this amount

of land and processing the pineapple amounts to about 20 workers receiving an annual payroll of $560,000.

Other Land Development Projects[3]

Other recent reductions in pineapple acreage for land development projects include 31 acres in Pukalani. Thus, land withdrawals for development total about 200 acres (169 acres for the Project and 31 acres in Pukalani).

Impact on Maui Pine

As mentioned above and discussed in Appendix B, Maui Pine is downsizing its operations in response to global economic forces and trends, and to capitalize on its competitive advantages. Much of the reduction in plantings will occur in West Maui because of the comparatively long trucking distance to the cannery and packing plant in Kahului.

Regarding cumulative impacts, the Project in combination with other recent and planned developments (about 200 acres of pineapple land) will not reduce cultivated acreage beyond the scheduled downsizing of Maui Pine's two plantations (a reduction of about 2,200 acres). With or without the withdrawal of 169 acres for the Project, Maui Pine should retain sufficient land to meet its lowered production targets. In fact, Maui Pine will be left with an inventory of uncultivated fields in West Maui.

In view of these findings, the Project will have limited impact on Maui Pine and no mitigation measures are necessary. In fact, the Project could benefit Maui Pine and contribute to its long-term survival because the Project will contribute to the profitability of the parent company, and a portion of these profits could be used, if necessary, by ML&P to help support Maui Pine during lean years.

NUISANCE ISSUES

Nuisances arising from farm operations can become an issue for both residents and farm operators. Some residents close to and downwind from farming operations may complain about occasional noise, dust, chemical spraying, etc. In turn, addressing the complaints can affect farming operations. For pineapple, most of the problems occur annually for a period of about 2 months when fields are planted or harvested.

However, for new homes in the Project, nearby pineapple operations are not likely to cause significant nuisance problems for the following reasons:

— None of the new homes will be close to field operations. In fact, the nearest homes will be separated from pineapple operations by wide gulches: 1,000 feet or more for homes downwind of fields (based on prevailing trade winds), and 300 feet or more for homes upwind of fields.

— Before new residents purchase their homes, they will be informed that they will be living near pineapple fields. This point is highlighted in the Kapalua Resorts promotional brochure and will be spelled out in the sales contracts. Under these circumstances, buyers are more likely to accept that nearby farm operations are part of the ambiance and lifestyle of the area.

In any case, Hawai'i's Right-to-Farm Act gives farmers who were operating before neighboring properties were developed the right to farm even if they cause a nuisance, provided that the farm activity does not threaten public health or safety.[13]

In view of the above, no additional measures are needed to mitigate potential nuisance problems.

Turning to the existing homes at Kapalua, some are within 200 feet of pineapple fields in the Project area and downwind from them. Because these fields will be developed as part of the Project, any existing nuisance problems related to them will be eliminated once they are withdrawn from cultivation.

Thus, taking into account both new homes in the Project and existing homes in Kapalua, the net effect of the Project will be to reduce the potential for nuisance issues.

DIVERSIFIED AGRICULTURE

Diversified Farming

Only a small portion (2 acres) of Maui Pine's papaya crop is planted near the Project and none of it will be impacted by the Project. Moreover, Maui Pine will be phasing out papaya production in this area in order to consolidate all of its papaya crop mauka of Wahikuli in Lahaina. Thus, the Project will not adversely affect existing diversified-agriculture activities.

However, the Project will commit 925 acres of agricultural land to a non-agricultural use. Based on soil quality and terrain (see above under "Agricultural Conditions"), about 500 to 585 acres are good agricultural land, of which about 150 acres are already being used for a golf course.

Even though some good agricultural land will be committed to a non-agricultural use, this commitment will not adversely affect the growth of diversified agriculture. This conclusion is based on the following findings from Appendix C:

— Ample land is available for diversified agriculture

A vast amount of land has been released from plantation agriculture (about 305,900 acres since 1968), and this release of land has far outpaced the demand for land for diversified crops (an increase of about 38,500 acres over this same period). While some of the released land has been converted or is scheduled to be converted to non-agricultural uses, most of it remains available for diversified crops. Thus, ample land is available on Maui, O'ahu, and other islands to accommodate the growth of diversified agriculture.

— Land is not the limiting factor to the growth of diversified agriculture

Consistent with the above, the limiting factor to the growth of diversified agriculture is *not* the *land supply*, but rather the *size of the market* for crops that can be grown *profitably* in Hawai'i.

These findings also apply to West Maui. Since the 1999 closure of Pioneer Mill, ample land is available for diversified crops. However, demand for agricultural land in West Maui is expected to be weak compared to demand on O'ahu and even in Central Maui because of West Maui's locational disadvantages (see above under "Locational Advantages and Disadvantages").

With regard to the Project, it will involve the loss of far too little good agricultural land to adversely affect the availability of land to farmers in West Maui or in other parts of the State, or to adversely affect the growth of diversified agriculture in Hawai'i.

Ranching

About 43 acres outside the Project area are used for the occasional grazing of about 20 head of cattle and about 6 horses, an operation that provides benefits of controlling weeds and supplemental income for one person. This operation is expected to continue during and after Project development and until this grazing land is placed in a higher use. Thus, the Project will not adversely affect the grazing operation.

OFFSETTING AND COMPARATIVE BENEFITS

While the Project will result in the development of some good agricultural land, this loss to agriculture will be offset by the following benefits:

- — A maximum of 690 new homes
- — Additional recreation amenities, including potential expansion of the Village Golf Course by 9 holes, a clubhouse building, open space, and mauka access to trails.
- — Approximately 149 new jobs, including an estimated 90 jobs in home maintenance and repair (based on one job per 7.5 homes), about 10 groundskeeper jobs for maintaining the 9-hole golf course addition, another 20 jobs affiliated with expanded golf-course operations, and about 10 jobs for maintaining common grounds and facilities[14,9,15]
- — Total payroll of approximately $3.2 million per year (based on Maui's 1998 average private-sector wage of $24,600 per year)[14]

Comparing the benefits and impacts of the potential 9-hole golf course addition versus pineapple operations on 169 acres, the advantage is clearly with the golf course:[2,13,9]

— Recreation

The golf course will provide recreational opportunities for about 75 additional golfers per day.

— Revenues

The golf course will generate gross revenues of about $2.75 million per year versus $1.6 million per year for pineapple.

— Employment

The golf course will employ about 30 additional people per year, about 10 of whom will maintain the grounds. Pineapple employs about 20 people, about 8 of whom are field workers.

— Tax Revenues

State excise taxes from the additional golf operations will exceed $110,000 per year (based on 4% of $2.75 million per year) versus

about $8,000 per years from the pineapple operations (1/2% of $1.6 million).

For the County, property tax revenues from a golf course can exceed $800 per acre per year, based on the resort tax rate of $8.48 per $1,000 and an assessed value of $100,000 or more per acre. For pineapple, the tax revenues are less than $5 per acre per year, based on the agricultural tax rate of $5.04 per $1,000 and an assessed value of less than $1,000 per acre.

— Water Use

During dry periods, the fairways and greens of a golf course typically require about 4,000 gallons per acre per day. In comparison, pineapple fields require about 1,900 gallons of water per acre per day during dry periods.

— Environmental Impacts

Golf courses offer a number of environmental benefits over pineapple operations. For example, once a golf course is covered in grasses and plants, soil runoff during rainstorms is very low. In contrast, soil runoff from a pineapple field can be significant if heavy rains occur soon after the field is plowed.

Also, more chemicals are used on pineapple fields to control pests and regulate growth than are used on golf courses.

Finally, golf courses often serve as part of the drainage system of development projects. During rainstorms, surface runoff is channeled into retention basins that have been incorporated into the design of the golf course. These retention basins allow the rainwater to soak into the ground and, in the process, the water is filtered by the grasses and soil, the aquifer is recharged, and less waterborne silt and debris are discharged into the ocean.

— Neighboring Property Values

Property values are enhanced for homes fronting a golf course which, in turn, contribute to higher property tax revenues. Because of nuisance problems, the opposite is generally true for homes fronting pineapple fields.

In summary, the benefits of the Project will offset the loss of agricultural land, while the golf course addition will provide more recreational, economic, and environmental benefits than are currently being provided by the pineapple operations.

CONSISTENCY WITH STATE AND COUNTY PLANS

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 *West Maui Community Plan* call directly or implicitly for preserving the economic viability of plantation agriculture and promoting the growth of diversified agriculture.[4,17-20] To accomplish this, an adequate supply of agriculturally suitable lands and water must be assured.

With regard to plantation agriculture, Maui Pine is downsizing its plantation in response to global economic forces and trends and to capitalize on its competitive advantages (see "Pineapple Operations" above and Appendix B). Because of this scheduled downsizing, which includes the withdrawal of fields within the Project area, Maui Pine should retain sufficient land and water to meet its lowered production targets. Thus, the Project will have limited impact on the economic viability of plantation agriculture. In fact, as previously indicated, the Project may enhance the survival of Maui Pine by contributing to the profitability of the parent company and its ability to support Maui Pine during lean years.

With regard to diversified agriculture, the Project will not adversely affect any existing operation, but it will reduce the availability of agricultural land by a small amount. However, because of the vast amount of land that has been released from plantation agriculture since the late 1960s, ample agricultural land is available on Maui, O'ahu, and other islands to accommodate the growth of diversified agriculture.

Regarding policies "...to preserve and protect agricultural lands," discussions in the "Agriculture" portion of the *State Functional Plan* recognize that redesignation of lands from Agriculture 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."[19] The enormous contraction in plantation agriculture—resulting in the supply of agricultural land far exceeding demand—constitutes a major change in economic and social conditions. Furthermore, the proposed Project will provide considerable benefits, including 690 new homes, an estimated 130 new jobs, and recreational benefits. This compares to 20 jobs currently provided by the pineapple operations on the land.

The Project is included in the County's *West Maui Community Plan*, but at 450 acres instead of the proposed 925 acres.[4] Furthermore, this plan calls for preserving "the current State Agriculture District boundaries ... in accordance with this Community Plan ..." Presumably, a major factor in protecting agricultural lands was to help preserve the economic viability of the two plantations in West Maui and to allow for the possible growth of diversified agriculture. However, since the Plan was written, Pioneer Mill has closed and released over 6,000 acres of former sugarcane lands, and Maui Pine has embarked on a downsizing of its pineapple operations. As a result, the need to protect agricultural land for agricultural purposes has greatly diminished.

In summary, the Project will not conflict with the major thrust of the plantation-agriculture portions or the diversified-agriculture portions of State plans, the *Maui County General Plan*, and the *West Maui Community Plan*.

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APPENDICES

Appendix A:
Overview of the Pineapple Industry

Brief History of Pineapple in Hawai'i

Following earlier commercial attempts in Hawaii and elsewhere, the world pineapple industry had its commercial start at the turn of the twentieth century in Central Oahu.[1,2] In 1898, some California farmers purchased homestead land in Wahiawa where they experimented with growing pineapple, along with a number of other fruits and vegetables. One of the original homesteaders was A. W. Eames, whose farm would evolve into the Del Monte Fresh Produce (Hawaii) Inc. (Del Monte) pineapple operations. In 1900, Jim Dole—a recent arrival from Massachusetts and second cousin of Sanford B. Dole, President of the Republic of Hawaii and then Governor of the Territory of Hawaii—purchased some of the homestead land. His farm became the pineapple operations of Dole Food Co., Inc. (Dole).

The pineapple industry was successful in Hawaii due to a combination of circumstances, but primary among them were the excellent growing conditions; the annexation of Hawaii to the United States as a territory, which thereby eliminated the 35% tariff on processed food products shipped to the U.S. market; technological advances in farming which increased yields and reduced farming costs; technological advances in canning which reduced canning costs and extended the shelf-life of the product; and effective marketing of a "new" and exotic fruit.

By 1915, the pineapple industry was Hawaii's second largest industry behind sugar.[1] By the 1920s, over a dozen plantations were operating on Oahu, Kauai, Maui, Molokai, Lanai and the Big Island.[2] During the 1930s and 1940s, Hawaii supplied 80% of the world's pineapple production and was known as the "Pineapple Capital of the World."[3]

In the late 1950s, Hawaii's pineapple industry had reached its zenith, with about 76,600 acres being farmed by various plantations.[3] In order of production, the major producers included Dole; Libby, McNeill & Libby of Honolulu, Ltd. (Libby); Del Monte; and Maui Pineapple Company, Ltd. (Maui Pine). But in the early 1960s, the industry began to contract as some producers moved their canning

operations to countries where labor and other costs were much lower, while other producers left the industry entirely.

By the late 1960s, Libby terminated all its Hawai'i operations. In the mid-1970s, Dole closed its Moloka'i plantation. In the early 1980s, Del Monte closed its Moloka'i plantation and its cannery.[2] Finally, in the early 1990s, Dole closed its Lana'i plantation and its cannery.

Hawaii employment in the pineapple industry declined from about 12,100 jobs in 1960 to 2,350 jobs in 1993, after which the employment data on pineapple were no longer reported by the State in order to avoid disclosure of individual operations.[4]

Hawaii's Current Pineapple Industry

Currently, Hawaii has three plantations cultivating pineapple on just two islands: Maui Pine on Maui, and Dole and Del Monte on O'ahu. Also, only Maui Pine still operates a cannery. Even though Hawaii's pineapple industry is much smaller than it once was, the remaining plantations are marginally competitive with overseas growers.

In 2000, these pineapple companies and a few independents farmed 20,700 acres (27% of the area that was planted in the late 1950s) and produced 354,000 tons of pineapple.[5] This amounted to 2.4% of the world's total pineapple supply (down from 80% in the 1930s and 1940s). Compared to foreign countries, Hawai'i was ranked tenth largest producer in 2000.[5,6] Hawai'i's total pineapple production had an estimated farm value of $101.5 million, a figure that excludes the value-added from processing and shipping.

The primary products of Hawai'i's pineapple companies today include fresh pineapple, chilled "fresh-cut" pineapple, pineapple juice and, for Maui Pine, canned pineapple.

Taking advantage of their O'ahu locations and the superior transportation services from Honolulu, Dole and Del Monte grow pineapple for the high-value fresh market on the mainland and in Hawaii—markets which cannot be serviced by low-cost Asian producers. Both companies deliver fresh pineapple to major cities throughout the mainland via air transportation that is made possible by Hawai'i's large visitor industry and the frequent flights from Honolulu to the mainland. The pineapple is carried in the hold of wide-bodied aircraft, and the airlines charge comparatively low backhaul rates. The two companies also deliver fresh pineapple to the West Coast via surface transportation, again at comparatively low backhaul rates.

Most of Maui Pine's production is canned, although a growing share of it is sold fresh (see Appendix B).

The success all three pineapple companies have enjoyed in the fresh market has been enhanced by the development of new varieties that are sweeter, and by the fresh-cut options that are more convenient for the consumer. In the U.S. market, these advances have contributed to an increase in the consumption of fresh pineapple from 1.9 pounds per person in 1995 to 3 pounds per person in 2000.[7]

Foreign Pineapple Operations of Dole, Del Monte and Maui Pine[1,2,8,9]

Outside Hawaii, Dole has pineapple plantations in Honduras, Costa Rica and Ecuador that deliver fresh pineapple to the Midwest, the East Coast, and European markets. In Asia, Dole has a large plantation in the Philippines where pineapple is grown for the canned market for distribution to the United States, Europe, and other countries, and for the fresh market in Japan. Also, Dole grows pineapple in Thailand for the canned market. In Africa, Dole has minority interest in plantations in Cameroon and the Ivory Coast.

Del Monte has a plantation in Costa Rica that delivers fresh pineapple to the East Coast and other U.S. markets via surface transportation. To supply its mainland market, Del Monte receives canned pineapple from a large plantation in the Philippines operated by Del Monte Foods, a separate company.

Following the lead of Dole and Del Monte, Maui Pine has recently become involved in a pineapple plantation in Costa Rica to supply fresh pineapple to the U.S. mainland and Europe, and in a plantation in Indonesia to supply canned pineapple to the U.S. market (see Appendix B).

World Production, Trade and Trends

Pineapple is grown at significant levels in 77 countries throughout the world.[6] The growing regions are generally located in the tropic and subtropic zones—that is, in the area between the Tropic of Cancer north of the equator and the Tropic of Capricorn south of the equator.[2]

In 2000, world pineapple production totaled 13.5 million metric tons.[6] The largest producers were Thailand (17% of world production), the Philippines (11.1%), Brazil (10.1%), China (9.8%), India (8.2%), Nigeria (6.5%), Mexico (3.6%), Colombia (3%), and Costa Rica (3%)—countries having comparatively low labor costs.

Based on 1999 data, about 2.46 million metric tons were exported (19% of the production). This included 1.05 million metric tons sold as fresh pineapple (43% of total exports), 1.06 million metric tons sold as canned pineapple (43%), and the remainder sold as juice or juice concentrate.[6]

For fresh pineapple, major exporters in 1999 were Costa Rica (33.6% of the world export market), Côte d'Ivoire (17.4%), and the Philippines (12.1%).[6] The largest importer was the United States (27.4% of the market), followed by France (16.3%), Japan (8.7%), and Belgium/Luxembourg (8.5%).

For canned pineapple, major exporters were Thailand (45.9% of the world market), the Philippines (17.3%), and Indonesia (12.8%).[6] Again, the largest importer was the United States (35.6% of the market), followed by Germany (11.5%), then Japan (6%).

Although the world pineapple industry is dominated by Del Monte and Dole, a collection of growers in Thailand is a major force in the canned market.

Trends indicate growth in production and exports, especially exports of fresh pineapple. From 1995 to 2000, world production of pineapple grew 7.7%. Those countries showing substantial growth include Costa Rica (up 53.9% since 1995), Ecuador (up 135.2%), and Mexico (up 72.7%).

Trade in pineapple grew at an even faster rate: 13.4% over the 5-year period from 1994 to 1999. The growth occurred in exports of the fresh fruit (up 39.8% from 1994 to 1999), but not the canned fruit (down 4.4%). Countries having increasing exports of fresh pineapple include Costa Rica (up 199.9%), Mexico (up 199%), the United States (i.e., Hawai'i, up 81%), and Côte d'Ivoire (up 36.5%). Countries having increasing exports of canned pineapple include Mexico (up 105.9%) and Indonesia (up 37.3%).

Taiwan was once a major producer for the canned market, but many plantations closed because, like Hawaii, economic advances on the island led to high labor costs that are not competitive with those of Thailand and the Philippines.[9] A decline also occurred in Malaysia for the same reason.

In summary, the following trends are apparent and are expected to continue:

- Growth in world production and consumption of pineapple.
- Growth in the total volume of pineapple traded among countries due to significant growth in the volume of fresh pineapple traded, but little or no growth in the volume of canned pineapple traded.
- For the expanding fresh pineapple market, much of the production increases occurring in Mexico, Central America and Africa (i.e., countries having low labor rates and, compared to Asia, faster delivery to the U.S. and European markets).
- For the canned market, a continued shift in production from various countries around the world to producers in Asia and, more recently, Mexico (i.e., countries having low labor rates).

U.S. TRADE RESTRICTIONS

With one notable exception, imports of fresh and canned pineapple into the United States are not restricted by tariffs or quotas. The exception is the anti-dumping duties that were imposed in 1995 on canned pineapple imported from Thailand. These duties, which were granted by the International Trade Commission (ITC) at the request of Maui Pine and the International Longshore and Warehousemen's Union (ILWU), range from less than 1% to 51%, depending upon the individual company.[9] The duties were recently extended for a five-year period ending in 2005.

In addition, duties of 5.3¢ per liter and 1.3¢ per liter are imposed on imported pineapple juice and pineapple juice concentrate, respectively.[10] However, under the North American Free Trade Agreement (NAFTA), the tariff on Mexican imports was phased out in 1998 for pineapple juice concentrate and will be phased out by 2003 for pineapple juice.

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APPENDIX B: OVERVIEW OF MAUI PINEAPPLE COMPANY, LTD.

BRIEF HISTORY

Maui Pineapple Company, Ltd. (Maui Pine) was formed in 1934 by the merger of two pineapple plantations in Central Maui (Maui Agriculture and Haleakala Ranch) that were owned by Alexander & Baldwin, Inc. (A&B), and a plantation and cannery purchased from California Packing Corporation (Calpac, now Del Monte). In 1962, Maui Pine acquired the West Maui pineapple plantation and cannery of Baldwin Packers. Del Monte's Maui plantation and the two A&B plantations all began operations in 1926, while Baldwin Packers traces its roots back to at least 1912.[1]

To supply cans for their pineapple, Maui Pine and Del Monte jointly operated a can manufacturing company from 1966 until 1977. In 1977, Maui Pine purchased full control of the operation.[2]

LAND AND WATER[3]

Maui Pine farms about 10,240 gross acres (about 9,100 net acres) split between two plantations: Honolua Plantation in West Maui and Hali'imaile Plantation in Central Maui. About 6,740 acres are owned by Maui Pine and about 3,500 acres are leased. In addition, an independent grower supplies about 6% of the pineapple processed by Maui Pine.

Maui Pine relies largely on rainfall to supply water to its fields at Honolua Plantation, and this is supplemented by irrigation water from Honolua Ditch (also known as Honokohau Ditch). Most of the Hali'imaile Plantation fields are irrigated with ground water and surface water.

Because the pineapple plant uses water efficiently, irrigation requirements are comparatively low. For fields in sunny areas having low rainfall, about 1/2 inch of water is applied weekly, which amounts to a daily average of about 1,900 gallons of

water per acre. In comparison, daily per-acre water usage exceeds 8,000 gallons for sugarcane, about 4,000 gallons for many diversified crops, and about 3,500 gallons for single-family homes.

CROP CYCLE[3]

Two pineapple crops are typically harvested from each new planting. The first harvest (known as the plant crop) is produced 18 to 23 months after planting, and the second harvest (known as the first ratoon crop) is harvested 12 to 14 months later. A third harvest (known as the second ratoon crop) may also be harvested depending upon conditions affecting the size of the fruit and the yield. The plant crop produces the largest fruit and the largest yield, while the two ratoon crops produce progressively smaller fruit and yields.

After the last crop is harvested, a field is usually fallowed for about a year. During the fallow period, the old plants are left in the field to (1) decompose and enrich the soil, and (2) help control nematodes and insects. After the fallow period, the soil is tilled and prepared for replanting.

PROCESSING AND PACKING[3]

Harvested pineapples are processed at Maui Pine's cannery and packing plant in Kahului. These facilities, plus a company-owned can plant, are located in a Foreign Trade Zone.

The cannery operates most of the year; however, over 40% of production takes place during the summer months. Efforts are underway to smooth out production across the year.

PRODUCTS AND MARKETS[3]

Maui Pine produces a number of products, including: fresh whole pineapple, chilled "fresh-cut" pineapple (precut in wedges and chunks and packaged in plastic), canned pineapple in various styles and grades, pineapple juice, pineapple juice concentrate, fruit punch, fruit juice blends, and fresh pineapple salsa.

Most of the pineapple grown by Maui Pine is canned and sold as store-brand pineapple (e.g., Safeway's Townhouse brand), with "100% HAWAIIAN U.S.A." stamped on the can lid. The canned products are sold principally to large grocery chains, other food processors, wholesale grocers, and to organizations offering a complete buyers' brand program to affiliated chains and wholesalers serving both retail and food service outlets. Two advantages of store-branded sales are favorable shelf space near Dole and Del Monte products, and comparatively low advertising costs.

A growing share of Maui Pine's pineapple is sold as high-value whole fruit and as chilled fresh-cut fruit. This fresh-cut pineapple, a relatively new product, is a high-value use of the fresh fruit that is not suitable for sale whole due to bruising or sunburn. In 1999, Maui Pine received a U.S. patent on its fresh-cut-pineapple technology, which enhances the quality of the product while extending its shelf-life. Fresh products are sold to retail and wholesale grocers in both Hawaii and the continental United States.

Another new product is pineapple juice sold in popular 64-ounce plastic bottles (commonly called "PET" containers). In addition, Maui Pine is test-marketing its fresh pineapple salsa in Hawai'i and California, exploring the market for certified-organic pineapple, and has small test plots of lychee, rambutan, longan, mandarin orange and *kava*.

SHIPPING[3]

Most of Maui Pine's canned products are shipped overseas on surface vessels—first by barge from Kahului Harbor, then by container ship to the West Coast. Shipping via Honolulu does not add to the transportation costs, however, because Matson absorbs the cost of the Kahului-to-Honolulu barge service. And because of the long shelf-life of canned products, the travel time to Honolulu does not result in lost product.

Most of the fresh products are shipped as air cargo by Hawaiian Airlines—first on inter-island aircraft from Kahului Airport to Honolulu International Airport, then on wide-bodied jets to the West Coast (usually Portland and Seattle). The interisland service adds to the shipping costs, requires extra handling to transfer the product from the smaller interisland aircraft to larger overseas aircraft, and adds travel time which can result in a the loss of fresh product.

The shipping difficulties limit sales of fresh products on the mainland. Surface shipping is impractical because of the long delivery times, especially since shipments from Maui must first be barged to Honolulu then transferred to a container ship. As mentioned above, air shipment via Honolulu adds to the transportation costs, requires extra handling, and adds to the travel time. Direct air cargo from Kahului Airport is the preferred choice, but the runway is too short to allow departure of wide-bodied aircraft with a full load of passengers and cargo in the hold, and relatively few flights provide direct service between Maui and the mainland.

PRODUCTION, SALES AND EXPORTS[3]

In 2000, Maui Pine produced about 175,000 tons of pineapple and grossed $85.9 million in revenues. The sales were down significantly from prior years ($94.5 million in 1999 and $97.7 million in 1998) due primarily to reduced plantings, low yields due to drought conditions, and low prices for canned pineapple.

U.S. sales amounted to 96.7% of total pineapple sales, while export sales (primarily to Japan, Canada and Western Europe) amounted to approximately 3.3% of the total.

Approximately 20 domestic customers accounted for about 64% of sales in 2000. Sales to the U.S. government, mainly the U.S. Department of Agriculture, amounted to approximately 12.3% of the total.

EMPLOYMENT[3]

Maui Pine provides significant employment: about 520 full-time employees and 780 seasonal or intermittent employees in 2000, or about 1,100 full-time-equivalent jobs. Annual payroll in 2000 amounted to $31 million.

In addition to the direct employment provided by Maui Pine, the company indirectly supports an estimated 1,100 jobs through its purchases of goods and services, as well as purchases by its employees.[4] Thus, total employment supported by Maui Pine amounts to about 2,200 direct-plus-indirect jobs.

The skills required of workers vary from the highly skilled (managers, agronomists, engineers, researchers), to skilled (supervisors, technicians, mechanics, equipment operators, journeymen, secretaries, etc.), to semi-skilled (field workers, fruit packers, glove repair workers, clerical help, etc.). Non-management employees are represented by the International Longshoremen's and Warehousemen's Union (ILWU).

Wages, salaries and benefits at Maui Pine are among the highest in the world for agricultural workers. This reflects (1) competition for labor with Hawai'i's visitor industry which has driven up wages, salaries and benefits; (2) negotiations by the ILWU; and (3) health and other benefits required under State law.

PROFITABILITY[3]

The profitability of Maui Pine is inconsistent, primarily because the company competes with low-cost imports of canned pineapple, price fluctuations in the world market, and occasional droughts that adversely affect yields.

COMPETITIVE AND OTHER ADVANTAGES[3]

Despite inconsistent profitability, operating the only pineapple cannery remaining in Hawai'i, competition with imports of low-cost canned pineapple, high labor costs, and a shipping disadvantage vis-a-vis the Dole and Del Monte plantations on Oahu, Maui Pine is continuing its pineapple operations on Maui.

Competitive advantages and other factors that explain Maui Pine's continued pineapple operation include:

- The marketing advantage of being the only supplier of canned Hawaiian pineapple—pineapple which is perceived to be higher in quality than pineapple from other areas.
- Their canned-pineapple store-brand marketing program which provides lower advertising costs and presents opportunities to sell other Maui Pine products.
- Limited price protection on canned pineapple provided by anti-dumping duties on canned pineapple produced in Thailand (see Appendix A).
- Success in terms of profitability and growth in sales of whole-fresh pineapple, chilled fresh-cut pineapple, juice sold in plastic bottles, fresh pineapple salsa, etc.
- Ongoing efforts to lower costs and increase productivity in order to remain competitive.
- Low land costs because most of the land is owned by the parent company, Maui Land & Pineapple Company, Inc. (ML&P).
- Pineapple production is a profitable way to hold land over the long term, while providing employment, contributing to Maui's economy, and managing the land to provide attractive open space and greenery.

- A parent company that supports Maui Pine in lean years using profits derived from resort and commercial operations, and from property development.

STRATEGIC PLAN[3]

Capitalizing on its competitive advantages (see above), and consistent with global economic forces and trends (see Appendix A), Maui Pine's strategic plan includes the following components:

- Products and Markets Served from Maui
  - Continue to produce canned pineapple on Maui to serve the existing large customer base (i.e., buyers of store-brand canned pineapple), but at a smaller volume and with a focus on the higher-value opportunities.
  - Shift more of the Maui production to fresh pineapple, chilled fresh-cut pineapple, and other high-value products for which the market is growing, subject to aircargo limits (e.g., limited aircargo capacity on direct overseas flights from Kahului).
  - Continue to explore the market for other pineapple products and other tropical fruits.
- Maui Production and Operations
  - By 2005, reduce the volume of pineapple produced on Maui by downsizing the two plantations on the order of 24% (about 2,200 acres). Fields to be retained will be those having a history of low per-unit costs, while fields to be withdrawn will have a history of high per-unit costs—based on the quality and volume of the fruit produced and on the cost of farming, pest control, irrigation, transportation to Kahului, etc. Most of the downsizing will occur at the Honolua Plantation because of the long trucking distance to Kahului. At the same time, Maui Pine is searching for additional land in Central and East Maui that is closer to Kahalui.
  - Downsize employment through voluntary, enhanced early retirement.
  - Continue efforts to improve operating efficiencies (i.e., lower costs and improve productivity).

— New Operations

- For customers who are unwilling to pay a premium for Hawaiian pineapple, shift a portion of the production to company-affiliated low-cost plantations outside Hawai'i (see next section).

In addition to strengthening the competitiveness of Maui Pine, this strategy will release land for development at Kapalua which will, in turn, contribute to the economic health of the parent company, ML&P. Correspondingly, a healthy parent company will be in a position to contribute to the survival of the pineapple operation during lean years.

OVERSEAS OPERATIONS[3]

Consistent with the above strategic plan, and following the lead of Dole and Del Monte in reaction to global economic forces and trends (see Appendix B), Maui Pine has recently become involved in two overseas pineapple operations.

In 1997, Royal Coast Tropical Fruit Company, Inc. (Royal Coast), a wholly owned subsidiary of Maui Pine, entered into a joint venture with an Indonesian pineapple grower and canner. The joint venture, Premium Tropicals International, LLC, markets and sells Indonesian canned pineapple in the United States.

In 1999, Royal Coast formed a 51%-owned pineapple production subsidiary in Central America. Pineapple cultivated in Central America is sold principally as fresh whole fruit to Maui Pine's customers in the United States and Europe. Sales of Maui Pine's Central American pineapple began in late 2000.

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APPENDIX C: HAWAI'I'S AGRICULTURAL LAND MARKET

INTRODUCTION

Presented below is an overview of the agricultural land market in Hawai'i. The discussion includes the release of land from plantation agriculture (i.e., sugarcane and pineapple), the growth in land requirements for diversified crops (i.e., all crops other than sugarcane and pineapple), and the availability of land for diversified crops.

RELEASE OF LAND FROM PLANTATION AGRICULTURE

Because Hawai'i's sugar and pineapple industries have contracted substantially over the past three decades, an enormous and growing supply of farm land is available for diversified agriculture and other land uses. Since 1968, land in plantation agriculture has declined from about 305,900 acres to about 68,700 acres in 2000, for a 32-year decrease of about 236,200 acres (an average decrease of about 7,400 acres per year).[1,2] This accounting reflects the recent closures of Pioneer Mill Co., Ltd. (Pioneer Mill) in West Maui and two sugar plantations on Kaua'i.

On Maui, the contraction and eventual closure of Wailuku Sugar Co. and Pioneer Mill released about 13,500 acres since 1979.[3]

GROWTH IN LAND REQUIREMENTS FOR DIVERSIFIED CROPS

Land requirements to accommodate the growth of diversified crops are modest compared to the available supply. As plantation agriculture was contracting, Statewide land requirements for diversified crops grew from 21,600 acres in 1968 to 60,100 acres in 2000, for a 32-year increase of 38,500 acres (an average increase of 1,200 acres per year).[1,2] Even this increase in diversified-crop acreage is high in that it includes many fields planted in grasses that are mowed for cattle feed rather than placing cattle on the fields and including the land in the inventory of grazing land.

Although a great many crops can be grown in Hawai'i's year-round subtropical climate, the modest growth in land requirements for diversified crops reflects the fact that few of them can be grown profitably on a large scale. The primary reasons for this are given below.[4]

- —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.
- —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.
- —High overseas transportation costs increase the cost of importing agricultural supplies and equipment and, for export crops, shipping produce to market.
- —For a number of crops, consumption volumes in Hawai'i are too small to support large, efficient 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 can be done locally because these farms incur lower costs for land, labor, supplies, fertilizer, pest control, equipment, etc. Furthermore, many of them benefit from large volumes and economies of scale.

In short, the limiting factor to the growth of diversified agriculture is *not* the *land supply*, but rather the *size of the market* for those crops which can be grown *profitably* in Hawai'i.

AVAILABILITY OF LAND FOR DIVERSIFIED AGRICULTURE

As indicated above, a vast amount of land has been released from plantation agriculture, and this release of land has far outpaced the demand for land for diversified crops. As a result, the amount of land in crops has declined from about 327,500 acres in 1968 to an estimated 129,800 acres in 2000, for a net release of about 197,700 acres (an average decrease of about 6,200 acres per year).[1,2]

Some of this land has been or is scheduled to be converted to urban, forestry or other uses. But, the majority of the 197,700 acres remains available for diversified crops. Much of this land is fallow, is used for grazing, or is in some other low-value land-holding operation. A major issue Statewide is how to use productively the vast amount of high-quality agricultural land that has become available.

In West Maui, most of the 6,000+ acres that were released from sugar cultivation by the 1999 closure of Pioneer Mill remain available for diversified agriculture.

Similarly, agricultural lands remain available on Kaua'i, O'ahu, Moloka'i, Lana'i and the Big Island. On O'ahu, most of the 22,500 acres released from sugar production during the 1990s remain available. Fields in Kunia and 'Ewa are regarded as among the best farm land in the State, based on the high solar radiation, high quality soils, and the short trucking distance to the large Honolulu market and, for export markets, to the Honolulu International Airport and Honolulu Harbor.[5] These lands have been leased, but markets for crops grown on the land are still being developed.[6] On the North Shore, various crops are being explored, but most of the former sugarcane land remains fallow.[7]

SUMMARY

In summary, ample land is available on all islands to accommodate the growth of diversified agriculture. Furthermore, the limiting factor to the growth of diversified agriculture is *not* the *land supply*, but rather the *size of the market* for crops that can be grown *profitably* in Hawai'i.

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Appendix C

Biological Survey
(Nagata 1997)

KAPALUA PROJECT DISTRICT 2
BIOLOGICAL SURVEY

PREPARED BY: Kenneth M. Nagata
FOR: PBR Hawaii
9 May 1997

INTRODUCTION

The project site occupies approximately 450 acres in Kapalua, Lahaina District, West Maui. It is situated *mauka* of Honoapiilani Highway directly across the present Kapalua Resort. The property extends from Honoapiilani Highway to approximately 850' elevation and from Honokahua Stream (east boundary) to a ridge nearly a mile to the west.

The vegetation of the region has been classified as one of lowland shrubs in the lower elevations and open shrubs in the upper areas (Ripperton & Hosaka 1942). Lantana (*Lantana camara*) and cactus (*Opuntia ficus-indica*) are widely distributed and koa-haole (*Leucaena leucocephala*) often forms dense stands 10 - 15' tall in the lower areas. Smaller shrubs such as 'ilima (*Sida fallax*), 'uhaloa (*Waltheria indica*), and Japanese tea (*Chamaecrista nictitans*) are prominant in open sites. Annuals, shortlived perennials and grasses such as Spanish needle (*Bidens pilosa*), false mallow (*Malvastrum coromandelianum*), cocklebur (*Xanthrum strumarium*), pili (*Heteropogon contortus*), Bermuda (*Cynodon dactylon*) and Natal redtop (*Rhynchelytrum repens*) are also common.

In the upper elvations guava (*Psidium guajava*) replaces koa-haole as the dominant shrub. Lantana, 'uhaloa, 'ilima and Japanese tea are present but not as abundant as in the lower areas. Grasses such as Bermuda, Natal redtop, golden beardgrass (*Chrysopogon aciculatus*), ricegrass (*Paspalum scorbiculatum*) and yellow foxtail (*Setaria gracilis*)are prominent in the upper areas.

RESULTS

VEGETATION

The land in the project site has been greatly altered by man. Most of the original vegetation has been replaced by a golf course, forestry plantings, and pineapple fields. Consequently most of the vegetation is secondary in nature and for the most part does not resemble that which was described by Ripperton and Hosaka (*1942*). Of the eight plant communities recognized only one is representative of the original vegetation in the region.

Cultivated Land (C)

Cultivated Land includes The Village Course at Kapalua, all ravines and uncultivated areas between the holes , and pineapple fields. Consisting of a mosaic of lawns and other landscaped areas, fairways and greens, grasslands, thickets and forest, it is the largest and the most complex of all the vegetation types in the project site. More than 75% of the approximately 200 plant species recorded in the property are found in the Cultivated Land. Relative abundance was not determined for plants in this community.

A significant portion of the Cultivated Land is occupied by The Village Course and associated landscaped areas. The fairways and greens are mostly Bermuda grass. Common landscape plants include oleander *(Nerium oleander)*, Eastern arborvitae *(Thuja occidentalis)*, be-still tree *(Cascabela thevetia)*, and sea grape *(Coccoloba uvifera)*. In addition, groves of Cook pine *(Araucaria columnaris)*, Formosan koa *(Acacia confusa)*, and various species of eucalyptus (*E. robusta, E.* spp.) which may have been originally installed as windbreaks or for reforestation have been incorporated into the golf course design.

Open and closed thickets of guava, koa-haole and Christmas berry (*Schinus terebinthifolius*) are found between the golf course holes. Often the shrubs are up to 15' tall and form closed canopied stands with a sparse understory. Where the canopy is open the result is a well developed herb layer of Para grass (*Brachiaria mutica*) or sourgrass *(Digitaria insularis)*. *Stachytarpheta urticifolia*, lantana, Natal redtop, Guinea grass (*Panicum maximum*), indigo (*Indigofera suffruticosa*) and laua'e *(Phymatosorus scolopendria)* are found in moderate numbers especially in sunny areas. Remnant pineapple (*Ananas comosus*) can occasionally be found and emergent Java plum *(Syzygium cumini)*, Formosan koa and one or more species of *Eucalyptus* are frequently associated with these thickets.

Also included in Cultivated Land are grasslands of Para grass, sourgrass, Hilo grass *(Paspalum conjugatum)* and molassesgrass *(Melinis minutiflora)*. Emergent through the grass are shrubs of guava, Christmas berry or koa-haole, and Cook pine. Few other species are found within these grasslands. Sword fern (*Nephrolepis exaltata*), milkweed (*Asclepia curassavica*), dog tail *(Buddleia asiatica)*, and Natal redtop occur in small to moderate numbers.

Pineapple fields occupy a significant portion of the Cultivated Land. The fields on the ridge above the 14th hole are well tended with very few weeds on the roadways or between the rows of pineapple. Sourgrass,, dog tail and dallis grass *(Paspalum dilatatum)* were observed but in very small numbers. The fields on the ridge along the west boundary of the property have been harvested and plowed. Nothing remains in these fields except for a few remnant pineapple plants and sourgrass and Henry's crabgrass *(Digitaria ciliaris)* in very small numbers along the roadways.

Eucalyptus Forest (EF)

The second largest vegetation type in the project site is the Eucalyptus Forest. It consists of extensive stands of Swamp mahogany *(Eucalyptus robusta)* and one or more other species of *Eucalyptus* which were probably planted for reforestation. This community occurs in Honokahua Gulch and in

the large gulch within the golf course. Generally the trees are at least 50' tall forming closed-canopied stands. On steeper slopes or where the soil is poor the trees are much shorter and form open canopies.

In the *makai* portion of Honokahua Gulch the Eucalyptus Forest extends to the floor of the gulch but from about the golf course 4th hole this community extends to only about mid-slope and from the 5th hole it occupies only the upper slopes. Typically the understory is poorly developed with occasional Christmas berry and sapling *Eucaplyptus* and a depauperate herb layer of sourgrass and laua'e. In some areas, however, the understory is dense with Christmas berry and koa-haole. Here the canopy is open and the herb layer is dominated by Para grass and Natal redtop with emergent guava, lantana and Christmas berry in the understory. Groves of ironwood *(Casuarina equisetifolia)* and Formosan koa occur in certain sites. At about midslope throughout the length of the Eucalyptus Forest, remnant native species such as a'ali'i *(Dodonaea viscosa)*, pukiawe *(Styphelia tameiameiae)*, 'akia *(Wikstroemia oahuensis*) and 'ulei *(Osteomeles anthyllidifolia)* occur in small to moderate numbers. In certain areas these species are abundant.

In the large gulch in the golf course the trees attain heights of nearly 100 feet. On the slopes the understory is usually open with moderate numbers of Christmas berry, koa-haole, guava and sapling *Euclayptus*. The sparse herb layer consists of laua'e, Para grass and sourgrass. In open canopied sites, however, the herb layer is well-developed and in some locations, dense thickets of Christmas berry occur. The native 'akia, a'ali'i and 'ulei also occur on the slopes but in small numbers. The gulch floor is characterized by very tall *Eucalyptus*, and koa-haole and Christmas berry up to 30' tall with a dense herb layer of asystasia *(Asystasia gangetica)*, sourgrass, Para grass or Guinea grass. Huehue haole *(Passiflora suberosa*) is common throughout the gulch and white thunbergia (*Thunbergia fragrans)* and asparagus fern *(Asparagus setaceus)* are found in smaller numbers.

Styphelia-Dodonaea Scrub (SDS)

The only native plant community in the project site is the Styphelia-Dodonaea Scrub. It occurs in the *mauka* portion of Honokahua Gulch at mid to upper slope where *Eucalyptus* ceases to be dominant. The slopes are steep, the soils are shallow and rock outcrops are common. The few stunted *Eucalyptus* trees which occur in this community provide less then 10% cover. The vegetation is dominated by pukiawe and a'ali'i 2-7' tall with moderate numbers of 'akia, 'ohi'a-lehua *(Metrosideros polymorpha)* and huehue (*Cocculus trilobus*). These native species provide at least 90% cover except in rocky areas. The ground cover is generally sparse and consists mainly of Natal redtop and golden beardgrass. 'Ohi'a-lehua becomes more abundant in the mauka portions of the community. Here increasing numbers of *Eucalyptus* and Formosan koa occur until once again they become dominant. A small colony of about 15 individuals of the native sandalwood, (*Santalum ellipticum*) or 'iliahialo'e was found on the slopes near the 5th hole.

Christmas berry Thicket (CT)

The lower slopes below the Schinus-Dodonaea Scrub Community and the floor of Honokahua Gulch is dominated by dense stands of Christmas berry. On the slopes these thickets are so dense that the herb layer is sparse, consisting of small numbers of 'ilima, Japanese tea, sourgrass and *Stachytarpheta urticifolia*. Small to moderate numbers of koa-haole, 'ulei, ironwood and Formosan koa are also found in this community. On the gulch floor the Christmas berry becomes 15-20' tall with an open understory and a well developed herb layer of basketgrass (*Oplismenus hirtellus*) and laua'e.

Mixed Forest (MF)

The Mixed Forest community occurs on the floor of Honokahua Gulch. It is a closed-canopied forest 50-60' tall consisting mostly of Java plum, one or more species of *Eucalyptus* and kukui (*Aleurites moluccana*). The understory is generally open with moderate numbers of koa-haole, guava, Christmas berry and noni (*Morinda citrifolia*). The well-developed herb layer is dominated by basketgrass and laua'e. Few other species occur in this community. This vegetation type is one of the smallest in the project site partly because a significant section of the gulch floor has been grubbed.

Mixed Gulch (MG)

The Mixed Gulch community occurs in the middle portion of the west gulch. It is an extensive community consisting of stands of one or more species of *Eucalyptus*, ironwood, Christmas berry, Formosan koa, guava and koa-haole. Typically, the stands of ironwood, *Eucalyptus* and Formosan koa are found on the upper slopes and Christmas berry, koa-haole and guava occur on the middle and lower slopes. Formosan koa is abundant on the east facing slopes and ironwood and *Eucalyptus* are dominant on the opposite side. A grove of Cook pine has been planted along the west crest of the gulch. The groves of *Eucalyptus*, ironwood and Formosan koa are generally tall with closed canopies. Among the few species found in the understory are Christmas berry and guava. Guava, koa-haole and especially Christmas berry, on the other hand, are shorter statured and often form thickets so dense that traversing them requires crawling on the ground. Generally the herb layer on the slopes is poorly developed and consist largely of Para grass and sourgrass.

Formosan Koa Forest (FKF)

Formosan Koa becomes especially abundant in the *mauka* section of the west gulch. Here it occupies both sides of the gulch as well as the floor, forming the Formosan Koa Forest community. This community consists of closed canopied Formosan koa trees 30-50' high with an open understory of sapling Formosan koa, Christmas berry and guava. On the slopes, the ground is thick with leaf litter and the herb layer consists of basketgrass and Formosan koa seedlings with smaller numbers of Para grass which is more abundant near the crest. The gulch floor is dominated by Formosan koa with an understory of Arabian coffee and an herb layer of basketgrass. Only a few kukui occur in this community. The stands of Christmas berry, guava and koa haole which are so prevalent on the middle and lower slopes in the Mixed Gulch community are conspicuously absent in this community.

Koa-haole Thicket (KHT)

The groves of ironwood, *Eucalyptus*, Formosan koa and Christmas berry are absent in the *makai* section of the west gulch. Here the vegetation is dominated by extensive stands of koa-haole 10-20' tall with emergent scattered *Eucalyptus* spp. and small clusters of Christmas berry and Formosan koa. The canopy cover of the koa-haole is nearly 100%, but the small leaves of the canopy provide for ample sunlight to filter into the understory. Consequently the herb layer is well-developed with vegetation cover of nearly 100%.. Para grass, Guinea grass and sourgrass dominate this layer. On rocky outcrops *Peperomia leptostachya* is common. White thunbergia is found in smaller number throughout this community.

The Koa-haole Thicket is also found on the *makai* end of Honokahua Gulch on the very steep, exposed slopes. In this area the koa-haole is shorter and several native 'ulei, 'akia and a'ali'i are found.

Native Plants and Native Plant Communities

Native plants are found in abundance in certain portions of the project site and several native species are found in small to moderate numbers throughout much of the property. One or more native species are found in every major vegetation type. The landscaped portions of the golf course and the pineapple fields are the only subcommunities without native species. One native community, the Schinus-Dodonaea Scrub, occurs on the slopes of Honokahua Gulch. This community appears surprisingly intact except where plantings of *Eucalyptus* had been attempted and in the *mauka* area where Formosan koa and *Eucalyptus* are encroaching. The predominant native species comprising this community are a'ali'i, pukiawe, 'ulei, 'akia and 'ohi'a-lehua with smaller numbers of huehue, 'ilima, *Peperomia leptostachya*, 'alahe'e *(Canthium odoratum)*, lama *(Diospyros ferrea)*, bracken *(Pteridium aquilinum* var. *decompositum)*, pala'a *(Sphenomeris chusana)*, pakahakaha *(Pleopeltis thunbergiana)*, and moa *(Psilotum nudum)*. Several native species are also found in other vegetation types in moderate or small numbers. Eleven are found in five or more vegetation types. The most widespread is the indigenous a'ali'i which occurs in every community except the Mixed Forest. Five species are found in all but two communities and five others occur in all but three communities. Of these eleven species two are endemic (*'akia* and *'ohi'a-lehua)* and nine are indigenous.

Eighteen native species are found in the project site. Fourteen are indigenous and four are endemic. All are common to the lowlands and forests of most of the islands in Hawaii. In addition, a small garden of native plants is maintained near the 2nd hole of The Village Course in the Cultivated Land. Several of the species occur naturally on the property, eg. alahe'e, 'akia, 'ulei and a'ali'i. Others such as ahu'awa *(Mariscus javanicus)*, kokio'-ke`oke`o *(Hibiscus arnottianus)*, ma`o hauhele *(H. brackenridgei)*, uhiuhi *(Caesalpinia kavaiensis)*, pohinahina *(Vitex ovata)*, koa *(Acacia koa)* and `anapanapa *(Colubrina asiatica)* are not found on the property. This garden is an Audubon Cooperative Sanctuary and is maintained for environmental education.

Endangered Species

No endangered or threatened plants occur naturally in the project site. Two species in the Audubon Cooperative Sanctuary however, are federally listed Endangered Species. Ma`o hauhele, native to Molokai, Lanai, Maui and Hawaii, was listed in 1994 *(Fed. Reg. 1994)*. Two thriving individuals are cultivated in the garden. One uhuuhi is also planted in the garden. This species, native to Kauai, Oahu, West Maui, and Hawaii, was listed in 1986 *(Fed. Reg. 1986)*.

FAUNA

Mammals

No mammals were observed in the project site. There is, however, a strong probability that mongoose *(Herpestes auropunctatus)* and perhaps feral cats *(Felis catus)* are present. One or more species of rats *(Rattus spp.)* and mice *(Mus musculus)* may also occur in the area.

Birds

One migratory species and eleven game, field, urban or domesticated birds were observed in the project site. Because of the complexity of the vegetation in the Cultivated Land, more species occur in this community than in any other. All of the species were observed in this community. Seven were observed in the Mixed Gulch, six were observed in the Koa-haole Thicket and five were seen in the Eucalyptus Forest.

ANATIDAE
Mallard duck *(Anas platyrhynchos)*
Six individuals were seen at the lake near The Village Course 5th tee.

CHARADRIIDAE
Pacific golden plover *(Pluvialis dominica)*
Three individuals were observed on the fairways of the 8th hole of the golf course.

COLUMBIDAE
Barred dove *(Geopelia striata)*
The common barred dove was observed in small numbers in the Cultivated Land especially in the golf course areas and in the Koa-haole Thicket.
Lace-neck dove *(Streptopelia chinensis)*
Lace-neck doves were seen in small to moderate numbers in the Cultivated Land, Koa-haole Thicket, Formosan Koa Forest and in the Mixed Gulch communities.

FRINGILLIDAE

Red-crested cardinal *(Paroaria coronata)*

This species occurs in large numbers in the Cultivated Land especially in the vicinity of the golf course. It is also found in smaller numbers in the Eucalyptus Forest and the Christmas berry Thicket.

Kentucky cardinal *(Richmondena cardinalis)*

This is the most widely distributed and one of the most abundant species in the project site. Occurring in moderate to large numbers in every vegetation type, it is particularly abundant in the Koa-haole Thicket and the Mixed Gulch. Numerous pairs were observed and its calls are a familiar sound throughout the property.

PASSERIDAE

House sparrow *(Passer domesticus)*

House sparrows are among the least common species in the project site. It was observed in moderate numbers only in the golf course area of the Cultivated Land.

PHASIANIDAE

Indian gray francolin *(Francolinus pondicerianus)*

These game birds were commonly observed and heard in four vegetation types. Approximately 15 were observed in the Koa-haole Thicket in the west gulch and about 12 were seen further *mauka* in the Mixed Gulch community. One was observed in the Eucalyptus Forest and several were seen in the Cultivated Land, both in the plowed fields along the west boundary and in the shrubs and grasslands between the holes in the golf course.

PLOCEIDAE

Rice-bird *(Lonchura punctulata)*

Rice-birds occur in small numbers in the Mixed Gulch and in the Cultivated Land.

STURNIDAE

Common mynah *(Acridotheres tristis)*

Small numbers of the common mynah were observed in the Mixed Gulch, Formosan Koa Forest and in the Cultivated Land especially in the golf course.

TIMALIIDAE

Chinese thrush *(Garrulax canorus)*

The Chinese thrush is one of the most conspicuous species in the property. Its varied songs were heard in all vegetation types except the Styphelia-Dodonaea Scrub but it was actually observed only in the Koa-haole Thicket and the Mixed Gulch. It is a very shy bird and only three pairs were actually seen.

SUMMARY

The vegetation in the project site consists of forests, thickets, scrubland, grasslands, pineapple fields, barren plowed fields, and landscaped areas including a golf course. As a result of extensive land modifications, much of the vegetation is secondary. For example, much of the forests are planted stands of various reforestation trees such as *Eucalyptus* spp., Formosan koa, Cook pine and ironwood. One intact native plant community consisting primarily of a'ali'i, pukiawe, 'akia, 'ulei and 'ohi'a-lehua with serveral other native species in smaller numbers was recorded on the slopes of Honokahua Gulch. This community represents the remnants of the native vegetation which once existed in the region. Many of these native species still persist in moderate to small numbers in other vegetation types throughout the site. All are common in Hawaii but two federally-listed Endangered Species are being cultivated in the Audubon Cooperative Sanctuary near the 2nd hole of the golf course.

No mammals and twelve bird species were observed in the site. One of the birds, the Pacific golden plover, is a migratory species and the rest are common urban, game, field or domesticated species.

POTENTIAL PROBLEMS AND MITIGATING MEASURES

Normally the presence of a federally-listed Endangered Species presents major problems for any proposed project. Unless federal funds are involved or the property is owned by the federal government, federal regulations would not apply. However, all Federal Endangered Species are also State Endangered Species and are subject to stringent State of Hawaii Statutes. The occurrence of two such Endangered Species on the property behooves consultation with the State Department of Land and Natural Resources . However, the fact that these species are not natural to the area but are being cultivated for public education is a mitigating factor. This is not perceived as a significant problem.

The subject property also contains a significant native plant community. The general health of this community is regarded as excellent and steps sould be taken to preserve it. It is fortunately located at the east boundary of the property on the slopes of Honokahua Gulch where construction activities are not likely to occur. As long as any disturbance is avoided on these slopes this community should remain intact.

RECOMMENDATIONS

Two recommendations are made with respect to the Federal Endangered Species and the native plant community:

1. Consultation with the Hawaii State Department of Land and Natural Resources. Hawaii State Revised Statutes require formal consultation if any Federal or State Endangered Species is discovered on the property.

2. To preserve the native plant community on the slopes of Honokahua Gulch, major disturbance on or near these slopes should be avoided.

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CHECK LIST OF PLANTS

SCIENTIFIC NAME	COMMON NAME	STATUS	EF	SDS	CT	MF	MG	FEF	KHT	C
PTERIDOPHYTA										
ADIANTACEAE										
Adiantum hispidulum Sw.		X	-	-	U	O	-	-	U	-
Pityrogramma austroamericana Domin	Gold fern	X	U	-	-	-	R	-	-	X
ASPLENIACEAE										
Asplenium nidus L.	Birds-nest fern	X	R	-	U	O	O	-	-	X
BLECHNACEAE										
Blechnum occidentale L.		X	X	-	X	O	O	U	-	-
DAVALLIACEAE										
Nephrolepis exaltata (L.) Schott	Sword fern	I	O	-	U	O	O	U	-	X
DENNSTAEDTIACEAE										
Pteridium aquilinum var. decompositum (Gaud.) A. Tryon	Bracken	I	-	U	-	-	-	-	-	-
LINDSAEACEAE										
Sphenomeris chusana (L.) Copel.	Pala'a	I	O	O	-	-	R	-	-	X
POLYPODIACEAE										
Phlebodium aureum (L.) J. Smith	Harefoot fern	.	-	-	R	-	U	-	-	X
Phymatosorus scolopendria (Burm.) Pichi Sermolli	Laua'e	X	O	U	C	C	-	R	R	X
Pleopeltis thunbergiana Kaulf.	Pakahakaha	I	-	O	U	-	U	-	-	-
PSILOTACEAE										
Psilotum nudum (L.) Beauv.	Moa	I	U	R	U	-	-	-	-	-
WOODSIACEAE										
Christella parasitica (L.) Leveille		I	-	-	-	U	O	U	-	-
GYMNOSPERMAE										
ARAUCARIACEAE										
Araucaria columnaris (Forst. f.) Hook.	Cook pine	X	-	R	-	-	U	U	R	X
A. heterophylla (Salisb.) Franco	Norfolk Island pine	X	-	-	-	-	-	-	-	X
CUPRESSACEAE										
Cupressus sp.		X	-	-	-	-	-	-	-	X
Juniperus sp.		X	-	-	-	-	-	-	-	X
Thuja occidentalis L.	Eastern arborvitae	I	-	-	-	-	-	-	-	X

CHECK LIST OF ANIMALS

SCIENTIFIC NAME	COMMON NAME	STATUS	EF	SDS	CT	MF	MG	FEF	KHT	C
BIRDS										
ANATIDAE										
Anas platyrhynchos	Mallard duck	X	-	-	-	-	-	-	-	X
CHARADRIIDAE										
Pluvialis dominica	Pacific golden plover	M	-	-	-	-	-	-	-	X
COLUMBIDAE										
Geopelia striata	Barred dove	X	-	-	-	-	-	-	X	X
Streptopelia chinensis	Lace-neck dove	X	-	-	-	-	X	X	X	X
FRINGILLIDAE										
Paroaria coronata	Red-crested cardinal	X	X		X	-		-	-	X
Richmondena cardinalis	Kentucky cardinal	X	X	X	X	X	X	X	X	X
PASSERIDAE										
Passer domesticus	House sparrow	X	-	-	-	-	-	-	-	X
PHASIANIDAE										
Francolinus pondicerianus	Indian gray francolin	X	X	-	-	-	X	-	X	X
PLOCEIDAE										
Lonchura punctulata	Rice-bird	X	-	-	-	-	X	-	-	X
STURNIDAE										
Acridotheres tristis	Common mynah	X	-	-	-	-	X	X	-	X
TIMALIIDAE										
Garrulax canorus	Chinese thrush	X	X	-	X	X	X	X	X	X
ZOSTEROPIDAE										
Zosterops japonicus	Japanese white-eye	X	X	-	X	X	X	X	X	X

PLANT SPECIES CHECKLIST

Families are arranged alphabetically in three major groups: Pteridophytes (ferns and allies), Gymnosperms (conifers) and Angiosperms (higher plants). The Angiosperms are further divided into Monocotyledons and Dicotyledons. Genera and species are arranged alphabetically within each family. Taxonomy, common names and status of Gymnnosperms and Angiosperms follow those of Neal (1975), St. John (1973), or Wagner, et. al. (1990). Taxonomy and status of the Pteridophytes are based on Wagner and Wagner's unpublished checklist. The abundance determinations are relative and are subject to the judgement of the investigator.

EXPLANATION OF SYMBOLS

Species Status:

- E - Endemic to the Hawaiian Islands, ie. occurring naturally nowhere else in the world.
- I - Indigenous, ie. native to the Hawaiian Islands but also occurring naturally elsewhere.
- X - Exotic (alien), ie. plants introduced after the Western discovery of the islands.
- P - Polynesian introductions, ie. plants introduced before the Western discovery of the islands.

Relative Abundance Ratings:

- A - ABUNDANT, generally the major or dominant species in a given area.
- C - COMMON, generally distributed throughout a given area in large numbers.
- O - OCCASIONAL, generally distributed through a major portion of a given area, but in small numbers.
- U - UNCOMMON, observed uncommonly but more than 10 times in a given area.
- R - RARE, observed 2 to 10 times in a given area.

Vegetation Types:

- EF - Eucalyptus Forest
- SDS - Styphelia-Dodonaea Scrub
- CT - Christmas berry Thicket
- MF - Mixed Forest
- MG - Mixed Gulch
- FKF - Formosan Koa Forest
- KHT - Koa-haole Thicket
- C - Cultivated Land

CHECK LIST OF PLANTS

SCIENTIFIC NAME	COMMON NAME	STATUS			EF	SDS	CT	MF	MG	FKF	KHT	C		
					RELATIVE ABUNDANCE									
ANGIOSPERMAE-MONOCOTYLEDONS														
AGAVACEAE														
Cordyline fruticosa (L.) A. Chev.	Ti	P			R	-	R	U	U	-	-	X		
Sansevieria trifasciata Prain	Snake plant	X			A	-	-	-	-	-	-	X		
AMARYLLIDACEAE														
Hippeastrum sp.		X			R	-	-	-	-	-	-	X		
ARACEAE														
Alocasia macrorrhiza (L.) Sweet	'Ape	P			-	-	-	R	-	-	-	-		
Syngonium auritum (L.) Schott		X			R	-	-	-		-	-	X		
ARECACEAE														
Chrysalidocarpus lutescens (Bory) H. Wendl.	Areca	X			-	-	-	-	-	-	-	X		
Cocos nucifera L.	Coconut	P			R	-	-	-	-	-	-	X		
Livistona sp.		X			-	-	-	-	-	-	-	X		
Veitchia merrillii (Becc.) H.E. Moore	Manila palm	X			-	-	-	-	-	-	-	X		
BROMELIACEAE														
Ananas comosus (Stickm.) Merr.	Pineapple	X			R	-	-	-	R	R	-	X		
CANNACEAE														
Canna indica L.	Indian shot	X			-	-	-	R	-	-	-	-		
COMMELINACEAE														
Commelina diffusa Burm. f.	Honohono	X			R	-	-	-	U	-	-	X		
Rhoeo spathacea (Sw.) Stearn	Oyster plant	X			-	-	-	-	-	-	-	X		
CYPERACEAE														
Cyperus rotundus L.	Nut grass	X			-	-	-	-	-	-	-	X		
Kyllinga nemoralis (J.R. Forster & G. Forster) Dandy ex Hutchinson & Dalziel	Kili'o'opu	X			-	-	-	-	-	-	-	X		
Mariscus javanicus (Houtt.) Merr. & Metcalfe	Ahu'awa	I			-	-	-	-	-	-	-	X		
DIOSCOREACEAE														
Dioscorea bulbifera L.	Pi'oi	P			-	-	-	R	-	-	-	-		
LILIACEAE														
Aloe vera (L.) Burm.	Aloe	X			R	-	-	-	-	-	-	X		
Asparagus africanus Lam.	Royal fern	X			-	-	-	-	-	-	-	X		
A. setaceus (Kunth) Jessop	Asparagus fern	X			U	-	R	-	U	-	R	X		
Pleomele marginata (Lam.) N.E. Br.		X			-	-	-	-	-	-	-	X		
MUSACEAE														
Ravenala madagascariensis J.F. Gmel.	Travellers tree	X			-	-	-	-	-	-	-	X		
Strelitzia reginae Banks	Bird of paradise	X			-	-	-	-	-	-	-	X		

CHECK LIST OF PLANTS

SCIENTIFIC NAME	COMMON NAME	STATUS	EF	SDS	CT	MO	MG	FKF	KHT	C
ANNONACEAE										
Annona sp.		I	R	-	-	-	-	-	-	X
APIACEAE										
Ciclospermum leptophyllum (Pers.) Sprague	Fir leaved celery	I	-	-	-	-	-	-	-	X
Centella asiatica (L.) Urb.	Asiatic pennywort	I	-	-	-	-	-	-	-	X
APOCYNACEAE										
Cascabela thevetia (L.) Lippold	Be-still tree	I	-	-	-	-	-	-	-	X
Catharanthus roseus (L.) G. Don	Madagascar periwinkle	I	-	-	-	-	-	-	-	X
Nerium oleander L.	Oleander	I	-	-	-	-	-	-	-	X
Plumeria rubra L.	Plumeria	I	-	-	-	-	-	-	-	X
ARALIACEAE										
Schefflera actinophylla (Endl.) Harms	Octopus tree	I	U	-	-	U	-	-	R	X
ASCLEPIADACEAE										
Asclepias curassavica L.	Milkweed	I	-	-	-	-	-	-	-	X
ASTERACEAE										
Ageratina adenophora (Spreng.) R. King & H. Robinson	Maui pamakani	I	R	U	-	-	-	-	-	-
A. riparia (Regel) R. King & H. Robinson	Hamakua pamakani	I	-	R	-	-	-	-	-	-
Ageratum conyzoides L.	Ageratum	I	-	R	-	U	R	-	U	X
Bidens pilosa L.	Spanish needle	I	-	-	-	-	R	-	-	X
Calyptocarpus vialis Less.		I	-	-	-	-	-	-	-	X
Conyza bonariensis (L.) Cronq.	Hairy horseweed	I	U	U	-	-	R	-	-	X
Crassocephalum crepidioides (Benth.) S. Moore		I	-	-	-	-	-	R	-	X
Elephantopus spicatus Juss. ex Aubl.		I	-	-	-	-	U	-	-	X
Emilia fosbergii Nicolson		I	U	-	-	-	-	-	-	X
E. sonchifolia (L.) DC.	Flora's paintbrush	I	R	-	-	-	R	-	R	X
Pluchea indica (L.) Less.	Indian fleabane	I	-	-	-	-	-	-	-	X
P. symphytifolia (Mill.) Gillis	Sourbush	I	R	-	U	U	-	-	-	X
Sonchus asper (L.) J. Hill	Prickly sow thistle	I	-	-	-	-	-	-	-	X
S. oleraceus L.	Sow thistle	I	R	-	-	-	-	-	-	X
Synedrella nodiflora (L.) Gaertn.	Synedrella	I	-	-	-	-	U	-	-	X
Verbesina encelioides (Cav.) Benth. & Hook.	Golden crown-beard	I	-	-	-	-	-	-	-	X
Wedelia trilobata (L.) Hitchc.	Wedelia	I	R	-	-	-	-	-	-	X
Youngia japonica (L.) DC.	Oriental hawksbeard	I	-	-	-	-	-	-	-	X
BIGNONIACEAE										
Spathodea campanulata Beauv.	African tulip	I	R	U	-	-	-	-	-	X
Tabebuia pentaphylla (L.) Hemsl.	Pink tecoma	I	-	-	-	-	-	-	-	X
BRASSICACEAE										
Lepidium virginicum L.		I	-	-	-	-	-	-	-	X
BUDDLEIACEAE										
Buddleia asiatica Lour.	Dog tail	I	-	-	-	-	-	-	-	X

CHECK LIST OF PLANTS

SCIENTIFIC NAME	COMMON NAME	STATUS	EF	SDS	CT	MT	MG	FKF	KHT	C
ORCHIDACEAE										
Spathoglottis plicata Bl.		I	U	U	R	-	-	-	-	X
PANDANACEAE										
Pandanus sp.		I	-	-	-	-	R	-	-	-
POACEAE										
Andropogon virginicus L.	Broomsedge	I	-	U	-	-	-	-	-	X
Bambusa vulgaris Schrad. ex Wendl.	Bamboo	I	R	-	-	-	-	-	-	X
Brachiaria mutica (Forssk.) Stapf	Para grass	I	O	-	-	-	O	O	C	X
Cenchrus echinatus L.	Common sandbur	I	-	-	-	-	-	-	-	X
Chloris barbata (L.) Sw.	Swollen fingergrass	I	-	-	-	-	-	-	-	X
C. virgata Sw.	Feather fingergrass	I	-	-	-	-	R	-	-	X
Chrysopogon aciculatus (Retz.) Trin.	Golden beardgrass	I	R	O	-	-	U	-	-	X
Cynodon dactylon (L.) Pers.	Bermuda grass	I	-	-	-	-	R	-	-	X
Digitaria ciliaris (Retz.) Koeler	Henry's crabgrass	I	-	R	-	-	-	-	-	X
D. insularis (L.) Mez ex Ekman	Sourgrass	I	O	-	C	O	O	U	C	X
Eleusine indica (L.) Gaertn.	Goosegrass	I	-	-	-	-	U	-	-	X
Eragrostis variabilis (Gaud.) Steud.		E	-	R	-	-	-	-	-	-
Melinis minutiflora Beauv.	Molassesgrass	I	-	-	-	-	U	-	-	X
Oplismenus hirtellus (L.) Beauv.	Basketgrass	I	-	-	O	C	O	C	-	-
Panicum maximum Jacq.	Guinea grass	I	O	-	-	-	O	-	A	X
Paspalum conjugatum Berg.	Hilo grass	I	U	-	-	-	-	U	-	X
P. dilatatum Poir.	Dallis grass	I	-	-	-	-	-	-	-	X
P. scrobiculatum L.	Ricegrass	I	-	-	-	-	-	-	-	X
Poa annua L.	Annual bluegrass	I	-	-	-	-	-	-	-	X
Phyllostachys bambusoides Sieb. & Succ.	Fish pole bamboo	I	R	-	-	-	R	-	R	X
Rhynchelytrum repens (Willd.) Hubb.	Natal redtop	I	O	C	O	-	U	-	-	X
Setaria gracilis Kunth		I	-	-	-	-	-	-	-	X
ZINGIBERACEAE										
Alpinia zerumbet (Pers.) Burtt & Smith	Shell ginger	I	-	-	-	-	-	-	-	X
Zingiber zerumbet (L.) Sm.***	'Awapuhi kuahiwi	P	-	-	-	U	-	-	-	-
ANGIOSPERMAE-DICOTYLEDONS										
ACANTHACEAE										
Asystasia gangetica (L.) T. Anders.	Asystasia	I	U	-	-	-	-	-	U	X
Thunbergia fragrans Roxb.	White thunbergia	I	U	-	-	U	U	R	O	X
AMARANTHACEAE										
Alternanthera caracasana Kunth	Mat chaff flower	I	-	-	-	-	-	-	-	X
Amaranthus spinosus L.	Spiny amaranth	I	R	-	-	-	-	-	-	X
ANACARDIACEAE										
Mangifera indica L.	Mango	I	R	-	-	-	-	-	-	-
Schinus terebinthifolius Raddi	Christmas berry	I	C	U	A	C	O	O	C	X

C H E C K   L I S T   O F   P L A N T S

SCIENTIFIC NAME	COMMON NAME	STATUS			EF	SDS	CT	KF	MC	FKF	KHT	C		
FABACEAE (con't)														
Crotalaria incana L.	Fuzzy rattlepod	I			R	-	-	-	-	-	-	X		
C. pallida Aiton	Smooth rattlepod	I			R	-	-	-	U	-	-	X		
Delonix regia (Boj.) Raf.	Royal poinciana	I			-	-	-	-	-	-	-	X		
Desmanthus virgatus (L.) Willd.	Virgate mimosa	I			-	-	-	-	-	-	-	X		
Desmodium incanum DC.	Spanish clover	I			R	U	-	-	-	-	-	X		
D. triflorum (L.) DC.	Three-flowered beggarweed	I			-	-	-	-	-	-	-	A		
Indigofera suffruticosa Mill.	Indigo	I			U	R	-	-	U	-	-	A		
Leucaena leucocephala (Lam.) de Wit	Koa-haole	I			O	U	O	C	O	U	A	X		
Macroptilium lathyroides (L.) Urban	Cow pea	I			R	-	-	-	-	-	U	X		
Pithecellobium dulce (Roxb.) Benth.	'Opiuma	I			R	-	-	-	-	-	-	X		
Samanea saman (Jacq.) Merr.	Monkeypod	I			-	-	-	-	-	-	-	X		
Senna alata (L.) Roxb.	Candlebush	I			R	-	-	-	-	-	-	X		
S. occidentalis (L.) Link	Coffee senna	I			-	-	-	-	-	-	-	X		
S. pendula (Humb. & Bonpl. ex Willd.) H. Irwin & Barneby		I			-	-	-	-	-	-	-	X		
S. surattensis (N.L. Burm.) H. Irwin & Barneby	Kolomona	I			-	-	-	-	U	-	U	X		
LAURACEAE														
Cassytha filiformis L.	Kauna'oa pehu	I			-	U	-	-	-	-	-	-		
Cinnamomum zeylanicum Bl.	Cinnamon	I			-	-	-	R	-	-	-	-		
MALVACEAE														
Abutilon grandifolium (Willd.) Sweet	Hairy abutilon	I			R	-	R	-	-	-	U	X		
Gossypium barbadense L.	Sea Island cotton	I			-	-	-	-	-	-	-	X		
Hibiscus arnottianus A. Gray	Koki'o-ke'oke'o	E			-	-	-	-	-	-	-	X		
H. brackenridgei A. Gray	Ma'o hau hele	E		Endangered	-	-	-	-	-	-	-	X		
H. x	Hibiscus hybrids	I			-	-	-	-	-	-	-	X		
Malvastrum coromandelianum (L.) Garcke	False mallow	I			-	-	-	-	-	-	-	X		
Sida fallax Walp.	'Ilima	I			R	O	C	U	-	-	-	X		
S. rhombifolia L.	Cuba jute	I			-	-	-	-	-	-	-	X		
MELIACEAE														
Toona ciliata var. australis (F. v. Muell.) C. DC.	Australian red cedar	I			R	-	R	R	R	-	R	X		
MENISPERMACEAE														
Cocculus trilobus (Thunb.) DC.	Huehue	I			O	O	O		-	-	R	X		
MORACEAE														
Ficus microcarpa L. f.	Chinese banyan	I			R	-	-	-	-	-	R	-		
F. pumila L.	Climbing fig	I			-	-	-	-	-	-	-	X		
MYRTACEAE														
Eucalyptus robusta Sm.	Swamp mahogany	I			O	R	U	-	-	-	-	X		
E. spp.	Eucalyptus	I			A	O	-	-	O	-	O	X		
Eugenia uniflora L.	Surinam cherry	I			R	-	-	-	-	-	-	-		
Melaleuca quinquenervia (Cav.) S.T. Blake	Paperbark	I			-	-	-	-	-	-	-	X		
Metrosideros polymorpha Gaud.	'Ohi'a-lehua	E			R	C	R	-	R	-	-	-		
Psidium cattleianum Sabine	Strawberry guava	I			U	-	R	R	-	O	-	X		
P. guava L.	Common guava	I			O	-	R	C	C	O	R	X		

C H E C K   L I S T   O F   P L A N T S

SCIENTIFIC NAME	COMMON NAME	STATUS			EF	SDS	CT	KF	MC	FKF	KHT	C		
CACTACEAE														
Hylocereus undatus (Haw.) Britton & Rose	Night-blooming cereus	I			-	-	-	-	-	-	-	X		
CARICACEAE														
Carica papaya L.	Papaya	I			R	-	-	-	R	-	-	X		
CASUARINACEAE														
Casuarina equisetifolia Stickm.	Common ironwood	I			O	U	U	-	O	-	-	X		
CLUSIACEAE														
Clusia rosea Jacq.	Autograph tree	I			R	-	-	-	-	-	-	X		
CONVOLVULACEAE														
Convolvulus arvensis L.	Field bindweed	I			-	-	-	-	R	-	-	X		
Ipomoea alba L.	Moon flower	I			R	-	-	U	-	-	-	X		
I. indica (J. Burm.) Merr.	Koali	I			R	-	U	U	U	-	U	X		
I. ochracea (Lindl.) G. Don		I			R	-	-	-	-	-	-	X		
Merremia aegyptia (L.) Urb.	Hairy merremia	I?			R	-	-	-	-	-	-	X		
M. tuberosa (L.) Rendle	Wood rose	I			R	-	-	-	-	-	-	-		
CRASSULACEAE														
Kalanchoe tubiflora (Harv.) Raym.-Hamet	Chandelier plant	I			-	-	-	-	-	-	R	-		
CUCURBITACEAE														
Coccinia grandis (L.) Voigt	Ivy gourd	I			R	-	-	-	-	-	-	-		
Cucurbita pepo L.	Pumpkin	I			-	-	-	-	-	-	-	X		
Momordica charantia L. var. abbreviata	Peria	I			R	-	-	-	-	-	-	X		
EBENACEAE														
Diospyros sandwicensis (A. DC.) Fosb.	Lama	E			-	U	O	-	-	-	-	-		
EPACRIDACEAE														
Styphelia tameiameiae (Cham.) F. Muell.	Pukiawe	I			O	A	U	-	R	-	-	X		
EUPHORBIACEAE														
Breynia disticha f. nivosa (W.G. Sm.) Croizat	Snowbush	I			-	-	-	-	-	-	-	X		
Aleurites moluccana (L.) Willd.	Kukui	P			R	-	R	C	O	U	C	X		
Chamaesyce hirta (L.) Millsp.	Garden spurge	I			-	-	-	-	-	-	-	X		
C. prostrata (Aiton) Small	Prostrate spurge	I			-	-	-	-	-	-	-	X		
Euphorbia heterophylla L.	Kaliko	I			-	-	-	-	-	-	-	X		
Ricinus communis L.	Castor bean	I			R	-	-	-	R	-	R	X		
FABACEAE														
Acacia confusa Merr.	Formosan koa	I			O	U	U	-	O	A	C	X		
A. koa A. Gray	Koa	E			-	-	-	-	-	-	-	X		
Caesalpinia kavaiensis H. Mann	Uhiuhi	E		Endangered	-	-	-	-	-	-	-	X		
Canavalia cathartica Thouars	Maunaloa	I			R	-	-	-	-	-	-	X		
Chamaecrista nictitans (L.) Moench	Japanese tea	I			[illegible]	[illegible]	-	-	R	-	-	X		

CHECK LIST OF PLANTS

SCIENTIFIC NAME	COMMON NAME	STATUS	EF	SDS	CT	MF	MG	FSC	ENT	C
SANTALACEAE										
Santalum ellipticum Gaud.	'Iliahialo'e	E	-	R	-	-	-	-	-	-
SAPINDACEAE										
Dodonaea viscosa Jacq.	'A'ali'i	I	O	A	U	-	R	U	U	X
Litchi chinensis Sonn.	Litchi	X	R	-	-	-	-	-	-	-
SOLANACEAE										
Datura stramonium L.	Jimson weed	X	-	-	-	-	-	-	-	X
Solanum americanum Mill.	Black nightshade	I?	-	-	R	-	-	-	R	X
S. seaforthianum Andr.		X	R	-	-	-	-	-	U	X
STERCULIACEAE										
Waltheria indica L.	'Uhaloa	I?	O	U	-	-	-	-	-	X
THYMELAEACEAE										
Wikstroemia oahuensis (A. Gray) Rock	'Akia	E	O	C	U	-	R	-	R	X
VERBENACEAE										
Lantana camara L.	Lantana	X	U	-	U	U	U	-	U	X
Stachytarpheta jamaicensis (L.) Vahl	Jamaica vervain	X	U	-	-	-	-	U	-	X
S. urticifolia (Salisb.) Sims		X	O	O	O	O	U	U	R	X
Vitex ovata Thunb.	Pohinahina	I	-	-	-	-	-	-	-	X
V. trifoliata var. subtrisecta (Ktze.) Mold.		X	-	-	-	-	-	-	-	X

CHECK LIST OF PLANTS

SCIENTIFIC NAME	COMMON NAME	STATUS	EF	SDS	CT	MF	MG	FSC	ENT	C
MYRTACEAE (con't)										
Syzygium cumini (L.) Skeels	Java plum	X	U	-	U	O	O	U	U	X
S. jambos (L.) Alston	Rose apple	X	-	-	R	-	-	-	-	-
NYCTAGINACEAE										
Boerhavia coccinea Mill.		X	-	-	-	-	R	-	-	X
Bougainvillea sp.	Bougainvillea	X	-	-	-	-	-	-	-	X
OXALIDACEAE										
Oxalis corniculata L.	Yellow wood sorrel	P?	-	-	-	-	-	-	-	X
O. corymbosa DC.	Pink wood sorrel	X	U	-	R	O	O	O	U	X
PASSIFLORACEAE										
Passiflora edulis f. flavicarpa Deg.	Yellow lilikoi	X	U	-	R	-	R	R	U	X
P. suberosa L.	Huehue-haole	X	O	-	-	-	R	R	-	X
P. subpeltata Ortega	White passionflower	X	R	-	-	-	-	-	-	-
PIPERACEAE										
Peperomia leptostachya Hook. & Arnott		I	R	U	O	-	U	U	U	-
PLUMBAGINACEAE										
Plumbago auriculata Lam.	Blue plumbago	X	-	-	-	-	-	-	-	X
POLYGALACEAE										
Polygala paniculata L.		X	-	-	-	-	-	-	-	X
POLYGONACEAE										
Coccoloba uvifera (L.) L.	Sea grape	X	-	-	-	-	-	-	-	X
PROTEACEAE										
Grevillea robusta A. Cunn.	Silver oak	X	U	R	-	-	U	R	-	X
Macadamia ternifolia var. integrifolia (Maiden & Betche) Maiden & Betche	Macadamia	X	R	-	-	-	-	-	-	-
RHAMNACEAE										
Colubrina asiatica (L.) Brongn.	'Anapanapa	I	-	-	-	-	-	-	-	X
ROSACEAE										
Osteomeles anthyllidifolia (Sm.) Lindl.	'Ulei	I	O	C	C	-	O	-	R	X
RUBIACEAE										
Canthium odoratum (G. Forster) Seem.	Alahe'e	I	R	R	-	-	R	O	-	X
Coffea arabica L.	Arabian coffee	X	-	-	-	U	O	O	U	-
Morinda citrifolia L.	Noni	P	U	-	R	O	O	U	-	X
RUTACEAE										
Murraya paniculata (L.) Jack	Mock orange	X	-	-	-	-	-	-	R	-

CHECK LIST OF ANIMALS

SCIENTIFIC NAME	COMMON NAME	STATUS	IF	SDS	CT	MF	MG	FXF	EXT	C
BIRDS										
ANATIDAE										
Anas platyrhynchos	Mallard duck	X	-	-	-	-	-	-	-	X
CHARADRIIDAE										
Pluvialis dominica	Pacific golden plover	M	-	-	-	-	-	-	-	X
COLUMBIDAE										
Geopelia striata	Barred dove	X	-	-	-	-	-	-	X	X
Streptopelia chinensis	Lace-neck dove	X	-	-	-	-	X	X	X	X
FRINGILLIDAE										
Paroaria coronata	Red-crested cardinal	X	X	-	X	-	-	-	-	X
Richmondena cardinalis	Kentucky cardinal	X	X	X	X	X	X	X	X	X
PASSERIDAE										
Passer domesticus	House sparrow	X	-	-	-	-	-	-	-	X
PHASIANIDAE										
Francolinus pondicerianus	Indian gray francolin	X	X	-	-	-	X	-	X	X
PLOCEIDAE										
Lonchura punctulata	Rice-bird	X	-	-	-	-	X	-	-	X
STURNIDAE										
Acridotheres tristis	Common mynah	X	-	-	-	-	X	X	-	X
TIMALIIDAE										
Garrulax canorus	Chinese thrush	X	X	-	X	X	X	X	X	X
ZOSTEROPIDAE										
Zosterops japonicus	Japanese white-eye	X	X	-	X	X	X	X	X	X

Appendix D

Botanical Survey
(Char 2001)

BOTANICAL SURVEY
KAPALUA MAUKA
KAPALUA, MAUI

by

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Prepared for: Kapalua Land Development Company, Ltd.

April 2001

BOTANICAL SURVEY
KAPALUA MAUKA
KAPALUA, MAUI

INTRODUCTION

The original plan covered a 450-acre parcel designated as Project District 2 on the West Maui Community Plan; 750 residential units were proposed for this parcel. A biological survey of the 450- acre parcel was conducted by Nagata in 1997.

Current plans call for the distribution of the same number of units or less over an expanded Project District 2 area. The area surveyed for the additional Project District 2 area covers approximately 585 acres (Figure 1). The additional acres are located mauka of the Kapalua Resort area, and extends from Honoapi'ilani Highway to approximately 1,280 ft. elevation.

Field studies to assess the botanical resources found on the additional acres were conducted on 09 to 11 February 2001; the survey team consisted of two botanists. The primary objectives of the survey were to:

1) provide a general description of the vegetation on the expanded study area;
2) inventory the flora;
3) search for threatened and endangered species as well as species of concern; and
4) identify areas of potential environmental problems or concerns and propose appropriate mitigation measures.

SURVEY METHODS

Prior to undertaking the field studies, a search was made of the pertinent literature to familiarize the principal investigator with other botanical studies conducted in the general area. Topographic maps as well as soil maps (based on aerial photographs) were examined to determine vegetation cover patterns, terrain characteristics, access, boundaries, and reference points. Actively cultivated pineapple fields cover large portions of the study site and the network of dirt roads which service these fields provided the primary access.

A walk-through survey method was used. Notes were made on plant associations and distribution, substrate types, disturbances, drainage, exposure, topography, etc. Plant identifications were made in the field; plants which could not be positively identified were collected for later determination in the herbarium, and for comparison with the recent taxonomic literature.

The species recorded are indicative of the season ("rainy" vs. "dry") and the environmental conditions at the time of the survey. A survey taken at a different time of the year and under varying environmental conditions would no doubt yield slight variations in the species list, especially of the weedy, annual plants.

DESCRIPTION OF THE VEGETATION

Five major vegetation cover types or plant communities are recognized on the expanded study area. A list of all the plant species inventoried during the field studies is presented in the checklist at the end of the report.

Cultivated Land

This vegetation type covers the most area on the study site and is the most variable. Cultivated land includes the pineapple fields, pastures, and disturbed areas along the gulch bottoms and roadsides. It is dominated by introduced plants, many of them weedy species.

Actively cultivated pineapple *(Ananas comosus)* fields comprise the bulk of the cultivated land and are found on the broad, more or less gently sloping ridges throughout the project site. The densely packed rows of pineapple plants support few weeds, most of which tend to occur along the margins of the fields. These include sourgrass *(Digitaria insularis)*, Natal

redtop grass *(Melinis repens)*, and Guinea grass *(Panicum maximum)*. Recently harvested and plowed fields are also relatively weed free.

Grassy, mostly open pastures are found on the ridges between 800 ft. and 1,280 ft. elevation. This area appears to have been in pineapple cultivation at one time. The grass cover usually consists of a mixture of broomsedge grass *(Andropogon virginicus)*, African dropseed *(Sporobolus africanus)*, and golden beardgrass *(Chrysopogon aciculatus)*, but in some places broomsedge may be the dominant grass cover. Clumps of young Formosan koa trees *(Acacia cunfusa)*, 3 to 15 ft. tall, are common in some places. Other plant species observed in the pastures in fairly large numbers include Glenwood grass *(Sacciolepis indica)*, Spanish clover *(Desmodium incanum)*, Asiatic pennywort *(Centella asiatica)*, Hilo grass *(Paspalum conjugatum)*, and narrow-leaved carpetgrass *(Axonopus fissifolius)*. At about 1,200 ft. elevation, the woody components increase; these include Christmas berry *(Schinus terebinthifolius)* Formosan koa, silk oak *(Grevillea robusta)* and walawi *(Psidium cattleianum* var. *littorale)*. Ground cover is a mixture of broomsedge grass, hairy swordfern *(Nephrolepis multiflora)*, and molassesgrass *(Melinis minutiflora)*. Scattered, tangled mats of uluhe fern *(Dicranopteris linearis)*, 3 ft. tall, also become common.

Storage and maintenance areas for the golf course are found in Honokahua Gulch where the gulch floor broadens out along its lower reaches. A large planting of papaya *(Carica papaya)* and a smaller planting of banana *(Musa* X *paradisiaca)* are also found here. Weedy, mostly annual plants are abundant on the disturbed areas.

Also included in the cultivated land plant community is the roadside vegetation. Where the roads abut the gulches or cross into the gulches, the vegetation consists of dense clumps of elephant grass *(Pennisetum purpureum)* and thick mats of molassesgrass and California grass *(Brachiaria mutica)*. Scattered thickets of Christmas berry, koa haole *(Leucaena leucocephala)*, and guava *(Psidium guajava)* are common to abundant.

Introduced Forest

Large, tall stands of introduced tree species such as *Eucalyptus*, river-oak ironwood *(Casuarina cunninghamiana)*, and Cook pine *(Araucaria columnaris)* occur in Honokahua Gulch and the smaller Napili 2-3 and Napili 4-5 gulches; these were probably planted for reforestation (Nagata 1997). Extensive stands of swamp mahogany *(Eucalyptus robusta)* and other *Eucalyptus* species form a closed canopied forest, 50 to 100 ft. tall. On the steeper slopes or where the soil is thin and rocky, the *Eucalyptus* trees are shorter and the canopy open. Understory is typically poorly developed with scattered Christmas berry shrubs, *Eucalyptus* saplings, and clumps of sourgrass. In some of the smaller gulches, laua'e fern *(Phymatosorus scolopendria)* is abundant. In many places, however, Christmas berry forms a dense thicket, 15 to 20 ft. tall. Where the *Eucalyptus* trees are shorter and more open, native species such as pukiawe *(Styphelia tameiameiae)*, a'ali'i *(Dodonaea viscosa)*, 'ulei *(Osteomeles anthyllidifolia)*, 'akia *(Wikstroemia oahuensis)*, and 'ohi'a lehua *(Metrosideros polymorpha)* are occasionally encountered.

Formosan koa, 20 to 40 ft. tall, is also abundant in the gulches as well as some of the broad ridges. The understory vegetation is variable. On the ridges, it consists of rather dense clumps of sourgrass, broomsedge, and nettle-leaved vervain *(Stachytarpheta cayennsis)*. On the steeper slopes, Christmas berry shrubs form a dense cover between the trees. Smaller stands of river-oak ironwood and Cook pine are found on the upper slopes of the gulches. Understory is sparse with a few Christmas berry and strawberry guava *(Psidium cattleianum)* shrubs and clumps of sourgrass; a layer of leaf litter is typically found under these trees.

On the floor of Honokahua Gulch, the forest is a mixture of Java plum *(Syzygium cumini)*, kukui *(Aleurites moluccana)*, and stands of *Eucalyptus* and Formosan koa. A few old common mango trees *(Mangifera indica)* with large rounded crowns are also occasionally encountered. Christmas berry shrubs form a dense cover between the trees. Groundcover is composed of the more shade-tolerant species such as basketgrass *(Oplismenus*

hirtellus) and laua'e fern. Coffee shrubs *(Coffea arabica)* are common in some places on the gulch floor.

Christmas Berry Thicket

Dense thickets of Christmas berry dominate the slopes and floor of Honokahua Gulch. Ground cover is sparse with leaf litter and bare soil prominent. Where the Christmas berry thins out or along the margins of the thickets where there is more light, molassesgrass, Spanish clover, partridge pea *(Chamaecrista nictitans)*, nettle-leaved vervain, and guava are common. Small stands of Formosan koa and a few lama trees *(Diospyros sandwicensis)* can also be found here.

Mixed Native Scrub

The upper slopes of Honokahua Gulch support mixed native scrub vegetation. The best examples of this plant community can be found on the upper slopes where the water pipeline (siphon) drops into the gulch and up to the project's upper boundary near a small puçu at 1,258 ft. elevation. The slopes are very steep in this area.

The vegetation consists of low, windswept shrubs of a'ali'i, pukiawe, and 'akia, and scattered 'ohi'a lehua trees, 3 to 7 ft. tall. Patches of uluhe fern are occasional. Other native plants found here in smaller numbers include ko'oko'olau *(Bidens micrantha* ssp. *micrantha)*, ama'u *(Sadleria cyatheoides)*, lama, 'akoko *(Chamaesyce celastroides* var. *amplectans)*, koa *(Acacia koa)*, 'ilima *(Sida fallax)*, naio *(Myoporum sandwicense)*, 'ulei, and alahe'e *(Psydrax odorata)*. Two plants of a native, woody lobelia, *Cyanea elliptica*, are found about 50 ft. downslope of the small pu'u at 1,258 ft. elevation; a small grove of *Araucaria* sp. trees is planted on the pu'u. 'Ala 'ala wai nui *(Peperomia blanda* var. *floribunda)* is locally common on some rocky outcrops. Ground cover consists primarily of molassesgrass and kilau fern *(Pteridium aquilinum* var. *decompositum)*.

Koa Haole Thicket

Koa haole thicket is found along the lower portions of the study site in the gulches and bordering the highway. Koa haole shrubs, 6 to 12 ft. tall, form somewhat dense thickets in these areas. A few scattered Christmas berry shrubs and Formosan koa trees are occasionally observed. Guinea grass, 3 to 4 ft. tall, forms a dense cover between the woody components. The white flowered thunbergia *(Thunbergia fragrans)* is common. A number of weedy species associated with disturbed sites are also found in this vegetation type. These include Chinese violet *(Asystasia gangetica)*, spiny amaranth *(Amaranthus spinosus)*, castor bean *(Ricinus communis)*, sourbush *(Pluchea carolinensis)*, coat buttons *(Tridax procuinbens)*, wild bittermelon *(Momordica charantia)*, indigo *(Indigofera suffruticosa)*, and swollen fingergrass *(Chloris barbaca)*.

DISCUSSION AND RECOMMENDATIONS

The vegetation on the majority of the expanded Project District 2 site (585 acres) is composed of introduced species such as *Eucalyptus*, Formosan koa, Christmas berry, California grass, and actively cultivated pineapple fields. Introduced species are all those plants which were brought to Hawai'i by humans, intentionally or accidentally, after Western contact (1778). One relatively intact native plant community, the mixed native scrub, is found on the upper slopes of Honokahua Gulch on its mauka section. This plant community represents the native vegetation which once existed on this part of Maui (Nagata 1997), but has now been replaced in most places by plant communities dominated by introduced species.

A total of 190 plant species were inventoried on the project site. Of these, 150 (79%) are introduced species, 5 (3%) are originally of Polynesian introduction, and 35 (18%) are native species. Of the native species, 24 are indigenous, that is, they are native to Hawai'i and elsewhere, and 11 are endemic, that is they are native only to Hawai'i. These endemic plants include two ferns, the 'ama'u *(Sadleria cyatheoides)* and kilau *(Pteridium aquilinum*

var. *decompositum)*, and nine flowering plants: the ko'oko'olau *(Bidens micrantha* ssp. *micrantha)*, *Cyanea elliptica*, lama *(Diospyros sandwicensis)*, 'akoko *(Chamaesyce celastroides* var. *amplectans)*, koa *(Acacia koa)*, 'ohi'a lehua *(Metrosideros polymorpha)*, 'akia *(Wikstroemia oahuensis)*, 'iliahi alo'e or sandalwood *(Santalum ellipticum)*, and pua kala or native poppy *(Argemone glauca)*. None of the plants inventoried on the project site is a threatened and endangered species or a species of concern (U.S. Fish and Wildlife Service 1999; Wagner *et al.* 1999).

The proposed development will take place on the broad, more or less gently sloping ridges now occupied by pineapple fields and pastures. Portions of Honokahua Gulch already are used for golf course operations or are cultivated.

Native plant-dominated vegetation occurs on the very steep upper slopes of Honokahua Gulch where no development activities are planned. It is recommended, however, that any major disturbances on or near these slopes should be avoided to prevent disturbance to the mixed native scrub vegetation.

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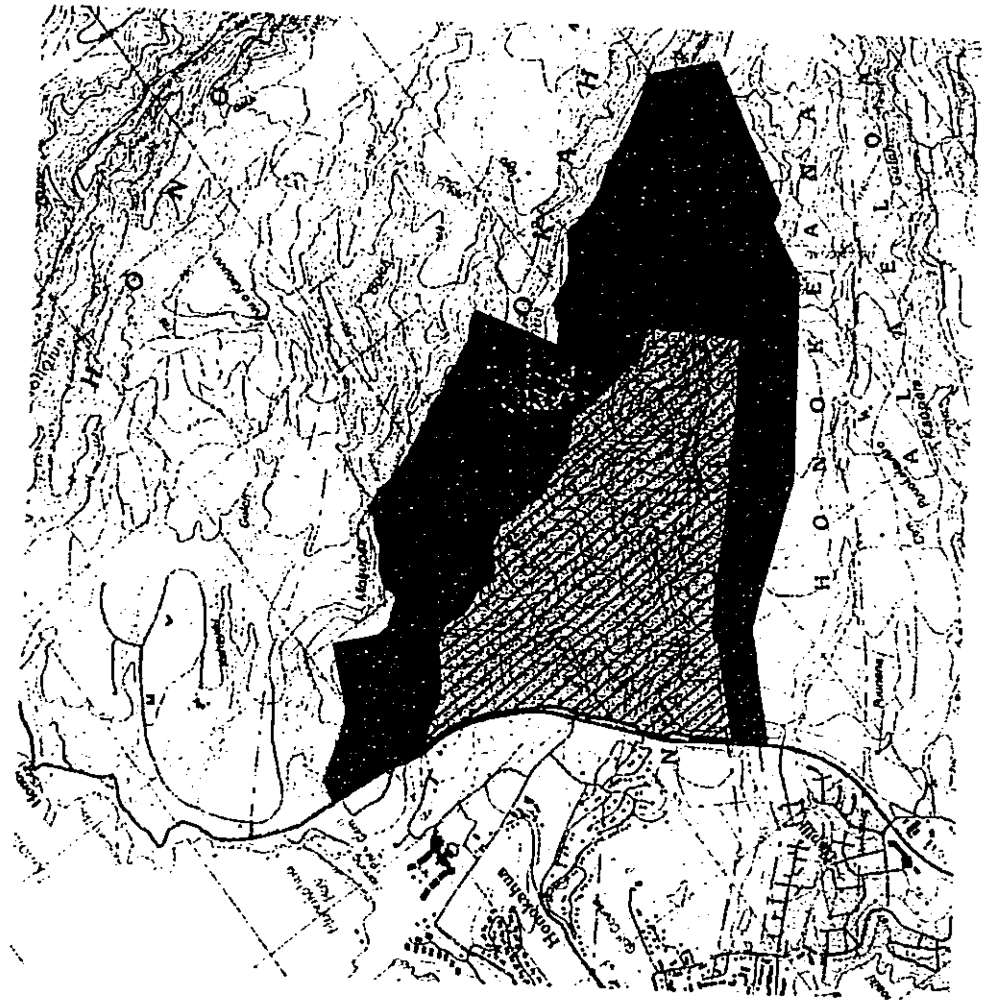


LEGEND

Current Project District 2 (450 acres)
Nagata 1997 Survey Area

Proposed Expanded Project District 2 (585 acres)
Current Botanical Survey Area

Source: U.S. Geological Survey

Figure 1
Botanical Survey

0 1,000 2,000 FEET

PLANT SPECIES LIST - - Kapalua Mauka

The following checklist is an inventory of all the plants observed on the project site during the field studies. The plant names are arranged alphabetically by families within each of four groups: Ferns and Fern Allies, Gymnosperms, Dicots, and Monocots. The taxonomy and nomenclature of the Ferns and Fern Allies follow Lamoureux (1988), the Gymnosperms are in accordance with St. John (1973), and the flowering plants, Dicots and Monocots, follow Wagner et al. (1990). The recent name changes for some of the flowering plants follow those reported in the Hawaii Biological Survey series (Evenhuis and Miller 1995-1999; Evenhuis and Eldredge 1999-2000).

For each species, the following information is provided:

1. Scientific name with author citation.
2. Common English and/or Hawaii name(s), when known.
3. Biogeographic status. The following symbols are used:
   - E = endemis = native only to the Hawaii Islands.
   - I = indigenous = native to the Hawaiian Islands and also elsewhere.
   - I? = questionably indigenous = data not clear if dispersal to the islands by natural or human-related mechanisms, but weight of evidence suggests probably indigenous.
   - P = Polynesian introduction = plants originally of Polynesian introduction prior to Western contact, that is, Cook's arrival in the Hawaiian Islands in 1778.
   - P? = questionably in a Polynesian introduction = species that may have been introduced by the Polynesian settlers or that possibly were introduced early in historical times (1778).
   - X = introduced or alien = all those plants which were brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact (1778).

   - X? = questionably introduced = dates of introduction very early; may also be indigenous or possibly of Polynesian introduction.
4. Presence (+) or absence (-) of a particular species within each of five vegetation types recognized on the project site (see test for discussion):
   - c = Cultivated Land
   - i = Introduced Forest
   - x = Christmas Berry Thicket
   - m = Mixed Native Scrub
   - k = Koa Haole Thicket

Scientific name	Common name	Status	Vegetation Type c	l	x	m	k
FERNS & FERN ALLIES							
ASPLENIACEAE (Bird's-nest fern family)							
Asplenium nidus L.	'ekaha, bird's-nest fern	I	-	+	+	-	-
BLECHNACEAE (Blechnum family)							
Blechnum occidentale L.	blechnum	X	-	+	+	+	-
Sadleria cyatheoides Kaulf.	'ama'u, 'ama'uma'u	E	-	-	-	+	-
DENNSTAEDTIACEAE (Dennstaedtia family)							
Microlepia strigosa (Thunb.) Presl.	palapalai, palai	I	-	+	-	+	-
GLEICHENIACEAE (Vine fern family)							
Dicranopteris linearis (Burm.) Underw.	uluhe, unuhe	I	+	+	-	+	-
HEMIONITIDACEAE (Gold fern family)							
Pityrogramma calomelanos (L.) Link	gold fern	X	-	-	-	+	-
HYPOLEPIDACEAE (Bracken family)							
Pteridium aquilinum var. decompositum (Gaud.) Tryon	kilau, kilau pueo	E	-	-	-	+	-
LINDSAEACEAE (Lace fern family)							
Sphenomeris chinensis (L.) Maxon	pala'a	I	-	+	+	+	-
NEPHROLEPIDACEAE (Swordfern family)							
Nephrolepis cordifolia (L.) Presl.	*'okupukupu, pamoho, ni'ani'au*	I	-	-	-	+	-
Nephrolepis multiflora (Roxb.) Jarrett ex Morton	hairy swordfern, 'okupukupu	X	+	+	+	+	-

Scientific name	Common name	Status	Vegetation Type c	l	x	m	k
POLYPODIACEAE (Common fern family)							
Phlebodium aureum (L.) J. Sm.	rabbit's foot fern, laua'e haole	X	-	+	-	-	-
Phymatosorus scolopendria (Burm.) Pic.-Ser. laua'e, lauwa'e	X	-	+	-	-	-	
Pleopeltis thunbergiana Kaulf.	pakahakaha, 'ekaha 'akolea	I	-	+	+	+	-
PSILOTACEAE (Whiskfern family)							
Psilotum nudum (L.) Beauv.	moa, moa nahele, pipi	I	-	+	+	+	-
THELYPTERIDACEAE (Downy wood-fern family)							
Christella parasitica (L.) Levl.	wood-fern	X	-	+	+	+	-
GYMNOSPERMS							
ARAYCARUACEAE (Araucaria family)							
Araucaria columnaris (G. Forst.) Hook	Cook pine	X	+	+	-	-	-
Araucaria sp.		X	+	-	-	-	-
FLOWERING PLANTS							
DICOTS							
ACANTHACEAE (Acanthus family)							
Asystasia gangetica (L.) T. Anderson	Chinese violet, coromandel	X	-	+	-	-	+
Justicia betonica L.	white shrimp plant	X	+	-	-	-	-
Thunbergia frangrans Roxb.		X	+	-	-	-	+
AMARANTHACEAE (Amaranth family)							
Amaranthus spinosus L.	spiny amaranth, pakai kuku	X	+	-	-	-	+
Amaranthus viridus L.	slender amaranth, pakai	X	+	-	-	-	-

Scientific name	Common name	Status	Vegetation Type c	i	x	m	k
ANACARDIACEAE (Mango family)							
Mangifera indica L.	mango, manako	X	-	+	+	-	-
Schinus terebinthifolius Raddi	Christmas berry	X	+	+	+	+	+
APIACEAE (Parsley family)							
Centella asiatica (L.) Urb.	Asiatic pennywort, pohe kula	X	+	+	-	-	-
APOCYNACEAE (Dogbane family)							
Catharanthus roseus (L.) G. Don	periwinkle	X	+	-	-	-	-
ARALIACEAE (Ginseng family)							
Schefflera actinophylla (Endl.) Harms	octopus tree	X	-	-	+	-	-
ASTERACEAE (Daisy family)							
Ageratina adenophora (Spreng.) R. King & H. Robinson	Maui pamakani, pamakani	X	-	+	+	-	-
Ageratina riparia (Regel) R. King & H. Robinson	Hamakua pamakani, pamakani	X	+	-	-	-	-
Ageratum conyzoides L.	maile hohono	X	+	-	+	-	-
Bidens micrantha Gaud. ssp. micrantha	ko'oko'olau	E	-	-	-	+	-
Bidens pilosa L.	Spanish needle, ki, ki nehe	X	+	+	-	-	-
Conyza bonariensis (L.) Cronq.	hairy horseweed, ilioha	X	+	+	-	-	-
Crassocephalum crepidioides (Benth.) S. Moore		X	+	-	-	-	-
Cyanthillium cinereum (L.) H. Rob.	little ironweed	X	-	-	+	-	-
Emilia fosbergii Nicolson	flora's paintbrush, pualele	X	+	-	-	-	-
Erechtites valerianifolia (Wolf) DC	fireweed	X	+	+	-	-	-
Gamochaeta purpurea (L.) Cabr.	purple cudweed	X	-	+	-	-	-
Hypochoeris radicata L.	hairy cat's ear, gosmore	X	+	-	-	-	-
Pluchea carolinensis (Jacq.) G. Don	sourbush, pluchea	X	+	+	-	-	+
Sonchus oleraceus L.	sowthistle, pualele	X	+	-	-	-	-
Spagneticola trilobata (L.) Pruski	wedelia	X	+	-	-	-	-
Synedrella nodiflora (L.) Gaertn.	nodeweed	X	+	-	-	-	-
Tridax procumbens L.	coat buttons	X	+	-	-	-	+

Scientific name	Common name	Status	Vegetation Type c	i	x	m	k
Verbesina encelioides (Cav.) Benth. & Hook.	golden crownbeard	X	+	-	-	-	+
Youngia japonica (L.) DC	oriental hawksbeard	X	+	-	+	-	-
BIGNONIACEAE (Bignonia family)							
Spathodea campanulata P. Beauv.	African tulip tree	X	-	+	-	-	-
BUDDLEIACEAE (Butterfly bush family)							
Buddleia asiatica Lour.	dog tail, huelo 'ilio	X	+	+	-	-	-
CAMPANULACEAE (Bellflower family)							
Cyanea elliptica (Rock) Lammers		E	-	-	-	+	-
CARICACEAE (Papaya family)							
Carica papaya L.	papaya, mikana	X	+	-	-	-	-
CASUARINACEAE (She-oak family)							
Casuarina cunninghamiana Miq.	river-oak casuarina	X	-	+	-	-	+
CHENOPODIACEAE (Goosefoot family)							
Chenopodium carinatum R. Br.		X	+	-	-	-	-
Chenopodium murale L.	'aheahea	X	+	-	-	-	+
CLUSIACEAE (Mangosteen family)							
Clusia rosea Jacq.	autograph tree, copey, Scotch attorney	X	-	+	-	-	-
CONVOLVULACEAE (Morning glory family)							
Ipomoea alba L.	moonflower, koali pehu	X	+	-	-	-	-
Ipomoea cairica (L.) Sweet	koali 'ai, koali	X?	+	-	-	-	+
Ipomoea indica (J. Burm.) Merr.	koali 'awa, koali 'awahia	I	+	+	-	-	-
Ipomoea obscura (L.) Ker-Gawl.	field bindweed	X	+	-	-	-	+
Ipomoea ochracea (Lindl.) G. Don		X	+	-	-	-	-
Ipomoea pes-caprae ssp. brasiliensis							

Scientific name	Common name	Status	Vegetation Type c	i	x	m	k
(L.) Ooststr.	pohuehue, beach morning glory	I	+	-	-	-	-
Ipomoea triloba L.	little bell, pink bindweed	X	+	-	-	-	-
Merremia aegyptia (L.) Urb.	hairy merremia, koali kua hulu	X?	+	-	-	-	-
CUCURBITACEAE (Gourd family)							
Momordica charantia L.	wild bittermelon	X	+	-	-	-	+
EBENACEAE (Ebony family							
Diospyros sandwicensis (A. DC) Fosb.	lama	E	-	-	+	+	-
EPACRIDACEAE (Epacris family)							
Styphelia tameiameiae (Cham. & Schlechtend.) F.v. Muell.	pukiawe, malele	I	-	+	+	+	-
EUPHORBIACEAE (Spurge family)							
Aleurites moluccana (L.) Willd.	kukui, tutui	P	+	+	+	-	-
Chamaesyce celastroides var. amplectans (Sherff) Degener & I. Degener	'akoko	E	-	-	-	+	-
Chamaesyce hirta (L.) Millsp.	hairy spurge, garden spurge	X	+	-	-	-	-
Chamaesyce hypericifolia (L.) Millsp.	graceful spurge	X	+	-	-	-	-
Phyllanthus debilis Klein ex Willd.	niruri	X	+	+	-	-	+
Phyllanthus tenellus Roxb.		X	+	-	-	-	-
Ricinus communis L.	castor bean, koli, pa'aila	X	+	-	-	-	+
FABACEAE (Pea family)							
Acacia confusa Merr.	Formosan Koa	X	+	+	+	+	+
Acacia farnesiana (L.) Willd.	klu	X	-	+	-	-	-
Acacia koa A. Gray	koa	E	-	-	-	+	-
Chamaecrista nictitans (L.) Moench	partridge pea, lauki	X	+	-	+	-	-
Crotalaria incana L.	fuzzy rattlepod, kukaehoki	X	+	-	-	-	-
Crotalaria pallida Aiton	smooth rattlebox, pikakani	X	+	-	-	-	+
Desmanthus pernambucanus (L.) Thellung	slender mimosa	X	+	-	-	-	+
Desmodium incanum DC	Spanish clover, ka'imi	X	+	-	+	-	-
Desmodium tortuosum (Sw.) DC	Florida beggarweed	X	+	-	-	-	-

Scientific name	Common name	Status	Vegetation Type c	i	x	m	k
Desmodium triflorum (L.) DC	three-flowered beggarweed	X	+	-	-	-	-
Indigofera hendecaphylla Jacq.	creeping indigo	X	+	-	-	-	-
Indigofera suffruticosa Mill.	indigo, 'iniko	X	+	+	-	-	+
Leucaena leucocephala (Lam.) de Wit	koa haole	X	+	+	-	-	+
Macroptilium atropurpureum (DC) Urb.		X	+	-	-	-	-
Medicago polymorpha L.	bur clover	X	+	-	-	-	-
Mimosa pudica var. unijuga L.	sensitive plant, pua hilahila	X	-	+	-	-	-
Neonotonia wightii (Wight & Arn.) Lackey		X	+	-	-	-	+
Pithecellobium dulce (Roxb.) Benth.	'opiuma	X	+	-	-	-	-
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	kiawe	X	+	-	-	-	+
Samanea saman (Jacq.) Merr.	monkeypod	X	+	-	-	-	-
Senna occidentalis (L.) Link	coffee senna, 'auko'i	X	+	-	-	-	-
LAMIACEAE (Mint family)							
Leonotis nepetifolia (L.) R. Br.	lion's ear	X	+	-	-	-	+
LAURACEAE (Laurel family)							
Cassytha filiformis L.	kaunaoa pehu	I	-	+	-	-	-
Cinnamomum burmanii (Nees) Blume	Padang cassia, cinnamon	X	-	+	-	-	-
LYTHRACEAE (Loosestrife family)							
Cuphea carthagenensis (Jacq.) Macbr.	tarweed, Colombian cuphea	X	+	+	-	-	-
MALVACEAE (Mallow family)							
Abutilon grandifolium (Willd.) Sweet	hairy abutilon, ma'o	X	+	+	-	-	+
Malva parviflora L.	cheese weed	X	+	-	-	-	-
Malvastrum coromandelianum (L.) Garcke	false mallow, hauuoi	X	+	-	-	-	+
Sida fallax Walp.	'ilima	I	+	-	-	+	-
Sida rhombifolia L.		X	+	+	-	-	-
Sida spinosa L.	prickly sida	X	+	-	-	-	-
MELASTOMATACEAE (Melastome family)							

Scientific name	Common name	Status	Vegetation Type c	i	x	m	k
Pterolepsis glomerata (Rottb.) Miq.		X	-	+	-	-	-
Tibouchina herbacea (DC) Cogn.		X	+	-	-	-	-
MELIACEAE (Mahogany family)							
Toona ciliata M. Roem.	Australian red cedar	X	-	+	+	-	-
MENISPERMACEAE (Moonseed family)							
Cocculus orbiculatus (L.) DC	huehue, hue	I	-	+	+	+	-
MORACEAE (Mulberry family)							
Ficus microcarpa L. fil.	Chinese banyan, Malayan banyan	X	-	-	+	-	-
MYOPORACEAE (Naio family)							
Myoporum sandwicense A. Gray	naio, false sandalwood	I	-	-	-	+	-
MYRTACEAE (Myrtle family)							
Corymbia citriodora (Hook.) K.D. Hill & L.A.S. Johnson	lemon-scented gum	X	-	+	-	-	-
Eucalyptus robusta Sm.	swamp mahogany	X	-	+	+	+	-
Eucalyptus ssp.	gum tree, eucalyptus	X	+	+	-	+	+
Metrosideros polymorpha Gaud.	'ohi'a lehua	E	-	+	+	+	-
Psidium cattleianum Sabine	strawberry guava	X	+	+	+	+	-
Psidium cattleianum var. littoriale (Raddi) Fosb.	waiawi	X	+	+	+	+	-
Psidium guajava L.	common guava, kuawa	X	+	+	+	-	+
Syzygium cumini (L.) Skeels	Java plum	X	+	+	+	-	+
NICTAGINACEAE (Four-o'clock family)							
Boerhavia coccinea Mill.		X	+	-	-	-	-
Mirabilis jalapa L.	four-o'clock, marvel of Peru, nani ahiahi	X	+	-	-	-	-

Scientific name	Common name	Status	Vegetation Type c	i	x	m	k
ONAGRACEAE (Evening primrose family)							
Ludwigia octovalvis (Jacq.) Raven	primrose willow, kamole	P?	-	+	-	-	-
OXALIDACEAE (Wood sorrel family)							
Oxalis corniculata L.	yellow wood sorrel, 'ihi 'ai	P?	-	+	-	-	-
Oxalis debilis Kuntz	pink wood sorrel, 'ihi pehu	X	-	+	-	-	-
PAPAVERACEAE (Poppy family)							
Argemone glauca (Nutt. ex Prain) Pope	pua kala, kala, naule	E	+	-	-	-	+
Argemone mexicana L.	Mexican poppy	X	+	-	-	-	-
PASSIFLORACEAE (Passion flower family)							
Passiflora edulis forma flavicarpa Degener	lilikoʻi	X	+	+	+	-	-
Passiflora suberosa L.	huehue haole	X	+	+	-	-	-
Passiflora subpeltata Ort.	white passion flower	X	-	-	-	+	-
PIPERACEAE (Pepper family)							
Peperomia blanda var. floribunds (Miq.) H. Huber	'ala'ala wai nui	I	-	+	+	+	+
POLYGALACEAE (Milkwort family)							
Polygala paniculata L.		X	+	+	-	-	-
PORTULACACEAE (Purslane family)							
Portulaca oleracea L.	common purslane, pigweed, 'ihi	X	+	-	-	-	+
PRIMULACEAE (Primrose family)							
Anagallis arvensis L.	scarlet pimpernel	X	+	-	-	-	-
PROTEACEAE (Protea family)							
Grevillea robusta A. Cunn. ex R. Br.	silk oak, silver oak, 'oka kilika	X	+	+	+	-	-
ROSACEAE (Rose family)							
Osteomeles anthyllidifolia (Sm.) Lindl.	'ulei, u'ulei	I	-	+	+	+	-

Scientific name	Common name	Status	Vegetation Type c	i	x	m	k
RUBIACEAE (Coffee family)							
Coffea arabica L.	coffee	X	-	-	+	-	-
Morinda citrifolia L.	noni	P	+	+	+	-	-
Psydrax odorata (G. Forster) A.C. Smith & S. Darwin	alahe'e, walahe'e	I	-	+	+	+	-
Spermacoce assurgens Ruiz & Pav.	buttonweed	X	+	-	-	-	-
RUTACEAE (Citrus family)							
Citrus aurantifolia (Christm.) Swingle	lime	X	+	-	-	-	-
SANTALACEAE (Sandalwood family)							
Santalum ellipticum Gaud.	'iliahi alo'e, coastal sandalwood	E	-	+	-	-	-
SAPINDACEAE (Soapberry family)							
Dodonaea viscosa Jacq.	'a'ali'i, 'a'ali'i makani	I	-	+	+	+	-
SOLANACEAE (Nightshade family)							
Datura stramonium L.	Jimson weed, la'au hano	X	+	-	-	-	-
Nicandra physalodes (L.) Gaertn.	apple of Peru	X	+	-	-	-	-
Nicotiana glauca R.C. Graham	tree tobacco	X	+	-	-	-	-
Solanum americanum Mill.	popolo, glossy nightshade	I?	+	-	-	+	-
Solanum lycopersicon var. cerasiforme (Dunal) Spooner, Anderson & Jansen	currant tomato, wild tomato	X	+	-	-	-	-
Solanum seaforthianum Andr.	blue potato vine	X	-	+	-	-	-
STERCULIACEAE (Cacao family)							
Waltheria indica L.	'uhaloa, hi'aloa, kanakaloa	I?	+	+	-	-	+
THYMELAEACEAE ('Akia family)							
Wikstroemia oahuensis (A. Gray) Rock	'akia	E	-	+	+	+	-
TILIACEAE (Linden family)							
Triumfetta semitriloba Jacq.	Sacramento bur bush	X	+	-	-	-	-

Scientific name	Common name	Status	Vegetation Type c	i	x	m	k
URTICACEAE (Nettle family)							
Pilea microphylla (L.) Liebm.	artillery plant	X	+	-	-	-	-
VERBENACEAE (Verbena family)							
Lantana camara L.	lantana, lakana	X	+	+	+	+	-
Stachytarpheta cayennsis (Rich.) Vahl	nettle-leaved vervain, owi, oi	X	+	-	-	+	-
Stachytarpheta jamaicensis (L.) Vahl	Jamaica vervain, owi, oi	X	+	+	-	-	-
MONOCOTS							
AGAVACEAE (Agave family)							
Cordyline fruticosa (L.) A. Chev.	ti, ki	P	+	+	+	-	-
BROMELIACEAE (Pineapple family)							
Ananas comosus (Stickm.) Merr.	pineapple	X	+	-	-	-	-
COMMELINACEAE (Spiderwort family)							
Commelina diffusa N.L. Burm.	honohono	X	-	+	+	-	-
CYPERACEAE (Sedge family)							
Cyperus gracilis R. Br.	McCoy grass	X	-	+	-	-	-
Cyperus rotundus L.	nutgrass, nut sedge	X	+	-	-	-	-
Fimbristylis dichotoma (L.) Vahl		I	+	-	-	-	-
Kyllinga brevifolia Rottb.	kyllinga, kili'o'opu	X	+	+	-	-	-
Pycreus polystachyos (Rottb.) P. Beauv.		I	-	+	-	-	-
LILIACEAE (Lily family)							
Aloe vera L.	aloe	X	-	+	-	-	-
Asparagus plumosus J.G. Baker	asparagus fern	X	-	+	-	-	-
MUSACEAE (Banana family)							
Musa X paradisiaca L.	banana	X	+	-	-	-	-

Appendix E

Avifaunal and Feral Mammal Survey
(Burner 2001)

AVIFAUNAL AND FERAL MAMMAL SURVEY OF EXPANDED PROJECT DISTRICT 2, KAPALUA, MAUI

Prepared for:

Kapalua Land Company, Ltd.
Kapalua, Maui

Prepared by:

Phil Bruner
Environmental Consultant
Faunal (Bird & Mammal) Surveys
Box 1775
BYU-H
Laie, HI 96762

Revised

18 April 2001

INTRODUCTION

This report provides the results of a three day (3, 4, 17 March 2001) field survey of approximately 585 acres designated as Expanded Project District 2 at Kapalua, Maui (Fig. 1). The report also references appropriate published and unpublished sources. The purpose of the field survey was:

1- To document the birds and mammals presently found on or near the property.
2- Investigate all habitats on the property and note any natural resources important to native or migratory species of birds and mammals.
3- If endangered or threatened species are located on the property identify those resources important to those species.

GENERAL SITE DESCRIPTION

The 585 acre site proposed to be included in Project District 2 is composed of deep forested ravines bounded by existing pineapple fields and a golf course. The topography of the ravines is very steep. Access to the ravines was obtained by road cuts that traversed the gulches. No running water was encountered in the ravines. However, during periods of significant rain the ravines likely contain flowing water. Vegetation in the ravines is dominated by introduced trees and shrubs. Nagata (1997) provides a comprehensive list of plants from this region.

SURVEY METHODS

The field survey was conducted on foot and by vehicle. All habitats were thoroughly examined. Data were taken early and late in the day when birds are most active and detectable. At various locations around the property census stations were established and eight minute counts at these stations were made of all birds seen or heard. These data were used to obtain relative abundance estimates. Rare species were tallied whenever encountered. Weather during the field survey was variable with both clear and light rain. Winds were generally light, especially in the morning hours. Scientific names used in this report follow Pyle (1997) and Honacki et al. (1992). Nagata (1997) uses out of date common names for some birds in his survey of this area. He follows a 1981 source which has names used back in the 1950's and 60's.

RESULTS AND DISCUSSION

Native Birds: (Landbirds and Seabirds)

The only native bird recorded on the survey was the Short-eared Owl or Pueo (*Asio flammeus sandwichensis*). One Pueo was seen foraging over a pineapple field adjoining the Expanded Project District 2 site on the morning of 3 March 2001. This species is listed as endangered on Oahu by the State of Hawaii, but not on Maui. Pueo are diurnal foragers and utilize a wide variety of habitats (Pratt et al. 1987, Hawaii Audubon Society 1993). This species is commonly seen on Maui, especially in forested and agricultural lands. The only other native landbird that might occur in the upper elevation forested gulches is the Maui Amakihi (*Hemignathus virens wilsoni*). This species is not threatened or endangered.

No seabirds were seen on the survey. The gulches are too accessible to predators for seabirds to nest. The endangered Dark-rumped Petrel (*Pterodroma phaeopygia sandwichensis*) nests at much higher elevation on Haleakala. Nagata (1997) does not report any native landbirds or seabirds on his survey of Kapalua Project District 2.

Migratory Birds:

The only migratory species observed on the survey was the Pacific Golden-Plover (*Pluvialis fulva*) This species is not threatened or endangered. They are the most abundant of the winter migrants to Hawaii (Johnson et al. 1981, 1989). A total of 16 plover were tallied over the course of the survey. These birds were seen along the pineapple field roads and on the golf course adjoining the gulches. Plover require open habitat for foraging and would not occur in the forested gulches. Nagata (1997) also reports this species on the golf course in his study of the Kapalua Project District 2.

Waterbirds:

No waterbirds were tallied on this survey. No standing water or habitat suitable for waterbirds was noted. Nagata (1997) recorded Mallard ducks (*Anas platyrynchos*) at the lake near the Village Course 5th tee.

Introduced Birds:

Fourteen species of introduced birds were accounted for over the course of the survey. None of these species are endangered or threatened. This array of birds conforms to data obtained on earlier studies (Bruner 1989, Nagata 1997). Table One provides a list of the introduced birds and their relative abundance.

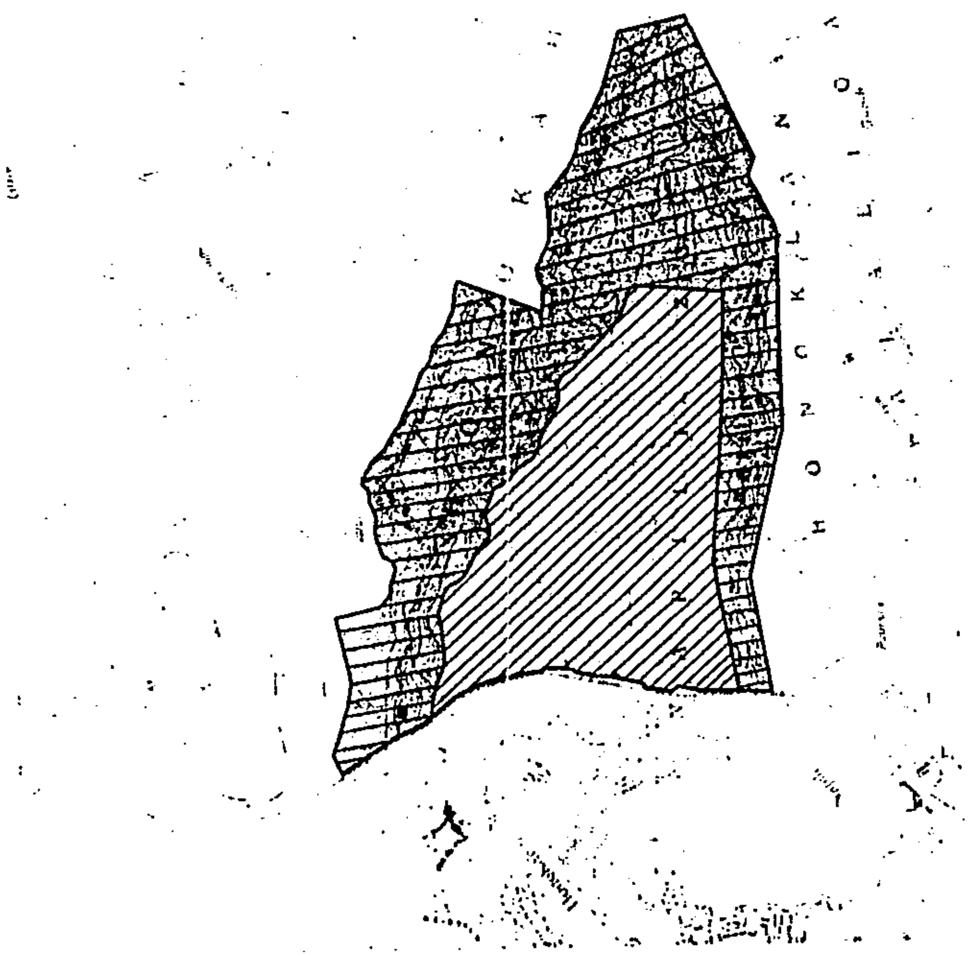
Mammals:

Evidence in the form of visual sightings and tracks revealed a total of four species of mammals. Eleven Small Indian Mongoose (*Herpestes auropunctatus*), three feral Cats

(*Felis catus*), one Roof Rat (*Rattus rattus*) were seen. The tracks of pigs (*Sus scrofa*) were observed at several locations in the gulches. Mice (*Mus musculus*) were not found, but likely occur on the property. The endangered, native Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) was not recorded. This species is relatively rare on Maui (Tomich 1968, Kepler and Scott 1990). Their behavior and distribution elsewhere in Hawaii have been examined (Jacobs 1991, 1993; Reynolds et al. 1998). This species forages at dusk and after dark in a wide variety of habitats including urban areas. They generally roost in trees during the day.

CONCLUSIONS

The survey covered all of the habitats on the site and nearby lands. The birds and mammals found on the survey were typical of this region of Maui. No threatened or endangered species were recorded. The gulches contain a dense forest of largely introduced vegetation. No unusual or unique habitats were encountered. Areas of similar habitat occur commonly on west Maui.



LEGEND

Current Project District 2 (450 acres)
Nagata 1997 Survey Area

Proposed Expanded Project District 2 (585 acres)
Current Faunal Survey Area

Source: U.S. Geological Survey

Figure 1
Faunal Survey

0 1,000 2,000 FEET

TABLE 1

Introduced birds recorded at the Expanded Project District 2 site at Kapalua, Maui. Relative Abundance estimates are based in eight minute counts at census stations throughout the study site. Abundant = 10+ birds per census station in appropriate habitat. Common = 5-9 birds per census station, Uncommon = 1-4 birds per census station. Rare = total number of birds seen over the entire survey (may or may not have been tallied on the census station).

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE
Gray Francolin	*Francolinus pondicerianus*	U
Ring-necked Pheasant	*Phasianus colchicus*	R = 4
Spotted Dove	*Streptopelia chinensis*	C
Zebra Dove	*Geopelia striata*	A
Barn Owl	*Tyto alba*	R = 2
Japanese Bush-Warbler	*Cettia diphone*	U
Hwamei	*Garrulax canorus*	C
Northern Mockingbird	*Mimus Polyglottos*	R = 2
Common Myna	*Acridotheres tristis*	C
Japanese White-eye	*Zosterops japonicus*	A
Northern Cardinal	*Cardinalis cardinalis*	C
Red-crested Cardinal	*Paroaria coronata*	U
House Finch	*Carpodacus mexicanus*	A
Nutmeg Mannikin	*Lonchura punctulata*	C

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Appendix G-1

Archaeological Survey
(Cultural Surveys Hawaii 1998)

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
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COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND
STATE PARKS

December 10, 2001

Hallett H. Hammatt, Ph.D.
Cultural Surveys Hawai'i
733 North Kalaheo Avenue
Kailua, Hawaii 96734

LOG NO: 28752
DOC NO: 0111MK16

Dear Dr. Hammatt,

SUBJECT: **Historic Preservation Review 6E-42 - Archaeological Inventory Survey Project District 2 at Kapalua**
Honokahua and Napili 2 and 3 Ahupua'a, Lahaina District, Maui
TMK (2) 4-2-01:01

Thank you for the opportunity to review this revised report which was retransmitted to our office on November 21, 2001. We apologize for the delay in our review. It is our understanding that these revisions were previously sent to our office several years back.

The revisions were in response to our letter of July 31, 1998 (Log 21077, Doc. 9802BD10). In that letter we indicated that the report was acceptable on the condition that the requested additions were addressed. Your revisions have addressed our initial concerns, and the report is acceptable. If you have any questions, please contact Dr. Melissa Kirkendall at 243-5169.

Aloha,

Don Hibbard, Administrator
State Historic Preservation Division

MK:jen

c: John Min, Director, Department of Planning, County of Maui, FAX 270-7634
Bert Ratte, County of Maui, Land Use and Codes, FAX 270-7972
Glen Ueno, County of Maui, Land Use and Codes, FAX 270-7972

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
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MICHAEL D. WILSON, CHAIRPERSON
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CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION DIVISION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

July 31, 1998

Dr. Hallett Hammatt
Cultural Surveys Hawaii
733 North Kalaheo Avenue
Kailua, Hawaii 96734

LOG NO: 21077
DOC NO: 9802BD10

Dear Dr. Hammatt:

SUBJECT: Chapter 6E-42 Historic Preservation Review of an Inventory Survey of Project District 2 at Kapalua
Honokahua & Napili 2-3 Ahupua'a, Lahaina District, Island of Maui
TMK 4-2-01: 01

This is a Historic Preservation review of a document entitled *Archaeological Survey of the Lands Comprising Project District 2 at Kapalua* submitted by Cultural Surveys Hawaii on February 11, 1998. This review was misplaced in our office, and we apologize for its delay.

Field methods employed in the survey appear to have been adequate to locate all historic sites on the property, totaling 7 sites. Four of these sites are plantation era sites (4459 -- flood control feature; 4462, Honokahua Plantation Cemetery; 4463, reservoir; 4465, a wall), one is a bridge (4464), and two are potentially precontact in age (4460, a rock overhang; 4461, a platform and petroglyph). Background information, historical research, and a review of previous archaeology were also sufficient to reconstruct expected patterns of pre-Contact settlement in the *ahupua'a*. Site descriptions and interpretations are basically adequate, with only a few needed additions (such as clarifying the nature of layers in test excavations). See Attachment 1 for needed additions. The information is sufficient to proceed with our review, with the understanding that the survey report will be revised to include the additions and an acceptable inventory survey report will be resubmitted to our Division.

We concur with all significance evaluations except one. We agree that 3 of the plantation era sites (4459, 4463, 4465) are "no longer significant" given the fact that sufficient information was recorded during the survey. We agree that the rock overhang (4460) is significant solely for its information content. We agree that 4461 (platform/petroglyph) and 4462 (the Honokahua Plantation Cemetery) are significant for their information content and for their cultural significance (the petroglyph and the cemetery). We are unable to concur with the evaluation that State Site 4464 (a bridge) is significant under Criteria C and D until further documentation (i.e. a plan map, drawing, and/or photos) is provided to our Architectural Branch for review. The golf course located in the NW corner of the subject property lies within the boundaries of State Site 1591 (the Honokahua Historic District), but it contains no significant historic sites today. In sum, we agree 3 significant historic sites are present (4460, 4461, 4462). A fourth (the bridge, 4464) may be significant.

We concur with the recommendation that sites 4460, 4461, and 4462 be preserved, and that a licensed land surveyor locate their respective buffer zones on future development plans. We are unable to concur yet with the recommendation that site 4464 (a bridge) undergo additional recording in the field, until documentation (i.e. a plan map, drawing, and/or photos) to resolve its significance is provided. We will also take into consideration the recommendation that State Site 1591 (the Honokahua Historic District) be redrawn to exclude the present golf course in the NW corner of the subject property.

We therefore find this inventory survey report to be acceptable, if the requested additions noted in Attachment 1 are addressed and an acceptable survey report is resubmitted to our Division. Please resolve the significance and mitigation issues for the bridge separately with our Architectural Branch. The mitigation commitment to preserve 4460, 4461 and 4462 (the two pre-Contact sites and the Honokahua Plantation Cemetery) is acceptable, and a Preservation Plan for these sites should be submitted to our Division for approval prior to beginning construction, outlining both interim and long-term protection measures. This plan need not be elaborate.

If you have any further questions, please contact Boyd Dixon at 243-5169.

Aloha,

DON HIBBARD, Administrator
State Historic Preservation Division

BD:jen

Attachment

cc. David Blane, Planning Department, County of Maui (fax: 243-7634)
Ralph Nagamine, Maui County Department of Public Works (fax: 243-7972)

Archaeological Survey of the Lands Comprising Project District 2 at Kapalua, Honokahua and Nāpili 2 & 3 *Ahupua'a* Lahaina District of Maui (TMK 4-2-01:01)

by
Tom Devereux, BA
William H. Folk, BA
and
Hallett H. Hammatt, Ph.D.

Prepared for

PBR Hawaii

Cultural Surveys Hawaii, Inc.
Revised August 1998

Archaeological Survey of the Lands Comprising Project District 2 at Kapalua, Honokahua and Nāpili 2 & 3 *Ahupua'a* Lahaina District of Maui (TMK 4-2-01:01)

by
Tom Devereux, BA
William H. Folk, BA
and
Hallett H. Hammatt, Ph.D.

Prepared for

PBR Hawaii

Cultural Surveys Hawaii, Inc.
Revised August 1998

ABSTRACT

An archaeological inventory survey of approximately 450 acres - known as Project District 2 -located in Honokahua and Nāpili 2,3, *ahupua'a*, in the Lahaina District of Maui (TMK 4-2-01:01) was conducted by Cultural Surveys Hawaii, Inc. for PBR Hawaii, over a 9 day period between 18 June and 11 July 1997.

The survey included subsurface testing in select archaeological sites. About 100 acres of the project area is in use as a golf course, and additional acres are currently in pineapple cultivation. Thus the archaeological study focused on the major gulches, and on wooded areas within the golf course.

During the survey eight historic properties were identified within the project area. Seven of these are newly discovered; they consist of walls, boulder terraces and a boulder pavement, an overhang shelter cave, an historic reservoir, a road bridge, and a cemetery. The eighth historic property was described and identified as site 50-50-01-1591 during the state-wide inventory of historic places (SIHP) in 1974. At that time, the boundaries of the site were arbitrarily drawn on the topographic map and most of the individual features to be included in it-were the center of the plantation village. It was described as the "Honokahua District", but is not on the Hawaii State or National Registers of Historic Places. The site boundaries extend in the Kapalua Project District 2, but none of the named features comprising the district are in this area. The site is now divided by the new HonoaPi'ilani highway.

Subsurface testing was conducted at the overhang shelter cave site 50-50-01-4460. Testing at this site yielded sparse middens, and a small hearth with abundant charcoal; this is believed to be an historic, temporary-use, shelter site. Radiocarbon dates from a single charcoal sample suggest a 19th or 20th century age.

Subsurface testing was also conducted at the terrace-platform site 50-50-01-4461. Cultural material from this site was very limited, thus, our interpretation of function and age is less conclusive. The site is believe to be an agricultural work area and storage platform.

All of the other sites including the cemetery and the road bridge are interpreted as historic features related to ranching and plantation agriculture.

The recommendation are: 1) to avoid impact to sites where future development is not planned; 2) sites should be located by licensed land survey, and site boundaries for the cemetery site 50-50-01-4462 recorded. The issue of the historic bridge is being handled separately with the Architectural Branch of the State Historic Preservation Division. Preservation is recommended for the overhang-shelter site 50-50-01-4460, for the petroglyph site 50-50-01-4461, and for the Honokahua Plantation Cemetery site 50-50-01-4462. We recommend also that site 50-50-01-1591 be dropped as a site designation within the Kapalua Project District 2 by redefining the site boundaries.

ACKNOWLEDGMENTS

We wish to extend our sincere gratitude to Mr. David Hulse of PBR, Hawaii and Robert McNatt of the Kapalua Land Company who were essential for the successful completion of this study. The Kapalua Land Company produced the project area maps included in this report and assisted personnel from Cultural Surveys in gaining access to several remote sections of the project area.

Maui Land and Pine was especially helpful to this study by allowing access through the pineapple fields and dispensing necessary gate keys.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

I. INTRODUCTION

Project Area Description

The project area is known as Project District 2 at Kapalua, Maui (Figure 1-4) and is located in the *ahupua'a* of Honokahua and Nāpili at the northern end of the Lahaina District (TMK 4-2-01:01) on the north flank of the dormant West Maui volcano, one of two major volcanos comprising Maui island. Exposed to the predominant northeast tradewind of the north Pacific the project area receives an average annual rainfall of between thirty and forty inches (Armstrong, *et al.* 1973:56). Although there is no temperature data specifically for Kapalua a comparable station might be Pa'uwela which records average minimum and maximum temperatures between sixty and ninety degrees Fahrenheit (:58).

The project boundaries are: the new HonoaPi'ilani Highway on the *makai* (north) side, an unmarked line through existing pineapple fields on the east, the stream bed of Honokahua gulch on the west, and an unmarked line through the pineapple fields and across the gulches is the *mauka* (south) boundary. The *makai*, or lower boundary of the project area is at an elevation of about two hundred feet above sea level approximately one-half mile from the shoreline, while the *mauka* boundary is approximately eight hundred and fifty feet above sea level a mile and a half to two miles from the shore.

The Project District 2 area comprises approximately four hundred and fifty acres, but over one hundred acres have already been grubbed, graded and landscaped and are in use for the Kapalua golf course. An additional one hundred acres more or less is presently in pineapple cultivation. These activities are concentrated on the broad flat ridges between valleys and, thus, the land within the valleys was the primary focus of the inventory survey. The valley walls are generally steep - eighty to over one hundred percent slope - with little soil development, but densely vegetated with trees and shrubs. Narrow alluvial terraces are common along the valley bottoms and have, in many areas, been altered by bulldozing or other means for ranch and plantation related activities.

Scope of Work

The scope of work for the Project District 2 archaeological inventory survey, standard for satisfying State and County requirements, included the following tasks:

1. A complete ground survey of the entire project area was conducted for the purpose of site inventory. All identified sites were described and located on the project area map. The sites were evaluated for function, interrelationships, and significance. Documentation included photographs and scale drawings of selected sites. All sites have been assigned State site numbers.

2. Limited subsurface testing was conducted to determine location, boundaries, depth and quantity of cultural materials within select archaeological sites and datable samples were obtained for chronological information.

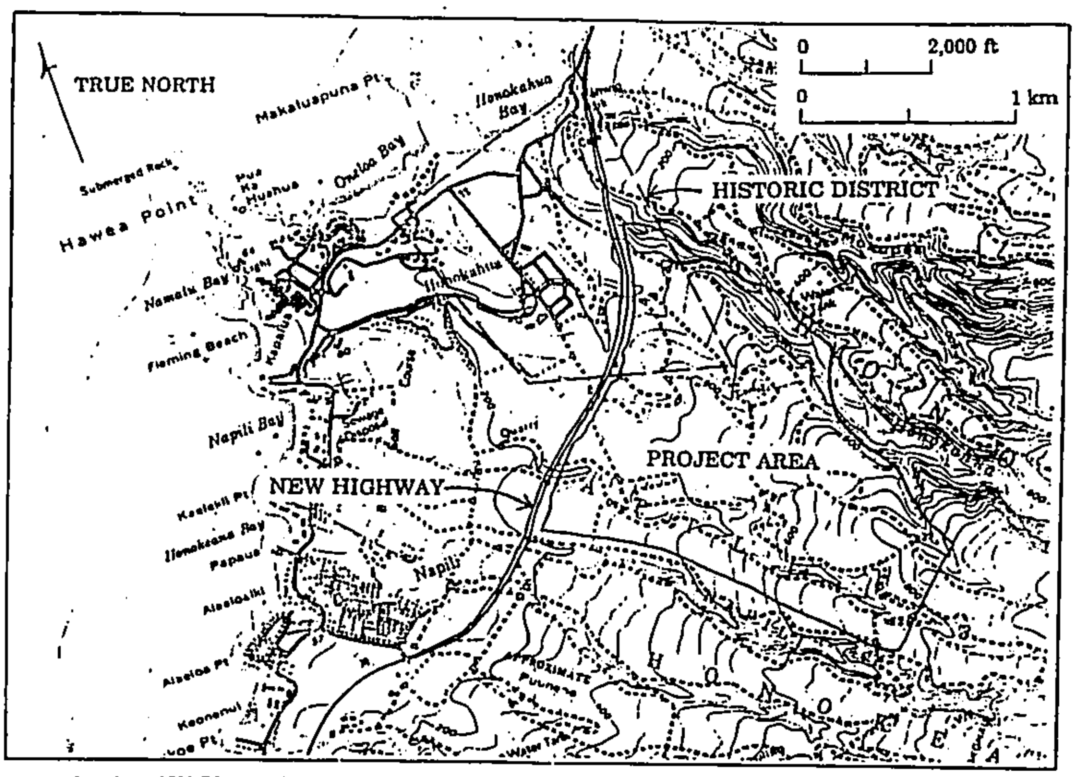

Figure 3 Portion of USGS 7.5 minute series Topographical map, Nāpili Quadrangle, Showing the project area Kapalua Project District 2 and the present boundaries of site 50-50-01-1591 in the project area..

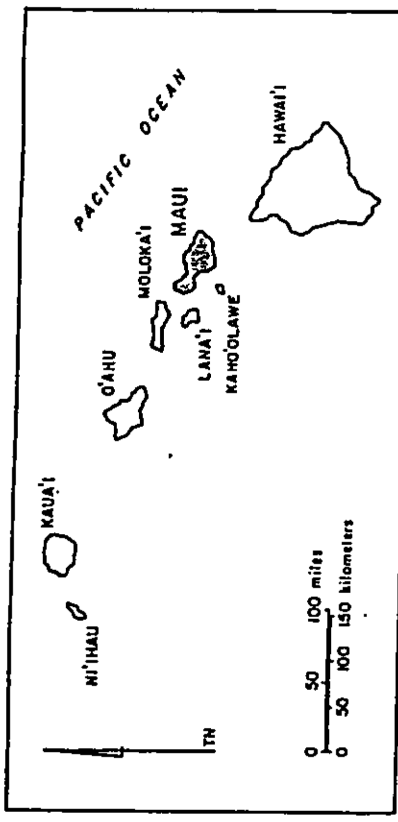

FIGURE 1
Map of the State of Hawai'i

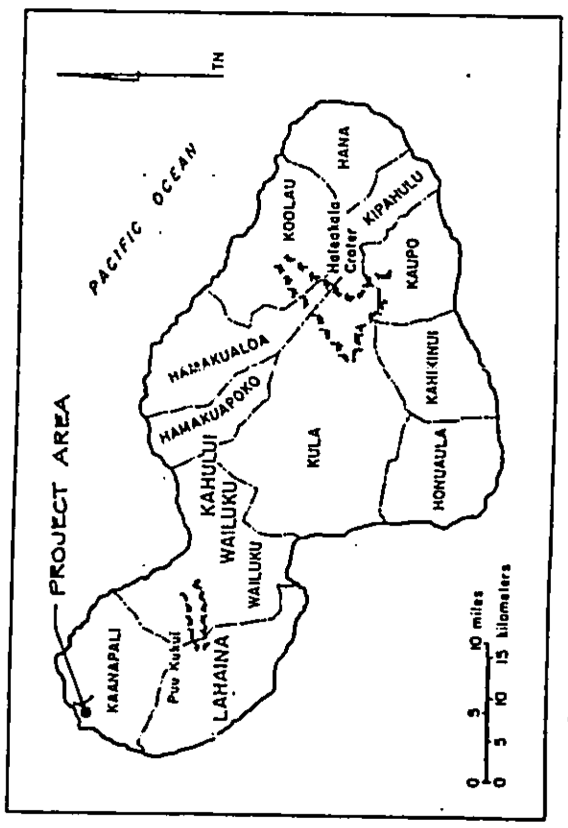

FIGURE 2
General Location Map, Maui Island

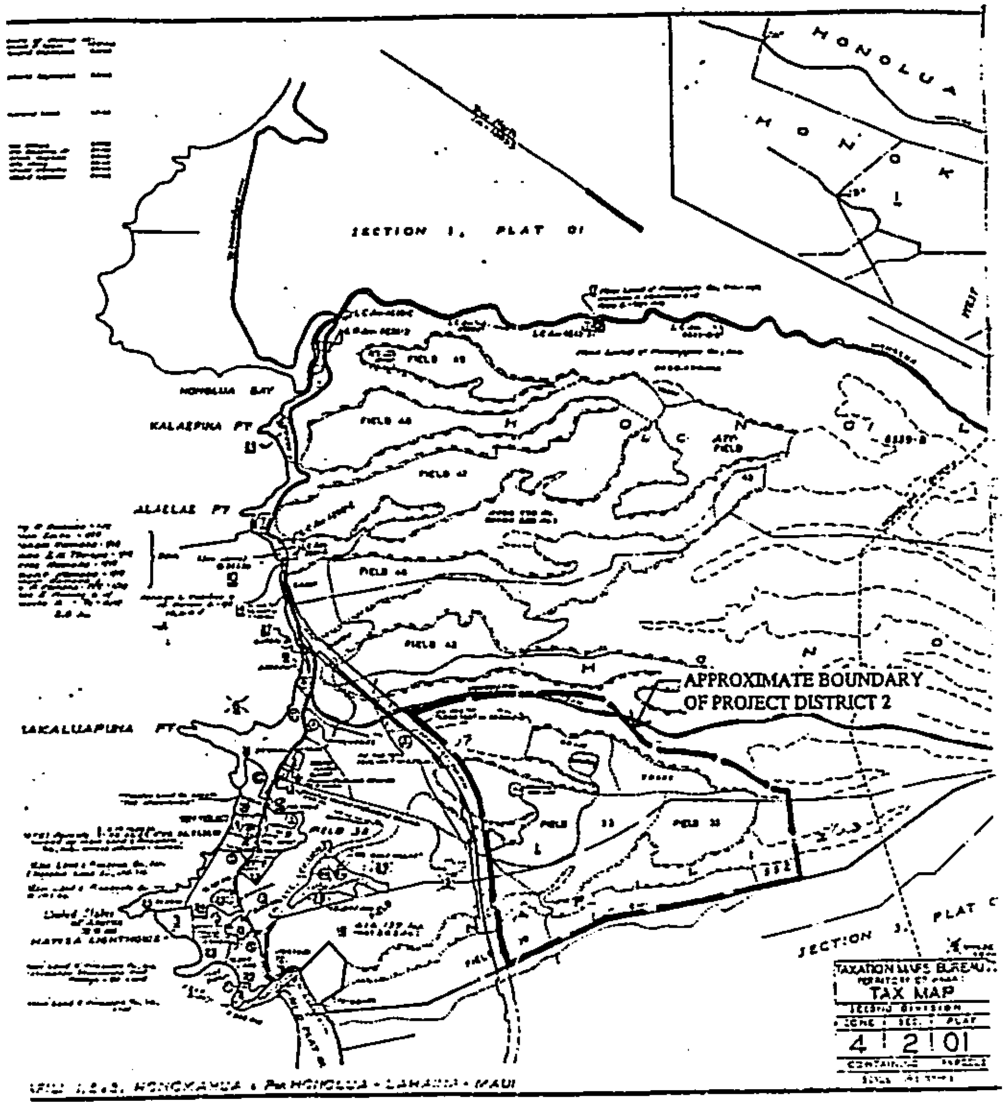

Figure 4 Maui County Tax Maps Showing the Kapalua Project District 2 Location

3. Background research on history and archaeology - including a search of historic maps, written records, Land Commission Awards, and Native Testimony - focused on the specific project area with general background on the *ahupua'a* and district and emphasizes settlement patterns.

4. Preparation of this survey report which includes:

   a. A topographic map of the survey area showing all archaeological sites and site areas;

   b. Descriptions of the archaeological sites with selected photographs, scale drawings, and discussions of function;

   c. An historical and archaeological background section summarizing prehistoric and historic land use as they relate to the archaeological features;

   d. A summary of site categories, and their significance in an archaeological and historic context;

   e. Recommendations based on all information generated which will specify what steps should be taken to mitigate impact of development on archaeological resources. Recommendations for mitigation - such as data recovery (excavation) and preservation of specific areas - will be developed in consultation with the landowner and the State and County agencies.

This scope also includes full coordination with the State Historic Preservation Officer (SHPO), Dr. Boyd Dixon and Maui County relating to archaeological matters. This coordination takes place after consent of the owner or representatives.

Methods

Surveying of the undeveloped portions of the project area was done on foot. Access to these areas was gained through the existing Kapalua Village Golf Course, and through cultivated pineapple fields of the plantation using a four-wheel drive vehicle. The undeveloped areas, without exception being in the gulches, were clearly defined by the boundaries of the developed and cultivated lands which are located predominantly on the broad, flat-topped ridges. This clear definition between developed (including cultivated land) and undeveloped areas facilitated locating the project area boundaries and the site locations in the gulches.

The project area map used for the fieldwork was produced by Warren S. Unemori - Engineering, Inc. at the scale one inch equals two hundred feet and includes topographic contours at ten foot intervals. The archeological sites were located on the project area map, relative to features identifiable on this map and on the ground, by triangulation with hand-held compass or by hand-held compass bearing and taped distance.

Individual archaeological sites located in the project area were described, maps of the sites were drawn to scale, and select photographs were taken. Reduced copies of the site maps were overlain on the project area map to create an archaeological site location map (see Survey Results section).

The two archaeological sites with potential to be of prehistoric age were selected for subsurface testing to provide data on the content and depth of cultural strata and material. The excavations were conducted by hand, with horizontal and vertical controls for recording. Excavated sediments were sieved through a 1/6 inch mesh of galvanized wire screen. Charcoal, midden, and artifacts were collected from the screening, and cataloged by site, feature, trench, stratum, and depth. Cataloging in the laboratory included basic descriptive analysis of the items recovered. This data is presented in the Artifact and Midden Catalogues in the Appendices. The items recovered are being held at Cultural Surveys Hawaii's laboratory in Kailua, O'ahu until a permanent repository for the materials is selected.

The archaeological sites are marked in the field with aluminum tags inscribed with the Cultural Surveys Hawaii (CSH) temporary site numbers, date of tag placement and initial of person placing the tag. State Inventory of Historic Places permanent site numbers were assigned to the sites in the laboratory. Table 1 correlates the temporary site numbers with the permanent SIHP site numbers.

The significance of the archaeological sites were assessed according to Bulletin 15 of the National Register of Historic Places for applying criteria for evaluation. Recommended treatment of the sites is determined on the basis of site complexity, configuration, and apparent function and age.

II. HONOKAHUA AND NAPILI *AHUPUA'A*: HISTORICAL DOCUMENTATION AND PREVIOUS ARCHAEOLOGY

Pre-Contact

The present study area lies within the *ahupua'a* of Honokahua and Nāpili 2-3, located in West Maui within the traditional Hawaiian *moku* (district) of Kā'anapali. Hawaiian traditions record the involvement of both *ahupua'a* in struggles of 18th-century Maui chiefs - Ka-uhi-'aimoku-a-Kama and Kamehameha-nui, both sons of Ke-kau-like - for ascendancy. The pioneering 19th-century Hawaiian historian Samuel Kamakau records the intensity of warfare played out at Honokahua and elsewhere on Maui:

> A whole year Alapa'i [chief of Hawai'i Island and an ally of Kamehameha-nui] spent in preparation for the war with Maui. It was in 1738 that he set out for the war in which he swept the country. What was this war like? It employed the unusual method in warfare of drying up the streams of Kaua'ula, Kanaha, and Mahoma (which is the stream near Lahainaluna). The wet taro patches and the brooks were dried up so that there was no food for the forces of Ka-uhi or for the country people. Alapa'i's men kept close watch over the brooks of Olowalu, Ukumehame, Wailuku, and Honokawai. When Pele-io-holani [chief of O'ahu and ally of Ka-uhi] heard that Alapa'i was at Lahaina he gathered all his forces at Honokahua and at Honolua. At Honokawai an engagement took place between the two armies, and the forces of Alapa'i were slaughtered and fled to Keawawa. There Alapa'i heard that Pele-io-holani had landed at Honokahua and had an army stationed at Keawawa, and he disposed his forces, some on sea and some on land. Although Pele-io-holani had but 640 men against Alapa'i's 8,440 from the six districts of Hawaii, there were among them some famous warriors...Pele-io-holani intended to unite his forces with those of Ka-uhi, but Alapa'i's men held Lahaina from Ukumehame to Mala on the north, and in attempting to aid Ka-uhi, Pele-io-holani became involved in difficulty. The hardest fighting, even compared with that at Nāpili and at Honokahua in Ka'anapali, took place on the day of the attack at Pu'unene. Pele-io-holani was surrounded on all sides, *mauka* and *makai*, by the forces of Alapa'i...The two ruling chiefs met there again, face to face, to end the war and become friends again, so great had been the slaughter on both sides...(Kamakau 1992:74)

Honokahua was not only notable for its internecine associations during the pre-contact period. Handy and Handy record its agricultural wealth:

> North of Lahaina are five valleys watered by streams draining the western slopes of the West Maui watershed: Honokawai, Kahana, Honokahua, Honolua, and Honokohau. The first four all had extensive *lo'i* lands in their valley bottoms, where terraces rose tier on tier in symmetrical stone-faced *lo'i*. On this part of the coast there is no sloping *kula* land seaward of the valleys as there is back of Lahaina and southeastward. (Handy and Handy

1972:494)

A third distinction for pre-contact Honokahua centerd on Honokahua Bay, identified as one of the "Hono-a-Pi'ilani," the six bays in the possession of Pi'ilani, the ruling chief of Maui. The others are Honokeana, Honokōwai, Honolua, Honokōhau, and Hononana. It thus appears that, while Honokahua may not have attained the renown of more celebrated *ahupua'a* of pre-contact Maui, events and personages associated with it would have, at least, assured its presence in the consciousness of Hawaiians on the island.

Early Historic to 1850

Sometime, likely in late 1790s, Honokahua *ahupua'a* was among the lands granted by Kamehameha I to Isaac Davis, one of two Englishmen who had entered his entourage.

John Young, an Englishman born at Liverpool, was boatswain on the American fur-trading vessel *Eleanora* when the ship anchored at Kealakekua Bay in 1790. Young happened to be ashore shortly after an incident had occurred further up the coast in North Kona. The schooner *Fair American*, a sister vessel of the *Eleanora*, had been commandeered by Kame'eiamoku, high chief of Kohala, and almost all aboard had been killed; the lone survivor was a Welshman, Isaac Davis. None of this was known to the company aboard the *Eleanora*. Kamehameha, paramount chief of the northwest side of Hawai'i island, anxious that Young might have learned of the incident, ordered the Englishman to be detained on shore. The *Eleanora* departed a few days later without Young.

Both Young and Davis were placed under the projection of Kamehameha who treated them so well that

> ...they were soon reconciled to spending their remaining days in Hawaii. They were given wives, lands, and servants, and became in effect Hawaiian chiefs. (Kuykendall 1965:25)

The two Englishmen became advisors to Kamehameha and participated in his consolidation of power, first on Hawai'i island and then throughout the Hawaiian chain. Kamehameha rewarded Davis for his services the following lands:

Waikoloa, Kohala, Hawaii	Waikahekahe 2, Puna, Hawaii
Kukuau 2, Hilo, Hawaii	Kupeke, Molokai
Kiilae, Kona, Hawaii	Kapaewakua, Lahaina, Maui
Honokahua, Maui	Hienaloli, Kona, Hawaii
Kapaa, Kohala, Hawaii	

During the years following Kamehameha's conquest, Davis continued to serve the monarch. He is documented as residing on O'ahu during the first decade of the 19th century until his death on O'ahu in 1810. No record places him at Honokahua at any time.

Censuses taken by Protestant missionaries throughout the Hawaiian Islands beginning in

1831 provide the earliest documentation of the size of the native population after the first decades of western contact. During the first census of Maui island in 1831-1832, a total population of 2,982 was recorded in the Kohala District; that Ka'anapali total comprised only 8.5% of the entire island population of 35,062 (Schmitt 1973:18). By the census of 1836, the Ka'anapali population had dropped to 1,341, comprising 5.5% of the Maui island population of 24,199 (*Ibid.*:38). These early censuses do not record the specific Honokahua or Nāpili population numbers.

After Isaac Davis' death in 1810, John Young had taken over the upbringing of Davis' children. When Young wrote his will in June of 1834, he declared:

> ...in behalf of my deceased Friend, Isaac Davis and for his children as he died without a will, the King Tammahamma gave to me all the said Isaac Davises lands and to take care of them and his children until his children come adge, and now they are come of adge. so I think it right to leve my last will & wishes that the King and Tahamano Adams & Boki and all the Chiefs will lett Isaac Davises children kep their father's lands, that King Tammahamma gave to him as a reward for asisting him, the King in his wars in conquering the islands of Owhyee, Mowee, Molotey and Waahoo and while we have undouted rights to leve to our children which I hope in God our young King will fullfil the wishes of his honored Father.

Young bequeathed to Isaac Davis' daughter Kale (Sarah), who had been born on February 15, 1797:

> Honokahua, Maui
> Kapaa, Kohala, Hawaii
> Waikahekahe 2, Puna, Hawaii.

Young died on December 16, 1835. His will had been endorsed by Kamehameha III, "an endorsement which indicated royal consent in confirming Young's continued possession, use and control" of the lands granted to him by Kamehameha and those granted to Isaac Davis that had been placed in his guardianship (Apple 1978:10). Full confirmation of Kale Davis' inheritance of Honokahua would be recorded in the following decade, during the *Mahele* in 1848.

The Organic Acts of 1845 and 1846 initiated the process of the *Mahele* - the division of Hawaiian lands - which introduced private property into Hawaiian society. In 1848 the crown and the *ali'i* (royalty) received their land titles. Subsequently, *kuleana* awards for individual parcels within the *ahupua'a* were subsequently granted in 1850. These awards were presented to tenants - native Hawaiians, naturalized foreigners, non-Hawaiians born in the islands, or long-term resident foreigners - who could prove occupancy on the parcels before 1845.

The entire *ahupua'a* of Honokahua (comprising 2650 acres) - along with Kapaa (Kohala, Hawai'i) and Waikahekahe (Puna, Hawai'i) - was awarded to Kale Davis (LCA 8522-B). No *kuleana* awards were granted within Honokahua.

The *ahupua`a* of Nāpili 1-3 (comprising 603 acres) was awarded to Laura Konia, a daughter of Kamehameha and wife of Abenera Paki. Paki and Konia were the parents of Bernice Pauahi Bishop. Other Ka`anapali *ahupua`a* awarded to Konia were Honokeana, Alaeloa, and Mailepai. No *kuleana* awards were granted in Nāpili.

1850s to 1900

Government censuses during the second half of the 19th century document the diminishing population of West Maui and, presumably, Honokahua and Nāpili, now subsumed in an enlarged Lahaina District. In 1853 a total of 4,833 persons was recorded in the Lahaina District. Twenty-five years later, in 1878, the total district population had dropped to 2,448; by 1896, it reached 2,398 (Schmitt 1977:12-13). The whaling industry in the Pacific Ocean reached its peak in 1859. Prices for whale oil collapsed five years later. Since the 1840s, the Hawaiian economy had been dependent primarily on supplying whale ships during their long layovers in the islands. With the dwindling arriving ships during the 1860s, the populaces of Lahaina Town and of neighboring west Maui *ahupua`a* dependent on the prosperity of Lahaina migrated to other parts of Maui and to other islands.

As the Hawaiian population of West Maui declined during the 19th century, missionaries and entrepreneurs moved into the district, reshaping the landscape for western enterprises and pursuits. Reverend Dwight Baldwin (1798-1886) had arrived in the Hawaiian Islands in 1831 and was stationed at Lahaina between 1835 and 1870. During the early 1850s, Baldwin had been granted 2,675 acres of land in northwest Maui. This land holding would be the basis for enterprises over expanding areas of west Maui undertaken by his son, Henry Perrine Baldwin, during subsequent decades of the 19th century.

Henry Perrine Baldwin (1842-1911), in the latter years of the 19th century, began leasing and purchasing tracts of land in West Maui, intending to set up a cattle ranching operation. In the early 1890s, Baldwin established Honolua Ranch, headquartered at Honolua Bay in Honolua *ahupua`a*, immediately adjacent to Honokahua *ahupua`a*. The ranch, under its first manager Richard C. Searle, Sr., soon became of focus of activity on West Maui:

> During Richard C. Searle, Sr.'s tenure as ranch manager, the interisland steamers called once a month at Honolua to deliver supplies and to pick up cattle hides, coffee, and other marketable items the ranch produced. The pier that the lighters tied up to was located close to the present boat ramp. Honokōhau, a nearby valley, supported a large taro-growing community that supplied taro to Honolua and points beyond...*Akule* were netted in the bay and in true Hawaiian tradition everyone who helped was given a *ka`au* of fish (a portion of forty)...In addition to the main ranch house, there were several other homes, a machine shop, a saddle shop, a nursery, a coffee warehouse, and a community store. (Clark 1980:68)

Coffee growing was eliminated after it proved unprofitable. Baldwin's land purchases, as Honolua Ranch developed, included Nāpili and the Honokahua lands of the Kale Davis which, by then, had become a holding of James Campbell.

1900s to Present

Following Baldwin's death in 1911, David T. Fleming took over management of Honolua Ranch in 1912. "Henry P. Baldwin [had been] interested in raising pineapples commercially and under Fleming's guidance the cattle ranch was converted to a pineapple plantation" (*Ibid.*:65). Fleming, who had already had experience growing pineapple at Haiku, began with the planting of pineapple on a small portion of the ranch's land at Honolua. By the 1920s, pineapple had been planted across West Maui from Māhinahina *ahupua`a* to Kahakuloa *ahupua`a*. A cannery was built in Honokahua in 1914 and, in 1923, Honolua Ranch became Baldwin Packers, Ltd. The Honokahua cannery ceased operation in 1920 when a new cannery was built in Lahaina.

The shift to pineapple in the second decade of the 20th century also involved a move of the Honolua Ranch operations, affecting the growth of Honokahua and Nāpili:

> In 1915 Fleming and his family moved into their newly constructed home, Maka`oi`oi, at the top of a hill in Honokahua. This move also marked the relocation of the entire Honolua Ranch Complex to Honokahua village...During this period of transition the population of Honokahua began to grow substantially...(*Ibid.*:68)

A small plantation community at Honokahua and Nāpili developed, focused around the Honolua Ranch/Baldwin Packers operations. The expanding role of pineapple in the life of West Maui is reflected in the increasing population totals recorded in territorial censuses during the first half of the 20th century. The Lahaina District had a total population of 7,953 in 1900, 11,742 in 1910, 14,941 in 1920, rising to 8,291 in 1940. During the decades following World War II, however, population totals for Lahaina dropped, reaching 5,524 in 1970 (Schmitt 1977:13-14)

In 1962 Maui Land and Pineapple Company was formed when Baldwin Packers merged with Maui Pineapple Company. Maui Land and Pineapple became the parent company of Kapalua Land Co. which conceived a resort master plan featuring the Kapalua Bay Hotel at the shore of Honokahua *ahupua`a*. The hotel opened in 1978, beginning the transformation of the former ranch and pineapple lands of Honokahua into a modern resort complex. That transformation would confront the prerogatives of the Hawaiian past when, in the 1980s, during excavations for a second hotel at Honokahua, the remains of more than 1000 Hawaiians, dating back to AD 700, were uncovered.

At present, within the study area itself, pineapple continues to be grown and harvested alongside the hotel golf course.

Archaeological Study within Honokahua and Nāpili 2-3 *ahupua'a*

Beginning in the late 1920s and continuing in recent decades, archaeological studies have been conducted within Honokāhua and Nāpili 2-3 *ahupua'a*. These studies complement and amplify the historical documentation record, suggesting patterns of Hawaiian activity within the two *ahupua'a* during the pre-contact and early post-contact periods (Figure 5).

The first attempt at an island-wide systematic archaeological survey of Maui was accomplished Winslow Walker of the Bishop Museum working between 1928 and 1929. Walker recorded a *heiau* (Site 16) identified as "Kahauiki" within the "Honokahua Region". Walker's manuscript locates the *heiau* "mauka to Kahauiki Camp a short distance up the west side of a gulch of the same name"; it is described as a "small irregular platform of stones whose walls have been taken for stock pens" (Walker 1931:unpaginated). Walker recorded no sites in Nāpili 2-3.

Walker's survey was followed up by an island-wide survey conducted in the early 1970s by the Historic Sites Section of the Department of Land and Natural Resources. During this survey structures associated with the ranching and commercial agricultural periods in Honokahua were combined into the State Inventory of Historic Places (SIHP) site 50-50-01-1591. These structures include: two churches, the Honolua Ranch stables, Honolua Ditch, the plantation town and workers camps, the Baldwin Packers cannery, the Honolua store, and the office of Maui Pineapple Company. The site was recorded on a form used for nominating sites to the Hawaii Register of Historic Places. On the form the site was called the Honokahua District, but the site is not on the National or Hawaii State Register of Historic Places.

Archaeological study in the 1970s focused specifically on the *makai* portions of Honokahua and Nāpili 2-3 in response to projected development within the two *ahupua'a*. In 1973 an archaeological survey of the "Honolua Development Area" was accomplished by the Dept. of Anthropology, B.P. Bishop Museum (Kirch 1973). The study area comprised a coastal parcel stretching from Fleming's Beach to Honokāhua Bay which also included four gulch areas extending *mauka*. Nine archaeological sites were recorded during the survey. Sites included: a cluster of eight features (D13-1) at a cove on Hawea point that "apparently served as a temporary settlement for prehistoric Hawaiians exploiting the nearby littoral and marine resources (Kirch 1973:4); a shelter cave (D13-2); a stone platform (D13-3) on a promontory above Oneloa Bay (the site furthest *mauka* of the shoreline); a terrace, enclosure, pavement and midden scatter (D13-4) - "most likely prehistoric" (*Ibid.*:5) - on Makaluapuna Point; a series of historic walls (D13-5) identified by informants as cattle pen walls; an exposed midden deposit (D13-6) - probably prehistoric - above Honokahua Beach; a large basalt boulder at Honokahua Beach which exhibited "several facets resulting from use as a grinding stone" (*Ibid.*:10); an historic-period midden deposit (D13-8); and an "indeterminate number of human (presumably prehistoric) burials" (D13-9) located in the sand dunes behind Honokahua Beach. Site D13-9 represents the initial recording of the Honokahua Burial Site, placed on the State Inventory of Historic Places - Site 50-50-01-1342 - in 1973.

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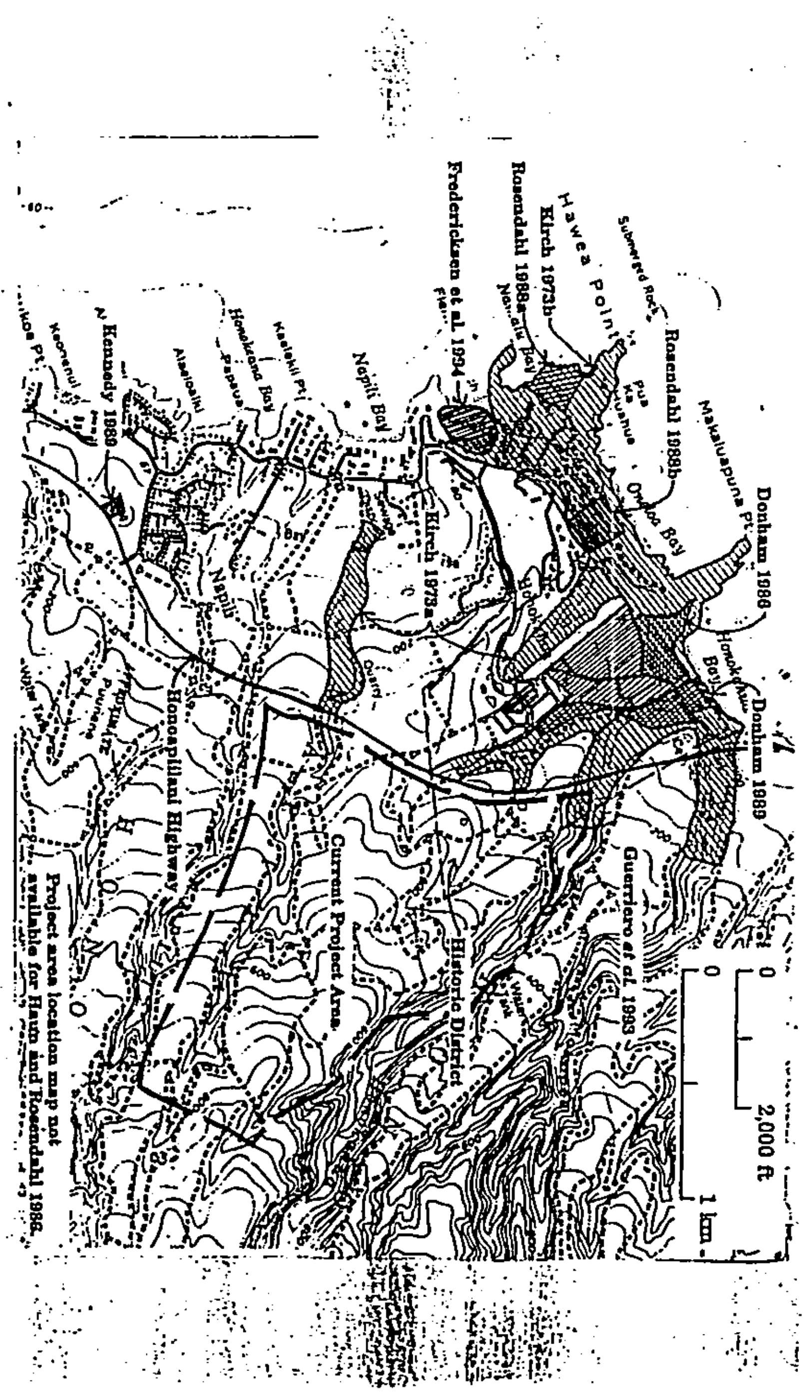

Figure 5 Portion of the USGS Topographic Map of Honokahua and Napili showing areas of previous archaeological study by report author and date.

During the 1980s, extensive archaeological study within Honokahua focused on the Kapalua Hotel Development Parcel 2-H, comprising 13.57 acres at Honokahua Bay within the Kapalua Bay Resort development. In 1986, the parcel was inspected by PHRI (Haun and Rosendahl 1986). The inspection identified human skeletal remains - associated with the Honokahua Burial Site - at six localities, extending the perimeter of the burial site.

A subsequent archaeological survey with test excavations at the Kapalua Hotel Development Parcel 2-H (Donham 1986) documented eight archaeological sites within the parcel. These included remnants of a prehistoric trail, a subsurface cultural deposit, three sites associated with historic ranching, a walled shelter and a rubble pile of indeterminate age, and the previously-recorded Honokahua Burial Site (50-50-01-1342). Tentative boundaries for the site were delineated, with areas of probable burial densities identified.

Data recovery and mitigation excavations were conducted at the Honokahua Burial Site by PHRI between March 1987 and December 1988, when work was terminated in response to community concerns. An interim report noted that the then-identified 920 burial features represented a multi-component burial site that radio-carbon analysis dated to AD 600 (Donham 1989). The final report on study of the burial site is not yet available.

In 1987, PHRI (M. Rosendahl 1988) conducted an archaeological reconnaissance survey of "The Cottages" project area (Kapalua Development Site 2-A) in Honokahua and Nāpili 2-3 (TMK 4-2-01:25). The survey encountered no cultural materials in any portion of the project area, which included exposed faces of sand dunes. Subsequently, subsurface reconnaissance testing of the same project area - then identified as "Kapalua Place" - was conducted by PHRI in 1988 (P. Rosendahl 1988a). The testing encountered "no evidence of prehistoric or early historic period use or occupation of the project area...during the course of surface grading, subsurface trenching or hand augering."

During the 1990s, archaeological study within the Kapalua Bay Resort area focused on the revised Kapalua Ritz-Carlton Hotel Site (TMK 4-2-01:4,5,por.12,13,por.18-34). Between October 1990 and July 1992, PHRI conducted archaeological monitoring, limited subsurface excavation and data recovery in three sections - designated Area I to III - of the hotel development (Guerriero *et al.* 1993). Nine sites containing 43 component features were identified during monitoring. Site functions included prehistoric burial (Site 1342A), prehistoric transportation and communication (Site 2876), prehistoric and historic habitation (Sites 2869, 2870, 2871, 2873, 2874, 2875) and agriculture (Site 2872). Six radiocarbon dates obtained from prehistoric Sites 1342A and -873 suggest cultural activity in the project area may have occurred as early as AD 1270, and as late as the modern period. (Guerriero *et al.* 1993:ii)

Additional archaeological study within Honokahua *ahupua'a* includes a 1994 inventory survey with test excavations of a 12.2 acre parcel (TMK 4-2-04:26) located between the Kapalua Bay Hotel and The Bay Club (Fredericksen *et al.* 1994). The parcel is the former site of a park for Maui Land and Pineapple Company employees. No archaeological sites or features were recorded during the survey. A total of 31 test units were excavated: no cultural deposits - indigenous or post-contact - were discovered.

Archaeological study specific to portions of Nāpili 2-3 *ahupua'a* has been much less

intensive. In 1988, PHRI conducted a field inspection of the "Hawea Point Residence Site" (TMK 4-2-1:3) on the south side of Hawea Point in Nāpili 2-3 (P. Rosendahl 1988b). During the field inspection, Sites 50-MA-D13-1 and 50-MA-D13-2 - fishing settlement and cave shelter - on Hawea Point which had been previously identified by Kirch (1973) during his survey of the Honolua Development Area were re-examined. Only one feature of Site D13-1, a stone platform, was found to be located within the Hawea Point Residence Site. No additional sites were encountered during the reconnaissance of the project area.

In 1989, Archaeological Consultants of Hawaii conducted a walk-through reconnaissance of a parcel proposed for location of a Nāpili fire station (TMK 4-3-01:por.01). The letter report on the reconnaissance (Kennedy 1989) indicated no surface sites in evidence; the parcel was noted to have been "subjected to significant alteration by repeated movement of heavy equipment".

Prehistoric Settlement Pattern

The settlement pattern postulated for Honokahua and Napili *ahupua'a* is derived from the findings of previous archaeological studies and from ethnographic records. The three major topographical zones probably drove the use patterns, therefore, we have used these zones to explain early settlement as follows:

(1) the coast and nearshore land - These lands contained temporary settlements, shelter caves, other stone structures, middens, and an extensive burial site. Evidence of permanency of habitation is not found along this shoreline today; this may be due to extensive historical modification of the land for the pineapple plantation, or it may be related to the large Honokahua burial site .

(2) the inland valley land - Previous investigations have extended inland in the valleys only to about the 200 foot elevation contour, roughly one kilometer from the sea. The current project extends this distance to roughly three kilometers inland to about the 800 foot contour. Physical evidence of prehistoric land use in the valleys is limited to a petroglyph - in the context of cobble pavements in boulder talus along the cliff-side edge of an extensive alluvial terrace - and a rock-overhang shelter. Both of these sites are in Honokahua valley. The alluvial terraces in all the valley bottoms have been significantly altered during the plantation era. Thus, we must rely on the ethnographer's reports that taro was raised in olden times (Handy 1940:106).

(3) the forested ridge-top land - These lands in Honokahua and Napili were subjected to cattle grazing, clearing and plowing for pineapple cultivation and, in the present project area, graded and landscaped into golf course. Nevertheless, we can be certain these lands were used for gathering forest products, and for forest plantings of various utilitarian Hawaiian plants.

Based on archaeological research and 19th-century land claim awards in other leeward valleys of Maui it is likely that there was pre-Contact habitation in the valley bottom and on the forested ridge tops, where there were temporary agriculturally-related habitations.

III. SURVEY RESULTS

A total of eight historic properties (sites) were identified during the present archaeological inventory survey of the Kapalua Project District 2. The project area and location of historic properties are shown in Figure 6 (located in back cover jacket). Site information is presented below beginning with detailed descriptions of each site. The site descriptions are followed by Table 1 presenting the sites by State Inventory of Historic Places number, field site number, site type, function, estimated age, significance evaluation, and recommended treatment for the features of each site.

Site Descriptions

Site #:	50-50-01-1591
Site Type:	Historic plantation complex
Function:	various
Features (#):	multiple
Condition:	Good
Elevation:	0-400 ft. amsl

Description: Site 50-01-1591 was first surveyed and recorded in detail by J.C. Wright in March 1974 (see Appendix A; refer to Figure 5). The site is described as containing several types of features which relate to historic plantation era agriculture in the Honokahua and Honolua areas. These features include the plantation village, the cannery facilities of Baldwin Packers, Honolua Ranch Stables, Honolua Ditch, the Maui Pineapple Company Office, plantation camp housing, and two churches.

The features named in the original description of 50-50-01-1591 are situated on the *makai* side of the new HonoaPi'ilani highway, outside of the project area. However, where the boundaries of the site extend *mauka* of the new highway into the Project District 2 study area, they encompasses the occupied plantation residence on the hill overlooking the tenth tee of the Kapalua golf course (shown on Figures 4 and 5). The residence could be considered a part of the site under the descriptive catagory of "plantation camp housing". A shallow gulch *mauka* of that residence contains various fruit trees including citrus, avocado, macadamia, and coconut. These are certainly related to the residence.

Figure is in the back cover jacket.

Figure 6 Kapalua Project District 2 boundary map showing locations of historic

Site #:	**50-50-01-4459**
Site Type:	**Wall**
Function:	**Agriculture**
Features (#):	**1**
Condition:	**Fair**
Elevation:	**250 ft. a.m.s.l.**

Description: Site 50-50-01-4459 (Figure 7) is a 55 meter (180 ft.) long wall segment located on the western side of the bed of Honokahua Stream. At its *mauka* end and for most of its distance to *makai* the wall stands upon the alluvial terrace at the very edge of the stream cut and incorporates large boulders of the terrace. Between the large boulders of the terrace the wall is constructed of small and few medium water-rounded boulders stacked 2-4 courses high, attaining a maximum height of 3 m. (9.8 ft.), and width of 1.1 m. (3.6 ft.).

The purpose of the wall appears to be to contain the stream in its present bed during flood levels. Thus, the alluvial terrace between the constructed wall and the valley's western wall is protected, as if by levee, from overflow of the river. The protected terrace is generally level and presently is vegetated predominantly with coffee, *kukui*, christmas berry, and various ferns, shrubs and grasses. At the *makai* end of the terrace is a bulldozer road-cut providing access to the terrace from the next terrace to *makai* on the west side of the river bed. No artifacts or midden were observed at Site -4459.

Site #:	**50-50-01-4460**
Site Type:	**Overhang shelter**
Function:	**Temporary habitation**
Features (#):	**1**
Condition:	**Excellent**
Elevation:	**175 ft. a.m.s.l.**

Description: Site 50-50-01-4460 is a rock-overhang shelter located within Honokahua Gulch at the base of the valley's west wall. Accessed by scrambling up about forty feet of boulder talus from the river bed to a vertical section of cliff, the rock-shelter is cave-like at 4.4 m. (14.4 ft.) wide, 2.1 m. (6.9 ft.) maximum height at its opening, and extending into the cliff face 2.9 m. (9.5 ft.) (Figure 8). The floor of the shelter appears to be mostly bedrock in the *mauka* portion; the *makai* portion of the shelter cave has a covering of silt and cave earth. This sediment is held in the shelter interior by a partially buried, small-boulder alignment 1.1 m. (3.6 ft.) in length along the outer edge of the floor.

Other cultural material observed at the site consisted of a small, water-rounded boulder about twenty-five centimeters long and fifteen centimeters in diameter; one end of the boulder is battered. This stone is lying on the surface at the *mauka* end of the shelter opening. There were also *kukui* nut shell fragments scattered about the surface of the shelter, but many showed evidence of knawing by rodents, and *kukui* trees are abundant adjacent to the shelter. No other artifacts or middens were observed on the surface of the shelter floor.

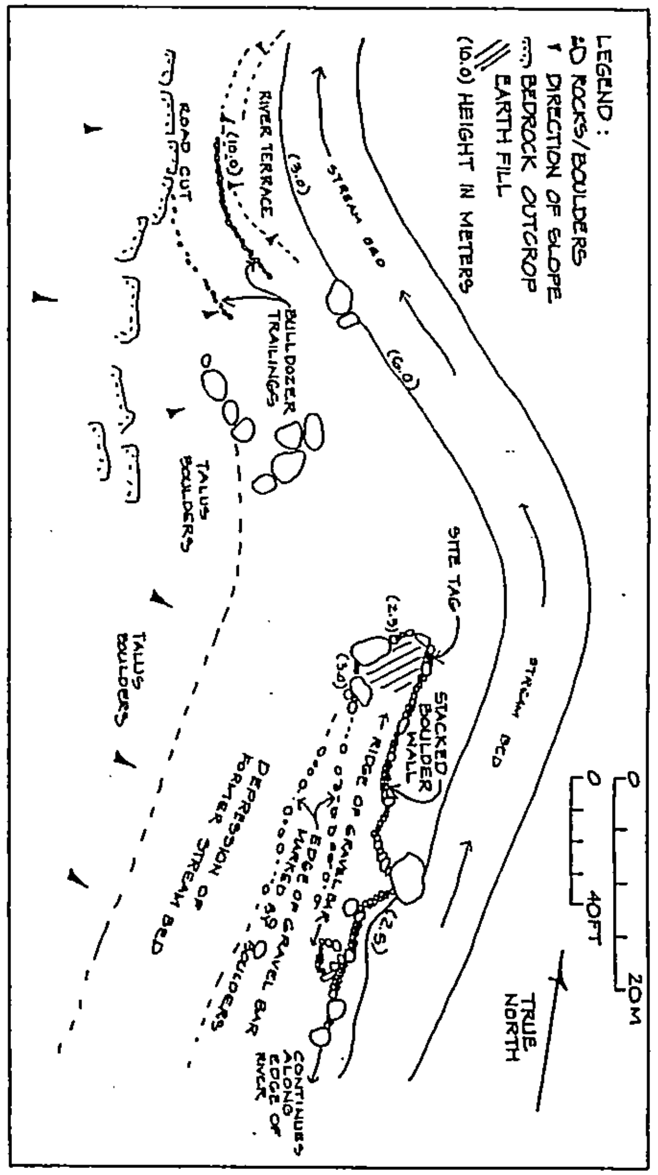

Figure 7 **Stacked boulder wall site 50-50-01-4459, built on the edge of an alluvial terrace in Honokahua Stream, and incorporating large stream deposited boulders, appears to have functioned as a flood control device for historic agricultural activities in the valley bottom.**

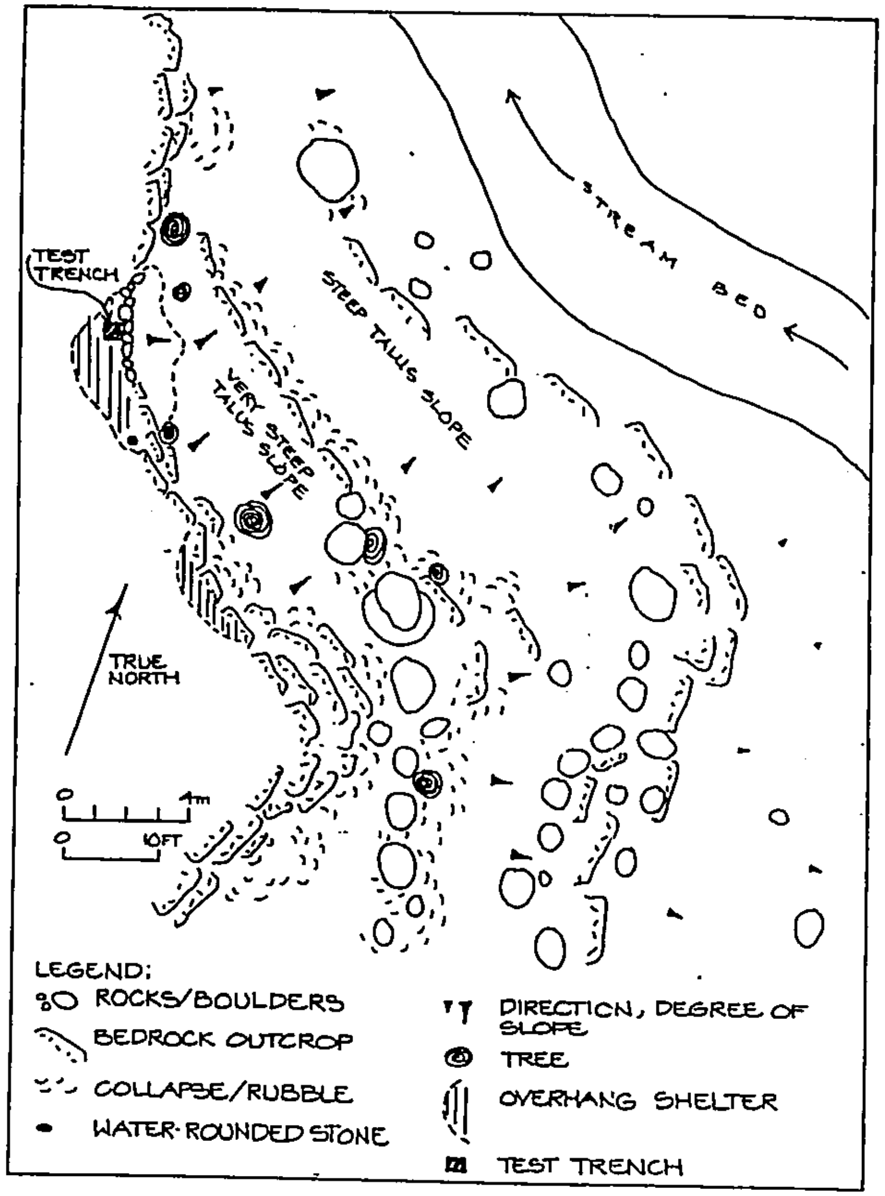

Figure 8 Rock-overhang shelter site 50-50-01-4460.

<u>Test Results</u>

A one-half meter square archaeological test unit was excavated in the overhang shelter site 50-50-01-4460 (see Figure 8) to challenge our preliminary functional interpretation of the site as a temporary habitation, and to collect charcoal for radiocarbon dating analysis. The test unit was dug in the sediment the *makai* end of the shelter to a maximum depth of 22 cm. where the bedrock of the shelter floor was encountered (Figure 9). The excavation yielded a small shallow hearth deposit with ample charcoal and few fragments of marine shell. Beta Analytic Inc. and Oxcal readings of the radiocarbon sample shows that a likely date for the overhang shelter to lie between 1800 and 1940. The stratigraphic history of the site revealed in the excavation is illustrated in Figure 9 and is described as follows:

Stratum IA 0-4 cm. depth; recent overburden	7.5YR 4/2 dry; brown, fine silt; loose, structureless, non-plastic; 10-20% white flecks of carbonate; Clear wavy boundary. Contains abundant leaf litter. *Kukui* nut shell is present, but shows characteristic signs of gnawing by rodents. This layer is thickest at the southwest corner of the test unit where no Stratum II is present.
Stratum IB 2-10 cm. depth; A-horizon	7.5YR 4/4 dry; brown, very fine, gravelly silt; compact; soft consistency, structureless, non-plastic, few roots and rootlets; abrupt wavy boundary. This layer contained no cultural material.
Stratum II 10-20 cm. depth; Cultural layer	7.5YR 3/2 dry; dark brown, very fine silt; weak crumb structure; soft consistence; slightly sticky, slightly plastic; many micro-and very fine rootlets; clear wavy boundary; contains cultural middens and artifacts (three basalt flakes) and a charcoal (7.5YR 2/0 black) and ash (7.5YR 7.5/0 white to light gray) deposit.
Stratum III 16-22+ cm. depth; Sterile subsoil	7.5YR 5/2 to 7.5YR 6/2 dry; brown to pinkish gray cave earth matrix, grading rapidly to coarse sand and gravel. Their was no cultural material found in this layer.

Site #:	50-50-01-4461
Site Type:	Complex
Function:	Agricultural work, or storage area/Rock Art
Features (#):	3
Condition:	Good
Elevation:	90 ft. a.m.s.l.

Description: Site 50-50-01-4461 consists of a stacked boulder wall enclosing an area of cobble paving in the talus, and a petroglyph in the cliffface, at the base of the steep western wall of Honokahua Gulch (Figure 10). The surrounding terrain is a wide, level alluvial terrace, and is covered with scattered koa haole, *kukui*, grasses, and christmas

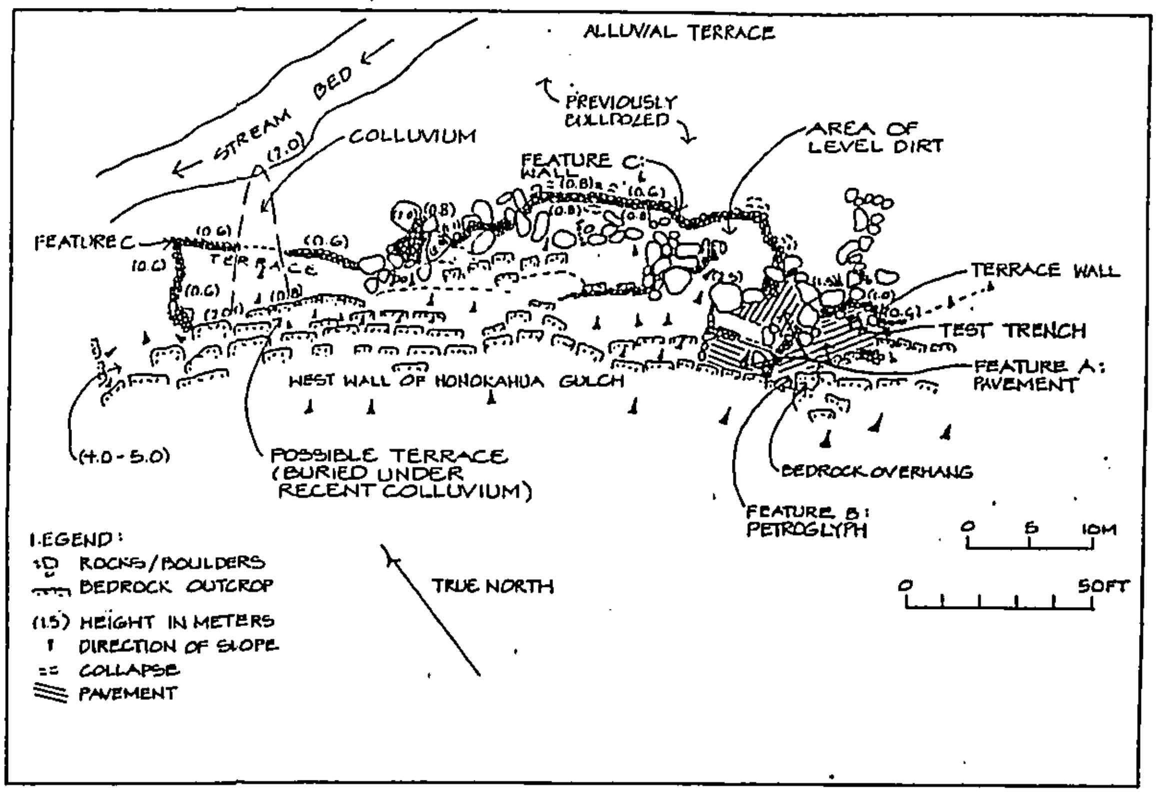

Figure 10 The stacked boulder wall of site 50-50-01-4461 encloses modifications to the talus and bedrock outcropings, and a petroglyph located at the base of the steep eastern cliff face of Honokahua Gulch. The alluvial terrace beyond the wall appears to have been bulldozed in the recent past.

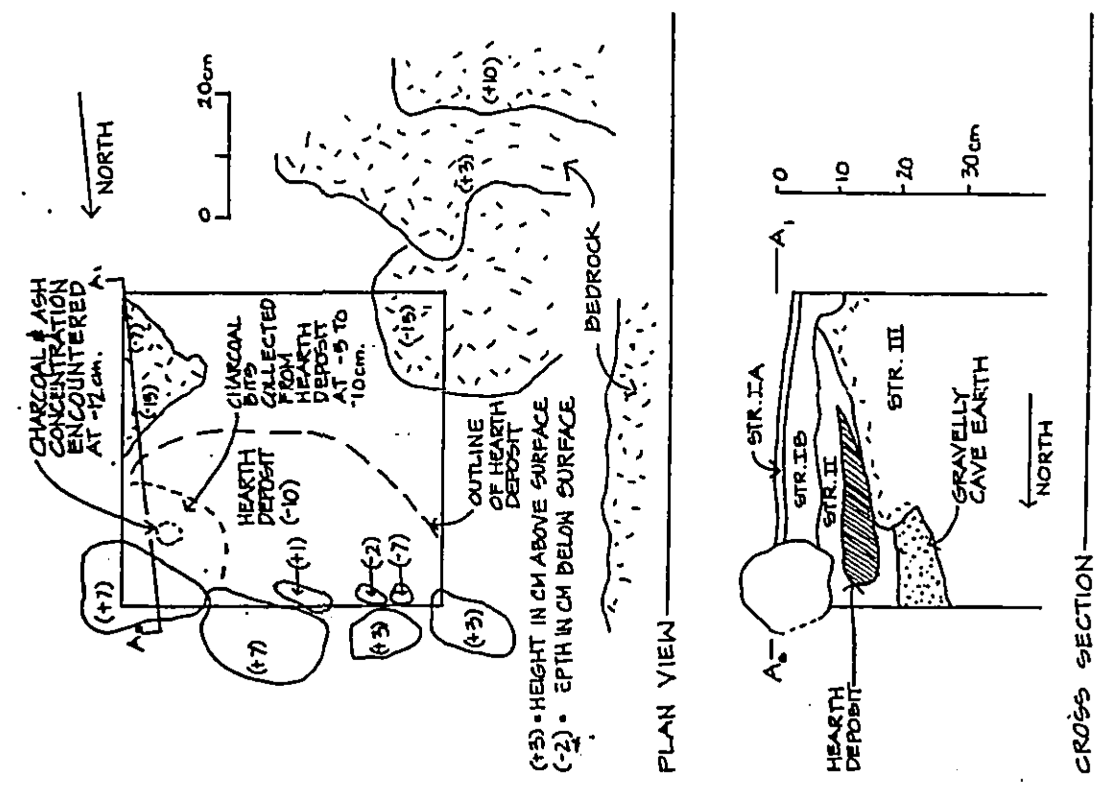

Figure 9 Plan and cross section of test unit excavation in the rock-overhang shelter

berry. Large boulders and boulder piles are scattered over the surrounding terrain suggesting bulldozing activities in the past

Feature A is comprised of a constructed terrace wall and three constructed, level pavements using the small boulders, cobbles and pebbles amongst a jumble of large talus boulders and basalt outcropping along the bottom of the west side of Honokahua gulch. The terrace wall is L-shaped, averages 1.5 m. (5 ft.) high, and supports the east edge of the larger of the three paved areas. The other two paved areas are merely extensions of the first pavement, but at levels ten to twenty centimeters below the larger pavement. The largest of the pavements was selected for testing; the results are as follows:

Test Results

The archaeological excavation at site 50-50-01-4461 was conducted to test our preliminary interpretation of site function and to collect charcoal for radiocarbon dating analysis. The one-meter square test unit was dug into the cobble and pebble surface of the pavement in the vicinity of the terrace retaining wall to a maximum depth of 82 cm. below the surface. The stratigraphic sequence found in the excavation is as follows (Figures 11 and 12):

Stratum I 0-21 cm. depth; Recent overburden	7.5YR 3/2 dry; dark brown clay loam; non-sticky; gravelly. This matrix is within the interstices of the cobble and boulder pavement. clear, irregular boundary. No cultural material was found in this layer.
Stratum II 15-43 cm. depth; Cultural layer	7.5YR 3/2 dry; dark brown fine, clay loam; 5-10% cobbles; non-sticky; loose, gravelly; abundant rootlets; clear irregular boundary. Cultural material present in this layer consisted of charcoal bits. A small concentration of the charcoal was collected from the SE quadrant of the unit at a depth of 35 cm. to 39 cm. depth.
Stratum III 38-82 cm. depth; Sterile subsoil	10YR 3/4 dry; dark yellowish brown very fine clay loam; weak subangular blocky structure, non-sticky; discontinuous layer in interstices of colluvial deposit of basalt cobbles and boulders. No cultural material was found associated with this layer.

Feature B is a single anthropomorphic petroglyph, pecked into the cliff face at the back of the larger, terraced pavement (Figure 13; also see Figure 10). The bedrock exhibits columnar or block jointing, and the petroglyph is positioned on a north, or *makai* facing exposure of one of the blocks that forms a shallow overhang at the cliff base. The figure measures approximately 8 inches tall and 8 inches wide (Figure 13).

Feature C wall and extending in a *mauka\makai* direction parallel with the cliff face for a total length of 62.5 m. (205 ft.) (refer to Figure 10). The wall is bi-faced and attains a maximum height of 1.1 m. (3.6 ft.), and a maximum width of 0.8 m. (2.6 ft.).

No middens or artifacts were found associated with any feature of site 50-50-01-4461.

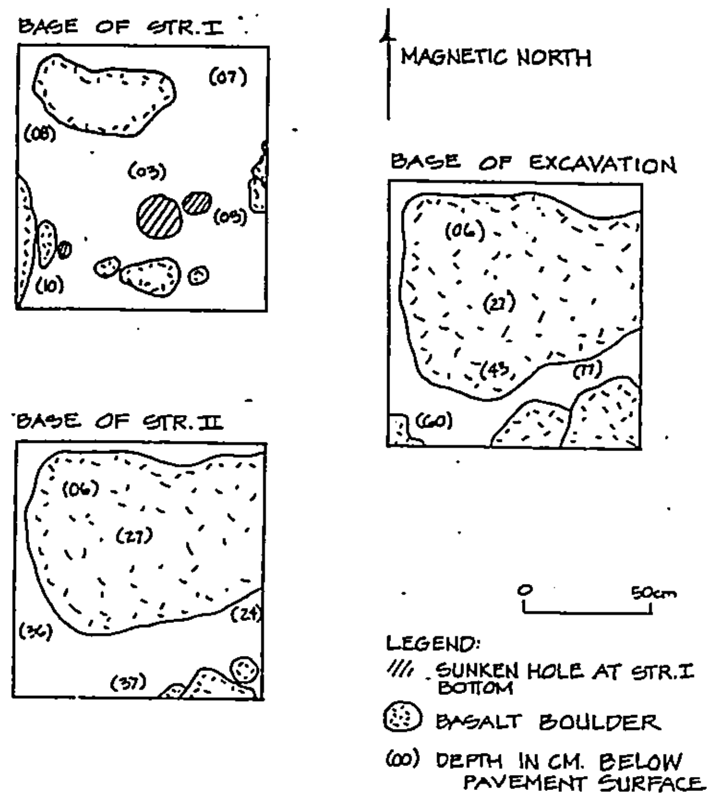

Figure 11 Plan and cross section of test unit excavation in the rock-overhang shelter site 50-50-01-4460.

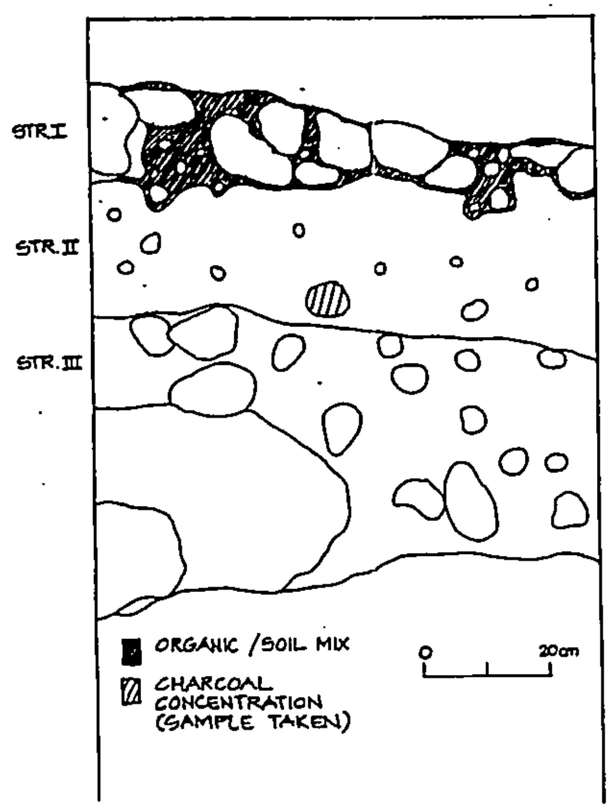

Figure 12 Profile of west face of test unit excavation in the surface of site 50-50-01-4461 feature A, an agricultural work or storage pavement.

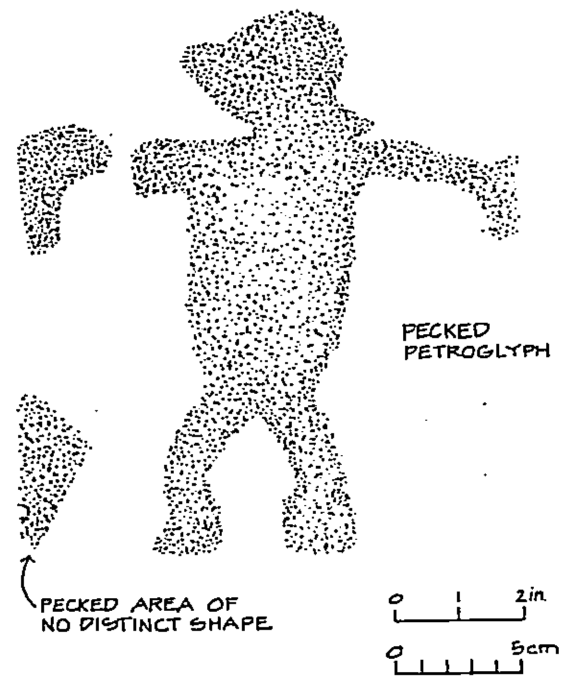

Figure 13 A freehand sketch of the petroglyph site 50-50-01-4461 feature B.

Site #: 50-50-01-4462
Site Type: Cemetery
Function: Burial
Features (#): 58+
Condition: Fair/Good
Elevation: 510 ft. a.m.s.l.

Description: Site 50-50-01-4462 is an historic cemetery located on a prominent bluff conscribed by the 3rd, 4th and 15th holes of the Kapalua Village Golf Course. The cemetery incorporates an area approximately 25 m. (82 ft.) long and 12 m. (39 ft.) wide, upon which fifty eight marked graves were observed (refer to Figure 6). Six of the graves have elaborate headstones of marble or other stone with inscriptions in English and ideographic characters of Chinese or Japanese. The remaining 52 graves contained no headstones, are marked with wood crosses made of 2X4 inch lumber, and are circumscribed by small water-rounded boulders. Glass and metal flower containers were observed throughout the site. The site is commonly know as the "Honokahua Camp Cemetery". Vegetation surrounding the site is trimmed, indicating that upkeep of the cemetery area is on-going.

Site #: 50-50-01-4463
Site Type: Complex
Function: Animal Containment/Agriculture
Features (#): 5
Condition: Fair
Elevation: 400 ft. a.m.s.l.

Description: Site 50-50-01-4463 (Figure 14) consists of five distinct structural features - A through E - situated along the steep sloping sides and floor of an unnamed gulch located at the western edge of a pineapple field identified as field 34 on Maui Land and Pine Company maps. The *makai* boundary of the site area is an unimproved road crossing the gulch, connecting the pineapple fields on the ridges on either side of the gulch.

The site area extends approximately 275 m. (900 ft.) *mauka-makai*, and is 100 m. (330 ft.) wide. The width of the site area is defined by roads and fields of the pineapple plantation, while its length, or limits to *mauka* and *makai* were selected to conform to the purpose for which they were built. Another unimproved, major plantation road separates this site area from that of site 50-50-01-4465.

<u>Feature A</u> of site 50-50-01-4463 is a narrow, elongated, historic reservoir built in the gulch bottom. The reservoir's dam is the unimproved road that interconnects the pine fields on either side of the gulch. Maximum width of the reservoir at the dam is 26 m.(85 ft.). Following the gulch bottom to *mauka* for 75 m.(245 ft.), it pinches out at a plunge pool in the middle of the steam bed partially formed by the structural walls of the reservoir.

The gulch walls on both sides of the reservoir basin have been cut and terraced as if for an older road bed descending from Field 34 on the west into the gulch and crossing the stream at the *mauka* end of the reservoir, then exiting to *makai* on the opposite, eastern side.

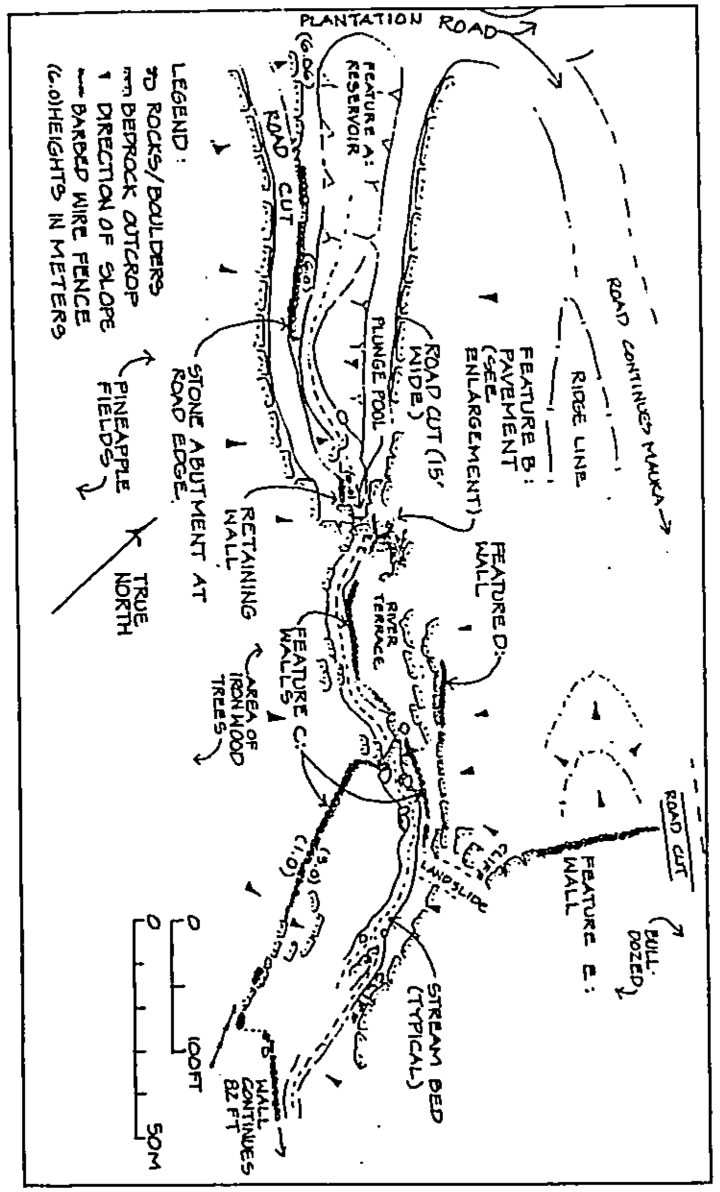

Figure 14 Plan view of site 50-50-01-4463 features A through E, a collection of wall segments (remnants) in a shallow

A section of stone facing 37.5 m. (123 ft.) long is constructed on the downslope side of the terrace cut along the western side of the reservoir. The faced area consists of small boulders stacked 4 to 9 courses high for a maximum height of 2.2 m. (7.2 ft.).

Feature B, a small roughly square paved area (Figure 15), is located approximately 10 m. (33 ft.) *mauka* of the upper limit of the feature A reservoir, along the eastern edge of the streambed. Feature B is constructed upon a bedrock outcrop, is 5.2 m. (17.1 ft.) N/S by 4.2 m. (13.8 ft.) E/W, and is constructed of small water rounded boulders with two sections of facing (max. ht. 35 cm.) along the eastern side of the paved area. No artifacts or midden were observed.

Feature C consists of two walls. The first begins 7.6 m. (24.9 ft.) upstream of the modified outcrop feature B and proceeds upstream following along its eastern bank for a total distance of 64 m. (210 ft.). It is constructed of small water-rounded basalt boulders stacked 2-5 courses high reaching a maximum height of 50 cm. and width of 75 cm.

A second wall begins 35.6 m. (117 ft.) upstream from the origin of the first wall running upslope along a bedrock outcrop parallel to the west side of the stream for a total distance of 95 m. (312 ft.). The second wall is constructed of small to medium water rounded and angular basalt boulders stacked 3-6 courses high reaching a maximum height of 1 m. (3.3 ft.). Barbed wire fencing is incorporated into several sections of the stone construction along the second wall. No artifacts or midden were observed at the features.

Feature D is a wall segment located 20.7 m. (68 ft.) upslope from Feature C wall intersection point along the gulches western cliff face. The wall segment is 13.7 m. (45 ft.) long and extends in a *mauka/makai* direction on the surface of a bedrock outcrop. The maximum height of the wall is 1.1 m. (3.6 ft.). No cultural material was observed.

Feature E is a wall segment located 35.1 m. (115 ft.) upslope at 258 degrees magnetic from Feature D wall segment. Feature E wall segment sits at the crest of the west side of the gulch. The total length of the wall segment is 12.2 m. (40 ft.) and extends in a east/west direction. The wall is constructed of small to medium boulders stacked 1-4 courses high attaining a maximum height of 55 cm. (1.8 ft.). No artifacts or midden were observed.

Site #:	50-50-01-4464
Site Type:	Historic Bridge
Function:	Transportation
Features (#):	1
Condition:	Good
Elevation:	250 ft. a.m.s.l.

Description: Site 50-50-01-4464 is a historic-era bridge located in the bottom of the unnamed gulch near the western project area boundary. The site is approximately 183 m. (600 ft.) from HonoaPi'ilani Highway (the *makai* project area boundary), 365 m. (1200 ft.) *makai* of State Site 50-50-01-4463 complex, and adjacent to the 13th tee of the Kapalua Village Golf Course (refer to Figure 5).

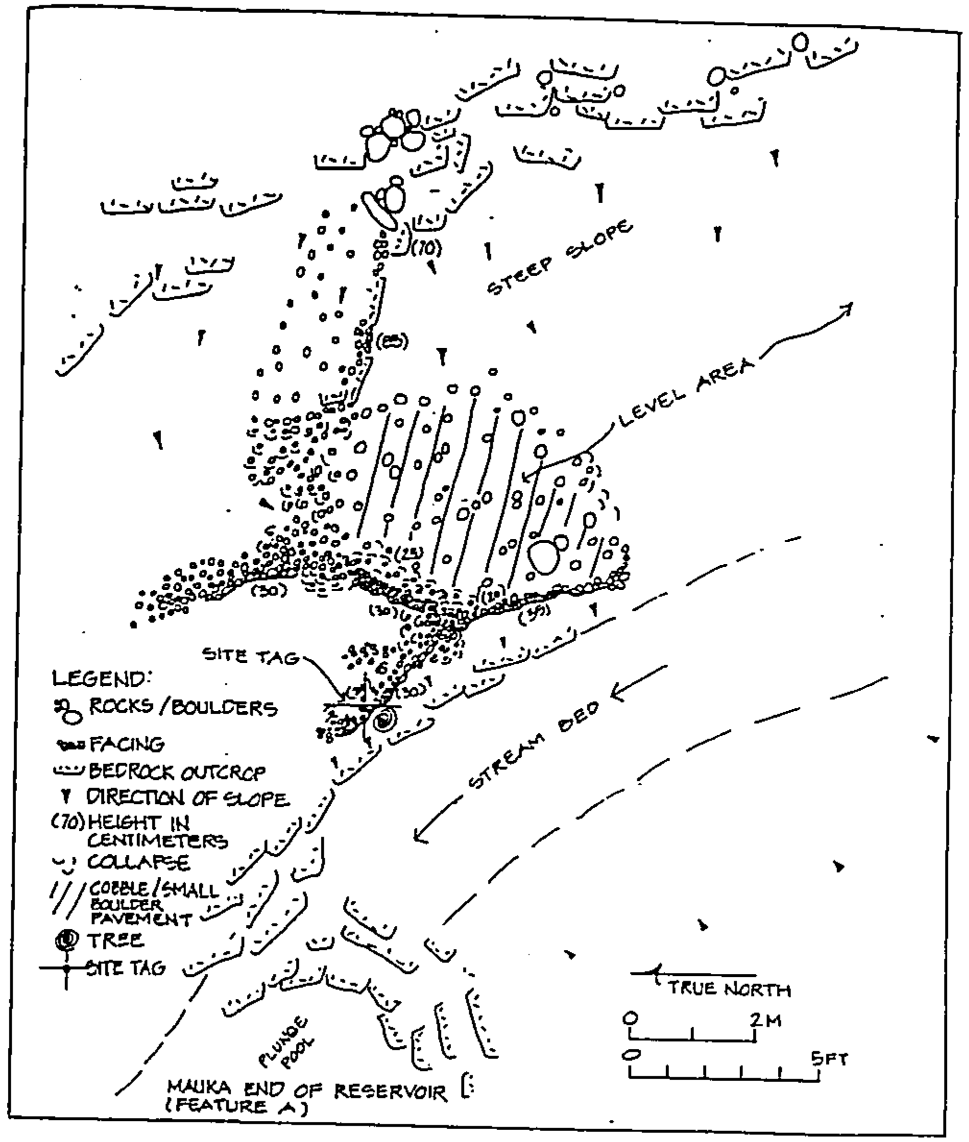

Figure 15 Plan view of site 50-50-01-4463 feature B

The rectangular historic bridge is approximately 5.5 m. (18 ft.) long and approximately 3.4 m. (11 ft.) wide, extending over the deep, narrow intermittent streambed. The two supporting sides of the historic bridge are constructed of cement and angular basalt boulders stacked 10-13 courses high , reaching a maximum height of 2.8 m. (9.2 ft.). The surface of the bridge is constructed solely of cement and is approximately 0.6 m. (2 ft.) thick. The bridge is commonly referred to as a Concrete Tee Beam or Reinforced Concrete Flat Slab Bridge (See figures in Historic Bridge Inventory and Evaluation; Islands of Maui and Molokai 1990:pps 51, 169). The distinction between the Concrete Tee Beam and the Reinforced Concrete Flat Slab Bridge is that the Flat Slab Bridge has reinforcing bars in its slab. We were unable to determine whether or not there were reinforcing bars. It is a one-span bridge with no railing or siding but barbed wire fencing and fence posts were observed along the *makai* side of the structure. No other artifact or midden were observed at the site. We believe this bridge belongs to the plantation era and its boulder and cement construction indicate it was probably built in the 1920s or 1930s.

Site #:	50-50-01-4465
Site Type:	Wall
Function:	Animal Containment
Features (#):	3
Condition:	Poor
Elevation:	510 ft. a.m.s.l.

Description: Site 50-50-01-4465 (Figure 16) is located in a small tributary gulch adjacent to site 50-50-01-4463. It consists of three walls sections (Features A-C) situated along the steep sloping sides, crest, and floor of the tributary. It is possible these two sites areas were integrated at one time as they are now separated only by a major plantation road. The wall segments extend over an area approximately 100 m. (328 ft.) wide east to west, by 152 m. (500 ft.) long north to south, or mauka-makai.

<u>Feature A</u> is a wall segment extending east/west. It is located on the top of a narrow ridge line between two gulches. The wall is 16.8 m. (55 ft.) long and 35-55 cm. (1.2-1.8 ft.) wide, is constructed of small to medium water rounded boulders stacked 2-4 courses high, and reaches a maximum height of c. (1.3 ft.). No cultural material was observed at the feature.

<u>Feature B</u> is a wall segment extending in a east/west direction located on the sloping side of the ridgeline 42.6 m. (140 ft.) *makai* of Feature A wall. The wall segment is 50.3 m. (165 ft.) long and 40-55 cm. (1.3-1.8 ft.) wide, and is constructed of small to medium water rounded boulders stacked 2-5 courses high, reaching a maximum height of 60 cm. (2 ft.). No artifacts or midden were observed at the feature.

<u>Feature C</u> is a wall segment extending in a *mauka/makai* direction located 15.2 m. (50 ft.) *makai* from the western end of Feature B wall. The wall segment is 79.8 m. (262 ft.) long and 40-55 cm. (1.3-1.8 ft.) wide, and is constructed of small to medium water rounded boulders stacked 2-6 courses high, reaching a maximum height of 70 cm. (2.3 ft.). No artifacts or midden were observed at the feature.

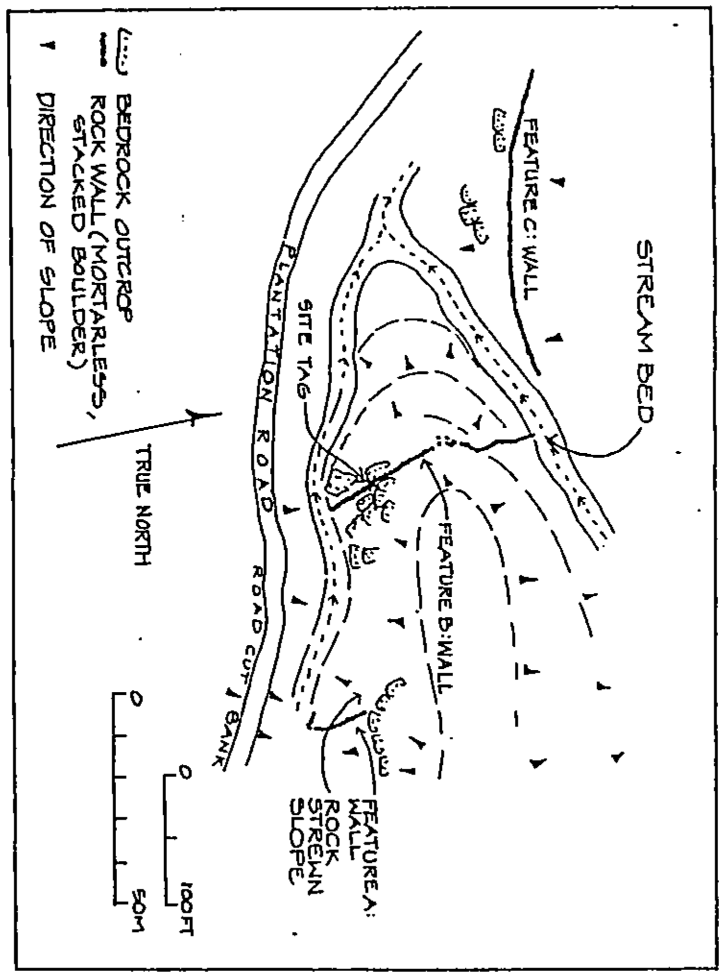

Figure 16 Plan view of site 50-50-01-4465 feature A

Summary of Results

A total of eight sites and complexes were identified during the present study. Of the eight sites identified four represent site complexes comprised of more than one feature. Site 50-50-01-1591 has eight plantation era features associated with it, but all are outside of the Kapalua Project District 2 study area. Site 50-50-01-4462 - an historic cemetery - contains a minimum of fifty-eight burial features. Sites 50-50-01-4463 and 50-50-01-4465 are comprised of five and three features respectively. The remaining three identified sites consisted of single features bringing the total number of features identified in the project area to a minimum of sixty-nine (excluding the eight features of 50-50-01-1591).

The site types represented in the project area are presented in Table 1, as well as the number of features associated with each site, the feature types, function, probable age, significance, and recommended treatment. A summary of Historic Property (Site) Types is presented in Table 1 to provided a brief interpretation of each site type observed in the present project area.

Two sites in Table 1 are assigned a probable prehistoric age. Both of these were tested by hand excavation and yielded charcoal. *Kukui*-nut shells were also observed in the surface layer of the sites, but these items appear to be transported to the sites by rodents. Table 2 (on page 38) presents the provenience of the charcoal samples collected. Charcoal from one site - the rock-overhang shelter - was dated by radiocarbon analysis.

Historic Property (Site) Types by Function

Function of a site is determined by criteria which include: site construction techniques and complexity; context, or association with other sites or geographical determinants; cultural content (surface and subsurface); and broader correlations with other archaeological sites of known function in Hawai'i.

In the project area the eight sites were placed in six functional categories. These are: district, agriculture, animal containment, temporary habitation, transportation, and religious. Some sites have more than one function. (Refer to Table 1 for the occurrences of these functional categories among the individual sites.) A summary of each functional category and its expected chronological period of use are presented below.

<u>District</u>
Site 50-50-01-1591 - Honokahua District - contains several types of features which relate to plantation era agriculture in the area. These features include the plantation village, the cannery facilities of Baldwin Packers, Honolua Ranch Stables, Honolua Ditch, the Maui Pineapple Company Office, plantation camp housing, and two churches (Wright 1974).

<u>Agriculture</u>
One of the project area sites is interpreted as primarily agricultural in function. Site 50-50-01-4459 is associated with historic intensive dryland agriculture located on the alluvial terraces of Honokahua Stream. The site is characterized by a wall section constructed of

Table 1: Table of Archaeological Features by Site Number, Type, Function, and Predicted Age

State Site # 50-50-01-	CSH Field #	Feature	Site Type	Function	Probable Age	Significance	Recommended Treatment
1591	none	---	Historic District	Plantation Operations	Historic	A, B	Preserve- Redefine boundary
4459	2	---	Wall	Agriculture	Historic	D	none
4460	3	---	Rock-overhang shelter	Temporary habitation	Pre-Historic	D	Preserve
4461	4	---	Complex	Temporary habitation /Rock art	Pre-Historic	C, D, E	none
4461	4	A	Petroglyph	Rock Art	Pre-Historic	---	Preserve
4461	4	B	Agriculture work/storage platform	Temporary habitation	Pre-Historic	---	Preserve
4462	5	---	Cemetery	Burial (58+graves)	Historic	E	Preserve
4463	11	---	Complex	Agriculture & Animal fencing	Historic	D	none
4463	11	A	Reservoir	Agriculture	Historic	---	none
4463	11	B	Modified outcrop	Agriculture	Historic	---	Data collection
4463	11	C	Wall	Animal fencing	Historic	---	none

State Site # 50-50-01-	CSH Field #	Feature	Site Type	Function	Probable Age	Significance	Recommended Treatment
4463	11	D	Wall	Animal fencing	Historic	---	none
4463	11	E	Wall	Animal fencing	Historic	—	none
4464	14	---	Bridge	Transportation	Historic	C, D	Architectural evaluation
4465	15	—	Complex	Animal fencing	Historic	D	none
4465	15	A	Wall	Animal fencing	Historic	---	none
4465	15	B	Wall	Animal fencing	Historic	---	none
4465	15	C	Wall	Animal fencing	Historic	---	none

large boulders - oriented parallel with the stream - possibly serving as a means of diverting water away from crops in times of flooding. We presume this is a feature of historic age, built after the Honokahua ditch system diverted water from the gulch except in times of heavy rain when overflow from the ditch would be sent flash-flooding down the valley.

One site (State Sites 50-50-01-4463) has evidence of combined animal containment practices in association with historic dryland agriculture. The site consists of a reservoir, a modified outcrop, and three walls for animal containment features. These agricultural features are attributed to large scale pineapple production during the 20th century.

Animal Fencing or Containment
The site 50-50-01-4465 complex is an area with a series of wall segments (Features A-C) interpreted as fences. The walls are oriented cross-slope (following along contours), or parallel to existing geographical features (*e.g.* streams, bedrock outcrops, roads) to form areas where animals (*e.g.* cattle, horses) may not enter or may be confined within.

The area of the site complex 50-50-01-4463 has the remains five features including three stone wall segments for animal containment and two agricultural features comprising a reservoir and a stone pavement on a modified outcrop.

Burial
Site 50-50-01-4462 consisted of a historic cemetery containing 58+ observed grave sites.

Temporary Habitation
Two of the projects sites are classified as temporary habitations. One of these sites is a complex (50-50-01-4460), while the other site (50-50-01-44461) contains a single feature.

Both of the temporary habitation sites and features in the project area are believed to be prehistoric or early historic in age. This interpretation is based upon the absence of historic artifacts, and the traditional Hawaiian techniques used in site construction. The living floor areas of the temporary structures range between approximately 4.4 m. (14.4 ft.) square and 5.5 m. (18 ft.) square.

The temporary habitation sites range in size between one or two structural features. These features types include a overhang rockshelter (50-50-01-4460); wall/modified outcrop, and petroglyph (50-50-01-4461).

Both of the temporary habitation sites and features lie within the same region, along the base of the eastern side of Honokahua valley.

Transportation
One of the project area sites is interpreted as relating to historic transportation in function. The site (50-50-01-4464) is either a historic Concrete Tee Beam style of bridge or a Reinforced Concrete Flat Slab bridge (if there are rebars inside the concrete slab it is the latter)(Hawaii Heritage Center 1990: 51, 171). The site is not included in an inventory and evaluation report, "Historic Bridge Inventory and Evaluation, Islands of Maui and

Molokai", produced for the Department of Transportation by Hawaii Heritage Center in September of 1990, but it is similar in structure to those 1-span bridges shown under those two types. The permanence of the construction materials utilized in the making of the bridge, as well as the construction style, suggest that the site is capable of handling heavy traffic.

Two of these sites (50-50-01-4463 and 50-50-01-4465) are each comprised of a complex of walls - with a total of ten component features - primarily oriented along a contour of the steep sides of the gulch in which they occur and along the edge of the stream bed in the bottom of the gulches.

The remaining identified sites consisted of single-featured sites, bringing the total number of features to 69. This total number of features observed in the project area accounts for site 50-01-1591 as a single feature (see Fig. 6). The formal site types represented in the project area are presented in Table 1, as well as the number of features associated with each site, the feature types, function, significance, and recommended treatment. Additional sites located in the project area consisted of walls, and an historic cement bridge.

-Radiocarbon Dating Results

A single charcoal sample from the hearth layer in the test unit dug in the rock-overhang shelter (Site 4460) was submitted to Beta Analytic, Inc. of Coral Gables, Florida for radiocarbon age analysis. The results of the analysis are presented in Appendix D. Using the Oxcal calibration program, the most likely date would be the period between 1800-1940 (See appendix). Therefore it is quite likely that the hearth was made and used in historic times and since no historic-period artifacts were found within the site or nearby it is also likely that the hearth may have been used earlier rather than later in this time frame

IV. SIGNIFICANCE

Significance of the historic properties located in the Kapalua Project District 2 is evaluated here and in Table 1 (Page 17) according to guidelines developed in National Register Bulletin 16 for documenting historical context to provide the basis on which to make decisions about preservation treatment. The National Register of Historic Places significance criteria are summarized as follows:

A Site reflects major trends or events in the history of the state or nation.

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

C Site is an excellent example of a site type.

D Site may be likely to yield information important in prehistory or history.

There are two property types in Kapalua Project District 2. These are Native Hawaiian Subsistence sites and Pineapple Plantation Era sites.

Sites included in the Native Hawaiian Subsistence property type are the rock-overhang shelter 50-50-01-4460 and the agricultural work area or storage platform (with petroglyph) 50-50-01-4461. These sites are significant under National Register criterion "D". These sites were formerly a part of the agricultural pursuits of the native peoples which would have included crops planted on the alluvial terraces in the valley bottom. While evidence of the native plantings has been obliterated by the historic era plantation activity, the two extant sites are likely to yield chronological information on use of the valley and will supplement previous archaeological studies on settlement pattern nearer the coast, and ethnographic data collected early in the twentieth century. The petroglyph feature A of 50-50-01-4461 is also considered significant under criterion "E" - a criterion developed by the Hawaii State Historic Preservation Officer(SHPO). The SHPO significance criteria follow the National Register criteria, but add the "E" criterion for sites of "... important cultural value..." (draft ru'es of the DLNR, Historic Preservation Division).

Sites of the Pineapple Plantation Era property type were recognized in 1974 during the state-wide inventory of historic places conducted by the Historic Sites Section of the State Parks Division of the Department of Land and Natural Resources (since replaced by the SHPO). That survey created the Honokahua District site 50-50-01-1591 (refer to: Figures 3; Figure 5; Appendix A), encompassing the center of the pineapple plantation community at Honokahua, to recognize its historic significance. The remaining five sites found in Kapalua Project District 2 during this survey also belong to the Pineapple Plantation Era property type.

Site 50-50-01-1591 as a whole is significant under criteria "A" and "B". Honokahua was converted from forest and Hawaiian farm land, to ranch and coffee land in the late nineteenth century under Henry Perrine Baldwin (1842-1911) and pineapple plantation agriculture was developed in the early twentieth century by D.T. Fleming for Baldwin's estate. These changes are representative of major trends in the Hawaiian history and are tied to significant population change through foreign immigration for plantation labor.

The reservoir, pavement and wall sections identified as 50-50-01-4463 and the wall sections 50-50-01-4465, now separated by only a single unimproved plantation road for the harvest trucks, were probably connected at one time. These features of water and animal control for the plantation are significant under criterion "D". They provide detail for everyday support activities not commonly included in business records, and they support the accuracy of, or fill in the blanks of old maps where infrastructure such as reservoirs may be depicted. The wall 50-50-01-4459 for flood control on an alluvial terrace in Honokahua gulch may also be included here under significance criteria "D".

The two remaining sites are also included in the Pineapple Plantation Era property type.

The boulder and concrete bridge, Site 50-50-01-4464, is not included in the recently published survey and evaluation of bridges on Maui and Molokai. The significance of the bridge is now being considered separately from the archaeological sites and the Architectural Branch of the State Historic Preservation Division will determine its historic preservation status. The bridge does yield information relating to the historic district on changing modes of transportation, permanency of stream crossing devices, and change in routes across the landscape or points of departure and arrival.

The cemetery 50-50-01-4462, know locally as the Honokahua Plantation Cemetery, is significant under criterion "E" (SHPO draft rules sec.146-6) because of its cultural value and importance to the descendants of those plantation workers buried there.

The historic bridge, 50-50-01-4464, probably a plantation-use bridge of the 1920s or 1930s, is a simple 1-span concrete bridge laid over boulder and concrete buttressing with no sides or railings. This type of bridge is either a Tee-Beam or Reinforced Concrete type bridge. The issue of significance is being handled separately with the Architectural Branch of the State Historic Preservation Division.

V. RECOMMENDATIONS

Preservation is recommended for three of the eight historic properties in the Kapalua Project District 2: the rock-overhang shelter 50-50-01-4460, the complex 50-50-01-4461 of walled in agricultural work area and petroglyph, and the Honokahua Plantation Cemetery 50-50-01-4462.

Detailed architectural data collection is recommended for the stone and concrete bridge 50-50-01-4464 to allow evaluation of its condition of preservation for comparison with other structures of the same type on Maui.

It is also recommended that the boundary of the site 50-50-01-1591 be redrawn so as to exclude the many acres of golf course land that is no longer relevant to the pineapple plantation era.

Precise location, by licensed land surveyor, of all of the historic properties located in Project District 2 is also recommended. This should take place as the first element of any development planning in the valleys of the project area, in advance of any construction activity.

The remaining three sites - wall 50-50-01-4459 in Honokahua valley; reservoir, pavement and walls 50-50-01-4463, and walls 50-50-01-4465 - have yield all the information they are likely to through the archaeological survey. Therefore, no further archaeological investigation is recommended for these sites.

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VII. APPENDIX A: Site 50-50-01-1591 - Honokahua District Site Form

Post-it Fax Note 7671	Date 7/23	# of pages 4
To W. Folk	From S. Collins	
Co./Dept. CSH	Co. SHPD	
Phone #	Phone #	
Fax # 262-4950	Fax # 587-0018	

50 / 01 / 1591
Island Quad Site No.

HAWAII REGISTER OF HISTORIC PLACES
SHORT FORM

Site name/type: Honokahua District

LOCATION: Honokahua, Lahaina

OWNER: Maui Land & Pineapple Company (major owner)
Kahului, Maui

MERIT: _Architectural x Historical

INFORMATION: Written _No x Yes: MAUI NEWS, June 13, 1914; August 8, 1919. A.L. Dean, Alexander & Baldwin, Ltd. Honolulu, 1950. Maui Historical Society, Lahaina Historical Guide. 1971.

Informant _No x Yes: Nobuo Furukawa; Geo. Naganuma; Jos. Swezey; Rev. John Kukahiko

GENERAL DESCRIPTION AND STATEMENT OF SIGNIFICANCE:

This site is being recommended for Reserve status based primarily on its historical interest.

The general historical development of this district began as a plan by Henry Perrine Baldwin (1842-1911) for creating a sugar plantation at West Maui. Land purchased by Baldwin, sometime before 1888, was consolidated into Honolua Ranch Company, and cattle and coffee were produced, with coffee later dropped as unprofitable. Operation of the Ranch was almost on a hobby or incidental basis by Baldwin. After his death in 1911, his estate abandoned plans for sugar and decided instead to plant pineapples, hiring as manager D.T. Fleming, who had successfully grown pines at Haiku. Fleming began planting pines at once and built Honolua Ditch, to replace the old Honokahua Ditch. A feature of the new ditch was a hydro-electric plant. Fleming also built himself a house, overlooking Napili Bay, on a knoll which became known as Pineapple Hill. (The house is leased out to a private operator as a restaurant.)

In 1913-14, a cannery was built at Honokahua, and the first pack of 6,000 cases was put up in 1914. The cannery was dismantled and a new cannery built at Lahaina in 1920 (see HRHP 1618).

Headquarters for the Ranch were moved from Honolua Bay to Honokahua during 1912 and 1914, and an office and small community were built up. Cattle operations were stopped, and lands not suited for pineapples were leased to Pioneer Mill Company for sugar cane.

Fleming was an enthusiastic planter, and attempted a number of small crops for diversification as well as planting thousands of ornamental trees. Aloe was planted with the hope it would be a commercial crop producing a medical extract. Mangoes, lychee, citrus, watermelon and others were planted, some with moderate success, and most with excellent fruit.

Honolua Ranch was incorporated in December, 1923, as Baldwin Packers, Ltd. Operations continued until 1963 when production costs brought about merger into Maui Pineapple Company. The present major owner, Maui Land & Pineapple Co., is in the process of building in the area a large resort complex, in the course of which Honokahua village will be phased out and a new residential district built.

REASON FOR USE OF SHORT FORM: limited architectural interest- district

SURVEYED BY J.C. Wright RECOMMENDATION Reserve

DATE OF SURVEY March 1974 TAX KEY 4-2-01

LOCATION MAP IS DRAWN ON OPPOSITE SIDE OF SHORT FORM

HRHP-4-73A

50-01-1591

HAWAII REGISTER OF HISTORIC PLACES

HISTORICAL SITES INFORMATION AND REVIEW FORM---CONTINUATION SHEET p.1

Please note subject heading (Statement of Significance, etc.; use separate sheet for each heading).

Features within the district:

1. Honolua Ditch

To replace the old Honokahua Ditch, the wood flumes of which had rotted, work began on the Honolua Ditch on June 8, 1912. Water from the project was turned on November 12, 1913.

Originating in Honokohau Valley, the Ditch consists primarily of tunnels, being 34,240 of the 36,622 feet of the length, ultimately connected to Wahikuli Reservoir near Lahaina. Sides of the Ditch were lined with cement plaster over steel mesh netting; the bottom was poured concrete from 2-3 inches thick. In the tunneling work, each lineal foot of excavation required 4½ lbs. of dynamite. Three intakes are at Honokohau, Kaluanui, and Honolua.

In the final report for the Ditch made by D.T. Fleming, he gave the total expenses as $239,841.62, and noted that "an unusual feature of the construction was that there was not a single fatal accident."

Crossing Honokahua Valley, about 1 3/4 miles from the coast road, is a pipe syphon, built of riveted German steel pipe (cement lined just a few years ago). At this location a powerhouse was installed. Prof. J.H. Foss, of the Engineering Department at Stanford University, installed the plant. Foss's wife was the daughter of W.C. Crook of Makawao, and his brother was an engineer with offices in Wailuku. Details of the equipment used are missing, but at the site still remains the Henry Francis turbine and a few remnants of poles and insulators. The Ditch, still in use, may again provide electrical power in the future as energy needs change.

2. In the village is the Maui Pineapple Company office, built in 1911, with a vault added in 1912. The L-shaped one-story gable structure has a verandah along the inside L and in the rear.

3. The area store (informant: Shoon Tet Hew) is about 50 years old and was built around an older store. It has been added to and modified many times.

4. Camp housing is typical of other plantations, with wood frame structures on rock footings. Gable and shed roofs and double hung twelve-light windows combine with board and batten construction are seen in the village. Two camp houses were pointed out by informants as having incorporated into their siding, pieces of redwood salvaged from flumes of the old Honokahua Ditch.

5. A few foundation and rock wall remains mark the cannery site. Small sections of track for shuttling pine containers are still visible.

(continued)

HRHP-4-73A

50-01-1591

HAWAII REGISTER OF HISTORIC PLACES

HISTORICAL SITES INFORMATION AND REVIEW FORM---CONTINUATION SHEET

Please note subject heading (Statement of Significance, etc.; use separate sheet for each heading).

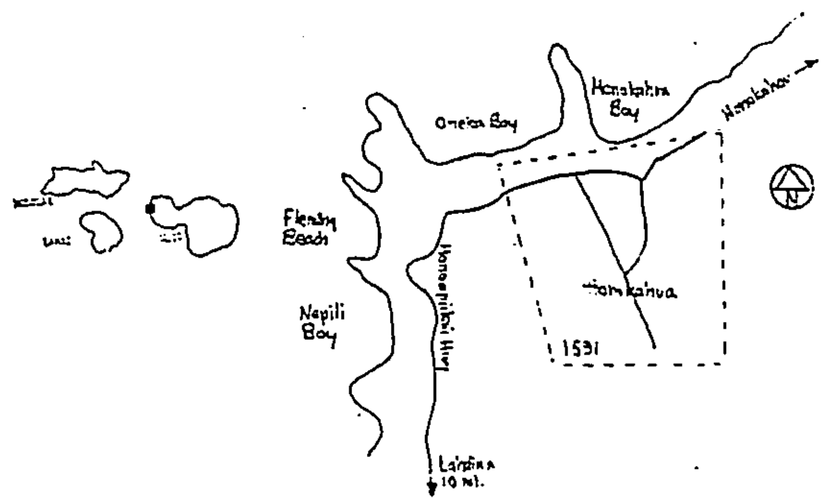
Features within the district - continued:

6. There are two churches in Honokahua. One is the Sacred Hearts Catholic Church, built circa 1925. It is a wooden church with a gable roof and ornamental barge-board on the main gable as well as the entrance gable. A tall, well proportioned spire is located on the side of the altar end. An arched ceiling sits above the altar and applied moulding on the interior provides a design pattern.

The Honokahua Congregational Church was a company clubhouse, which was converted to a church in 1964. The shingled one-story structure has a gable roof and separate enclosed gable entrance. A small belfry is located above. Windows are double hung four-light. The pastor is Rev. John Kukahike, who moved to Honokahua in 1905 and was a 1910 graduate of Lahainaluna High School and got his certification from the Hawaiian Board of Missions.

20-21-22 N	20-21-30 N	20-59-50 N	20-59-42 N
156-39-43 W	156-39-09 W	156-39-32 W	156-39-00 W

(powerhouse location: 20-59-02 N 156-38-10 W)



DOCUMENT CAPTURED AS RECEIVED

VIII. APPENDIX B: Photo Appendix

Figure 17 Honokahua Valley; site 50-50-01-4459 is on the west bank (the right side of the streambed in this photo). A minor flash-flood is filling the stream.

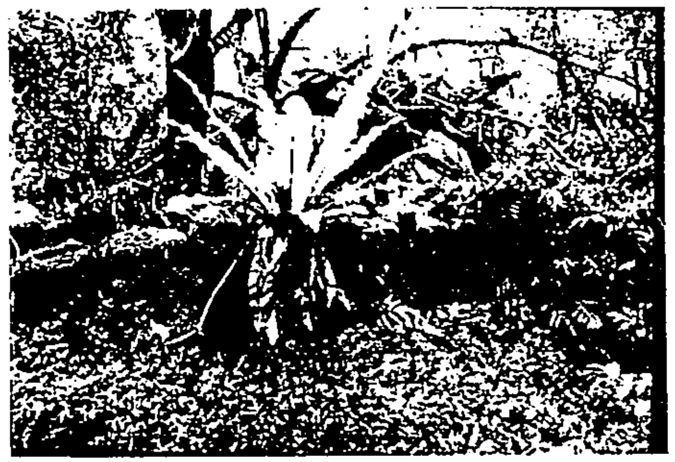


Figure 18 A portion of the wall comprising site 50-50-01-4459.

DOCUMENT CAPTURED AS RECEIVED

Figure 20 Site 50-50-01-4460. View to *Mauka*, or South. The overhang shelter is at the right. Note the small rounded boulder at the wall base.

Figure 19 Site 50-50-01-4460. View to *makai*, or north. Note the small boulder alignment at the threshold of the overhang.

Figure 21 Site 50-50-01-4460. South end of the shelter-cave floor prior to excavation of a 50 by 50 centimeter square test unit.

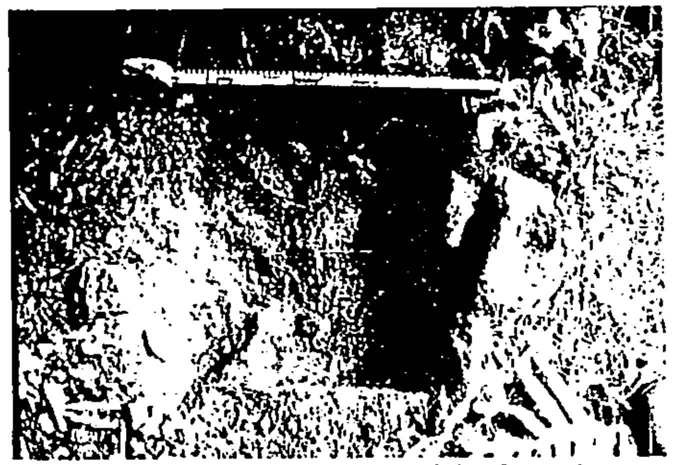


Figure 22 Site 50-50-01-4460. The test unit at completion of excavation.

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Figure 23 Site 50-50-01-4461. View of the *mauka*, or south, end of the boundary wall. The terrace platform is at left center of the photograph. The large boulder at the right is talus.

Figure 24 Site 50-50-01-4461. Detail of the terrace platform retaining wall.

Figure 25 Site 50-50-01-4461. The terraced platform surface prior to excavation of the test unit. The small boulders are primarily talus from the cliff rising at the back edge of the pavement.

Figure 26 Site 50-50-01-4461. View of the west profile of the test unit following excavation to the large, talus-boulder substrate at about sixty centimeters depth.

DOCUMENT CAPTURED AS RECEIVED

Figure 29 Three-part wide angle view of the Honokahua Plantation Cemetery 50-50-01-4462. Other graves were observed over the hill crest at the left.

Figure 27 This columnar, or block lava outcropping at site 50-50-01-4461 carries a petroglyph (feature B) of anthropomorphic form on the north-facing surface. The petroglyph is the white blur left of the upper end of the scale.

Figure 28 Site 50-50-01-4461 feature B. Close-up of petroglyph (just left of the center of the photograph).

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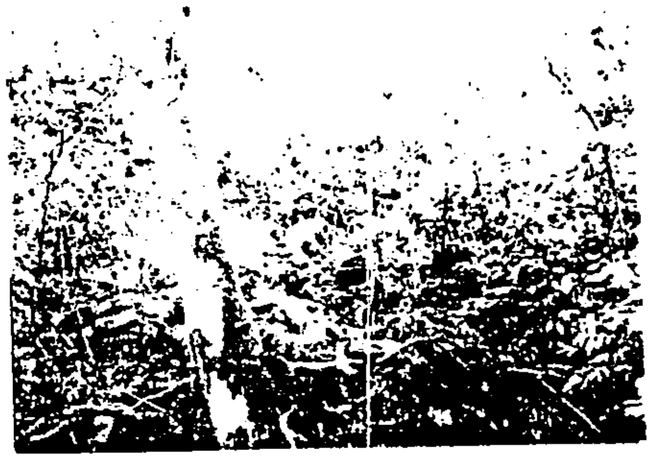


Figure 30 Site 50-50-01-4463. This wall, running across the ridge crest between the two stream drainages, is in a poor state of preservation.

Figure 31 Site 50-50-01-4463. This wall, running along the contour on the east side of the site, has a few sections that are well preserved.

Figure 32 Site 50-50-01-4465. The reservoir from its *mauka*, end, facing north. The grass-covered dam, created by the plantation road, is in the background.

Figure 33 A view of the *mauka* end of the reservoir feature of site 50-50-01-4465. The streambed is the reservoir in-flow creating a small plunge pool here.

IX. APPENDIX C: Testing Results Catalogs

Artifact Catalog: State Site # 4460

Acc #	Trench	Stratum	Depth (cm.)	Pieces	Length	Width	Thickness	Weight	Material	Function
			(cm.)		(cm.)	(cm.)	(cm.)	(gms.)		
1	1	I	0-10	2	1.9/2.7	1.0/2.0	0.3/0.2	3	Basalt	flakes
2	1	I	0-10	1	2.1/1.8	1.3/1.5	0.9/1.0	6	Basalt	manuport water-rounded pebbles
3	1	II	15-20	1	2.6	1.8	0.2	1.9	Basalt	flake

Midden Catalog

State Site	4460	4460	4460
Trench/Feature	1	1	1
Depth (cm.)/Stratum	0-10/I	10-15/II	15-20/II
Cellana sp.		0.4	
Cypraea caputserpentis		1.2	
Littorina pinctada	1.3	5.4	0.3
Nerita picea		0.5	
Thaididae sp.	0.1		
Unidentified/misc. shell		0.3	0.7
Echinoderm	0.2	0.2	
Bone			0.3
Kukui nut	9.3	4.1	
Total midden	10.9	12.1	1.3

Charcoal Samples Catalog

Acc #	State Site	Trench	Feature	Stratum	Depth (cm.)	Weight (gms.)	Description
C-1	4460	1		I	0-10	9.7	Small to medium charcoal flecks
C-2	4460	1		II	10-15	10.2	Small to large charcoal flecks
C-3	4460	1	Ash lens	I	12-15	28.5	Small charcoal flecks
*C-4	4460	1		II	15-20	33.2	Small to medium charcoal flecks
C-5	4461	1		II	32-35	9.2	Small to medium charcoal flecks

* = 16 grams of sample sent to Beta Analytic for dating analysis

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD

UNIVERSITY BRANCH
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305/667-5167 FAX: 305/663-0964
E-MAIL: beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

FOR: Dr. Hallett H. Hammatt
Cultural Surveys Hawaii

DATE RECEIVED: October 24, 1997
DATE REPORTED: November 18, 1997

Sample Data	Measured C14 Age	C13/C12 Ratio	Conventional C14 Age (*)
Beta-110757	60 +/- 60 BP	-23.6 o/oo	0 +/- 60 BP

SAMPLE #: KAPA 7
ANALYSIS: radiometric-standard
MATERIAL/PRETREATMENT:(charred material): acid/alkali/acid

NOTE: It is important to read the calendar calibration information and to use the calendar calibrated results (reported separately) when interpreting these results in AD/BC terms.

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.) By international convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years) Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

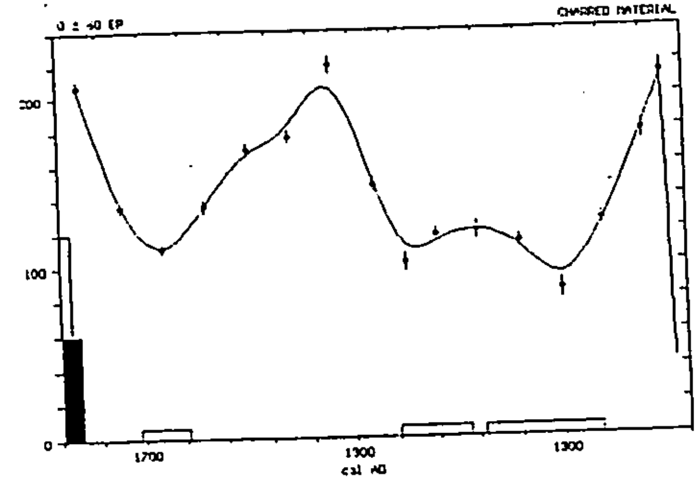
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables:C13/C12=-28.6:lab mult.=1)

Laboratory Number:	Beta-110757
Conventional radiocarbon age:	0 ± 60 BP
Calibrated results: (2 sigma, 95% probability)	cal AD 1700 to 1720 and cal AD 1820 to 1855 and cal AD 1860 to 1920

Intercept data:

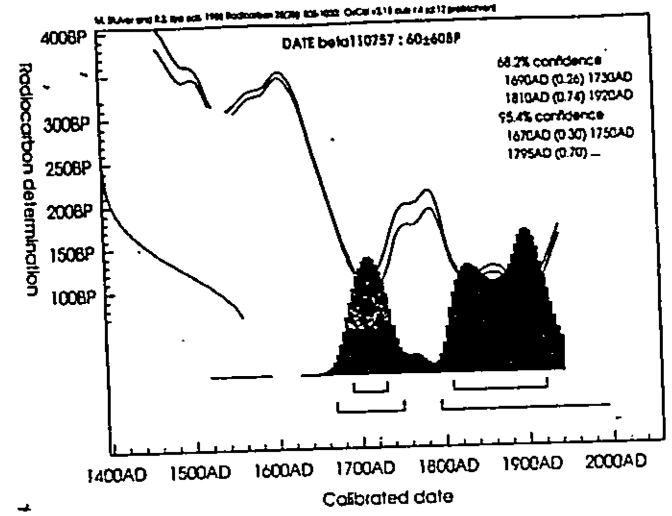
Intercepts of radiocarbon age with calibration curve:	NO INTERCEPTS
1 sigma calibrated result:	NO INTERCEPTS



References:
Pretoria Calibration Curve for Short Lived Samples
Vogel, J. C., Fels, A., Visser, E. and Becker, B., 1993, Radiocarbon 35(1), p73-86
A Simplified Approach to Calibrating C14 Dates
Talma, A. S. and Vogel, J. C., 1993, Radiocarbon 35(2), p317-322
Calibration - 1993
Stuiver, M., Long, A., Kra, R. S. and Devine, J. M., 1993, Radiocarbon 35(1)

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 ▪ Tel: (305)667-5167 ▪ Fax: (305)663-0964 ▪ E-mail: beta@radiocarbon.com



HARCOAL SAMPLES CATALOG

:ULTURAL SURVEYS HAWAII
'roject: Kapalua Inventory Survey

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Depth (cm)	Weight (gms)	[illegible] Description [illegible]
C-1	4460	1		I	0-10	9.7	Small to medium charcoal flecks
C-2	4460	1		II	10-15	102	Small to large charcoal flecks
C-3	4460	1	Ash lens	I	12-15	28.5	Small charcoal flecks
*C-4	4460	1		II	15-20	33.2	Small to medium charcoal flecks
C-5	4461	1		II	32-35	9.2	Small to medium charcoal flecks

* 16 grams of sample sent to Beta Analytic for dating analysis

Appendix J-2

Archaeological Survey
(Xamanek Researches 2002)

R

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

July 30, 2002

Mr. Erik Fredericksen
Xamanek Researches
P O Box 880131
Pukalani, Hawai'i 96788

LOG NO: 30421 ✓
DOC NO: 0207MK04

Dear Mr. Fredericksen:

Subject: **Chapter 6E- Historic Preservation Review – Revised Archaeological Inventory Survey Report, 475 Acres in Kapalua District 2 Project Area**
Napili and Honokahua Ahupua'a, Lahaina District, Maui
TMK (2) 4-2-01:por 1

This letter reviews this revised report which was sent to our office on 30 May 2002 (E. Fredericksen & D. Fredericksen 2002. Archaeological Inventory Survey of 475 Acres in Kapalua District 2 Project Area, Located in Napili and Honokahu Ahupua'a, Lahaina District, Maui Island. Xamanek Researches ms.) along with a fax of July 25, 2002, clarifying site counts in the significance section. The revisions were in response to our review letter of March 2002 (SHPD Log 29526, Doc. 0203MK05) and our fax of July 15, 2002.

The site interpretations have been clarified as per our comments. In addition, the summary and conclusions have been revised to include a discussion and maps indicating the distribution of various site types in the two gulches Thirty-nine historic sites are present in the project area.

We concur with the significance evaluations that 26 sites are significant solely under Criterion "d" of the Federal and State historic preservation guidelines, and we agree that one of these sites (5161, an animal containment wall) is "no longer significant" as a reasonable and adequate amount of its significant information was recorded during the survey. Thirteen sites are significant under multiple criteria. [Sites 5139, 5142, 5157, and 5158 contain possible burial features] Thus, 38 significant historic sites are present in the project area

We also agree with the mitigation commitments for the 38 sites as indicated in the report. All but one site will be passively preserved Site 5132 (a bridge foundation) has suffered damage and no longer retains integrity. No mitigation is needed for this site, and it needs no further protection.

The next step in the review process is to go to the Maui/Lanai Islands Burial Council for a vote on treatment. Sites with burial components will need a burial preservation plan submitted to our Burials Program and the Maui/Lanai Islands Burial Council for consideration. Non-burial sites will need a simple preservation plan to be reviewed and approved by our Archaeology Branch.

The revised report is acceptable. If you have any questions, please contact Dr. Melissa Kirkendall at 243-5169.

Aloha,

Don Hibbard, Administrator
State Historic Preservation Division

MK:jk

c: John Min, Director, Department of Planning, County of Maui, FAX 270-7634
Bert Ratte, County of Maui, Land Use and Codes, FAX 270-7972
Glen Ueno, County of Maui, Land Use and Codes, FAX 270-7972

4-2-01, por 1

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING, ROOM 555
601 KAMOKILA BOULEVARD
KAPOLEI, HAWAII 96707

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CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND
STATE PARKS

April 1, 2002

Mr. Erik Fredericksen
Xamanek Researches
P.O. Box 880131
Pukalani, Maui, Hawai'i 96788

LOG NO: 29520
DOC NO: 0203MK05

Dear Mr. Fredericksen,

SUBJECT: Chapter 6E Historic Preservation Review, Archaeological Inventory Survey
475 Acres in Kapalua District II Project Area
Napili and Honokahua Ahupua'a, Lahaina District, Maui Island
TMK (2) 4-2-01: por 1

Thank you for the opportunity to review the report received by our office on January 15, 2002, (Fredericksen and Fredericksen 2001, *Archaeological Inventory Survey of 475 Acres in Kapalua District 2 Project Area, Located in Napili and Honokahua Ahupua'a, Lahaina District, Maui Island, TMK 4-2-01: por 1*...Xamanek ms.). We apologize for the delay in our review.

The background section acceptably describes the ahupua'a settlement pattern, including pre-contact distribution and post-contact land uses. (Note: page 4, paragraph 1, quote from Kamakau, Mahoma should read Kahoma.)

We find that the survey has adequately covered the project area, documenting 37 historic properties. The site descriptions are acceptable. However, the interpretations need some clarifications before we can find them to be acceptable. Also, the summary section of the report needs to be revised and amplified to more fully interpret the sites. Please see the attachment for details. Twenty-eight of the sites are pre-European or early 1800s sites (most appearing to be agricultural and temporary habitations). The remaining 9 sites are ranch or plantation era sites.

Until these interpretation concerns are resolved, we are unable to evaluate the significance evaluations and mitigation recommendations. However, we do make some comments on those in the attachment.

We will await the revised report. As always, if you disagree with our comments or have any questions, please contact Dr. Melissa Kirkendall (Maui/Lana'i SHPD 243-5169) as soon as possible to resolve these concerns.

Aloha,

Don Hibbard, Administrator
State Historic Preservation Division

MK:jen

c: John Min, Director, Department of Planning, County of Maui, FAX 270-7634
Bert Ratte, County of Maui, Land Use and Codes, FAX 270-7972
Glen Ueno, County of Maui, Land Use and Codes, FAX 270-7972

APR -4 2002

Attachment

Archaeological Inventory Survey of 475 Acres in Kapalua District 2 Project Area, Located in Napili and Honokahua Ahupua'a, Lahaina District, Maui Island, TMK 4-2-01: por 1

Xamanek

Site Inventory – Site Descriptions, Interpretations and Chronology

Our concerns are only with site interpretations.

1. pp. 21-22, Site 5130. Why are you concluding that this site is ceremonial? What archaeological traits argue for this? What kind of ceremonial site do you believe it is (large heiau, shrine, etc.)? What is the age of this site, based on current evidence.
2. Pp. 32-36, Site 5136. Why are you concluding that this site is agricultural? What archaeological traits argue for this? We are assuming that probably a soil area is behind the feature's stonework, but it needs to be stated. Also, are you concluding this is a dryland field or an irrigated field? These points on agricultural sites are repeated throughout the paper. Please go through the report and clarify these points for the relevant agricultural interpretations – e.g., pp. 43 (Site 5139), p. 53 (Site 5144), p. 65 (Site 5151), p. 69 (Site 5154), etc.
3. P. 47, Site 5140. We assume that you are using the term "habitation" to refer to "permanent habitation". You need to make this clear somewhere, either at the start of the findings, or in each site description. Why do you conclude that this is a permanent habitation? What archaeological evidence supports this? Also, here, and elsewhere throughout the report, you state the site is pre-contact and possibly post-contact in age. We assume that you are assuming that the site may have been occupied into the late 1700s and very early 1800s as trade goods were not widely distributed until after that time. But, you need to clarify somewhere what you mean, maybe at the start of the site descriptions.
4. P. 48, Site 5141. Why do you think that this is a burial site? What archaeological traits indicate it might be a burial? Typically, a small stone pile with an upright is interpreted as a small shrine (like a pohaku o Kane in the inland agricultural areas). This typical interpretation is based on historical documents noting uprights and small platform or mound associated with such shrines.
5. P. 49, Site 5142. Why do you interpret this as a possible burial cave when no skeletal remains were seen?
6. P. 62, site 5149. Don't you mean to interpret this as a temporary habitation?
7. P. 67-68. What possibilities of function might exist for Features A and D?
8. P. 70, Site 5155. We agree with the religious conclusion. But what type of religious site is this likely to be – perhaps an agricultural shrine, or a family shrine?
9. P. 73, Site 5156. Is this interpreted as a permanent habitation? What archaeological evidence leads you to this conclusion? Is the agricultural site dryland or irrigated?
10. P. 78, Site 5157. Why are you concluding this is a burial? What evidence is there for this conclusion?
11. P. 76-81, Site 5158. Why is Feature C interpreted as a possible burial? Similarly, why is Feature F interpreted as a possible burial? What is Feature A interpreted to be, and what evidence? Note also, page 81 says this site is agricultural, but the interpretations at present note two possible burials. Be sure to resolve this after interpretations are justified.
12. Summary and Conclusions
    a. Please revise the summary to discuss the distribution, within the gulches, of various site type categories. Several potential questions arise when examining the data from the project.
    b. Do the various gulches exhibit a similar site pattern distribution?
    c. What is the proximity/relationship between agricultural and habitation sites? Note here the differences in dryland vs. irrigated agriculture.
    d. In terms of site type categories, what is the variability in terms of mauka/makai distribution?
    e. Do the radiocarbon dates tell you about occupation of upper valleys? For example as you have dates for agricultural sites and temporary habitations, are those dates more recent farther back in the valleys?

The preparation of different maps or overlays based on the site type categories might facilitate examination in this manner, and allow for a better synthesis of the volume of data collected during this inventory survey.

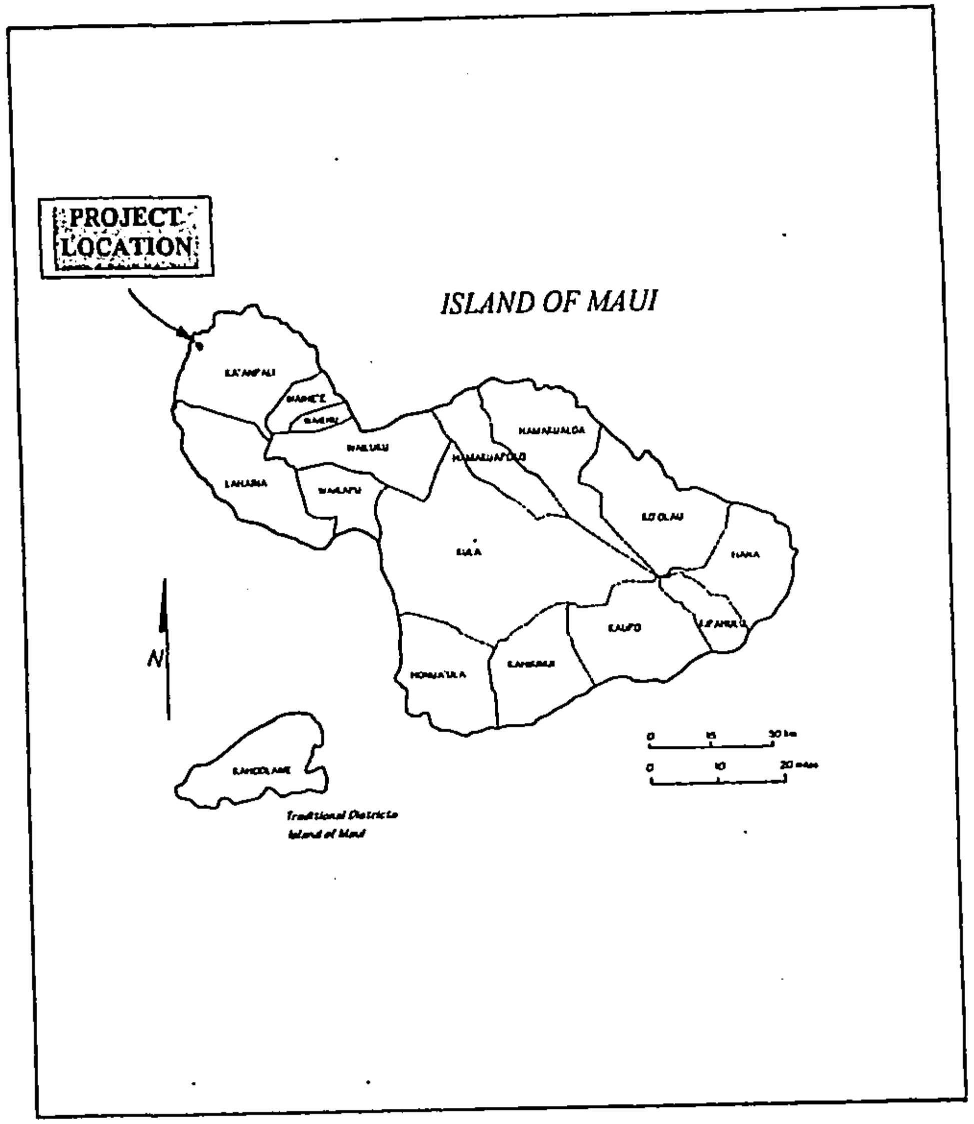
Significance Evaluations

If the burials and religious (ceremonial) features are acceptably justified, then we plan on agreeing with the significance evaluations. One site, a ranch wall (5161), will be no longer significant, as an adequate and reasonable amount of its significant information was recorded during the survey. The other 38 sites will be significant –solely for their information content or under multiple criteria.

Mitigation Commitments

Regardless of the significance evaluations, we will be able to agree with the mitigation recommendations indicated in Table 7 that all but two sites will be passively preserved. Sites 5132 (bridge foundation) and 5161 (animal containment wall) have been severely damaged and no longer retain their integrity, and we agree that they will need no mitigation or protection. However, again, significance evaluations will be important in regard to burials. If justifications for burial interpretations cannot be given and some features are not considered to be burials, then certain sites might not go to the Burial Council. Clearly, this needs to be resolved in the survey report revisions.

[illegible] ARCHAEOLOGICAL INVENTORY SURVEY OF [illegible]
[illegible] ACRES [illegible] DISTRICT PROJECT AREA
LOCATED IN [illegible] HONOKAHUA [illegible]
[illegible] DISTRICT
[illegible] MAUI ISLAND [illegible]
(TMK: [illegible])



Prepared by:
Erik M. Fredericksen
Demaris L. Fredericksen

Xamanek Researches
Pukalani, Maui

September 30, 2001
(Revised May 28, 2002)

ABSTRACT

Xamanek Researches carried out an archaeological inventory survey on a c. 475-acre parcel of land on West Maui during the summer of 2001. The project area includes portions of land in Honokahua and Napili 2 & 3 *Ahupua'a*, Lahaina District, Island of Maui (TMK 4-2-01:01). The project area includes active and abandoned pineapple fields and portions of Honokahua, Napili and Mokupea Gulches.

A total of 37 previously unidentified sites were located during this archaeological inventory survey. These sites were assigned SIHP No. 50-50-01-5127 through 5163. In addition further information was gathered on a previously identified rock wall (Site 4459) and an exposed portion of Honolua Ditch (Site 1591) was photographed. The site types found during this inventory survey include single and multiple component agricultural sites including terraces, temporary and more permanent habitation areas, possible ceremonial areas, possible burial features, and ranch era and plantation era sites.

A total of 26 sites (Sites 5127, 5128, 5129, 5131, 5133, 5135, 5136, 5137, 5140, 5143, 5144-5150, 5151-5154, 5159, 5160, 5161, 5162, and 4459) are considered significant for their information content only under Criterion "d" of the Federal and State historic preservation guidelines. These sites consist of temporary habitation rock shelters, smaller agricultural complexes, and ranch and plantation era sites. Several sites were tested and six charcoal samples were submitted for analysis. Two of the 6 radiocarbon samples came from excavations at the Site 5133 and Site 5145 rock shelters. The Site 5133 results suggest usage into recent times, while the Site 5145 results suggest late precontact to early post-contact usage. Four radiocarbon samples came from excavations at agricultural Sites 5139, 5140, 5156 and 5158. The returned dates ranged from the mid-fifteenth century to more recent times.

Of the above 26 sites, one is considered no longer significant because it has yielded an adequate amount of information (Site 5161). No further archaeological work is needed for altered the ranch era wall in Mokupea Gulch. Six historic properties—Sites 5146, 5147, 5150, 5152, 5159 and 4459—are rock walls in Honokahua Gulch that were likely built in post-contact times. While these walls could be potentially considered no longer significant in other situations, they are part of the relatively well-preserved cultural landscape that lies within Honokahua Gulch and should be preserved.

Twelve sites are considered to be significant under multiple significance criteria. Criteria "c" and "d" sites include Sites 5138 and 5139. Both of these complexes are excellent examples of surviving agricultural sites in Honokahua Gulch. The bridge sites in Napili Gulch—Sites 5132 and 5163—are also considered significant under Criteria "c" and "d". Site 5163 is an excellent example of a remnant of the plantation era transportation system. Site 5134—a plantation era water intake—likely qualifies under Criterion "a", because of its probable association with Honolua Ditch (Site 1591). Eight sites qualify for significance under Criterion "e" because of possible burial and/or ceremonial functions. The 4 sites thought to contain possible burial features include Sites 5141, 5142, 5157 and 5158. Sites 5130, 5132, 5155, and 5156 are considered to have potential ceremonial significance. The Site 5138 complex includes habitation and possible ceremonial features. This site is in good overall condition and likely qualifies for significance under Criterion "c" as well as Criteria "d" and "e".

All of the sites mentioned above lie in drainage areas. No significant material culture remains were found in the surrounding pineapple fields that have been cultivated for decades. Kapalua Land Company, Ltd. has agreed to place all sites in the gulch areas in "as is" preservation. Consequently no further work beyond the inventory level is recommended, other than the preparation of a preservation plan for the project area.

Table of Contents

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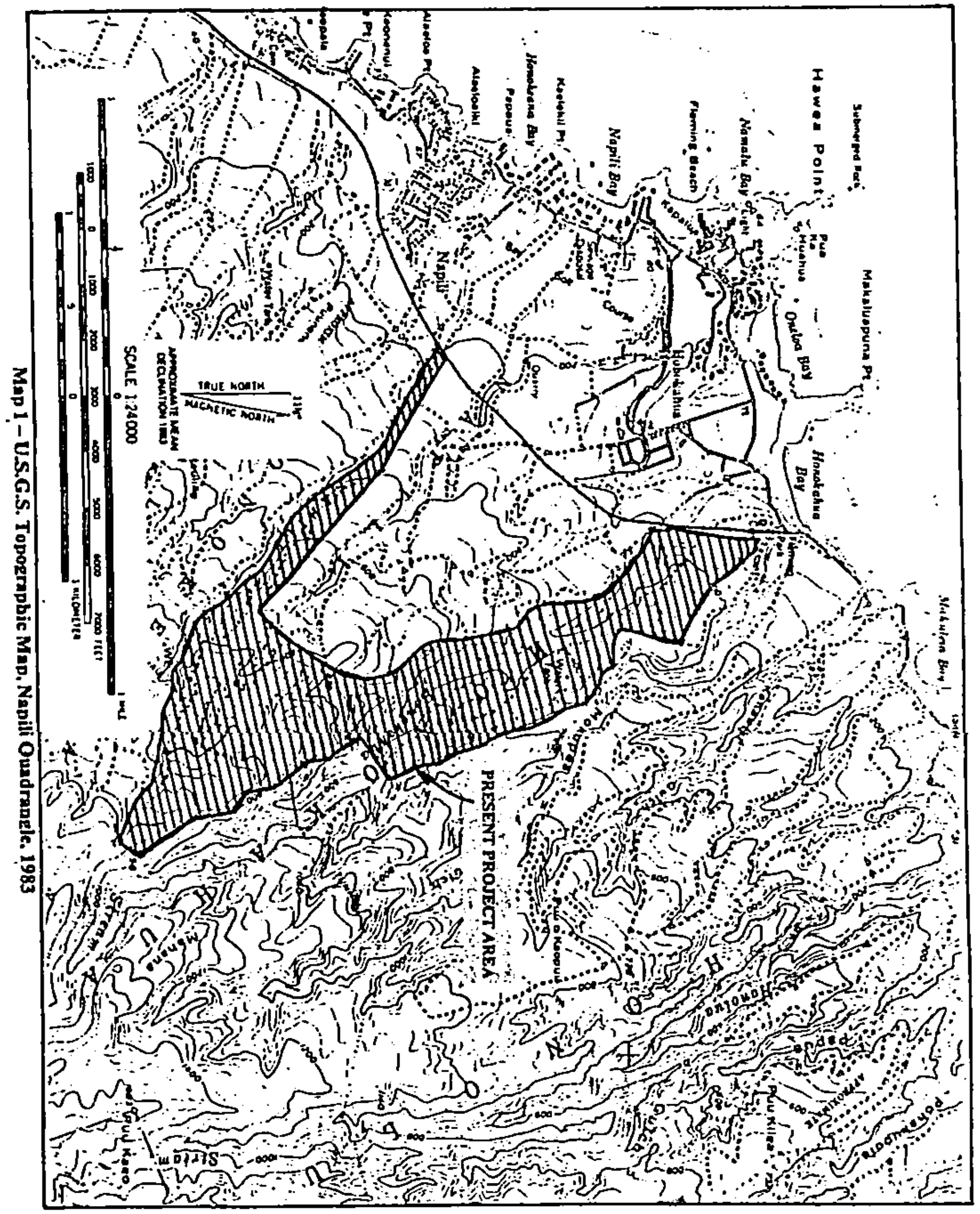
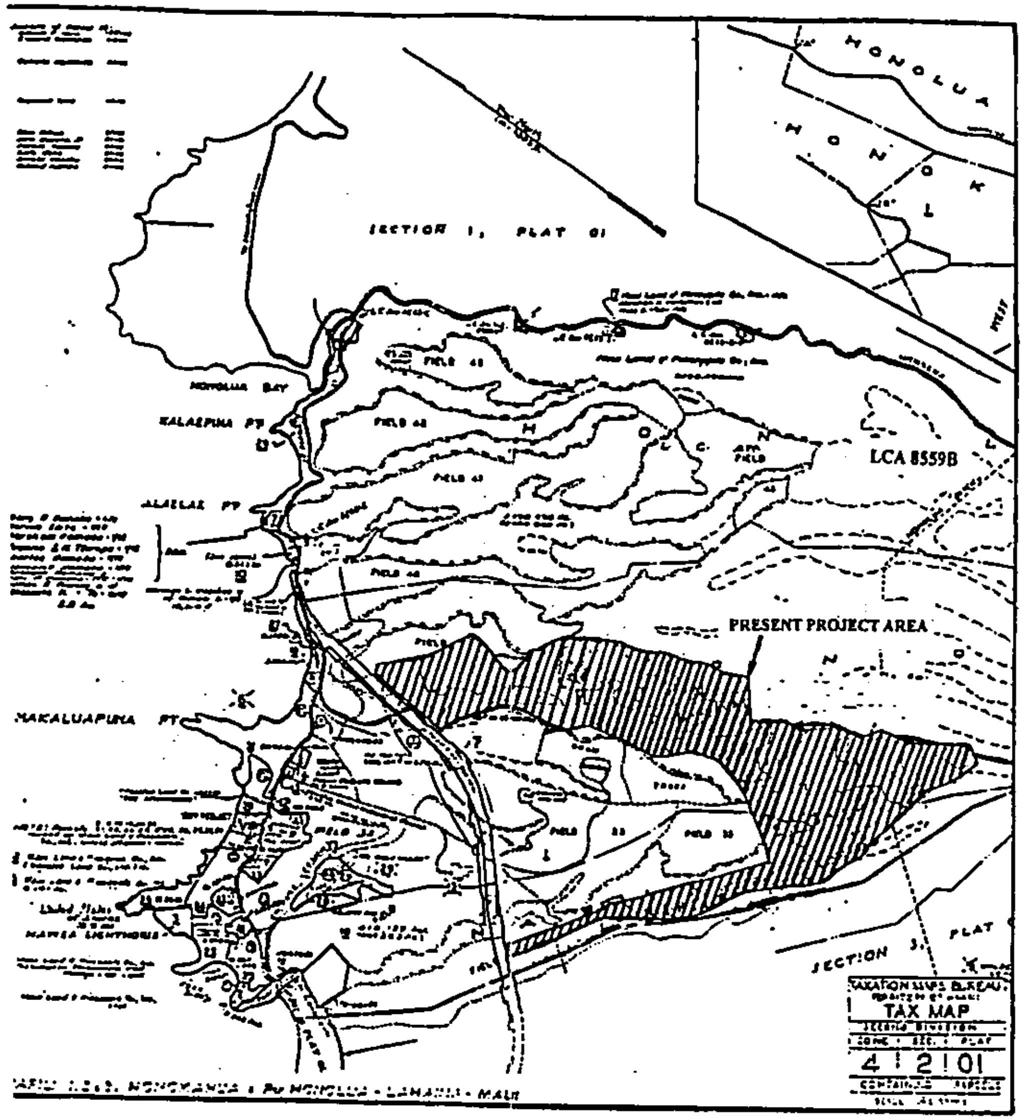


Map 1 – U.S.G.S. Topographic Map, Napili Quadrangle, 1983



Map 2 – Zone 4, Section 1, Plat 01, State of Hawaii, Tax Map Bureau.

INTRODUCTION

Mr. Robert McNatt, Vice President of Development, Kapalua Land Company, Ltd., contacted Xamanek Researches in the early Spring of 2001 regarding what work might be required for a c. 475-acre portion of land in Kapalua, Maui. This land unit forms the proposed expansion Project District 2, when and if the community plan is changed. The original Project District 2 area consists of 450 acres with the existing community plan allowing for the development of 750 residential units. Kapalua Land Company Ltd. is proposing an expansion to c. 925 acres with a reduction in density to 690 units. This proposed community plan amendment necessitates an Environmental Impact Statement (EIS). It was subsequently determined that an archaeological inventory survey would be needed for the expanded 475-acre portion of the Project District 2 area.[1] We were asked to submit a proposal and were subsequently contracted to carry out the archaeological inventory survey on the 475-acre portion of the expanded Project District 2.

The expanded project area is comprised of land owned by Maui Pineapple Company, Ltd. This 475-acre study area lies *mauka* (east) of Honoapi'ilani Highway and includes portions of Honokahua and Napili Gulches as well as the land between them along with some land between Honokahua and Mokupea Gulches (Map 3). Much of the land outside of the gulches has been in pineapple production for several decades. However, the majority of the gulch areas have not been impacted by pineapple cultivation.

The project area lies in portions of Honokahua and Napili 2 & 3 *Ahupua'a*, Lahaina District, Maui (TMK 4-2-01:01). This report presents the inventory survey level results for the 475-acre portion of the expanded Project District 2.

ACKNOWLEDGEMENTS

Xamanek Researches wishes to thank Mr. Robert McNatt, Mr. Ryan Churchill, and Ms. Debi Mahon of Kapalua Land Company, Ltd. for their cooperation and understanding in working towards the successful completion of this project.

[1] Cultural Surveys Hawaii, Inc. conducted an inventory survey on the original 450 acre portion of Project District 2 in 1998.

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Study Parcel

The study area consists of approximately 475 acres, on the northwest portion of West Maui, in the district of Lahaina. This region receives between 40 and 60 inches of rain annually, and is generally subject to trade winds. Temperatures are fairly constant throughout the year.

Soil associations within the project area are Waiakoa-Keahua-Molokai, which are described as moderately deep to deep, relatively level, well-drained moderately fine subsoil on low uplands (Foote et al., 1972). On the uplands between gulches or drainage features, the soils are of the Kahana Series (KbB, KbC, and KbD). The gulches are characterized as rough, broken land (rRR) that consists of very steep land broken by numerous intermittent drainage channels. In most places it is not stony—local relief can be from 25 to as much as 500 feet. Runoff is rapid, and geologic erosion is active. Small areas of rock outcrop, stones, and soil slips are not unusual—weathered rock fragments are commonly mixed with the soil material (Ibid., p. 119).

The vegetation on the upland areas has been completely altered by commercial pineapple cultivation—some fields are still active. Considerable alteration of the natural sequence of vegetation has also occurred in the valleys, where alien species, such as *koa haole* (Leucaena glauca), natal grass, buffelgrass, Christmas berry trees (Schinus terebinthifolius), Java plum (Eugenia cuminii), eucalyptus, ironwood trees, and Formosan *koa* (Acacia confusa) dominate. Remnants of Hawaiian cultigens also occur, such as *noni* (Morinda citrifolia), *kukui* nut trees (Aleurites moluccana), *ki* (Cordyline fruticosa), *hala* (Pandanus tectorius), as well as more recent introductions like coffee and guava shrubs, rose apple trees (Eugenia jambos), and mango trees. Several species of fern were found in wetter areas—some growing out of rock archaeological features, while *laua'e* ferns (Phymatosorus scolopendria) blanketed the ground in other portions.

The project area extends *mauka* (east) of Honoapi'ilani Highway, and north of Plantation Estates at Kapalua. The northern boundary of the project area includes a small portion of Mokupea Gulch, and the ridge between this gulch and Honokahua Gulch. The southern border essentially runs along the bottom of Napili Gulch. The ridges between these drainage features have been under cultivation for decades, and cattle ranching was extensive prior to this.

BACKGROUND HISTORICAL INFORMATION

Precontact and early post-contact times

The study region is situated to the north of Lahaina. There are five large valleys in this western portion of the West Maui Mountains. They are Honokawai, Kahana, Honokahua, Honolua, and Honokohau. Handy and Handy (1972, pg. 494) note:

"The first four all had extensive lo'i lands in their valley bottoms, where terraces rose tier on tier in symmetrical stone-faced lo'i. On this part of the coast there is no sloping kula land seaward of the valleys as there is back of Lahaina and southeastward. Honokohau in particular, which is watered by a large rivulet flowing from far back in the mountains, had the most extensive system of lo'i along this coast."

There was not as large a population in this part of Maui, as was present on the windward side of West Maui. However, there were five valley agricultural systems that no doubt supplied much of the food required by a fair-sized population, which lived in clusters at the mouths of them. These were linked together by the "*ala loa*" (long path)—a trail system which was said to have been built by Kiha-a-Pi'ilani, son of Pi'ilani, in the early 1500s. Walker (1931, p. 301) notes:

"The north end of West Maui also is traversed by a paved trail. Sections of it can be seen from Honolua to Honokohau and Kahakuloa. It is paved with beach rocks and has a width of four to six feet. Disregarding elevations and depressions it takes the shortest route between two points that is possible for foot travel. This trail is also spoken of as the Kihapiilani Trail."

According to Martha R. Fleming (1933, p. 3-9), as reported in Handy and Handy (1972), much of the *Alaloa* had been covered or obliterated during the course of road building in the late 19th and early 20th century. The route of the present Honoapi'ilani Highway probably covers this ancient feature in some portions of the project area.

The traditional district or *moku* of Ka'anapali was the location of one of the encounters between chiefs of Maui and the Island of Hawaii, as they struggled for ascendancy. Samuel Kamakau (1992, p. 74) tells about the conflict that took place in 1738, after an entire year of preparation by the Big Island chief Alapa'i. He states:

"What was this war like? It employed the unusual method in warfare of drying up

the streams of Kaua'ula, Kanaha, and Kahoma (which is the stream near Lahainaluna). The wet taro patches and the brooks were dried up so that there was no food for the forces of Ka-uhi or for the country people. Alapa'i's men kept close watch over the brooks of Olowalu, Ukumehame, Wailuku and Honokawai. When Pele-io-holani[2] heard that Alapa'i was at Lahaina he gathered all his forces at Honokahua and at Honolua. At Honokawai an engagement took ploace between the two armies and the forces of Alapa'i were slaughtered and fled to Keawawa. There Alapa'i heard that Pele-io-holani had landed at Honokahua and had an army stationed at Keawawa, and he disposed his forces, some on sea and some on land. Although Pele-io-holani had but 640 men against Alapa'i's 8,440 from the six districts of Hawaii, there were among them some famous warriors. ...Pele-oi-holani intended to unite his forces with those of Ka-uhi, but Alapa'i's men held Lahaina from Ukumehame to Mala on the north...Pele-oi-holani was surrounded on all sides, mauka and makai, by the forces of Alapa'i.... The two ruling chiefs met there again, face to face, to end the war and become friends again, so great had been the slaughter on both sides...."

Early Post-contact

In the late 18th or early 19th century, Kamehameha I gave the entire *ahupua'a* of Honokahua to Isaac Davis, in return for his help in Kamehameha's wars of conquest. Davis, along with another Englishman named John Young, had been "detained" by Kamehameha. Davis' ship, the Fair American, had been captured and all aboard except him had been killed. Young was kept ashore until his ship, the Eleanora departed without him. Both men were treated so well by Kamehameha that they were quite willing to remain with him, and acted as his advisors while he consolidated his power within the islands. In return for their counsel, Kamehameha gave both men large tracts of land in northwest Maui (Silva, 1986).

Upon the sudden death of Isaac Davis in 1810, his large land holdings were turned over to John Young to manage—in fact Young even adopted several of Davis's youngest children. When he died in 1835, the land was divided among both Young's and Davis's heirs. During the Mahele in 1848, a formal 2,650-acre grant—the entire *ahupua'a* of Honokahua—was awarded formally to Davis' daughter, Kale (Sally) Davis (LCA 8522B, RP 2236), who was then the wife of Alexander Adams, another favorite of Kamehameha I. The only notation in the Native Register (710v3) was "Title to be quieted." Signed L. P. KALAMA, Secretary, Palace 12 February 1848.

Also during the Mahele, the entire *ahupua'a* of Napili comprising of 603 acres was awarded to L. Konia, a granddaughter of Kamehameha I by Kamehameha III (LCA 5524). Other *ahupua'a* in Ka'anapali awarded to Konia were Honokeana, Alaeloa, and Mailepai to the south.[3]

[2] Pele-io-holani was chief of Oahu, and an ally of Ka-uhi, a son of Ke'kaulike. Another name for Ka-uhi is Ka'uhi-pu-mai-ka-hoaka—Ka-uhi-covered-by-the-shadow-of-the-cresent-moon (Kamakau, p. 73).

[3] Laura Konia was a granddaughter of Kamehameha I, and the wife of Abner Paki, and the mother of Bernice Pauahi Bishop (Day, 1984, p. 80). In a manuscript dated c. 1972, Inez Ashdown states that "The Hui Lands of Maile-pai, Kahana, Kahua, Kahana-iole, Pohale, Mahinahina, Honokowai and up to the gulches of Papa-na-hoa and Nuku-nuku-apua'a, beyond Honkohau and including the 'Ahupua'a of Honolua, all belonged to Konia. Konia, in turn, before her death on

A census taken in 1831 estimated the entire population of Ka'anapali at 8.5% of the island total of 35,062—about 2,980 (Schmitt, 1973, p. 18). By 1836, it had dropped to about 5.5% of the island total—1,341 (Ibid., p. 38).

There were no kuleana awards in the present project area.

Post-1850s—Honolua Ranch and Pineapple eras

The population of West Maui was on the decline in the second half of the 19th century. The Pacific whaling industry which had fueled the Hawaiian economy since the 1840s, prompted by the discovery of oil in Pennsylvania a decade or so earlier, collapsed in the 1860s. Those who had worked in the support occupations for supplying whaling ships since the 1840s had to look elsewhere for their livelihood.

In Lahaina, sugar production was developing, while to the north in Ka'anapali district, other options such as ranching and cultivation of different commercial crops began to emerge. These included coffee and pineapples.

The Reverend Dwight Baldwin, who arrived in Hawaii in 1831, was stationed in Lahaina from 1835 to 1870. He was granted 2675 acres on land in northwest Maui, which provided the basis for new enterprises undertaken by his son, Henry Perrine Baldwin. In 1890, he visited Honolua. Here he met with Richard C. Searle and his wife—a Hawaiian Chiefess, who was a descendent of the Kamehameha, Konia, Lunalilo, Davis and Young families. The families lived there in the "old style" raising cattle and horses, raising *taro* in Honokohau, and fishing along the coast (Ashdown, 1972).

The lands of Kale Davis became part of the Campbell Estate in the later part of the 19th century. Honolua Ranch was established, and pioneered cattle production in the area. Baldwin saw an opportunity for putting lands into more lucrative production, and around 1892 began leasing the Campbell lands, including Honolua Ranch. Richard Searle was hired as manager and continued the ranching activities and initiated coffee production. The coffee venture proved unprofitable, and was soon terminated. Eventually, Baldwin acquired the Campbell-Damon holdings in Honolua and Honokahau, and the lands of various families including descendants of Kale Davis and James Young Kanehoa (Ibid.).

Following Baldwin's death in 1911, David T. Fleming became manager of Honolua Ranch. He had had experience with pineapple growing in Haiku, and gradually began shifting the focus to pineapple production. In 1915, the Honolua Ranch/Baldwin Packers complex was moved from Honolua to Honokahua. A pineapple cannery was built, as were the Honolua Stables. By the 1920s, pineapple was being grown in West Maui on a large scale, becoming the dominant crop of the region.

July 2, 1857, left her lands to King William Lunalilo. From His Majesty the Honolua lands went to family relatives including the Young and Davis families at Honolua (Ashdown, p. 17).

The small plantation communities of Honokahua and Napili developed around the Honolua Ranch/Baldwin Packers pineapple operations. The population of Lahaina District increased in the first 4 decades of the 20th century. Honolua Stable ceased operation in c. 1963, following the merger of Baldwin Packers with Maui Land and Pineapple Company, the latter having been formed in 1962. As early as 1964, Maui Land and Pineapple Co. began planning resort development, which has culminated in the Kapalua complex that exists today.

Oral History

Mr. Aimoku Pali, born and raised in West Maui, was interviewed by Walter Fredericksen in August of 2001 (Fredericksen, September 2001). Mr. Pali had been recommended as a person being knowledgeable about land usage in West Maui. He is aware of archaeological features in the major valleys. He and his family members and friends have hunted small game, gathered medicinal herbs, and other forest products in the valleys. According to Mr. Pali, *taro* has not been grown in the valleys for generations.

Another informant, Mr. Alexander Ross was born in 1937 in Honolua valley in a plantation camp. His mother's family lived in Honokohau valley, and he spent most of his youth in the area, going to school and working for the plantation. Some of his relatives grew *taro* in small patches near Honolua. He remembers hunting pig and deer, pheasant and quail, in the valleys, and picking *pipi'au* in the streams. While in the valleys, he and his father would also collect medicinal plants, and firewood. But he indicated that they never hunted or gathered on a subsistence basis—only to supplement what they bought. He mentioned that 2 families—the Chung and Shim families—actively grew *taro* which they processed in the Lahaina Poi Factory. This reference is probably to Honolua Valley.

Mr. Wesely Nohara, Superintendent of Honolua Plantation, Maui Pineapple Company, Ltd. (affiliated with Kapalua Land Company), was interviewed by Walter Fredericksen in 1999. Mr. Nohara was born and lives in Honolua. He said that the plantation controls entry into both Napili and Honokahua valleys by having locked gates. They allow access through a system of permits. He said that most applications are for pig hunting. He doesn't remember any entry requests for persons wanting to utilize the old *lo'i* for agriculture. He also suggested that these valleys were not very wet, and that dry land crops such as sweet potatoes would have been more compatible to these microenvironments than wet *taro*.

Discussion

All informants acknowledge that in post-World War II times, traditional use of the 2 valleys in the project area has been limited. Hunters still utilize them on occasion, and people continue to collect herbs and forest products to some degree.

PREVIOUS ARCHAEOLOGICAL RESEARCH

Three *heiau* are located in the general coastal area in fairly close proximity to the study corridor. These were recorded during the survey done by Winslow Walker in 1929-1930 (Walker, 1931). One is located in the Honokahua region—Site 16, and two are in Honolua—Sites 17 and 18. Site 16 is identified as Kahuaiki *heiau*, and is described as follows: "A small irregular platform of stones whose walls have been taken for stock pens." Its location is noted as "*mauka* to Kahauiki Camp a short distance up the west side of a gulch of the same name." (Ibid., p. 119). Site 17 is identified as Puhalakau (Ai Maia) *heiau*. It location is "*makai* to Honolua Park along shore. Its description reads: "Heiau for Kuula. Level space showing some paving with small stones. Modern stone walls and houses built on the site obliterating its outlines. Fisherman's ko'a formerly on beach has been washed away," according to informant Kepuhi Keahi of Honolua (Ibid. p. 120). Site 18 is called Honuaula *heiau*, and was located in Honolua Gulch just east of a bend in the road. It is described as "Remains of old stone platforms and walls. Measures 29 ft. on south, 46 on west, 20 on north, 54 on east. North wall 3 ft. thick. Whole interior formerly paved with stone, now largely removed to build pens."
(Ibid., p. 121). The locations of these *heiau* are shown on Figure 1—Walker's map of this part of Maui.

Subsequent research (Moore, 1974) indicates that Site 18 was destroyed and was not Honua'ula *heiau*. Honua'ula heiau is Site 1471, a complex series of walls, platforms, and enclosures, and is in excellent shape. It is located east of the highway beyond Honolua Stream Bridge, outside the present project area (SHPD Doc. 0007MK16, 8/15/2000.)

Maui Land and Pineapple Company Development

This area of development is part of the Honokahua Historic District (Site 50-50-1591). This Historic District, as described in the 1973 State Inventory of Historic Places, includes the plantation village, the cannery facilities of Baldwin Packers, Honolua Ranch Stables, Honolua Ditch, the Maui Pineapple Office, the Honolua Store, plantation camp housing and two churches (Wright, 1974, short form data sheet). In a 1973 survey for Maui Land and Pineapple Company, in connection with the Honolua Development, the Bishop Museum's Department of Anthropology did work at Fleming Beach (at Kapalua), to the northeast of the subject parcel (Kirch, 1973). Kirch also worked at Fleming Beach Park at Honokahua Bay, and at Hawea Point Oneloa Bay and Makaluapuna Point. A site-complex made up of 8 features (Site 1346) was identified at Hawea Point, and was

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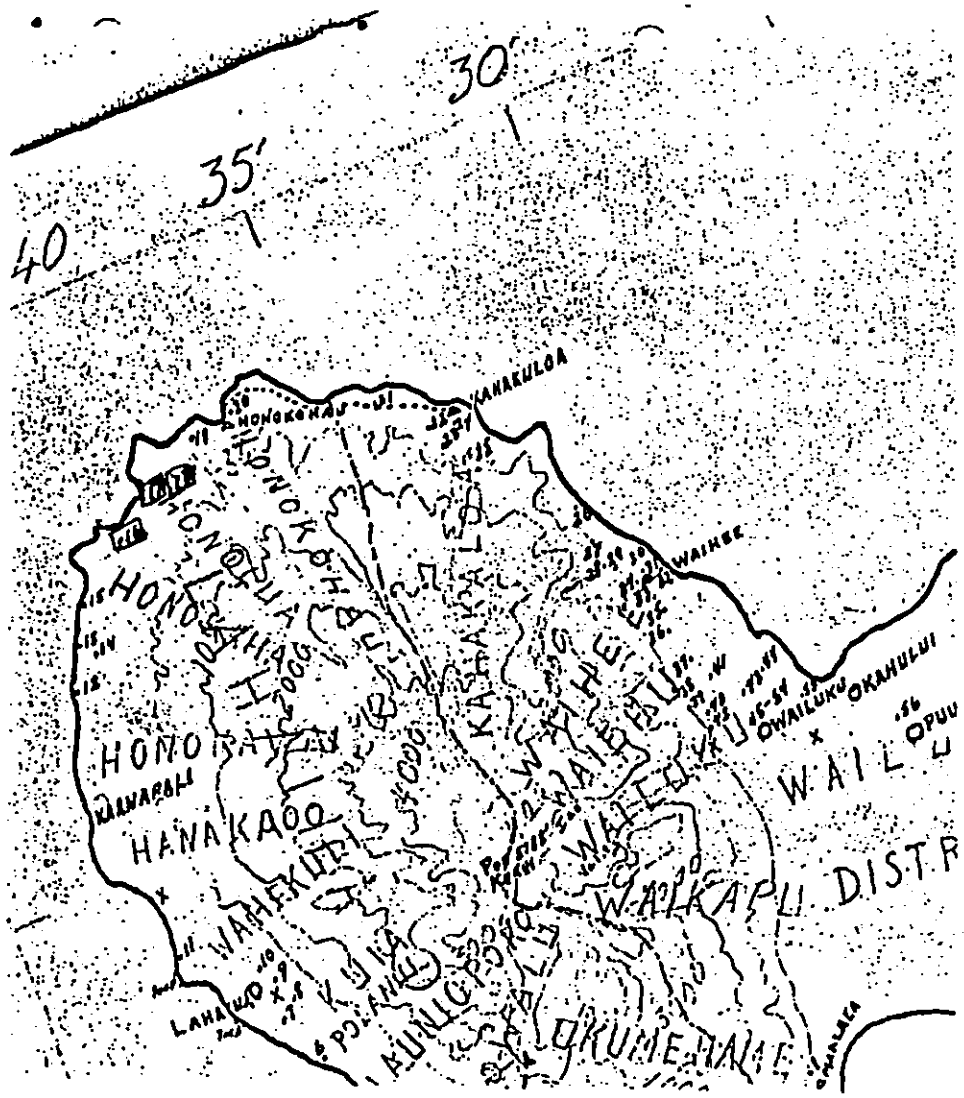

Figure 1 – Walker's map showing location of *heiau* in West Maui.

interpreted as a temporary Hawaiian settlement for marine exploitation and dated from c. AD 1500. Another site (Site 1347) was a cave shelter on the cliff face of Hawea Point, while a third, Site 1348 was identified as a stone terrace platform, and was located on a promontory overlooking Oneloa Bay. During this survey the Honokahua Burial Site (Site 1342) was first identified. Several sites were located and described, including a house site, terrace, enclosure and midden deposits, along the south band of Honokahua Stream on the east side of Fleming Beach Park (Site 1345) [Kirch, 1973].

Numbers of archaeological projects have been undertaken and completed in the general Kapalua Resort complex in the intervening years. Archaeological research for Kapalua Hotel Development, Parcel 2-H was divided into three phases of investigation—reconnaissance survey, intensive survey and testing, and data recovery/mitigation excavations. In early 1986, initial clearing for access roads exposed disturbed human skeletal material. The pedestrian survey pinpointed 6 areas where human remains were present, expanding the boundaries of the Honokahua Burial area, and calling for a more detailed intensive survey to be conducted (Haun and Rosendahl, 1986).

This intensive survey was conducted, and included both surface and systematic soil coring and test excavations. A total of 8 sites were identified, including Honokahua Burial Site (site 1342). The probable boundaries for this burial site were defined, and areas of probability for burial recovery were formulated. Other prehistoric sites reported included segments of a prehistoric trail (Site 2015), and a subsurface cultural deposit (Site 2016). Three historic sites were associated with ranching—Honolua Ranch Stables, a concrete water trough and an enclosure (BPBM D12-15). Two other sites—a walled shelter near a trail and a recent hearth, and a rubble pile, were of indeterminate age (Donham, 1986).

Beginning in March of 1987, the data recovery and mitigation excavations began and continued until December 1988, when fieldwork was halted, due to external pressure. The interim results of the fieldwork were presented in an informational report describing the Honokahua Burial area as a multi-component burial site with over 1000 prehistoric burials. The site appears to have been used from as early as AD 600, according to radiocarbon analysis (Donham, 1989). The final report on archaeological findings is still being prepared. Archaeological work associated with the development of the Kapalua/Ritz-Carlton Resort complex by PHRI resulted in over 24 reports between 1986 and 1992.

After secession of excavation at the Honokahua Burial site, the Ritz-Carlton Hotel site was moved inland to a less culturally sensitive area. The archaeological monitoring strategy for the Ritz-Carlton Hotel new site included additional research in areas contiguous to the Honokahua burial ground. This project work was divided into 3 areas (Guerriero, et. al., April 1993, p. 31). Area I contained 5 sites (Sites 2869, 2870, 2971, 2874 and 2875). One site was identified in Area II—Site 2872; in Area III—three sites were located (Sites 1342A, 2873 and 2876).

Site 2869 consists of 2 historic subsurface cultural deposits, and one historic feature containing 694 historic artifacts primarily of Japanese origin. The other feature also contained historic materials, although considerably fewer in number. These deposits probably represent a refuse dump for the nearby Japanese Plantation Camp (Ibid., p. 34). Site 2870 is part of another refuse dump, including structural remnants related to Honolua School and its outbuildings. Site 2871 consists of features (dwellings, tennis court, grandstands, Quonset hut, potting area) associated with late-plantation-era mid-management personnel activity during the 1940s through the 1960s (Ibid., p. 36). Site 2872 consists of historic stone-faced terracing and retaining walls. Site 2872 is composed of 6 features, a communal outhouse, a stone pile placed on corrugated roofing, 2 pits containing non-indigenous material and shell midden, and 2 bowl-shaped fire pits (*Imu*). All features are considered modern. Site 2875 is a concrete foundation floor, perhaps a relic of plantation life in the early to mid-20th century (Ibid., pp. 38-41).

In Area III, 3 sites were identified. Site 1342A consists of 10 prehistoric human burials peripheral to the central burial ground. Site 2873 consists of precontact cultural deposits and fire pits indicative of prehistoric habitation, and Site 2876, which is a prehistoric trail remnant (Ibid., pp. 41-49). In Site 1342A, BU-2 was located 1.7-1.8 m. below surface and produced two datable radiocarbon samples. One ranged from AD 1703-1918, and another, recovered from a deeper level yielded a date range from AD 1270-1650. A third radiocarbon date of AD 1670-1950 was recovered from BU-7 (Ibid.).

Although two dates could be within the post-contact period, the method of burial (flexed) is precontact in configuration. Site 2873 consists of a series of *imu*. Charcoal from 3 of these fire pits dated the utilization of the area between AD 1423-1680 (Ibid., pp. 58-60). Such features are ordinarily associated with habitation, but no clear habitation sites were found in Area III.[7]

Site 2876 is a trail segment located among the burials and is probably a segment of the prehistoric trail mentioned earlier—Site 2015. It consists of 2 parallel alignments of large angular and subangular basalt bounders, stacked roughly in 2 courses. The interior is paved with angular basalt and small cobbles, with some scattered waterworn coral fragments present as well (Guerriero, et. al., 1993, p. 60).

In May of 1994, Xamanek Researches conducted an archaeological inventory survey on a 12.1-acre area referred to as the Kapalua Bay Hotel and The Bay Club grounds, which lies northeast of the project area. A series of 28 subsurface backhoe tests were excavated. While no historic sites were located during our survey, an area of sand dune deposits was noted at the northern end of the project parcel. It was impossible to test the area at the time, because of underground sprinkler systems and electrical conduits. The recommendation was to survey this portion in the event that the area was to be developed in the future (Fredericksen, et. al., September 1994).

In May of 1996, Xamanek Researches returned to examine the previously untested dune areas. As an addendum to the original inventory survey, the findings, which were negative, were reported in September 1996 (Fredericksen, et.al.). However, archaeological monitoring was recommended during any future earthmoving activities in the dune area (Zone B).

[7] At Fleming Beach Park located west of the archaeological sites just discussed, where Hoookahua Stream enters the ocean, Kirch found habitation indicators such as midden deposits (Kirch. 1973). Site 2873 may be associated with that complex.

Kapalua Land Company, Ltd. began development of this parcel in 2000, and retained Xamanek Researches to carry out the required monitoring program. During the course of the project 3 previously unidentified sites were located. These consisted of Site 4814—a post-contact crypt burial; Site 4815—a precontact subsurface habitation layer and Site 5059—previously disturbed human remains (Fredericksen, March 2001). Site 4815 yielded a radiocarbon age of 290 +/- 40 BP, and a calibrated date range of AD1490 to 1665. The intercept of the radiocarbon age with the calibration curve fell at AD 1640.

In June through July of 1997, Cultural Surveys Hawaii, Inc. undertook an inventory survey of c. 450 acres, identified as Project District 2. This study was located on the *mauka* side of Honoapiilani Highway, and is surrounded by the present project area (Devereux, Folk and Hammatt, Draft February, 1998). Eight sites were identified—seven of which had been previously unrecorded. They consist of walls, boulder terraces and a boulder pavement, an overhang shelter cave, an historic reservoir, a road bridge, and a cemetery. None appeared to be precontact. The eighth is Site 1591, the Honokahua Historic District. Features within this district include Honolua Ditch, the Honolua area store, camp housing, Maui Pineapple Company Office, cannery site, and 2 churches—Sacred Hearts Catholic Church and the Honokahua Congregational Church.

In November of 1997, Xamanek Researches conducted a reconnaissance survey for the proposed 11-acre Spa Resort Project at Kapalua. This parcel is bordered on the south by Honoapiilani Highway, on the west by the Pineapple Hill Subdivision, on the north by Simpson Way and on the east by Office Road (Fredericksen, November 17, 1997). The now-closed Pineapple Hill Restaurant is located in the center of the parcel. The building was built in 1915, and was the home of D. T. Fleming, manager of Honolua Plantation. The survey did not locate any significant material remains, except for the aforementioned building. Since the building has been severely damaged by termite activity, it was recommended that photo documentation of the structure be done, if the owner decided to demolish the building. While no other archaeological work was deemed necessary, on-call monitoring was recommended, in the event that any significant material cultural remains are encountered during construction activities.

The Honoapi'ilani Highway corridor from Alaelae Point to Honolua Bay was surveyed by Xamanek Researches in 1999 (Fredericksen and Fredericksen, March 2000). The only site identified in the narrow project area consisted of 2 dry-laid rock retaining wall sections that support Honoapi'ilani Highway in the vicinity of Makuleia Bay (Site 4829).

Concurrent with this inventory survey, a section *makai* of Honoapi'ilani Highway was also surveyed for the Kapalua Land Company, Ltd. The 1.3 km. long coastal strip stretched along the shorelines of Mokupeia and Honolua Bays—and totaled c. 23 acres. A total of 6 previously unidentified sites were located (Sites 5093 through 5098) and 2 previously identified sites (Sites 5006 and 5007) were further investigated. Site 5093 consists of a paved platform/enclosure and fish-spotting station; Site 5094 is a terrace remnant; Site 5095 is a remnant of the Old Government Road; Site 5096 is what remains of the old Honolua Ranch "slaughterhouse"; Site 5097 consists of 2 rock overhang shelters; and Site 5098 is a rock overhang shelter which contains a precontact burial dated to the 17th century. Site 5097 was dated by radiometric analysis, and the calendric date ranges at 2 sigma were AD 1500-1690, AD 1730-1810, and AD 1920-1950. The intercept date was AD 1660. The other 2 sites are an historic rubbish dump (Site 5006) and a L-shaped modified outcrop that forms a partial enclosure (Site 5007) [Fredericksen and Fredericksen, report pending].

Fleming Beach Park

Fleming Beach Park lies to the southwest of the present project area, and is a popular recreation park, maintained by the County of Maui. In February and March of 1994, Xamanek Researches undertook subsurface testing in the areas of the park destined for renovation work (Fredericksen, et. al., May 1994). Renovation plans called for the construction of a restroom facility on a sand dune area, and a connecting walkway path from the existing parking A total of 10 manual 1.0 x 2.0 meter test units were excavated, and ranged in depth from 1.2 to 2.2 meters in depth. A further 109 auger tests were placed at 2 meter intervals over the area, and ranged from 0.3 to 1.2 meters in depth. The manual testing was required as part of an agreement between the County of Maui Recreation Department, the Maui and Lana'i Islands Burial Council, and the State Historic Preservation Division. The testing was designed to assure a "buffer" zone of at least 1 meter between surface construction and possible cultural material and/or human remains that might lie below that depth.

At sometime in the past, in an effort to stabilize the sand dune, a cap of reddish brown clay had been placed on the loose sand. It ranges in thickness from 0.4 to 1.0 meter in tested locations. It most likely was obtained from the streambed to the south. No indigenous cultural material was found *in situ*. However, one test unit contained some indigenous artifacts and shell midden, mixed with modern historic material. It appeared that this area of the park had been filled in the relatively recent past. It is not known from where the fill material originated. Finally, there were no human remains located in the tested areas (Fredericksen, et. al., May 1994).

On August 29, 1995, human remains were uncovered while workers were digging a sewer line. Xamanek Researches investigated and found the remains to be part of an *in situ* burial, contained within a basin-shaped pit. Given that the individual was buried in a flexed position, it was determined that the remains were that of a native Hawaiian, probably peripheral to the Site 1342A burial complex on the adjacent property (Fredericksen, et. al., February 1996, p. 4). Mitigation of this burial included sifting the disturbed sands to recover displaced skeletal remains, construction of a concrete enclosure and cement cap, and refilling the excavation.

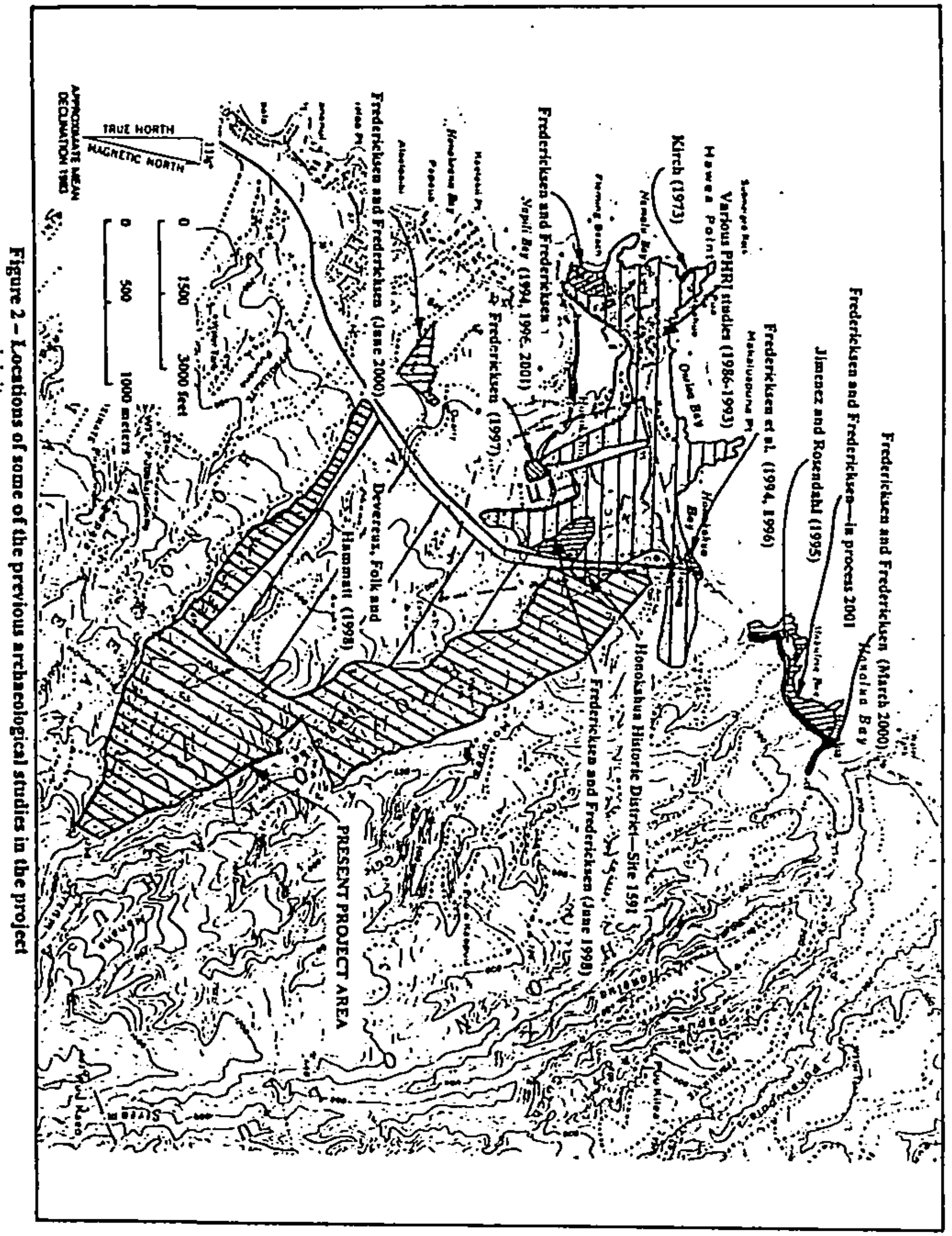

Figure 2 – Locations of some of the previous archaeological studies in the project vicinity.

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Other archaeological studies

An archaeological inventory survey was conducted by PHRI in 1995 on a 2.47-acre coastal parcel (4-2-4: 31) that lies to the northwest of the present study area on Alaelae Point. Five sites consisting of six components were identified during the survey. They included a firepit (Site 4141), and terrace (Site 4142), platform (Site 4143), modified outcrop (Site 4144), and boundary wall (Site 4145). A radiocarbon age of 210 +/- 50 BP, with calibrated cylindrical ranges of AD 1528-1555, 1633-1704, 1720-1820, and 1916-1954, was obtained from Site 4144 (Jimenez and Rosendahl, October 1995).

Settlement Patterns and Expectation of Findings

The precontact *ahupua'a* settlement pattern in this region of Maui, includes permanent and temporary habitation sites located along the coastal regions, and in the inland valleys, which included extensive agricultural systems. While the population of Honokahua in the 1830s was not estimated to be great, the precontact population was likely considerably larger. The extensive burial ground at Honokahua to the west of the present project area also suggests a sizable precontact population.

The kinds of sites that might be expected along the coast, associated with habitation, would be stone structures such as enclosures, midden deposits, and burial areas. It is also possible that part of the precontact encircling trail—Alaloa—Sites 2015, and 2876, that were identified near the Honokahua Burial Site in 1986 and 1993 crossing Honokahua and Napili ahupua'a.[8] In the valleys, sites such as stone walls, enclosures, pond fields and irrigation ditches associated with taro production might be expected. Temporary habitation sites could be identified by walled enclosures, fire and refuse pits, etc. These temporary habitation sites could also take the form of rock shelters, both in valleys and along the rocky coasts, wherever such geological features were present. One *heiau* was located in Honokahua *ahupua'a* nearer the coastline.

As far as the inland area between valleys is concerned, this region has been under pineapple cultivation for decades. Prior to that, cattle grazing occurred, and in some areas, modern golf courses exist. While these areas were no doubt utilized in precontact times for the collection of forest products, emanating from temporary camps or habitation sites, and perhaps some dry land cultivation with similar temporary habitation areas, it would not be expected to find remaining evidence of this activity. Historic structures, such as cattle walls and pens and transportation features associated with plantation agriculture would be the sites representative of this more recent activity.

[8] In other areas of Maui the historic government (*aupuni*) road followed the *Alaloa* trail, which was built about 1516 by Kihapi'ilani after his conquest of the whole island. This trail "was paved with stones along much of its extend, hence it was referred to as the '*kipapa* (pavement) of Kihapi'ilani'. (Fleming, 1933, p. 7—in Handy and Handy, 1972, p. 489).

Site expectations in project area

The kinds of precontact sites that might be expected in the project area in Honokahua and Napili *ahupua'a* would be the types of sites typically found in valleys in this portion of West Maui. These would be agricultural terraces and walls, and temporary habitation clusters associated with both wet and agricultural sites. Such sites would be in the form of surface rock enclosures and rock overhang shelters. Agricultural terraces and possibly some associated water delivery systems would be expected where *taro* cultivation took place. Also associated with the agricultural terraces, one might expect ceremonial structures, such as agricultural shrines, which would take the form of stone platforms and pavings. Human burial sites might also be expected, associated with rock shelters, since these have been noted by earlier archaeological studies. However, concentrations of human burials would not be expected, since the pattern in this region reveals that burials seem to be concentrated in the coastal sand dune/beach areas.

The kinds of post-contact sites that might be present would be features associated with ranching activities such as refuse dumps, rock walls and animal pens. Also features associated with plantation agriculture such as road building would be expected in the project area.

ARCHAEOLOGICAL FIELD METHODS

Fieldwork on the expanded Project District 2 study area was carried out by Xamanek Researches in two phases. An initial pedestrian inspection was conducted on the c. 475 acre project area during April and May 2001. This preliminary work was undertaken in order to obtain a general understanding of the project area and to locate surface sites. The surface inspection focused on the drainage areas. Pedestrian survey sweeps were spaced 5 to 10 meters apart and followed the gulch contours. Areas along the gulch rims at the margins of the pineapple fields were also walked. The field roads were examined on foot. The area between Honokahua and Napili Gulches, currently in pasture, was covered with c. 15 meter pedestrian sweeps roughly oriented N-S.

Inventory level fieldwork was subsequently undertaken during May, June and July of 2001. In addition, field checks and supplemental mapping with the project surveyors from Warren S. Unemori Engineering, Inc. were carried out in September 2001. Archaeological project members included Hugh Coflin, Mark Donham, and Daniel Vicars. Erik Fredericksen was the field director and coordinator for the project. Demaris

Fredericksen worked on the research, production and the overall editing of this report, and Walter Fredericksen acted as a senior advisor.

The evaluation phase of this inventory survey included manual subsurface investigations and site mapping. Numbers of sites required various levels of clearing, in order to properly evaluate them. Limited subsurface manual excavations were conducted at selected sites in order to obtain radiocarbon samples and to gain additional information regarding site function.

Test Units were excavated by stratigraphic layers, and 10 cm. levels were utilized in strata greater than 10 centimeters in thickness. All soil was screened through 1/8th inch mesh hardware cloth. Cultural materials were collected in the field for later laboratory analysis. Standard laboratory procedures were followed and no material culture remains, with the exception of six charcoal samples, were transported off island. All radiocarbon samples were placed in aluminum foil in the field. The six selected samples were subsequently processed and placed in aluminum foil, and sent to Beta Analytic, Inc. in Florida for radiometric analysis.

Standard recordation methods were followed in the field. Mark Donham carried out the mapping in the field, and he further refined the maps and figures when project fieldwork was completed. He also put together much of the information in Appendix A. Photographs were taken by various field members with 35mm color film.

A total of 37 previously unrecorded archaeological sites were located during this inventory survey. In addition, further information was gathered on one previously identified site in Honokohua Gulch (Site 4459). In addition, The Honolua Ditch (Site 1591) crosses the project area, and was photographed in Napili Gulch (Photo 17). In all, 8 sites and the single exposed portion of Honolua Ditch were found in Napili Gulch, 2 sites were located in minor gulches between Napili and Honokohua Gulches, 25 sites were identified in Honokahua Gulch, and 2 sites were recorded in Mokupea Gulch. The newly identified sites were assigned SIHP Numbers 50-50-01-5127 to 5163.

ARCHAEOLOGICAL FINDINGS

Site Descriptions

A total of 37 previously unrecorded archaeological sites were located during this inventory survey.[6] In addition, further information was gathered on one previously identified site in Honokahua Gulch (Site 4459). In all, 8 sites were located in Napili Gulch, 2 sites were found in minor gulches between Napili and Honokahua Gulches, 25 sites were identified in Honokahua Gulch, and 2 sites were recorded in Mokupea Gulch.

Napili Gulch Sites

There were 8 sites located in Napili Gulch. They are described below.

Site 50-50-01-5127 [Figure 3] (2)[7]

This site consists of a level, terraced area and a retaining wall. Site 5127 is located along the southern project boundary and lies near the bottom of Napili Gulch c. 350 meters southeast of Honoapi'ilani Highway. The site lies between a cluster of large boulders near the drainage bottom. Overall site dimensions are c. 8 meters N-S by 7 meters E-W by 0.70-meter maximum wall height. Observed flora in the general vicinity included *koa haole* shrubs, thin buffelgrass cover and alien weeds. The general area has been impacted by previous bulldozing activities, and a double power pole lies c. 8 meters to the ENE of the site.

The level terraced area measures c. 3 by 3 meters. The crudely stacked retaining wall is constructed of waterworn and angular cobbles and lies along the southern side of the terraced area, facing the streambed. This wall measures 3.0 meters E-W by 1.25 meters N-S and is up to 0.70 meter high (3 courses) and 1.0 meter in width. No portable remains were noted at this possible precontact agricultural site.

[6] Many sites are described as being precontact to early post-contact. This assumes that a site was occupied into the late 1700s and very early 1800s, as trade goods were not widely distributed until after that time. Also, disruption of traditional subsistence patterns and subsequent depopulation of rural valleys took place in the early 19th century, when chiefs began to move their residences to centers such as Lahaina.

[7] Bracketed numbers represent Xamanek Researches field identification numbers.

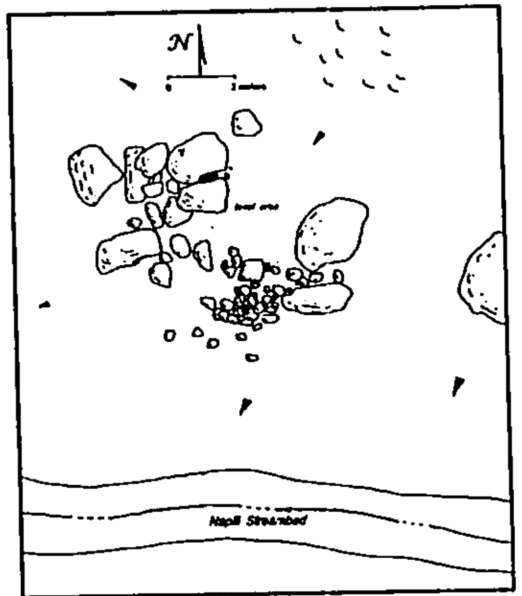

Figure 3 – Plan view of Site 5127.

50-50-01-5128 [Figure 4] (3)

This single component site consists of an overhang rock shelter that lies along the base of the northwestern slope of Napili Gulch. The rock shelter is c. 4 meters NE of the streambed and 3 meters above it. The general area is rugged with numbers of basalt boulders and outcrops present along the relatively steep slope (greater than 50%) of the gulch. Flora noted in the vicinity of the site consisted of a mature *koa haole* stand along with alien grasses and weeds. This site is approximately 430 meters SE of Honoapi'ilani Highway.

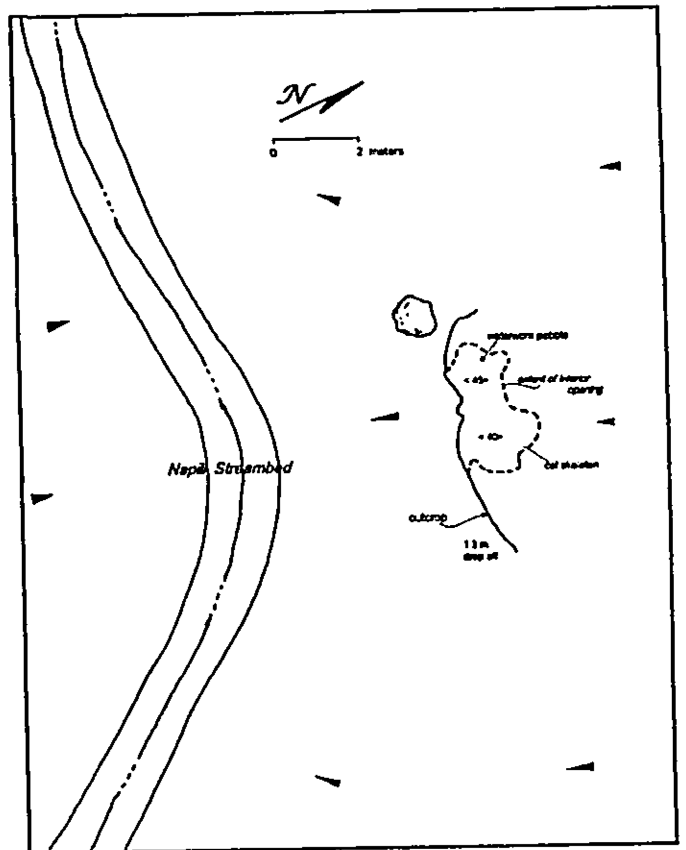

Figure 4 – Plan view of Site 5128.

The overall dimensions of Site 5128 are 3.25 meters E-W by 2.0 meters deep N-S by 0.45 meters maximum ceiling height. This small overhang has been partially filled in by slope wash. One water worn cobble was noted within the overhang along with a relatively recent cat skeleton and several pieces of black plastic mulch. No subsurface testing was undertaken at this small overhang that is tentatively interpreted as a precontact temporary habitation area or a storage area.

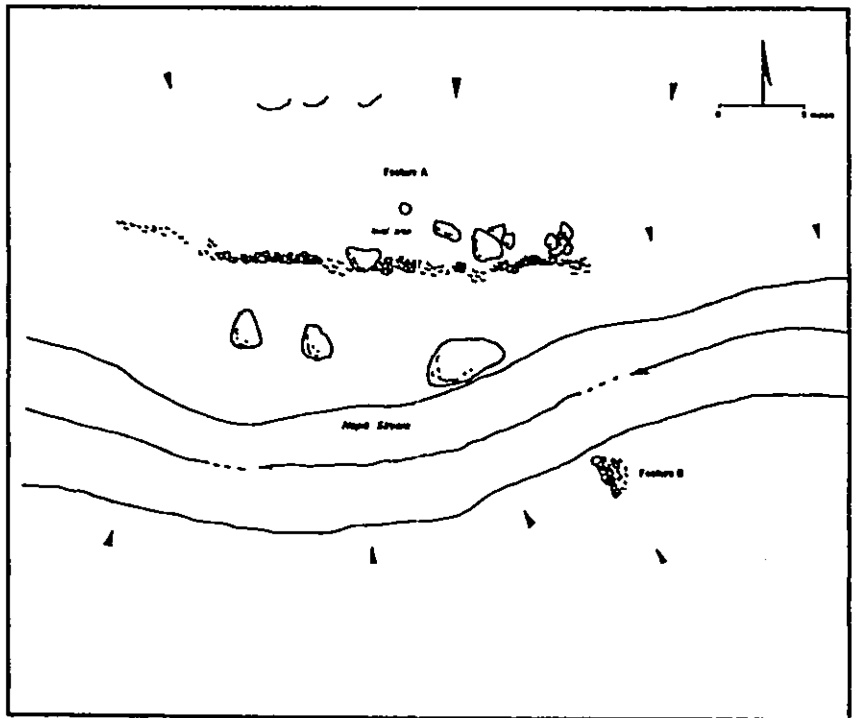

Figure 5 – Plan view of Site 5129.

Site 50-50-01-5129 [Figure 5; Photo 10] (6)

This small site complex is located along the southern project boundary in the Napili Gulch bottom. The site consists of a terrace (Feature A) and a small wall section (Feature B). It sits on either side of the streambed at the base of the gulch. A portion of the site has been impacted by a bulldozed plantation road that crosses the gulch. Flora noted in the general area included a grove of large common mango and *kukui* trees. In addition, scattered *noni*, coffee, guava, *ki* and *hala* plants were also observed along the gulch's bottom. Christmas berry trees dominate the rocky slopes of the gulch in this portion of the project area.

The overall dimensions of this site are c. 27 meters E-W by 18 meters N-S. Feature A, a terrace that parallels the streambed along its northern bank, dominates the site. Feature B, a small wall section, lies c. 12 meters to the south on the opposite side of the southern

streambed. A substantial pineapple field access road cuts across the drainage area approximately 45 meters *mauka* (south), upstream of the site. Displaced boulders present on the terrace were likely deposited by bulldozer activity above during construction of the previously noted road. Site 5131 and Site 5130 are located c. 46 and 85 meters respectively downstream to the west.

The **Feature A** terrace lies c. 5 to 9 meters from the edge of the streambed along the northern side of the gulch (Photo 10). The retaining wall of this terrace parallels the streambed and has an overall length of c. 24 meters. This wall is generally well built of stacked sub-angular basalt cobbles and boulders. It is vertically faced and up to 6 to 7 rock courses high with 0.75 to 1.0 meter high sections that average 0.5 meter in width. Some portions of the retaining wall have collapsed. The level terraced area measures c. 20.0 meters E-W by 1.4 meters in width N-S. A few large boulders sit atop the terraced area and are likely associated with the construction of the road above. No portable remains were found during the surface inspection of Feature A.

Feature B is located on the opposite side of the streambed to the south to the south of Feature A. This rock wall measures 2.6 meters N-S in length by 1.0 meter E-W wide and 1.0 maximum height. This short wall section sits at the base of the western gulch slope within about one meter of the streambed cut bank. The wall is well built of sub-angular basalt cobbles and boulders that average 0.45 to 0.65 in size. It is 6 to 7 courses in height and faced on its western side. The eastern side of this wall has collapsed.

Site 5129 is interpreted as a probable precontact agricultural area. Plantation era earth moving activities have impacted portions of the site. However, the overall integrity of this site is generally good. No subsurface testing was undertaken at this site.

Site 50-50-01-5130 [Figure 6; Photo 11] (7)

This single component site is located in Napili Gulch along the project's southern boundary. The site consists of a small enclosure that lies in the bottom of the gulch at the base of its steep southern slope. This enclosure is 2.4 meters south of the edge of the streambed on a level area that extends c. 50 meters to the NE of the streambed. Primary flora is comprised of large mango trees with scattered *kukui* trees, coffee, guava and *ki* plants. Four *ki* plants are contained within this enclosure. The surrounding gulch slopes are covered with Christmas berry, rose apple and eucalyptus trees.

This small enclosure has a rounded triangular shape. Its walls are generally well built of sub-angular cobbles and boulders averaging 3-4 courses in height. The interior of this enclosure is faced along its northern, northwestern and southern sides with less refined stacking elsewhere. A formal entryway appears to exist along its central northern side that faces the stream. A small, prepared notch measuring c. 30 by 30 centimeters occurs along the outer NW facing wall. The western end of the enclosure is built of boulders that are larger than the average rocks used in its overall construction. This enclosure measures 4.8 meters E-W by 3.8 meters N-S with a maximum wall width of 0.6.

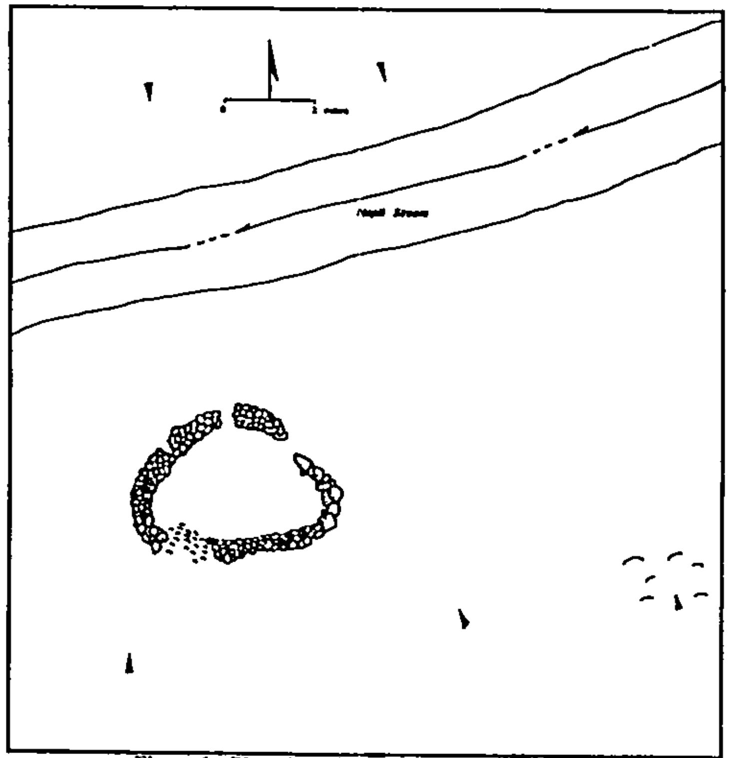

Figure 6 – Plan view of Site 5130.

meter, and a maximum wall height of 0.80 meter. No portable remains were noted during surface inspection and site recordation. Because of the attention given to construction, Site 5130 is tentatively interpreted as a possible ceremonial structure—possibly an agricultural shrine. No conclusion can be made as to the age of this feature. Site 5131 lies c. 30 meters to the east of this site.

Site 50-50-01-5131 [Figure 7; Photo 12] (41)

This site is located on a level area along the southern bank of Napili Gulch about one meter south of the streambed. Observed flora in the gulch bottom area consisted of large mango trees, with fewer *kukui* and rose apple trees, and an understory of coffee shrubs. Christmas berry trees dominate the gulch slopes. Talus boulders are concentrated along the base of the slope of the gulch directly adjacent to the south.

The site consists of a rock pile that measures 5.0 meters N-S by 3.25 meters E-W by 0.65 meter in height. This pile is made up of crudely stacked sub-angular, and

waterworn cobbles and boulders ranging from c. 0.30 to 0.9 meter diameter. The NE face of this probable clear pile appears to be purposefully curving. A small depression measuring 0.50 meter in diameter and 0.50 meter deep occurs directly west of this pile. A second smaller, less organized rock pile lies c. 5 meters to the west along with a few talus boulders. No significant material culture remains were noted in the general area and no subsurface testing was undertaken. Site 5131 is tentatively interpreted as an agricultural clear pile. However, the relative age of this site remains unclear. This site shares the same broad level area as the Site 5130 enclosure that lies c. 30 meters to the west.

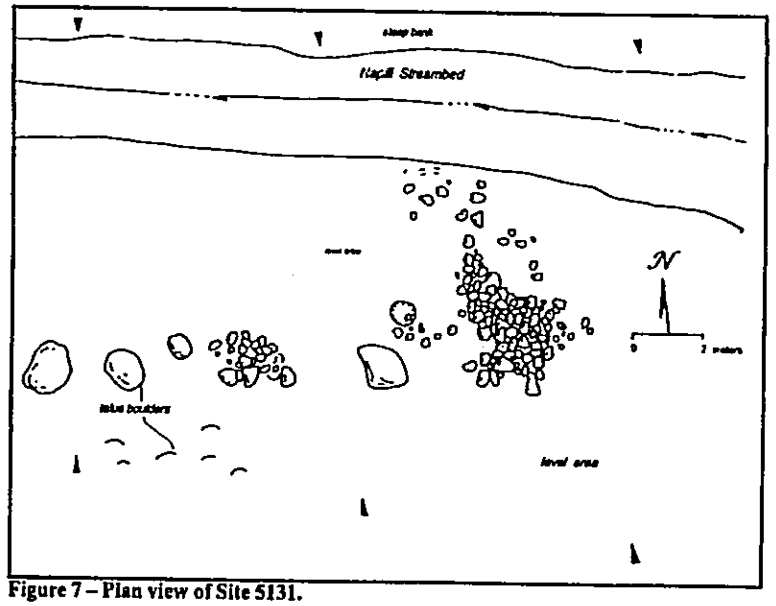

Figure 7 – Plan view of Site 5131.

Site 505-50-01-5132 [Figure 8; Photo 13] (8)

Site 5132 is located along the southern project boundary, in the bottom of the Napili Gulch. This pineapple plantation era site is composed of two bridge embankment rock walls. Christmas berry thickets dominate flora in the general area. In addition, scattered mango, *kukui* and rose apple trees were also observed along with alien grasses and annual weeds.

This site consists of a pair of walls that are constructed of mortared hewn basalt blocks. These cut blocks average 30 by 60 centimeters in size. The walls are 6.4 meters

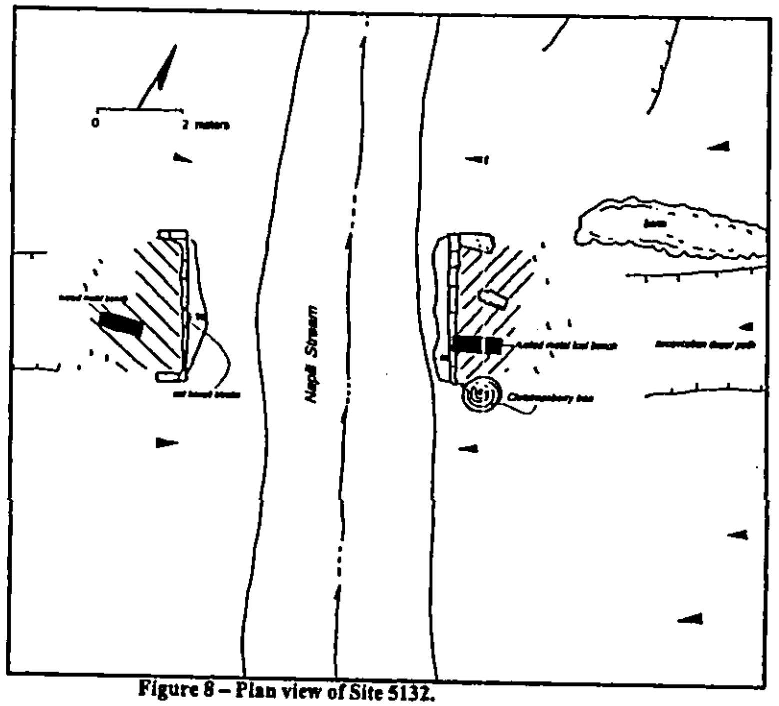

Figure 8 – Plan view of Site 5132.

apart and lie on opposite sides of Napili Stream. The walls each create a small level area on the edge of the otherwise steep stream bank. The bridge structure has been removed and the site has been modified by recent plantation activities. Two recent, large ditch-like excavations extend up either side of the gulch from the back portions of the level areas created by the walls. No subsurface testing was undertaken at this plantation-era site.[10]

Site 50-50-01-5133 [Figures 9-12; Photos 15, 16] (9)

This probable precontact site complex is located along the southern project boundary in the bottom of Napili Gulch. It lies on both sides of the streambed and is approximately 500 meters from the southeastern corner of the project area. Discontinuous basalt escarpments create the borders of this site at the base of the steep gulch slopes. Dominant flora noted in the general vicinity consisted of an over story of large mango trees on the relatively level gulch floor, along with sparse *ki* plants and alien

[10] Mr. Wesley Nohara, Manager of Honolua Plantation—Maui Pineapple Company, Inc., has indicated that this site and Site 5163 are associated with the old pineapple roads that ran through the area (personal communication).

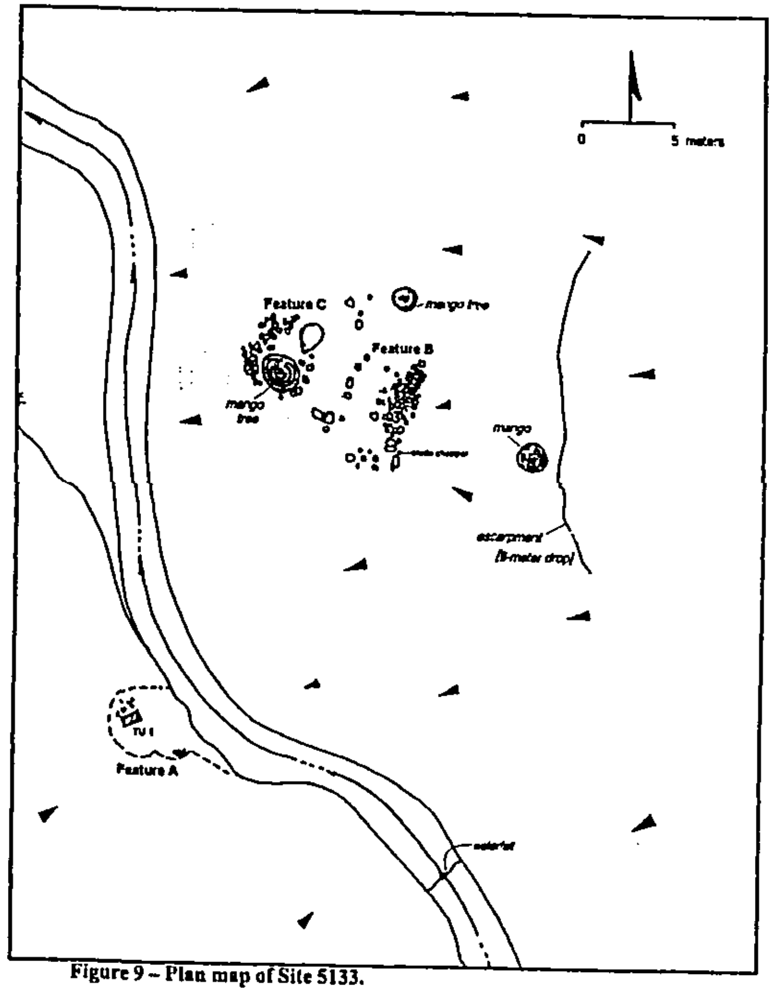

Figure 9 – Plan map of Site 5133.

grasses on the ground surface. Christmas berry thickets cover the surrounding gulch slopes.

Site 5133 consists of a large rock shelter, Feature A, which sits at the base of an escarpment on the western side of the streambed and Features B and C, which are located on the opposite side of the stream. Feature B is a crudely constructed retaining wall, while Feature C consists of a crude rock pile. The overall site measures c. 27 meters NE-SW by 16 meters NW-SE.

Feature A sits directly at the western edge of the streambed near the base of a c. 4-meter high escarpment (Photo 15). The interior of this overhang is relatively spacious and measures 8.0 meters NW-SE by 4.2 meters NE-SW with a 3.6 meters maximum ceiling height. Several fire-cracked rocks and a few flecks of charcoal were present on the surface of the overhang. In addition, a cache of stacked basalt cobbles was noted in the southeastern portion of the interior of the cave. One controlled excavation unit was utilized to test this feature.

Test Unit I

This 0.5 by 1.0 meter unit was placed in the northwestern portion of the cave. The unit was oriented E-W and was a maximum of 40 centimeters deep. Two soil layers were present in this test unit.

Layer I (0-6 cmbs) was composed of reddish yellow (7.5 YR 6/6) silty loam. This loose, stratum was very rocky (50% subangular cobbles by volume) and yielded about 9 g. of charcoal and a few fire-cracked rocks that were not collected.

Layer II (6-26 cmbs) was rockier than the overlying stratum and consisted of light gray (7.5 YR 7/1) silt. This loose, dry layer yielded moderate amounts of material culture remains, including 1.5 g. of marine shellfish, 0.4 g. of fish bone, a few *kukui* nut shells (1.1 g.), and 9.8 g. of charcoal. In addition, a portion of a hearth was located in TU 1.

> **Feature 33.1** was first encountered at c. 7 cmbs and extended to a maximum depth of 24 cmbs. This loose, gray (7.5 YR 5/1) silt contained several fire-cracked rocks, and a small amount of marine shellfish (2.9 g.), 5.1 g. of kukui nut shell, and 147.4 g. of charcoal. The charcoal was collected from this feature from between 15-24 cmbs and placed in aluminum foil. A sample was subsequently submitted to Beta Analytic, Inc. in Florida for analysis. The sample returned a modern radiocarbon age (See Table 5).

No identifiable post-contact material culture remains were located in the remainder of Layer II. The test unit was abandoned at weathered bedrock between 35-40 cmbs. Feature A is interpreted as a rock overhang shelter that appears to have been used into the 20th century for temporary habitation.

Feature B lies c. 15 meters to the northeast of the Feature A rock shelter and about 12 meters east of the streambed (Photo 16). This feature is a crude linear rubble pile that sits at the base of a moderate slope that drops down from the base of a c. 8-meter high esarpment on the eastern side of the gulch. A level area measuring c. 4.0 by 6.0 meters

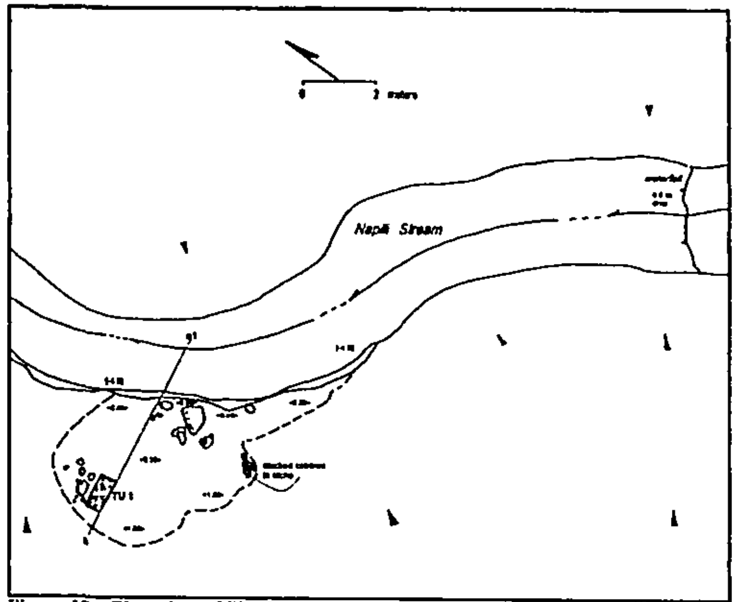

Figure 10 – Plan view of Site 5133.

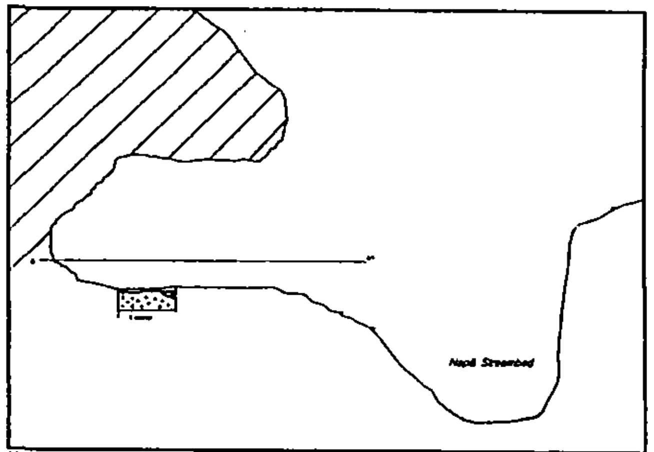

Figure 11 – Site 5133 profile.

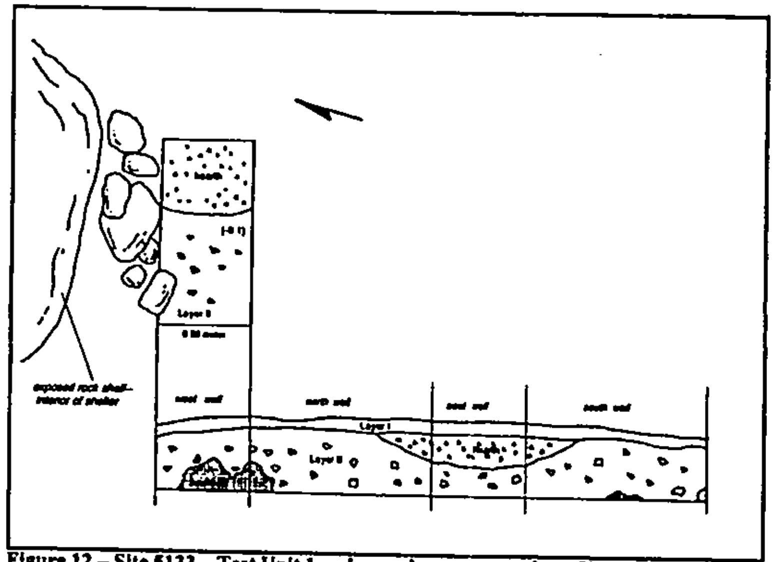

Figure 12 – Site 5133—Test Unit 1—plan and wrap-around profile.

is directly below this pile. This feature may have been constructed to serve as a retaining wall to prevent slope wash from inundating the level area. This feature measures 7.5 meters N-S by 2.5 meters E-W with a maximum height of 0.80 meter. It is interpreted as an agricultural retaining wall remnant or a possible clear pile. One crude stone chopper was noted on the southern side of this feature. Another possible wall remnant, Feature C, is 6.0 meters west of this feature.

Feature C sits c. 5 meters east of the edge of the streambed (Photo 16). It consists of a linear concentration of sub-angular cobbles and boulders averaging 0.60 meter in size. One boulder c. 1.0 by 1.5 meters appears to be incorporated into the feature. The retaining wall/possible clear pile measures 5.0 meters N-S by 3.2 meters E-W and has a maximum wall height of 0.65 meters. A massive mango tree appears to have grown through a portion of this wall/clear pile. A level area measuring c. 8 meters N-S by 3 meters E-W is located directly west at the edge of the streambed. The eastern edge of this feature adjoins the level area below Feature B.

Site 50-50-01-5163 [Figure 13; Photo 14]

This site is located in Napili Gulch and is interpreted as a part of the plantation era transportation system. The site crosses the gulch in an area vegetated with *koa haole*, buffelgrass and alien weeds. Site 5127 lies c. 15 meters to the southwest.

Site 5163 is composed of an unpaved dirt road that is c. 175 meters long by an average of 4.0 meters wide. Two dry-laid retaining wall sections are associated with the road cut. The wall on the northeastern bank of the gulch is c. 32 meters in length by a maximum of 0.8 meters in height. The wall section on the southern gulch bank is c. 58 meters long by a maximum of 2.0 meters high.[11] Both walls are in good condition and relatively well built. A concrete bridge with no inscription crosses the streambed. This bridge is constructed of poured concrete and has mortared boulders and cobbles at its 4 corners. The overall dimensions of this bridge are 5.8 meters in width by 3.5 meters in width.

An informant, Mr. Wesley Nohara, manager of Honolua Plantation, believes that Site 5163 was built in the 1920s or 1930s. It is a remnant of the plantation's transportation system.

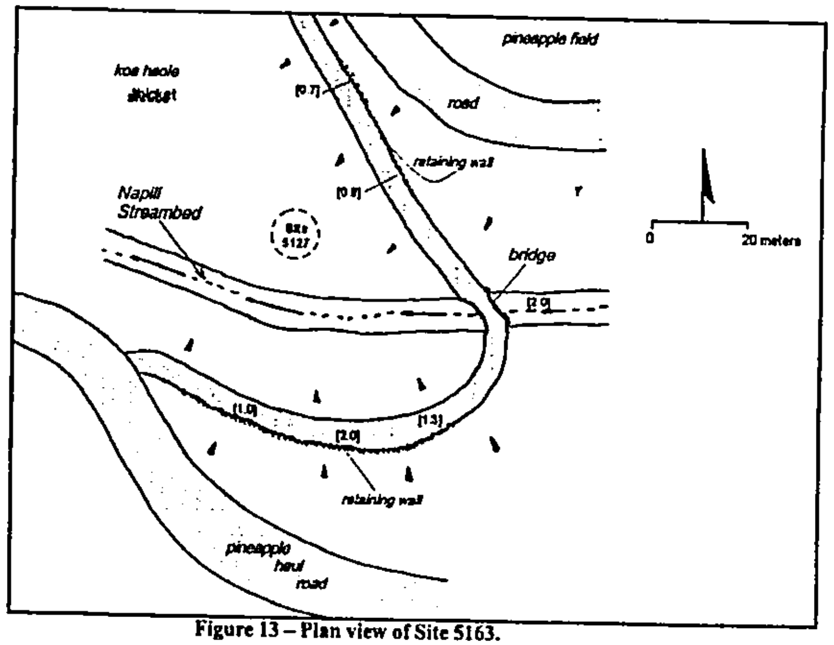

Figure 13 – Plan view of Site 5163.

[11] This portion of Site 5163 if off of the project area.

Sites between Napili and Honokahua Gulches

Two sites are located between Napili and Honokahua Gulches in smaller drainage areas.

Site 50-50-01-5134 [Figure 14; Photo 18] (10)

This plantation-era site is located in the streambed of the unnamed gulch that is north of Napili Gulch. Steep slopes rise quickly on either side of the stream. Flora noted in the area consists of Formosan *koa* and *kukui* trees, coffee shrubs, and alien grasses and weeds. This dam consists of a small, mortared basalt cobble wall that partially spans this unnamed drainage area. It appears probable that this wall once blocked water flow when it was functional, raising the water level so that it would flow into the concrete cylinder. The wall section measures 2.0 meters N-S by 0.45 meter wide and has a 1.05-meter maximum height. The concrete cylinder 0.58 meter in diameter lies directly adjacent to the upstream side of the wall. It protrudes 0.40 meter from the streambed. The upper edge of this cylinder has a lip that likely supported a grated lid for water intake. The streambed is silted in c. 10.0 meters upstream.

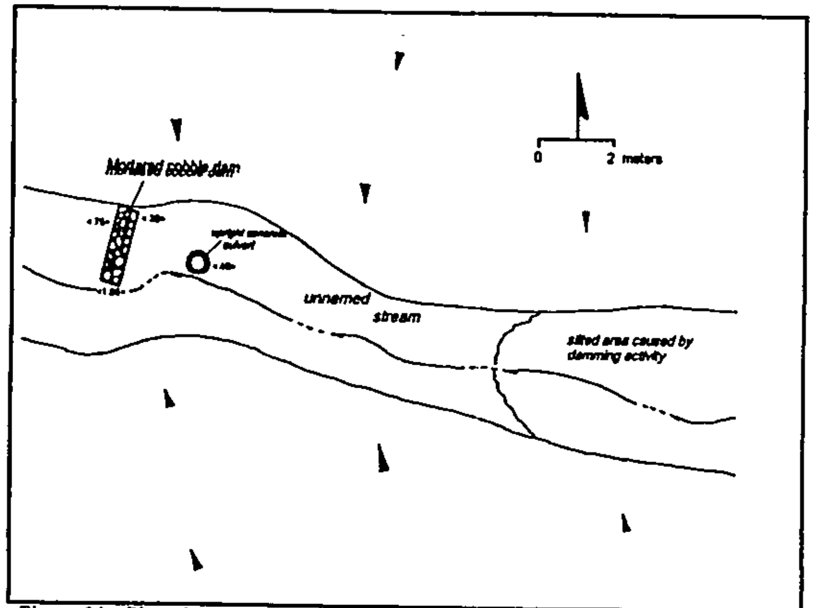

Figure 14 – Plan view of Site 5134.

This water collection complex is likely associated with the Honokohau/Honolua Ditch system (designated as part of the Honokahua Historic District—Site 1591). This

system crosses the project area above the 800-foot elevation level, and is visible in the bottom of Napili Gulch, c. 240 meters to the southwest.

Site 50-50-01-5135 [Figure 15] (12)

This site lies approximately 500 meters up (northwest) the large tributary gulch that enters the western side of Honokahua Gulch in the central portion of the project area. This small overhang shelter sits at the base of a c. 2 meter high escarpment on the eastern its and directly adjacent to a c. 3.5 meter high waterfall. Primary flora in this gulch bottom consists of *kukui* tree cover and dense coffee shrub undergrowth, while the steep slopes are covered with Christmas berry trees. This small overhang measures 1.5 meter NE-SW by 1.0 meter deep with a 0.80-meter maximum ceiling height. One waterworn pebble manuport was noted on the interior surface. No subsurface testing was conducted here. This site is interpreted as a possible precontact temporary habitation/shelter.

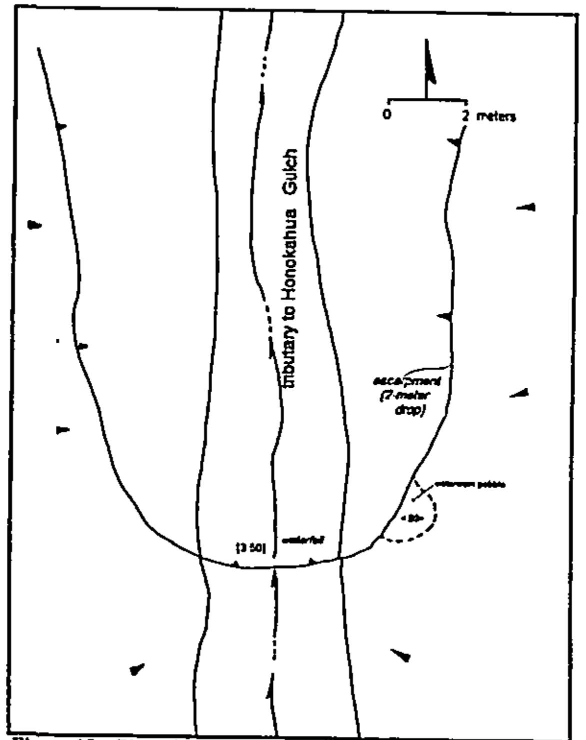

Figure 15 – Plan view of Site 5135.

Sites in Honokahua Gulch

There are 25 previously unidentified sites that were located in the Honokahua Gulch portion of the project area. These sites include temporary habitation overhang shelters, possible burial caves, agricultural and habitation area complexes, boundary/animal containment walls, and possible ceremonial structures.

Site 50-50-01-5136 [Figure 16-19; Photo 19] (13)

This dryland agricultural site complex is located in the bottom of Honokahua Gulch and lies primarily along the base of the gulch's southwestern slope. The streambed is c. 20 to 30 meters east of this site. The site extends up a smaller tributary gulch, which enters the southwestern side of the gulch near the east central portion of the project area. Flora in the vicinity consists almost solely of Christmas berry thickets, along with alien grasses and weeds. A bulldozer cut road passes directly along the eastern side of the site and has impacted a portion of Feature A.

Site 5136 consists of three components; a stacked, faced wall (Feature A); a stacked, faced rock wall with a possible terrace remnant (Feature B); and a terrace remnant with an associated retaining wall (Feature C). Remnants of relatively level areas of soil behind these rock features suggest an agricultural function for them. The overall site measures c. 60 meters N-S by 25 meters E-W. Bulldozing activities associated with the road mentioned above have altered portions of the site.

Feature A is a stacked rock wall that follows the contour of the slope c. 6 meters up from the base of the gulch. This wall is interpreted as a possible animal containment feature. It measures 17.5 meters NW-SE in length by 1.5 meters in width by a maximum of 1.0 meter in height. This wall is fairly built of sub-angular basalt cobbles and boulders, and is 5 to 6 courses high. It ranges from good to poor condition and has been altered by bulldozing activities.

Feature B is a short, L-shaped wall section that ends directly at the edge of the tributary gulch mentioned above. It measures 7.5 meters NW-SE by 2.4 meters NE-SE and has a 1.1 meters maximum wall height. This wall is faced on its eastern or down slope side where it reaches its maximum height. The western or upslope side of this feature is only 0.10 meter high giving it a terrace retaining wall appearance. The level area on the upslope side measures c. 10 meters N-S by 2 meters E-W. This feature is c. 20 meters SE of Feature A.

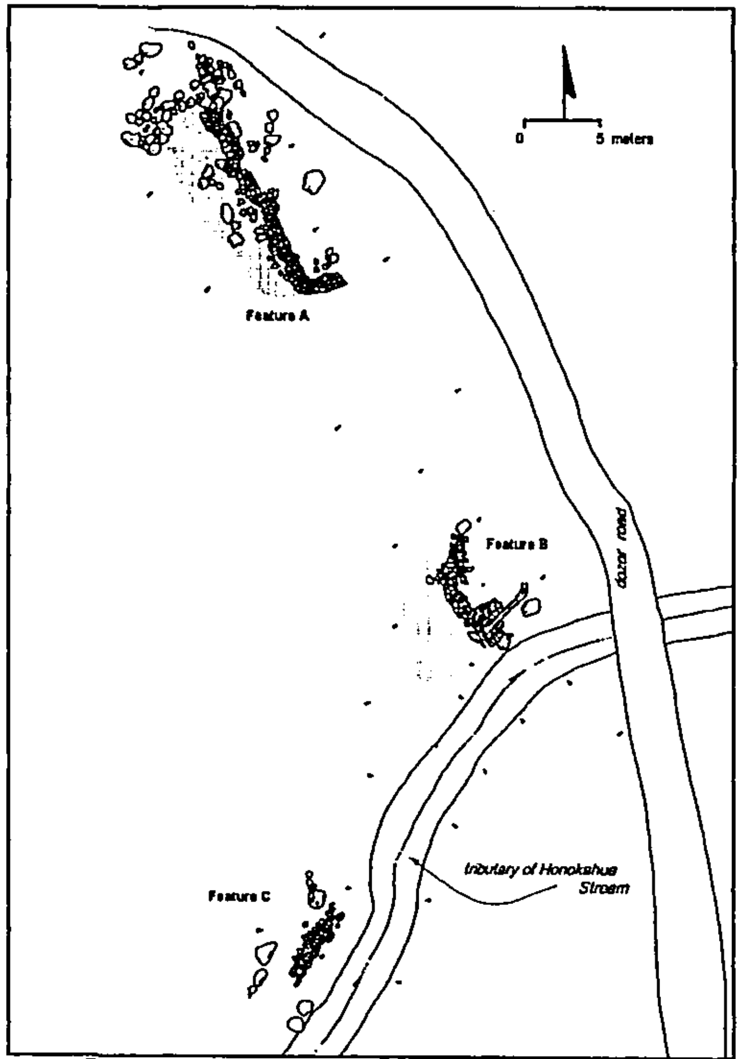

Figure 16 – Plan view of Site 5136.

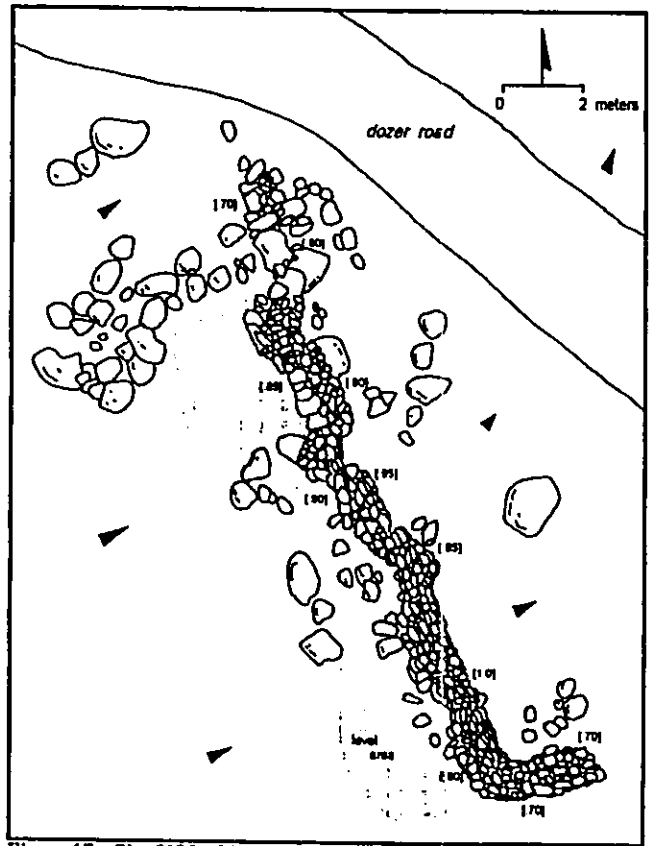

Figure 17 – Site 5136—Plan view Feature A.

Feature C consists of a short wall section that parallels the western edge of the tributary streambed (Photo 19). The wall is built from sub-angular basalt cobbles and boulders. This wall is 4-5 courses high and 0.95 meter high on its eastern (streambed) side and only 0.10 meter high on the upslope side. There is no appreciable level area on the upslope side but this may be due to slope wash. This feature lies c. 20 meters southwest of Feature B up the tributary gulch.

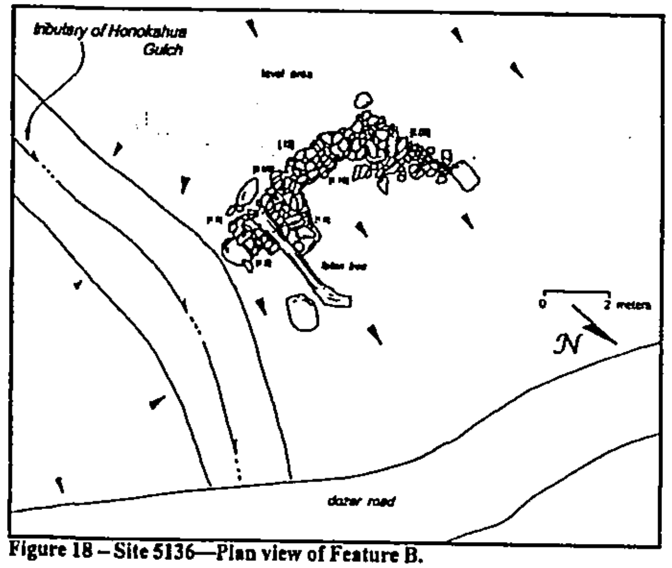

Figure 18 – Site 5136—Plan view of Feature B.

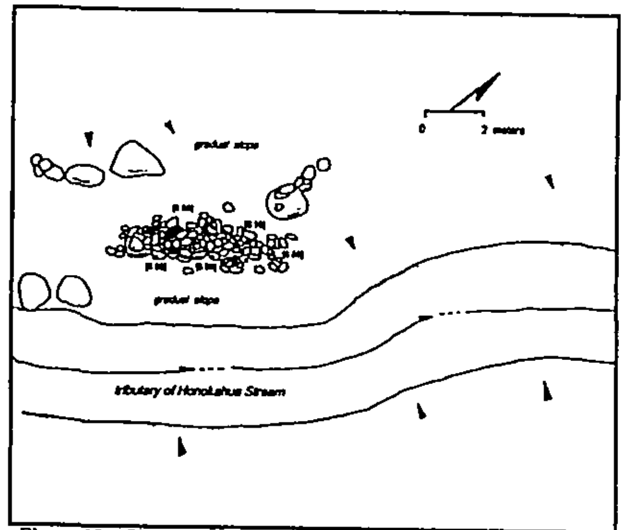

Figure 19 – Site 5136—Plan view of Feature C.

Site 5136 is interpreted as an agricultural complex that may have pre- and post-contact components. Bulldozing activities have altered portions of this site. No portable remains were located and no subsurface testing was undertaken here.

Site 50-50-01-5137 [Figure 20; Photo 20] (14)

This site complex is located on a broad level area in the bottom of Honokahua Gulch, at the base of the gulch's southwestern slope. The naturally occurring talus boulders at the base of this slope are incorporated in the construction of the two enclosure features. The streambed lies c. 20 meters to the northwest of the site. Over story flora consists of mature *kukui*, rose apple and eucalyptus trees. Under story vegetation is composed of abundant *ki* plants and coffee shrubs. Bird nest ferns grow on portions of the bare rock walls of these features.

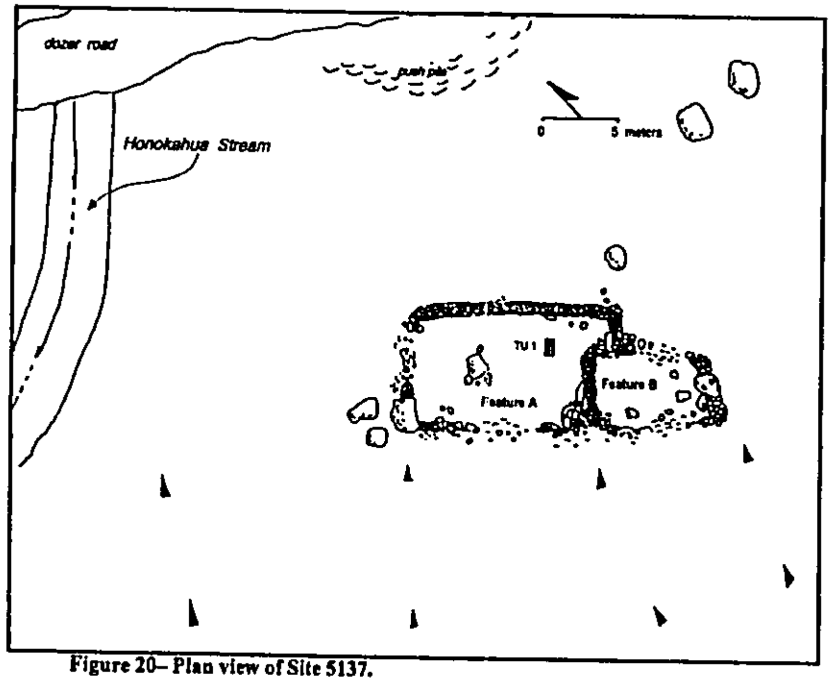

Figure 20– Plan view of Site 5137.

Site 5137 is composed of two rectangular rock wall enclosures that share a common central wall. The enclosures' southwestern sides abut the base of the gulch's slope. Both features incorporate basalt outcrops in their construction. These features are constructed from large talus boulders, subangular basalt cobbles and boulders collected from immediate

area. Each feature is constructed in a different manner. Feature A, the larger of the two, has a faced, core filled section of wall while Feature B is constructed in a rougher manner. Overall site dimensions are 22.0 meters NW-SE by 10.0 meters NE- SW. Inspection of the site suggests that Feature A may have been added on to Feature B.

Feature A is a rectangular rock wall enclosure that abuts the base of the southwestern gulch slope. The upslope wall of this feature has for the most part been impacted by slope wash and has largely collapsed. The northeastern (down slope) wall is a somewhat low core filled faced wall that averages 0.70 meter high and 0.80 meter wide. It is constructed of subangular cobbles and boulders, 3-4 courses high with sub-angular gravel, pebbles and cobbles used for the core fill. The remaining wall sections are more crudely stacked but are faced in the intact portions and incorporate naturally occurring talus boulders in the construction. This enclosure measures 14.0 meters NW-SE by 9.0 meters NE-SW with a maximum wall height of 1.0 meter. One test unit was utilized to assess subsurface conditions.

Test Unit 1

This 0.5 by 1.0 meter unit was placed in the northwestern portion of the cave. The unit was oriented E-W and was a maximum of 40 centimeters deep. Two soil layers were present in this test unit.

Layer I (0-6 cmbs) was composed of reddish yellow (75. YR 6/6) silty loam. This loose, stratum was very rocky (50% subangular cobbles by volume) and sterile.

Layer II (6-26 cmbs) was rockier than the overlying stratum and consisted of light gray (7.5 YR 7/1) silt. This loose, dry layer yielded a trace of charcoal.

Feature B is a smaller rectangular rock walled enclosure. It also abuts the base of the southwestern gulch slope along the feature's southwestern side. The enclosure wall is collapsed in this location due to slope wash. The overall construction style consists of a stacked, faced wall of subangular cobbles and boulders 3-5 courses high, and 1.0 meter in width. Basalt outcrops and large naturally occurring talus boulders are incorporated into the walls. A portion of the northeastern wall has collapsed. The northwestern wall of this feature is shared with the enclosure Feature A, which may be a later addition. This enclosure measures 10.0 meters NW-SE by 7.0 meters NE-SW and has a maximum wall height of 1.2 meters.

Discussion

The function and relative age of these enclosures remains somewhat unclear. The relatively low wall heights do no not tend support a possible animal containment function. Given the general level of care and labor expenditure employed in the overall construction of this site, Site 5137 is tentatively interpreted as a possible habitation area. However, there is an absence of any recognizable food midden in TU 1. It appears possible that it may have been used and/or modified in early post-contact times. In order to make a firm determination of function, additional work would be required.

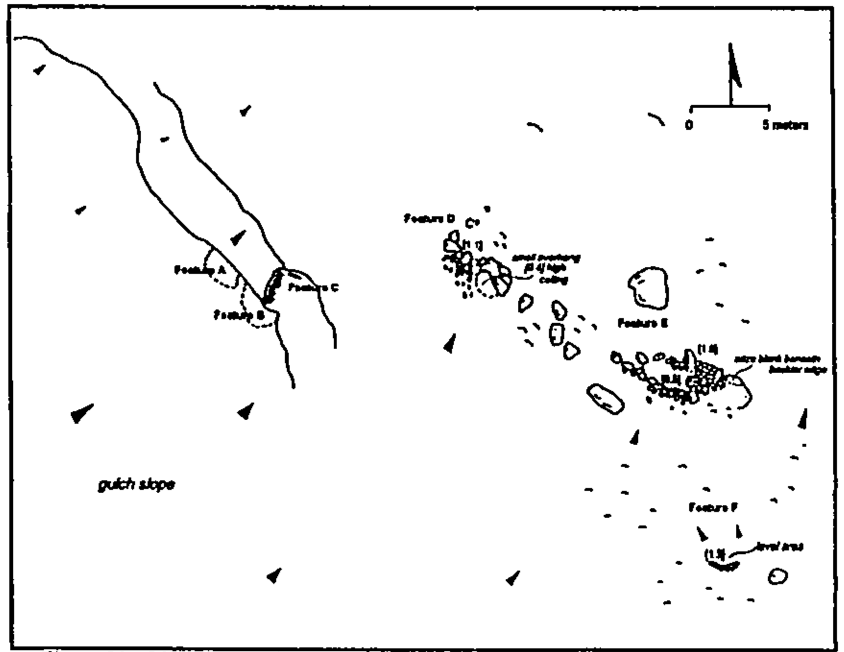

Figure 21 – Plan view of Site 5138.

Site 50-50-01-5138 [Figure 21; Photo 21] (15)

Site 5138, a complex of rock shelters and terraces, lies some 20 meters upslope to the south of Site 5142. This habitation, agricultural and ceremonial site complex includes six components (Features A-F). It is located near the base of the southwestern slope of Honokahua Gulch. Observed flora in the general area consists of Christmas berry tree cover on the rocky slopes, with *kukui* and rose apple trees, *noni*, *ki* and coffee plants growing on the adjacent gulch floor. Bird nest ferns grow on exposed rocks of several features. The overall site measures c. 22 meters E-W by 12 meters N-S.

This site consists of two, side by side rock shelters—Features A and B, a small, stacked retaining wall (Feature C) in front of the Feature B shelter, two terraces (Features D and E), and small retaining wall and level area (Feature F). Features A and B are located near the base of c. 5 meter high escarpment at the western end of the site. These two overhang shelters have marine shell and charcoal scattered on their floors. Feature C modifies the outcrop area in front of Feature B and forms a small level area. Features D, E and F lie down slope to the east near the base of the gulch slope.

Feature A lies about 15 meters southwest of the gulch floor near the base of the escarpment on the western edge of the site. A level area with good soil deposition exists on the shelter floor where scattered marine shells and charcoal are visible. This rock overhang measures 1.7 meters NW-SE by 1.5 meters deep and has a maximum ceiling height of 1.3 meters. It is interpreted as a precontact temporary habitation area. The Feature B overhang is located about 1.0 meter to the south.

Feature B is small rock shelter is also located near the base of the escarpment noted above. A level floor with fair soil deposit exists within. Observed surface portable remains included two marine shell fragments (Planaxis labiosa), one crab claw fragment, and small charcoal chunks. A large unworked basalt flake lies outside the shelter c. 3 meters to the northwest. The Feature B overhang is also interpreted as a precontact temporary habitation area. Feature C, a somewhat level area on top of a modified outcrop, lies just to the NE of.

Feature C is a modified outcrop/terrace that measures 1.5 meters NE-SW by 1.2 meters NW-S. It sits directly outside the entrance of the Feature B rock shelter. This level area is created on a basalt outcrop ledge by two small, stacked retaining walls. A small wall c. 2.0 meters in length NE-SW lies along the top edge of the northwestern side of this outcrop. This wall is c. 0.5 meter high and (4 courses). A similar though smaller wall runs along the top edge of the outcrops' northeastern side. This second wall is c. 1.1 meters NW-SE by up to 0.5 meter high (2-4 courses). Both wall sections are constructed of subangular basalt cobbles.

Feature D consists of a cluster of talus boulders with an added retaining wall that measures 2.0 meters NE-SW by 1.5 meters in width. This wall is built of subangular cobbles and is a maximum of 1.1 meters high (5 courses). This wall creates a small level area below that is c. 1.5 meters square. A small overhang or cupboard is beneath a boulder at the feature's eastern end. This overhang measures 2.0 meters wide by 1.3 meters deep with a maximum ceiling height of 0.4 meter.

Feature E is composed of a cluster of large talus boulders the spaces around which have been filled with subangular cobbles. A small, crudely stacked retaining wall lies below the talus wall on the sloping terrain. This retaining wall creates a small level terrace measuring 3.0 meters E-W by 2.0 meters N-S. The wall measures 3.0 meters E-W by 0.5 meter in width and is about 0.5 meter in height. It wraps around the upslope side of the level area. An adz blank (Artifact #14) was located tucked in a niche beneath the edge of a talus boulder at the feature's northeastern corner during a subsequent field visit. This artifact was not collected, but was measured in the field, and returned to its *in situ* location. It measured 84.0 x 28.0 x 18.0 mm.

Feature F feature consists of a small, level terraced area that measures 2.0 meters E-W in length by 1.3 meters N-S in width. This level area is created in the otherwise steeply sloping terrain by a small nearly vertical, faced retaining wall. This well-built wall measures 2.2 meters in length by 0.25 meter in width and has a maximum height of 1.3 meters. This wall is constructed on the upslope side of the level area, thus holding back slope wash. This feature is unique in its quality of construction and small size. The retaining wall appears to have been built to create the small, level space below it. It is possible that this feature could have held an image of some kind in the past.

Discussion

Features A and B are clearly temporary habitation areas, and the Feature C terrace provides additional space in front of the two overhangs, particularly Feature B. While Features D and E appear to be retaining walls, they do not appear to have particularly large associated terraces. However, it remains possible that these are agricultural features that may have been partly covered by slope wash over time. The positioning of Feature F on the steep slope, and the overall care with which it was constructed, suggests a ceremonial rather than an agricultural function. While this interpretation remains somewhat speculative, it is noted that there were no other similar features located within the c. 475-acre project area. While the overall function of Site 5138 remains somewhat unclear, the presence of indigenous portable remains including artifacts suggests that it is a precontact site.

Site 50-50-01-5139 [Figure 22; Photos 22, 23] **(16)**

This site is located in the bottom of Honokahua Gulch on the eastern side of the streambed. The site consists of a complex of 8 dryland agricultural terraces, 1 rock alignment and 1 small overhang (Features A-J). The majority of these features occur at or near the base of the gulch's eastern slope. This site lies approximately 60 meters upstream to the southeast of an access road that cuts across the stream for a papaya plantation. A mature forest of rose apple and *kukui* trees forms the over story vegetation. *Noni* and coffee shrubs dominate the under story. The ground is blanketed with *laua'e* ferns. Christmas berry trees cover much of the gulch's slope. Overall site dimensions are c. 50.0 meters N-S by 30.0 meters E-W.

Site 5139 includes 7 probable agricultural terraces (Features A, B, D and F-J). Some of these features are created by the modification of outcrops that are present along the base of the gulch. Others have low, stacked retaining walls, behind which soil suitable for agricultural usage is to be found. In both instances, a level, terraced soil area is created behind the stonework of these features. Also present is single rock alignment that is possibly part of a pathway (Feature C). A small overhang, too low in ceiling height to be a shelter contains one piece of water worn coral inside (Feature E). The site is in good overall condition and does not appear to have been impacted by post-contact earth moving activities.

Feature A consists of a level terraced area that measures 9.0 meters N-S by 4.0 meters E-W. A retaining wall c. 7 meters in length N-S runs along the western side and is mainly constructed of subangular cobbles and a few waterworn cobbles. This wall is 2 to 4 courses in height and incorporates existing outcrops. This feature is set back c. 8.0 meters east of Honokahua Stream. One test unit was excavated to assess subsurface conditions.

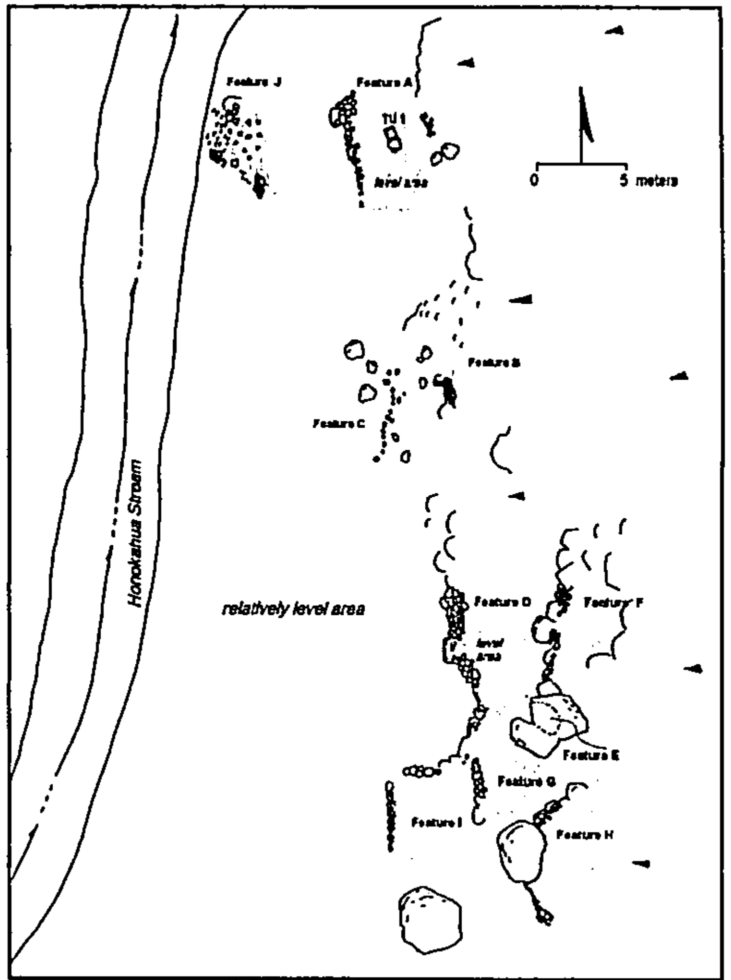

Figure 22 – Plan view of Site 5139.

Test Unit 1

This 0.5 by 0.5 meter unit was placed in the central portion of Feature A. Three rocky strata were encountered before this unit was abandoned at 55 cmbs.

Layer I (0-12 cmbs) was composed of reddish brown (5 YR 5/3) clay loam. This very compact soil was sterile.

Layer II (c. 10-50 cmbs) consisted of brown (7.5 YR 5/3) silty clay loam. This stratum yielded 48.4 g. of charcoal, and a scant amount of fishbone—but no other portable remains. One bulk sample was recovered from between 27 and 35 cmbs. This sample (Beta-157893) returned a conventional radiocarbon age of 110±60 BP. The 2 Sigma calibrated result (95% probability) for this sample is AD 1660 to beyond 1960. The radiocarbon age has several different intercepts with the calibration curve from Cal AD 1700 through Cal AD 1950 (See Table 5).

Layer III (c. 45-55 cmbs) consisted of light brown (7.5 YR 6/3) silty clay loam. This rocky stratum was sterile.

Feature B consists of a crude retaining wall that was built by stacking 2 to 4 courses of sub-angular and waterworn cobbles into cracks in the existing basalt outcrop. This retaining wall measures 3.0 meters N-S by 2.0 meters E-W with a maximum wall height of 0.60 meters. A small terraced area measuring 2.5 meters N-S by 1.0 meter E-W is created on the upslope, western side of this wall. This feature is about 15 meters east of Honokahua Stream. A small rock alignment, Feature C, lies about 2 meters to the west of the Feature B terrace.

Feature C consists of a single course of sub-angular basalt boulders that are placed in a nearly straight line less than 0.1 meter apart for c. 5.5 meters in overall length. The long axis of this feature parallels the streambed, which is about 12 meters to the west. This feature may be a remnant of a path.

Feature D includes a retaining wall that is constructed by the stacking of 6 to7 courses of sub-angular cobbles and boulders into the spaces between basalt outcrops or talus boulders along the base of the gulch slope. Wall dimensions are 6.5 meters N-S by 5.0 meters E-W by 0.9 meter maximum wall height. A level area 6.0 meters N-S by 4.0 meters E-W is created above this wall.

Feature E consists of a small overhang that exists beneath a large talus boulder. This overhang measures 1.1 meters N-S by 1.7 meters deep by a maximum ceiling height of 0.50 meter. This overhang has marginal shelter potential at best due to its low ceiling height. It may have been utilized as a cupboard or may be a possible burial area. The presence of a piece of branch coral suggests that there may be an alternative function for this space. The boulder that creates this overhang sits at the southern end of the Feature F terrace.

Feature F consists of a retaining wall that is oriented N-S along a series of outcrops and level, terraced area. The overall feature measures 7.5 meters N-S by 3.5 meters E-W with a maximum wall height of 1.5 meters. Cracks in the outcrop are filled in with sub-angular cobbles 1 to 4 courses high. This modified outcrop creates a level, terraced area

measuring c. 7.5 meters N-S by 3.5 meters E-W. The boulder that creates the Feature E overhang sits at the southern end of this terrace that is about 22 meters east of Honokahua Stream.

Feature G consists of a small terraced area measuring c. 3.5 meters N-S by 3.5 meters E-W. This feature is created by a retaining wall that is up to 0.8 meter high and constructed of 2 to 3 courses of subangular cobbles stacked between basalt outcrops. The terraced portion of this feature extends back to the base of the retaining wall of the Feature H terrace 3.5 meters to the southeast. The Feature I terrace is directly adjacent to the west. Feature G is c. 20 meters east of Honokahua Stream.

Feature H consists of a level area and two associated retaining walls. Overall dimensions are 7.5 meters N-S by 6.5 meters E-W by 1.0-meter maximum wall height. The terrace has a level area measuring 6.5 meters N-S by 5.0 meters E-W. Retaining walls are on two sides of this roughly square terrace. The northwestern side of the feature has a retaining wall of subangular cobbles and boulders 5 courses and 1.0 meter high. Large talus boulders are incorporated into the wall including one boulder c. 3.5 meters across that is at the corner of the feature. The other wall faces southwest and is 2 courses and 0.50 meter high. The Feature G and Feature I terraces are directly below to the west.

Feature I measures 6.0 meters N-S by 4.5 meters E-W with a maximum wall height of 0.5 meter. This terrace has a level area measuring c. 5.5 meters N-S by 4.0 meters E-W. An associated retaining wall c. 4.5 meters in length is on the western side of the feature. This wall is built of subangular cobbles 3 courses and 0.5 meters high. A short rock alignment delineates the northern end of the terrace. This wall is about 16 meters east of Honokahua Stream. Features G and H are other terraces that are directly upslope to the east.

Feature J sits at the edge of the streambed cut bank. A relatively level area measures 6.0 meters N-S by 4.0 meters E-W. The western side of this feature contains a retaining wall-like rubble pile that may be collapse. A short section of faced wall a maximum of 0.75 meter high lies along the southern edge of the feature. Feature A, a more intact terrace, lies c. 4.0 meters to the east.

Discussion

Site 5139 is interpreted as a dryland agricultural complex. One charcoal sample was recovered from the Feature A terrace was inconclusive. It appears possible that Site 5139 was used from precontact times into post-contact times.

Site 50-50-01-5140 [Figure 23-26; Photo 24] (17)

This site remnant is situated in the bottom of Honokahua Gulch, some 32 meters east of the stream. Site 5140 lies along the base of the gulch's eastern slope, at the northern edge of the mouth of a substantially incised tributary gulch that enters the main gulch along its eastern side. The area has been heavily impacted by previous earth moving activities associated with the construction of a bulldozer cut road that drops down from the pineapple field to the east. Large push piles have encroached to within about 6 meters of the site's southern edge. This abandoned road cut enters Honokahua Gulch along the northern side of the previously mentioned tributary. Two large bulldozer push piles are out on the level area near the stream where a few conspicuous rock concentrations remain. These may be remnants of features that where destroyed during the earlier bulldozer activity. The abandoned road cut and the push piles are overgrown with vegetation. Flora in the general vicinity of this site consists of *noni* and *koa haole* shrubs, and guava and rose apple trees. In addition, coffee plants were noted directly to

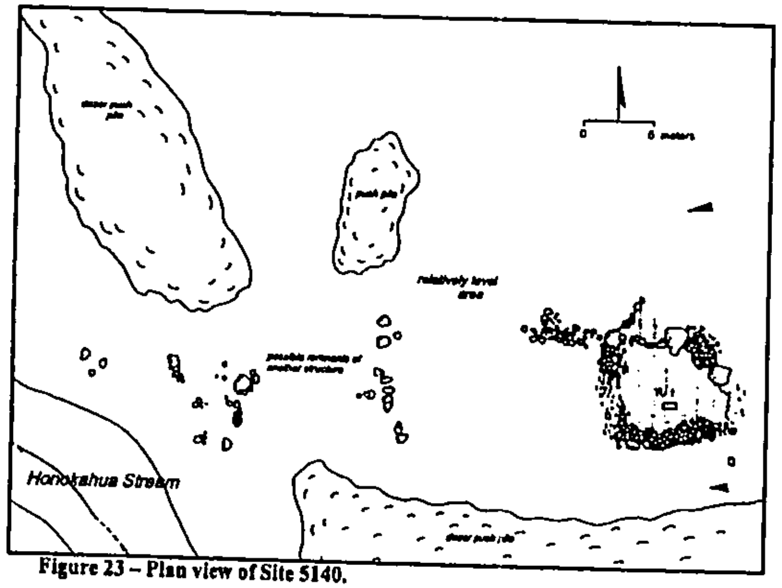

Figure 23 – Plan view of Site 5140.

the west on the level area near the streambed. Christmas berry trees cover the gulch slope above the site.

The identifiable portion of the site measures 8.5 meters N-S by 13.5 meters E-W by 1.0 maximum wall height. This site consists of a terrace feature with a level surface area measuring 6.0 meters N-S by 6.5 meters E-W. A crudely stacked retaining wall runs along the western side of this feature with a maximum height of 0.8 meter. This wall is built of subangular cobbles and boulders and incorporates existing large talus boulders. A crudely stacked, freestanding wall runs the width of the terrace along its southern border. This wall is constructed of 2 to 3 courses of subangular boulders and cobbles and has a maximum height of 0.5 meter. At the northwestern corner of the terrace is a crudely stacked retaining wall has been stacked in and among the existing talus boulders to a height of 1.0 meter at

the base of the gulch slope. A small level area with an associated retaining wall, measuring c. 2.0 meters N-S by 2.0 meters E-W with a maximum wall height of 0.6 meter lies on the northern end of the primary terrace. At the northwestern corner of the primary terrace, a short collapsed wall section extends out to the west some 5.5 meters and has a maximum height of 0.5 meter. One test unit was used to sample subsurface conditions.

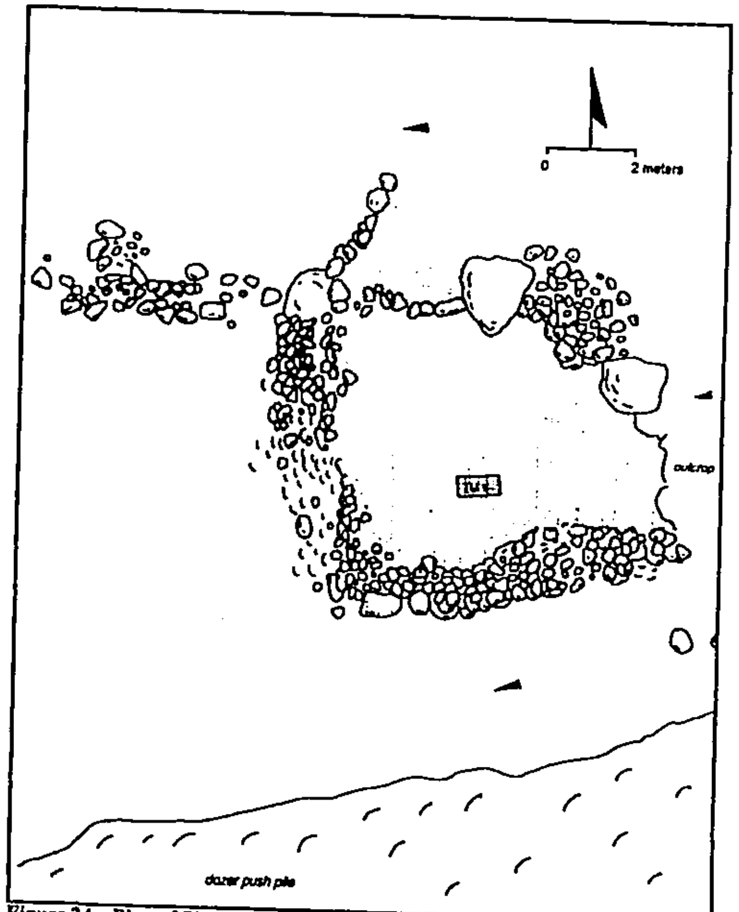

Figure 24 – Plan of Site 5140 feature.

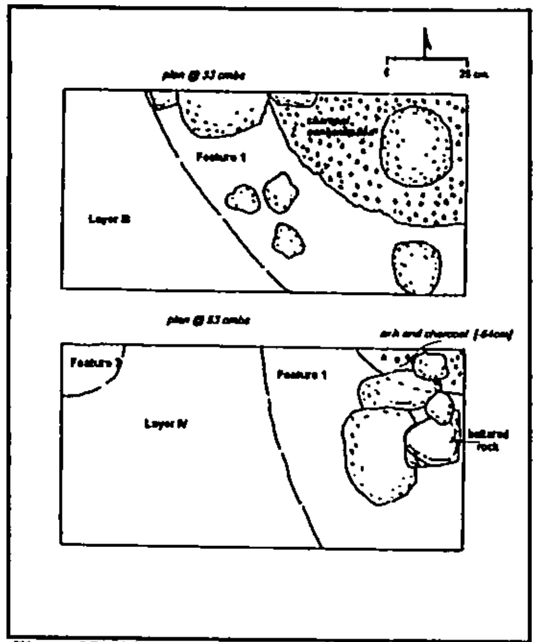

Figure 25 – Plan of TU I—Site 5140.

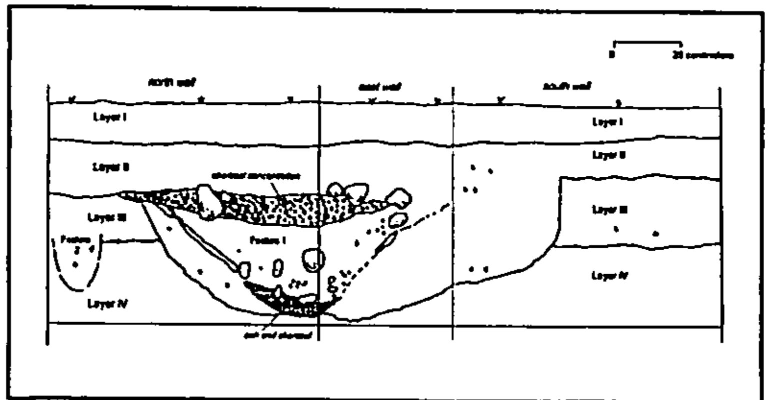

Figure 26 – Profile of Test Unit 1—Site 5140.

Test Unit 1

This 0.5 by 1.0 meter unit was placed near the center of the primary terrace. Test Unit 1 was excavated to a maximum depth of 53 cmbs and three strata were encountered.

Layer I (0-19 cmbs) was composed of dark brown (7.5 YR 3/3) silty clay loam with less than 5% subangular pebbles. Small amounts of material culture remains were recovered from the lower portion of this layer. These portable remains included a few fishbone fragments, an unidentified tooth fragment (1.1 g.), a few pieces of marine shellfish (4.4 g.), and a scant amount of scattered charcoal. In addition, 5 pieces of coral were located. One artifact (Artifact #1)—a small piece of worked bone was recovered.

Layer II (c. 15-33 cmbs) consisted of dark brown (7.5 YR ¾) silty clay loam with 20% subangular pebbles and gravel. Several fire-cracked rocks and an increase in charcoal were noted in this rocky layer. Recovered material culture remains included 4.5 g. of faunal bone, 0.4 g. of fish bone, 1.9 g. of marine shellfish, and 3 artifacts. Artifact #2 is an adze fragment, Artifact #3 a polished basalt flake, and Artifact #4 an edge-altered basalt flake. In addition, one subsurface feature originated in this stratum. In addition 3 unworked basalt flakes and 5 pieces of coral were collected, along with 33.4 g. of charcoal, and 0.8 g. of *kukui* nut shell.

> Feature 40.1 extended from c. 29 to 78 cmbs and appeared to be a large basin shaped pit. This pit feature extended into beyond the walls of TU 1. This gray (7.5 YR 5/1) feature is interpreted as a hearth. Two hundred and forty three grams of charcoal were collected. A radiocarbon sample was submitted for subsequent analysis. This sample (Beta-157894) returned a conventional radiocarbon age of 210±80 BP. Calibrated results at 2 Sigma (95% probability) are Cal AD 1490 to 1950. The radiocarbon age intercepts the calibration curve at AD 1660.
>
> Other findings included 2.5 g. of marine shellfish, 0.3 g. of sea urchin remains, 2.5 g. of dog bone, 0.2 g. of bird bone, and 0.6 g. of fish bone, 5 basalt flakes, 1 piece of coral, and 1 waterworn pebble. A hammerstone (Artifact #6) was also recovered.

Layer III (c. 27-53 cmbs) was made up of brown (7.5 YR 5/3) silty clay with c. 20% by volume subangular pebbles and gravel. This compact stratum yielded lower amounts of material culture remains than the overlying stratum. Recovered portable remains included 4.5 g. of marine shell, 0.4 g. of mammal bone, 48.1 g. of charcoal, and 0.7 g. of *kukui* nut shell. In addition, a subsurface feature was located in this layer.

> Feature 40.2 (c. 48-68 cmbs) was located in the northwestern corner of the unit. No portable remains other than scattered charcoal was found in this possible posthole.

Layer IV extended from c. 52 cmbs to the bottom of the unit at 80 cmbs. This sterile, rocky layer was composed of brown (7.5 YR 5/4) silty loam.

Discussion

Site 5140 is interpreted as a probable late precontact permanent habitation area that may have been utilized into post-contact time as well.

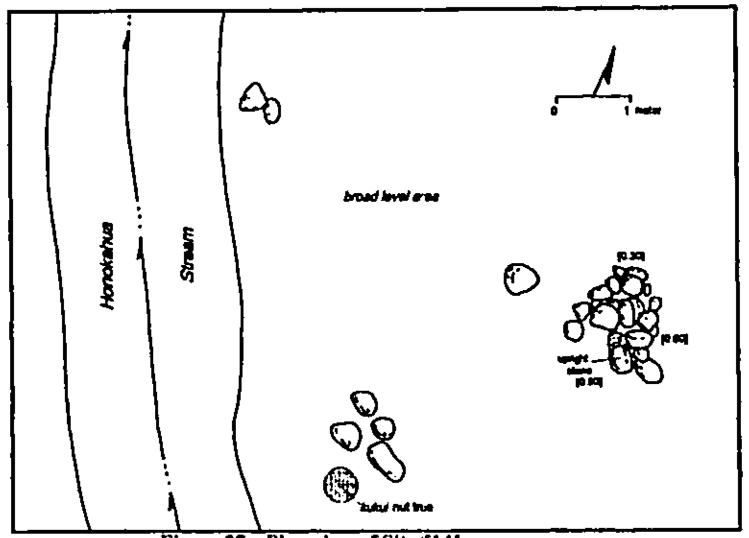

Figure 27 – Plan view of Site 5141.

Site 50-50-01-5141 [Figure 27; Photo 25] (18)

This single component site is located in the bottom of Honokahua Gulch, on a broad level area about 4.5 meters east of the stream bank. The site lies directly west of the mouth of the substantially incised tributary gulch that enters the main gulch along its eastern side. The vegetation in the general area consists of mature rose apple and *kukui* trees, along with an under story of *noni*, *ki* and coffee plants.

The site consists of a conspicuous, roughly oval shaped cluster of sub-angular cobbles and boulders c. 0.35 to 0.50 meter in diameter. A single upright stone trapezoidal in shape is located in the southern corner of the cluster of rocks. The feature measures 1.6 meters N-S by 1.4 meters E-W by 0.60-meter maximum height, and lies 4.5 meters east of the streambed. No testing was undertaken at this site and no portable remains were located on the surface in the immediate vicinity. Given the general location of the feature in an inland agricultural area, it is possible that it represents a small shrine such as a Pohaku o Kane. An alternative interpretation is that it represents a possible precontact or early post-contact isolated burial site. Again no testing was done to determine if human remains were contained within the feature.

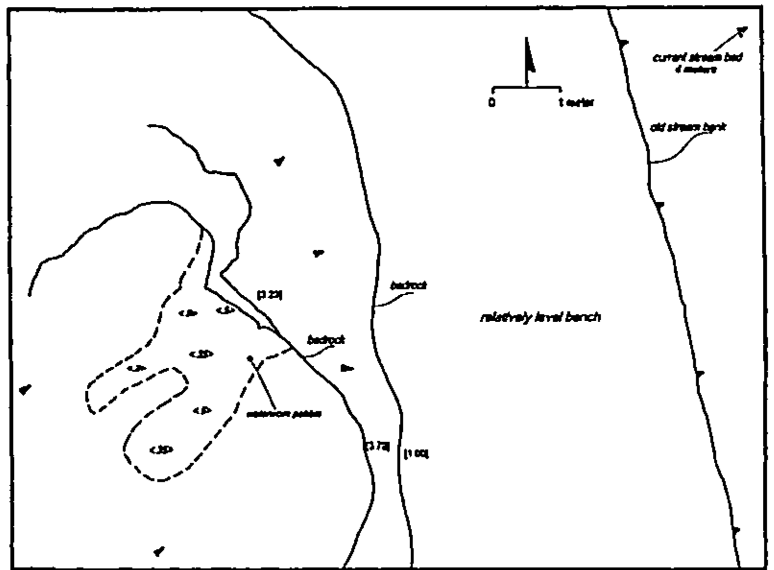

Figure 28 – Site 5142 plan.

Site 50-50-01-5142 [Figure 28; Photo 25] (19)

This rock overhang is located in the Honokahua Gulch, near the base of the gulch's western slope. This small shelter is situated in an escarpment face c. 4.7 meters above a level area adjacent to the western edge of the gulch bottom, about 13 meters west of the streambed. Observed flora in the general vicinity consisted of ironwood trees on the gulch slope adjacent to and above the shelter, and Christmas berry, *kukui*, *noni* trees and coffee plants below near the streambed.

This rock overhang measures 1.4 meters NW-SE in width by 2.6 meters in depth with a maximum ceiling height of 0.9 meter (average height is approximately 0.4 meter). This overhang has a low ceiling height and it appears that its use as a temporary habitation area would have been limited. One waterworn pebble was noted in the confined interior of this overhang. Because of the limited size of this overhang, it appears unlikely that temporary habitation was its primary function. While subsurface testing was not undertaken, it is possible that it could contain a burial. There have been instances elsewhere on Maui where constricted overhangs similar to Site 5142 (e.g., Olowalu, Pukalani and Nahiku) were confirmed to contain human remains.

Site 50-50-01-5143 [Figure 29, 30; Photo 26] (20)

This rock shelter lies near the base of Honokahua Gulch's western slope. The shelter is located at the base of a c. 5-meter high escarpment and is c. 7 meters above and 8 meters west of a level area on the gulch floor that is now a papaya orchard. Other flora noted in the area consisted of an over story of Christmas berry, rose apple and guava trees.

In addition, *laua'e* ferns, various alien vines and *koa haole* shrubs comprise the under story. The streambed is located c. 35 meters to the east.

Site 5143 appears to have been vandalized by bottle hunters. The soil deposit within this overhang varies from over 0.4 meter at the test unit location at the shelter's southern end to non-existent in the central portion of the shelter where exposed rock is visible. The overhang measures 7.0 meters N-S in width by 1.5 meters in depth E-W by up to 0.7 meter in ceiling height. Observed portable remains noted on the floor included two unidentified mammal (non-human) bone fragments and one small cowry shell fragment. In addition, burnt *kukui* nut fragments were noted in a small niche in shelter wall. One test unit was utilized to assess subsurface conditions.

Test Unit 1

T.U.1 (0.5 x 0.5 meter) yielded moderate amounts of midden and charcoal from soil. This unit was placed directly outside of the primary chamber beneath the lip of the overhang. This unit contained two strata.

Layer I (0-18 cmbs) was composed of loose, brown (7.5 YR 5/4) silty loam with c. 20% fine gravel. One small charcoal fleck (less than 0.1 g) was found near the bottom of Layer I.

Layer II (c. 18 -65 cmbs) consisted of dark brown (7.5 YR ¾) silty loam that contained more gravel than the overlying stratum and c. 20% subangular cobbles by volume. Layer II yielded 9.7 g. of marine shellfish remains, 0.8 g. of dog bone, 0.5 g. of fishbone, 2.1 g. of *kukui* nut shell, and 94.6 g. of charcoal. In addition, one piece of unworked volcanic glass, 3 basalt flakes, and a piece of ochre were also recovered from the screen. The unit was abandoned due to very difficult digging conditions.

Site 5143 is interpreted as a temporary habitation area that was possibly utilized during late-precontact times and/or post-contact times.

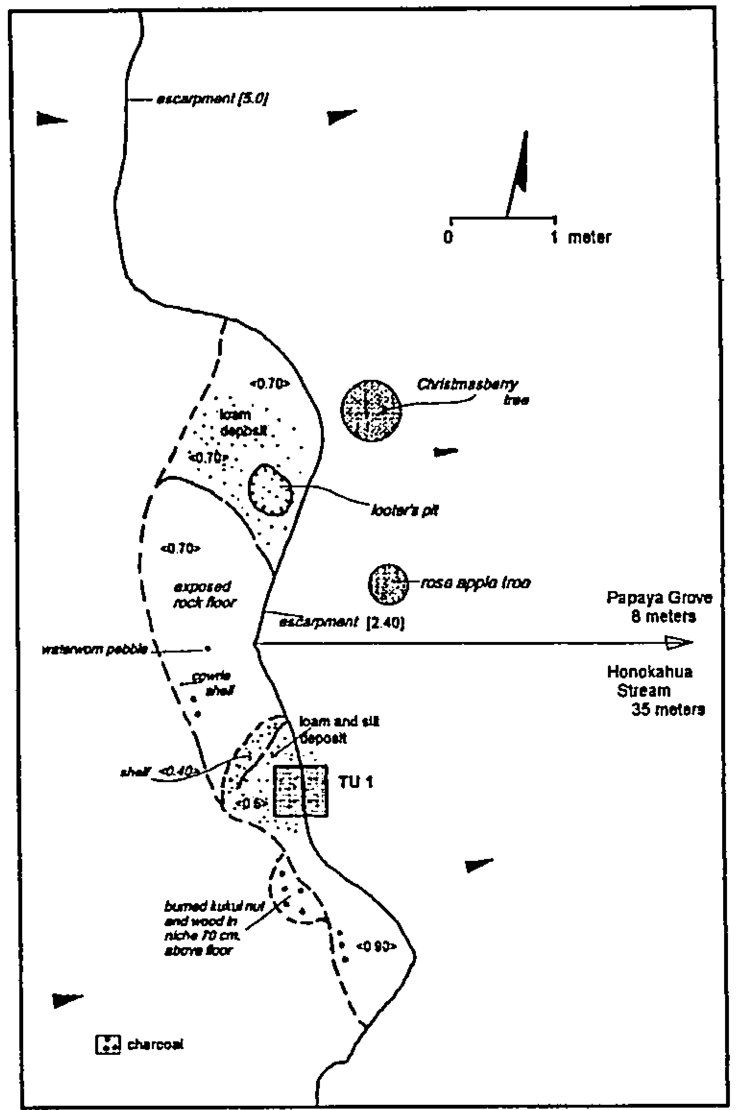

Figure 29 – Site 5143—plan view.

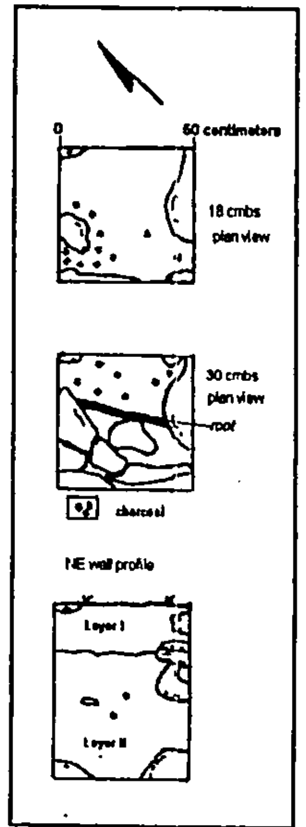

Figure 30 – Plan views and profile of TU 1—Site 5143.

Site 50-50-01-5144 [Figure 31, 32; Photo 27] **(21)**

This terrace is located in Honokahua Gulch c. 2 meters east of the streambed on a relatively level area. Site 5144 lies c. 17 meters southwest of the Kapalua maintenance facility's paved access road. It appears likely that previous road construction activities impacted the northeastern edge of this site. Flora present in the general vicinity of this site includes Christmas berry, eucalyptus and *kukui* trees along with scattered *noni* plants. *Koa haole* shrubs cover the eastern gulch slope c. 30 meters to the northeast.

Overall site dimensions are 8.0 meters NE-SW by 6.0 meters NW-SE by 1.3 meters in height. A crudely stacked, faced retaining wall built of subangular cobbles and boulders runs along the western edge of the terrace paralleling the streambed. A free standing, crudely stacked and partially faced rock wall runs along the southeastern edge of the terrace. A boulder c. 2 meters wide is incorporated into this wall. The relatively level terraced area measures c. 4.0 meters NW-SE by 4.0 meters NE-SW and is partly covered by a large tree. This tree was mechanically felled in the relatively recent past. One test unit was placed along the inside of the freestanding wall on the southeastern-central portion of the terrace.

Test Unit 1

T.U.1 (0.5 x 0.9 meter) was located near the interior of wall of Site 5144. This unit was excavated to a maximum depth of 85 cmbs and contained two strata. Layer I (0-60 cmbs) was composed of brown (7.5 YR 5/4) silty loam. This stratum was very rocky and yielded a trace (0.2 g) of scattered charcoal and 1 burnt *kukui* nut fragment. Layer II consisted of light brown (7.5 YR 6/3) silt with over 50% gravel by volume. This layer was sterile and excavation was halted at a boulder.

Site 5144 is tentatively interpreted as a late precontact to early post-contact dryland agricultural site remnant. The general lack of material culture remains in TU 1, suggest that here was not a habitation function attached to Site 5144. This terrace has been impacted by previous earth moving activities associated with the construction of a paved access road.

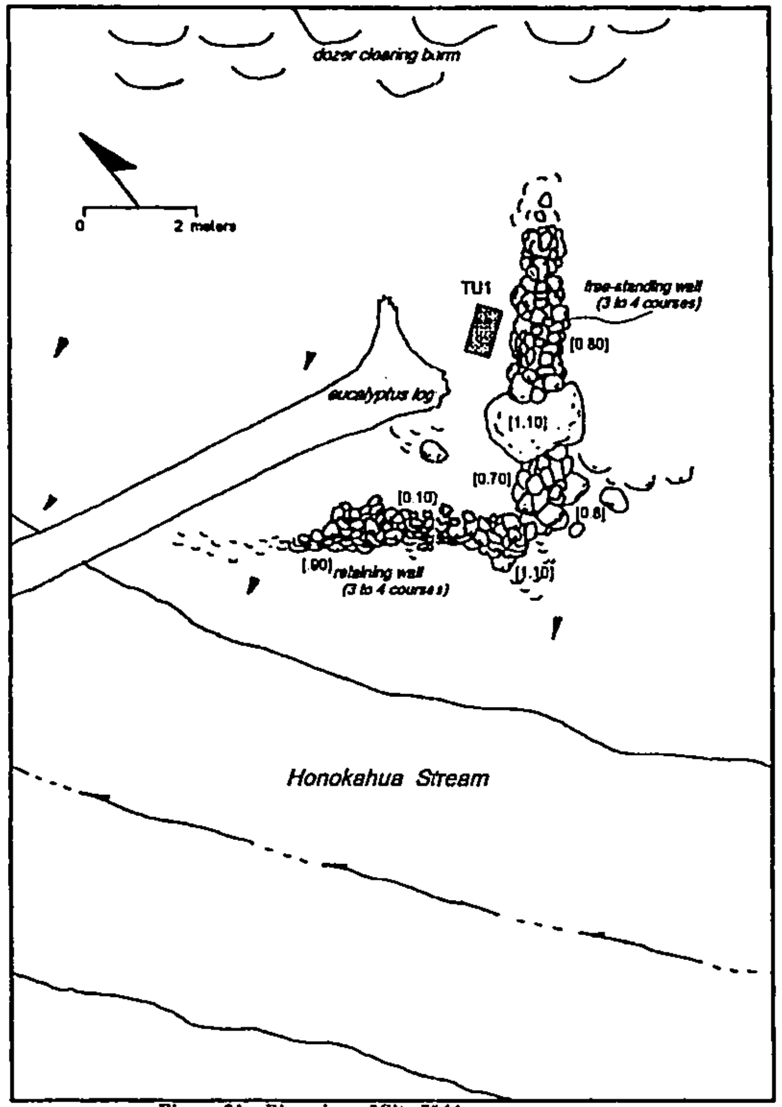

Figure 31 – Plan view of Site 5144.

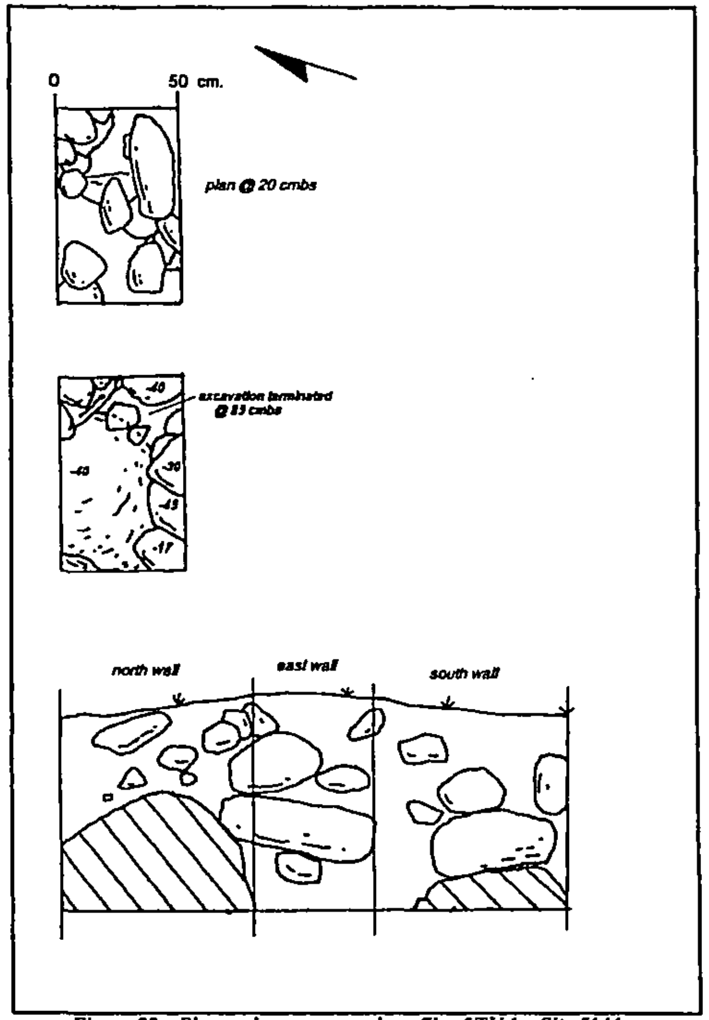

Figure 32 – Plan and wrap-around profile of TU 1—Site 5144.

Site 50-50-01-5145 [Figure 33, 34; Photo 28] **(22)**

This rock overhang shelter is located in Honokahua Gulch, c. 47 meters west of streambed, near the base of the western gulch slope. A large rock wall, Site 4459, lies c. 36 meters ESE from this site near the stream. This shelter is at the base of a c. 7-meter high escarpment. The terrain slopes gradually down to the streambed from the base of this escarpment. Flora in the general area consists of Java plum, Christmas berry and eucalyptus trees along with *noni*, *ki* and coffee plants.

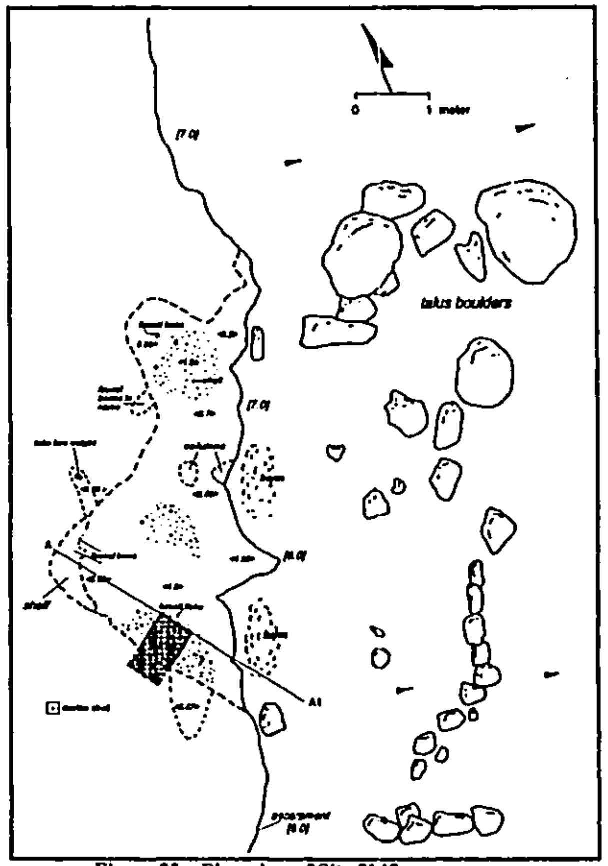

Figure 33 – Plan view of Site 5145.

Overall site dimensions are 5.5 meters NE-SW in width by 3.0 meters NW-SE in depth by up to 1.5 meters maximum ceiling height (average ceiling height 0.70 meter). The interior floor is largely exposed rock with some pockets of soil deposit. An earthen berm sits directly beneath the drip-line of the shelter and is likely slope wash. A small boulder sits directly outside the mouth of the shelter on its south end. This rock may be a possible seat. Portable remains were visible on the surface of this overhang and included one basalt flake, three faunal bone fragments, and ten marine shells (<u>Planaxis labiosa</u>, <u>Nerita picea</u>, <u>Thyidadae</u>, <u>Cypraea sp.</u>). In addition, one octopus lure weight was located in a narrow niche in the back wall of the shelter with the aid of a flashlight. This lure (Artifact # 13) is fashioned from dense coral and weighs 446.0 g. It measures 96.0 x 74.0 x 47.0 mm [Photos3 &4]. One test unit was utilized to assess subsurface conditions.

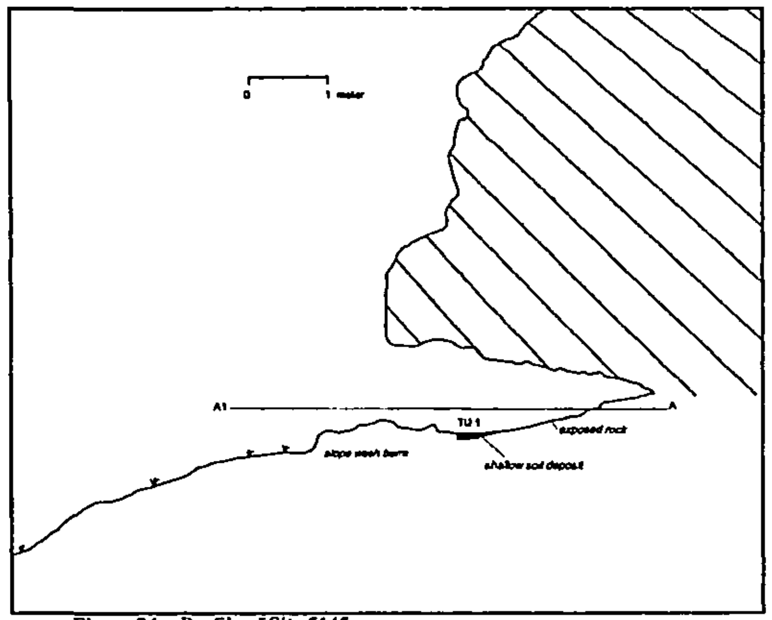

Figure 34 - Profile of Site 5145.

Test Unit 1

T.U.1 (0.9 x 0.5 meter) was excavated along the western side of the rock overhang. This unit was excavated to bedrock at a maximum depth of 19 cmbs. Layer I extended top bedrock and was made up of brown (7.5 YR 5/3) silt. This stratum yielded moderate amounts of portable remains including 30.0 g. of Planaxis and 6.7 g. of other marine shellfish, 3.5 g. of fish bone. Several artifacts were recovered—a shark tooth (Artifact #11), an adze fragment (Artifact #7), 2 pieces of utilized volcanic glass (Artifacts #8 and #12), 2 pieces of worked bone (Artifacts #9 and #10). In addition, 4 unworked basalt flakes, 4 pieces of volcanic glass and 3 pieces of coral were recovered from the screen. One bulk soil sample was recovered from the layer between 10 and 14 cmbs and yielded nearly 40 g. of charcoal. This sample returned a conventional radiocarbon age of 240 $\pm$ 60 BP. The 2 Sigma calibrated results (95 % probability) were Cal AD 1500 to 1690 and Cal AD 1730 to 1810 and Cal AD 1920 to 1950. The intercept of the radiocarbon age with the calibration curve is Cal AD 1660.

Discussion

Excavation at this site yielded indigenous material culture remains including fishing gear and lithics. No post-contact remains were found in the overhang shelter. One charcoal sample was recovered and returned a conventional radiocarbon age of 240$\pm$60 BP. While three calibrated date ranges ranging from precontact to modern were given for the sample. Given the lack of any post-contact portable remains, it appears likely that this temporary habitation area was utilized in late precontact and/or early post-contact times, rather than modern times.

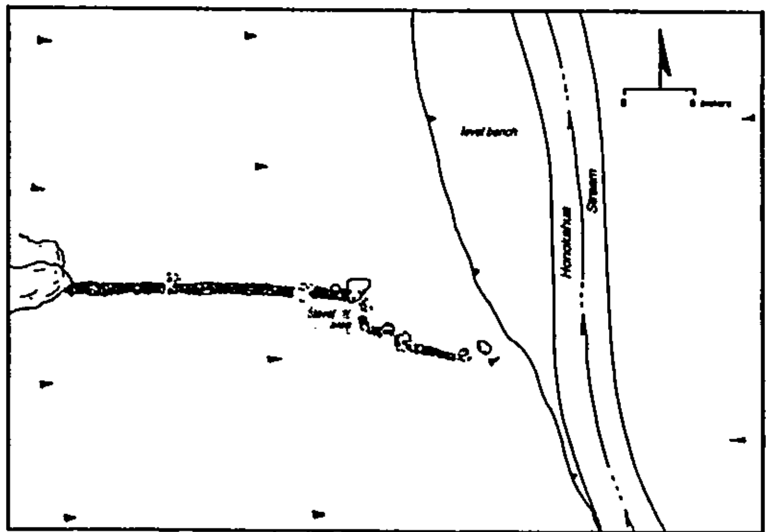

Figure 35 – Plan view of Site 5146.

Site 50-50-01-5146 [Figure 35] (23)

This rock wall is located on Honokahua Gulch's western slope. The wall is oriented E/W and runs directly up the moderately steep slope starting from a point c. 6.5 meters west and 3 meters above the northern end of a deeply incised section of the streambed. The

gulch slope has moderate quantities of talus boulders covering it. Christmas berry trees cover the general area. A few scattered *noni* shrubs were also noted.

The Site 5146 wall is in generally fair condition. Overall dimensions for this wall are c. 28 meters E-W in length by 0.9-meter maximum width by 1.05 meters maximum height. The overall quality of construction is poor to fair. For the most part, this wall is poorly constructed. This wall is constructed of subangular basalt cobbles and boulders, and it runs E-W straight up the western gulch slope. Large basalt outcrops and/or talus boulders have been incorporated into its construction. The western uppermost end of the wall terminates at a large basalt outcrop. Site 5146 is interpreted as an early post-contact boundary and/or livestock containment wall.

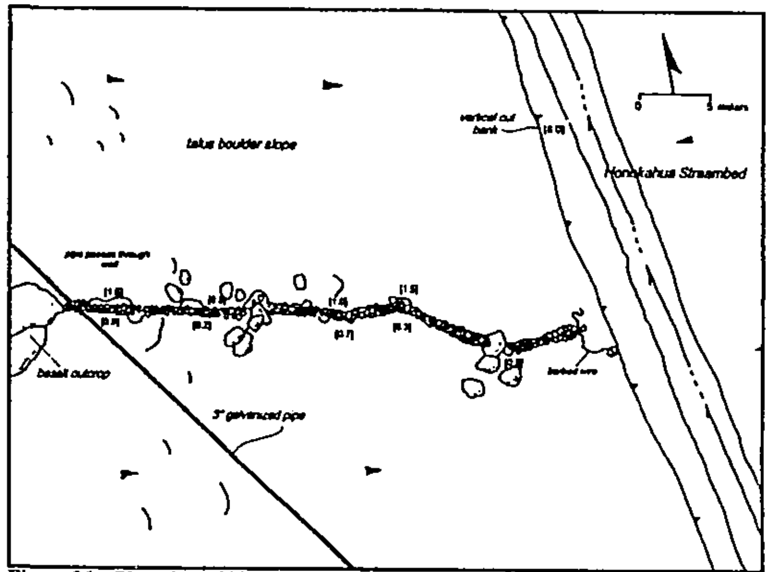

Figure 36 – Plan view of Site 5147.

Site 50-50-01-5147 [Figure 36; Photo 29] (24)

This wall is similar to the Site 5146 wall, and lies c. 75 meters SSE, upstream. It is also located along the western slope of Honokahua Gulch. Site 5147 starts at a point at the top of a cut bank c. 8 meters high along the western side of a deeply incised section of the stream. The wall runs straight up the moderately steep gulch slope that is covered with talus deposit. Observed flora is composed of mature Christmas berry and rose apple trees, along with *noni*, guava and *ki* plants.

This wall appears to follow a linear basalt outcrop straight up the fairly steep gulch slope. This linear outcrop is modified with the addition of 2 to 6 courses of subangular cobbles and boulders placed atop and between the cracks in the outcrop. The wall also incorporates large talus boulders. In other areas stacked rock wall sections are clearly discernable. The wall ends at a large outcrop at its uppermost western end. The wall has been modified in two locations. A 3" diameter galvanized water pipe passes though the wall near its western end. The second modification occurs where a short length of barbed wire is tied to a Christmas berry tree and a boulder at the wall's eastern end. The overall dimensions of this wall are 38 meters E-W in length by 1.0 meter in maximum width by up to 1.5 meters in height. Site 5147 is interpreted as post-contact boundary/animal containment wall.

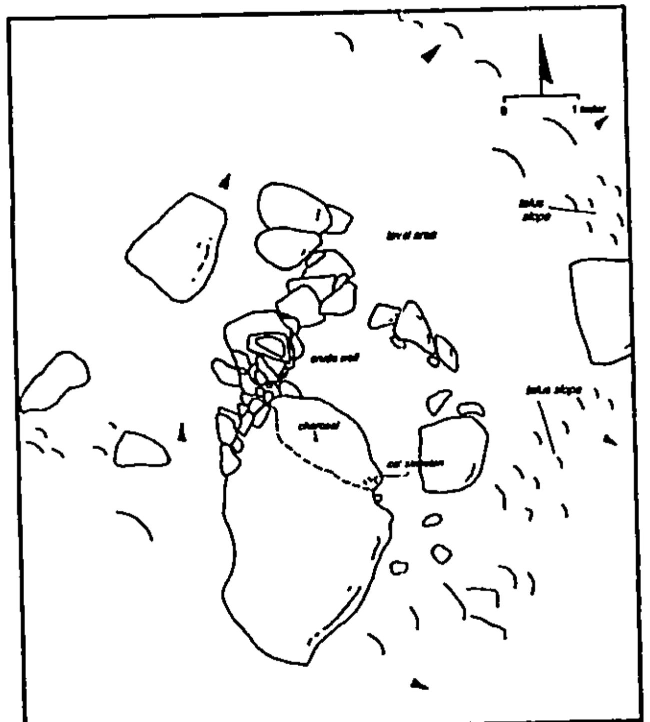

Figure 37 – Site 5148—plan view.

Site 50-50-01-5148 [Figure 37] (25)

This site is located midway up Honokahua Gulch's western slope. This small overhang sits beneath the edge of a large talus boulder in a gradually sloping area that is

covered by a talus deposit. Observed flora consisted of Christmas berry trees along with a few *noni* and *ki* plants in the general area.

This small overhang measures 1.8 meters NW-SE wide by 0.8 meter deep with a maximum ceiling height of 1.45 meters. The northwestern side of the talus boulder has been modified with the addition of a small, stacked rock wall. This wall encloses the northwestern end of the overhang and extends c. one meter out from the boulder. This wall consists of crudely stacked subangular cobbles and boulders 5 to 6 courses and 0.9 meter high. A cleared, level area measuring 4.5 meters N-S by 3.5 E-W lies adjacent to and NNE of the shelter. Some charcoal was noted on the floor of the shelter. This site is interpreted as a temporary habitation area that may have been utilized in precontact and possibly into post-contact times.

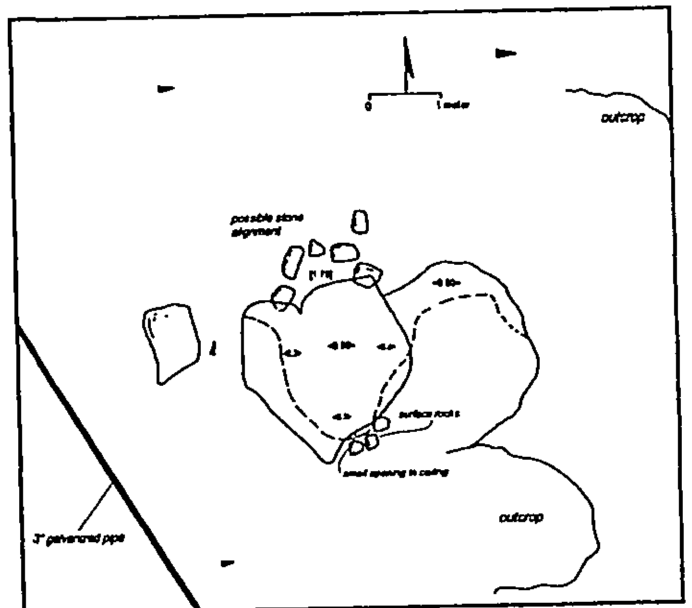

Figure 38 – Plan view of Site 5149.

Site 50-50-01-5149 [Figure 38; Photo 30] (39)

This small rock overhang is located on the lower portion of the western slope of Honokahua Gulch. Talus deposit covers most of this sloping area. Observed flora consists of Christmas berry thickets, rose apple trees and a few *noni* plants.

The overall size of this site is 4.0 meters E-W by 3.0 meters N-S by 0.90 meter maximum ceiling height of shelter. It consists of a small overhang shelter measuring 2.0 meters E-W by 2.1 meters deep with a maximum ceiling height of 0.9 meter. A semi-circular rock alignment measuring 1.5 meters in length E-W and 0.7 meter in width is located directly outside the shelter. This alignment consists of 5 subangular boulders averaging 0.4 meter in size, which are placed so as to form a semi-circular arrangement at the mouth of the shelter. A small crack that has been partially blocked off by the placement of 3 cobbles lies near the back or southern end of the shelter. An inspection of the overhang floor revealed charcoal flecking and some scattered fish bone. No subsurface testing was undertaken at this site. This site is interpreted as a possible precontact temporary habitation area that may have been used in early post-contact times as well.

Site 50-50-01-5150 [Figure 39; Photo 31] (26)

This wall is located in the bottom of Honokahua Gulch. It lies from 5.0 to 12.0 meters west of the streambed bank in a relatively level area of mature forest. A sheer escarpment of c. 15 meters in height lies directly opposite the northern end of this wall on the eastern side of the streambed. The gulch slope rises moderately from the western side of the wall. Flora noted in the area included Christmas berry, *kukui*, and rose apple trees along with *noni*, guava and coffee plants. A bulldozed road has impacted this site. This road parallels the wall along the majority of its length and large amounts of boulders and trees have been pushed up along the western side of the wall.

This wall is constructed of crudely stacked sub-angular cobbles and boulders. Talus boulders occur in large amounts scattered about the area and many of these boulders have been incorporated into the wall. The wall measures c. 96 meters N-S length by 33 meters E-W by 1.5 meters maximum wall width by 1.1 meters maximum height. Overall appearance of this wall is crude with occasional partially faced sections. The wall parallels the stream and runs in a nearly straight line N-S for most of its length. It turns sharply as the stream bends to the west. The northern most section of wall, which is c. 8 meters in length, has been separated from the rest of the wall by a previous bulldozer cut road. The road's initial construction and subsequent maintenance appears to have destroyed a 13-meter long section of the wall. Site 5150 is interpreted as a boundary wall that may have also served as an animal containment wall.

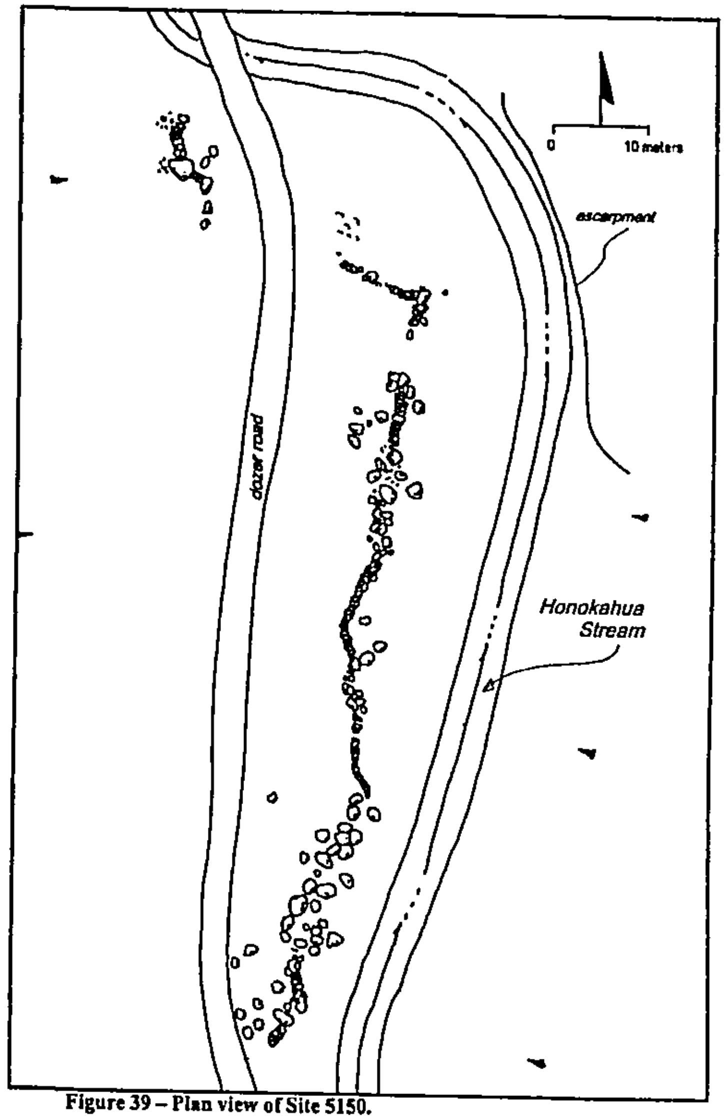

Figure 39 – Plan view of Site 5150.

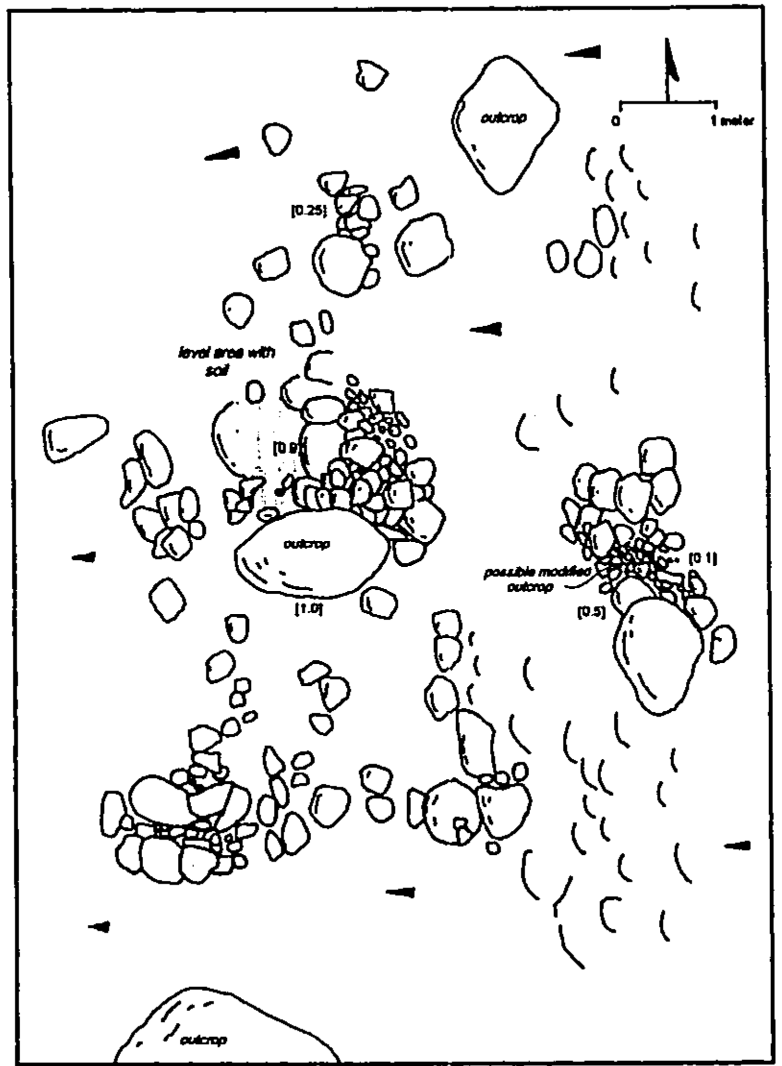

Figure 40 – Plan view of Site 5151.

Site 50-50-01-5151 [Figure 40] (28)

This single component site is located at the base of Honokahua Gulch's eastern slope and about 10 meters east of the stream cut bank. A bulldozer cut road, the same as that which impacted Site 5150, passes c. 11 meters to the east of Site 5151. The site lies on a gentle talus slope that is blanketed with Christmas berry thickets and several *kukui* trees to the west. The Site 4459 wall is directly west on the opposite side of the stream.

This site consists of a small, rock retaining wall that has been constructed by stacking sub-angular cobbles in and around a basalt outcrop. Overall dimensions are c. 2.5 meters N-S by 2.3 meters E-W by 0.9 meters maximum wall height. This modification creates a small level area on the down slope, western side. This terrace measures 1.5 meters N-S by 0.5 meter E-W. A possible modified outcrop is directly above this feature to the east. The slope is covered with talus deposit in the general area. No portable remains were located during the surface inspection and no subsurface testing was undertaken. Site 5151 is interpreted as a possible dryland agricultural site. This conclusion is based on the presence of a level soil area created by a retaining wall.

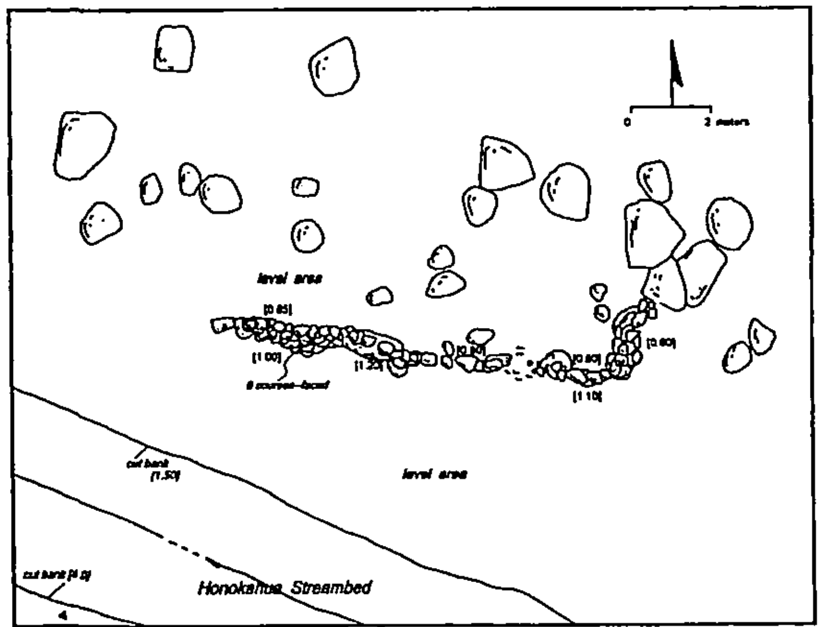

Figure 41 – Plan view of Site 5152.

Site 50-50-01-5152 [Figure 41; Photo 32] **(29)**

This rock wall is located in Honokahua Gulch, near the edge of the streambed. It lies c. 3 meters to the north of the c. 1.5 meter high stream cut bank and at the base of the gulch's eastern slope. The wall sits in a level area that is strewn with large boulders—many greater than 1.0 meter in diameter. Flora noted in the vicinity of the site consisted of Christmas berry and rose apple trees, along with an under story of alien grasses and weeds. A bulldozer cut road lies about 10 meters northeast of the eastern end of this wall. Site 5152 has been altered by bulldozing activities.

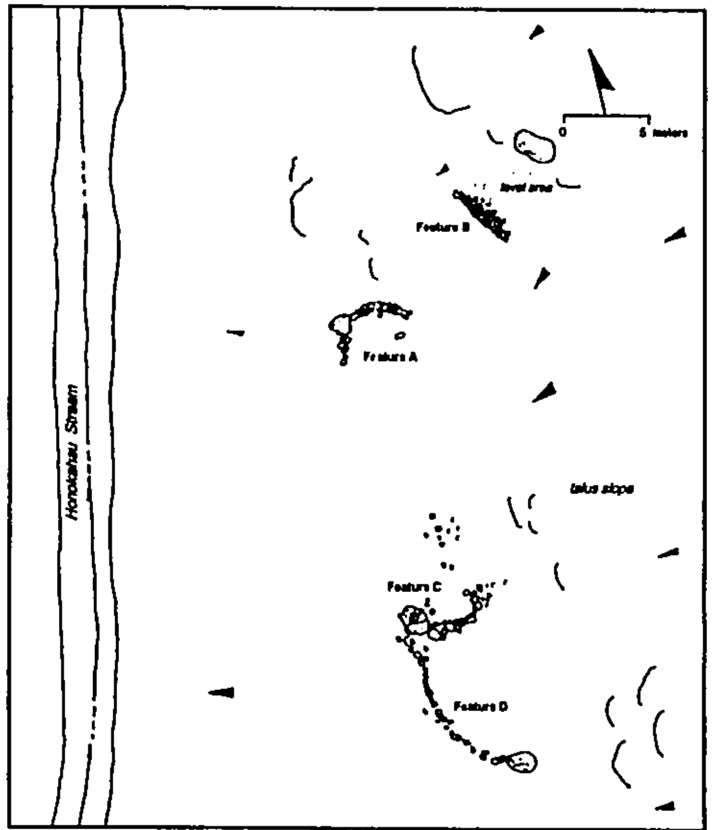

Figure 42 – Plan view of Site 5153.

The overall dimensions of this wall are 10.8 meters E-W in length by 1.4 meters N-S in width by a maximum wall height of 1.2 meters. The wall is generally constructed in a rough fashion and incorporates subangular rocks of various sizes including large boulders. Smaller boulders and cobbles are stacked atop and between the boulders. The western end of the wall is faced along its southern side that faces the stream. The wall forms an L-shape in plan view. A 90-degree bend near the wall's eastern end continues terminates at a cluster of large boulders that have likely been pushed from previous road construction activities. While the relative age of the Site 5152 wall remains unclear, it is interpreted as a boundary wall that may have been used for animal containment.

Site 50-50-01-5153 [Figure 42; Photo 33] **(30)**

This site is located along the base of Honokahua Gulch's eastern slope. It sits in a relatively level area c. 12.5 to 25 meters east of the streambed. The talus slope above is covered and the area has a great deal of boulders and cobbles scattered around. Primary vegetation noted in the general vicinity consisted of Christmas berry thickets with a few rose apple trees and sparse *noni* plants.

This site consists of two small partial enclosure walls (Features A and C), one small terrace feature (Feature B) and one rock alignment (Feature D). The overall dimensions of this site are c. 40 meters N-S by 19 meters E-W. Feature A is a small, L-shaped wall that is located in the central portion of the site, c. 12.5 meters east of the streambed. Feature B is a terrace that is built into the slope base, c. 7.0 meters northeast of Feature A. Feature C is a small roughly C-shaped crudely stacked wall c. 14.5 meters to the south of Feature A. Feature D is a rock alignment that extends off the southeastern corner of Feature C.

Feature A consists of a rock wall that forms a partial enclosure. This L-shaped feature measures 5.0 meters E-W by 4.0 meters N-S with a maximum wall height of 0.7 meter. This L-shaped feature consists of a low, crudely stacked wall that runs E-W along its northern side for about 4 meters. The wall is constructed with subangular cobbles and is up to 8 rock courses high. A basalt outcrop forms the northwestern corner where a crude wall of 2 courses of small boulders trends southward for 2.0 meters. This partial enclosure is in good general condition. While its function and age remain unclear, it may represent a temporary habitation shelter.

Feature B is composed of a terrace and an associated retaining wall with overall dimensions of 4.6 meters NW-SE by 4.5 meters NE-SW by 1.8 meters maximum wall height. The faced retaining wall of this terrace is well built of sub-angular cobbles up to 10 courses high. This terrace is interpreted as a probable precontact and/or early post-contact dryland agricultural feature.

Feature C consists of a crudely stacked rock wall that abuts a large talus boulder along the feature's southern and eastern sides. This partial enclosure measures 5.0 meters E-W by 3.0 meters N-S by up to 0.6 meter high. This wall is built of subangular cobbles and boulders, and is 2-3 courses high along its north facing side and is a single course high on its other side. Additional stacking around the talus boulder creates a slightly sunken, partially enclosed area that measures 3.0 meters E-W by 2.0 meters N-S. While the function of this partial enclosure remains somewhat unclear, it is tentatively interpreted as a precontact and/or early post-contact dryland agricultural feature.

Feature D consists of a rock alignment with overall dimensions of c. 9 meters N-S by 3 meters E-W by 0.8-meter maximum height. This feature consists of a slightly curving rock alignment that is made of sub-angular rocks that average 30 centimeters in diameter. The Feature D alignment extends between a boulder at the southwestern exterior corner of Feature C to another boulder 8.0 meters south of Feature C. The purpose of this alignment remains somewhat unclear, but it may represent another dry land agricultural feature within the complex.

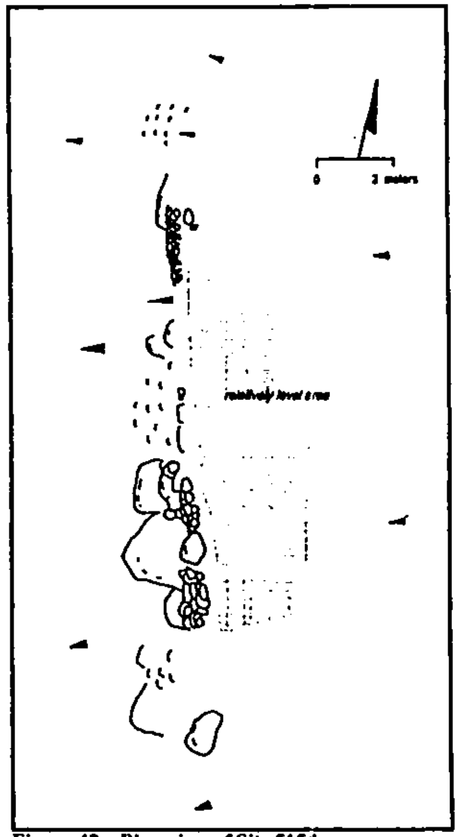

Figure 43 – Plan view of Site 5154.

Site 50-50-01-5154 [Figure 43; Photo 34] **(31)**

This terrace is located on the moderately sloping eastern side of Honokahua Gulch. The terrace is approximately 80 meters east of the streambed and 50 meters above the base of the gulch slope. Flora consists of Christmas berry trees and sparse *noni* plants. The ground is covered with *laua'e* ferns.

Overall site dimensions are 13.0 meters NNW-SSE by 5.0 meters WSW-ENE by 1.3 meters maximum wall height. This terrace is built into the slope. Its retaining wall varies from a well built, vertically faced wall 8 courses and 1.3 meters high at the northern end, to a section of crude stacking on boulders at the southern end. The central portion of this retaining wall has apparently collapsed. A level terraced area measuring c. 10 meters N-S by 2.2 meters E-W exists above the wall to the east. This site is interpreted as a probable precontact dryland agricultural feature, because of the concentration of soil suitable for cultivation retained behind the rock wall of the site.

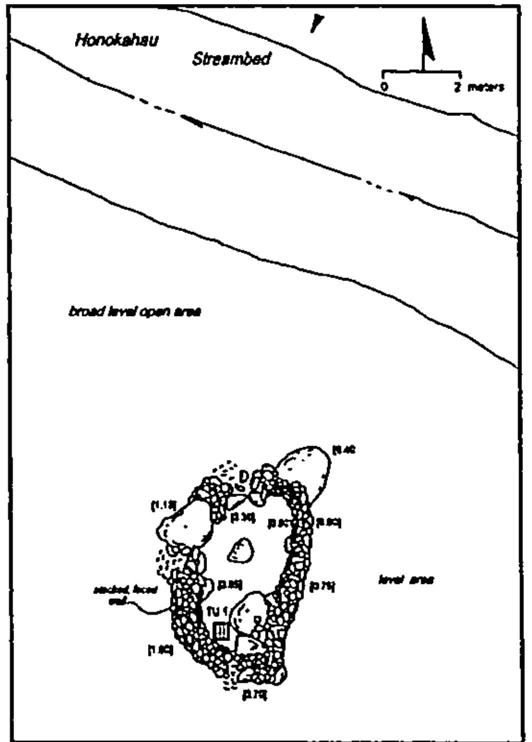

Figure 44 – Plan view of Site 5155.

Site 50-50-01-5155 [Figures 44, 45; Photos 35, 36] (32)

This site is located in the bottom of Honokahua Gulch, in a level area c. 6 meters south of the streambed near a large bend. A steep cut bank at the base of the gulch's eastern slope lies on the opposite side of the stream to the north. A bulldozer cut road lies 17.5 meters to the SSW. Flora noted in the general area consisted of *kukui*, Christmas berry and eucalyptus trees as well as *noni*, *ki* and coffee plants.

Site 5155 is a substantial rock wall enclosure that measures 5.5 meters N-S by 3.5 meters E-W by 1.1 meters maximum wall height by 0.6 t0o 0.8 meter thick. This enclosure is roughly oval shaped with stacked, faced walls built of sub-angular boulders and cobbles a maximum of 6 courses high. Large existing boulders are incorporated into the enclosure's walls. An apparent opening or entrance is at the north end of the feature facing the streamed. It is interesting to note that two large boulders occupy most of the surface area inside within the enclosure. These boulders are embedded in the ground, and the feature appears to have been purposefully built around them. One test unit was used to assess subsurface conditions.

Test Unit 1

This 50 by 50 centimeter unit was placed next to the southern interior portion of the enclosure. This very rocky unit was up to 65 cm deep and contained two soil layers. Layer I was a maximum of 26 cm thick and was composed of dark brown (7.5 YR ¾) silty loam. No material culture remains were found in this stratum. Layer II (c. 24-65 cmbs) consisted of brown (7.5 YR 5/3) silt that contained over 50% by volume of subangular cobbles and pebbles. This layer yielded two very small charcoal flecks (less than 0.1 g) that were likely vertically displaced by a tree root. Excavation was abandoned at weathered bedrock.

There were no significant portable remains located during the surface inspection or during subsurface testing at this site. Site 5155 is tentatively interpreted as a ceremonial rather than a habitation structure. This conclusion is based on this enclosure's high construction quality, a lack of any food midden remains, and the presence of two partly exposed boulders in its interior. As noted previously, the structure appears to have been purposefully built around these boulders, greatly reducing the usable floor space and the likelihood that it could have been utilized as a habitation area. Site 5155 may represent an agricultural shrine, given the relative proximity of several agricultural sites in this portion of Honokahua Gulch.

Site 50-50-01-5156 [Figures 46, 47; Photo 37] (33)

This site complex is located along the base of Honokahua Gulch's eastern slope, and lies c. 7 meters to 43 meters east of the streambed. The area is fairly open and level. Flora in the general vicinity included *kukui*, rose apple and Christmas berry trees, along with *noni* and *ki* plants.

The overall dimensions of Site 5156 are c. 40 meters E-W by 25 meters N-S. This site consists of, a U-shaped partial enclosure (Feature A), a small rock cupboard/overhang (Feature B), a small oval shaped enclosure at the center of the site (Feature C), a level terraced area (Feature D) and a possible terrace remnant (Feature E).

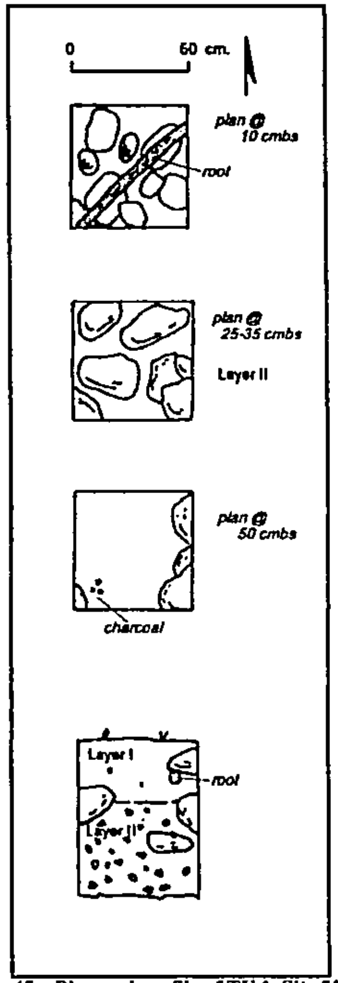

Figure 45 – Plan and profile of TU 1, Site 5155.

Feature A consists of a U-shaped partial enclosure consisting of a crudely stacked low wall measuring 9.0 meters NE-SW by 7.5 meters NW-SE by 0.6 meter in width with a maximum wall height of 0.85 meter. The enclosure wall is collapsed for the most part and appears as a linear rubble pile in the form of a roughly square shape open to the northeast. It is constructed of sub-angular cobbles and boulders along with talus boulders up to 1.5

meters across. A large boulder sits at the terminus of the enclosure's southeastern wall at its northeastern corner (Photo 37). There is distinctive upright boulder situated along the inside of the enclosure's southeastern wall near its terminus. This boulder has a trapezoidal shape and stands vertically 0.8 meter high along that section of wall. No significant surface material culture remains were located at this feature that is interpreted as a probable precontact permanent habitation area.

Feature B consists of a small overhang that measures 1.0 meter in width by 1.2 meters in depth with a maximum ceiling height of 0.5 meter. While this overhang is too small to be considered a marginal shelter, it is roomy enough to have been utilized for storage or as a possible burial chamber. One dog's tooth was located on the interior the feature's floor.

Feature C consists of a small oval rock enclosure that measures 7.0 meters NNE-SSW by 3.5 meters WNW-ESE by 0.6 meter in width, with a maximum height of 0.8 meter. The wall is constructed of stacked subangular cobbles and boulders and is partially collapsed in areas and in poor condition. A large boulder is curiously located in the center of this enclosure. It seems possible but unlikely that the boulder could have rolled into the enclosure from the gulch slope after its construction. It should be noted that the enclosure at Site 5155, some 80 meters downstream to the northwest also has 2 boulderx at its center. The level terraced area of Feature E abuts the southeastern edge of this enclosure where its wall doubles as a retaining wall. This enclosure is tentatively interpreted as a possible ceremonial area—perhaps an agricultural shrine.

Feature D is composed of a relatively level, terraced area that abuts the southeastern side of the Feature C enclosure. The southeastern wall of Feature C essentially serves as the retaining wall for the Feature D terrace along its northwestern edge. The southeastern edge of the terraced area appears to have been cut down into the gradual slope and no discernable retaining wall is present, only sparse rubble. One test unit was used to sample subsurface conditions at this location.

Test Unit 1

This 0.5 by 0.5 meter unit was excavated to weathered bedrock at a maximum depth of 59 cmbs. One soil layer was encountered and one charcoal sample was collected and submitted to Beta Analytic, Inc. in Florida for radiometric analysis.

Layer I (0-58 cmbs) was composed of brown (7.5 YR 5/3) silty loam that contained moderate amounts of organic materials which lessened with depth, and less than 10% by volume of subangular pebbles. This slightly compact to compact stratum yielded 158.8 g. of charcoal, 0.1 g. of fishbone and a single large basalt flake. The bulk of the charcoal was recovered from 50-58 cmbs, and placed in aluminum foil for subsequent analysis. This sample returned a conventional age of 310 ± 50 BP. The calibrated result for this sample at 2 Sigma (95% probability) is Cal AD 1460 to 1660. The intercepts of the radiocarbon age with the calibration curve are Cal AD 1530, Cal AD 1550 and Cal AD 1630.

Feature D is interpreted as an agricultural terrace that appears to have been utilized as early as the mid-1400s.

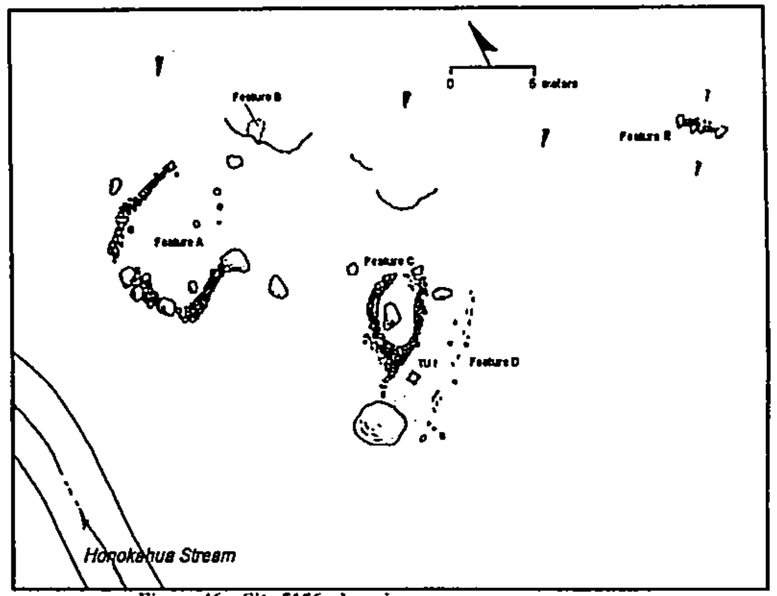

Figure 46 – Site 5156 plan view.

Feature E appears to be a terrace remnant. It consists of stacked subangular cobbles and boulders 6-7 courses high, placed between large partially buried talus boulders forming a crude retaining wall. This feature measures 3.0 meters E-W length by 1.0 meter N-S width with a maximum wall height of 0.9 meter. No terraced area is visible above this retaining wall. This feature is tentatively interpreted as a possible agricultural terrace remnant.

Discussion

This site complex consists of five features. Site 5156 is interpreted as a probable dryland agricultural site. This site also contains a probable permanent habitation area (Feature A), as well as a possible agricultural shrine (Feature C). The latter interpretation is based on the presence of what appears to be a boulder (*pohaku*) incorporated into the interior of the structure floor. The radiocarbon date for the Feature D agricultural terrace indicates that this site was utilized in mid- to late-precontact times.

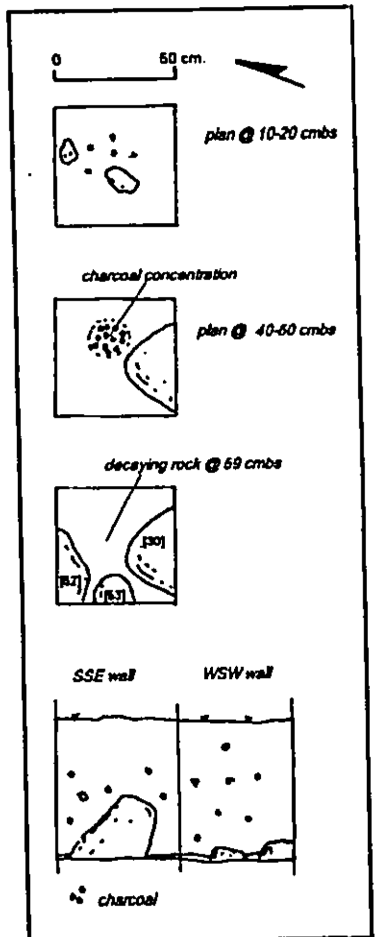

Figure 47 – Plan views and profile of Test Unit 1, Site 5156.

Site 50-50-01-5157 [Figure 48; Photo 38] (34)

This rock overhang lies along the base of Honokahua Gulch's eastern slope. This site is located in a c. 5 meter high escarpment, about 3 meters above the level gulch floor and c. 14 meters northeast of the streambed. Flora observed in the general area consists

primarily of rose apple trees. In addition, a single mountain apple tree (*'Ohi'a 'ai*) lies directly west of the escarpment. *Noni* and *ki* plants are common under story vegetation in the general area.

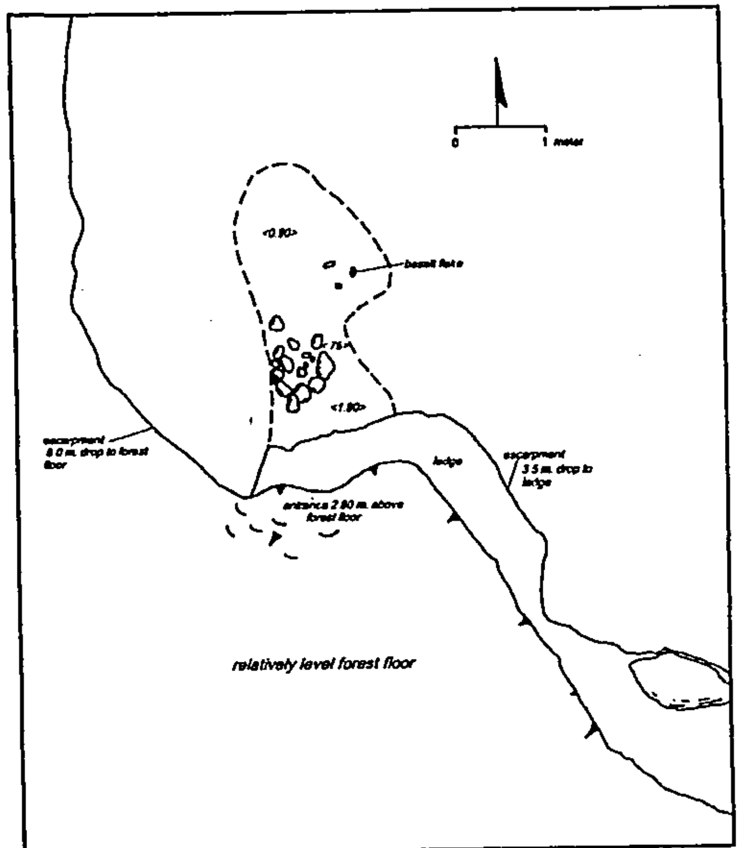

Figure 48 – Plan view of Site 5157.

Dimensions for this rock overhang are 1.5 meters in width E-W by 3.0 meters in depth N-S by 1.8 meters maximum ceiling height. The site is accessed by a steep climb up to a ledge at the south facing mouth of the shelter. The interior of the shelter is relatively spacious, due to its ceiling height. On the floor of the shelter, near its mouth is an oval arrangement of 16 sub-angular and angular cobbles. This arrangement measures 1.0 meter

N-S by 0.7 meter E-W. Most of the cobbles, averaging 0.2 meter in size, are partially buried in the soil of the shelter's floor. A good soil deposit appears to be present. One partially buried basalt flake was noted in the back of the overhang. Site 5157 is interpreted as a possible precontact and/or early post-contact temporary habitation area that appears to contain a burial. The oval stone feature, on what appears to be a relatively deep soil deposit suggest the presence of a burial.

Site 50-50-01-5158 [Figure 49, 50; Photo 39] (35)

This site is located on a broad, level, open area adjacent to the base of the eastern slope of Honokahua Gulch. The site lies near the southern project boundary where it crosses the gulch. The site ranges from 19.0 to 40.0 meters northeast of the streambed. Numerous talus boulders are scattered across the area. Flora present in the general vicinity consists of rose apple and *kukui* trees, *ki*, *noni* and coffee plants, *laua'e* ferns and bird nest ferns, and alien grasses.

The overall dimensions of this dry land agricultural complex are c. 74 meters NNW-SSE by 35 meters WSW-ENE. Site 5158 is dominated by a large partial enclosure—Feature A. A small wall remnant—Feature B—and a conspicuous small rock mound—Feature C—are directly southwest of the Feature A enclosure. Features D and E are similar circular rock walled depressions. Feature D is c. 6 meters west of the large Feature A enclosure and Feature E is c. 35 meters to the north. Features G and I lie along the base of the gulch slope to the east of Feature A. Feature F is a small platform-like feature further up the gulch slope. Feature H is a short section of faced, stacked wall on the southern edge of the site c. 30 meters southeast of Feature A. The overall condition of the various features of this site varies from good to poor condition. Some bulldozing has occurred in the near vicinity of the site. No surface portable remains other than relatively recent camping gear were noted at this site.

Feature A consists of a large rectangular rock walled partial enclosure that is open on its western side, facing the stream. The overall dimensions of this feature are c. 13 meters NNW-SSE by 9 meters ENE-WSW by an average wall height 0.8 meter (1.2 meter maximum) and 0.8 meter maximum wall width. The feature wall is well built of sub-angular boulders and cobbles with an average height of 0.8 meter (5 to 6 courses) and 0.8 meter in width. The walls are vertically faced for the majority of the intact portions, although the northeastern corner of the enclosure has partially collapsed. A partially buried boulder[9] is located near the center of this enclosure. This feature could represent a possible habitation area. One excavation unit was used to sample subsurface conditions at this location. However, in order to make a more definitive evaluation of this feature, data recovery should be undertaken.

[9] This boulder is about 0.5 meter high, is relatively comfortable, and may have been used as a seat.

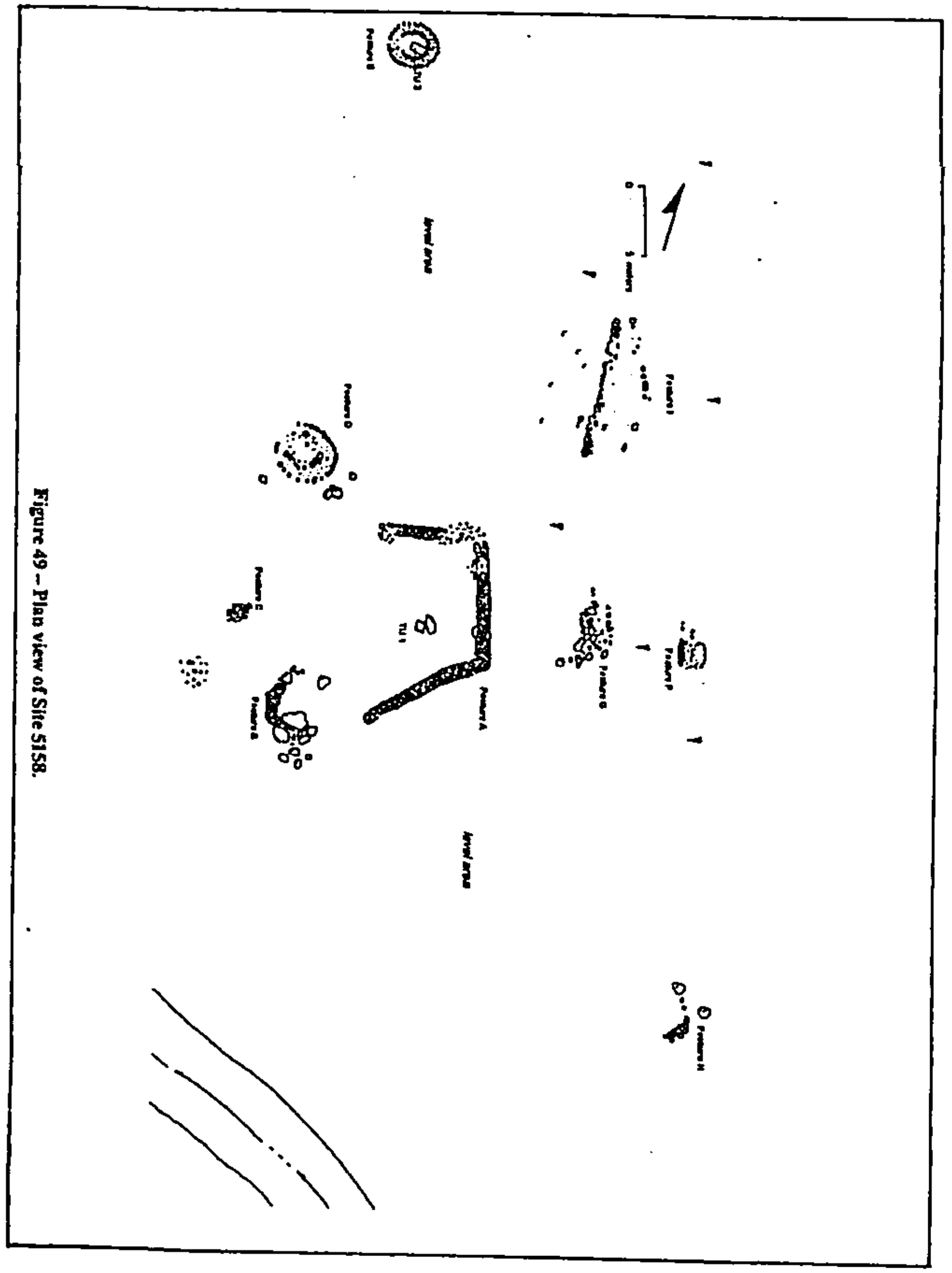

Figure 49 – Plan view of Site 5158.

Test Unit 1

This excavation unit was placed just west of the previously noted boulder. Two soil layers were contained in TU 1.

Layer I (0-24 cmbs) was composed of brown (7.5 YR 4/3) clay loam that contained less than 10% by volume subangular cobbles and pebbles. Recovered material culture remains included 12 waterworn pebbles, two waterworn cobbles, a scratched pebble, and a small amount of scattered charcoal (3.4 g.).

Layer II (c. 24-35 cmbs) consisted of brown (7.5 YR 5/4) clay loam with increasing amounts of weathered bedrock. This rocky stratum was sterile and excavation was terminated at weathered bedrock.

Feature B consists of a crudely stacked wall that forms a rough c-shape with dimensions of 4.5 meters N-S by 4.6 meters E-W by 0.55-meter maximum wall height and 1.0 meter maximum wall width. The wall is roughly constructed of sub-angular cobbles and boulders a maximum of 3 courses high. This feature is open to the northeast and faces the open side of the Feature A enclosure. The feature wall incorporates a basalt outcrop and surrounding boulders on its southern end. The function of this feature remains somewhat unclear.

Feature C consists of a distinctive, mounded, oval shaped rock pile that measures 2.0 meters E-W by 1.65 meters N-S by 0.4-meter maximum height. Sub-angular cobbles 0.1 to 0.2 meter in size and boulders up to 0.65 meter in diameter are stacked in an organized fashion. This feature lies 8.0 meters west of the open side of the Feature A enclosure. Feature B lies c. 5 meters southeast and Feature D is c. 10 meters to the north. Although no stone upright was found associated with it, Feature C could be an agricultural shrine. It also may be a possible burial—as it resembles similar stone mounds elsewhere that are known to contain human remains.

Feature D consists of a single course of boulders up to 0.6 meter in diameter that forms a circular alignment c. 5 meters in diameter. A circular walled depression 0.6 meter deep lies within this alignment. This interior depression is 2.4 meters in diameter. The inside wall height is a maximum of 0.4 meter high with more of the wall buried in soil and duff. The top of the inner wall is flush with the top edge of the feature, which is essentially the earthen core fill between the exterior alignment and inner wall. The outer and inner walls together measure 1.5 meters across. The overall condition of this feature is fair. Feature D is 5.0 meters northwest of the Feature A enclosure's northwestern corner. Feature E, a similar circular depression, lies c. 27 meters to the north. The function and relative age of Feature D is based on information recovered from excavation undertaken at Feature E.

Feature E, while similar, is in better condition than Feature D. This "doughnut" shaped feature consists of a circular low wall that encloses a circular walled depression. The circular wall consists of 1 to 2 courses of small boulders and is roughly 4 meters in diameter. The inner wall is built of sub-angular, vesicular small boulders and cobbles. The faced inner wall is 3 courses high and 0.55 meter high. This inner wall has had some type of mortar applied to its surface. The mortar material is crumbling off the surface and appears to be a mixture of lime and soil. The area between the exterior and interior walls is filled with earth and small rocks. The width of the combined walls surrounding the depression is

1.0 meter. Feature E sits at the northern edge of Site 5158. One excavation unit was utilized to investigate the interior of this feature.

Test Unit 2

This 0.5 by 1.0 meter unit was used to assess the depth of the inner wall and to obtain a possible radiocarbon sample. Two soil layers were located in the unit before it was halted in sterile soil.

Layer I extended to c. 25 cm below the existing interior surface of the feature. This brown (7.5 YR 4/4) clay loam contained hundreds of decayed *kukui* nuts. These appeared to have been deposited relatively recently by rodents. A total of 55.5 g. of charcoal were collected.

Layer II was composed of a very dark gray (7.5 YR 3/1) silt and charcoal mix. No other portable remains were found in this deposit. This layer extended from c. 25-37 cm below the interior surface of the feature. A total of 885.0 g. of charcoal was collected. One charcoal sample was submitted to Beta Analytic, Inc. for analysis. This sample returned a post-contact of 80± 50 BP which is outside of the calibration range.

Layer III was made up of brown (7.5 YR 5/4) clay loam that extended to the bottom of the unit at 49 cmbs. This rocky stratum was sterile and was terminated in weathered bedrock.

Excavation of T.U. 2 demonstrated that the inner wall of Feature E extends c. 0.4 meter below the existing surface, giving the wall an overall height of 1.05 meters. This comparatively shallow depth indicates that this feature does not seem to be a well. A charcoal sample recovered from T.U. 2 yielded a post-contact date. While the functions of Features D and E remain somewhat unclear, it appears that at least Feature E was utilized to burn wood.

Feature F lies on the eastern gulch slope above the rest of Site 5158. This feature consists of a short core filled wall section. The long axis of this wall contours the existing slope. The wall measures 2.0 meters in length and 1.0 meter in width and is built from sub-angular and vesicular cobbles and small boulders. It is crudely faced on either side with earth and rubble fill. This feature has a platform-like appearance. A small depression measuring 2.0 meters N-S by 1.0 meter E-W abuts the east or upslope side of this wall. No subsurface testing was conducted at this feature that is tentatively interpreted as a possible early post-contact burial.[10]

Feature G consists of crudely stacked sub-angular cobbles and small boulders that are incorporated into outcrop to form a crude retaining wall. A level area measuring 2.5 meters in length N-S by 1.0 meter in width E-W is on the eastern or upslope side of this wall. A rock alignment of 6 small boulders, 2.5 meters long, parallels the long axis of the feature along the level area's eastern or back edge. This feature is interpreted as a possible agricultural terrace remnant whose relative age remains unknown.

Feature H is a small wall section that extends outward from the base of the gulch slope at the southern end of the site. This wall is built from small, sub-angular boulders averaging 50 centimeters in size and is 5 courses (0.8 meter high) and faced on its northwestern side. It measures 2.4 meters NE-SW in length by 0.75 meter NW-SE in by

[10] Feature F resembles some known early post-contact burial features located in Olowalu.

0.8 meter maximum height. The opposing southern side of the wall is not faced but crudely stacked and is 3 courses high. Its function remains unclear.

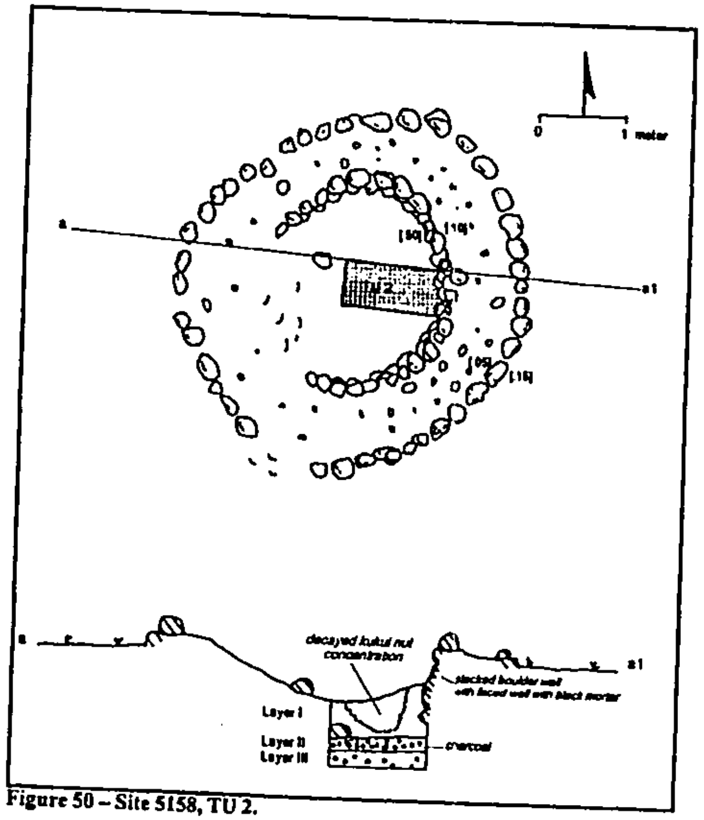

Figure 50 – Site 5158, TU 2.

Feature I is a relatively large terrace that measures 10.0 meters N-S by 3.0 meters E-W by 0.5-meter maximum retaining wall height. This terrace sits at the base of the eastern gulch slope where a crudely stacked retaining wall is incorporated into existing rock outcrop. A level area measuring c. 10 meters N-S by 2.5 meters E-W is along the eastern or upslope side of the retaining wall. This feature is about 9 meters northeast of the Feature A enclosure. Feature I is interpreted as a probable agricultural terrace. Its relative age remains unclear.

Discussion

Site 5158 consists of a complex of a large partial enclosure and a small semi-enclosure, two terraces, two circular rock lined depressions, two rock piles and a small platform. This site is tentatively interpreted as a late precontact dryland agricultural permanent habitation complex, with associated burials that was probably modified and utilized into post-contact times.

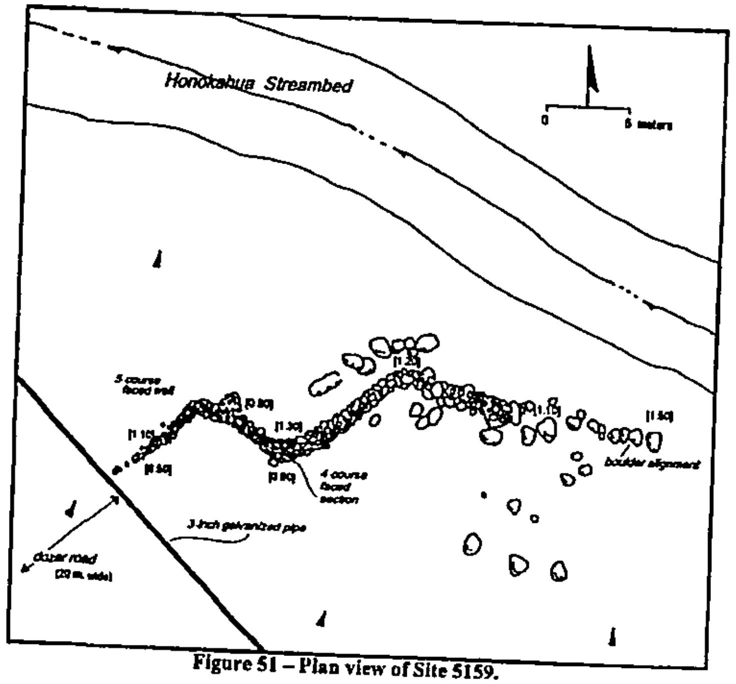

Figure 51 – Plan view of Site 5159.

Site 50-50-01-5159 [Figure 51] (36)

This rock wall lies in a gradually sloping, boulder-strewn area of Honokahua Gulch and is from c. 3.5 to 19 meters southwest of the streambed. A bulldozed road lies c. 20 meters to the southwest. Flora in the general area includes Christmas berry and rose apple trees along with scattered *noni* and *ki* plants.

The overall dimensions of this wall are 31.0 meters E-W by 1.1 meters maximum wall width by 1.3 meters maximum wall height. This wall starts at a low cut bank c. 20

meters southwest of the streambed and snakes easterly, diagonally down the gradual gulch slope to a point about 3 meters south of the streambed. The wall is generally well built and faced in places along its length. It is constructed of sub-angular cobbles and boulders and is a maximum of 5 courses in height. The wall incorporates several large boulders and its odd plan view may be the result of the builder(s) simply connecting existing talus boulders along the slope. Site 5159 is interpreted as a possible boundary and/or animal containment wall that may date from late precontact to early post-contact times.

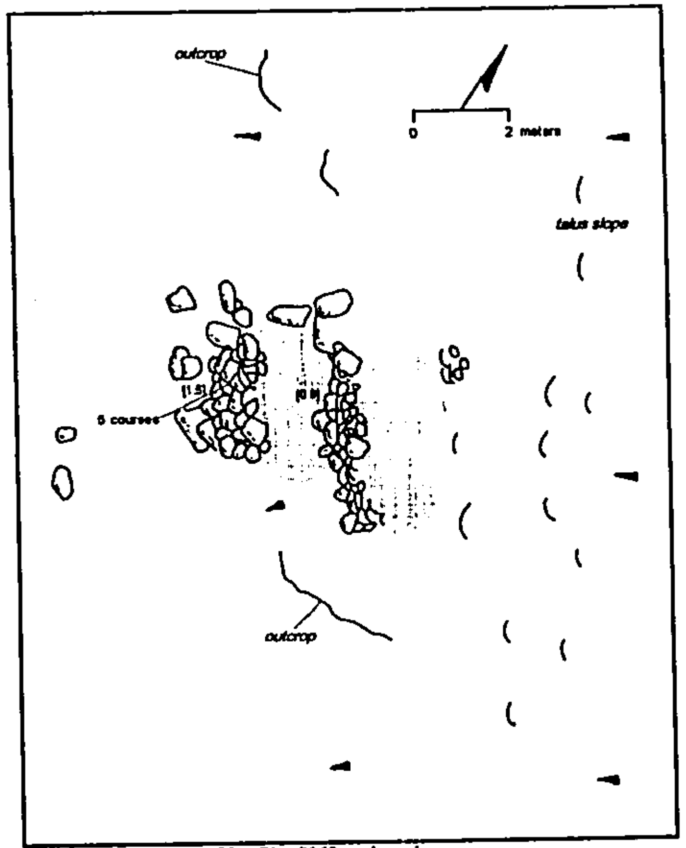

Figure 52 – Site 5160—plan view.

Site 50-50-01-5160 [Figure 52; Photo 40] (40)

This dry land agricultural site consists of two terraces and lies along the base of Honokahua Gulch's eastern slope c. 47 meters east of the streambed. A broad level open area extends directly to the west of Site 5160 on the gulch bottom. Observed flora in the general vicinity consisted of rose apple and guava trees, along with *noni*, *ki* and coffee plants, and bird nest ferns. Relatively dense Christmas berry thickets grow on the gulch slope around and above the two terraces. Talus boulders are scattered over the general site area.

The overall dimensions of this site are 6.0 meters NW-SW length by 5.5 meters NW-SE. Both terraces are in generally fair condition and appear to be unaltered. These terrace features step from the base of the eastern gulch slope, and appear to contain moderate amounts of soil. Each terrace has an associated retaining wall that is constructed from sub-angular cobbles and boulders that are incorporated into the existing talus boulder deposit at the gulch base. No significant surface portable remains were noted and no subsurface investigation was undertaken.

Feature A measures 3.5 meters NW-SE by 3.0 meters NW-SW by 1.3 meters maximum wall height. This terrace has a level area that is 3.5 meters NW-SE by 3.0 meters NW-SW. The retaining wall of this terrace is crudely stacked yet vertical. Large talus boulders form the foundation for 5 courses of sub-angular smaller boulders and cobbles. Feature B terrace is directly upslope, abutting the eastern edge of the Feature A level area. Feature A is interpreted as a probable dryland agricultural terrace that may have been utilized in late precontact and/or early post-contact times.

Feature B measures 4.0 meters NW-SE by 2.5 meters NE-SW by 0.9 meter maximum wall height. An associated level area measures 3.8 meters NW-SE by 1.5 meters NE-SW. The retaining wall of this feature is generally well built, and contains existing talus boulders that form its foundation. Sub-angular boulders and cobbles are stacked 4-5 courses high on this foundation. This retaining wall forms the eastern or upslope edge of Feature A's terraced area. Feature B is also interpreted as a probable dryland agricultural terrace that may have been utilized in late precontact and/or early post-contact times.

Site 50-50-01-4459 [Figure 53]

About 75% of this wall was originally recorded by Cultural Surveys of Hawaii in 1999 (Devereux, Folk and Hammatt, February 1998). A description of the entire wall follows. It is interpreted as possible boundary wall and/or animal containment wall. This wall is located in Honokahua Gulch. This wall parallels the streambed for c. 89 meters along its western bank c. 1-5 meters from the edge of the stream's cut bank. The base of the western gulch slope is c. 10-20 meters west of the wall. Flora noted in the general area consisted of Christmas berry, rose apple and *kukui* trees, along with *noni*, *ki* and coffee plants. Bird nest and *laua'e* ferns cover the rocks of this wall.

The Site 4459 wall consists of stacked, semi-rounded and waterworn boulders and cobbles. The wall incorporates numerous large talus boulders along its length where

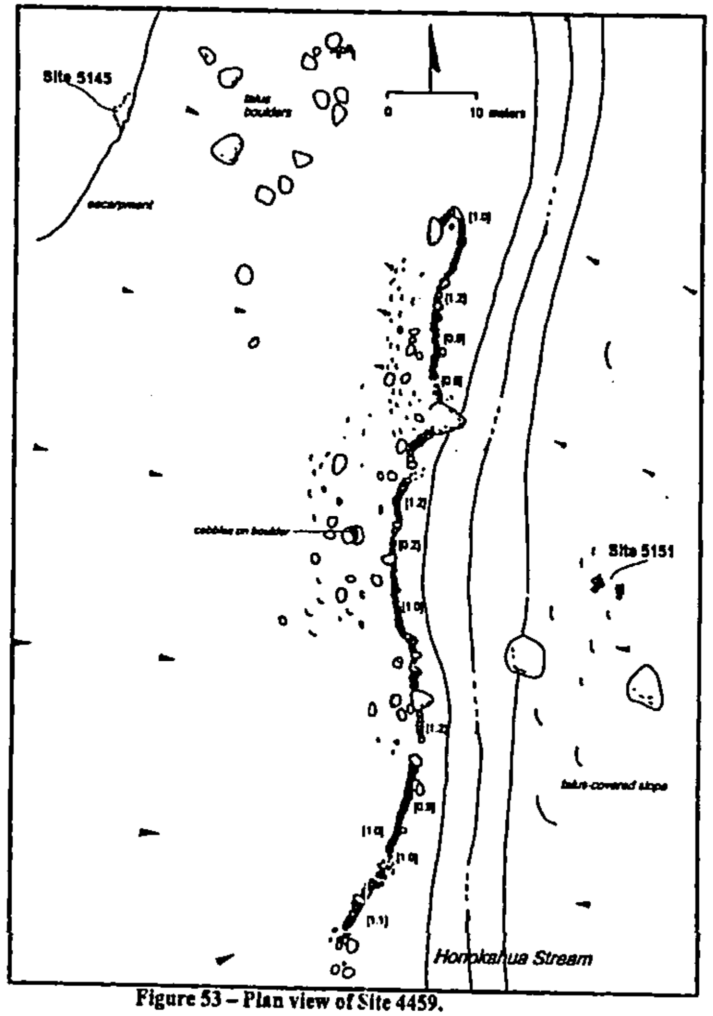

Figure 53 – Plan view of Site 4459.

small boulders up to 0.8 meters in diameter and cobbles have been stacked upon and in-between them. It is generally well built with sections that are vertically faced 4-6 courses

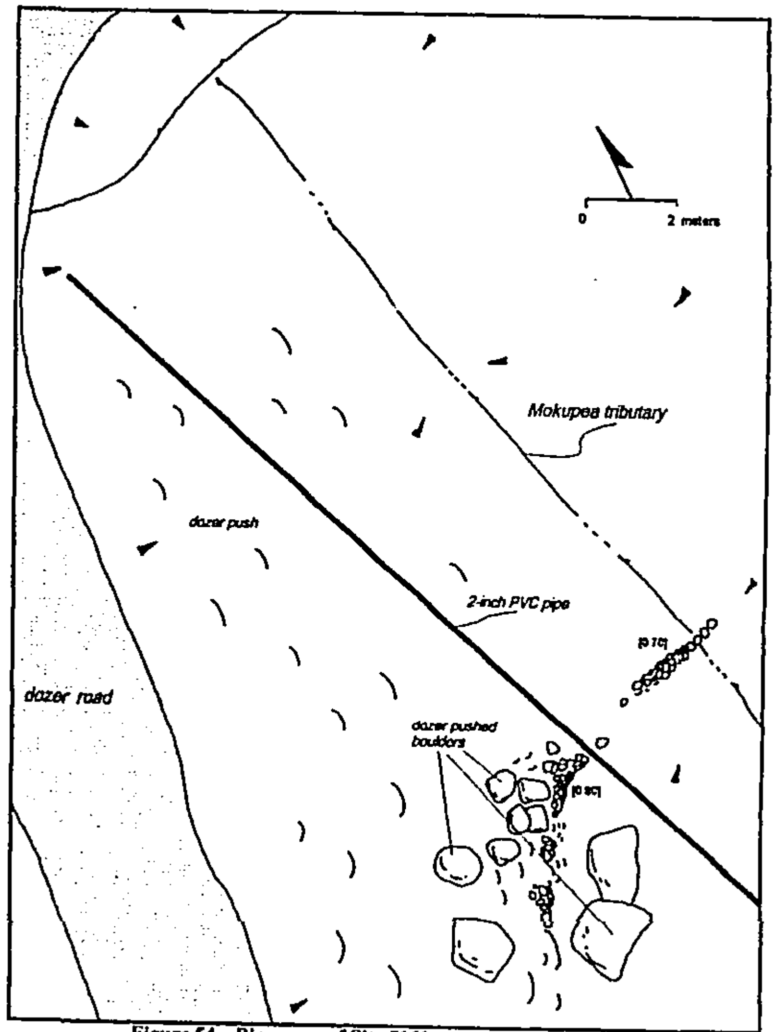

Figure 54 – Plan map of Site 5161.

high mainly on the eastern or streamside of the wall. The western side of Site 4459 abuts a low linear mound along the northern half of the wall's length. This mound is apparently an alluvial deposit from an earlier streambed course, the bed of which is discernable on the western side of the wall near its northern end. The northern end of the wall makes a curious hairpin turn around the northern portion of this mound. A small, modified outcrop consisting of several cobbles placed in a crack between two talus boulders is 2.0 meters west of the wall's midsection. One test unit was placed in the turn around near the probable alluvial deposit noted above.

Test Unit 1

This 0.5 by 0.5 meter unit was utilized to investigate subsurface conditions near the possible alluvial mound. One soil layer was encountered in TU 1 before it was terminated at a boulder c. 60 cmbs. Layer I was composed of brown (7.5 YR 4/3) silty loam that contained over 25% by volume of subangular and waterworn pebbles and cobbles. No material culture remains were found and no profile was recorded.

Sites in Mokupea Gulch

Both of these sites are located near the eastern project boundary in the rugged Mokupea Gulch. Cultivated pineapple fields are present on the tableland between Mokupea Gulch and Honokahua Gulch.

Site 50-50-01-5161 [Figure 54; Photo 41] (37)

This rock wall is located at the fork of the large tributary of Mokupea Gulch along the eastern project boundary. The wall partially crosses this tributary streambed at its eastern end and is severely impacted at its western end by the relatively recent construction of a substantial bulldozer cut road that descends into the gulch from the pineapple field to the west near a water tank. Observed vegetation in the vicinity of this site included Christmas berry thickets, Formosan *koa* and coffee trees, and various alien grasses and weeds.

The overall dimensions of this wall are 8.5 meters E-W by 0.7 meters maximum width by 0.8 meters maximum height. The eastern end of this wall lies in the bottom of the tributary streambed and is 2.7 meters in length, 0.70 meters and 4 courses of sub-angular boulders high. The wall is faced on its northern or downstream side. It runs perpendicular to and across the western edge of the streambed. An alignment of 4 boulders makes up the last meter in the wall's length in the very bottom of the streambed. There is a 1.8 meter gap at the western end of this section before a crudely stacked section continues to the southwest roughly contouring the steep gulch slope where it terminates at a pile of boulders pushed by machinery during the previously noted road construction. This road crosses the drainage c. 16 meters to the north, downstream of the wall. Site 5161 is interpreted as a ranch/pineapple plantation era animal containment wall.

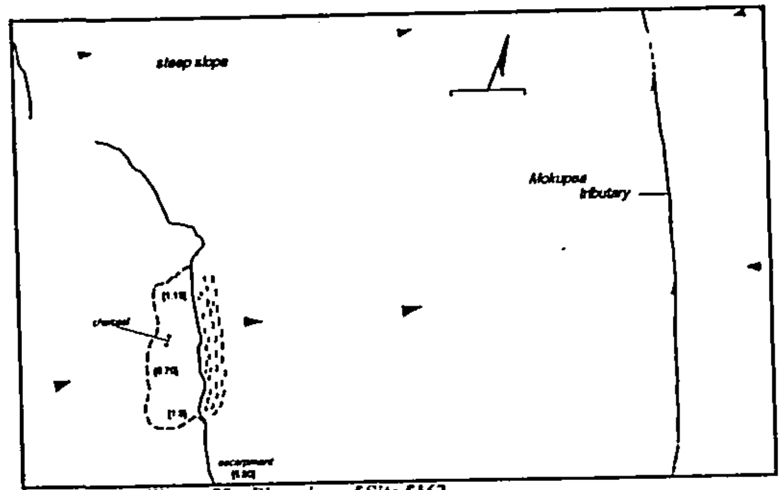

Figure 55 – Plan view of Site 5162.

Site 50-50-01-5162 [Figure 55; Photo 42] (38)

This rock overhang is located on the western side of the steep sided tributary gulch of Mokupea Gulch along the eastern project boundary. Site 5162 lies at the base of a c. 5-meter high escarpment on this very steep slope. This escarpment is about 12 meters west of and 6 meters above the tributary streambed. Noted vegetation in the general area consisted of relatively dense Christmas berry thickets on the slope and the small level area in the gulch bottom.

This rock shelter is on a steep slope above the streambed. A slope wash mound lies at the mouth of the shelter. Site 5162 measures 4.0 meters N-S by 1.4 meters E-W with a 1.1-meter maximum ceiling height. Ceiling exfoliation consisting of angular cobble rubble covers the floor of the interior to an undetermined depth. No soil deposit was visible, although some sparse amounts of scattered charcoal were noted on the SE end of the shelter surface. No subsurface testing was undertaken because of this site's isolation. Site 5162 is interpreted as a possible precontact and/or post-contact temporary habitation area.

Table 2[10]

Summary of material culture remains from Sites 5133 through 5143

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]									
Cellana sp.								0.1	0.7
Conus sp.							3.4		
Cypraea sp.		0.1			4.5	1.9	0.7	2.1	8.4
Nerita picea		0.9	0.2					0.1	0.1
Planaxis sp.								0.2	0.2
Turbo sandwicensis			0.1						
Unidentified		0.2	1.5		0.1		0.4		0.5
[illegible]									
Sea urchin		0.3	1.3					0.3	
Pencil urchin									
[illegible]									
	0.1								
[illegible]									
Dog bone								2.5	0.8
Bird bone								0.2	
Mammal						4.5	0.4		
Fish		0.4	0.3	0.1	0.1	0.4		0.6	0.5
Unidentified					1.1		0.5	0.4	
[illegible]									
Kukui nut shell		1.1	5.1			0.8	0.7	0.3	2.1
Charcoal	9.0	0.8	147.4	48.4	0.1	33.4	48.1	245.0	94.6
UNWORKED BASALT FLAKES (pieces)						(5) 36.4		(5) 23.8	(1) 2.3 (2) 24.1
UNWORKED VOLCANIC GLASS FLAKES (pieces)									(1) 0.3
UNWORKED CORAL (pieces)					(5) 12.3	(3) 5.0	(1) 0.2	(1) 1.1	
WATERWORN PEBBLES (pieces)								(1) 5.4	
[illegible]									
Adze fragment						#2			
Polished basalt flake						#3			
Utilized basalt flake						#4			
Basalt chopper							#5		
Hammerstone								#6	
Worked bone					#1				

Weight in grams

[10] There is no Table 1.

Table 3

Summary of material culture remains from Sites 5144 through 5158

[illegible]	Site 5144	Site 5145	Site 5156	Site 5158		
[illegible]	[illegible]	TU 1 Layer [illegible]	Fea. D TU 1	Fea. A TU 1	TU 2 Layer I	TU 2 Layer II
[illegible]						
Cellana sp.		0.6				
Cypraea sp.		1.3				
Nerita picea		1.5				
Planaxis sp.		30.0				
Thaididae sp.		1.1				
Unidentified		1.2				
BIVALVE						
Isognomon sp.		0.4				
[illegible]						
Sea urchin		0.1				
BONE						
Mammal		0.1				
Fish		3.5	0.1			
Unidentified						
FLORAL						
Kukui nut shell	0.2	0.1	0.2			
Charcoal		39.5	158.8	3.4	55.5	885.9
UNWORKED BASALT FLAKES (pieces)		(4) 57.0	(1) 36.2			
UNWORKED VOLCANIC GLASS FLAKES (pieces)		(4) 0.9				
UNWORKED CORAL (pieces)		(3) 1.6				
[illegible]						
Utilized volcanic glass		#8, #12				
Adze fragment		#7				
Worked bone		#9 #10				
Shark tooth		#11				
Octopus lure weight		#13[11]				

[11] This artifact was found in a small niche inside the rock shelter—not in TU 1.

Artifacts

Relatively few indigenous artifacts—a total of 13—were recovered from subsurface testing. These are listed on Table 4. They consist of 2 utilized/worked/edge-altered basalt flakes, 2 adze portions, 2 pieces of utilized volcanic glass, and a shark tooth—all of which can be considered to be cutting tools. In addition, 3 small pieces of worked bone may be discarded fragments of larger tools, i.e. fishhooks, broken in the process of manufacture. Two large basalt artifacts—a hammerstone (that also may have been used as a grinding stone)[14], with reddish fire markings, and a crude chopper probably represent artifacts that remained permanently at the site for use when needed. Finally, there was an octopus lure weight found in a niche in a rock overhang shelter, obviously carefully placed in a relatively inaccessible location within the rock shelter, possibly for safe keeping. A 14th artifact—an adze—was also located in a small niche at Site 5138, and was left in place.

Table 4

Indigenous Artifacts

Site number	Test Unit, Feature Layer/level	Artifact number	Description	L x W x T (mm)	Weight (g)
5140	TU 1, LI, L2	1	Worked bone fragment	17.5 x 7.0 x 3.0	0.3
	TU 1, L II, L 1	2	Adze fragment	47.5 x 17.0 x 10.0	9.2
		3	Ground stone flake	51.0 x 27.0 x 4.5	7.3
		4	Utilized basalt flake	40.0 x 24.0 x 4.5	4.8
	TU 1, L III, L3	5	Basalt chopper	190.0 x 160.0 x 55.0	1794.0
		6	Hammerstone/grinder	260.0 x 120.0 x 70.0	3.402 kg.
5145	TU 1, LI, L1	7	Adze fragment (2 polished sides)	21.5 x 13.0 x 12.5	4.6
		8	Utilized volcanic glass	11.5 x 8.0 x 4.0	0.5
		9	Worked bone fragment	10.0 x 6.5 x 2.5	0.1
		10	Worked bone fragment	19.0 x 9.5 x 4.0	0.6
		11	Utilized shark tooth	15.0 x 13.0 x 2.5	0.3
		12	Utilized volcanic glass	15.0 x 9.0 x 3.65	0.6
	Located in small niche in shelter	13	Octopus lure weight (dense coral)	96.0 x 74.0 x 47.0	446.0
5138	Located in small niche	14	Small basalt adze (left *in situ*)	84.0 x 28.0 x 18.0	--

[14] This artifact has a flattened side.

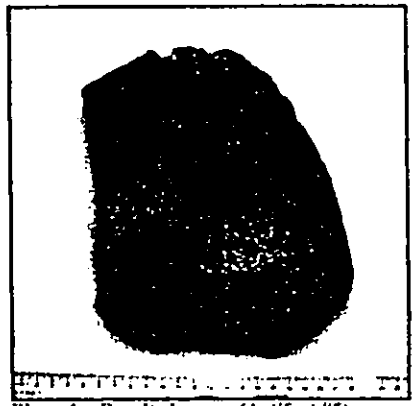

Photo 1 – Basalt chopper (Artifact #5)

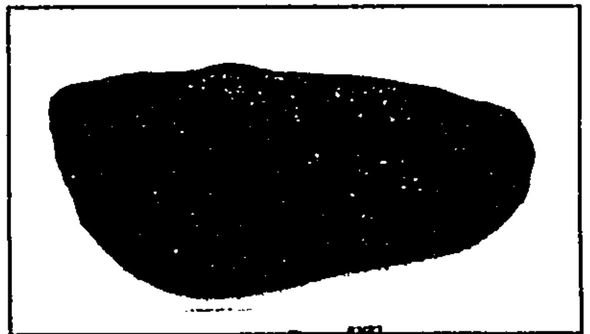

Photo 2 – Basalt hammerstone/grinder (Artifact #6)

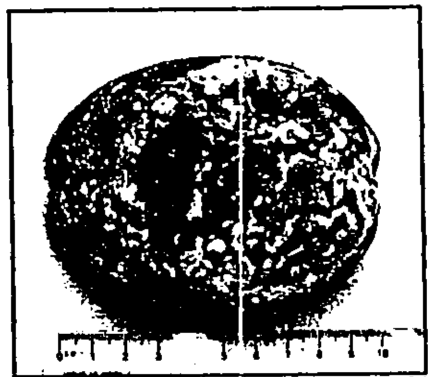

Photo 3 – Top view octopus lure weight made out of dense coral (Artifact #13).

Photo 4 – Obverse view of coral octopus lure (Artifact #13).

Photo 5 – Basalt cutting tools—left to right: Artifact #3, Artifact #4, Artifact #2, and Artifact #7.

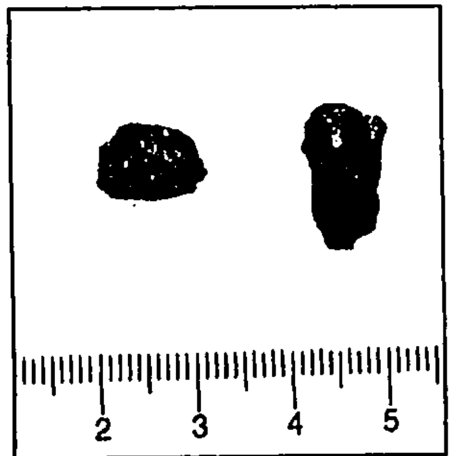

Photo 6 – Volcanic glass: Artifacts #8 and #12.

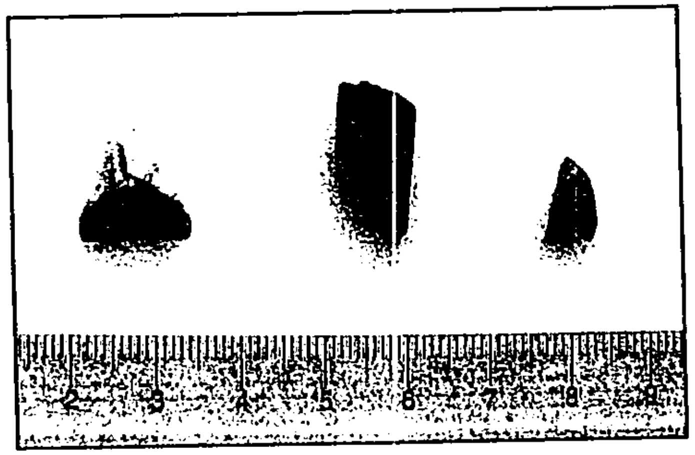

Photo 7 – Shark tooth (Artifact #11) and worked bone (Artifacts #10 & #9).

Radiocarbon Analysis

A total of 6 charcoal samples were submitted to Beta Analytic, Inc. for radiometric analysis. Refer to Appendix B for the calibration curve graphs on 4 of these samples. The other 2 samples returned modern dates that were outside of the calibration range. As can be seen on the table below, only one site, Site 5156, returned a clear precontact date.

Table 5
Radiocarbon Dating Results

Beta Analytic #	Provenience	Radiocarbon age	*2 sigma calibration	Intercept date(s)
157892	Site 5133, TU 1 Feature A	50 +/- 50 BP	Outside calibration range	
157893	Site 5139, TU 1 Feature A	110 +/- 60 BP	AD 1660 to beyond 1960	AD 1700 AD 1720 AD 1820 AD 1840 AD 1880 AD 1920 AD 1950
157894	Site 5140, TU 1	210 +/- 80 BP	AD 1450 to 1950	AD 1660
157895	Site 5145, TU 1	240 +/- 60 BP	AD 1500 to 1690 AD 1730 to 1810 AD 1920 to 1950	AD 1660
157896	Site 5156, TU 1 Feature D	310 +/- 50 BP	AD 1440 to 1660	AD 1530 AD 1550 AD 1630
157897	Site 5158, TU 2 Feature E	30 +/- 50 BP	Outside calibration range	

Table 6
Site Function and Estimated Age

Site Number	Feature	Description	Function	Age	Remarks
Sites in Napili Gulch					
5127	sc	Terrace**	Agriculture	Precontact (?)	Fair condition
5128	sc	Rock overhang	Shelter/storage	Precontact (?)	Unaltered
5129	A	Terrace	Agriculture	Precontact—post-contact	Impacted by bulldozing activities
	B	Rock wall	Agriculture (?)	Precontact—post-contact	Partially collapsed
5130	sc	Enclosure	Ceremonial (?)	Precontact (?)	Unaltered, good condition
5131	sc	Rock pile	Agricultural	Post-contact	Possible clear pile
5132	sc	Embankment walls	Transportation	Plantation era	Bridge span destroyed
5163	sc	Dirt road, retaining walls and bridge	Transportation	Plantation era	Good overall condition
5133	A	Rock overhang	Temporary habitation	Precontact (?) to 20th century	Returned modern radiocarbon date
	B, C	Retaining wall remnants	Agricultural	Precontact (?) to post-contact	Fair condition
1591	sc	Section of Honolua Ditch water system	Agricultural	Plantation era 1913	Good condition
Sites between Napili and Honokahua Gulches					
5134	sc	Water intake	Agricultural	Plantation era	Possibly associated with Honolua Ditch
5135	sc	Rock overhang	Temporary habitation	Precontact—post-contact (?)	One waterworn pebble on interior surface
Sites in Honokahua Gulch					
5136	A	Rock wall	Boundary/animal containment	Post-contact	Altered by bulldozer
	B	Terrace remnant	Agricultural	Precontact—post-contact	Altered by bulldozer
	C	Terrace remnant	Agricultural	Precontact—post-contact	Unaltered
5137	A, B	Enclosures	Agricultural/habitation	Precontact—post-contact	Unaltered
5138	A, B	Rock overhangs	Temporary habitation	Precontact	Shell midden on Feature A floor surface
	C	Terrace	Unknown	Precontact	Located in front of Feature B overhang
	D	Retaining wall with niche	Agricultural—Ceremonial (?)	Precontact	Unaltered
	E	Terrace	Agricultural—Ceremonial (?)	Precontact	Adze found in niche
	F	Terrace	Ceremonial (?)	Precontact	Very well-built retaining wall w/small level area in front

**single component site

5139	A, B, D, F-J	Terraces	Agricultural	Precontact—early post-contact	Feature A—Radiometric date AD 1660 to 1960
	C	Rock alignment	Agricultural	Precontact—Post-contact	
	E	Rock overhang	Cupboard or possible burial cave	Precontact (?)	Coral on overhang floor

5140	sc	Terrace	Habitation	Precontact—early Post-contact	Radiometric date AD 1450 to 1950
5141	sc	Rock pile	Shrine	Precontact—early post-contact	Pile contains an upright stone marker
5142	sc	Rock overhang	Possible burial cave	Precontact (?)	Unaltered
5143	sc	Rock overhang	Temporary habitation	Precontact (?)	Surface midden
5144	sc	Terrace	Agricultural	Precontact—early post-contact	Altered by bulldozing
5145	sc	Rock overhang	Temporary habitation	Precontact—early post contact	Radiometric date AD 1500 to 1810
5146	sc	Rock wall	Boundary/animal containment	Early post-contact	Wall runs upslope
5147	sc	Rock wall	Boundary/animal containment	Early post-contact	Wall runs upslope
5148	sc	Rock shelter	Temporary habitation	Precontact—early contact	Wall encloses portion of overhang
5149	sc	Rock overhang	Temporary habitation	Precontact—early contact	Fish bone on interior floor surface
5150	sc	Rock wall	Boundary/animal containment	Early post-contact	Altered by bulldozing
5151	sc	Possible terrace	Agricultural (?)	Precontact (?)	Unaltered
5152	sc	Rock wall	Boundary/animal containment	Early post-contact	Altered by bulldozing
5153	A	Partial enclosure	Unknown	Precontact—early post-contact (?)	L-shaped
	B	Terrace	Agricultural	Precontact—early post-contact	2 waterworn cobbles in terrace
	C	Partial enclosure	Agricultural (?)	Precontact—early post-contact	Open to the north
	D	Rock alignment	Agricultural (?)	Precontact—early post-contact	unaltered
5154	sc	Terrace	Agricultural	Precontact—early post-contact	Partially collapsed
5155	sc	Oval enclosure	Ceremonial (?)	Precontact—early post-contact	Built around embedded boulders
5156	A	Partial enclosure	Habitation (?)	Precontact—early post-contact	U-shaped
	B	Rock overhang niche	Possible storage or burial chamber	Precontact—early post-contact	Dog molar on floor
	C	Oval enclosure	Probable agricultural shrine	Precontact—early post-contact	Built around embedded boulders
	D	Terrace	Agricultural	Precontact	Radiometric data AD 1440 to 1660
	E	Terrace	Agricultural	Precontact (?)	

5157	sc	Rock overhang	Temporary habitation, possible burial	Precontact—early post-contact	Oval rock alignment on floor
5158	A	Partial enclosure	Habitation (?)	Precontact—early post-contact (?)	Roughly rectangular in shape
	B	Partial enclosure	Habitation (?)	Precontact—early post-contact (?)	Rough C-shape
	C	Oval rock pile	Possible agricultural shrine or burial	Precontact—early post-contact	Distinctive mounded oval shape
	D	Circular walled depression	Unknown	Post-contact	Fair condition
	E	Circular walled depression	Unknown	Post-contact	Radiometric date—modern
	F	Small platform	Possible burial	Precontact—early post-contact	Depression in platform
	G	Terrace	Agricultural	Precontact—early post-contact	Unaltered
	H	Small rock alignment	Unknown	Precontact—early post-contact (?)	Unaltered
	I	Terrace	Agricultural	Precontact—early post-contact	Unaltered
5159	sc	Rock wall	Boundary/animal containment	Early post-contact	Talus boulders incorporated
5160	A, B	Terraces	Agricultural	Precontact—early post-contact	Unaltered
5161	sc	Rock wall	Animal containment	Ranch era	Wall crosses part of streambed
5162	sc	Rock overhang	Temporary habitation	Precontact (?)	
4459	sc	Rock wall	Boundary/animal containment	Early post-contact	

SUMMARY

A total of 37 previously unidentified sites were located during this archaeological inventory survey. These sites have been assigned SIHP No. 50-50-01-5127 to 5163. In addition further information was gathered on a previously identified rock wall (Site 4459), and an exposed portion of Honolua Ditch (Site 1591) that was photographed in Napili Gulch. The site types identified during this survey include single and multiple component agricultural sites including terraces, temporary and more permanent habitation areas, possible ceremonial areas and shrines, possible burial features, and ranch era and plantation era sites. Refer to Table 6 for additional details concerning site function and age interpretations, and Table 7 for site significance and proposed mitigation.

The types of sites that were located and described in this inventory survey report are consistent with those that were expected to be present in the project area. The predicted precontact to 1850s settlement pattern was thought to include:

- habitation (temporary and possibly permanent) areas and associated agricultural *lo'i*, in areas along Honokahua Stream which were afforded a reliable water source;
- temporary habitation shelters, and possible dry land agriculture features in Napili Gulch and dryer portions of Honokahua Gulch;
- ceremonial structures such as *heiau*, or agricultural shrines.

Precontact to 1850s Sites

Twenty-eight of the sites located during the inventory survey are interpreted as precontact or probable precontact cultural resources. There are 61 recognizable features associated with these 28 sites. Encountered sites include agriculture, habitation, possible burial, and possible ceremonial functions. Some sites have been partly impacted by post-contact activities associated with road construction—especially in Honokahua Gulch. However, most precontact or possible precontact sites located in the project area appear to be largely intact.

There are 4 sites that are thought to possibly contain burials. These include Sites 5139, 5142, 5157 and 5158. Feature E of Site 5139 is a small rock overhang that contains a piece of branch coral on its interior surface. Site 5142 is a deep, restricted rock overhang, while Site 5157 is a rock overhang that was apparently used for temporary habitation and contains an oval pile of rocks that could contain a burial. Feature C of Site 5158 is a small oval-shaped rock pile, while Feature F is a small platform. All of these potential burial sites are located in Honokahua Gulch.

Nine sites (10 rock overhangs) are interpreted as temporary habitation shelters (Sites 5128, 5133, 5135, 5138 (Features A and B), 5143, 5145, 5148, 5149, 5162. Thirty-three features are thought to have agricultural and/or habitation functions (Sites 5127, 4 features at 5129, 5131, 3 features at 5136, 2 features at 5137, 7 features at 5139, 5140, 5144[21], 5151, 4 features at 5153, 5154, 4 features at 5156, 6 features at 5158, and 2 features at Site 5160). Site 5138 contains both temporary habitation and possible ceremonial features.

Sites 5130 and 5155 are single component sites that are tentatively interpreted as ceremonial rather than habitation structures. Sites 5141 (single component) and 5158 (multi-component) are thought to each contain an agricultural shrine that consists of an oval pile of rocks.

Two radiocarbon dates were obtained from subsurface testing at rock overhang shelters and four dates came from agricultural/habitation sites (refer to Table 5). The Site 5128 overhang in Napili Gulch returned a modern date. Excavation at the Site 5145 overhang in Honokahua Gulch yielded date ranges from late precontact through modern times. However, given the lack of any post-contact portable remains, it appears that this temporary habitation shelter could have been utilized in the late precontact and/or early post-contact period. Other rock overhang sites in the project area also may have been used from the late precontact period into post-contact times. There is a general lack of post-contact material culture remains—including trade goods—at any of the rock overhang shelters, suggesting that they may not have been used in modern times.

Four agricultural/habitation sites—Sites 5139, 5140, 5156 and 5158—yielded radiocarbon dates. Two of these sites (i.e. Sites 5139, 5140) returned calibrated date ranges from precontact to more recent times. However, again given the lack of post-contact portable remains in test instances at these sites, it appears that the earlier ranges from late precontact to early post-contact times are more likely rather than the more recent ones.

Subsurface results from Feature D of the Site 5158 complex returned a modern date. Modern camping refuse was found in the vicinity of this site. There are other features at this site that may be precontact features, but these were not tested.

One feature, Feature D, at Site 5156 returned a date of AD 1440 to AD 1660, which represents the only clear precontact feature. It is an agricultural terrace that lies above a possible ceremonial feature.

In general, precontact to mid-1800s sites are located in portions of the project area that have not been heavily impacted by subsequent ranch and pineapple plantation era activities. The distribution of sites on the project map (Map 3) allows the reader to visualize the impact that the plantation has had on the cultural landscape.

Plantation and Ranch Era Sites

The plantation and ranch era sites that were expected to be present in the project area were walls, and roadways associated with ranching activities and/or later pineapple cultivation.

Nine of the sites described in this report are interpreted as sites associated with the ranch and/or plantation eras. These sites include the remains of a plantation era concrete bridge foundation (Site 5132), and a bridge and roadway (Site 5163), both in Napili Gulch, a pineapple plantation era water intake between Honokahua and Napili Gulches (Site 5134), 5 rock walls in Honokahua Gulch (Sites 5146, 5147, 5150, 5152, 5159)[14], and one rock wall in Mokupea Gulch (Site 5161). The walls at Sites 5146, 5147, and 5161 are interpreted as animal containment walls, while Sites 5150 and 4459 are interpreted as possible boundary walls that also may have served as animal containment features. It seems that 2 bridges in Napili Gulch (Sites 5132 and Site 5162) were built in the 1920-30s, according to an informant, Mr. Wesley Nohara. The water intake (Site 5134) was probably built after the completion of the Honolua Ditch (Site 1591) in the early 1900s.

CONCLUSIONS

The project area includes sizable portions of Honokahua and Napili Gulches. Honokahua, the larger and wetter of the two, contains 28 sites. Napili Gulch contains 9 sites, and 2 sites are located between the gulches. Portions of both gulches have been impacted by post-contact earth moving activities. The distribution and configuration of site types within each valley is presented on Maps 4, while Maps 5 and 6 show distribution of agricultural and multi-component sites.

In general, sites with dry land agricultural components are more common further inland in both gulches. There were no agricultural sites with *lo'i* and *'auwai* identified during the survey within the bounds of the project area. However, such sites probably lie further *mauka* in the gulches, where water would have been more plentiful. The lower number of agricultural sites (4) in Napili Gulch is most likely due to the fact that it is smaller and dryer, therefore not as suitable for agricultural activity. However, the percentage of sites with agricultural components present in each gulch is essentially the same—44%.

Several of the larger agricultural sites located in Honokahua Gulch have permanent habitation components. Some of these sites also contain ceremonial features, i.e. agricultural shrines, and possible burial features, which is also consistent with the precontact settlement patterns in Hawaii. The more favorable soil and moisture conditions present in that gulch probably account for the increased complexity of the sites located there. Evidence of temporary habitation which was identified during this survey of the project area was limited to rock overhang sites.

It should be noted once more that the lower portion of Honokahua Gulch has been heavily impacted by the construction of a large maintenance facility, a paved road, and a substantial papaya orchard and access road. In addition, the lower part of Napili Gulch has also been heavily disturbed by activities associated with road construction, the placement of power lines, and commercial agriculture. These disturbances show up as a "blank area" on the site distribution and function map (Map 4), suggesting that indigenous sites that probably existed in these areas have been destroyed by such alteration of the landscape.

[14] Another wall, Site 4459, was identified in the earlier inventory survey (Devereux, et al., 1998).

Site Significance Evaluations

The following significance evaluations are based on the Rules Governing Procedures for Historic Preservation Review (DLNR 1996; Chapter 275). According to these rules, a site must possess integrity of location, design, setting, materials, workmanship, feeling and association and shall meet one or more of the following criteria:

Criterion "a"—Be associated with events that have made an important contribution to the broad patterns of our history;

Criterion "b"—Be associated with the lives of persons important in our past;

Criterion "c"—Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value;

Criterion "d"—Have yielded, or is likely to yield, important information for research on prehistory or history;

Criterion "e"—Have an important traditional cultural value to the native Hawaiian people or to another ethnic group of the state due to associations with traditional cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts.

Sites can be considered no longer significant when they qualify only under Criterion "d" and sufficient information has been collected from them during inventory survey level investigation. Refer to Table 7 for the significance evaluations and proposed mitigation treatment for the sites discussed in this inventory survey report.

A total of 26 sites (Sites 5127, 5128, 5129, 5131, 5133, 5135, 5136, 5137, 5140, 5143, 5144-5150, 5159, 5161, 5151-5154, 5160, 5162, and 4459[15]) are considered significant for their information content only under Criterion "d" of the Federal and State historic preservation guidelines. These sites consist of temporary habitation rock shelters, smaller agricultural complexes, and ranch and plantation era sites. Several sites were tested and 6 charcoal samples were submitted for analysis. Two of the 6 radiocarbon samples came from excavations at the Site 5133 and Site 5145 rock shelters. The Site 5133 results suggest usage into recent times, while the Site 5145 results suggest late precontact to early post-contact usage. Four radiocarbon samples came from excavations at agricultural Sites 5139, 5140, 5156 and 5158. The returned dates ranged from the mid-fifteenth century to recent times.

Of the above 26 sites, only one—Site 5161—is considered no longer significant because it has yielded an adequate amount of information. No further archaeological work is needed for this altered ranch-era wall. Six historic properties—Sites 5146, 5147, 5150, 5152, 5159, and 4459—are rock walls in Honokahua Gulch that were built in post-contact times. While these walls could be potentially considered no longer significant in other situations, they are part of the relatively well-preserved cultural landscape that lies within Honokahua Gulch and should be preserved. It is important to note that Kapalua Land Company Ltd. has agreed to place all sites contained in Honokahua and Napili Gulches in "as is" preservation.

Eleven sites are considered to be significant under multiple significance criteria. Criteria "c" and "d" sites include Sites 5138 and 5139, which have agricultural components.[16] Both of these complexes are excellent examples of surviving agricultural sites in Honokahua Gulch. The bridge sites in Napili Gulch—Sites 5132 and 5163—are also considered significant under Criteria "c" and "d". Site 5163, in particular, is an excellent example of a remnant of the plantation era transportation system. Site 5134—the plantation era water intake—likely qualifies under Criterion "a", because of its probable association with Honolua Ditch (Site 1591). Nine sites qualify for significance under Criterion "e" because of possible ceremonial and/or burial functions. The 4 sites thought to contain possible burial features include Sites 5139, 5142, 5157 and 5158. Sites 5130, 5141, 5155, 5156 and 5158 are considered to have potential ceremonial significance. The Site 5138 complex includes habitation and possible ceremonial features. This site is in good overall condition and likely qualifies for significance under Criterion "c" as well as Criteria "d" and "e".

[15] This wall was partly recorded in a Cultural Surveys Hawaii 1998 inventory survey on an adjacent parcel of land.
[16] Feature E of Site 5139 may possibly contain a burial.

Site Mitigation Recommendations

The site significance and proposed mitigation recommendations for the 37 sites identified on the 475-acre study area are shown on Table 7. The majority of these sites are still considered to be significant and passive preservation is recommended. While the 6 walls within Honokahua Gulch could be considered potentially no longer significant in other situations, these sites are part of the relatively well-preserved complex of sites within this large gulch. Because Kapalua Land Company, Ltd. has agreed to place the identified sites in the gulch areas in "as is" preservation, there is an important opportunity to preserve more marginal sites such as these probable post-contact walls that are part of the cultural landscape within Honokahua Gulch.

As previously noted, Kapalua Land Company, Ltd. has agreed to place all sites in the gulch areas in "as is" preservation. Consequently no further work beyond the inventory level is recommended, other than the preparation of a preservation plan for the project area.

Table 7

Significance Evaluations—Proposed Mitigation

5127	Terrace—agriculture/habitation	d	Passive preservation
5128	Rock shelter	d	Passive preservation
5129	Agricultural complex (2)	d	Passive preservation
5130	Enclosure	d, e	Passive preservation
5131	Rock pile/clear pile	d	Passive preservation
5132	Bridge foundation (2)	c, d	(Bridge span destroyed)
5163	Dirt road with 2 retaining walls and concrete bridge	c, d	Passive preservation
5133	Agricultural complex (3)	d	Passive preservation
5134	Plantation water intake	a, d	Passive preservation
5135	Rock shelter	d	Passive preservation
5136	Agricultural complex (3)	d	Passive preservation
5137	Agriculture/habitation (2)	d	Passive preservation
5138	Habitation/ceremonial complex (6)	c, d, e	Passive preservation
5139	Agricultural complex (10)	c, d, e	Passive preservation
5140	Habitation area site remnant	d	Passive preservation
5141	Possible burial mound	d, e	Passive preservation
5142	Possible burial cave	d, e	Passive preservation
5143	Rock shelter	d	Passive preservation
5144	Possible agriculture/habitation terrace	d	Passive preservation
5145	Rock shelter	d	Passive preservation
5146	Boundary/animal containment wall	d	Passive preservation
5147	Boundary/animal containment wall	d	Passive preservation
5148	Rock shelter	d	Passive preservation
5149	Rock shelter	d	Passive preservation
5150	Boundary/animal containment wall	d	Passive preservation
5151	Terrace/modified outcrop	d	Passive preservation
5152	Boundary/animal containment wall	d	Passive preservation
5153	Agricultural complex (4)	d	Passive preservation
5154	Agricultural terrace	d	Passive preservation
5155	Enclosure	d, e	Passive preservation
5156	Agricultural complex (5)	d, e	Passive preservation
5157	Possible burial cave	d, e	Passive preservation
5158	Complex (9)	d, e	Passive preservation
5159	Boundary/animal containment wall	d	Passive preservation
5160	Agricultural terraces (2)	d	Passive preservation
5161	Animal containment wall	NLS[17]	(Impacted by bulldozer)
5162	Rock shelter	d	Passive preservation
4459	Boundary/animal containment wall	d	Passive preservation

[17] No longer significant—sufficient information has been collected

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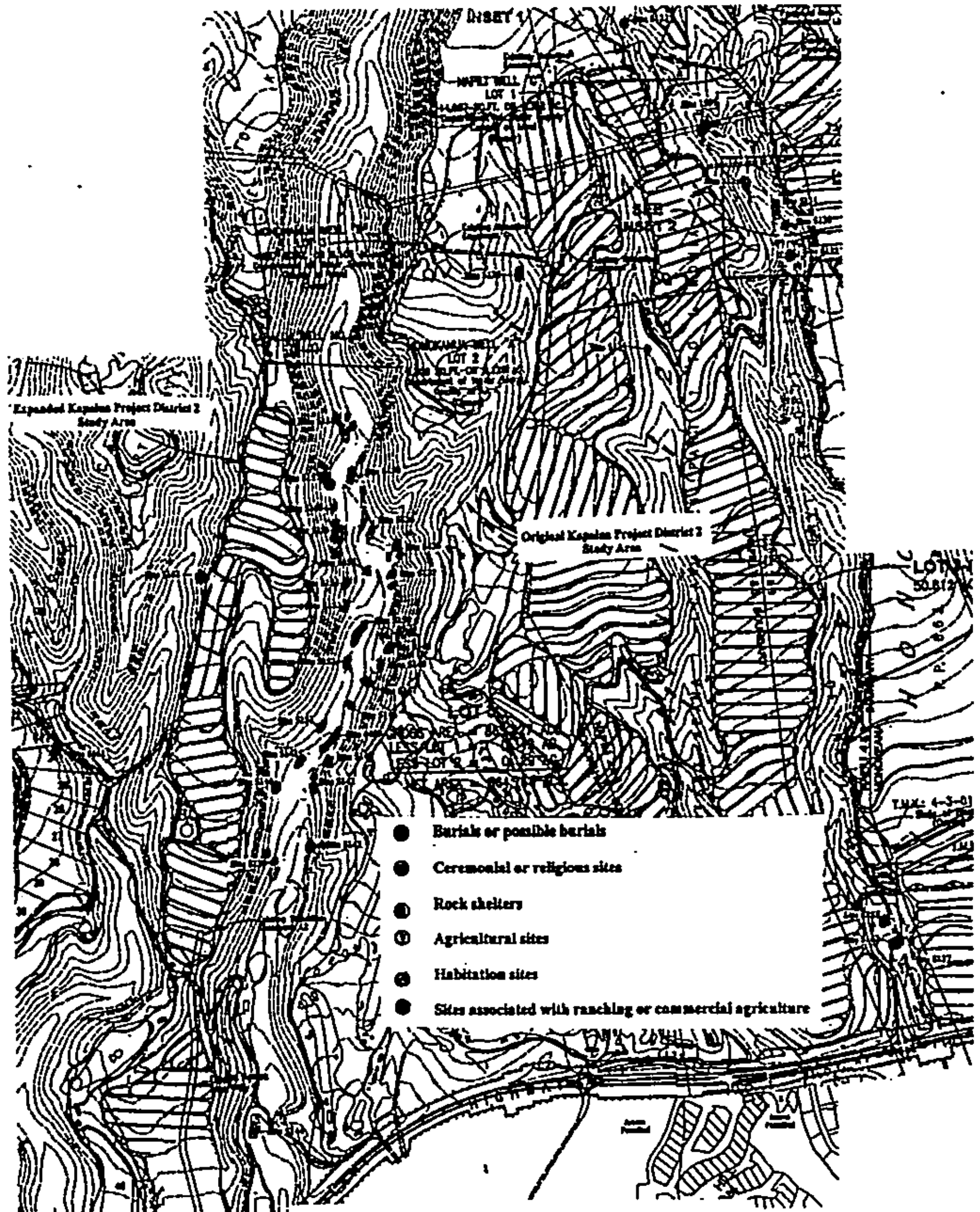

Map 4 – Distribution of sites according to function.

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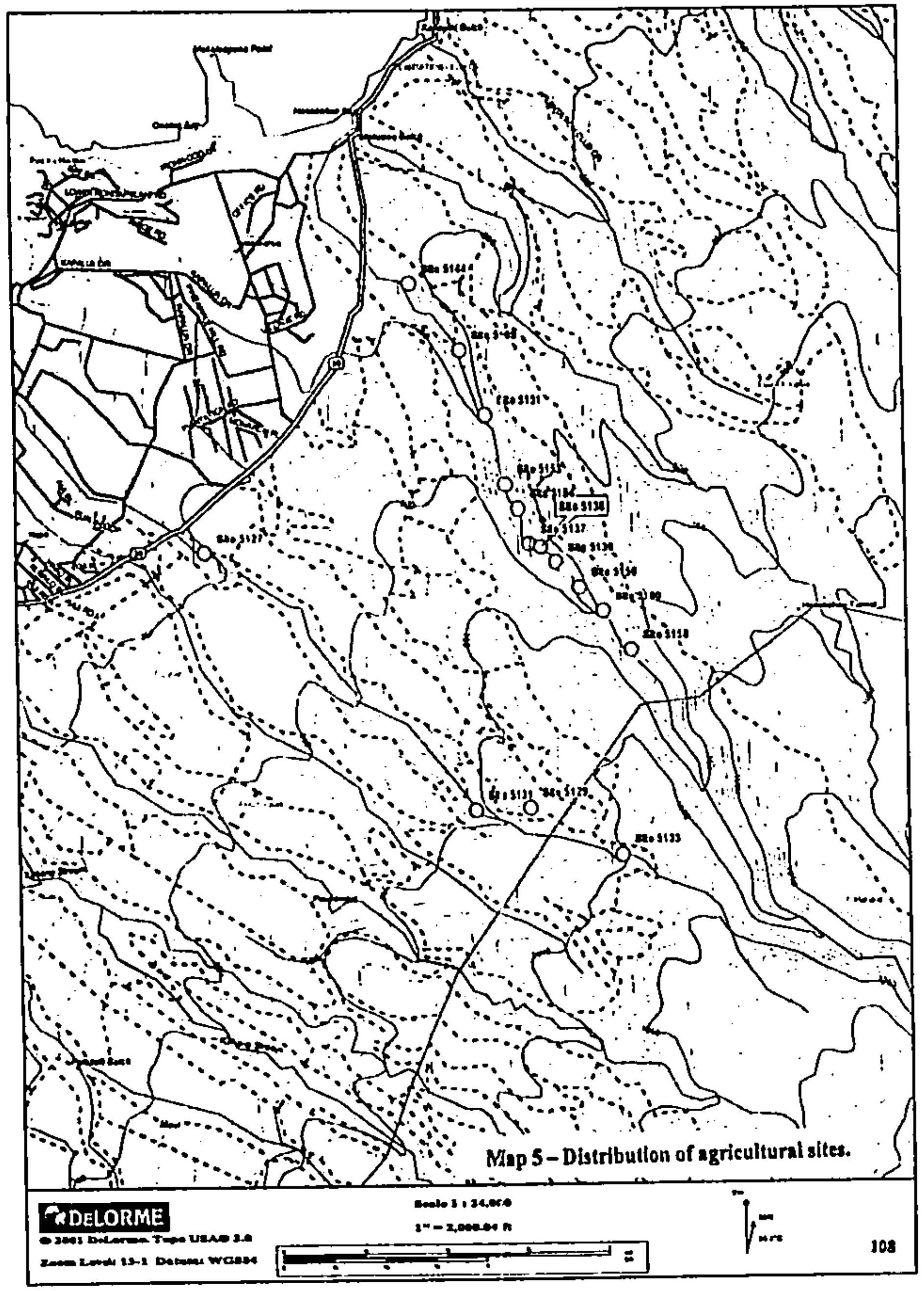
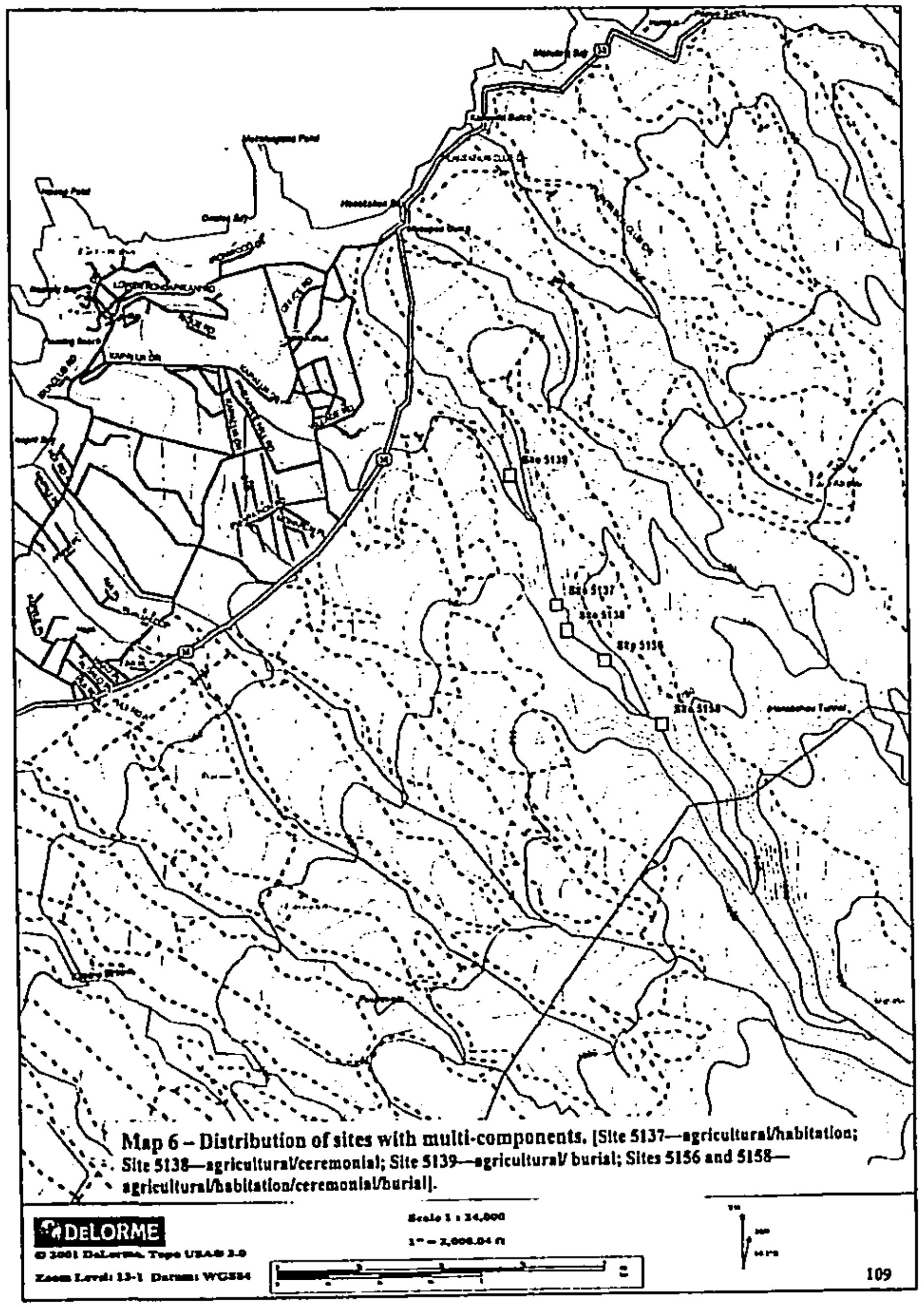


Map 5 – Distribution of agricultural sites.



Map 6 – Distribution of sites with multi-components. [Site 5137—agricultural/habitation; Site 5138—agricultural/ceremonial; Site 5139—agricultural/ burial; Sites 5156 and 5158—agricultural/habitation/ceremonial/burial].

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APPENDIX A

Site descriptions and Photographs

Photo 8 – Overview of Napili Gulch—view to the west (*makai*).

Photo 9 – General view east (*mauka*) into Honokahua Gulch. Kapalua Resort Maintenance facility in foreground.

APPENDIX A
Site Descriptions
Sites 50-01-5127 through [illegible]

Site 5127

(2)

Site Type: single component, terrace – modified outcrop
Environmental setting: This site is located along the southern project boundary within Napili Gulch, approximately 350 meters southeast of Honoapi'ilani Highway, in a relatively level area 4.0 meters north of the streambed. A double power pole lies c. 8.0 meters to the ENE. Flora consists primarily of *koa haole* trees and a thin buffelgrass cover.
Dimensions: 8.0 meters N-S by 7 meters E-W by 0.70 meters maximum height.
Function: possible agricultural
Subsurface potential: fair
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact (?)
Portable remains: none

Comments: This site consists of a level, terraced area measuring approximately 3.0 by 3.0 meters. The site lies between a cluster of large boulders in the drainage bottom. A crudely stacked retaining wall constructed of waterworn and angular cobbles is along the south side of the feature, facing the streambed. The wall measures 3 meters E-W by 1.25 meters N-S by 0.70 meters, 3 courses in height and 1.0 meter in width. The surrounding area is mostly uneven ground with a broad level area directly on the opposite side of the streambed (off of the project area).

Site 5128

(3)

Site type: Single component - rock shelter
Environmental setting: This site is located along the southern project boundary in the bottom of Napili gulch, at the base of its NW slope. Numerous basalt outcrops and boulders occur in this area where the slope is relatively steep (greater than 50%). The shelter is c. 4 meters NE of Napili Stream and 3 meters above it. Flora consists of a mature *koa haole* stand and alien grasses. The site is approximately 430 meters SE of Honoapi'ilani Highway.
Dimensions: 3.25 meters E-W by 2.0 meters deep N-S by 0.45 meter maximum ceiling height.

Function: temporary habitation/storage
Subsurface potential: moderate
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact (?)
Portable remains: 1 Waterworn pebble.

Comments: As the dimensions illustrate, the shelter potential is marginal, however slope wash has partially filled the interior and the waterworn pebble appears to be a manuport. There is sufficient room in this overhang for it to have been used as a storage area. A cat skeleton and a few pieces of pineapple field plastic mulch were also noted on the interior floor.

Site 5129

(6)

Site type: complex consisting of a terrace (Feature A) and a small wall section (Feature B).
Environmental setting: This site is located along the southern project boundary in the Napili gulch bottom. It is approximately 175 meters northwest or downstream from where the old Honolua Ditch crosses the drainage. The site sits on either side of the streambed at the bases of the gulch slopes. Flora noted in the area included a grove of large mango and *kukui* trees. Scattered *noni*, coffee, guava, *ki* and *hala* plants were also noted in the gulch bottom. Christmas berry trees dominated the rocky slopes of the gulch in this area.
Dimensions: 27 meters E-W by 18 meters N-S
Function: agricultural
Subsurface potential: moderate
Tested: no
Integrity: altered. Boulders lying on the terrace were likely pushed by bulldozer activity above during construction of the road that cuts across the drainage.
Condition: varied
Estimated age: precontact—early post-contact
Portable remains: none

Comments: Feature A, a terrace that parallels the streambed along its northern bank, dominates the site. Feature B, a small wall section, sits c. 12 meters to the south, on the opposite side of the streambed from Feature A's east end. A substantial road built for pineapple field access, cuts across the drainage approximately 45 meters south, upstream of the site. Site 5130 and 5131 are downstream, west 85.0 and 46.0 meters, respectively.

Feature A
Type: terrace
Dimensions: 24.0 meters E-W by 1.5 meters N-S by 1.0-meter maximum wall height.
Function: agricultural
Subsurface potential: good

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Photo 10 – Site 5129—Feature A terrace retaining wall—view to the northeast.

Photo 11 – Site 5130 enclosure—view to the south southeast. Note *ki* plants in the interior.

Tested: no
Integrity: altered by bulldozer push.
Condition: good
Estimated age: precontact—post-contact
Portable remains: none

Comments: This terrace sits along the northern bank of Napili Stream 5 to 9 meters from the edge of the stream. The retaining wall of this terrace parallels the streambed and has an overall length of 24.0 meters. It is well built of stacked sub-angular basalt cobbles and boulders. It is vertically faced 6 to 7 courses with 0.75 meter to 1.0 meter high sections averaging 0.5 meters in width. Some portions are collapsed. The level terraced area measures 20.0 meters E-W by 1.4 meters in width N-S. A few large boulders sit atop the terrace area that are likely bulldozer pushed from above. Feature B sits directly on the opposite side of the streambed to the south.

Feature B
Type: rock wall/clear pile
Dimensions: 2.6 meters length N-S by 1.0 meter wide E-W and 1.0 maximum height.
Function: agricultural, possibly simply a linear clearing pile for level area directly east.
Subsurface potential: limited
Tested: no
Integrity: unaltered
Condition: fair
Estimated age: precontact—post-contact
Portable remains: none.

Comments: This short feature sits at the base of the western gulch slope within about one meter of the streambed cut bank and c. 12.0 meters south from feature A on the opposite side of the streambed. The wall is well built of sub-angular basalt cobbles and boulders averaging 0.45 to 0.65 meter in size, 6 to 7 courses height and faced on the western side. The eastern side is collapsed.

Site 5130 (7)

Site type: single component, enclosure.
Environmental: This site located in Napili Gulch along the southern project boundary, approximately 260 meters northwest or downstream of where the old Honolua Ditch crosses the drainage. The site sits in the bottom of the gulch at the base of its steep southern slope. The enclosure is 2.4 meters south of the edge of the streambed on a level area that extends out 50.0 meters to the NE along the south side of the streambed. Primary flora consists of large mango trees with scattered *kukui* trees, coffee, guava and *koa haole* shrubs. Four *ki* plants are contained within this enclosure. The surrounding gulch slopes are covered in Christmas berry, rose apple and eucalyptus trees.
Dimensions: 4.8 meters E-W by 3.8 meters N-S and 0.80 meter maximum wall height and 0.6 meters maximum wall width.
Function: ceremonial

Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: possible precontact
Portable remains: none

Comments: This small enclosure has a rounded triangular shape in plan. The walls are generally well built of sub-angular cobbles and boulders averaging 3-4 courses. The interior wall is faced along its northern, northwestern and southern sides with less refined stacking elsewhere. A formal entryway appears to exist along the central northern side facing the stream. A small, prepared notch measuring 0.30 by 0.30 meter occurs along the outer NW facing wall. The western end of the enclosure is built of boulders that are larger than the average rocks used in the overall construction. The maximum wall height is along the interior southern wall. Slope wash appears to have filled the opposing side of this wall that abuts the base of the gulch. Site 5131 lies c. 30 meters to the east, while Feature A of Site 5129 is located 85 meters east on the opposite side of the streambed.

Site 5131

(41)

Site type: single component, rock pile.
Environmental: This site is located along the southern project boundary in the Napili gulch bottom, on a level area along the southern bank about one meter south of the streambed. Observed flora in the gulch bottom included large mango trees, with fewer *kukui* and rose apple trees, and coffee shrubs. Christmas berry trees dominate the gulch slopes. Talus boulders are concentrated along the base of the slope of the gulch directly adjacent to the south.
Dimensions: 12.0 meters E-W by 6.0 meters N-S and 0.65 meter maximum height.
Function: possible clearing pile
Subsurface potential: limited
Tested: no
Integrity: unaltered
Condition: fair
Estimated age: post-contact
Portable remains: none

Comments: This seeming disorganized pile of rock shares the same broad level area as the Site 5130 enclosure that is 30.5 meters to the west. The primary pile measures 5.0 meters N-S by 3.25 meters E-W by 0.65 in height and is of crudely stacked sub-angular, and waterworn cobbles and boulders with the average rock size of 0.30 meter. The NE face of the pile appears to be purposefully curving. A small depression measuring 0.50 meter in diameter and 0.50 meter deep occurs directly west of the pile. A second smaller, less organized pile lies 5.0 meters to the west along with a few talus boulders. Feature A of Site 5129 is located c. 46 meters to the east, upstream on the opposite side of the streambed.


Photo 12 – Site 5131—clear pile in Napili—view to the east.


Photo 13 – Site 5132—cut basalt and mortar bridge foundation. View to the northeast with Napili Streambed in foreground.

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Site 5132 (8)

Site type: pair of embankment walls
Environmental setting: This site is located along the southern project boundary, in the bottom of the Napili Gulch. Flora consists primarily of Christmas berry thicket with fewer mango, *kukui* and rose apple trees in the general vicinity.
Dimensions: 11.0 meters NE-SW by 3.5 meters NW-SE and 0.90 maximum wall height
Function: bridge or aqueduct crossing.
Subsurface potential: very limited
Tested: no
Integrity: altered, original function abandoned, recent adaptations.
Condition: varied
Estimated age: pineapple plantation era
Portable remains: 2 rusted metal tool benches, 1 short sawed off section of white 3" PVC pipe, and an 8" pipe coupler.

Comments: This site consists of a pair of stone walls of cut basalt mortared blocks that sit opposite each other paralleling Napili Stream on either side of the stream 6.4 meters apart. The walls each create a small level area on the edge of the otherwise steep stream bank. Each wall section measures 3.5 meters in length NE-SW by 0.60 meter in width by 0.90 meter in height and is essentially identical. The walls are built from cut basalt blocks c. 0.30 by 0.50 cm. Each wall has a concrete cap along the top with a single 7/8" anchor bolt protruding from the concrete. Each wall also has a small tool bench that sits atop the level area created by the wall. These are obviously more recent additions to possibly support a smaller pipe. Two recent, large ditch-like excavations extend up either side of the gulch from the back portions of the level areas created by the walls.

Site 5163

Site type: segment of unpaved road with bridge and 2 retaining walls
Environmental setting: This site is located and extends south of the southern project boundary. Flora in this portion of Napili Gulch includes *koa haole* shrubs, night-blooming cereus, and alien grasses and weeds.
Dimensions: c.175 meters long by 4 meters wide with maximum retaining wall height of 2.0 meters.
Function: plantation era transportation
Subsurface potential: very limited
Tested: no
Integrity: largely unaltered
Condition: good overall
Estimated age: pineapple plantation era—1920s to 1930s
Portable remains: some modern remains including refuse, power lines lie nearby to the west.

Comments: This site remnant in Napili Gulch consists of a section of unpaved road c. 175 meters long by 4 meters wide that crosses the streambed. Two dry laid rock

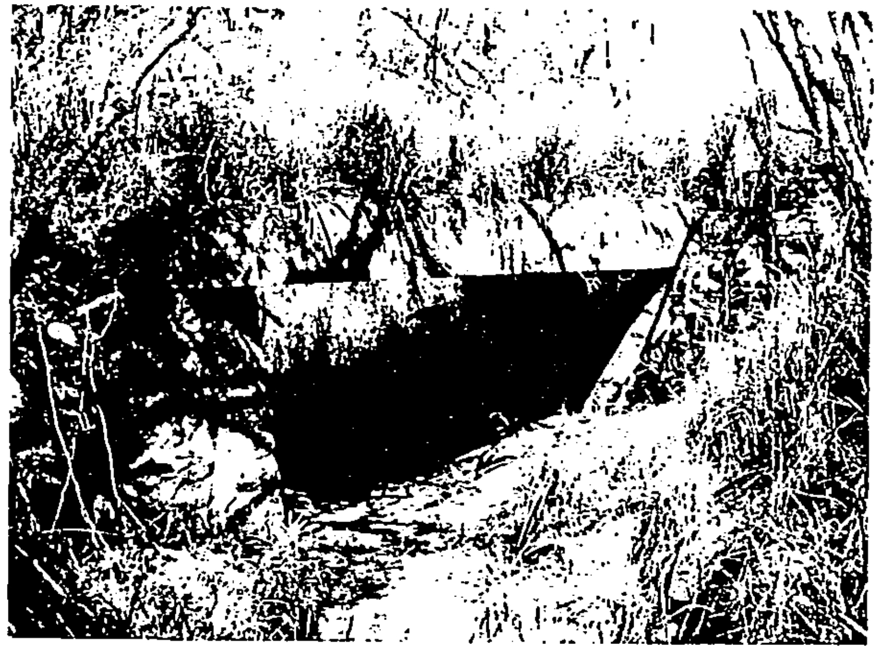

Photo 14 – Site 5163—plantation era concrete bridge, crossing Napili Stream—view to the east.

retaining walls and a concrete bridge are associated with this road. The wall on the northeastern side of the gulch measures c. 32 meters in length and is up to 0.8 meter in height. The second wall is more substantial and lies along the southern bank of Napili Gulch off of the project area. This wall measures c. 60 meters in length by up to 2.0 meters in height. Both walls are constructed from tabular basalt that is common on this part of Maui. The bridge is white washed and built of concrete. It measures 5.8 meters in length by 3.5 meters in width. Two mortared basalt cobble and boulder walls support the bridge span.

Site 5133

(9)

Site type: complex consisting of a single rock shelter, a terrace remnant and a rock alignment
Environmental: This site is located along the southern project boundary. It lies in the bottom of Napili Gulch on both sides of the streambed and is approximately 500 meters from the southeast corner of the project area. Discontinuous basalt escarpments create the borders of this site at the base of the steep gulch slopes. The dry streambed passes through the center of this site and an intermittent waterfall c. 5 meters high lies about 8 meters south of the site's southern boundary. Dominant flora present in the vicinity consists of large mango trees in the relatively level gulch floor, and sparse *ki* plants and low grass carpet the ground surface. Christmas berry thickets cover the surrounding gulch slopes.
Dimensions: 27.0 meters NE-SW by 16.0 meters NW-SE
Function: temporary habitation, agriculture
Subsurface potential: good
Tested: T.U. 1 excavated at Feature A
Integrity: unaltered
Condition: good
Estimated age: post-contact
Portable remains: sparse charcoal (Feature A), crude basalt chopper (Feature B)

Comments: This site consists of a large rock shelter, Feature A, which sits at the base of an escarpment on the west side of Napili stream and Features B and C, which are located on the opposite side of the stream. Feature B is a crudely constructed retaining wall. Feature C consists of a crude rock pile.

Feature A
Type: rock shelter
Dimensions: 8.0 meters NW-SE by 4.2 meters NE-SW and 3.6 meters maximum ceiling height
Function: temporary habitation
Subsurface potential: good
Tested: T.U.1 (0.50 x 1.00 m) yielded moderate amounts of midden, copious charcoal from Feature 33.1—hearth.
Integrity: unaltered
Condition: good

Estimated age: possible precontact—20th century
Radiocarbon age: Beta Analytic #157892: 50 +/- 50 (2 sigma—outside calibration range)
Portable remains: trace charcoal, sparse fire cracked rock on floor of shelter

Comments: This rock shelter sits directly at the western edge of Napili Stream at the base of a c. 4-meter high escarpment. The interior of this overhang is spacious. Soil covers the bulk of the shelter floor. A small pile of cobbles is along the eastern wall and a concentration of cobbles and sparse fire cracked rock is in the back of the shelter in its western corner. A few large rocks are scattered at the mouth of the shelter. A c. 5 meter high waterfall lies 8 meters upstream, to the east of the shelter's mouth.

Feature B
Type: Retaining wall remnant
Dimensions: 7.5 meters N-S by 2.5 meters E-W width and 0.80 meter maximum height.
Function: possible agricultural
Subsurface potential: fair
Tested: no
Integrity: unaltered
Condition: fair
Estimated age: possible precontact—early post-contact
Portable remains: 1 crude stone chopper tool

Comments: This feature is a crude linear rubble pile that sits at the base of a moderate slope that drops down from the base of a c. 8 meter high escarpment on the eastern side of the gulch. Feature B lies c. 12 meters east of the Napili streambed. A level area measuring 4.0 by 6.0 meters is directly below the pile. This feature may have been constructed to serve as a retaining wall to prevent slope wash from inundating the level area. A potential rock alignment parallels the linear pile running across the center of the level area. Another possible wall remnant, Feature C, is 6.0 meters west of this feature.

Feature C
Type: Retaining wall remnant
Dimensions: 5.0 meters N-S by 3.2 meters E-W and 0.65 meter maximum wall height
Function: possible agricultural
Subsurface potential: fair
Tested: no
Integrity: unaltered
Condition: poor
Estimated age: possible precontact—early post-contact
Portable remains: none

Comments: This feature sits c. 5 meters east of the edge of the Napili streambed. It is a linear, roughly circular concentration of sub-angular cobbles and boulders averaging 0.60 meter in size. One boulder c. 1.0 by 1.5 meters appears to be incorporated into the feature. The crudely stacked rock partially encircles a massive mango tree. A level area

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Photo 15 – Site 5133—Feature A rock shelter—view of the south southwest.

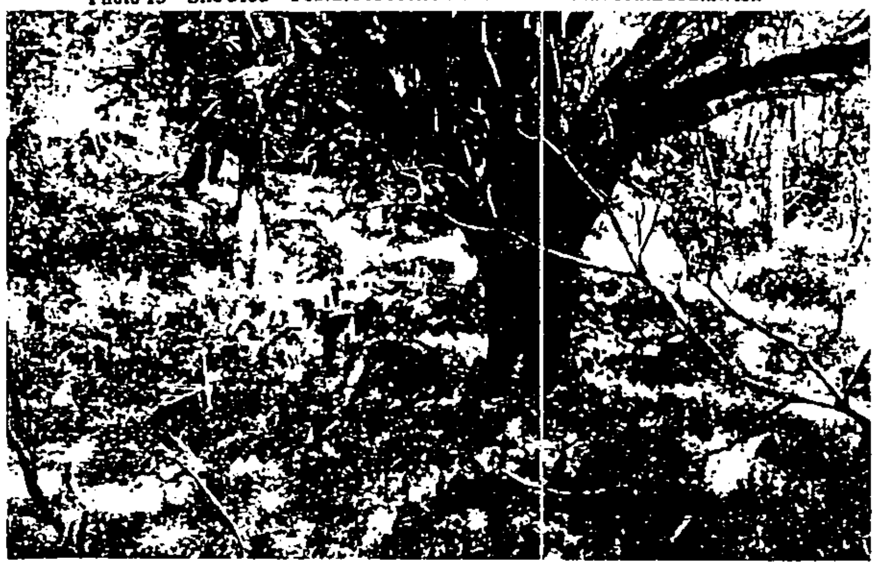

Photo 16 – Site 5133—Feature B in background. Feature C in foreground—view to the south southeast.

measuring c. 8.0 meters N-S by 3.0 meters E-W is located directly west at the edge of the streambed. The eastern edge of this feature adjoins the level area mentioned in the Feature B description.

Site 5134 (10)

Site type: dam with associated water intake
Environmental: This site is located in the streambed of the unnamed gulch that is the next gulch north of Napili Gulch. Steep slopes rise quickly on either side of the stream. Flora consists of Formosan *koa* and *kukui* trees, and coffee shrubs. A silted in section of the gulch bottom lies c. 10.0 meters upstream to the east. This area may have been created when the dam associated with this site was operational.
Dimensions: 2.0 meters N-S by 3.0 meters E-W
Function: agricultural, water collection
Subsurface potential: none
Tested: no
Integrity: altered, parts of system missing.
Condition: good
Estimated age: pineapple plantation era
Portable remains: none

Comments: This site consists of a small, mortared basalt cobble wall, which partially spans the streambed. It appears probable that this portion of the site blocked the water flow when the dam was functional. The wall measures 2.0 in length N-S by 0.45 wide and 1.05 meter maximum height. Directly adjacent on the upstream side of the wall, is a concrete cylinder 0.58 meters in diameter, protruding from the streambed 0.40 meter. The upper edge of the cylinder has a lip that would have supported a grated lid for water intake. The streambed is silted in c. 10 meters upstream. The damming of the stream apparently caused this siltation.

Site 5135 (12)

Site type: single component, rock shelter.
Environmental: This site lies approximately 500 meters up (northwest) the large tributary gulch that enters the western side of Honokahua Gulch in the central portion of the project area. The small shelter is at the base of an escarpment 2.0 meters above the streambed on its east side and directly adjacent to a c. 3.5 meter high waterfall. Primary flora in the gulch bottom consists of *kukui* tree cover and dense coffee shrub undergrowth. The gulch sides, which rise sharply from the streambed, are covered with Christmas berry trees.
Dimensions: 1.5 meter NE-SW wide by 1.0 deep and 0.80 meter maximum ceiling height
Function: temporary habitation/shelter
Subsurface potential: poor, little or no deposit within the shelter
Tested: no
Integrity: unaltered

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Photo 17 – Site 1591—section of Honolua Ditch in Napili Gulch. View to the east. Note 1913 date.

Photo 18 – Site 5134—cylindrical concrete intake with dam, associated with Honolua Ditch—view to northwest.

Condition: good
Estimated age: precontact—post-contact
Portable remains: 1 waterworn pebble

Comments: Although small, the rock shelter is in an interesting location and is roomy enough for an individual to find protection. The soil deposit within the overhang is very thin. One waterworn pebble manuport was noted on the surface interior.

Site 5136 (13)

Site type: complex, 2 rock wall sections and 1 terrace retaining wall
Environmental: This site is located within the bottom of Honokahua Gulch and primarily lies along the base of the gulch's SW slope. Honokahua Stream lies c. 20.0 to 30.0 meters east of this site. The site extends up a smaller tributary gulch, which enters the SW side of Honokahua Gulch near the east central portion of the project area. Flora consists almost solely of Christmas berry thicket. A bulldozer cut road passes directly along the eastern side of the site and has impacted a portion of Feature A.
Dimensions: 60.0 meters N-S by 25.0 meters E-W
Function: agricultural
Subsurface potential: fair
Tested: no
Integrity: altered, bulldozer activity
Condition: varied
Estimated age: precontact—early post-contact
Portable remains: none

Comments: The three features included in this site lie within 21.0 meters of each other and are constructed in a similar manner. Feature A is the largest feature of this site. It consists of a free standing rock wall. Feature B is a possible terrace remnant c. 20.0 meters SE of Feature A. Feature C is another possible terrace remnant c. 20 meters SW of Feature B.

Feature A
Type: stacked, faced rock wall
Dimensions: 17.5 meters NW-SE in length by 1.5 meter wide by 1.0 meter maximum height.
Function: Boundary/animal containment
Subsurface potential: fair
Tested: no
Integrity: altered, bulldozer activity
Condition: good to poor
Estimated age: post-contact
Portable remains: none

Comments: This feature is a stacked rock wall, which follows the contour of the slope of the gulch at c. 6.0 meters up from the base of the slope. The wall is built of sub-angular basalt cobbles and boulders, and is 5 to 6 courses high. The construction technique utilizes natural large talus boulders in places. This wall is crudely faced on both sides and has small areas of collapse. There are two level areas on the western side of the wall measuring c. 2 by 4 meters each. These level areas may have been created by slope wash. There is a possibility that Feature A and Feature B were once part of a single feature. However, previous bulldozing activities associated with the construction of the road has impacted the area.

Feature B
Type: stacked, faced rock wall with possible terrace remnant
Dimensions: 7.5 meters NW-SE by 2.4 meters NE-SE and 1.1 meters maximum wall height.
Function: possible agricultural
Subsurface potential: fair
Tested: no
Integrity: altered, bulldozer activity
Condition: good to poor
Estimated age: precontact—post-contact
Portable remains: none

Comments: This is a short, L-shaped wall section that ends directly at the edge of the tributary gulch mentioned in the site description above. This wall is faced on the eastern or down slope side where it is up to 1.1 meter high. The western or upslope side of the wall is only 0.10 meter high giving it a terrace retaining wall appearance. There is a level area on the upslope side measuring c. 10 meters N-S by 2 meters E-W. This feature is c. 20 meters SE of Feature A. Both Features A and B may have been part of the same feature prior to previous bulldozing activities.

Feature C
Type: terrace remnant, retaining wall
Dimensions: 5.0 meters NE-SW in length by 0.80 meter width and 0.95 meter maximum wall height
Function: possible agricultural
Subsurface potential: limited
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—post contact
Portable remains: none

Comments: This short wall section parallels the western edge of the tributary streambed. The wall is built from sub-angular basalt cobbles and boulders. This wall is 4-5 courses high and 0.95 meter high on its eastern (streambed) side and only 0.10 meter high on the upslope side. There is no appreciable level area on the upslope side but this may be due to slope wash. This feature is c. 20.0 meters SW, up the tributary gulch, from Feature B.

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Photo 19 – Site 5136—Feature C retaining wall—view to the west-southwest.

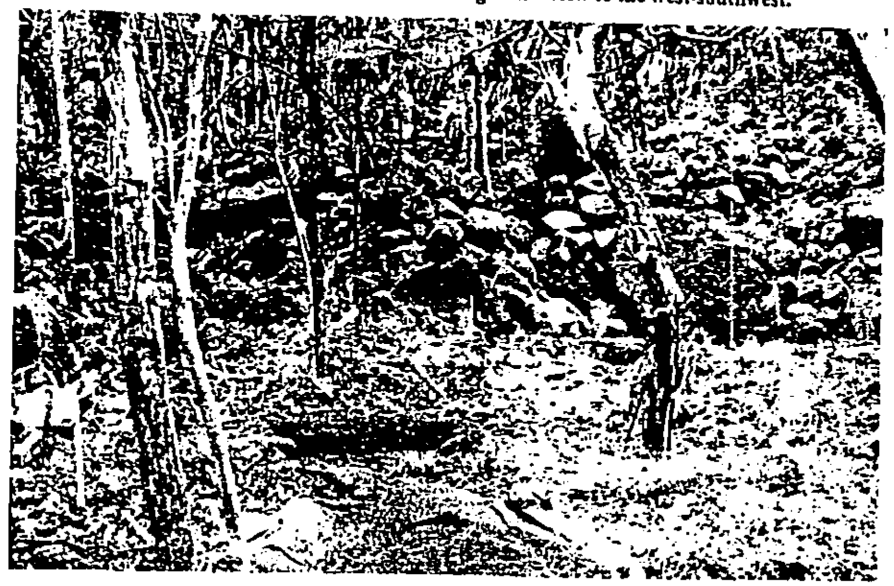

Photo 20 – Site 5137—Feature A enclosure wall in background—TU 1 in Foreground—view to the southeast.

Site 5137 (14)

Site type: complex, 2 adjoined enclosures
Environmental: This site is located on a broad level area in the bottom of Honokahua Gulch, at the base of the gulch's southwestern slope. The naturally occurring talus boulders at the base of the slope are incorporated into the construction of these features. The Honokahua Stream lies c. 20 meters to the northwest. Over story flora consists of mature *kukui*, rose apple and eucalyptus trees. Under story vegetation is composed of abundant *ki* plants and coffee shrubs. Bird nest ferns grow on the bare rock walls of the features.
Dimensions: 22.0 meters NW-SE by 10.0 meters NE- SW
Function: possible agricultural/habitation
Subsurface potential: good
Tested: yes, T.U. (0.50 x 1.0 meter) yielded trace charcoal
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remains: none

Comments: This site consists of two rectangular rock wall enclosures that share a common central wall. The enclosures are joined end to end and their southwest sides abut the base of the gulch's slope. Both features are incorporate basalt outcrops in their construction. These features are constructed from large talus boulders, subangular basalt cobbles and boulders collected from immediate area. Each feature is constructed in a different manner. Feature A, the larger of the two, has a faced, core filled section of wall while Feature B is constructed in a rougher manner. Inspection of the site suggests that Feature A may have been added on to Feature B. Site 5138, a complex of rock shelters and terraces, lies some 20.0 meters upslope to the south.

Feature A
Type: enclosure
Dimensions: 14.0 meters NW-SE by 9.0 meters NE-SW by 1.0 meters maximum wall height
Function: possible agricultural/habitation
Subsurface potential: good
Tested: yes, T.U.1 (0.50 x 1.0 meter) yielded a small charcoal sample from soil.
Integrity: unaltered
Condition: good
Estimated age: precontact—post-contact
Portable remains: none
Comments: This feature consists of a rectangular rock wall enclosure that abuts the base of the southwestern gulch slope. The upslope wall of this feature has for the most part been compromised by slope wash and has largely collapsed. The northeastern (down slope) wall is a somewhat low core filled faced wall averaging 0.70 meter high and 0.80 meter wide. It is constructed of subangular cobbles and boulders 3-4 courses high with sub-angular gravel, pebbles and cobbles used for the core fill. The remaining wall

sections are more crudely stacked but are faced in the intact portions and incorporate naturally occurring talus boulders in the construction. This enclosure's southeastern wall is shared with Feature B.

Feature B
Type: enclosure
Dimensions: 10.0 meters NW-SE by 7.0 meters NE-SW by 1.2 meters maximum wall height.
Function: possible agricultural/habitation
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: varied
Estimated age: precontact—post-contact
Portable remains: none

Comments: This feature is a small rectangular rock walled enclosure. It abuts the base of the southwestern gulch slope along the feature's southwestern side. The enclosure wall is collapsed in this location due to slope wash. The overall construction style consists of a stacked, faced wall of subangular cobbles and boulders 3-5 courses high, and 1.0 meter in width. Basalt outcrops and large naturally occurring talus boulders are incorporated into the walls. A portion of the northeastern wall has collapsed. The northwestern wall of this feature is shared with the enclosure Feature A, which may be a later addition.

Site 5138 (15)

Site type: complex consisting of rock shelters and terraces.
Environmental setting: This site is located near the base of the southwestern slope of Honokahua Gulch. The two rock shelters are located at the base of a c. 5 meter high escarpment that is visible from Site 5137 which lies c. 20 meters to the north on the level gulch floor. The slopes of the gulch are largely covered with talus boulders, some of which were incorporated into the majority of the terrace features of Site 5138. Observed flora consists of Christmas berry tree cover on the rocky slopes, with *kukui* and rose apple trees, *noni*, *ki* and coffee plants growing in the adjacent gulch floor. Bird nest ferns grow on the rocks of several features.
Dimensions: 22 meters E/W by 12 meters N/S
Function: temporary habitation, agricultural, ceremonial
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remains: sparse marine shell, coral and lithic debitage (Feature A vicinity), small adz blank (see Feature D) and a crude cobble chopper, beneath a boulder's edge c. 6.0 meters NE of Feature C.

Comments: This site consists of two, side by side rock shelters—Features A and B, a small, stacked retaining wall (Feature F) in front of the Feature B shelter, two terraces (Features C and D), and small retaining wall and level area (Feature E). Features A and B lie near the base of an escarpment at the western end of the site. These two overhang shelters have marine shell and charcoal scattered on their floors. Feature C modifies the outcrop area in front of Feature B and forms a small level area. Features D, E and F lie down slope to the east near the base of the gulch slope.

Feature A
Type: rock shelter
Dimensions: 1.7 meters NW-SE width by 1.5 meters deep and 1.3 maximum ceiling height
Function: temporary habitation
Subsurface potential: excellent
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact
Portable remains: 2 marine shell (*Planaxis labiosa*), 1 crab claw fragment, small charcoal chunks on surface. A large basalt flake is outside the shelter c. 3 meters to the northwest.

Comments: This rock shelter is at the base of a c. 5 meter high escarpment that lies about 15 meters SW of the gulch floor. A level area with good soil deposition exists on the shelter floor where the marine shells and charcoal are scattered. The Feature B overhang is located about 1.0 meter to the south.

Feature B
Type: rock shelter
Dimensions: 3.0 meters NW-SE width by 1.4 meters deep by 1.2 meters maximum ceiling height
Function: temporary habitation
Subsurface potential: excellent
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact
Portable remains: small charcoal chunks scattered on surface

Comments: This small rock shelter is situated near the base of the escarpment on the western edge of the site. A level floor with fair soil deposit exists within. Feature C, a somewhat level area on top of a modified outcrop, lies just to the NE of Feature B.
Feature C
Type: modified outcrop, terrace
Dimensions: 2.0 meters NE-SW by 1.8 meters NW-SE

Function: Indeterminate
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact
Portable remains: none

Comments: This feature is directly outside the entrance of the Feature B rock shelter. Feature C consists of a small, level area measuring c. 1.5 meters NE-SW by 1.2 meters NW-SE. This level area is created on a basalt outcrop ledge by two small, stacked rock retaining walls. A small wall c. 2.0 meters in length NE-SW lies along the top edge of the northwestern side of this outcrop. This wall is c. 0.5 meter high and (4 courses). A similar though smaller wall runs along the top edge of the outcrops' northeastern side. This second wall is c. 1.1 meters NW-SE by up to 0.5 meter high (2-4 courses). Both wall sections are constructed of subangular basalt cobbles.

Feature D
Type: modified talus boulders with retaining wall and overhang
Dimensions: 5.0 meters NW-SE by 3.0 meters NE-SW by 2.0 overall height
Function: agricultural, possible ceremonial
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact
Portable remains: none

Comments: This feature consists of a cluster of talus boulders to which has been added a small retaining wall measuring c. 2.0 meters NE-SW in length by 1.5 meters wide. This wall is built of subangular cobbles and is c. 1.1 meters high (5 courses). This wall creates a small level area below that is c. 1.5 meters square. A small overhang is beneath a boulder at the feature's eastern edge. This overhang measures c. 2.0 meters wide by 1.3 meters deep with a maximum ceiling height of 0.40 meter.

Feature E
Type: Terrace, modified talus deposit
Dimensions: 8.0 meters E-W by 3.0 meters N-S by 1.60 meters maximum height
Function: agricultural, possible ceremonial
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact
Portable remains: small adz blank, east corner of feature.

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Photo 21 – Site 5138—Features B and C—view to the southeast.

Comments: This feature consists of a cluster of large talus boulders the spaces around which have been filled with subangular cobbles. A small, crudely stacked retaining wall lies below the talus wall on the sloping terrain. This small retaining wall creates a small level terrace measuring 3.0 meters E-W by 2.0 meters N-S. The retaining wall measures c. 3.0 meters E-W by 0.5 meter in width and is c. 0.50 meter in height. It wraps around the upslope side of the level area. The adz blank was located beneath the edge of a talus boulder at the feature's northeastern corner.

Feature F
Type: terrace
Dimensions: 2.2 meters E-W by 1.3 meters N-S by 1.3 meters maximum wall height.
Function: possible ceremonial
Subsurface potential: fair
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact
Portable remains: none

Comments: This feature consists of a small, level terraced area measuring c. 2.0 meters E-W in length by 1.3 meters N-S in width. The level area is created in the otherwise sloping terrain by a small nearly vertical, faced retaining wall. This well-built wall measures c. 2.2 meters in length by 0.25 meter in width and has a maximum height of 1.3 meters. This wall is constructed along the upslope side of the level area, thus holding back slope wash. This feature is unique in its quality of construction and small size. The retaining wall appears to have been built to create the level space. This feature may have held an image of some kind in the past.

Site 5139 (16)

Features A-J
Site type: complex of 8 agricultural terraces, 1 rock alignment and 1 small overhang
Environmental: This site is located in the bottom of Honokahua Gulch on the eastern side of the stream. The majority of the features occur at or near the base of the gulch's eastern slope. This site lies approximately 60 meters upstream to the southeast of the road that cuts across the stream by the papaya plantation. A mature forest of rose apple and *kukui* trees forms the over story vegetation. *Noni* and coffee shrubs dominate the under story. The ground is blanketed with *lauа'e* ferns. Christmas berry trees cover the gulch's slope.
Dimensions: 50.0 meters N-S by 30.0 meters E-W
Function: agricultural, possible burial cave
Subsurface potential: good
Tested: yes, T.U. 1, (0.50 x 0.50 meter), yielded charcoal in soil
Integrity: unaltered
Condition: good
Estimated age: precontact—post-contact

Photo 22 – Site 5139—Feature A terrace, TU 1 in process—view to the east.

Photo 23 – Site 5139—Terraces—Feature G in foreground and Feature H in background. View to the east.

Radiocarbon date: Beta Analytic #157893: 110 +/- 60 BP. 2 sigma calibration date: AD 1660 to beyond 1960. Intercept dates: AD 1700, 1720, 1820, 1840, 1880, 1920, 1950.
Portable remains: 1 piece of waterworn coral

Comments: This site includes seven probable agricultural terraces. Some of these features are created by the modification of outcrops that are present along the base of the gulch. Others have low, stacked retaining walls. In both cases, a level terraced area is created. Also present is single rock alignment that is possibly part of a pathway. A small overhang, too low in ceiling height to be a shelter contains a piece of water worn coral inside.

Feature A
Type: terrace
Dimensions: 9.0 meters N-S by 4.0 meters E-W by 0.80 meters maximum wall height
Function: agricultural
Subsurface potential: good
Tested: yes, T.U.1 (0.50 x 0.50 meter) yielded charcoal in soil
Integrity: unaltered
Condition: good
Estimated age: precontact--post-contact
Portable remains: none

Comments: The level terraced area measures c. 9 meters N-S by 4 meters E-W. A retaining wall c. 7 meters in length N-S runs along the western side and is mainly constructed of subangular cobbles and a few waterworn cobbles. The wall is 2 to 4 courses in height and incorporates existing outcrops. This feature is set back c. 8 meters east of Honokahua Stream.

Feature B
Type: Modified outcrop, terrace
Dimensions: 3.0 meters N-S by 2.0 meters E-W by 0.60 meter maximum wall height
Function: agricultural
Subsurface potential: fair
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—post-contact
Portable remains: none

Comments: This feature consists of a crude retaining wall built by stacking 2 to 4 courses of sub-angular and waterworn cobbles into cracks in the existing basalt outcrop. A small terraced area measuring 2.5 meters N-S by 1.0 meter E-W is created on the upslope, western side of the wall. This feature is about 15 meters east of Honokahua Stream. A small rock alignment, Feature C, lies 2.0 meters to the west of the Feature B terrace.

Feature C
Type: Rock alignment
Dimensions: 5.5 meters N-S length by 0.60 meter E-W width
Function: possible path remnant
Subsurface potential: fair
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—post-contact
Portable remains: none

Comments: Feature C consists of a single course of sub-angular basalt boulders that are placed in a nearly straight line less than 0.1 meter apart for c. 5.5 meters in overall length. The long axis of this feature parallels the streambed, which is about 12 meters to the west.

Feature D
Type: Terrace
Dimensions: 6.5 meters N-S by 5.0 meters E-W by 0.9 meter maximum wall height
Function: agricultural
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: Precontact—post-contact
Portable remains: none

Comments: The retaining wall of this terrace is constructed by the stacking of 6 to7 courses of sub-angular cobbles and boulders into the spaces between basalt outcrops or talus boulders along the base of the gulch slope. A level area c. 6 meters N-S by 4 meters E-W is created above this wall. The Feature F terrace lies directly adjacent to the east.

Feature E
Type: Overhang, possible cupboard
Dimensions: 1.1 meters N-S with by 1.7 meters deep by 0.50 maximum ceiling height
Function: possible burial cave
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact (?)
Portable remains: 1 piece of waterworn coral

Comments: This small overhang exists beneath a large talus boulder and has marginal shelter potential at best due to the low ceiling height. The presence of the coral however does suggest that there may be an alternative function for the space. The boulder that creates the overhang sits at the south end of the Feature F terrace. Feature E is c. 22 meters east of Honokahua Stream.

Feature F
Type: terrace
Dimensions: 7.5 meters N-S by 3.5 meters E-W by 1.5 meters maximum wall height
Function: agricultural
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—post-contact
Portable remains: none

Comments: The retaining wall of this feature is oriented N-S along a series of outcrops which make up most of the wall. Cracks or clefts are filled in with sub-angular cobbles 1 to 4 courses high. This modified outcrop creates a level, terraced area measuring c. 7.5 meters N-S by 3.5 meters E-W. The boulder that creates the Feature E overhang sits at the southern end of this terrace that is about 22 meters east of Honokahua Stream. The Feature D terrace lies adjacent and down slope to the west.

Feature G
Type: terrace
Dimensions: 3.5 meters N-S by 3.20 meters E-W by 0.80 meter maximum wall height
Function: agricultural
Subsurface potential: good
Integrity: unaltered
Condition: good
Estimated age: precontact—post-contact
Portable remains: none

Comments: This feature consists of a small terraced area measuring c. 3.5 meters N-S by 3.5 meters E-W. This feature is created by a retaining wall constructed of 2 to 3 courses of subangular cobbles stacked between basalt outcrops. The terraced area of this feature extends back to the base of the retaining wall of the Feature H terrace c. 3.5 meters to the southeast. The Feature I terrace is directly adjacent to the west. Feature G is c. 20 meters east of Honokahua Stream.

Feature H
Type: terrace
Dimensions: 7.5 meters N-S by 6.5 meters E-W by 1.0 meters maximum wall height
Function: agricultural
Subsurface potential: good

Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—post-contact
Portable remains: none

Comments: This terrace has a level area measuring 6.5 meters N-S by 5.0 meters E-W. Retaining walls are on two sides of this roughly square terrace. The northwestern facing side has a retaining wall of subangular cobbles and boulders 5 courses and 1.0 meter high. Large talus boulders are incorporated into the wall including one boulder c. 3.5 meters across that is at the corner of the feature. The other wall faces southwest and is 2 courses and 0.50 meters high. The Feature G and Feature I terraces are directly below to the west.

Feature I
Type: terrace
Dimensions: 6.0 meters N-S by 4.5 meters E-W by 0.5 meters maximum wall height.
Function: agricultural
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—post-contact
Portable remains: none

Comments: This terrace has a level area measuring c. 5.5 meters N-S by 4.0 meters E-W. A retaining wall c. 4.5 meters in length is on the western side of this terrace. The wall is built of subangular cobbles 3 courses and 0.5 meter high. A short rock alignment delineates the northern end of the terrace. This wall is about 16 meters east of Honokahua Stream. Features G and H are other terraces that are directly upslope to the east.

Feature J
Type: terrace
Dimensions: 6.0 meters N-S by 5.0 meters E-W by 0.75 meters maximum wall height
Function: agricultural
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: fair
Estimated age: precontact—post-contact
Portable remains: none

Comments: This terrace remnant sits at the edge of the Honokahua Stream cut bank. A relatively level area measures 6.0 meters N-S by 4.0 meters E-W. The western side of the feature contains a retaining wall-like rubble pile that may be collapse. A short section

of faced wall is along the southern edge of the feature. Feature A, a more intact terrace, lies c. 4 meters to the east.

Site 5140 (17)

Site type: single component, terrace with associated wall and possible disturbed remnants.
Environmental setting: This site is situated in the bottom of Honokahua Gulch, some 32 meters east of the stream. Site 5140 is along the base of the gulch's eastern slope, at the northern edge of the mouth of a substantially incised tributary gulch entering the main gulch along its eastern side. A great deal of earlier bulldozer activity is evident in this area. Large push piles from a bulldozer cut road that drops down from the pineapple field to the east have encroached to within about 6 meters of the site's southern edge. This abandoned road cut enters Honokahua Gulch along the northern side of the aforementioned tributary. Two large bulldozer push piles are out on the level area near the stream where a few conspicuous rock concentrations remain. These may be remnants of features that where destroyed during the earlier bulldozer activity. The abandoned road cut and the push piles are overgrown with vegetation. Flora in the vicinity of this site consists of noni and *koa haole* shrubs, and guava with rose apple trees. In addition, coffee plants were noted directly to the west on the level area near the stream. Christmas berry trees grow thickly on the gulch slope above the site.
Dimensions: 8.5 meters N-S by 13.5 meters E-W by 1.0 maximum wall height.
Function: habitation
Subsurface potential: good
Tested: yes, T.U.1 (0.50 x 1.0 meter) yielded moderate amounts of midden and substantial hearth feature with copious amounts of charcoal.
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Radiocarbon date: Beta Analytic #157894: 210 +/- 80 BP. 2 sigma calibration date range: AD 1450-1950. Intercept date AD 1660.
Portable remains: none observed on surface

Comments: This site consists of a terrace feature with a level surface area measuring 6.0 meters N-S by 6.5 meters E-W. A crudely stacked retaining wall runs along the western side of the feature with a maximum height of 0.8 meter. This wall is built of subangular cobbles and boulders and incorporates existing large talus boulders. A crudely stacked, free standing wall runs the width of the terrace along its southern border. This wall is constructed of 2 to 3 courses of subangular boulders and cobbles and has a maximum height of 0.5 meter. At the northwestern corner of the terrace is a crudely stacked retaining wall has been stacked in and among the existing talus boulders to a height of 1.0 meter at the base of the gulch slope. A small level area with an associated retaining wall, measuring 2.0 meters N-S by 2.0 meters E-W with a maximum wall height of 0.6 meter lies on the northern end of the primary terrace. At the northwestern corner of the primary terrace, a short collapsed wall section extends out to the west some 5.5 meters and has a

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Photo 24 – Site 5140—Test Unit 1 completed—view to the south.

Photo 25 – Site 5141—possible burial—view to the north.

maximum height of 0.5 meter. Test Unit #1 was placed near the center of this primary terrace.

Site 5141 (18)

Site type: single component, rock pile
Environmental: This site is located in the bottom of Honokahua Gulch, on a broad level area about 4.5 meters east of the stream bank and directly west of the mouth of the substantially incised tributary gulch that enters the main gulch on its eastern side. The vegetation in the area consists of mature rose apple and *kukui* trees, along with an under story of *noni*, *ki* and coffee plants.
Dimensions: 1.6 meters N-S by 1.4 meters E-W by 0.60 meter maximum height.
Function: agricultural shrine (Pohaku o Kane); or possible burial marker
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remains: none

Comments: This is a conspicuous, roughly oval shaped cluster of sub-angular cobbles and boulders up to 0.35 by 0.50 meter in size. A single upright stone trapezoidal in shape sits at the southern corner of the cluster. The feature is 4.5 meters east of the streambed. A few other small boulders are scattered in the general area. Site 5142, a small rock shelter with burial potential, lies c. 27 meters to the west on the opposite side of the streambed.

Site 5142 (19)

Site type: single component, rock overhang
Environmental: This site is located in the Honokahua Gulch, near the base of the gulch's western slope. The small shelter is situated in an escarpment face c. 4.7 meters above a level area adjacent to the western edge of the gulch bottom, about 13 meters west of the streambed. Observed flora in the area consists of ironwood trees on the gulch slope adjacent to and above the shelter, and Christmas berry, *kukui*, *noni* and coffee growth below near the streambed.
Dimensions: 1.4 meters NW-SE width by 2.6 meters depth by 0.9 meter maximum ceiling height, (average height is approximately 0.4 meter).
Function: possible burial cave, (shelter potential is marginal due to restricted ceiling height)
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: possible precontact
Portable remains: 1 waterworn pebble.

Photo 26 – Site 5143—rock overhang shelter—TU 1 completed—view to the south.

Comments: Due to the shelter's low ceiling height, its use for temporary habitation would seem limited. There is a soil deposit within the shelter and judging from overhangs of similar proportions, there is a possibility that this was used as a burial cave. Further investigation would be needed to confirm this. Site 5141 lies c. 27 meters east on the opposite side on the stream.

Site 5143 (20)

Site type: single component, rock shelter
Environmental: This site lies in Honokahua Gulch, near the base of the gulch's western slope. The shelter is at the base of a c. 5-meter high escarpment and is 7.0 meters above and 8.0 meters west of a level area on the gulch floor that is now a papaya orchard. Other flora noted in the area consists of an over story of Christmas berry, rose apple and guava trees. In addition, *laua'e* ferns, vines and *koa haole* shrubs comprise the under story. Honokahua Stream is located c. 35 meters to the east.
Dimensions: 7.0 meters N-S width by 1.5 meters in depth E-W by 0.7 meter maximum ceiling height.
Function: temporary habitation
Integrity: altered (probable bottle hunter)
Subsurface potential: good
Tested: yes, T.U.1 (0.5 x 0.5 meter) yielded moderate amounts of midden and charcoal from soil. Unit was placed directly outside the primary chamber beneath shallow overhang.
Condition: good
Estimated age: precontact
Portable remains: 2 unidentified, non-human, mammal bone fragments, 1 small cowry shell fragment all on shelter floor, burnt *kukui* nut fragments in small niche in shelter wall.

Comments: Deposit within this shelter varies from over 0.4 meter at the test unit location at the shelter's southern end to non-existent in the central portion of the shelter where exposed rock is visible. A crudely excavated pit about 0.5 meter in diameter is in the northern end of the shelter and is likely a bottle hunter's pit. Little intact deposit remains in that area of the shelter.

Site 5144 (21)

Site type: single component, terrace
Environmental: This site is located in Honokahua Gulch, 2.0 meters east of the streambed on a relatively level area. Site 21 lies c. 17.0 meters southwest of the Kapalua maintenance facility's paved access road paved. A bulldozer clear pile, likely created during previous road construction, is within 2.0 meters of the site's northeastern edge. Flora in the vicinity of this site consists of Christmas berry, eucalyptus and *kukui* trees, along with scattered *noni* plants. *Koa haole* shrubs cover the eastern gulch slope c. 30 meters to the northeast.

Dimensions: 8.0 meters NE-SW by 6.0 meters NW-SE by 1.3 meters maximum wall height.
Function: possible agricultural
Subsurface potential: fair
Tested: yes, T.U.1 (0.5 x 0.5 meter) yielded a trace of charcoal and 1 burnt *kukui* nut fragment in a very rocky matrix.
Integrity: altered by bulldozer clearing and grading.
Condition: fair
Estimated age: precontact—early post-contact
Portable remains: none

Comments: A crudely stacked, faced retaining wall built of subangular cobbles and boulders runs along the western edge of the terrace paralleling the streambed. It is c. 4.5 meters in length NW-SE, and has a maximum height of 1.1 meters (3 to 4 courses). A free standing, crudely stacked and partially faced rock wall runs along the southeastern edge of the terrace. It is constructed of subangular cobbles and boulders and is and 0.80 meter high (3 to 4 courses) by 1.0 meter in width. A boulder c. 2.0 meters wide is incorporated into this wall. The relatively level terraced area measures c. 4.0 meters NW-SE by 4.0 meters NE-SW and is partly covered by a large tree. This felled tree was mechanically pushed there. The test unit was placed along the inside of the freestanding wall on the southeast-central portion of the terrace.

Site 5145 (22)

Site type: single component, rock shelter
Environmental: This site is located in Honokahua Gulch, c. 47 meters west of Honokahua Stream, near the base of the western gulch slope. A large rock wall, Site 4456, is 36.0 meters ESE from this site, near the stream. This shelter is at the base of a c. 7.0-meter high escarpment. From the base of the escarpment the terrain slopes gradually down to the streambed. Flora in immediate area around the shelter consists of Christmas berry and eucalyptus trees. Java plum, Christmas berry and eucalyptus trees, *noni, ki* and coffee plants grow below the site.
Dimensions: 5.5 meters NE-SW width by 3.0 meters NW-SE depth by 1.5 meters maximum ceiling height (average ceiling height 0.70 meters).
Function: temporary habitation
Subsurface potential: good
Tested: yes, T.U.1 (0.9 x 0.5 meter) yielded moderate amounts of midden including charcoal, marine shell, adz fragment and shark tooth.
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Radiocarbon date: Beta Analytic # 157895: 240 +/- 60 BP. 2 sigma calibration date ranges: AD 1500 to 1690; AD 1730 to 1810; AD 1920 to 1950. Intercept date AD 1660.
Portable remains: 1 octopus lure weight, 1 basalt flake, 3 faunal bone fragments, 10 marine shell (*Planaxis labiosa, Neritapicea, Thyidadae, Cypraea* sp.) all on interior surface of shelter.

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Photo 27 – Site 5144—terrace—view to the east.

Photo 28 – Site 5145—general view of rock overhang shelter—TU 1 complete—view to the west.

Comments: This rock shelter has sufficient evidence to demonstrate that it had been utilized. The octopus lure was recovered from a narrow niche in the back wall of the shelter, visible only with the aid of a flashlight. The interior floor is largely exposed rock but some pockets of soil deposit are present. An earthen berm sits directly beneath the drip-line of the shelter that is likely slope wash. A small boulder sits directly outside the mouth of the shelter on its south end. It may represent a possible seat.

Site 5146 (23)

Site type: single component, rock wall
Environmental: This wall is located in Honokahua Gulch, on the gulch's western slope. The wall which is oriented E/W runs directly up the moderately steep slope starting from a point c. 6.5 meters west and 3.0 meters above the northern end of a deeply incised section of the streambed. The gulch slope has a moderate amount of talus boulders covering it. The area is heavily forested with Christmas berry trees with occasional *noni* shrubs.
Dimensions: 28.0 meters E-W length by 0.9 meter in maximum width by 1.05meters maximum height.
Function: possible boundary/animal containment wall
Subsurface potential: limited
Tested: no
Integrity: unaltered
Condition: fair
Estimated age: early post-contact
Portable remains: none

Comments: The Site 5146 wall is crudely stacked for the most part with occasional short sections where it is faced on both sides and 4 to 5 stone courses in height. This wall consists of subangular basalt cobbles and boulders, and it is oriented E-W and runs straight up the western gulch slope. Large basalt outcrops and/or talus boulders have been incorporated into the construction. The western uppermost end of the wall terminates at a large basalt outcrop. Site 5147 is a larger though similar type of wall that lies c. 75 meters SSE, upstream from this site.

Site 5147 (24)

Site type: single component, rock wall
Environment: This wall is located in the Honokahua Gulch, on its western slope. The wall starts at a point at the top of a cut bank c. 8 meters high along the western side of a deeply incised section of Honokahua Stream. The wall runs straight up the moderately steep gulch slope that is covered with talus deposit. Observed flora consists of mature Christmas berry and rose apple trees, along with *noni*, guava and *ki* plants.
Dimensions: 38.0 meters E-W length by 1.0 meters maximum width by 1.5 meters maximum height.
Function: possible boundary/animal containment wall
Subsurface potential: limited

Tested: no
Integrity: altered slightly by addition of barbed wire and a 3" water pipe that was passed beneath a short section of the wall near the wall's western terminus.
Condition: good
Estimated age: early post-contact
Portable remains: none

Comments: This wall appears to follow a linear basalt outcrop straight up the fairly steep gulch slope. The linear outcrop is modified with the addition of 2 to 6 courses of subangular cobbles and boulders placed atop and between the cracks in the outcrop. Some areas along the wall appear natural or only slightly modified and the sheer size of some of the boulders employed make it difficult to imagine how these areas were built. In other areas the stacked rock wall sections are clearly discernable. The wall terminates at a large outcrop at its uppermost western end. Near the western end a 3" galvanized water pipe was passed though the wall in order to hold the pipe in place on the slope. A short length of barbed wire is tied to a Christmas berry tree and a boulder at the eastern end of the wall. Site 23 is a similar type of wall and lies c. 74.0 meters to the NNW, downstream from this site. Site 5149, a small rock shelter is about 43.0 meters SSE of this wall's eastern end.

Site 5148 (25)

Site type: single component, rock shelter with associated wall
Environmental: This site is located in Honokahua Gulch, midway up the gulch's western slope. A small overhang exists beneath the edge of a large talus boulder.in a gradually sloping area that is covered by a talus deposit. Flora consists of Christmas berry trees with a few *noni* and *ki* plants in the general area.
Dimensions: 4.4 meters NE-SW overall length by 3.5 meters NW-SE by 1.45 meters maximum ceiling height of shelter and 0.9 meter maximum wall height.
Function: temporary habitation
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remains: charcoal within overhang area

Comments: This is a small overhang measuring 1.8 meters NW-SE wide by 0.8 meter deep with maximum ceiling height of 1.45 meters. The overhang exists beneath the northeastern face of a large talus boulder that angles back in on itself creating the small sheltered area. The northwestern side of the boulder has been modified with the addition of a small crudely stacked rock wall. This wall encloses that end of the overhang and continues out from the boulder for about one meter. This wall consists of crudely stacked subangular cobbles and boulders 5 to 6 courses and 0.9 meter high. Directly adjacent to the NNE of the shelter is a level area measuring 4.5 meters N-S by 3.5 E-W. This level

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Photo 29 – Site 5147—animal containment wall—view to the east.

Photo 30 – Site 5149—rock shelter—view to the southwest.

area appears to have been partially cleared of talus boulders. Site 5149—another small rock shelter—lies some 40.0 meters to the WNW.

Site 5149 (39)

Site type: single component, rock shelter
Environmental: This site is located in Honokahua Gulch, in the lower portion of the western gulch slope. The existing terrain ranges from a gradual (c. 10%) to a moderate (c. 20%) slope. Talus deposit covers most of this area. Observed flora consists of Christmas berry thickets, rose apple trees and a few *noni* plants.
Dimensions: 4.0 meters E-W by 3.0 meters N-S by 0.90 maximum ceiling height of shelter
Function: temporary habitation
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remains: charcoal flecking, fish bone inside shelter.

Comments: This site consists of a small shelter measuring 2.0 meters E-W by 2.1 meters deep with a maximum ceiling height of 0.9 meter. Large boulders that rest atop each other create the rock shelter, which is open to the north. A semi-circular rock alignment measuring 1.5 meters in length E-W and 0.7 meter in width is located directly outside the shelter. This alignment consists of 5 subangular boulders averaging 0.4 meter in size, which are placed so as to form a semi-circular arrangement at the mouth of the shelter. A small crack that has been partially blocked off by the placement of 3 cobbles lies near the back or southern end of the shelter. Site 5148, another small shelter, is located c. 40 meters to the south. Site 5147—a rock wall—is some 43 meters to the NNW. Site 5150, a rock wall in the gulch bottom, lies about 60 meters to the east.

Site 5150 (26)

Site type: rock wall
Environmental: This site is located in the bottom of Honokahua Gulch. The wall lies from 5.0 to 12.0 meters west of the stream in a relatively level area of mature forest. A sheer escarpment of c. 15 meters in height lies directly opposite the northern end of the wall on the eastern side of the stream. The gulch slope rises moderately from the western side of the wall. A bulldozer cut road has effectively cut the northern portion of the site off from the rest of the wall. This road parallels the wall along the majority of its length and large amounts of boulders and trees have been pushed up along the western side of the wall. Flora noted in the area included Christmas berry, *kukui*, and rose apple trees along with *noni*, guava and coffee plants.
Dimensions: 96.0 meters N-S length by 33.0 meters E-W by 1.5 meter maximum wall width by 1.1 meters maximum height (not including a single incorporated boulder c. 2 meters in height).

Function: boundary/animal containment wall
Subsurface potential: limited
Tested: no
Integrity: altered by bulldozer activity
Condition: varied, good to poor
Estimated age: early post-contact
Portable remains: none

Comments: This wall is constructed of crudely stacked sub-angular cobbles and boulders. Talus boulders occur in large amounts scattered about the area. Dozens of these boulders have been incorporated into the wall. Many sections have boulders averaging 1.0 meter in diameter with smaller boulders and cobbles stacked on top and between ranging from 4 to7 stone courses high. Overall appearance of this wall is crude with occasional partially faced sections. The wall parallels the stream and runs in a nearly straight line N-S for most of its length. It turns sharply as the stream bends to the west. The northern most section of wall, which is c. 8 meters in length, has been separated from the rest of the wall by a previous bulldozer cut road. The road's initial construction and subsequent maintenance has effectively destroyed a 13 meter long section of the wall. The road parallels the western side of the wall and is an average of 7.0 meters west of it. A great deal of bulldozer push is along the road's edge and push has compromised portions of the wall near its southern end and has destroyed the wall completely at its southern terminus. Site 5152, a wall section of similar construction is located c. 35 meters down stream to the north of the northern end of this wall. Site 5152 lies c. 10 meters west of the bulldozer road and has also been impacted.

Site 5151 (28)

Site type: single component, possible terrace or modified outcrop
Environmental: This site is located in Honokahua Gulch, at the base of the gulch's eastern slope and about meters east of the stream. A bulldozer cut road, the same as that which impacted Site 5150, passes c. 11 meters to the east of Site 5151. The site lies on a gentle talus slope that is blanketed with Christmas berry thickets and several *kukui* trees to the west. The Site 4459 wall is directly west on the opposite side of the stream.
Dimensions: 2.5 meters N-S by 2.3 meters E-W by 0.9 meter maximum wall height.
Function: possible agricultural
Subsurface potential: fair
Tested: no
Integrity: unaltered
Condition: good
Estimated age: possible precontact
Portable remains: none

Comments: This site consists of a small, crude retaining wall that has been constructed by stacking sub-angular cobbles in and around a basalt outcrop creating a small level area on the down slope, western side. This terrace measures 1.5 meters N-S by 0.5 meter E-W.

Photo 31 – Site 5150—boundary or animal containment wall—view to the northwest.

Photo 32 – Site 5152—boundary or animal containment wall—view to the northeast.

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A possible modified outcrop is directly above this feature to the east. The slope is covered with talus deposit in the general area.

Site 5152 (29)

Site type: single component, rock wall
Environmental: This site is located in Honokahua Gulch, near the edge of the stream. The wall lies c. 3 meters to the north of the stream's c. 1.5 meter high cut bank and at the base of the gulch's eastern slope. The wall sits in a level area that is strewn with large boulders—many greater than 1.0 meter in diameter. Flora noted in the vicinity of the site consisted of Christmas berry and rose apple trees, along with an understory of alien grasses and weeds. A bulldozer cut road lies 10.0 meters northeast of the eastern end of this wall. A great number of pushed boulders and cobbles are deposited along the road's edge.
Dimensions: 10.8 meters E-W length by 1.4 meters N-S width by 1.2 meters maximum wall height.
Function: possible boundary/animal containment wall
Subsurface potential: fair
Tested: no
Integrity: altered by bulldozer activity
Condition: varied
Estimated age: early post-contact
Portable remains: none

Comments: This wall is constructed in a rough fashion, incorporating subangular rocks of various sizes including large boulders that were apparently used in place. Smaller boulders and cobbles are crudely stacked atop and between the boulders. The western end of the wall is faced along its southern side that faces the stream. The wall reaches a maximum height of 6 courses and about one meter in height. Elsewhere along the wall's length the construction tends to be much cruder. The wall forms an L-shape in plan view. The long section is c. 11.0 meters in length and parallels the streambed. A 90-degree bend at its eastern end continues on for 2.5 meters and terminates at a cluster of large boulders that have likely been pushed from the previous road construction. The bulldozer road is located c. 10 meters northeast of the eastern end of the wall. Site 5150, a rock wall of similar style, is c. 35 meters to the south, up the bulldozed road.

Site 5153 (30)

Features A-D
Site type: complex, with partial enclosure walls, 1 terrace and 1 rock alignment
Environmental: This site is located in Honokahua Gulch, along the base of the gulch's eastern slope. It sits in a relatively level area c. 12.5 to 25.0 meters east of the stream. The talus slope above is covered and the area has a great deal of boulders and cobbles scattered around. Primary vegetation consists of Christmas berry thickets with a few rose apple trees and sparse *noni* plants.
Dimensions: 40.0 meters N-S by 19.0 meters E-W

Function: possible habitation, agricultural
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remains: none

Comments: This site consists of 2 small partial enclosure walls, 1 small terrace feature and 1 rock alignment. Feature A is a small, L-shaped wall sitting in the central portion of the site, 12.5 meters east of the streambed. Feature B is a terrace that is built into the slope base, c. 7.0 meters northeast of Feature A. Feature C is a small roughly C-shaped crudely stacked wall c. 14.5 meters to the south of Feature A. Feature D is a rock alignment extending off the southeastern corner of Feature C.

Feature A
Type: rock wall, partial enclosure
Dimensions: 5.0 meters E-W by 4.0 meters N-S by 0.7 meters maximum wall height.
Function: agriculture (?)
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remains: none

Comments: This L-shaped feature consists of a low, crudely stacked wall that runs E-W along its northern side for about 4 meters. The wall is constructed of with subangular cobbles and is up to 8 rock courses high. A basalt outcrop forms the northwestern corner where a crude wall of 2 courses of small boulders trends southward for 2.0 meters. The resulting partially enclosed area is open to the south and faces the open side of Feature C that sits c. 14 meters to the south.

Feature B
Type: terrace
Dimensions: 4.6 meters NW-SE by 4.5 meters NE-SW by 1.8 meters maximum wall height.
Function: possible agricultural
Subsurface potential: fair
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remains: none

Comments: This terrace lies at the base of the gulch slope. The retaining wall of this terrace is well built of sub-angular cobbles 10 courses high and nearly vertically faced. Some of the wall appears to include weathered bedrock outcrop. Two waterworn cobbles are incorporated in the construction materials. A level area measuring 3.0 x 3.0 meters was created up slope to the east. The feature lies in a gently sloping area.

Feature C
Type: rock wall, partial enclosure
Dimensions: 5.0 meters E-W by 3.0 meters N-S by 0.6 meters maximum wall height.
Function: possible agricultural
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remains: none

Comments: This feature consists of a crudely stacked rock wall that abuts a large talus boulder along the feature's southern and eastern sides. This wall is built of subangular cobbles and boulders, 2-3 courses high along its north facing side and a single course high on the other side of the wall, giving it a retaining wall appearance. Additional stacking around the boulder creates a slightly sunken, partially enclosed area measuring 3.0 meters E-W by 2.0 meters N-S. The feature is open to the north, facing the open side of Feature A, which lies c. 14 meters to the north. The area within Feature C is relatively level. Feature D is a rock alignment that extends off the southwestern corner of this feature.

Feature D
Type: rock alignment
Dimensions: 9.0 meters N-S by 3.0 meters E-W by 0.8 meters maximum height (boulder at south end)
Function: possible agricultural
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remains: none

Comments: This feature consists of a slightly curving rock alignment made of sub-angular rocks averaging 30 centimeters in diameter. The Feature D alignment extends between a boulder at the southwestern exterior corner of Feature C to another boulder 8.0 meters south of Feature C. The alignment incorporates this boulder with the addition of two courses of cobbles. The alignment runs across a level area at the base of the slope. Site 5154, a possible agricultural terrace, is c. 45 meters southeast from the southern end of this site.

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Photo 33 – Site 5153—Feature B—view to the northeast.

Photo 34 – Site 5154—terrace retaining wall—view to the northeast.

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Site 5154 (31)

Site type: single component, terrace
Environmental: This site is located in Honokahua Gulch, on the moderately sloping eastern side of the gulch. The terrace is approximately 80 meters east of Honokahua Stream and 50 meters above the base of the gulch slope. Flora consists of Christmas berry thicket and sparse *noni* plants. The ground is covered with *laua'e* ferns.
Dimensions: 13.0 meters NNW-SSE by 5.0 meters WSW-ENE by 1.3 meters maximum wall height.
Function: possible agricultural
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remains: none

Comments: This terrace is built into the slope. Its retaining wall varies from a well built, vertically faced wall 8 courses and 1.3 meters high at the northern end, to a section of crude stacking on boulders at the southern end. The central portion of this retaining wall has apparently collapsed. A level terraced area measuring c. 10 meters N-S by 2.2 meters E-W exists above the wall to the east.

Site 5155 (32)

Site type: rock wall enclosure
Environmental: This site is located in bottom of Honokahua Gulch, in a level area c. 6 meters south of the streambed near a large bend. A steep cut bank at the base of the gulch's eastern slope lies on the opposite side of the stream to the north. A bulldozer cut road lies 17.5 meters to the SSW. Flora in the area consists of *kukui*, Christmas berry and eucalyptus trees as well as *noni*, *ki* and coffee plants.
Dimensions: 5.5 meters N-S by 3.5 meters E-W by 1.1 meters maximum wall height
Function: possible ceremonial
Subsurface potential: fair
Tested: yes, T.U.1— 0.5x0.5 meter—yielded very sparse charcoal flecks.
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remains: none

Comments: This is a substantial rock wall enclosure. The feature is roughly oval shaped with stacked, faced walls built of sub-angular boulders and cobbles a maximum of 6 courses high. Large existing boulders are incorporated into the walls. The walls of this enclosure are 60-80 centimeters thick. The apparent opening or entrance is at the north end of the feature facing the stream. The wall sections around the entryway are slightly collapsed but the remainder of the feature remains intact. It is interesting to note that

Photo 35 – Site 5155—enclosure—view to the southwest.

Photo 36 – Site 5155—enclosure—view to the northeast.

two large boulders occupy most of the surface area inside within the enclosure. These boulders are embedded in the ground, and the feature appears to have been purposefully built around them. Site 5156 is c. 80 meters upstream to the southeast. The Site 5132 enclosures are c. 40 meters to the west on the opposite side of the gulch bottom.

Site 5156 (33)

Features A-E
Site type: complex with rock wall enclosures, 1 terrace and 1 rock niche.
Environmental: This site is located in Honokahua Gulch, 7.0 meters to 43.0 meters east of the stream, along the base of the gulch's eastern slope. The area is fairly open and level. Flora consists of *kukui*, rose apple, Christmas berry trees, and *noni* and *ki* plants.
Dimensions: 40.0 meters E-W by 25.0 meters N-S
Function: possible habitation, agricultural
Subsurface potential: good
Tested: yes, T.U.1 at Feature C, a 0.5 x 0.5 meter unit yielded copious charcoal samples from every level down to 50 cmbs.
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remains: none

Comments: This site consists of Feature A, a U-shaped partial enclosure at the western edge of the site c. 7 meters east of the streambed. Feature B is a small rock cupboard directly northeast of Feature A. Feature C consists of a small oval shaped enclosure at the center of the site. Feature D is a level terraced area abutting the southeastern side of Feature C. Feature E is a small possible terrace remnant at the eastern edge of the site at the base of the gulch slope.

Feature A
Type: rock wall partial enclosure
Dimensions: 9.0 meters NE-SW by 7.5 meters NW-SE by 0.85 meter maximum wall height.
Function: possible habitation
subsurface potential: good
Tested: no
Integrity: unaltered
Condition: varied
Estimated age: precontact—early post-contact

Comments: This is a U-shaped partial enclosure consisting of a crudely stacked low wall averaging 0.4 meter in height and 0.6 meter in width. The wall is collapsed for the most part appearing as a linear rubble pile in the form of a roughly square shape open to the northeast. The wall is constructed of sub-angular cobbles and boulders along with talus boulders up to 1.5 meters across. A large boulder sits at the terminus of the enclosure's

southeastern wall at the northeastern corner. There is distinctive upright boulder situated along the inside of the enclosure's southeastern wall near its terminus. This boulder has a trapezoidal shape and stands vertically 0.8-meter high along that section of wall. The opening of the enclosure faces the base of the gulch slope where Feature B, the small rock cupboard sits c. 4 meters to the northeast. The area between the two features is level with a few talus boulders scattered around.

Feature B
Type: rock niche or cupboard
Dimensions: 1.0 meter in width by 1.2 meters in depth by 0.5-meter maximum ceiling height
Function: storage, potential burial chamber
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remains: dog molar on interior floor surface

Comments: This feature is too small to be considered even a marginal shelter. However, it is roomy enough for it having been used for storage and with the presence of the dog tooth there is potential for other skeletal remains. A soil deposit of undetermined depth exists within the feature. Feature B lies c. 4 meters to the southwest of Feature A.

Feature C
Type: rock wall enclosure
Dimensions: 7.0 meters NNE-SSW by 3.5 meters WNW-ESE by 0.8 meter maximum ceiling height.
Function: possible habitation or ceremonial
Subsurface potential: fair
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remains: none

Comments: Feature C is a small oval enclosure. The wall is fabricated of crudely stacked subangular cobbles and boulders and is partially collapsed in areas. The wall has a maximum height of 0.8 meter and is 0.6 meter in width. A mound of cobbles 0.6 meter high that terminates at a large talus boulder creates the southern end of the enclosure. The enclosure has an opening in the wall on its NNE end measuring 1.0 meter across. This opening faces directly toward the base of the gulch slope 3.5 meters to the north. A large boulder is curiously located in the center of the enclosure. It is possible but unlikely that the boulder rolled into the enclosure from the gulch slope after its construction. It should be noted that the enclosure at Site 5155, some 80 meters downstream to the northwest also has a boulder at its center. The level terraced area of

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Feature E abuts the southeastern edge of this enclosure where its wall doubles as a retaining wall. The interior height of the southeastern wall is 0.8 meter while the exterior wall height is level with the terraced area.

Feature D
Type: terrace
Dimensions: 8.0 meters NE-SW by 2.5 meters NW-SE
Function: agricultural
Subsurface potential: good
Tested: yes, T.U.1, a 0.5 x 0.5 meter unit, yielded copious charcoal from the surface down to 59 cmbs. Radiometric date range AD 1440 to 1660 (See Appendix B)
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Radiocarbon date: Beta Analytic #157896: 310 +/- 50 BP. 2 sigma calibration date range: AD 1440 to 1660. Intercept dates: AD 1530, 1550, 1630.
Portable remains: none on surface

Comments: This is a level terraced area that abuts the southeastern side of the enclosure Feature C. The southeastern wall of Feature C serves as the retaining wall of this terrace along its northwestern edge. The southeastern edge of the terraced area appears to have cut down into the gradual slope and no discernable retaining wall is present, only sparse rubble.

Feature E
Type: possible terrace remnant
Dimensions: 3.0 meters E-W length by 1.0 meter N-S width by 0.9-meter maximum wall height.
Function: agricultural
Subsurface potential: fair
Tested: no
Integrity: unaltered
Condition: fair
Estimated age: precontact—early post-contact
Portable remains: none

Comments: This feature consists of stacked subangular cobbles and boulders 6-7 courses high, placed between large partially buried talus boulders forming a crude retaining wall. No level terraced are is present above the retaining wall. This feature is located 5.0 meters above the base of the eastern gulch slope at the eastern end of this site. A similar feature is located at Site 5160, some 35 meters to the ESE.

Photo 37 – Site 5156—Feature A enclosure. Note upright rock at left center—view of the south southwest.

Photo 38 – Site 5157—rock overhang shelter—view to the north.

Site 5157 (34)

Site type: single component, rock shelter
Environmental: This site is located in the bottom of Honokahua Gulch, along the base of the gulch's eastern slope. The rock shelter is in a 5-meter high escarpment, 3.0 meters above the level gulch floor and c. 14 meters northeast of Honokahua Stream. Flora in the area consists primarily of rose apple trees. A single mountain apple tree lies directly west of the escarpment. *Noni* and *ki* plants are common in the general area.
Dimensions: 1.5 meters in width E-W by 3.0 meters deep N-S by 1.8 maximum ceiling height.
Function: possible temporary habitation, burial chamber.
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remains: 1 basalt flake, 16 subangular and angular cobbles brought to shelter used in an oval alignment.

Comments: This rock shelter is located 3.0 meters above the gulch bottom. It is accessed by a steep climb up to a ledge at the south facing mouth of the shelter. The interior of the shelter is relatively spacious, due to its ceiling height. On the floor of the shelter, near its mouth is an oval arrangement of sub-angular and angular cobbles. The arrangement measures 1.0 meter N-S by 0.7 meter E-W. Most of the cobbles, averaging 0.2 meters in size, are partially buried in the soil of the shelter's floor. A good soil deposit appears to be present. It appears probable that this oval rock arrangement is a burial marker.

Site 5158 (35)

Features A-I
Site type: complex of a partial enclosure, 2 terraces, 2 circular rock lined depressions, 2 rock piles and a small platform.
Environmental: This site is located in Honokahua Gulch, in a broad, level, open area adjacent to the base of the eastern slope of the gulch. The site is near the southern project boundary where it crosses the gulch. The site ranges from 19.0 to 40.0 meters northeast of Honokahua Stream. Numerous talus boulders are scattered across the area. Flora consists of rose apple and *kukui* trees, *ki*, *noni* and coffee plants, *laua'e ferns* and bird nest ferns.
Dimensions: 74.0 meters NNW-SSE by 35.0 meters WSW-ENE
Function: possible habitation, agricultural, ceremonial, possible burial
Subsurface potential: good
Tested: yes, T.U.1—a 0.5 x 0.5 meter unit within the Feature A enclosure—yielded sparse charcoal. T.U.2—a 0.5 x 1.0 meter unit within the Feature E rock lined depression, contained a dense charcoal layer.
Integrity: generally unaltered, some slight possible bulldozing impact
Condition: varied, good to poor

Estimated age: precontact—early post-contact
Portable remains: none, aside from recent camping debris

Comments: This site has as its central dominant feature a fairly large partial enclosure, Feature A. A small wall remnant—Feature B—and a conspicuous small rock mound—Feature C—are directly southwest of the enclosure. Features D and E are similar circular rock walled depressions. Feature D is c. 6 meters west of the large Feature A enclosure and Feature E is c. 35 meters to the north. Features G and I are along the base of the gulch slope to the east of Feature A. Feature F is a small platform-like feature further up the gulch slope. Feature H is a short section of faced, stacked wall on the southern edge of the site 30.5 meters southeast of Feature A

Feature A
Type: rock walled partial enclosure
Dimensions: 13.0 meters NNW-SSE by 9.0 meters ENE-WSW by wall height. Average wall height 0.8 meter (1.2 meter maximum), 0.8 meter maximum wall width
Function: possible habitation
Subsurface potential: good
Tested: yes, T.U.1—a 0.5 x 0.5 meter unit—yielded sparse charcoal
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remain: none

Comments: This is a rectangular rock walled partial enclosure that is open on its western side, facing the stream. The wall is built of sub-angular boulders and cobbles 5 to 6 courses and averaging 0.8 meter in height and 0.8 meter in width. The walls are vertically faced for the majority of the intact portions. The northeastern corner of the enclosure is partially collapsed. The intact southern wall curves outward slightly. A small partially buried boulder is near the center of the enclosure. This boulder is 0.5 meter in height and is a fairly comfortable seat.

Feature B
Type: semi-enclosure
Dimensions: 4.5 meters N-S by 4.6 meters E-W by 0.55 meter maximum wall height, 1.0 meter maximum wall width
Function: possible habitation
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remains: none

Comments: This is a crudely stacked wall forming a rough c-shape open to the northeast facing the open side of Feature A. The wall is constructed of sub-angular cobbles and boulders a maximum of 3 courses and 0.55 meter high and 1.0 meter maximum width. There are no real faced sections. The wall incorporates an outcrop and surrounding boulders on its southern end.

Feature C
Type: oval shaped rock pile
Dimensions: 2.0 meters E-W by 1.65 meters N-S by 0.4 meter maximum height
Function: possible burial
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remains: none

Comments: This is a distinctive, mounded, oval shaped rock pile. Sub-angular cobbles 0.1 to 0.2 meter in size and boulders up to 0.65 meter in diameter are stacked in an organized fashion. This feature is c. 26 meters east of the stream and 8.0 meters west of the open side of the Feature A enclosure. Feature B lies c. 5 meters southeast. Feature D is c. 10 meters north.

Feature D
Type: circular walled depression
Dimensions: 4.4 meters E-W by 5.0 meters N-S by 0.25 meter maximum external height and 0.6 meter maximum internal depression depth.
Function: undetermined
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: fair
Estimated age: post-contact
Portable remains: none

Comments: This feature consists of a single course of boulders up to 0.6 meter in diameter that are placed in a circular alignment approximately 5.0 meters in diameter. A circular walled depression 0.6 meter deep lies within this alignment. This interior depression is 2.4 meters in diameter. The inside wall height is a maximum of 0.4 meter high with more of the wall buried in soil and duff. The top of the inner wall is flush with the top edge of the feature, which is essentially the earthen core fill between the exterior alignment and inner wall. The alignment and inner wall together measure 1.5 meters across. Feature E lies 26.5 meters to the north and is of a similar type though in better condition. Feature D is 5.0 meters northwest of Feature A, enclosure's, northwestern corner.

Feature E
Type: circular walled depression

Dimensions: 4.0 meters E-W by 3.7 meters (roughly 4.0 meters in diameter) by 0.35 exterior height and 0.55 inner wall height.
Function: undetermined, though it this must have had a function related to fire based on test unit findings.
Tested: yes, T.U.#2, a 0.5 x 1.0 meter unit, yielded a thick charcoal layer within the feature depression.
Integrity: unaltered
Condition: good
Estimated age: post contact
Radiocarbon date: Beta Analytic #15897: 30 +/- 50 BP. 2 sigma—outside calibration range.
Portable remains: none on surface

Comments: This doughnut shaped feature consists of a circular low wall that encloses a circular walled depression. The circular wall consists of 1 to 2 courses of small boulders and is roughly 4.0 meters in diameter. The inner wall is built of sub-angular, vesicular small boulders and cobbles. The faced inner wall is 3 courses high and 0.55 meter high. This inner wall has had some type of mortar applied to its surface. The mortar material is crumbling off the surface and may be a mixture of lime and soil. The top edge of the inner wall is flush with the top of the feature. The area between the exterior and interior walls is filled with earth and small rocks. The width of the combined walls surrounding the depression is 1.0 meter. Feature D is of a similar type. Feature D lies 26.5 meters to the south. Feature E sits at the northern edge of this site. Test Unit #2 demonstrated that the inner wall of this feature extended below the surface for 0.4 meter, giving the wall an overall height of 1.05 meters and a total of 6 courses.

Feature F
Type: small core-filled wall or platform with associated depression.
Dimensions: 2.0 meters N-S by 2.0 meters E-W by 0.7 meter maximum wall height
Function: undetermined
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact.
Portable remains: none

Comments: This feature is situated on the eastern gulch slope above the rest of the site, and c. 10 meters up from the base of the gulch slope. The feature consists of a short core filled wall section with its long axis contouring the slope. The wall measures 2.0 meters in length and 1.0 meter wide and is built from sub-angular and vesicular cobbles and small boulders crudely faced on either side with earth and rubble fill. The wall has a platform-like appearance. Directly abutting the east or up slope side of the wall is a small depression measuring 2.0 meters N-S by 1.0 meter E-W, copying the footprint size of the wall. This feature is 5.0 meters up slope (east) of the Feature G terrace.

Feature G
Type: possible terrace
Dimensions: 5.0 meters E-W by 4.0 meters N-S by 0.9 meters maximum wall or modification height.
Function: possible agricultural.
Subsurface potential: good
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact.
Portable remains: none

Comments: This feature is immediately above and east of the base of the gulch slope. The feature consists of crudely stacked sub-angular cobbles and small boulders incorporated into native rock outcrop to form a crude retaining wall. A level area measuring 2.5 meters in length N-S by 1.0 meter in width E-W is on the eastern or up slope side of the wall. A rock alignment of 6 small boulders, 2.5 meters long, parallels the long axis of the feature along the level area's eastern or back edge.

Feature H
Type: rock wall
Dimensions: 2.4 meters NE-SW length by 0.75 meter NW-SE width of wall by 0.8 meters maximum height.
Function: unknown
Subsurface potential: limited
Tested: no
Integrity: unaltered
Condition: good
Estimated age: unknown
Portable remains: none

Comments: This small wall section extends outward from the base of the gulch slope at the southern end of the site. The wall is built from small, sub-angular boulders averaging 50 centimeters in size. It is 5 courses and 80 centimeters high and faced on its northwestern side. The opposing southern side of the wall is not faced but crudely stacked and is 3 courses high. This wall lies c. 26 meters east of the Honokahua Stream bank and 30.5 meters southeast of the Feature A enclosure.

Feature I
Type: terrace
Dimensions: 10.0 meters N-S by 3.0 meters E-W by 0.5 meters maximum retaining wall height.
Function: possible agricultural
Subsurface potential: good
Tested: no
Integrity: unaltered

Photo 39 – Site 5158—Feature A wall—view to the south-southeast.

Photo 40 – Site 5160—overview of agricultural terraces. View to the northeast.

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Condition: good
Estimated age: precontact—early post-contact
Portable remains: none

Comments: This terrace sits at the base of the eastern gulch slope where a crudely stacked retaining wall is incorporated into existing rock outcrop. The retaining wall measures 10.0 meters in length and is built from sub-angular cobbles and small boulders 2 to 3 courses in height. A level area measuring 10.0 meter N-S by 2.5 meters E-W is along the eastern or up slope side of the retaining wall. This feature is 9.0 meters northeast of the Feature A enclosure.

Site 5159 (36)

Site type: single component, rock wall
Environmental: This site lies in Honokahua Gulch and is from 3.5 to 19.0 meters south west of the stream in a gradually sloping, boulder strewn area. The bulldozed road lies 20.0 meters to the southwest. Flora consists of Christmas berry and rose apple trees with scattered *noni* and *ki* plants.
Dimensions: 31.0 meters E-W length by 1.1 meters maximum wall width and 1.3 meters maximum wall height.
Function: possible boundary/animal containment wall
Subsurface potential: limited
Tested: no
Integrity: unaltered
Condition: good
Estimated age: early post-contact
Portable remains: none

Comments: This wall starts at a low cut bank 20.0 meters southwest Honokahua Stream and snakes easterly, diagonally down the gradual slope to a point 3.0 meters south of the streambed. The wall is generally well built and faced in places along its length. It is constructed of sub-angular cobbles and boulders and is a maximum of 5 courses in height. Along the length of the wall are naturally occurring large talus boulders that are incorporated into the construction. The wall incorporates several large boulders and its odd snake-like plan view may be the result of the builder simply connecting the boulders along the slope.

Site 5160 (40)

Features A-B
Site type: complex of 2 terrace features.
Environmental: This site is located in Honokahua Gulch, along the base of the gulch's eastern slope, c. 47 meters east of Honokahua Stream. A broad level open area exists directly adjacent to the west of the site on the gulch bottom where the flora consists of rose apple and guava trees, *noni*, *ki*, and coffee plants, and bird nest ferns. Christmas

berry thickets grow on the gulch slope around and above the terraces. Talus boulders are scattered over the site area.
Dimensions: 6.0 meters NW-SW length by 5.5 meters NW-SE
Function: possibly agricultural
Subsurface potential: fair
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remains: none

Comments: This site consists of two terrace features that step from the base of the eastern gulch slope. Each terrace has its own retaining wall that is constructed from sub-angular cobbles and boulders stacked and incorporated into the existing talus boulder deposit at the gulch base. This site is 30.0 meters southeast of Site 5156 and 69.0 meters northwest of Site 5157.

Feature A
Type: terrace
Dimensions: 3.0 meters NW-SE by 3.0 meters NW-SW by 1.3 meters maximum wall height. Level terrace area measures 3.5 meters NW-SE by 1.25 meters NE-SW
Function: possibly agricultural
Subsurface potential: fair
Tested: no
Integrity: unaltered
Condition: good
Estimated age: precontact—early post-contact
Portable remains: none

Comments: The retaining wall of this terrace feature is crudely stacked yet vertical. Large talus boulders form the foundation for 5 courses of sub-angular smaller boulders and cobbles. The Feature B terrace is directly up slope, abutting the eastern edge of this feature's level area.

Feature B
Type: terrace
Dimensions: 4.0 meters NW-SE length by 2.5 meters NE-SW width by 0.9 meters maximum wall height. The level terraced area measures 3.8 meters NW-SE 1.5 meters NE-SW
Function: possibly agricultural
Subsurface potential: fair
Tested: no
Estimated age: precontact—early post-contact
Portable remains: none

Comments: The retaining wall of this feature is generally well built, utilizing existing talus boulders for the foundation of the stacking of 4-5 courses of sub-angular smaller boulders and cobbles. This retaining wall forms the eastern or upslope edge of Feature A's terraced area.

Site 5161 (37)

Site type: rock wall
Environmental: This site is located at the fork of the large tributary to Mokupea Gulch along the eastern project boundary. The wall partially crosses the tributary streambed at its eastern end and is severely impacted at its western end by the construction of a substantial bulldozer cut road that descends into the gulch from the pineapple field to the west near a water tank. Flora consists of Christmas berry thickets, Formosan *koa* and coffee trees.
Dimensions: 8.5 meters E-W by 0.7 meters maximum width by 0.8 meters maximum height.
Function: possible agricultural
Subsurface potential: limited
Tested: no
Integrity: altered by bulldozer activity
Condition: varied
Estimated age: post contact – possible ranch/pineapple plantation era
Portable remains: none

Comments: The eastern end of this wall is in the bottom of the tributary streambed. Here a short section of the wall is 2.7 meters in length, 0.70 meter and 4 courses of sub-angular boulders high. The wall is faced on its northern or downstream side. It runs perpendicular to and across the western edge of the streambed. A rock alignment of 4 boulders makes up the last meter in the wall's length in the very bottom of the streambed. There is a 1.8 meter gap at the western end of this section before a crudely stacked section continues to the southwest roughly contouring the steep gulch slope before it terminates in a pile of boulders pushed by machinery during the construction of the road. The road crosses the drainage c. 16 meters to the north, downstream of the wall.

Site 5162 (38)

Site type: rock shelter
Environmental: This site is located on the western side of the steep sided tributary gulch of Mokupea Gulch along the eastern project boundary. The rock shelter lies at the base of a c. 5 meter high escarpment on the very steep slope. This escarpment is 12.0 meters west of and 6.0 meters above the Mokupea tributary streambed. Flora consists of Christmas berry thickets covering the slope and the small level area in the gulch bottom.
Dimensions: 4.0 meters in width N-S by 1.4 meters in depth E-W by 1.1 meter maximum ceiling height.
Function: temporary habitation.
Subsurface potential: fair

Photo 41 – Site 5161—animal containment wall in Mokupea—view to the southwest.

Photo 42 – Site 5162—rock overhang in Mokupea—view to the west northwest.

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Tested: no
Integrity: unaltered
Condition: good
Estimated age: possible precontact
Portable remains: charcoal in sparse amounts scattered in the SE end of the shelter

Comments: This rock shelter is on a steep slope above the streambed. A slope wash mound is at the mouth of the shelter. Ceiling exfoliation consisting of angular cobble rubble covers the floor of the interior to an undetermined depth. No soil deposit was visible.

Site 4459

Site Type: single component, rock wall
Environmental: This wall is located in Honokahua Gulch. The wall parallels the streambed for 89.0 meters along its western bank, 1-5 meters from the edge of the streams cut bank. The base of the western gulch slope is 10-20 meters west of the wall. Flora consists of Christmas berry, rose apple and *kukui* trees, *noni*, *ki* and coffee plants. Bird nest and *laua'e* ferns cover the rocks of this wall.
Dimensions: 89.0 meters length N/S by 1.20 meters maximum height by 1.10 meters maximum width.
Function: possible boundary/animal containment wall
Subsurface potential: fair
Tested: yes, T.U.#1 (0.50 x 0.50 meter) sterile.
Integrity: unaltered
Condition: good
Estimated age: early post contact.
Portable remains: none

Comments: About 75% of this wall was originally recorded by Cultural Surveys of Hawaii in 1998. A description of the entire wall follows. This wall consists of stacked, semi-rounded and waterworn boulders and cobbles. The wall incorporates numerous large talus boulders along its length where small boulders up to 0.8 meters and cobbles have been stacked upon and in-between them. It is generally well built with sections that are vertically faced 4-6 courses high mainly on the eastern or streamside of the wall. The western side of the wall abuts a low linear mound along the northern half of the wall's length. The mound is apparently an alluvial deposit from an earlier streambed course, the bed of which is discernable on the western side of the wall near its northern end. At the north end of the wall there is a curious hairpin turn around the northern portion of the mound. A small rock pile is 22.0 meters northwest of the northern end of the wall. A small, modified outcrop consisting of several cobbles placed in a crack between two talus boulders is 2.0 meters west of the wall's midsection. The Site 5145 rock shelter is c. 38 meters west of the wall's northern end. The Site 5151 terrace is directly east on the opposite side of the steam bed from the wall's midsection. Site 5146, a rock wall, is c. 40 meters south of the Site 4459 wall's southern end.

APPENDIX B

Radiometric Analysis Data

Beta Analytic, Inc.
Miami, Florida

BETA ANALYTIC INC.
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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Walter Fredericksen — Report Date: 9/10/01

Xamanek Researches — Material Received: 7/27/01

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 157892	0 +/- 50 BP	-22.2 o/oo	50 +/- 50 BP
Beta - 157893	100 +/- 60 BP	-24.5 o/oo	110 +/- 60 BP
Beta - 157894	220 +/- 80 BP	-26.0 o/oo	210 +/- 80 BP
Beta - 157895	200 +/- 60 BP	-22.6 o/oo	240 +/- 60 BP
Beta - 157896	280 +/- 50 BP	-22.8 o/oo	310 +/- 50 BP

Beta - 157892
SAMPLE : KAPALUA MAUKA-SAMPLE#1
ANALYSIS : Radiometric-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : (result is outside of calibration range)

Beta - 157893
SAMPLE : KAPALUA MAUKA-SAMPLE#2
ANALYSIS : Radiometric-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1660 to beyond 1960 (Cal BP 290 to 0)

Beta - 157894
SAMPLE : KAPALUA MAUKA-SAMPLE#3
ANALYSIS : Radiometric-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1490 to 1950 (Cal BP 460 to 0)

Beta - 157895
SAMPLE : KAPALUA MAUKA-SAMPLE#4
ANALYSIS : Radiometric-Standard delivery (with extended counting)
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1500 to 1690 (Cal BP 450 to 260) AND Cal AD 1730 to 1810 (Cal BP 220 to 140)
Cal AD 1920 to 1950 (Cal BP 30 to 0)

Beta - 157896
SAMPLE : KAPALUA MAUKA-SAMPLE#5
ANALYSIS : Radiometric-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1460 to 1660 (Cal BP 490 to 290)

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By international convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

BETA ANALYTIC INC.
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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Walter Fredericksen — Report Date: 9/10/01

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 157897	80 +/- 50 BP	-27.9 o/oo	30 +/- 50 BP

Beta - 157897
SAMPLE : KAPALUA MAUKA-SAMPLE#6
ANALYSIS : Radiometric-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : (result is outside of the calibration range)

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By international convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.5:lab. mult=1)

Laboratory number: Beta-157893

Conventional radiocarbon age: 110±60 BP

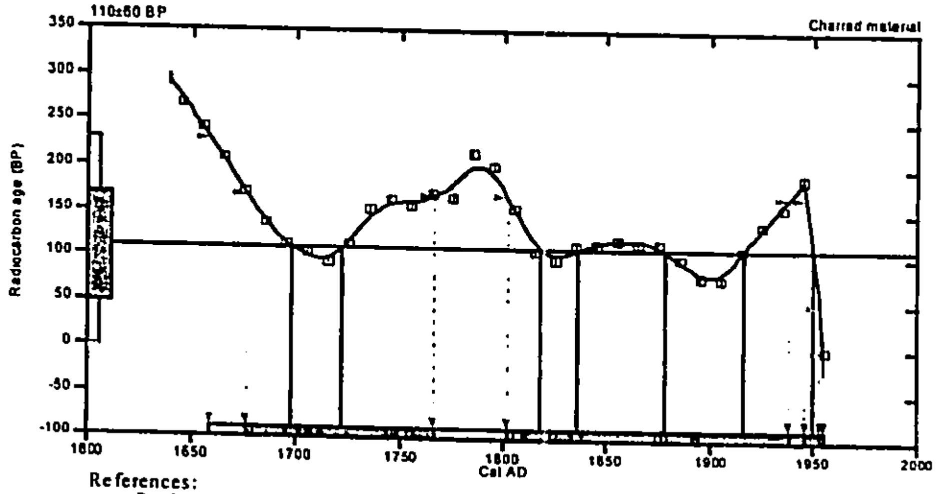
2 Sigma calibrated result*: Cal AD 1660 to beyond 1960 (Cal BP 290 to 0)
(95% probability)

* 2 Sigma range being quoted is the maximum antiquity based on the minus 2 Sigma range

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal AD 1700 (Cal BP 250) and
Cal AD 1720 (Cal BP 230) and
Cal AD 1820 (Cal BP 130) and
Cal AD 1840 (Cal BP 110) and
Cal AD 1880 (Cal BP 70) and
Cal AD 1920 (Cal BP 30) and
Cal AD 1950 (Cal BP 0)

1 Sigma calibrated results: (68% probability) Cal AD 1680 to 1770 (Cal BP 270 to 180) and
Cal AD 1800 to 1940 (Cal BP 150 to 10) and
Cal AD 1950 to 1950 (Cal BP 0 to 0)



References:
Database used
Calibration Database
Editorial Comment
Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii
INTCAL98 Radiocarbon Age Calibration
Stuiver, M., et al., 1998, Radiocarbon 40(3), p1041-1083
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26:lab. mult=1)

Laboratory number: Beta-157894

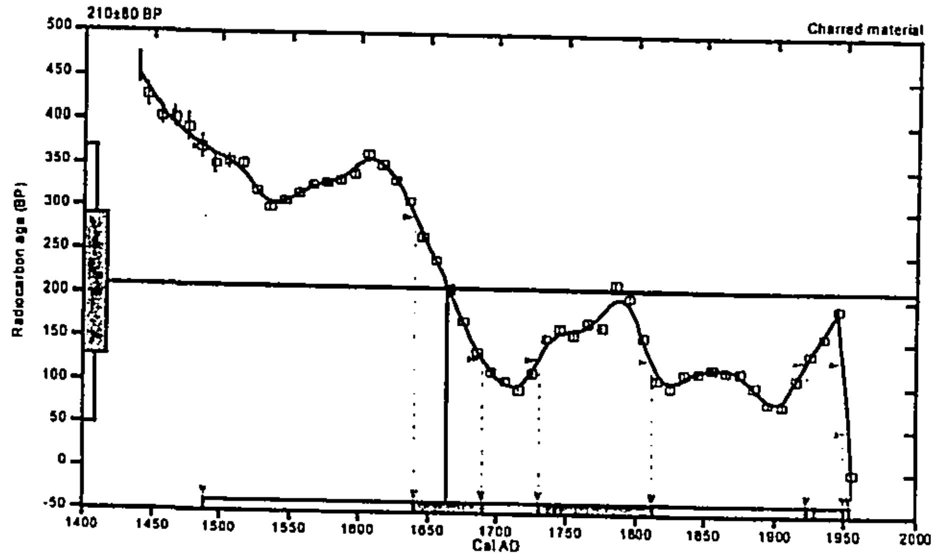
Conventional radiocarbon age: 210±80 BP

2 Sigma calibrated result: Cal AD 1490 to 1950 (Cal BP 460 to 0)
(95% probability)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1660 (Cal BP 290)

1 Sigma calibrated results: (68% probability) Cal AD 1640 to 1690 (Cal BP 310 to 260) and
Cal AD 1730 to 1810 (Cal BP 220 to 140) and
Cal AD 1920 to 1950 (Cal BP 30 to 0)



References:
Database used
Calibration Database
Editorial Comment
Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii
INTCAL98 Radiocarbon Age Calibration
Stuiver, M., et al., 1998, Radiocarbon 40(3), p1041-1083
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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-22.6:lab. mult=1)

Laboratory number: Beta-157895

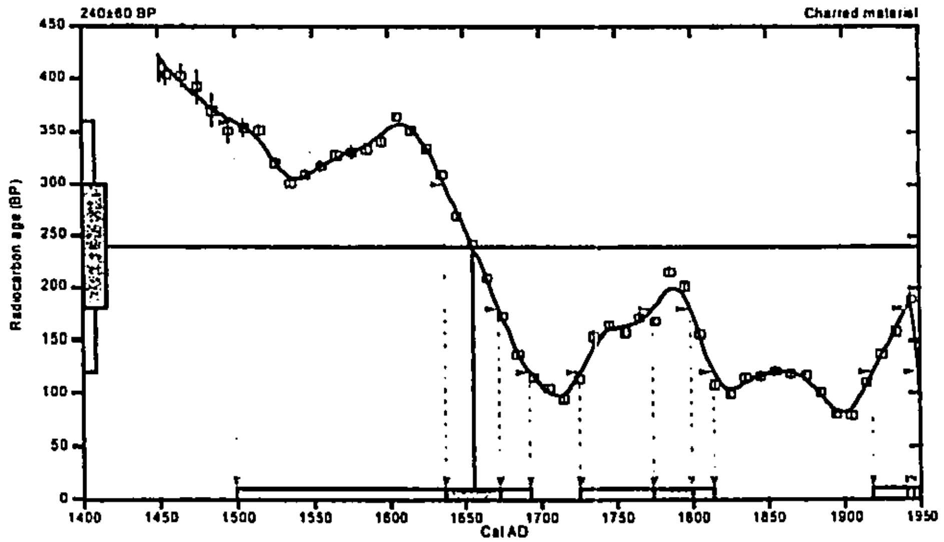
Conventional radiocarbon age: 240±60 BP

2 Sigma calibrated results: (95% probability) Cal AD 1500 to 1690 (Cal BP 450 to 260) and Cal AD 1730 to 1810 (Cal BP 220 to 140) and Cal AD 1920 to 1950 (Cal BP 30 to 0)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1660 (Cal BP 290)

1 Sigma calibrated results: (68% probability) Cal AD 1640 to 1670 (Cal BP 310 to 280) and Cal AD 1770 to 1800 (Cal BP 180 to 150) and Cal AD 1940 to 1950 (Cal BP 10 to 0)



References:
Database used
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Editorial Comment
Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii
INTCAL98 Radiocarbon Age Calibration
Stuiver, M., et. al., 1998, Radiocarbon 40(3), p1041-1083
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-22.8:lab. mult=1)

Laboratory number: Beta-157896

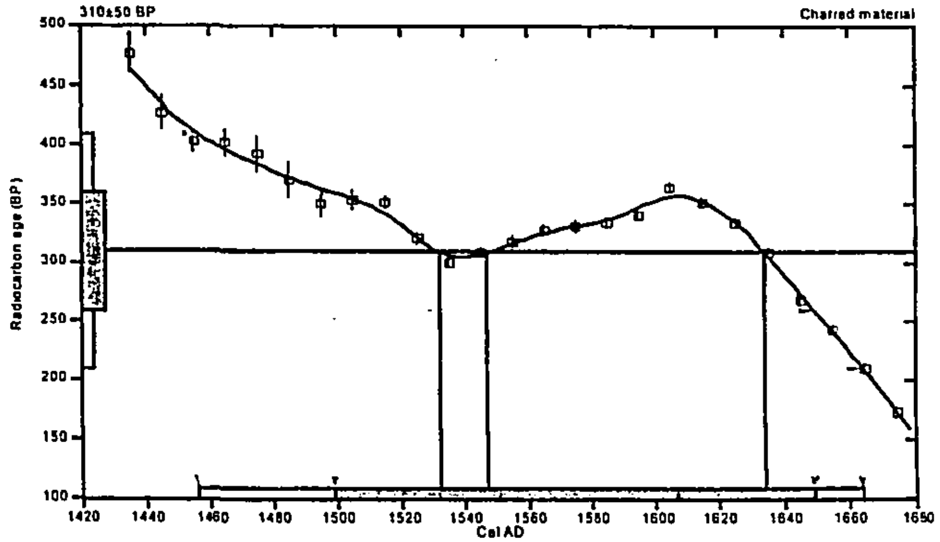
Conventional radiocarbon age: 310±50 BP

2 Sigma calibrated result: (95% probability) Cal AD 1460 to 1660 (Cal BP 490 to 290)

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal AD 1530 (Cal BP 420) and Cal AD 1550 (Cal BP 400) and Cal AD 1630 (Cal BP 320)

1 Sigma calibrated result: (68% probability) Cal AD 1500 to 1650 (Cal BP 450 to 300)



References:
Database used
Calibration Database
Editorial Comment
Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii
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Appendix G

Cultural Impact Study

AN HISTORIC AND TRADITIONAL LAND USE STUDY UTILIZING ORAL HISTORY INTERVIEWS FOR ASSESSING CULTURAL IMPACTS, FOR THE KAPALUA PROJECT 2 AND EXPANDED PROJECT 2, KAPALUA, MAUI, HAWAII

By:

Xamanek Researches
Pukalani, Maui, Hawaii

Walter M. Fredericksen,
Professor emeritus, U. H.

October 29, 2001

INTRODUCTION

PBR Hawaii, on behalf of Kapalua Land Company, Ltd., contacted us to prepare an historic and traditional land use study, utilizing oral history data for the Kapalua expanded Project District 2 (Witten, December 29, 2000). This report would provide data towards meeting EIS requirements for a cultural impact assessment for the project (Chapter 343 Hawaii Revised Statutes).

This study will then be used for assessing potential cultural impacts on the local resident community in the Kapalua area. These oral histories provide data from a good cross-section of community members. We were fortunate to have numerous friends and acquaintances on Maui who recommended various community members who could contribute useful cultural data through the oral history method.

Most potential informants we approached for their input to the oral history project were happy to be involved and contributing to its goals. Some persons were unable to participate for reasons of absence from the State, or in some instances illness, and in only one case, a feeling they had nothing to contribute. In any event, we were able to interview 12 informants for this project. They ranged from long-standing community members who were born in the area or had lived nearly all their lives there, and/or who had known numbers of long-time residents through friendship or occupational relationships.

Some of the informants were (and are) also active participants in Aluli'ke, OHA (Office of Hawaiian Affairs), Maui/Lanai Islands Burial Council, Department of Hawaiian Homelands, and Friends of Moku'ula. These contributors are noted in the text, along with their particular data input. The data are enhanced because of the informant's areas of expertise, reflected by the organizational name, e.g., OHA (Office of Hawaiian Affairs).

An archaeological inventory survey on the initial Project District 2 had been undertaken and completed in mid-late1997 by Cultural Surveys Hawaii, Inc. (Devereux, et al., August 1998). Xamanek Researches subsequently carried out an historic/traditional land use study for this 450 acre project in late 1999 (Fredericksen, 1999).

During 2001, Xamanek Researches undertook an archaeological inventory survey on the c. 475 additional acres included in the Kapalua expanded Project District 2 (Figures 1 and 2).

In order to meet the EIS requirements for a cultural impact assessment for the expanded Project District 2, additional study and recordation of traditional Hawaiian land use practices needed to be prepared. Gathering of oral history from individuals being born in, living in, or otherwise familiar with the Kapalua Project District 2 site area, was to be undertaken, and presented in the present report. Informants who contributed data in 1999 are included, as well as ones interviewed in 2001.

PROJECT BACKGROUND HISTORY

Original Kapalua Project District 2 (450 acres)

Cultural Surveys Hawaii, Inc. conducted an archaeological inventory survey on a large parcel of land known as the Kapalua Project District 2 (Honokahua and Napili 2,3 *ahupua'a*), Lahaina District of Maui (Devereux, et al., August 1998).

The significant findings of this initial Kapalua Project District 2 survey are summarized below (Ibid.):

"During the survey eight historic properties were identified within the project area. Seven of these are newly discovered; they consist of walls, boulder terraces and a boulder pavement, an overhang shelter cave, an historic reservoir, a road bridge, and a cemetery. The eighth historic property was described and identified as site 50-50-01-1591 during the statewide inventory of historic places (SIHP) in 1974. At that time, the boundaries of the site were arbitrarily drawn on the topographic map and most of the individual features to be included in it were the center of the plantation village".

The numbered sites, in addition to Site 1591, also included Sites 4459 through 4464.

Kapalua Expanded Project District 2 (475 acres):

Xamanek Researches carried out an archaeological inventory survey on the proposed expanded 475-acre portion of Project District 2 during the summer of 2001 (see Figure 2). The expanded project area includes portions of land in Honokahua and Napili 2 & 3 *Ahupua'a*, Lahaina District, Island of Maui (TMK 4-2-01:01). The project area includes active and abandoned pineapple fields and portions of Honokahua, Napili and Mokupea Gulches. The results of the draft archaeological inventory survey report are briefly summarized below (Fredericksen and Fredericksen, September 2001).

A total of 37 previously unidentified sites were located during this archaeological inventory survey. These sites were assigned SIHP No. 50-50-01-5127 through 5163. In addition further information was gathered on a previously identified rock wall (Site 4459) and an exposed portion of Honolua Ditch (Site 1591) was photographed. The site types found during this inventory survey include single and multiple component agricultural sites including terraces, temporary and more permanent habitation areas, possible ceremonial areas, possible burial features, and ranch era and plantation era sites.

A total of 26 sites (Sites 5127, 5128, 5129, 5131, 5133, 5135, 5136, 5137, 5140, 5143, 5144-5150, 5159, 5161, 5151-5154, 5160, 5162, and 4459) are considered significant for their information content only under Criterion "d" of the Federal and State historic preservation guidelines. These sites consist of temporary habitation rock shelters, smaller agricultural complexes, and ranch and plantation era sites. Several sites were tested and six charcoal samples were submitted for analysis. Two of the 6 radiocarbon samples came from excavations at the Site 5133 and Site 5145 rock shelters. The Site 5133 results suggest usage into recent times, while the Site 5145 results suggest late pre-contact to early post-contact usage. Four radiocarbon samples came from excavations at agricultural Sites 5139, 5140, 5156 and 5158. The returned dates ranged from the mid-fifteenth century to more recent times.

Of the above 26 sites, one is considered no longer significant because it has yielded an adequate amount of information (Site 5161). No further archaeological work is needed for an altered ranch era wall in Mokupea Gulch. Six historic properties—Sites 5146, 5147, 5150, 5152, 5159 and 4459—are rock walls in Honokahua Gulch that were likely built in post-contact times. While these walls could be potentially considered no longer significant in other situations, they are part of the relatively well preserved cultural landscape that lies within Honokahua Gulch and should be preserved.

Eleven sites are considered to be significant under multiple significance criteria. Criteria "c" and "d" sites include Sites 5138 and 5139. Both of these complexes are excellent examples of surviving agricultural sites in Honokahua Gulch. The plantation era bridge sites in Napili Gulch—Sites 5132 and 5163—are also considered significant under Criteria "c" and "d". Site 5163 is an excellent example of a remnant of the plantation era transportation system. Site 5134—a plantation era water intake—likely qualifies under Criterion "a", because of its probable association with Honolua Ditch (Site 1591). Eight sites qualify for significance under Criterion "e" because of possible burial and/or ceremonial functions. The 4 sites thought to contain possible burial features include Sites 5141, 5142, 5157 and 5158. Sites 5130, 5132, 5155, and 5156 are considered to have potential ceremonial significance. The Site 5138 complex includes habitation and possible ceremonial features. This site is in good overall condition and likely qualifies for significance under Criterion "c" as well as Criteria "d" and "e".

All of the sites mentioned above lie in drainage areas. No significant material culture remains were found in the surrounding pineapple fields that have been cultivated for decades. It is important to note that Kapalua Land Company, Ltd. has agreed to place all sites in the gulch areas in "as is" preservation. Consequently, no further work beyond the inventory level is recommended, other than the preparation of a preservation plan for the project area.

The above perusal of the archaeological survey work undertaken and completed on the two project areas indicates fairly intensive use of the region, especially the valleys ("gulches") during precontact and early post-contact times. Numbers of other archaeological studies in the immediate region and its environs provide extensive data for earlier settlement patterns (Donham, 1986, 1989; Guerriero, et al., 1993; Haun, et al., 1986; Jimenez and Rosendahl, 1995). The discussion below serves to describe the nature and intensity of land use and settlement patterns from precontact to post-contact times and up to the "plantation" era and the present. Most of this material is derived from existing published regional histories, ethnological studies and related reports and papers.

ORAL HISTORY AND LAND USE PROJECT DESCRIPTION

In initiating our cultural impact assessment report on the original 450-acre project, we conferred with SHPD (Dr. Sara Collins) regarding several aspects of the proposed project. Dr. Collins suggested at the time that we include persons who were considered to be knowledgeable by such organizations as OHA, and the Maui/Lana'i Islands Burial Council. Both of these organizations have interests in and concerns with projects such as this one and believe the additional taking of oral histories will enhance the utility of the reports.

It was determined that additional historical studies should be carried out for the 475-acre expanded portion of Project District 2 that includes portions of Honokahua and Napili Gulches. Xamanek Researches has undertaken the requested additional oral history work with the results of this research work being presented in this report.

There is a useful body of historic literature/documentation dealing with settlement patterns and traditional land use practices in the project area. In some recent works, precontact settlement patterns are described. These studies give us a descriptive overview of the precontact, post-contact and more recent-historic cultural status of the study region's population.

In their descriptions of west Maui, for example, Handy and Handy (1972, pg. 494), note:

"To the north of Lahaina are 5 valleys in the western portion of the West Maui Mountains. They are Honokawai, Kahana, Honokahua, Honolua, and Honokohau.

The first four all had extensive lo'i lands in their valley bottoms, where terraces rose tier on tier in symmetrical stone-faced lo'i. On this part of the coast there is no sloping kula land seaward of the valleys as there is back of Lahaina and southeastward. Honokohau in particular, which is watered by a large rivulet flowing from far back in the mountains, had the most extensive system of lo'i along this coast.

There was not as large a population on this leeward part of Maui as there was on the windward side of west Maui. There were five valley agricultural systems that no doubt supplied much of the food required by a fair-sized population, which lived in clusters at the mouths of them. These areas were linked together by the *"ala loa"* (long path)—a trail system which was said to have been built by Kiha-a-Pi'ilani, son of Pi'ilani, in the early 1500s (Ibid.).

Regarding this trail, Walker (1931, p. 301) notes:

"The north end of West Maui also is traversed by a paved trail. Sections of it can be seen from Honolua to Honokohau and Kahakuloa. It is paved with beach rocks and has a width of four to six feet. Disregarding elevations and depressions it takes the shortest route between two points that is possible for foot travel. This trail is also spoken of as the Kihapiilani Trail".

According to Martha R. Fleming (1933, p. 3-9, as reported in Handy and Handy, 1972), much of the *Alaloa* had been covered or obliterated during the course of road building in the late 19th and early 20th centuries. The present route of Honoapi'ilani Highway probably covers this ancient feature in some portions of the study area. The earlier existence of the trail reinforces the notion that this region of west Maui practiced fairly intensive agriculture, supplying not only their own region with produce, but others as well.

The precontact settlement pattern in this region of Maui, includes permanent and temporary habitation sites located along the coastal regions, and in the inland valleys, extensive *lo'i* systems. While the population of Honokahua in the 1830s was not estimated to be great, the precontact population was likely considerably larger. The extensive burial ground at Honokahua also suggests a sizable precontact population.

The kinds of sites that are typical along the coast associated with habitation are stone structures such as enclosures, midden deposits, and burial areas. In the valleys, sites such as stone wall enclosures, pond fields and irrigation ditches associated with taro production are to be found. Temporary habitation sites take the form of rock shelters, both in valleys and along the rocky coasts, where present.

Major changes in land stewardship were initiated by King Kamehameha I as he rewarded loyal advisors with land grants. He awarded the *Ahupua'a* of Honokahua to Isaac Davis toward the end of the 18th century. Both he and John Young had served as advisors to him while he consolidated his power within the islands. When Davis suddenly died in 1810, John Young took over the management of the large land holding, which upon his death in 1835 was divided between his and Davis's heirs (Day, 1984, p. 80).

During the great Mahele, 1848, the entire 2650-acre Honokahua *ahupua'a* (LCA 8522B, RP 2236) was awarded to Davis' daughter, Kale (Sally) Davis, then wife of Alexander Adams, who was also a favorite advisor of King Kamehameha I.

In addition to this grant, the *ahupua'a* of Napili was awarded to King Kamehameha I's granddaughter, L.Konia, by Kamehameha III, along with other *ahupua'a*—Malepai, Alaeloa and Honokeana. There were no kuleana awards in the present project area.

The population decline in this part of west Maui is reflected in a census taken in 1831, and again in 1836. The area population went from c. 2980 to c. 1341 out of a Maui Island total of c. 35,000 (Schmitt, 1973). Some of this change was probably initiated by the decline in the Pacific Whaling industry, beginning in the late 1830s and collapsing by the 1860s, causing many persons in support occupations to seek new employment.

Some sugar production and other commercial crops (e.g., coffee and pineapples), as well as cattle, were introduced during this period. Pineapple and sugar became the most important crops, continuing in production through most of the 20th century. Maui Land and Pineapple Company became the dominant company in the region and by 1964, it began planning resort development, resulting in the Kapalua complex that exists today.

The present study was undertaken to meet recent State Law requirements for land use:

The PASH case (Public Access Shoreline Hawaii, a community group on the island of Hawaii), resulted in the Hawaii Supreme Court ruling that the state has an obligation to protect the traditional and customary rights of Native Hawaiians. It recognizes that unique conditions are placed on the rights of landowners in Hawaii. The decision recognized the traditional and customary rights of Native Hawaiians regarding

the land and the importance of maintaining those rights. Chapter 343 Hawaii Revised Statutes (Environmental Impact Statement Law) serves to set requirements which must be met before most types of land development are allowed.

THE PROJECT

Fieldwork and Research

The purpose of undertaking oral history is to help elucidate historically recorded land use practices and settlement patterns, or to provide additional data which the existing histories do not contain. Understanding what areas were accessed, and for what reasons, is critical to an overview of traditional uses and settlement patterns, leading to a prediction of the cultural impact of the proposed development.

As discussed earlier in this report, the PASH Case makes the effort to guarantee Native Hawaiians certain rights to traditional and customary land use activities. These kinds of gathered oral history data are useful in considering land-claim or right-of-access concerns, by helping to elucidate existing historic documents by the testimonies of living individuals.

Methodology

In anthropological literature dealing with the bringing together of data regarding human cultural/behavioral history, ethnography and ethnology are the areas most concerned with methods for recovering oral histories from peoples still living who remember customs, belief systems, and the effects of these factors on their particular ethnic beliefs and behavior. There are numbers of different methods that can be used to gather oral history. The interviewer can talk directly with individuals (informants), utilize various media systems for gathering data (e.g., telephone, computer and film), use written question/answer sheets, or opt to talk to knowledgeable groups. A combination of such techniques may also be utilized to good advantage.

In all such studies, allowances are made for variability in memory patterns (checked by cross-referencing individuals in a given socio-cultural context), socio-temporal context (age-group reference of a given individual) and other factors influencing the data. It is not possible to gather oral histories that are absolutely accurate. It is, however, possible to gather data that are statistically meaningful and important within a given cultural context. In this sense, oral histories are supplementary information gathered to implement a particular cultural consideration.

It is also necessary for the interviewer to construct numbers of questions germane to the goals of the oral history study and help the interviewer guide a meaningful session with a number of different informants. The interview document will also set parameters on the questions asked, keeping them relevant for the research. A basic questionnaire devised for use by the interviewer when collecting oral history from an informant for this type of project is as follows:

••••••••••••••••••••••••••••••••••

—Kapalua Project District 2 – Sample Oral History Interview Questions —

General: Age, sex, occupation of informant, if available. Resident time in Hawaii, and/or Maui.

1. What is your connection with the area? Were you born there? Did you live there? Did you have family or friends who either lived there, or know the area?
2. Did you know that many *lo'i* are located in the five valleys which are located on either side of the Kapalua Project District 2?[1]
3. Did you, or those you know or knew, ever access the valleys for food (taro, etc.), for other materials, such as wood (for fire or construction, etc.), herbs, (medicinal or seasonings and preservatives), or game animals, for subsistence?
4. The Upland plain between the valleys has been used by the plantation for pineapple production for decades – back to the mid-nineteenth century. Does anyone know of any other significant use for the Kapalua Project District 2 lands?
5. Do you know of any other traditional land use practices and/or access to the Kapalua Project District 2 area that should be on the record? Traditionally used access trails would be an example.

[1] *Lo'i* are primarily precontact agricultural terraces, usually built in fertile, wet valleys, utilizing stone walls for supporting the terracing, and with irrigation ditches/canals for constant water availability and, having trails which make the areas accessible for work, harvest and general care and maintenance. The preferred food crop was *taro*, although other crops were grown. The coming of the market economy led to general abandonment.

Answers to the above questions are then organized into individual narratives and included in the study as supportive data or rebuttal material, in terms of the historic documents.

FIELDWORK: Kapalua Project District #2 & Expanded Project District #2

Interviews With Oral History Informants

Some of the oral history informants, were interviewed in 1999, and, supplied information germane to the expanded study as well. The geographical location of Project District 2 and the expanded Project District 2 are contiguous, both geographically and socio-culturally. These interviews will be presented first. They are followed by the interviews taken in September and October of 2001.

Informant: Mr. Charles Kaupu, Cultural Specialist, Kapalua, Maui, Hawaii

Mr. Charles Kaupu had been recommended as an oral history informant for Kapalua Resort. He serves as a cultural specialist for the Kapalua complex, giving lectures to visitors on Hawaiian culture. We contacted him in early July 1999.

Discussions via telephone included settlement patterns before the area became 'Kapalua Resort'. His understanding was that this part of west Maui had supported coastal villages, where fishing and shoreline gathering were dominant, probably not much subsistence agricultural being practiced, with the possible exception of the extensive valley *lo'i*. He did say that he didn't have much information regarding their use in historic times. His testimony was basically supportive of, or not contrary to the written history for the area. Which included the utilization of the upland portions of the Kapalua Project District #2 for plantation agriculture, emphasizing pineapple production.

He also suggested checking the Honokahua Plantation Cemetery (located on the Kapalua Village Golf Course), commonly known as "Honokahua Camp Cemetery" for family names who may have survivors still living in this area of Maui. The cemetery is listed in the SIHP (State Inventory of Historic Places) as Site 4462, which guarantees site preservation and rights of access by kin to those interred at the cemetery. Interestingly, research into burial records for Honokahua Plantation Cemetery (at Maui Historical Society), indicate it is an historical site, not directly associated with precontact times, and therefore, probably not relevant to present concerns (Maui Historical Society, Historic burial records).

We met at Kapalua on July 16, 1999. After enjoying his presentation to a gathered group of shop visitors on present Hawaiian cultural practices, he turned to chants as used for repositories of their history and genealogical structure. He described numerous aspects of Hawaiian folklore and mythology, with appropriate chants and stories. His guests were very appreciative of his efforts, knowledge and abilities.

When the guests had left, Mr. Kaupu talked on with us about our efforts to better understand land-use. He suggested that we interview additional persons who may better understand the particular land use and practices at Kapalua Project District #2 . He suggested we talk with Mr. Charles Maxwell, who was apparently quite knowledgeable since, according to Mr. Kaupu, he was born and raised in the area in question (Subsequently, we did interview Mr. Maxwell, reiterated later in this report).

It should be noted here that these testimonies are for historic land use at the project area, since it has been primarily used for pineapple cultivation for many decades (along with cattle grazing and production). Sugarcane production was primary in lands to the southeast (Lahaina and environs). One of the intriguing questions regards the possible continued use of the *lo'i* in the valleys. And if they are utilized at all, to what extent or degree, and for what purpose?

Traditional land use documentation is fairly limited to this historic period, when plantation agricultural practices were in place. The upland areas joining the valleys were in use by plantation interests and were not, therefore, a meaningful part of traditional land use practices. This was also the case further to the southeast, i.e., Lahaina, Olowalu, Ukumehame, etc., where the equivalent of a *'Kula'* land existed, and subsistence agricultural technologies were utilized.

Major concerns in oral history interviews were made with the knowledge these persons had regarding their recollections of traditional access, in terms of gathering subsistence items, such as wood collection, other subsistence plant items (i.e., food products, construction materials, etc.). Access trails to the *lo'i*, and any other gathering areas are also of concern, in terms of the right of continued traditional access. No interviewee throughout this project implied they had ever relied on gathering from the valleys.

Informant: Mr. Wesley Nohara, Superintendent of Honolua Plantation, Maui Pineapple Co., Ltd. –September 1999

On September 24, and 28, 1999, Mr. Wesley Nohara was interviewed by telephone conversation. His testimony is as follows:

Mr. Nohara is the Superintendent of Honolua Plantation—Maui Pineapple Company, Ltd.—which has an affiliation with Kapalua Land Company, Ltd. He was born in 1954, and has a number of relatives who lived in the vicinity of the project area,

and are knowledgeable about plantation times (personal communication, September 24, 1999).

Mr. Nohara lived in Honolua, and was born there (near Honolua Store). His contacts include his family and many persons who have lived in this area and have worked with him, or who know a number of persons who have lived there for most of their lives.

In his position with the plantation, he works with many employees who are in contact with most of the agricultural areas, including Project District 2. He said that they did not have a lot of information regarding the valley *lo'i*, and their possible recent use in subsistence agricultural practices. The information that they do have indicates that they are not. The plantation owns these areas and they also control entry by issuing entrance permits. Pig hunters are the most common applicants for entrance permits in recent times.

Mr. Nohara said they do not receive entry requests from persons wanting to utilize the old *lo'i* for agriculture. They prefer not to grant entry permits for visiting the *lo'i*, both to protect them and because of legal liability concerns. He also pointed out the lack of perennial water availability in most of the valleys in recent times, partially due to diversion of water from the valleys for use in the resort area and pineapple fields. There are also indications that some of the valleys were never very wet and that dryland crops, such as sweet potatoes, were probably more commonly grown than wet taro.

He stated that these upland plains had always (from his knowledge) been used for pineapple production, and that there were no known uses for these lands other than for that purpose, in historic times. He knew of no exploitation of the existing *lo'i* for subsistence purposes, allowing that precontact use would have been different. No one he knew had any definitive information that would change the existing historic documentation for the area. He said the Project District 2 lands had "always been in pineapple production" (historic times).

Regarding traditional land use access rights, he knew of no one, or family, who either had or have had use of the valley *lo'i* in historic times. From this discussion, it was apparent that there were no presently known access trails or roads to the valley areas and their precontact features.

Honolua Ditch is a water carrier system that crosses a portion of the project. Cattle are allowed to graze in this area and there are some stands of Norfolk Pines.

Informant: Mr. Earl Kukahiko, Educator, Lahainaluna High School, DOE Retiree—September 1999.

Mr. Kukahiko was born, raised and lived most of his life in West Maui. He was born near the Kapalua Project District 2 area and spent his early years the general area. He worked on the plantation and was considered to have knowledgeable expertise regarding agricultural technology and practices. He taught at Lahainaluna High School for many years, directing much of the boarding school farming activity and coaching in athletics.

Although fairly brief, his interview provided additional, corroborative information regarding traditional land use(s) and practices. Essentially, he concurred with other interviewees regarding upland use as being for plantation/pineapple agriculture and some cattle grazing activities. He also knew of the valley *lo'i* complexes and concurred with others that they have not been used for agriculture for a long time.

Informant: Patricia Nishiyama, Na Kupuna O Maui—September 1999

Ms. Nishiyama was born in Lahaina. Her parents and family also lived there. As a girl, she recalls many years ago visiting the shoreline from Napili Bay to Namalu Bay with her parents *makai* of the present Project District #2 area.

Her mother worked at the Honolua Pineapple Plantation. When she visited her there on occasion, she observed that much of the general area *mauka* was cultivated in pineapple. This image of abundant pineapple has stayed with her through the years.

Ms. Nishiyama does not have any family who lived in this area, but does know a few people who did. She did not have much information regarding land use in the general area, but did not think people were too interested in visiting the rugged valley landscapes for agricultural practices. She, too, however has known numbers of pig hunters who utilize the area for hunting.

She indicated that Na Kupuna O Maui has concerns about a *heiau* that may be located near to or possibly on the Kapalua Project District #2 area in Honokahua Gulch. This *heiau* may be Kahauiki Heiau (Walker Site 16, SIHP Site 50-50-01-16).[2] Ms. Nishiyama claims to know its location, and if it is determined to be there, it should be cleaned, restored and protected since it is a major site, and various interested and legitimate groups may want to visit it.

The CSH report on the archaeological inventory survey of the Kapalua Project District #2 makes reference to this heiau or its possible location as follows (CSH, 1998):

[2] Described by Walker (1931, p. 119) as: "...mauka to Kahauiki camp a short distance up the west side of a gulch of the same name. A small irregular platform of stones whose walls have been taken for stock pens." This *heiau* was apparently not relocated during the 1973 statewide inventory, and the SHPD office in Honolulu has no record of its location.

"The first attempt at an island-wide systematic archaeological survey of Maui was accomplished [by] Winslow Walker of the Bishop Museum working between 1928 and 1929. Walker recorded a heiau (Site 16) identified as "Kahauiki" within the "Honokahua Region". Walker's manuscript locates the heiau "mauka to Kahauiki Camp a short distance up the west side of the gulch of the same name"; it is described as a "small irregular platform of stones whose walls have been taken for stock pens" (Walker 1931: unpaginated). Walker recorded no sites in Napili 2-3."

Kahauiki Gulch is located approximately three-quarters of a mile to the northwest of the project area, two gulches away.

Mr. Charles Maxwell, Chairman, Maui and Lanai Islands Burial Council—September 1999.

Mr. Maxwell provided some supportive information about the project. He is very knowledgeable about traditional land use and practices in Hawaiian culture, and he was born in Honokahua. Mr. Maxwell was unable to undergo extensive interviewing on the subject due to illness at the time, but we were able to talk briefly. He noted that the area was heavily utilized in precontact times. Mr. Maxwell also went on to say that he was not raised in the area, but felt an affinity to the region.

Informant: Mr. Aimoku Pali, employed by Kamehameha School, Pukalani, Hawaii—September 2001.

Mr. Pali was recommended as being a knowledgeable person by several community members, regarding the geo-cultural area under study. He presently lives in Kahikinui and works at the Kamehameha School in Pukalani. Mr. Pali was born on west Maui and grew up in Honokohau. He has most of his family and many friends still resident in the area. Interestingly, all informants in this study are long-time friends with each other, and in some cases they are related by kinship. He served in the U.S.M.C. during the war in Viet Nam.

Most of the data gathered from Mr. Pali are the result of a number of telephone conversations and some vis-à-vis talks. He is interested in and concerned with events in Hawaii, and especially the kinds of commercial developments occurring on West Maui, as well as other areas in Hawaii. His special areas of interest include cultural preservation and environmental conservation.

One of the more unique geological features of this region on Maui includes five valleys, all north and west of the town of Lahaina in the West Maui Mountains. They are named: Honokawai, Kahana, Honokahua, Honolua, and Honokohau. In precontact times these valleys were undoubtedly utilized in relatively heavy food production. The lo'i (stone-faced terraces) that survive in the valleys provide sites for the raising of wetland taro.

Mr. Pali, and many of his relatives and friends are aware that *lo'i* exist in the valleys, and some have visited them. They also know the function of these structures, but don't know of anyone who relies upon them for growing taro today. Many have also visited the valleys on occasions, hunting small game, gathering medicinal herbs, seasonings and/or preservatives, along with occasional wood for fire or construction.

Mr. Pali believed that the uplands between the valleys ("kula" areas) have been used by the plantation for pineapple cultivation (and some cattle) since the early /middle part of the 19th century. He went on to say that it has now been such a long time ago that no living persons would remember the beginning of the plantation era.

Mr. Pali cannot recall any other significant use of the lands in this area. He did not know whether or not there might have been traditionally used access trails into these valleys. He also believed that Kapalua Land Company, Ltd. recognizes the 2 valleys concerned in this area, as preservation areas, not to be included in any commercial development plans that they have. He was pleased to find out that Kapalua Land Company, Ltd. intends to preserve significant sites that lie in the 475-acre Project District #2 area.

Informant: Mr. Alexander Ross, U.S.M.C., Retired. Born on Maui, and Maui Resident—September 2001.

Mr. Alexander Ross was recommended by Mr. Pali as being a person of knowledge and insight regarding the community there. Various telephone interviews provided the following data, relevant to this study.

Mr. Ross was born at a plantation camp located toward the mouth of Honolua valley. There was no physician available to attend his mother, so a midwife assisted his mother in his birth (year: 1937).

His mother had lived in Honokohau Valley. He spent most of his youth in the area (and Honolua), going to school and working for the pineapple plantation. Some of his relatives grew taro, but in patches near Honolua Stream. Two families—the Chung and Shim families founded the Lahaina Poi Factory that operated at Lahaina (Front Street and Lahainaluna Road), where it remained for many years. They grew much of their taro at Honolua, according to Mr. Ross.

He grew up knowing about the many *lo'i* that had been built in the valleys in earlier times. He visited different sites on various occasions and remembers how well done the stone work was and how extensive the structures were in some of the valleys.

Mr. Ross described various trips into the valleys with his father and other relatives and friends, with the purpose of hunting, fishing and gathering. Pigs were the main mammals hunted, along with Axis deer. Pheasant and Quail were the birds most hunted. "Pipi'au" were gathered from the streams. He also said that although they took such trips to the valleys, they did not rely on them for important sources for food collection. During these trips, medicinal herbs and firewood, etc., would sometimes be gathered. Mr. Ross indicated that the plantation issues entry permits for hunting and other purposes on the plantation lands these days.

Mr. Ross eventually went into the U.S.M.C., served in the war in Viet Nam and continued in the Marines until he retired (1956 – 1976). He still resides on West Maui along with his wife, Louise. Mr. Ross was also pleased that Kapalua Land Company, Ltd. plans to preserve the sites identified during the 2001 inventory survey of the expanded Project District 2.

Informant: William Wai'o'hu, Born on Maui and continuous resident; Maui/Lanai Islands Burial Council representative—October 2001.

Mr. Wai'o'hu was born in Ukumehame in 1941, then his family moved to Olowalu and from there to Lahaina (in 1948), where he continues to reside. His father was a plantation employee. Although more of a Lahaina person, he has spent most of his life in the region, and feels he knows it quite well. As with all the informants utilized in this oral history, he is knowledgeable of the region, and said he knows many of the people in the area.

He has been quite involved in conservation and preservation of Hawaiian culture, attested to by his service on the Burial Council. He maintains involvement with other groups concerned with Hawaiian culture and preservation of historic sites.

He is knowledgeable regarding valley use in early agricultural practices, but does not think people living in the west Maui area have utilized the valleys for a long time, other than for visiting the sites there. A little hunting is still practiced, but not to a very great extent. He is also aware of the numbers of archaeological sites located in the valleys, although he has not seen too many of them. He concurs with the common knowledge that the major use of the upland plains (Kula areas) between the valleys has been for commercial agriculture since the middle of the 19th century.

He believes the Plantation owners have always granted access permission to legitimate persons seeking it for hunting, gathering or just observation of nature. Most of the informants for this report have not heard of any problems with plantation land-use access policies.

A number of individuals who were contacted in September and October of 2001, for their input to this project could not be fully interviewed, given the time restraint for the project. The reasons were usually either difficulty in sustaining telephone contact for the interview, or leaving messages that were unable to be answered, so additional input of these informants could not be included in this report. Several of these informants are listed here, since they were successfully contacted and were affiliated with significant community organizations, but we were not able to complete the interviews at this time.

1) **Thelma Shimaoka, Community Resource Coordinator, OHA** (Office of Hawaiian Affairs). We discussed the project and she was excited about it. But she wanted us to check with her supervisor (in Honolulu), Colin Kippen, before beginning the proposed interview. We phoned Mr. Kippen on three occasions, and left messages requesting that he contact us.

2) **Rose Marie Duey, Maui Island Representative for Alull'ke**
We had an instructive telephone conversation, in which she shared good information. Basically, she approved of the study and its goals. She attempted to contact other persons who we might interview about the project, but was unable to make contact.

3) **Vanessa Medeiros, Department of Hawaiian Homelands.** We discussed the project and had a useful interchange.

4) **Akoni Akana, Executive Director, Friends of Moku'ula.** He was "off-Island" during the time we were trying to contact him. His assistant, Shirley took messages, so he would know we had tried to contact him about this project.

DISCUSSION, SUMMARY AND CONCLUSIONS

The forgoing report presents traditional land use information gathered through the medium of oral histories given from interviewed informants. This report summarizes the results of that research. Chapter 343, Hawaii Revised Statutes (Environmental Impact Statement Law) requests that part of the EIS (Environmental Impact Statement) include a 'cultural impact assessment', which addresses possible impacts a proposed development undertaking may have on the population of the area affected. This implies that a number of persons familiar with the area be interviewed, in order to achieve a fair sample.

We were fortunate in finding additional persons who agreed to be interviewed for this work, and who were willing and able to provide their oral history input. We thank them.

The questions put to each informant were essentially the same, taken from the Sample Oral History Interview Questions (See pp. 8-9, this report). The information provided testimony regarding the informant's perceptions of traditional land use and practices for the subject area.

To conclude, the information obtained from the interviews corroborates the perceptions of these practices that: 1) the valley *lo'i*, and other structures are no longer used in agricultural production, as they once were; 2) the uplands between the valleys are presently in, and have been in, pineapple production for many decades; 3) the plantation owns these lands and will grant entry permits to hunters wishing to hunt for wild game in the valleys; 4) No interviewee in this study provided opinions contrary to those expressed by other interviewees; 5) Some concern was expressed over the need to preserve Native Hawaiian sites, but most concurred that Kapalua would try to protect them.

The project produced information supporting the expressed feeling by interviewees that Kapalua Project District #2 and the Expanded Project District #2 were not "threatening" to perceived life-styles by local residents. All felt that they could access the lands if they "wanted to" or "needed to". Most were familiar with the existence of *lo'i* in valleys, but did not think they were that important for agricultural uses anymore, but that they should be preserved and that access to visit the sites should be granted to those interested. Most all contributors had either hunted in the lands at one time or another, or felt that as long as they could hunt there, if they wanted to, it was 'alright'. All interviewees were very pleased with the preservation of archaeological sites in the valleys and their future protection. There was appreciation for the general concern shown by Kapalua for these matters and also, the protection of the land for the future.

This was a very rewarding project. We wish to thank all those who participated, giving up their time in order to share their cultural knowledge about this project.

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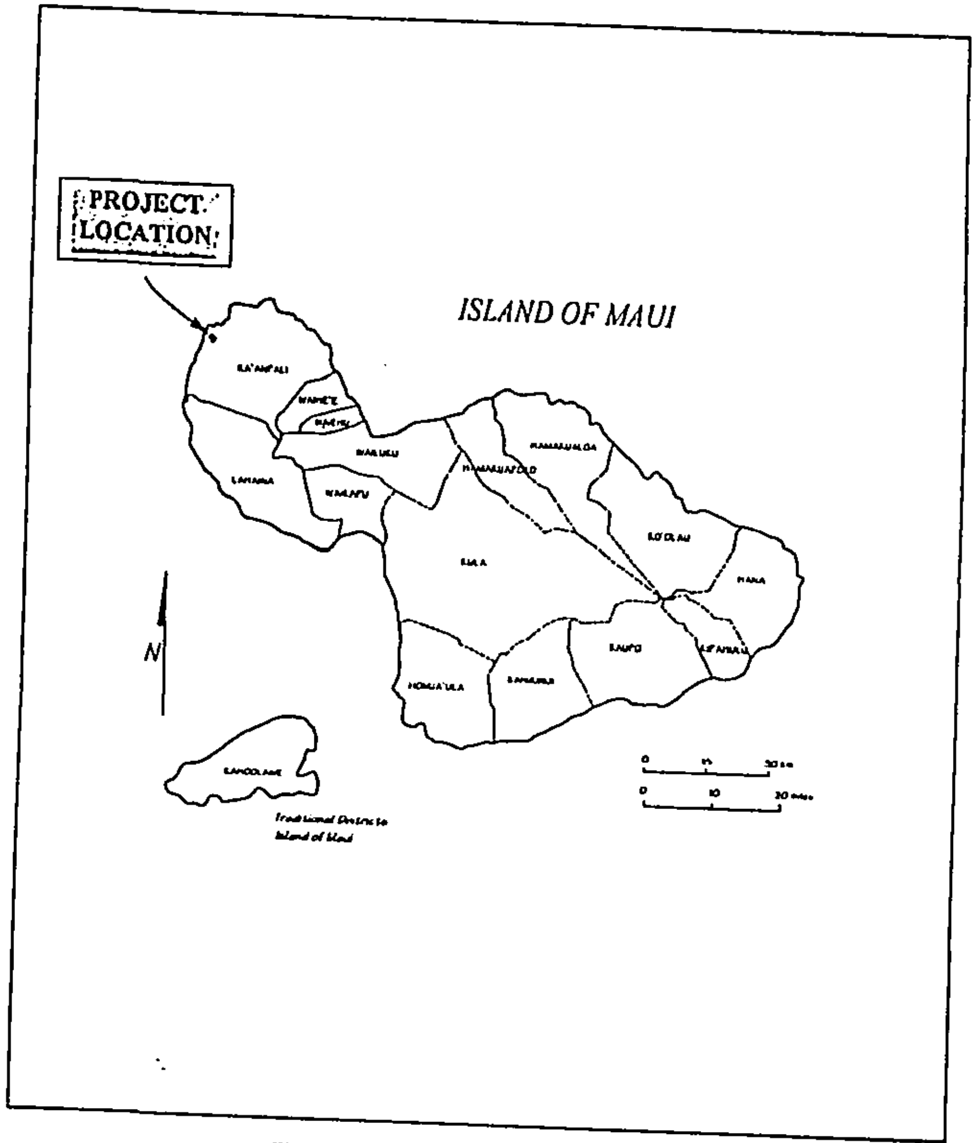

Figure 1 – Location of the project area.

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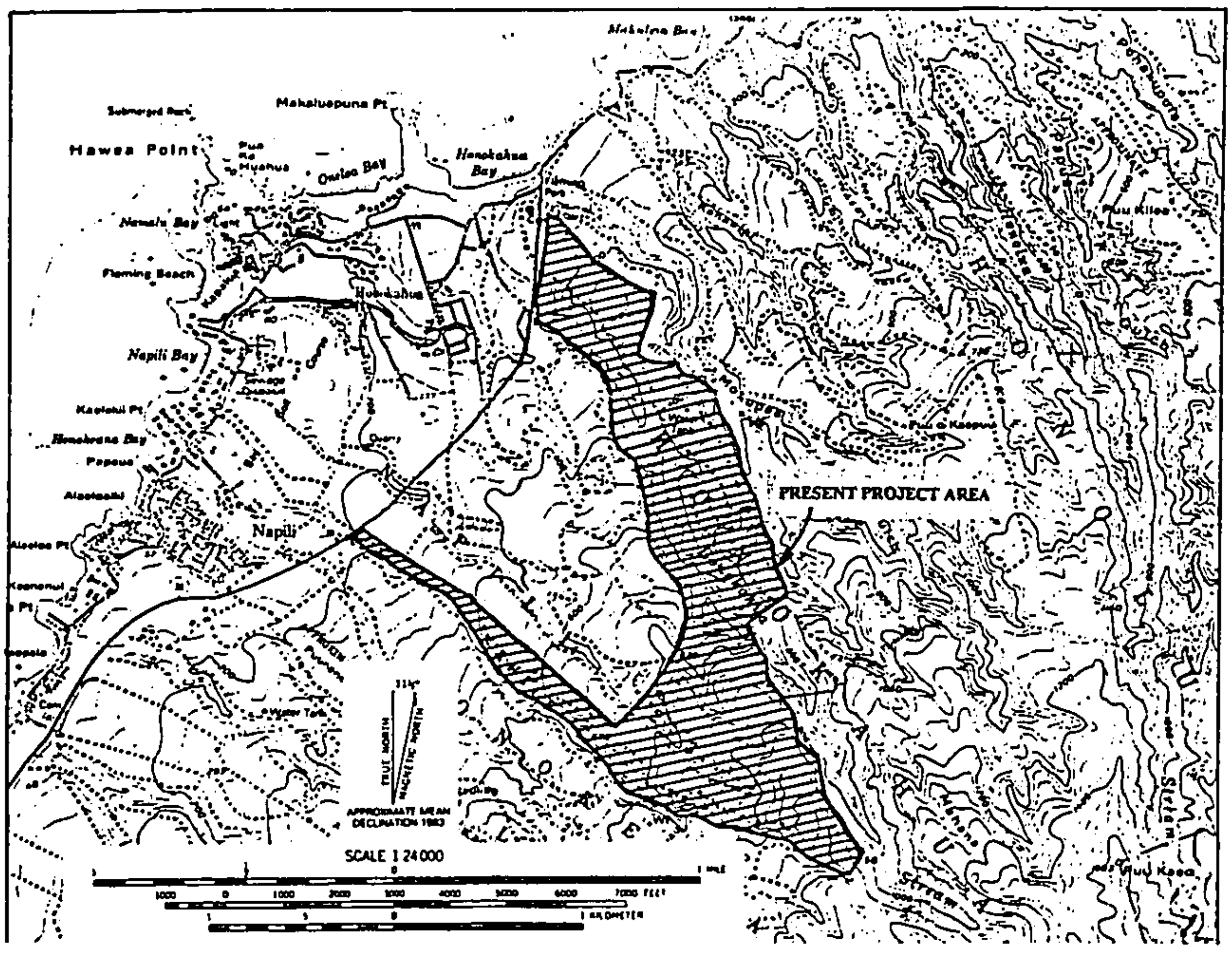

Appendix H

Marine Water Quality Study
(Marine Reseach Consultants 2002)

MARINE ENVIRONMENTAL MONITORING PROGRAM
KAPALUA MAUKA, MAUI, HAWAII

Report No. 2002-1

Prepared for

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April 2002

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EXECUTIVE OFFICE

I. INTRODUCTION AND PURPOSE

Kapalua Mauka is a master-planned resort residential and recreational community comprised of 690 homes, a golf course and related recreational amenities on approximately 925 aces of land mauka of the Kapalua Resort and Honoapi'ilani Highway in west Maui. As part of the community, the current 18-hole Village Golf Course that now has 16 holes on the site (the other two holes are makai of Honoapi'ilani Highway is proposed to be expanded to a total of 27 holes. This expansion may include the addition of a secondary clubhouse within the Kapalua Mauka community site.

Development of the Kapalua Mauka community will transform pineapple fields into a resort residential and recreational community. The change in land use is not expected to have significant adverse effects on either the existing watershed, downstream properties, or coastal marine waters. While post-development runoff is expected to increase slightly, detention and desilting basins will maintain the existing levels of runoff leaving the site. In addition, water quality of the runoff from the site is expected to improve from the present scenario of pineapple fields, particularly in terms of sediment runoff.

In 1990, Maui Land and Pineapple Company, Inc. retained Marine Research Consultants to institute a water quality monitoring program to assess water chemistry characteristics of nearby Honolua Bay. The intent of the program was to establish a quantitative baseline of water chemistry constituents that could reveal if water quality in the Bay was being affected by factors associated with the activities of man. If such factors were identified, mitigative measures could be instituted early enough to prevent serious degradation of water quality or alteration of biotic communities within the Bay. In addition, the monitoring data could be used to evaluate whether planned activities had the potential to cause impacts to the marine environment. To date, the program has included fourteen phases of monitoring over a duration of twelve years, with the last survey conducted on March 2002.

As part of the planning process for the Kapalua Mauka development, a water quality assessment program similar to the Honolua Bay monitoring has been initiated. The intent of the assessment is to develop a baseline set of conditions that can be used to evaluate impacts to water quality in Honokahua and Napili Bays, which will receive runoff and groundwater flow from the Kapalua Mauka development. In addition, results of the water quality assessment can be used to address the effects of groundwater withdrawal associated with the project on the nearshore ecosystems within the two Bays.

II. ANALYTICAL METHODS

1. Water Chemistry

Sampling methodology is identical to that of the monitoring program conducted in Honolua Bay conducted between 1990 and 2002. Water quality was evaluated along two transects in Honokahua Bay and one transect in Napili Bay that extended from the shorelines at the "back" of the Bays (in the vicinity of the beach) out to the open ocean, a distance of approximately 1,600 feet. Transects in Honokahua Bay were oriented parallel to the "sides" of the Bay, with one transect running along the northern shore (T-1), and the other transect (T-2) along the southern shore. In Napili Bay, the sampling transect ran parallel to the northern shoreline (T-3) (see Figure 1).

Water samples were collected at nine stations along each transect. Sampling was concentrated in the innermost portions of the Bays, as these are the regions which are most likely to receive inputs from land. Water samples were collected at two depths; a surface sample was collected within approximately 6 inches of the surface, and a bottom sample was collected within 1 foot of the sea floor. At the sampling stations located one and 3 feet from the shoreline, only surface samples were collected.

Water quality parameters evaluated included the specific criteria designated for embayments in Chapter 11-54, Section 06 (Open Coastal waters) of the State of Hawaii, Department of Health (DOH) Water Quality Standards. These criteria include: total nitrogen (TN), nitrate + nitrite nitrogen (NO_3^- + NO_2^-), ammonium (NH_4^+), total phosphorus (TP), chlorophyll *a* (Chl *a*), turbidity, temperature, pH and salinity. In addition, orthophosphate phosphorus (PO_4^{-3}) and silica (Si) were also reported because these parameters are sensitive indicators of biological activity and the degree of groundwater mixing. Dissolved organic phosphorus (TOP) and dissolved organic nitrogen (TON) were calculated as the difference between TP and inorganic P (PO_4^{3-}), and TN and inorganic N (NO_3^- + NH_4^+), respectively.

All fieldwork was conducted on March 2, 2002 with sampling personnel working from a small boat. Water samples were collected in 1-liter polyethylene bottles using a 1.8-liter, Niskin-type oceanographic sampling

bottle. These bottles were lowered to the desired sampling depths with spring-loaded endcaps cocked in an open position ensuring complete flow-through of water. At the desired depth, a messenger released from the surface triggered closure of the endcaps. Nearshore samples were collected by swimmers opening sampling bottles at the desired locations.

Subsamples for nutrient analyses were immediately placed in 125-milliliter (ml) acid-washed, triple rinsed, polyethylene bottles and stored on ice until returned to Honolulu. Analyses for NH_4^+, PO_4^{3-}, and NO_3^- + NO_2^- were performed using a Technicon Autoanalyzer according to standard methods for seawater analysis (Strickland and Parsons 1968, Grasshoff 1983). TN and TP were analyzed in a similar fashion on unfiltered samples following oxidative digestion. Detection limits for nutrients are 0.01 µM (0.14 µg/L) for NO_3^- and NH_4^+, 0.01 µM (0.31 µg/L) for PO_4^{3-}, 0.1 µM (1.4 µg/L) for TN and 0.1 µM (3.1 µg/L) for TP.

Water for other analyses was subsampled from 1-liter polyethylene bottles and kept chilled until analysis. Chl *a* was measured by filtering 300 ml of water through glass fiber filters; pigments on filters were extracted in 90% acetone in the dark at -20° C for 12-24 hours, and the fluorescence before and after acidification of the extract was measured with a Turner Designs fluorometer. Salinity was determined using an AGE Model 2100 laboratory salinometer with a precision of 0.0003‰.

In-situ field measurements of pH, temperature and turbidity were acquired with portable field meters (readability of 0.01 pH units, 0.01°C and 0.01 nepthelometric turbidity units [ntu], respectively).

All laboratory water chemistry analyses were conducted by Marine Analytical Specialists (Honolulu, HI). Marine Analytical Specialists possesses the appropriate approval ratings for these analyses from the State of Hawaii Department of Health, and the U.S. Environmental Protection Agency.

2. Assessment of Marine Community Structure

Evaluation of the marine biological community was conducted by qualitative reconnaissance surveys along the length of the area fronting the edges of Honokahua and Napili Bays from the shoreline out to the 10 meters (30 feet) depth contour. Information gathered during the surveys included abundance estimates of the dominant flora and fauna, as well as observations on the factors that affect these biotic assemblages.

III. RESULTS

1. Environmental Conditions

Weather conditions that occur in the area are distinguished primarily by the strength of tradewinds, and size of breaking surf along the outer perimeter of the Bay. The March 2002 sampling took place during a period of mild tradewinds (10 knots) and virtually no long-period swell. Within the Bays (i.e. from the shoreline to about 700 feet offshore) sea conditions during the March 2002 survey were calm.

It is of interest that in January 2002, approximately two months before the survey, several large rainfall events occurred in West Maui. Total rainfall for the month of January was approximately 10 inches, which resulted in substantial deposition of sediment into the Bay through discharge from all of the streams in the Kapalua area.

2. Water Quality

A. Horizontal Stratification

An ongoing monitoring program in neighboring Honolua Bay has revealed a relatively consistent pattern of water chemistry characterized by three distinct zones. An innermost zone, within 50 feet of the shoreline, generally exhibits relatively high concentrations of Si, NO_3^-, and PO_4^{3-} (dissolved nutrients which occur in high concentrations in groundwater) and low salinity (which is essentially zero in groundwater). These results are presumably a reflection of concentrated groundwater efflux near the shoreline.

A second zone comprises the area from about 50 feet from the back shoreline out to the rocky outcrops that define the mouth of the Bay. This zone (hereafter termed the central Bay) includes the samples from between 50 and 700 feet from the back shoreline. In this area, nutrients that are present in groundwater are generally elevated relative to concentrations found in open ocean waters, but are reduced in comparison to concentrations in the nearshore zone.

The third zone consists of the area seaward of the outer boundaries of the Bay. At sampling stations between 700 and 1,200 feet from the back shoreline, Bay water is thoroughly mixed with open ocean water by wind, wave and currents. As a result of such mixing, the chemical constituents

that characterize waters within the Bay are generally not detectable, and water chemistry reflects coastal oceanic conditions.

In Honokahua and Napili Bays, the results of water chemistry analyses indicate a much less pronounced zonation pattern. Tables 1 and 2 show results of water chemistry analyses for samples collected during March 2002 along the three transects shown in Figure 1. Figures 2 and 3 show plots of twelve water chemistry constituents as functions of distance from the back shoreline of the Bays extending to the open ocean.

The only transect that shows a structure similar to the pattern described for Honolua is the North Honokahua transect. Plots of Si and NO_3^- exhibit a peak in the mid-bay region (400-700 ft from shore)(Figure 2). Conversely, salinity shows a marked decrease in the region (Figure 3). On the Honokahua South transect, the distribution of nutrients in Bay waters is substantially different from along the north transect. Visible springs of groundwater were evident near the shoreline at the origin of the south transect. As a result of spring water entering the ocean, the concentrations of Si, NO_3^- PO_4^{3-}, TP and TN were substantially elevated at the two stations near the shoreline (0 and 3 feet). Similarly, salinity was significantly lower at these sampling stations than at the corresponding distances from shore on the other two transects. Beyond this distance from shore, concentrations of all inorganic nutrients generally decreased with distance from shore without the noticeable peak in the mid-bay region. At Napili, there was only a very small gradient of nutrients and salinity along the entire sampling gradient (Tables 1 and 2, Figures 2 and 3).

The only exception to this pattern was in surface concentrations of NH_4^+ at the surface of south Honokahua Bay. Between 200 and 1000 feet from shore, concentrations of NH_4^+ were distinctly higher than on the other two transects (Figure 2). Surface samples of TOP, TON, TP and TN showed little trends in concentrations at any of the sampling stations and were of the same magnitude among the three transects (Figure 2). Such patterns are consistent with the low concentrations of these organic constituents in groundwater relative to ocean water (see well data in Tables 1 and 2).

Turbidity in surface waters was distinctly elevated in the samples collected within 200 feet of the shoreline on all three transects (Figure 3). Overall turbidity in the zone within 200 ft of the shoreline was highest on the Napili transect relative to either off the Honokahua transects. Beyond this distance from shore, turbidity was similar on all three transects (Figure 2).

The horizontal gradients of Chl *a* differed on all three transects. On the Napili transect Chl *a* showed a similar pattern to turbidity with the highest concentrations at the shoreline and steadily decreasing values to a distance of 200 feet from shore. On the Honokahua North transect, values of Chl *a* were similar (≥ 0.2 µg/L) throughout the entire transect. On the Honokahua South transect, Chl *a* in surface waters showed peak values at stations 700 and 1100 feet from shore, forming a very distinct peak in the plot of concentration as a function of distance from shore (Figure 3).

Horizontal profiles of temperature showed general trends on the Honokohua transects of coolest temperatures nearest the shoreline with increasing values with distance from shore. Temperature on the Napili transect was essentially uniform in the nearshore region (within 700 feet from shore) with gradual increasing values in the offshore region (Figure 3, Tables 1 and 2).

B. Vertical Stratification

Figures 2 and 3 also show concentrations of water chemistry parameters as functions of distance offshore from the back of the Bays with respect to vertical stratification. As low salinity groundwater is less dense than ocean, the incoming freshwater forms a low density, high nutrient content surface lens. On all three transects surface concentrations of Si were higher, and salinity lower than the corresponding bottom sample (Tables 1, 2). With several exceptions, primarily at the offshore stations, the same pattern occurs for NO_3^- and TN (Tables 1, 2). However, the other inorganic nutrients (PO_4^{3-} and NH_4^+) and organic nutrients (TON, TOP) showed little indication of vertical stratification with similar values in surface and bottom water (Tables 1, 2). The degree of vertical stratification is clearly a function of the concentration of the difference in concentration between groundwater and ocean water, and the proximity to the source of groundwater input at the shoreline.

In general, turbidity was elevated in surface samples within 400 feet of the shoreline on all three transect. Concentrations of Chl *a* showed no distinctive differences between surface and bottom samples, with the exception of the two surface samples with anomalously high values on the South Honokohua transect (Tables 1, 2, Figure 3).

C. Conservative Mixing Analysis

A useful treatment of water chemistry data for interpreting the extent of material inputs from land is application of a hydrographic mixing model. It is possible to evaluate the extent of nutrient input from sources other than groundwater efflux by plotting the concentration of the dissolved material as a function of salinity (Officer 1979, Smith and Atkinson 1994, Dollar and Atkinson 1992). Comparison of the curves produced by such plots with conservative mixing lines provide an indication of the origin and fate of the material in question.

Figure 4 shows plots of concentrations of four constituents (Si, NO_3^-, NH_4^+, PO_4^{3-}) as functions of salinity for the samples collected in Honokahua and Napili Bays in March 2002. Each graph also shows conservative mixing lines that are constructed by connecting the endpoint concentrations of open ocean water and groundwater from two potable wells located upslope of Kapalua that were sampled in May 2001 (Tables 1 and 2). The average concentrations of NO_3^- (18 µM) and Si (608 µM) used to construct the mixing lines from data collected in 2001 is similar to the average values of five wells in the Napili-Honokohua sampled from 1993-1997 as shown in Soicher and Peterson (1997) (average NO_3^- = 18.7µM; average Si = 654 µM). These similarities indicate that the nutrient concentrations in pristine groundwater in the area has not changed substantially over the last decade.

If the parameter in question displays purely conservative behavior (no input or removal from any process other than physical mixing), data points should fall on, or near, the conservative mixing line. If, however, nutrients are added to the system through processes such as leaching of fertilizers to groundwater, data points will fall above the mixing line. If material is being removed from the system by processes such as biological uptake, data points will fall below the mixing line.

Dissolved Si represents a check on the model as this material is present in high concentration in groundwater, but is not a major component of fertilizer, and is generally not utilized rapidly within the nearshore environment by biological processes. It can be seen in Figure 4 that when Si concentrations are plotted versus salinity, data points prescribe a straight line that fall on the conservative mixing line. Linear regression of Si as a function of salinity yields significant correlation with R^2's of 0.99, 0.99 and 0.96 for the North and South Honokohua and Napili transects, respectively. In addition, the upper and lower confidence limits around the y-intercept of regressed data from each transect also encompass the mean concentration of Si in the two wells (608 µM). The Y-intercept can be regarded as the concentration of Si at salinity of zero. Hence, it is clear that the concentrations of Si in the water samples collected within Honokahua and Napili Bays is a mixture of only ocean water and groundwater.

It is of interest to note that similar analyses conducted in Honolua Bay at the same time as the Honokohua/Napili sampling produced a different result. In Honolua Bay, plots of Si versus salinity produced a trend below the conservative mixing lines. It is likely that the deviation of the data from the mixing line was a result of input of another source of surface water in Honolua Bay with a lower concentration of Si than potable groundwater. The most likely possibility of such input in low silica surface water from Honolua Stream that periodically flows to the Bay. Because of the deep indentation of Honolua Bay into the shoreline, circulation within the inner Bay is low, and stream water appears to be retained in the inner zone. Linear regression of the Si data against salinity yielded a Y-intercept of 440 µM, compared to 610 µM for the combined Honokohua/Napili data set collected on the same day. These comparisons suggest that surface water was a component of the nearshore waters in Honolua Bay, but not in Honokahua and Napili Bays at the time of sampling. The overall linear distribution of the Si data points in Figures 8 and 9, however, indicates that the mixing model provides a valid representation of the system under investigation.

The plots of NO_3^- versus salinity for the March 2002 data from the Honokohua/Napili transects show patterns different from the linear distributions of dissolved Si (Figure 4). Data points fall in a scattered array substantially above the conservative mixing lines. Linear regression of NO_3^- versus salinity resulted in significant correlation at North and South Honokohua (R^2 of 0.85 and 0.99, respectively), but no significant regression at Napili. The y-intercepts for 34 ± 8 µM on the North Honokahua transect and 133 ± 3 µM on the South Honokahua transect are above the mean concentration of NO_3^- in high level groundwater (18 µM) indicating a subsidy of NO_3^- to the ocean from sources other than natural groundwater. These subsidies essentially double the NO_3^- in groundwater on the northern Honokahua transect, and represent about a 7-fold increase on the southern Honokahua transect.

As NO_3^- is the form of nitrogen most common in fertilizer mixes, it is likely that the source of the subsidy of NO_3^- that is evident from the mixing model is leaching of fertilizers from golf courses, landscaped areas, and agriculture (pineapple), all of which occur inland of Honokahua Bay. Regression of NO_3^- versus salinity from the Napili transect, however, did not yield a significant linear distribution, even though data for this transect fell within the same magnitude as those from Honokohua (Figure 4).

If biotic uptake of nutrients was an important factor in controlling nutrient concentrations in the water column, distinct upward concave curvilinearity would be evident. With no such curvilinearity apparent on any of the three transects, it does not appear that biotic processes are resulting in detectable net nutrient uptake. Such a result is important in that it indicates that marine plants are not removing nutrients from the water column to a detectable degree. Hence, the nutrient subsidies from land to the ocean are not being taken up by algae or plankton in the nearshore zone, but rather are mixed by physical processes with ocean water to background levels.

The other form of dissolved inorganic nitrogen, NH_4^+, does not occur in elevated concentrations in groundwater relative to ocean water. The conservative mixing lines in Figure 4 are essentially "flat" with similar concentrations in groundwater and open ocean water. For the March 2002 survey, plots of NH_4^+ as functions of salinity result in a scatter of data above the mixing line (Figure 4) with no significant linearity. The lack of a relationship between salinity and NH_4^+ suggests that concentrations within the Bays are primarily a consequence of biotic activity rather than input from sources on land.

PO_4^{3-} is also a component of fertilizer but is usually not found to leach to groundwater to the extent of NO_3^-, owing to a high absorptive affinity of phosphorus in soils. It can be seen that most of the PO_4^{3-} points from all three transects fall above the mixing lines during the March 2002 sampling (Figure 4). The only set of data points for PO_4^{-3} that prescribe a significant linear trend (R^2 of 0.99) is the South Honokohua transect. Inspection of the data, however, suggests that the significant linearity is a result of the very high concentrations at the sampling location nearest the shoreline, where the concentration of PO_4^{3-} was an order of magnitude higher than all of the remaining samples. Data from the other two transects is essentially random in distribution with no relationship between salinity and concentration.

D. Compliance with DOH Standards

Also shown in Tables 1 and 2 are DOH water quality standards for open coastal waters under "wet" conditions. Honokohua and Napili Bays are considered open coastal waters rather than embayments because they do not have restricted openings to coastal waters defined by a ratio of total bay volume to the cross-sectional entrance area of seven hundred to one or greater. The criteria for wet conditions are applied to Honokohua and Napili Bays because these areas likely receive at least 3 million gallons per day of freshwater discharge per shoreline mile. DOH standards include specific criteria for three situations; criteria that are not to be exceeded during either 10% or 2% of the time, and criteria that are not to be exceeded by the geometric mean of samples. With only a single sample set collected from each sampling station, comparison of the 10% or 2% of the time for any sample is not statistically meaningful. However, comparing sample concentrations to these criteria provide an indication of whether water quality is near the stated specific criteria.

During the March 2002 survey, at least one measure of all inorganic nutrients with specific standards (TN, TP, NO_3^-, NH_4^+) exceeded the DOH 2% and 10% criteria. On the Honokohua North transect, the 10% criterion was exceeded on most of the surface samples within 700 feet of the shoreline. On this transect, NH_4^+ was only above the DOH limits at the shoreline, while samples within the offshore waters were all below the limits. On the Honokahua South transect, the two samples collected within 3 feet of the shoreline, which contained substantial spring water, exceeded limits for NO_3^-, TN and TP. Even with the high input of NO_3^- at the shoreline, water from samples along the majority of the transect did not contain concentrations of NO_3^- above the DOH limits. This was not the case on the Honokahua North transect, where there was no apparent distinct input of groundwater at the shoreline. On the Napili transect, only one measurement of NO_3^- from 200 feet offshore exceeded the DOH 10% limit.

NO_3^- is normally found in high concentrations in uncontaminated groundwater. As discussed above, however, the application of the data to conservative mixing model indicates extraneous subsidies of NO_3^- from activities on land. While the subsidies were highest on the Honokohua South transect, concentrations of NO_3^- only exceeded the standards in the two samples collected closest to shore.

3. BIOTIC COMMUNITY STRUCTURE

Both Honokohua and Napili Bays are crescent-shaped indentations in the shoreline that are delineated by rocky headlands that extend from the shoreline seaward. The interiors of the Bays consist of sand bottoms that extend to pocket beaches above the intertidal area. As both bays are exposed to long-period swells from the north and south, the sand bottoms are kept in a state of continual resuspension, preventing settlement of most macrofauna.

At the nearshore "corners" of the bays, boulders are interspersed in the sand bottom. At the time of the survey, substantial areas of the boulders were covered with the green alga *Enteromorpha* spp., which commonly occurs in nearshore habitats in Hawaii that are exposed to seepage of

groundwater. Probably as a result of scouring of resuspended sand, few corals or other macrobiota were observed on the nearshore boulders.

The rocky headlands that define the boundaries of the Bays represent the zones with the most biologically diversity. Within the intertidal areas the rocky outcrops are covered with a variety of macroalgae, predominantly consisting of the red algae, *Pterocladia capillacea* and *Ahnfeltia concinna*. The introduced red algae *Hypnea musciformis* was not observed in either of the Bays. This species has colonized much of the coastline of West Maui and Kihei south of Kapalua and resulted in nuisance blooms in many areas over the last decade.

With distance from shore, algal cover diminishes, and coral cover increases. Coral species consisted of sturdy branching colonies of *Pocillopora meandrina*, and encrusting forms of *Porites lobata* and *Montipora capitata*, *M. patula* and *M. flabellata*. On the flat upper surfaces of the submerged headlands, coral cover accounted for approximately 20-40% of bottom cover. Other abundant invertebrates included the boring sea urchins *Echinometra matheai* and *Echinostrephus aciculatus*.

Dominant species of fish in the bays includes mixed schools of surgeonfish (Acanthuridae), butterflyfish (Chaetodontidae), wrasses (Labridae) and damselfishes (Pomacentridae). Several small papio (*Caranx melampygus*) were seen in the deeper areas at the seaward most points of the rocky headlands.

Several species of marine animals that occur in Hawaiian waters have been declared threatened or endangered by Federal jurisdiction. The threatened green sea turtle (*Chelonia mydas*) occurs commonly along the coastlines of all of islands including Maui, and is known to feed on selected species of macroalgae. The endangered hawksbill turtle (*Eretmochelys imbricata*) is known infrequently from waters off of Maui. Hawaiian monk seals (*Monachus schlauslandi*) are also sighted occasionally around the high islands. The shoreline area fronting Kapalua consists primarily of sandy beaches, making the area accessible for turtle and seal haul-outs. While turtles (and possibly seals) undoubtedly occur in the offshore areas and on the beaches, none were observed during the fieldwork for the present assessment.

Populations of the endangered humpback whale (*Megaptera novaeangliae*) winter in the Hawaiian Islands from December to April. The present survey was conducted in March, when whales are present in Hawaiian waters. While whales were present in areas offshore of Kapalua, all of the regions where studies were conducted were too shallow for whales to normally inhabit.

One concern that has been raised is the potential effect from groundwater withdrawal resulting from the project on nearshore ecosystems and any cultural practices dependent on nearshore resources. Specifically, this concern is aimed at resources which are dependent upon an influx of freshwater, which is an integral factor for the growth of limu. Results of the water chemistry analyses in Honokohua and Napili Bays, observed biotic assemblages in the Bays, as well results of past studies conducted in the area provide several important points to address this concern.

First, while there are areas where freshwater springs result in rich growth of some species of limu, it is the elevated nutrient content of the water, rather than the salinity or "freshness" that is the responsible for the increased growth. Hence, it is important to note that in the past decade, perhaps the most severe impact to the West Maui coastal areas is the proliferation of several species of algae. It is perceived (though never proven) that one of the factors driving this proliferation is the addition of nutrients to the ocean from land use activities. Under this scenario, removal of groundwater, and the nutrients that the groundwater contains, could theoretically return the balance between natural and man-induced nutrient loading back toward pre-development levels. So rather than providing a negative effect, lowering nutrient discharge to the ocean by lowering groundwater flow could actually produce a positive effect.

In the same context, it has been shown that the greatest contribution of nutrients to groundwater from human activities on West Maui is from sugarcane and pineapple agriculture. On the other hand, golf courses, resort and residential development provide a relatively small contribution (Soicher and Peterson 1997). If the proposed project replaces pineapple agriculture with resort and residential development, the overall subsidies of nutrients delivered to the ocean should decrease.

Second, the degree of mixing in the nearshore areas within Honokohua and Napili Bays is so substantial that the area affected by mixing of freshwater and ocean water is very small. The water chemistry survey was conducted during a period when mixing from wind and waves was absolutely minimal. Even so, the effects of the very prominent shoreline spring at the South Honokohua transect site, which contained concentrations of NO_3^- that were unquestionably elevated as result of human activity, were diluted to background levels within 50 feet of the shoreline. Beyond this distance, which includes most of the bay, water chemistry showed essentially no

effects from input from land. On the north side of Honokohua, elevated nutrients were detectable in surface waters, but not in bottom waters. Hence, the water in contact with limu growing on the bottom would not result in increased (or decreased) potential for limu growth. In Napili Bay, there was little evidence of any input of materials from land to the ocean. Thus, changes in groundwater composition or discharge rates would have little or no effect on the biotic composition of the area.

It is also possible to quantitatively evaluate the change to groundwater discharge that may result from the project, and estimate the effect to nearshore marine biota. All non-potable water required for the project will come from Honolua ditch, and therefore will not have an effect on groundwater flux. Typical groundwater discharge rates along the West Maui coastline are 5-6 million gallons per day per shoreline mile (Soicher and Peterson 1997). The entire Kapalua Resort encompasses about 3 miles of coastline for a total discharge of 15-18 mgd. At present, the resort uses about 600,000 gallons per day of potable water, or about 3-4% of the total coastal discharge. Engineering projections estimate use by Kaupalua Mauka will be about 300,000 gpd, which is about 2% of groundwater flux. Hence, with the project in place, potable water use will change groundwater flux from about 96% to 94% of natural flow. Such a change is well within natural variability, and with the mixing factors described above in the nearshore zone, will not result in any changes over present conditions.

SUMMARY

- The first phase of water chemistry monitoring of Honokohua and Napili Bays at Kapalua, West Maui was carried out on March 2, 2002. Forty-eight water samples were collected along three transects that extend from the shoreline out to the open ocean. In May 2001, water samples were collected from two potable wells above the Kapalua developments in order to determine the composition of naturally occurring groundwater that enters the Bays. Freshwater was not flowing from Honokohua Stream to the Bay at the time of sampling. The survey was conducted during a period of mild tradewinds and very little swell.

- Results of water chemistry analyses reveal horizontal gradients of salinity and nutrients occur within the Bays as a result of inflow of brackish groundwater that contains high concentrations of Si, NO_3^- and PO_4^{3-} compared to ocean water. The most conspicuous groundwater input occurred in the southern region of Honokahua Bay where groundwater springs were visible on the shoreline. However, the input of groundwater does not appear to provide a major influence of water chemistry in the embayments beyond about 50 feet from the shoreline. Beyond the outer boundaries of the Bay, horizontal gradients are not evident owing to complete mixing by waves and wind of Bay water and coastal ocean water.

- Vertical stratification is also present within the Bays, as a result of lower density groundwater "floating" on top of higher density oceanic water. Nutrient concentrations are elevated in the surface layer of low salinity water. Water in the subsurface layer within the Bays is similar in composition as open ocean water beyond the boundaries of the Bays.

- Water chemistry constituents that do not occur in high concentrations in groundwater do not display distinct gradients of distribution, but are often slightly higher in the inner and central Bay relative to open coastal waters. With several exceptions, turbidity and Chl *a* were elevated only at the sampling stations within 200 feet of the shoreline.

- Scaling nutrient concentrations to salinity provides important data on groundwater input to the coastal ocean within the two bays under study. The excellent fit of Si concentrations along the mixing lines created with pristine groundwater indicate that the only freshwater entering the Bays is groundwater; at the time of sampling surface water was not present within the Bays. This result is substantially different than results from a similar study conducted in Honolua Bay on the same day, where surface water from streamflow was evident in landward portion of the bay.

- Subsidies of NO_3^- to Bay waters are evident, likely from human from activities on land. The most likely sources of the subsidies of NO_3^- are leaching of fertilizer nutrients from agriculture, golf course and landscaping. Results of previous surveys in Honolua Bay suggest similar inputs of nutrients has been occurring over the last decade, but appears to be decreasing with time. Elevated levels of NH_4^+ relative to the mixing lines do not appear to be a result of activities on land, but rather from natural biotic reactions within the nearshore ocean.

- Any nutrients entering the Bay via groundwater efflux appear to remain entrained in low density surface strata, and do not come into contact with most benthic organisms that are attached to the floor of

the Bay. As a result, nutrients entering the Bay from both natural and man induced activities do not appear to be causing any negative impacts to either water quality or biotic structure of Honokohua and Napili Bays.

- With the exception of the two samples collected in the shoreline spring at the origin of the Honokohua south transect, the only measurements of water quality constituents from the March 2002 survey that were found to exceed State of Hawaii DOH standards were NO_3^- and NH_4^+. Most of the exceedances occurred for NO_3^- in surface samples on the Honokohua north transect. As discussed above, subsidies of NO_3^- from shoreline activities results in elevated concentrations in the surface layer of offshore water.

- The physical structure of the bays consists of sandy plains separated by rocky headlands that jut seaward from the shoreline and separate the cusp-shaped embayments. Most of the biotic community structure within the Bays consists of coral and algae that have settled on the submerged portions of the rocky headlands. There is little habitation of macrobiota on the sandy floors of the bays due to continual resuspension of sand.

- There have been concerns over the effects to biotic composition of the communities that might result from pumping of potable water for use in the planned resort. Freshwater flow to the ocean is responsible for increased nutrients in the nearshore zone which can result in increased algal growth, which in turn can provide the base for a food-chain of marine resources. There are several reasons why the withdrawal of groundwater from the proposed development will not likely result in alteration to biotic communities. First, the engineering estimates indicate that the project will remove only about 2% of the groundwater flux to the nearshore area, which is well within the natural variability of discharge. Secondly, results of the present study indicate that the nearshore region which is exposed to decreased salinity/increased nutrients is very narrow as a result of the typical physical mixing of water from wind and waves. Thirdly, the area has been subjected to increases in nutrient concentrations in groundwater from agriculture and resort development for decades. Pumpage of a small percentage of groundwater will serve to lower nutrient delivery to the nearshore area, moving the system back toward the level that occurred prior to human activity on the shoreline.

- It is anticipated that follow-up studies duplicating the survey described in this report will take place during the course of development of the project.

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TABLE 1. Water chemistry measurements in Honokohua and Napili Bays collected March 2, 2002 and two groundwater wells located upslope from ocean sampling area sampled May 4, 2001. Abbreviations as follows: S=surface; D=deep; BDL=below detection limit; DFS=distance from shore. Nutrient concentrations are shown in micromolar units (µM). Also shown are the State of Hawaii, Department of Health (DOH) "not to exceed more than 10% of the time" and "not to exceed more than 2% of the time" water quality standards for embayments under "wet" conditions. Shaded and boxed values exceed DOH 2% standards; shaded values exceed 10% limits. For sampling transect locations, see Figure 1.

TRANSECT	NO.	DFS (ft)	PO4 (µM)	NO3 (µM)	NH4 (µM)	Si (µM)	TOP (µM)	TON (µM)	TP (µM)	TN (µM)	TURB (NTU)	SALINITY (o/oo)	CHL a (µg/L)	TEMP (deg.C)	O2 (%sat.)	pH
DOH 10%	STD			1.00	0.61				1.29	17.86	1.25		0.90	*	**	***
	2% STD			1.78	1.07				1.93	25.00	2.00		1.75			
	1S	0	0.19	0.80	1.68	15.88	0.31	6.77	0.50	9.25	0.46	34.290	0.19	23.0	96	8.14
Honokohua	2S	3	0.09	1.08	0.35	14.38	0.36	6.29	0.45	7.73	0.16	34.198	0.18	23.0	90	8.20
North	3S	50	0.12	1.31	0.18	14.17	0.31	5.97	0.43	7.44	0.19	34.321	0.16	23.1	86	8.17
T-1	3D	50	0.11	0.68	0.26	5.61	0.29	5.23	0.40	6.15	0.13	34.773	0.20	23.0	92	8.17
	4S	100	0.09	1.32	0.16	11.68	0.35	4.72	0.44	6.00	0.15	34.460	0.11	23.4	87	8.16
	4D	100	0.16	0.28	0.20	2.67	0.31	4.06	0.47	4.54	0.09	34.998	0.14	23.5	89	8.19
	5S	200	0.07	0.73	0.17	9.39	0.35	6.20	0.42	7.10	0.11	34.578	0.12	23.2	92	8.16
	5D	200	0.07	0.34	0.24	1.67	0.30	5.34	0.37	5.52	0.08	35.010	0.08	23.3	91	8.18
	6S	400	0.12	1.29	0.10	18.91	0.27	5.80	0.39	7.19	0.09	33.985	0.12	23.1	88	8.16
	6D	400	0.08	0.30	BDL	1.35	0.26	6.10	0.34	6.40	0.08	35.014	0.13	23.4	91	8.18
	7S	700	0.11	1.52	0.05	22.56	0.29	5.68	0.40	7.23	0.10	33.788	0.08	23.1	83	8.16
	7D	700	0.08	0.51	0.16	1.85	0.32	6.18	0.40	6.65	0.09	35.017	0.14	23.4	82	8.18
	8S	1100	0.09	0.49	0.05	1.44	0.33	7.54	0.42	8.08	0.07	35.028	0.13	23.4	86	8.18
	8D	1100	0.10	0.53	0.25	1.63	0.31	5.65	0.41	6.43	0.10	35.017	0.14	23.3	86	8.17
	9S	1600	0.08	0.28	0.32	2.21	0.30	6.72	0.36	7.32	0.11	35.014	0.14	23.5	84	8.17
	9D	1600	0.14	0.01	0.20	3.93	0.48	8.40	0.62	8.01	0.10	34.998	0.13	23.3	84	8.17
	1S	0	2.05	111.95	0.05	508.15	0.25	15.75	2.30	127.75	0.09	5.037	0.10	23.1	101	8.10
Honokohua	2S	3	0.17	12.39	0.02	74.74	0.33	8.23	0.50	20.16	0.22	31.100	0.27	23.1	104	8.22
South	3S	50	0.09	0.38	0.16	6.59	0.33	9.26	0.42	9.80	0.20	34.739	0.13	23.1	106	8.20
T-2	3D	50	0.10	0.44	0.11	6.30	0.31	8.26	0.41	8.81	0.19	34.745	0.16	23.0	106	8.20
	4S	100	0.12	0.45	0.27	4.25	0.23	7.40	0.35	8.12	0.20	34.849	0.14	23.3	85	8.18
	4D	100	0.11	0.55	0.56	3.95	0.27	6.71	0.38	7.02	0.17	34.862	0.13	23.2	83	8.18
	5S	200	0.12	0.87	0.72	12.37	0.23	5.23	0.35	6.02	0.15	34.392	0.11	23.3	80	8.16
	5D	200	0.10	0.23	0.22	1.64	0.37	6.72	0.47	7.17	0.13	34.987	0.14	23.3	79	8.17
	6S	400	0.09	0.80	0.45	6.08	0.25	6.15	0.34	7.40	0.11	34.757	0.13	23.5	78	8.17
	6D	400	0.09	0.50	0.13	1.92	0.27	6.33	0.36	6.96	0.08	35.007	0.12	23.4	79	8.18
	7S	700	0.08	0.57	0.45	2.95	0.41	6.87	0.49	7.89	0.08	34.967	0.69	23.5	93	8.18
	7D	700	0.11	0.59	0.11	1.42	0.27	6.14	0.38	6.84	0.09	35.000	0.13	23.4	95	8.18
	8S	1100	0.11	0.65	0.58	4.02	0.29	6.33	0.40	7.56	0.11	34.893	0.78	23.4	98	8.17
	8D	1100	0.12	0.68	0.46	3.46	0.27	4.94	0.39	6.08	0.12	34.906	0.19	23.3	97	8.17
	9S	1600	0.10	0.55	0.22	1.85	0.31	5.21	0.41	5.98	0.08	35.018	0.12	23.5	98	8.18
	9D	1600	0.11	0.55	0.20	2.02	0.33	6.72	0.44	7.47	0.09	34.982	0.13	23.3	98	8.18
	1S	0	0.12	0.61	0.30	14.84	0.32	6.89	0.44	7.80	0.66	34.360	0.73	23.4	89	8.27
Napili	2S	3	0.12	0.62	0.22	14.53	0.34	8.08	0.48	8.92	0.49	34.362	0.58	23.5	92	8.28
T-3	3S	50	0.13	0.88	0.23	7.81	0.30	6.92	0.43	8.03	0.50	34.634	0.44	23.5	92	8.19
	3D	50	0.13	0.86	0.18	7.70	0.31	6.62	0.44	7.66	0.47	34.631	0.52	23.5	93	8.19
	4S	100	0.12	0.70	0.28	8.64	0.37	7.21	0.49	8.19	0.28	34.772	0.31	23.5	90	8.17
	4D	100	0.12	0.80	0.24	5.49	0.29	8.03	0.41	9.07	0.26	34.777	0.28	23.5	90	8.17
	5S	200	0.13	1.12	0.18	6.25	0.28	5.19	0.41	6.49	0.55	34.689	0.22	23.3	99	8.15
	5D	200	0.11	0.74	0.15	4.72	0.31	5.63	0.42	6.52	0.32	34.792	0.62	23.3	99	8.15
	6S	400	0.11	0.64	0.17	4.77	0.34	5.78	0.45	6.59	0.18	34.853	0.26	23.5	92	8.17
	6D	400	0.11	0.63	0.21	4.32	0.29	6.78	0.40	7.62	0.15	34.903	0.28	23.3	88	8.16
	7S	700	0.11	0.52	0.07	4.08	0.28	5.40	0.39	5.99	0.10	34.912	0.27	23.4	85	8.15
	7D	700	0.10	0.61	0.22	2.67	0.31	5.80	0.41	6.63	0.12	34.902	0.25	23.2	84	8.16
	8S	1100	0.11	0.65	0.15	3.55	0.31	6.08	0.42	6.88	0.09	34.931	0.24	23.5	87	8.16
	8D	1100	0.10	0.69	0.13	2.51	0.28	4.71	0.38	5.53	0.10	34.937	0.22	23.2	84	8.16
	9S	1600	0.11	0.41	0.23	1.37	0.34	4.96	0.45	5.60	0.08	35.017	0.12	23.7	94	8.18
	9D	1600	0.09	0.33	0.50	1.21	0.29	6.41	0.38	7.24	0.09	35.042	0.11	23.6	94	8.18
WELL 1 (5938-03)			1.72	14.81	0.33	619	0.80	11.82	2.52	26.95	-	0.081	-	-		-
WELL 2 (5938-02)			1.72	21.05	0.24	598	0.74	9.76	2.46	31.05	-	0.076	-	-		-

* Shall vary no more that 1 °C from "ambient conditions"
** Shall not be less than 75% saturation
*** Shall not deviate more than 0.5 units from a value of 8.1

TABLE 2. Water chemistry measurements in Honokohua and Napili Bays collected March 2, 2002 and two groundwater wells located upslope from ocean sampling area sampled May 4, 2001. Abbreviations as follows: S=surface; D=deep; BDL=below detection limit; DFS=distance from shore. Nutrient concentrations shown in units of micrograms per liter (µg/L). Also shown are the State of Hawaii, Department of Health (DOH) "not to exceed more than 10% of the time" and "not to exceed more than 2% of the time" water quality standards for open coastal waters under "wet" conditions. Shaded and boxed values exceed DOH 2% standards; shaded values exceed 10% standards. For sampling transect locations, see Figure 1.

TRANSECT	NO.	DFS (ft)	PO4 (µg/L)	NO3 (µg/L)	NH4 (µg/L)	Si (µg/L)	TOP (µg/L)	TON (µg/L)	TP (µg/L)	TN (µg/L)	TURB (NTU)	SALINITY (o/oo)	CHL a (µg/L)	TEMP (deg.C)	O2 (%sat.)	pH
DOH 10%	STD			14.00	8.50				40.00	250.0	1.25		0.90	*	**	***
	2% STD			25.00	15.00				60.00	350.0	2.00		1.75			
	1S	0	5.89	11.20	23.52	446.23	9.61	94.78	15.50	129.50	0.46	34.290	0.19	23.0	96	8.14
Honokohua	2S	3	2.79	15.26	4.90	404.08	11.16	88.06	13.95	108.22	0.16	34.198	0.18	23.0	90	8.20
North	3S	50	3.72	18.34	2.24	398.18	9.61	83.58	13.33	104.16	0.19	34.321	0.16	23.1	86	8.17
T-1	3D	50	3.41	9.24	3.64	157.64	8.99	73.22	12.40	86.10	0.13	34.773	0.20	23.0	92	8.17
	4S	100	2.79	18.68	2.24	328.21	10.85	66.08	13.64	84.00	0.15	34.460	0.11	23.4	87	8.16
	4D	100	4.96	3.92	2.80	75.03	9.61	56.84	14.57	63.56	0.09	34.998	0.14	23.5	89	8.19
	5S	200	2.17	10.22	2.38	263.86	10.85	86.80	13.02	99.40	0.11	34.578	0.12	23.2	92	8.16
	5D	200	2.17	4.76	3.36	46.93	9.30	74.76	11.47	82.88	0.08	35.010	0.08	23.3	91	8.18
	6S	400	3.72	18.06	1.40	531.37	8.37	81.20	12.09	100.66	0.09	33.985	0.12	23.1	88	8.16
	6D	400	2.48	4.20	bdl	37.94	8.06	85.40	10.54	89.60	0.08	35.014	0.13	23.4	91	8.18
	7S	700	3.41	21.28	0.70	633.94	8.99	79.24	12.40	101.22	0.10	33.788	0.08	23.1	83	8.16
	7D	700	2.48	7.14	2.24	51.99	9.92	86.52	12.40	95.90	0.09	35.017	0.14	23.4	82	8.18
	8S	1100	2.79	6.86	0.70	40.46	10.23	105.56	13.02	113.12	0.07	35.028	0.13	23.4	86	8.18
	8D	1100	3.10	7.42	3.50	45.80	9.61	79.10	12.71	90.02	0.10	35.017	0.14	23.3	86	8.17
	9S	1600	1.86	3.92	4.48	62.10	9.30	94.08	11.16	102.48	0.11	35.014	0.14	23.5	84	8.17
	9D	1600	4.34	0.14	2.80	110.43	14.88	89.60	19.22	92.54	0.10	34.998	0.13	23.3	84	8.17
	1S	0	63.55	1567.30	0.70	14279.02	7.75	220.50	71.30	1788.50	0.09	5.037	0.10	23.1	101	8.10
Honokohua	2S	3	5.27	173.46	0.28	2100.19	10.23	115.22	15.50	288.96	0.22	31.100	0.27	23.1	104	8.22
South	3S	50	2.79	5.32	2.24	165.18	10.23	129.64	13.02	137.20	0.20	34.739	0.13	23.1	106	8.20
T-2	3D	50	3.10	6.16	1.54	177.03	9.61	115.64	12.71	123.34	0.19	34.745	0.16	23.0	106	8.20
	4S	100	3.72	6.30	3.78	119.43	7.13	103.60	10.85	113.68	0.20	34.849	0.14	23.3	85	8.18
	4D	100	3.41	7.70	7.84	111.00	8.37	93.94	11.78	109.48	0.17	34.862	0.13	23.2	83	8.18
	5S	200	3.72	12.18	10.08	347.60	7.13	73.22	10.85	95.48	0.15	34.392	0.11	23.3	80	8.16
	5D	200	3.10	3.22	3.08	46.08	11.47	94.08	14.57	100.38	0.13	34.987	0.14	23.3	79	8.17
	6S	400	2.79	11.20	6.30	170.85	7.75	86.10	10.54	103.60	0.11	34.757	0.13	23.5	78	8.17
	6D	400	2.79	7.00	1.82	53.95	8.37	88.62	11.16	97.44	0.08	35.007	0.12	23.4	79	8.18
	7S	700	2.48	7.98	6.30	82.90	12.71	96.18	15.19	110.46	0.08	34.967	0.69	23.5	93	8.18
	7D	700	3.41	8.26	1.54	39.90	8.37	85.96	11.78	95.76	0.09	35.000	0.13	23.4	95	8.18
	8S	1100	3.41	9.10	8.12	112.96	8.99	88.62	12.40	105.84	0.11	34.893	0.78	23.4	98	8.17
	8D	1100	3.72	9.52	6.44	97.23	8.37	69.16	12.09	85.12	0.12	34.906	0.19	23.3	97	8.17
	9S	1600	3.10	7.70	3.08	51.99	9.61	72.94	12.71	83.72	0.08	35.018	0.12	23.5	98	8.18
	9D	1600	3.41	7.70	2.80	56.76	10.23	94.08	13.64	104.58	0.09	34.982	0.13	23.3	98	8.18
	1S	0	3.72	8.54	4.20	417.00	9.92	96.46	13.64	109.20	0.66	34.360	0.73	23.4	89	8.27
Napili	2S	3	3.72	8.68	3.08	408.29	10.54	113.12	14.26	124.88	0.49	34.362	0.58	23.5	92	8.28
T-3	3S	50	4.03	12.32	3.22	219.46	9.30	96.88	13.33	112.42	0.50	34.634	0.44	23.5	92	8.19
	3D	50	4.03	12.04	2.52	216.37	9.61	92.68	13.64	107.24	0.47	34.631	0.52	23.5	93	8.19
	4S	100	3.72	9.80	3.92	186.58	11.47	100.94	15.19	114.66	0.28	34.772	0.31	23.5	90	8.17
	4D	100	3.72	11.20	3.36	154.27	8.99	112.42	12.71	126.98	0.26	34.777	0.28	23.5	90	8.17
	5S	200	4.03	15.68	2.52	175.63	8.68	72.66	12.71	90.86	0.55	34.689	0.22	23.3	99	8.15
	5D	200	3.41	10.36	2.10	132.63	9.61	78.82	13.02	91.28	0.32	34.792	0.62	23.3	99	8.15
	6S	400	3.41	8.96	2.38	134.04	10.54	80.92	13.95	92.26	0.16	34.853	0.26	23.5	92	8.17
	6D	400	3.41	8.82	2.94	121.39	8.99	94.92	12.40	106.68	0.15	34.903	0.28	23.3	88	8.16
	7S	700	3.41	7.28	0.98	114.65	8.68	75.60	12.09	83.86	0.10	34.912	0.27	23.4	85	8.15
	7D	700	3.10	8.54	3.08	75.03	9.61	81.20	12.71	92.82	0.12	34.902	0.25	23.2	84	8.16
	8S	1100	3.41	9.10	2.10	99.76	9.61	85.12	13.02	98.32	0.09	34.931	0.24	23.5	87	8.16
	8D	1100	3.10	9.66	1.82	70.53	8.68	65.94	11.78	77.42	0.10	34.937	0.22	23.2	84	8.16
	9S	1600	3.41	5.74	3.22	38.50	10.54	69.44	13.95	78.40	0.08	35.017	0.12	23.7	94	8.18
	9D	1600	2.79	4.62	7.00	34.00	8.99	89.74	11.78	101.36	0.09	35.042	0.11	23.6	94	8.18
WELL 1 (5938-03)			53.37	207.27	4.55	17394	24.85	165.41	78.22	377.23	-	0.081	-	-		-
WELL 2 (5938-02)			53.25	294.71	3.41	16795	22.99	136.65	76.24	434.77	-	0.076	-	-		-

* Shall vary no more that 1 °C from "ambient conditions"
** Shall not be less than 75% saturation
*** Shall not deviate more than 0.5 units from a value of 8.1

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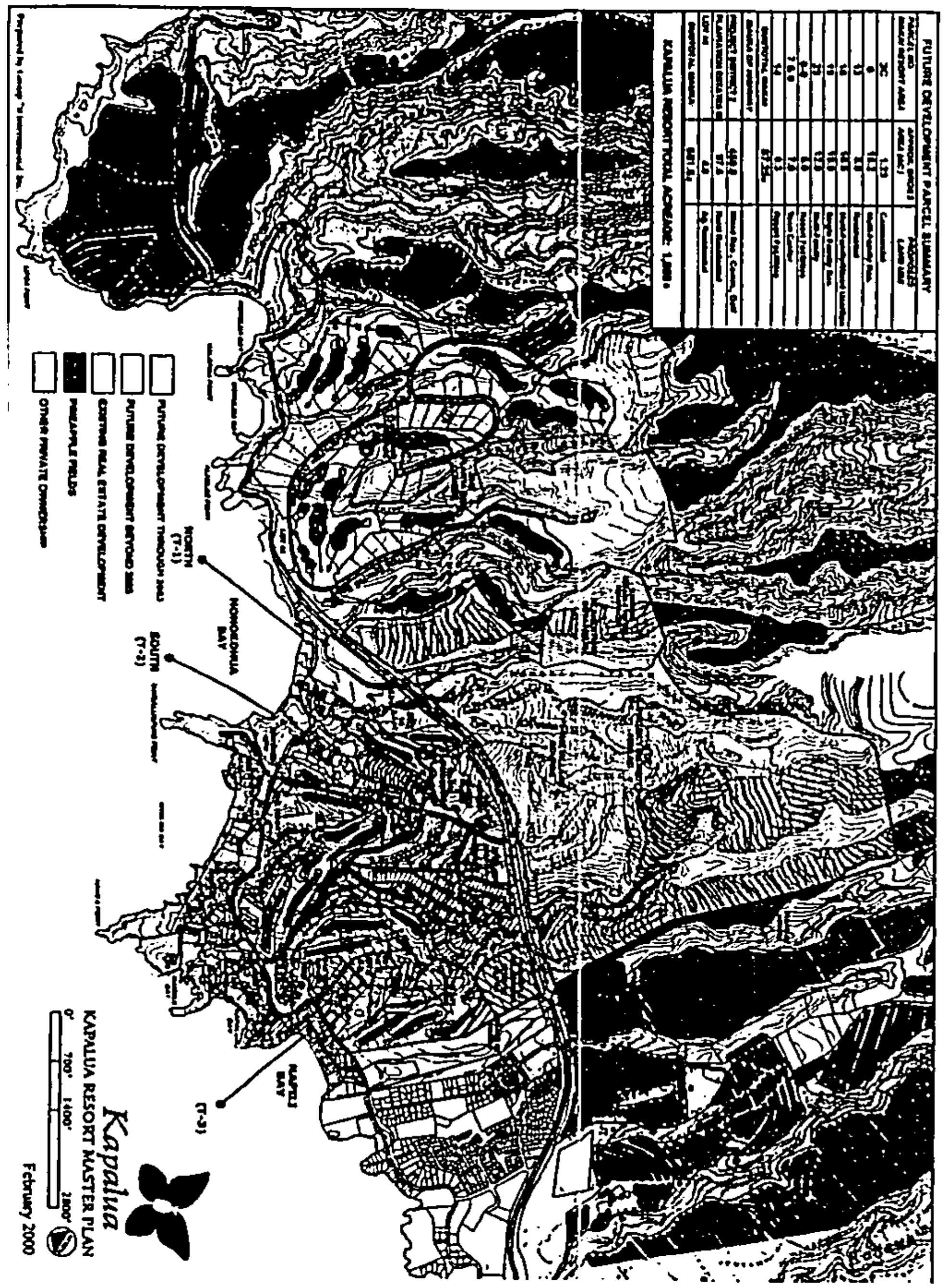

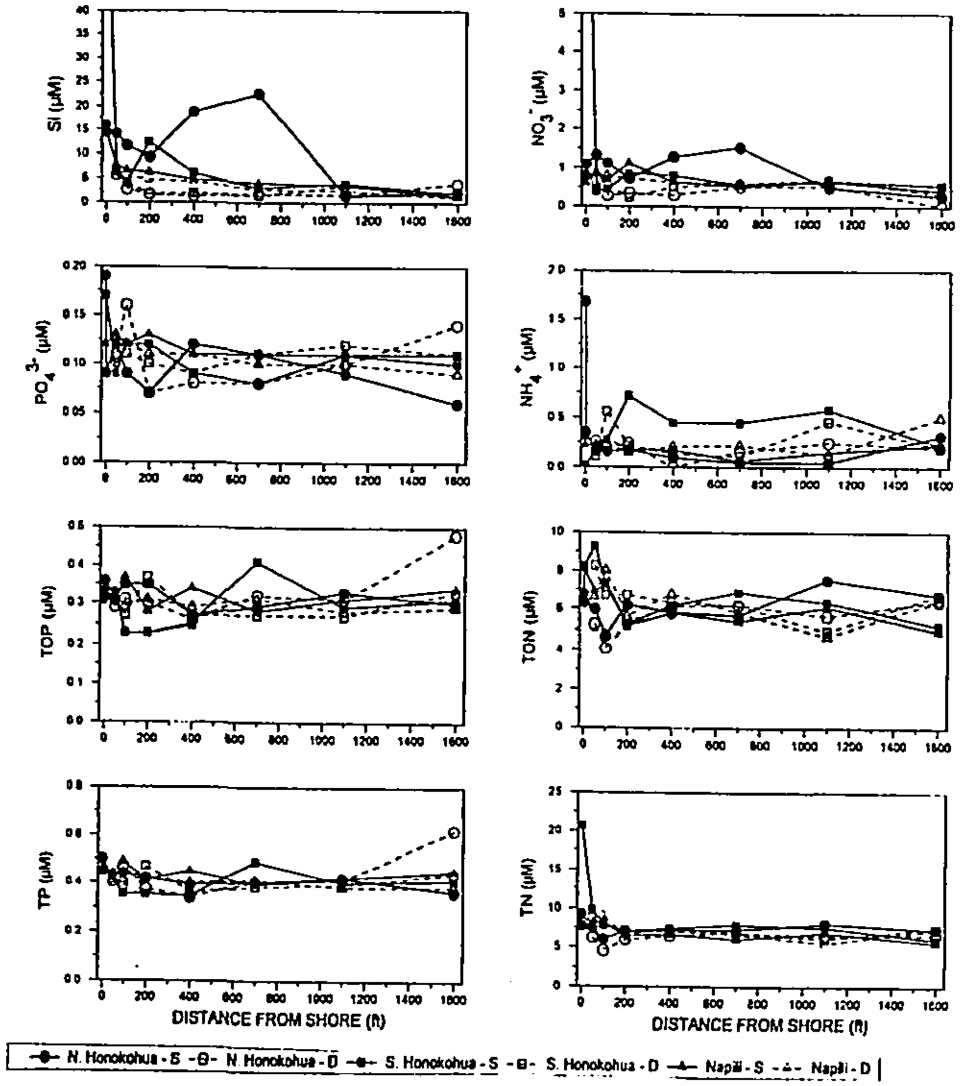

FIGURE 2. Plots of dissolved nutrients in surface (S) and deep (D) samples collected along two transects in Honokohua Bay and one transect in Napili Bay on March 2, 2002 as a function of distance from the shoreline. For transect locations, see Figure 1.

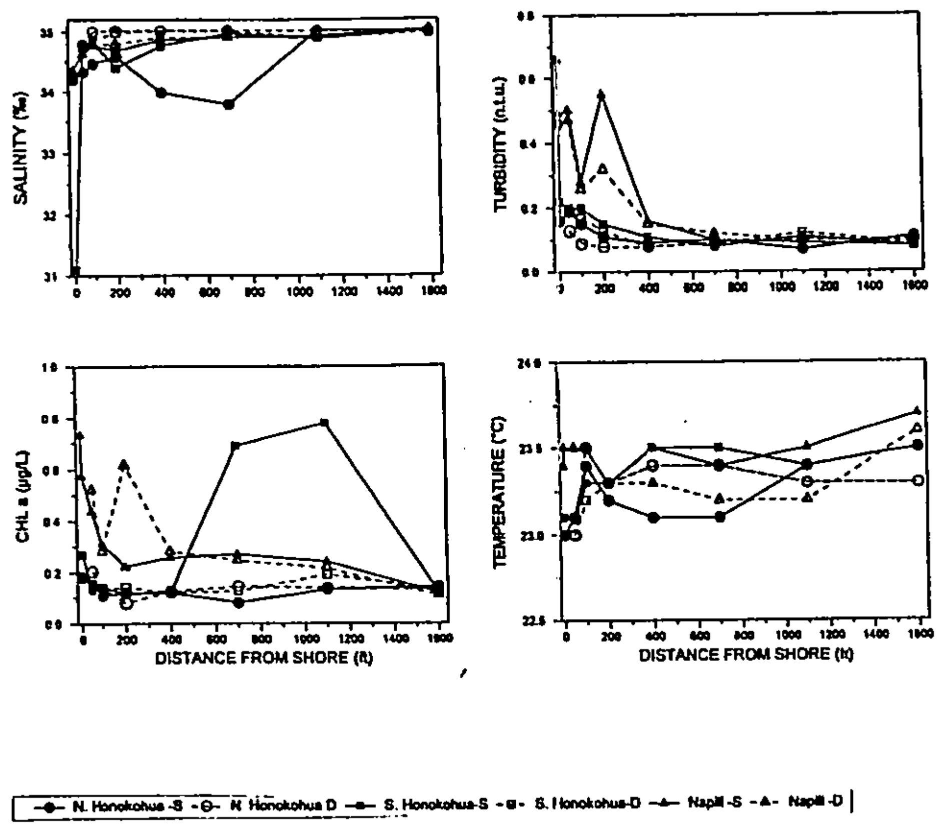

FIGURE 3. Plots of water chemistry constituents in surface (S) and deep (D) samples collected along two transects in Honokohua Bay and one transect in Napili Bay on March 2, 2002 as a function of distance from the shoreline. For transect locations, see Figure 1.

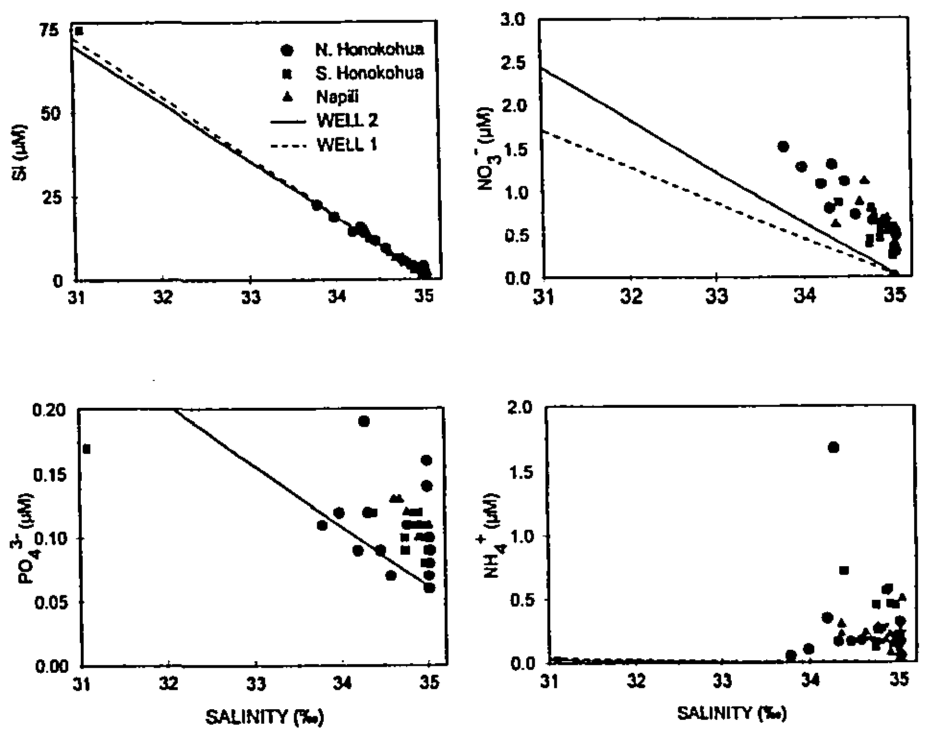

FIGURE 4. Mixing diagram showing concentration of dissolved nutrients from samples collected along two transects in Honokohua Bay and one transect in Napili Bay in March 2002 as functions of salinity. Straight lines in each plot are conservative mixing lines constructed by connecting the concentrations in open ocean water with water from two groudwater wells upslope of the sampling area. For transect locations, see Figure 1.

Appendix J

Traffic Impact Analysis Report

TRAFFIC IMPACT ANALYSIS

KAPALUA PD-2
KAPALUA, MAUI, HAWAII

December 2001

PARSONS BRINCKERHOFF QUADE & DOUGLAS

Over a Century of Engineering Excellence

TRAFFIC IMPACT ANALYSIS

KAPALUA PD-2
KAPALUA, MAUI, HAWAII

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TRAFFIC IMPACT ANALYSIS

KAPALUA PD-2
Kapalua, Maui, Hawaii

December 2001

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16251A.01

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

I. INTRODUCTION

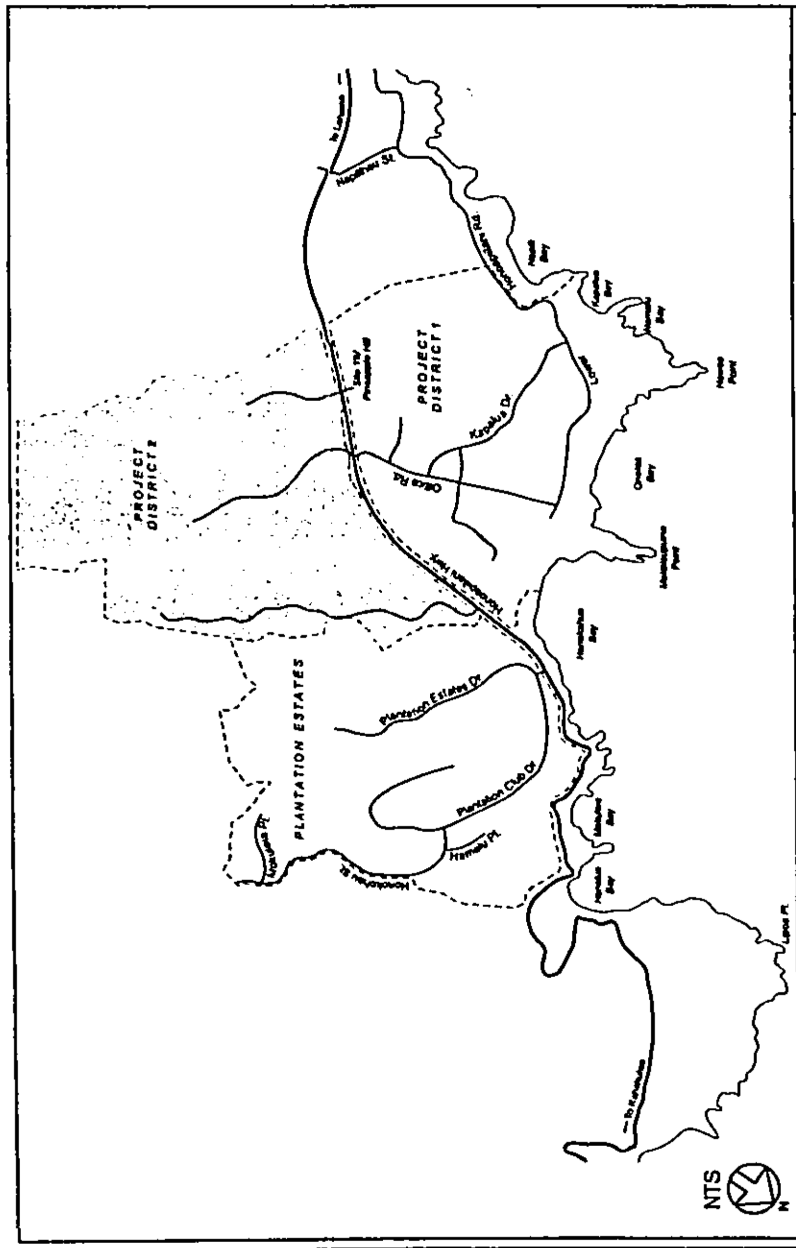
Kapalua Resort is an established visitor resort development located in the northern part of West Maui. It currently includes three golf courses, a golf academy, a tennis complex, a boutique shopping center, the Ritz-Carlton and the Kapalua Bay Hotels, and detached and attached resort residential. Figure 1 illustrates the location of the Kapalua Resort. The majority of this development is located within Project District – 1 (PD-1), located makai of Honoapiilani Highway. Mauka of the Highway is the Plantation Estates, The Plantation Golf Course, and 16 holes of The Village Golf Course.

A. Traffic Impact Analysis for Proposed PD-2

Kapalua Land Company is proposing to continue the development of Kapalua Resort by proceeding with Project District – 2 (PD-2), located directly mauka of PD-1, across Honoapiilani Highway. PD-2 would include an additional 9 golf course holes, a clubhouse, and single-family and multi-family residential uses. Kapalua PD-2 is proposed to access Honoapiilani Highway at three locations: opposite the existing Office Road, between the existing Site 19/Pineapple Hill Service Access and Napilihau Street, and north of Office Road. Figure 2 illustrates a conceptual development plan for PD-2. This report documents the assumptions and methodology used to conduct a traffic impact analysis for the PD-2 development and summarizes the results and recommendations of the analysis.

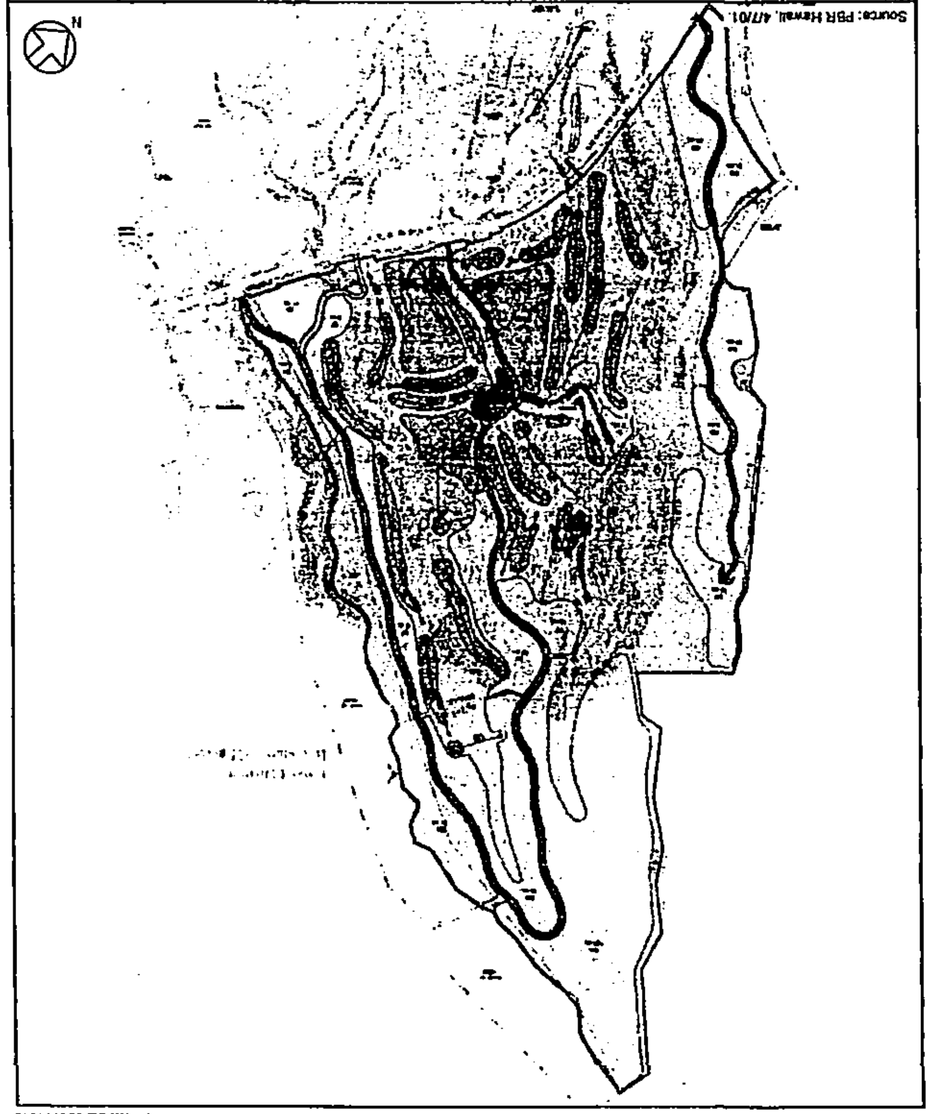
B. Traffic Analysis For The Buildout of Kapalua Resort

One of the conditions included in approval of recent SMA applications for Kapalua developments in PD-1 was the completion of a traffic impact analysis of the entire Kapalua Resort Development. It was agreed by the County of Maui and State of Hawaii agencies that the traffic impact analysis for PD-2 would be an appropriate vehicle for this analysis. This analysis would include not only the proposed PD-2 development but also future developments located in PD-1 and the Plantation Estates areas. The purpose of the study would be to identify the long-range traffic impacts of the Kapalua Resort to the Honoapiilani Highway corridor between Kapalua and Honokowai. This report also documents the results of this long-range traffic analysis of Kapalua Resort Development, thereby satisfying the conditions of the PD-1 SMA permits.



LOCATION MAP

Figure 1



Source: PBR Hawaii, 4/7/01.

CONCEPTUAL SITE PLAN

Figure 2

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II. EXISTING CONDITIONS

A. Existing Roadway System

Existing roadways and intersections relevant to this study include the following:

- Honoapiilani Highway

  Honoapiilani Highway is an arterial highway that is oriented in the north-south direction within the Kapalua area. It is the main route providing north-south mobility in West Maui and provides primary connection between West Maui and the rest of Maui. From Nakalele Point to Honokowai, it is a two-lane, undivided roadway. Between Honokowai and south Lahaina, it is a four-lane, undivided roadway. From south Lahaina to Wailuku, it is again a two-lane, undivided roadway. The segment of Honoapiilani Highway analyzed in this study extends from Office Road on the north to Lower Honoapiilani Road in Honokowai. The posted speed limit on Honoapiilani Highway is 45 miles per hour in this segment.

- Office Road

  Office Road is the main mauka-makai circulator roadway that serves the Kapalua resort. It provides direct access to various facilities in this area including the Village Golf Course and Golf Course Academy, Ritz-Carlton Kapalua Hotel, Kapalua Tennis Complex, Kapalua Art School and Honolua Store. It also provides access to Simpson Way and the existing resort residential development of Pineapple Hill. This two-lane collector extends from Honoapiilani Highway to Lower Honoapiilani Road. The intersections of Office Road with Honoapiilani Highway and Lower Honoapiilani Road operate as unsignalized intersections with STOP signs controlling Office Road. It is currently an undivided road with approximately 10-foot travel lanes and a posted speed limit of 25 miles per hour.

- Pineapple Hill/Site 19 Service Access

  This is an existing driveway on the makai side of Honoapiilani Highway that currently provides service vehicles access to the Pineapple Hill subdivision. At some time in the future, this service access may serve resident traffic from

Pineapple Hill and Site 19 developments. If this were to occur, this access would be gated and card-controlled. Residents of Pineapple Hill currently access the subdivision via Simpson Way off of Office Road, internal to Kapalua Resort. The Simpson Way access is gated with card-control access. The proposed Site 19 resort residential development will also be accessed via Simpson Way. STOP-sign control is currently in place at the makai approach to Honoapiilani Highway.

- Napilihau Street is a two-lane road that provides mauka-makai access between Honoapiilani Highway and Lower Honoapiilani Road. The Napili Plaza commercial development and residential subdivisions are provided access by this roadway. The intersection of Napilihau Street with Honoapiilani Highway is signalized, while the intersection of Napilihau Street and Lower Honoapiilani Road is unsignalized with STOP-sign control on the Napilihau Street approach. Napilihau Street has a posted speed limit of 25 miles per hour.

- Hoohui Road is a two-lane road that provides mauka-makai access between Honoapiilani Highway and Lower Honoapiilani Road. The Kahana Gateway commercial development is located north of Hoohui Road. The intersection of Honoapiilani Highway and Hoohui Road is signalized, while the intersection of Lower Honoapiilani Road and Hoohui Road is unsignalized with STOP-sign control on the Hoohui Road approach.

- Akahele Street is a two-lane road that provides mauka-makai access between Honoapiilani Highway and Lower Honoapiilani Road. It also provides access to the Kapalua West Maui Airport located mauka of Honoapiilani Highway. The Honoapiilani Highway/Akahele Street intersection is signalized, while the Lower Honoapiilani Road/Akahele Street intersection is unsignalized with STOP-sign control on the Akahele Street approach.

- Lower Honoapiilani Road is the old Honoapiilani Highway. It is a two-lane, undivided roadway that runs parallel to Honoapiilani Highway starting at Kapalua Resort and extending south to intersect Honoapiilani Highway just south of the Honokowai Stream bridge. The Honoapiilani Highway/Lower Honoapiilani Road intersection is signalized. The segment of Honoapiilani Highway between

Honokowai Stream and Kaanapali Parkway was recently widened from two to four lanes.

B. Existing Traffic Conditions

Manual turning movement traffic counts were collected from previous studies such as the Kapalua Golf Academy Traffic Impact Analysis (February 1998), Kapalua Site 29 Traffic Impact Analysis (May 1998), Kapalua Site 19 Traffic Impact Analysis (April 1999), and the West Maui Traffic Safety and Noise Study (April 2000), and traffic counts conducted by the State of Hawaii Department of Transportation.

These traffic volumes were adjusted to update them to the current year and are summarized in Figure 3.

The intersections along Honoapiilani Highway from Office Road to Lower Honoapiilani Road were evaluated based on the existing roadway conditions previously described and using the methodologies for signalized and unsignalized intersections outlined in the 2000 Highway Capacity Manual. Operating conditions are expressed as a qualitative measure known as Level-of-Service (LOS) with a letter designation ranging from A to F. LOS A represents free-flow operating conditions and LOS F represents congested conditions. Level-of-Service definitions are included in Appendix B at the end of this report.

Table 1 summarizes the existing intersection level of service within the Honoapiilani Highway study corridor. Overall, the operational analysis of the existing conditions along the Honoapiilani Highway study corridor confirms that the intersections operate well for peak hour conditions. Most approach and movement LOS are C or better. The recent signalization of the Honoapiilani Highway/Napilihau Street intersection resulted in significant reductions in delay for the Napilihau Street and Maui Pineapple Baseyard approaches.

The Honoapiilani Highway/Lower Honoapiilani Road intersection operations are much improved after the completion of the Honoapiilani Highway widening between the Honokowai Bridge area and Kaanapali Drive. This still remains a busy intersection but it operates acceptably for peak hour conditions.

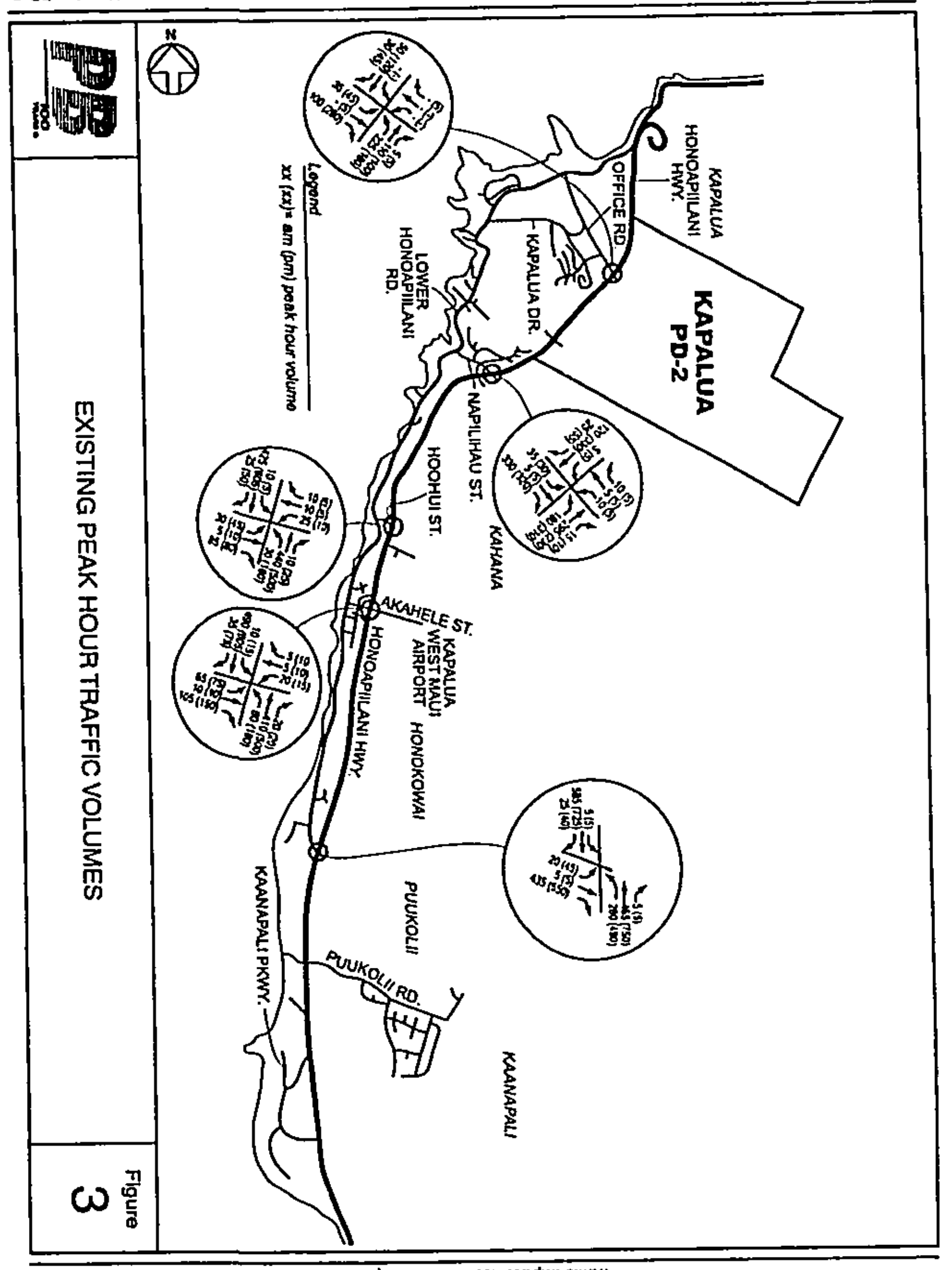


Figure 3

EXISTING PEAK HOUR TRAFFIC VOLUMES

Table 1
Existing Conditions
Levels-of-Service (LOS) Summary

Intersection (Movements)	AM Peak Hour LOS	AM Peak Hour Delay (sec/veh)	PM Peak Hour LOS	PM Peak Hour Delay (sec/veh)
Honoapiilani Hwy./Office Road		**unsignalized**		
Northbound Left	A	7.8	A	7.9
Southbound Left	-	-	-	-
Westbound PD-2 Access	-	-	-	-
Eastbound Office Road	B	11.0	B1	11.3
Honoapiilani Hwy./Site 19		**unsignalized**		
Northbound Left	-	-	-	-
Southbound Left	-	-	-	-
Westbound PD-2 Access	-	-	-	-
Eastbound PD-2 Access	-	-	-	-
Honoapiilani Hwy./Napilihau St.	**B**	**9.4**	**B**	**11.8**
Northbound Honoapiilani	B	9.3	B	12.3
Southbound Honoapiilani	B	13.2	C	15.3
Westbound Maui Pine Access	B	14.8	C	15.9
Eastbound Napilihau Street	B	7.5	B	8.1
Honoapiilani Hwy./Hoohui St.	**B**	**11.3**	**B**	**11.1**
Northbound Honoapiilani	A	8.1	A	8.6
Southbound Honoapiilani	A	8.0	A	9.3
Westbound	C	28.8	C	28.4
Eastbound Hoohui Street	C	29.7	C	29.7
Honoapiilani Hwy./Akahele St.	**B**	**12.3**	**B**	**12.9**
Northbound Honoapiilani	A	8.3	A	9.9
Southbound Honoapiilani	A	9.0	A	9.7
Westbound Akahele Street	C	27.8	C	27.8
Eastbound Akahele Street	C	29.5	C	30.4
Honoapiilani Hwy./Lower Honoapiilani	**C**	**22.2**	**C**	**33.6**
Northbound Honoapiilani	B	12.2	C	33.7
Southbound Honoapiilani	C	21.2	C	25.9
Westbound Maint. Access	E	57.3	E	57.3
Eastbound Lower Honoapiilani	D	38.1	D	42.5

Notes: **XXX** Overall intersection LOS (Weighted average of turning movement LOS)
XXX Turning movement or approach LOS.

In summary, the existing Honoapiilani Highway corridor between Lower Honoapiilani Road in Honokowai and Office Road in Kapalua operates well during the peak hours. There is available capacity for traffic growth in this corridor.

III. TRAVEL DEMAND ESTIMATION

Future traffic volumes at full buildout of the Kapalua Resorts (including the proposed PD-2) consist of three components: traffic generated by the proposed PD-2 area, traffic generated by the buildout of the existing PD-1 and Plantation areas, and regional traffic growth not associated with Kapalua. The Maui Long-Range Land Transportation Plan, February 1997, was used as a basis for the regional traffic growth component. The PD-2 and buildout of PD-1/Plantation areas components were estimated using trip generation relationships documented in the Institute of Transportation Engineers (ITE) publication, Trip Generation, 6th Edition.

Future Year 2020 traffic volumes will be estimated for two conditions: Year 2020 without PD-2 and Year 2020 with PD-2. The Year 2020 without PD-2 traffic volumes includes the buildout of PD-1 and the regional traffic growth component. The Year 2020 with PD-2 traffic volumes adds the traffic generated by the proposed PD-2.

A. Buildout of PD-1 and Plantation Parcels

There are parcels within the approved PD-1 and the Plantation Golf Course area that were not in place at the time traffic data were collected. The following parcels remain for development:

- Parcel 6 — 100 attached du*
- Parcel 13 — 40 attached du
- Parcel 16 — Golf Academy (already completed)
- Parcel 18 — 40 attached du, 20,000 sf Spa
- Parcel 19 — 31 detached du
- Parcel 29 — 36 attached du
- Parcel 6-0 — 20,000 sf warehouse/maint.
- Parcel 7/8 — 40,000 sf commercial
- Parcel 14 — 15,000 sf warehouse/office
- Plantation Estates II — 22 detached du

*du=dwelling unit, sf=square feet of floor area

This totals to 216 attached du, 53 detached du, 40,000 sf commercial, 35,000 sf warehouse/maintenance/office, and 20,000 sf Spa. The warehouse/maintenance/office parcel is a re-build and consolidation of existing uses within Kapalua Resort. As a result, this development is not expected to generate new traffic. The commercial and Spa uses target Resort guests, and a substantial proportion of trips associated with them are projected to remain within the Kapalua Resort. It was assumed that 50 percent of the retail trips remain within the Kapalua area, while 90 percent of the Spa trips remain within the Kapalua area. Kapalua Resort also provides on-demand shuttle service for guests staying in Kapalua. This shuttle service will serve much of this internal demand, further reducing traditional auto trip making within the resort.

Table 2 summarizes the estimated external vehicle trips from these uses.

Table 2
Trip Generation Summary
Peak Hour External Vehicle Trips
PD-1 Vacant Parcels and Plantation Estates

Land Use	ITE Code	Intensity	AM Peak Hour		PM Peak Hour	
			In	Out	In	Out
PD-1 Vacant Parcels						
Resort Single Family	260	76 du	11	12	8	12
Resort Multi Family	330	218 du	64	38	64	64
Resort Retail	820	40,000 sf	28	18	83	89
Resort Spa	493	20,000 sf	4	4	4	4
Warehouse/Maint.	710	20,000 sf	-	-	-	-
Warehouse/Office	710	15,000 sf	-	-	-	-
Sub-Total PD-1 Vacant Parcels			107	72	159	169
Plantation Estates						
Plantation Estates II	260	22 du	2	1	2	3
Total PD-1 and Plantation Estates			109	73	161	172

Notes: du=dwelling unit, sf=square feet floor area, traffic volumes are in vehicles per hour
Trip generation relationship per ITE Code in Trip Generation, 6th edition.

B. Year 2020 Regional Travel Demand

Traffic forecasts from the Maui Long-Range Land Transportation Plan, February 1997, were used as a basis for estimating future traffic growth in the Honoapiilani Highway study corridor. Implicit in these future forecasts is the assumption of the completion of the Lahaina Bypass from Puamana to Honokowai. In the study for Kapalua PD-2, major intersections on Honoapiilani Highway between Kapalua and Honokowai were analyzed.

Within this context, the future Lahaina Bypass affects mainly the Honoapiilani Highway/Lower Honoapiilani Road intersection. The future Lahaina Bypass would divert a portion of the traffic demand that is now concentrated on Honoapiilani Highway. Based on review of the Maui Long-Range Land Transportation Plan, it appears that approximately 40 percent of the trips in this corridor would utilize the future Lahaina Bypass instead of Honoapiilani Highway. The future Lahaina Bypass would likely change traffic patterns at the Honoapiilani Highway/Lower Honoapiilani Road intersection. The new Lahaina Bypass is proposed to intersect Honoapiilani Highway north of the Lower Honoapiilani Road intersection. It is close enough to Lower Honoapiilani Road, however, that a portion of traffic to and from Lower Honoapiilani Road (assumed to be the same as the portion diverted off of Honoapiilani Highway) would choose to use it. This would even out the proportions of turn movements to and from the north and south at this intersection. Currently the turn movements are oriented mainly to the south (to and from Lahaina). It is forecasted that the turn movements to the north (to and from the Bypass) would increase significantly.

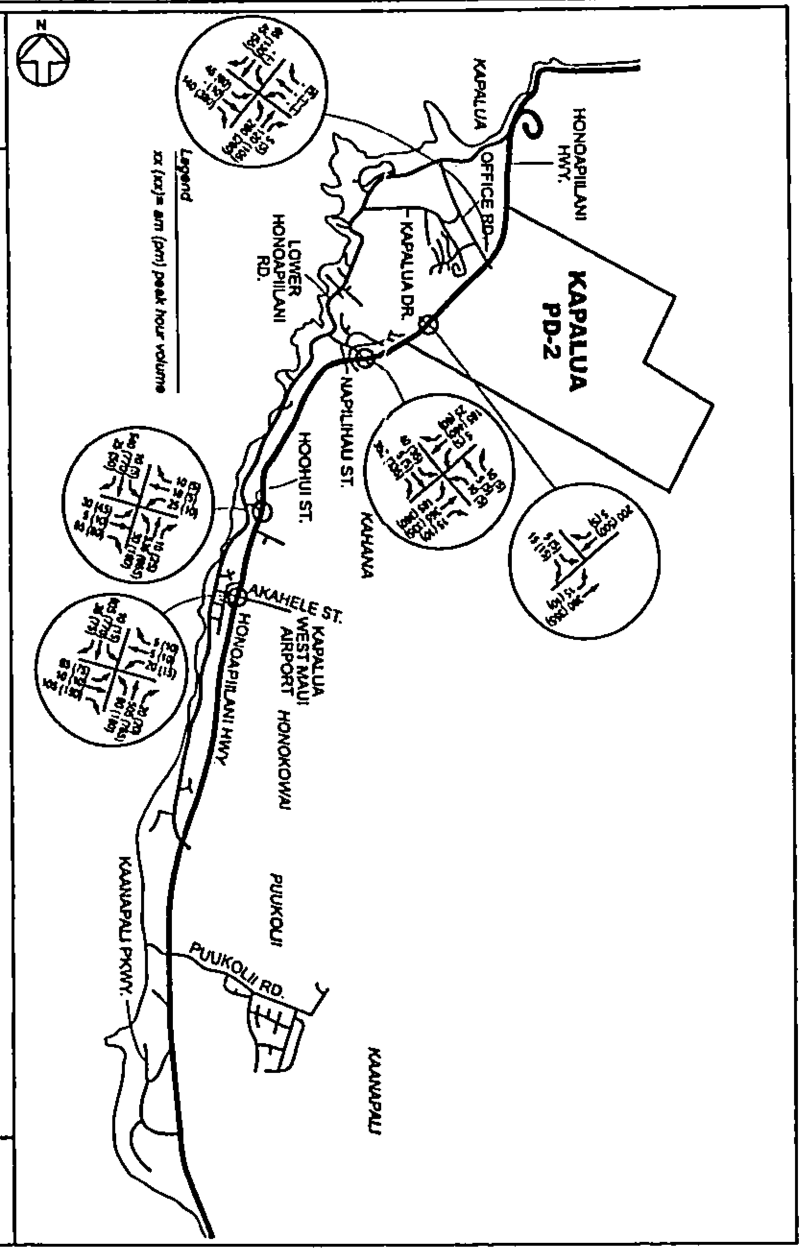
C. Year 2020 PD-1/Plantation Estates Buildout and Regional Traffic

The PD-1/Plantation Estates external traffic was added to the Year 2020 regional traffic forecasts to create a Year 2020 without PD-2 traffic volume forecast. Figure 4 summarizes the forecasted AM and PM peak hour traffic volumes for this scenario.

D. PD-2 Development

The proposed PD-2 development and the corresponding vehicular trip generation is shown in Table 3. As shown, 390 single family and 300 multi-family resort residential units are proposed. In addition, the existing Village Golf Course is expanded by an additional 9 holes.

The resort residential units are expected to be more rural in character than those already located within Kapalua Resort. However, their operational characteristics are expected to be similar. Many of the owners of such units occupy them for only certain times during the year.



PROJECTED YEAR 2020
PEAK HOUR VOLUMES WITHOUT PD-2

Figure 4

Table 3
Trip Generation Summary
Peak Hour Vehicle Trips
PD-2 Development

Land Use	ITE Code	Intensity	AM Peak Hour In	AM Peak Hour Out	PM Peak Hour In	PM Peak Hour Out
Resort Single Family Rural	260	80 du	9	4	9	12
Plantation Estates III Access		80 du	9	4	9	12
Resort Single Family Rural	260	70 du	8	3	8	10
Resort Single Family Urban	260	100	11	5	11	15
Resort Multi Family	330	300 du	75	29	63	83
Office Road Access		470 du	94	37	82	108
Resort Single Family Rural	260	32 du	3	2	3	5
Resort Single Family Urban	260	108 du	12	5	12	16
South Access		140 du	15	7	15	21
Total PD-2			118	48	106	141

Notes: du=dwelling unit, traffic volumes are in vehicles per hour
Trip generation relationship per ITE Code in Trip Generation, 6th edition

These estimated traffic volumes were distributed according to existing travel patterns in the Kapalua areas as follows:

- North on Honoapiilani Highway 10%
- To/From Kapalua Resort (makai of Honoapiilani) 25%
- South on Honoapiilani Highway 65%

These traffic volumes were assigned to the Plantation Estates III, Office Road and south access and added to the assignment of buildout of PD-1/Plantation Estates and regional traffic growth shown in Figure 4.

The resulting Year 2020 peak hour traffic volumes with the PD-2 Development is summarized in Figure 5.

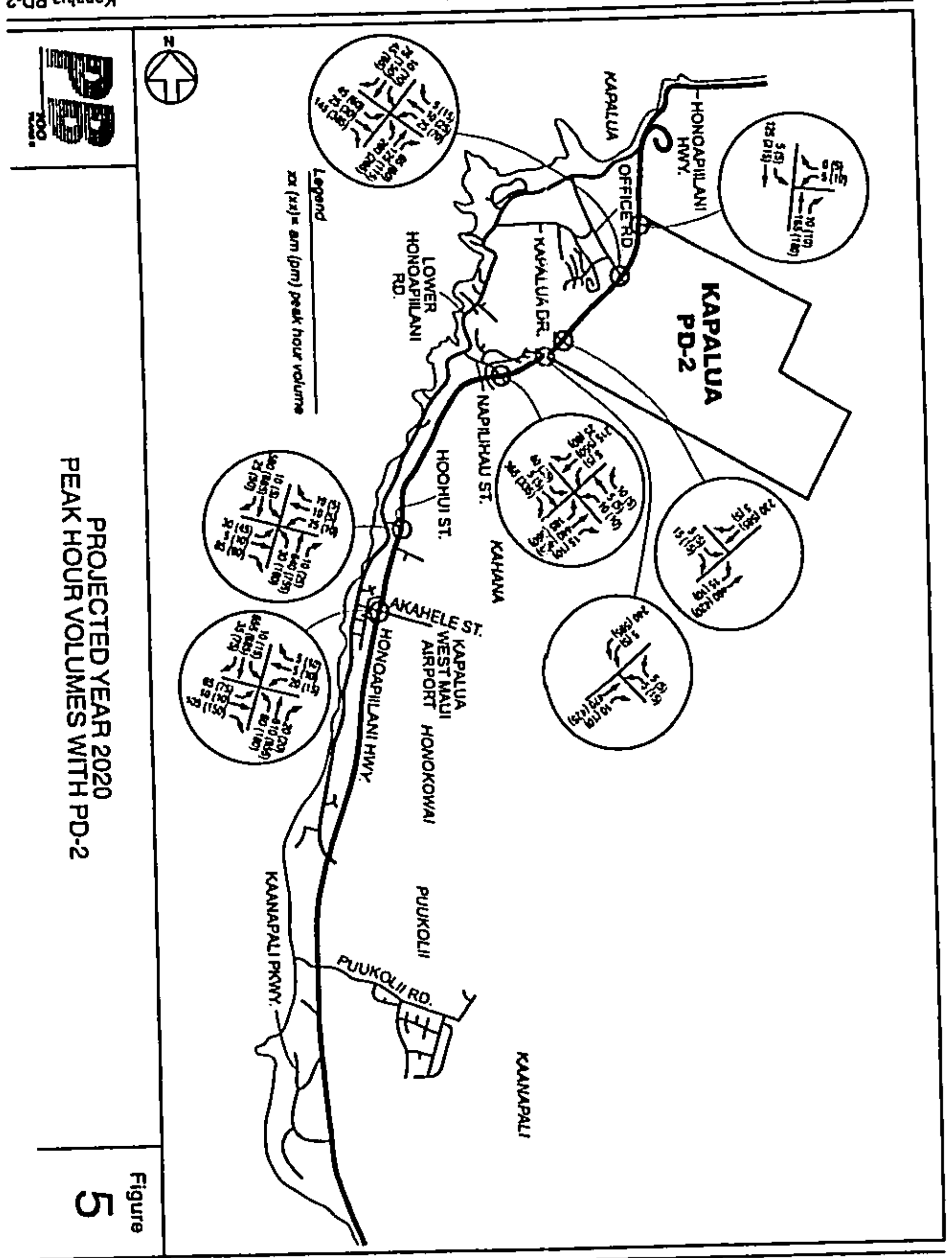


Figure 5

PROJECTED YEAR 2020
PEAK HOUR VOLUMES WITH PD-2

IV. FUTURE TRAFFIC CONDITIONS WITHOUT PD-2

A. Background

In a typical traffic impact analysis study, the future traffic conditions without the proposed development serves primarily as a baseline forecast. Traffic impacts caused by traffic increases in excess of the baseline forecast are attributed to the proposed development.

In this study, this is one of the purposes of the future traffic conditions without the proposed development. However, an additional use for this forecast is to fulfill the conditions contained in the SMA approvals for several Kapalua projects within PD-1, namely the Kapalua Golf Academy, Site 29, and Site 19. The condition in the SMA approvals pertain to the State of Hawaii Department of Transportation's (SDOT) concern that traffic impacts of individual developments within Kapalua could not be identified without considering the full buildout of the Kapalua Resort. Therefore, while acknowledging that the individual Kapalua Golf Academy, Site 29, and Site 19 developments did not have significant traffic impacts, SDOT stated the Kapalua Resort could have a significant impact once all of its components are built out. The condition required the evaluation of intersections along Honoapiilani Highway from Office Road in Kapalua to Lower Honoapiilani Road in Honokowai.

This part of the analysis in this report addresses the PD-1 and Plantation Estates portions of the Kapalua Resort. These are treated separately from the proposed PD-2 because PD-1 is already classified urban by the State of Hawaii Land Use Commission and is already zoned PD by Maui County. PD-2, on the other hand, still needs to reclassify the land within it from agriculture to urban and obtain PD zoning.

The end result of this evaluation for PD-1 and Plantation Estates is to satisfy the SMA conditions for Kapalua Golf Academy, Site 29, and Site 19 and to eliminate the need for the condition in future SMA applications for Kapalua parcels within PD-1 and Plantation Estates.

B. Traffic Analysis

The Year 2020 peak hour traffic volumes without PD-2 illustrated in Figure 4 were used as input into the intersection analyses.

The intersections along Honoapiilani Highway from Office Road to Lower Honoapiilani Road were evaluated based on the existing roadway conditions previously described and using the methodologies for signalized and unsignalized intersections outlined in the 2000 Highway Capacity Manual. Operating conditions are expressed as a qualitative measure known as Level-of-Service (LOS) with a letter designation ranging from A to F. LOS A represents free-flow operating conditions and LOS F represents congested conditions. Level-of-Service definitions are included in Appendix B at the end of this report.

Table 4 summarizes the Year 2020 peak hour intersection level of service within the Honoapiilani Highway study corridor. Overall, the operational analysis of the Year 2020 without PD-2 conditions along the Honoapiilani Highway study corridor finds that the intersections would operate well for peak hour conditions. Most approach and movement LOS are C or better. The Lower Honoapiilani Road intersection would benefit from the redistribution of traffic and lower through movement volume on Honoapiilani Highway due to the future Lahaina Bypass.

An important finding is that based on the buildout of PD-1 and Plantation Estates and the regional growth forecasted in the Maui Long-Range Land Transportation Plan, Honoapiilani Highway is projected to have enough capacity to continue as a two-lane arterial roadway, north of its junction with the future Lahaina Bypass.

Table 4
Year 2020 Peak Hour without PD-2
Levels-of-Service (LOS) Summary

Intersection (Movements)	AM Peak Hour LOS	AM Peak Hour Delay (sec/veh)	PM Peak Hour LOS	PM Peak Hour Delay (sec/veh)
Honoapiilani Hwy./Office Road		unsignalized		
Northbound Left	A	8.0	A	8.2
Southbound Left	-	-	-	-
Westbound PD-2 Access	-	-	-	-
Eastbound Office Road	B	12.2	B	13.8
Honoapiilani Hwy./Site 19		unsignalized		
Northbound Left	A	7.7	A	8.5
Southbound Left	-	-	-	-
Westbound PD-2 Access	-	-	-	-
Eastbound PD-2 Access	B	10.3	B	13.5
Honoapiilani Hwy./Napilihau St.	**B**	**11.9**	**B**	**16.9**
Northbound Honoapiilani	B	11.0	B	17.3
Southbound Honoapiilani	B	19.4	C	20.6
Westbound Maui Pine Access	B	19.6	C	20.2
Eastbound Napilihau Street	A	8.5	B	10.7
Honoapiilani Hwy./Hoohui St.	**B**	**11.4**	**B**	**12.4**
Northbound Honoapiilani	A	8.8	B	10.1
Southbound Honoapiilani	A	8.8	B	11.6
Westbound	C	28.8	C	28.4
Eastbound Hoohui Street	C	29.7	C	29.7
Honoapiilani Hwy./Akahele St.	**B**	**12.3**	**B**	**14.5**
Northbound Honoapiilani	A	9.0	B	12.3
Southbound Honoapiilani	A	9.9	B	12.1
Westbound Akahele Street	C	27.8	C	27.8
Eastbound Akahele Street	C	29.5	C	30.4
Honoapiilani Hwy./Lower Honoapiilani	**C**	**20.7**	**C**	**24.1**
Northbound Honoapiilani	B	14.3	C	21.1
Southbound Honoapiilani	B	17.3	C	23.5
Westbound Maint. Access	E	57.3	E	57.3
Eastbound Lower Honoapiilani	C	33.2	C	29.2

Notes: **XXX** Overall intersection LOS (Weighted average of turning movement LOS).
XXX Turning movement or approach LOS.

V. FUTURE TRAFFIC CONDITIONS WITH PD-2

A. Background

This part of the evaluation pertains to traffic impacts specific to the proposed Kapalua PD-2 Development. It can be used as supporting documentation for the State Land Use District Boundary Amendment (SLUDBA) and Maui County rezoning.

This analysis assumes that the PD-1 and Plantation Estates components of the Kapalua Resort are built out and regional traffic growth consistent with the Maui Long-Range Land Transportation Plan has occurred.

The PD-2 traffic demand estimated in Chapter III of this report was added to the Year 2020 traffic and analyzed in the same manner.

B. Traffic Analysis

The Year 2020 peak hour traffic volumes with PD-2 illustrated in Figure 5 were used as input into the intersection analyses.

The intersections along Honoapiilani Highway from Office Road to Lower Honoapiilani Road were evaluated based on the existing roadway conditions previously described and using the methodologies for signalized and unsignalized intersections outlined in the 1994 Highway Capacity Manual with 1997 Revisions. Operating conditions are expressed as a qualitative measure known as Level-of-Service (LOS) with a letter designation ranging from A to F. LOS A represents free-flow operating conditions and LOS F represents congested conditions. Level-of-Service definitions are included in Appendix B at the end of this report.

Certain operational changes were assumed for the condition with PD-2. It is assumed that the Office Road/Honoapiilani Highway intersection is signalized.

Table 5 summarizes the Year 2020 peak hour intersection level of service within the Honoapiilani Highway study corridor. Overall, the operational analysis of the Year 2020 with PD-2 conditions along the Honoapiilani Highway study corridor finds that the intersections would continue to operate well for peak hour conditions. Most approach and

turn movements would be LOS C or better. There are slight increases in delay over operations in the without PD-2 scenario, but these increases do not change the LOS at the intersections studied.

As in the without PD-2 scenario, an important finding is that with the traffic from the proposed PD-2 added to the buildout of PD-1 and Plantation Estates and the regional growth forecasted in the Maui Long-Range Land Transportation Plan, Honoapiilani Highway appears to have enough capacity to continue as a two-lane arterial roadway, north of its junction with the future Lahaina Bypass.

Table 5
Year 2020 Peak Hour with PD-2
Levels-of-Service (LOS) Summary

Intersection (Movements)	AM Peak Hour LOS	AM Peak Hour Delay (sec/veh)	PM Peak Hour LOS	PM Peak Hour Delay (sec/veh)
Honoapiilani Hwy./Plantation Estates III		unsignalized		
Southbound Left	A	7.6	A	7.6
Westbound Plantation Estates III Access	B	10.3	B	10.9
Honoapiilani Hwy./Office Road	**B**	**16.4**	**B**	**14.8**
Northbound Honoapiilani	B	18.6	B	17.0
Southbound Honoapiilani	B	19.2	B	19.7
Westbound PD-2 Access	B	18.3	C	21.0
Eastbound Office Road	A	9.5	A	9.0
Honoapiilani Hwy./Site 19		unsignalized		
Northbound Left	A	7.7	A	8.7
Eastbound Site 19 Access	B	10.5	B	14.4
Honoapiilani Hwy./ South Access		unsignalized		
Southbound Left	A	8.3	A	8.2
Westbound PD-2 Access	B	12.7	C	19.9
Honoapiilani Hwy./Napilihau St.	**B**	**12.1**	**B**	**18.8**
Northbound Honoapiilani	B	11.2	B	16.8
Southbound Honoapiilani	B	19.8	C	26.3
Westbound Maui Pine Access	B	19.6	C	21.2
Eastbound Napilihau Street	A	8.5	B	10.7
Honoapiilani Hwy./Hoohui St.	**B**	**11.8**	**B**	**14.1**
Northbound Honoapiilani	A	9.8	B	11.5
Southbound Honoapiilani	A	9.2	B	14.2
Westbound	C	28.8	C	28.4
Eastbound Hoohui Street	C	29.7	C	29.7
Honoapiilani Hwy./Akahele St.	**B**	**12.7**	**B**	**16.6**
Northbound Honoapiilani	A	9.9	B	14.7
Southbound Honoapiilani	B	10.5	B	14.9
Westbound Akahele Street	C	27.8	C	27.8
Eastbound Akahele Street	C	29.5	C	30.4
Honoapiilani Hwy./Lower Honoapiilani	**C**	**20.7**	**C**	**24.9**
Northbound Honoapiilani	B	14.6	C	22.3
Southbound Honoapiilani	B	17.6	C	24.7
Westbound Maint. Access	E	57.3	E	57.3
Eastbound Lower Honoapiilani	C	33.2	C	29.2

Notes: **XXX** Overall intersection LOS (Weighted average of turning movement LOS).
XXX Turning movement or approach LOS.

VI. SUMMARY AND CONCLUSION

A. Summary

1. Proposed PD-2 Traffic Impacts

Kapalua Land Company is proposing to continue the development of Kapalua Resort by proceeding with Project District – 2 (PD-2), to be located directly mauka of PD-1, across Honoapiilani Highway. PD-2 would include an additional 9 golf course holes, and single family and multi-family resort residential. Kapalua PD-2 is proposed to access Honoapiilani Highway at three locations: opposite the existing Office Road, between the existing Site 19/Pineapple Hill Service Access and Napilihau Street and north of Office Road.

This traffic impact analysis study found that the existing Honoapiilani Highway can accommodate the proposed PD-2 development. If the proposed PD-2development is implemented, it is recommended that the intersection of Honoapiilani Highway and Office Road be signalized when warranted.

2. Buildout of Kapalua Resort

One of the conditions included in approval of recent SMA applications for Kapalua developments in PD-1 was the completion of a traffic impact analysis of the entire Kapalua Resort Development. It was agreed by the County of Maui and State of Hawaii agencies that the traffic impact analysis for PD-2 would be an appropriate vehicle for this comprehensive analysis. This analysis would include not only the proposed PD-2 development but also the future development located in PD-1 and the Plantation Estates areas. The purpose of the study would be to identify the long-range traffic impacts to the Honoapiilani Highway corridor between Kapalua and Honokowai.

This traffic impact analysis study found that the buildout of the Kapalua Resort, including the proposed PD-2 development, could be accommodated by the Honoapiilani Highway corridor between Kapalua and Honokowai. It is projected that north of the Honoapiilani Highway/Lahaina Bypass junction, Honoapiilani Highway could continue to operate as a two-lane arterial. Between the Lahaina Bypass junction and Lower Honoapiilani Road, Honoapiilani Highway is projected to be a four-lane arterial.

B. Conclusion

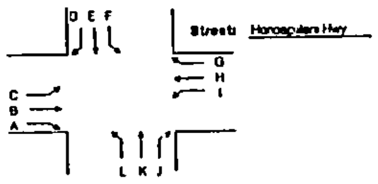
The proposed PD-2 Development and the buildout of the Kapalua Resort can be accommodated by the Honoapiilani Highway corridor between Kapalua and Honokowai. Certain intersection improvements are recommended at the Office Road/Honoapiilani Highway and will be implemented by the developer subject to approval by the State of Hawaii Department of Transportation.

APPENDIX

A. Traffic Count Data

TRAFFIC COUNT SHEET

Intersection: Honoapiilani Hwy / Office Road
Date: 09/30-10/01/97
By: Nam-Chau Anselmo
Weather: Clear & Sunny



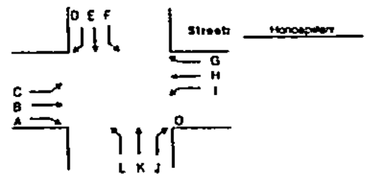
TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3 30 - 3 45	0	15	42	48	0	12	12	28	0	0	0	0	157	688
3 45 - 4 00	0	26	39	59	1	9	15	24	0	0	0	0	173	692
4 00 - 4 15	0	25	36	100	1	8	11	20	0	1	0	0	202	658
4 15 - 4 30	0	29	47	35	1	12	7	25	0	0	0	0	156	611
4 30 - 4 45	2	16	33	56	3	15	9	35	0	2	0	0	181	562
4 45 - 5 00	1	19	26	37	0	9	18	29	0	0	0	0	139	
5 00 - 5 15	1	15	40	44	0	8	14	31	0	0	1	1	155	
5 15 - 5 30	0	12	37	29	0	8	11	10	0	0	0	0	107	
7 00 - 7 15	0	15	45	19	0	8	4	8	0	0	0	0	99	451
7 15 - 7 30	0	9	48	23	0	8	6	8	0	0	0	0	102	450
7 30 - 7 45	0	20	60	17	1	11	11	8	0	1	0	0	129	452
7 45 - 8 00	0	28	49	18	0	6	7	13	0	0	0	0	121	441
8 00 - 8 15	0	15	33	30	0	9	2	9	0	0	0	0	98	455
8 15 - 8 30	0	15	38	26	0	4	2	19	0	0	0	0	104	
8 30 - 8 45	0	17	42	28	0	14	10	9	0	0	0	0	118	
8 45 - 9 00	0	27	35	41	0	14	7	11	0	0	0	0	135	

OTES:

Draw arrows on board indicating turning movements being counted.
Indicate the direction of road (Example: Ewa bound or Honolulu bound or North direction etc.)
Read the counters on the count board and **note the readings every 15 minutes**.
DO NOT RESET THE COUNTERS.
Note down any unusual occurences like accidents, parades etc.

AM COUNT SHEET

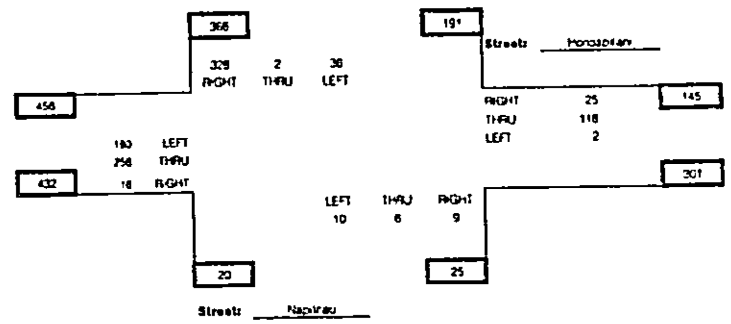
Intersection: Honoapiilani/Napilihau
Date: 5/25/93
By: .
Weather: .



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6 30 - 6 45	2	33	23	31	2	6	1	12	1	5	1	4	121	807
6 45 - 7 00	1	59	43	50	0	4	3	20	2	1	0	2	165	924
7 00 - 7 15	3	58	25	86	0	7	5	27	1	3	1	4	218	969
7 15 - 7 30	10	59	47	104	1	8	6	40	1	2	3	2	283	994
7 30 - 7 45	2	77	44	70	1	8	10	21	0	2	1	2	238	923
7 45 - 8 00	1	64	44	68	0	13	4	30	0	2	1	2	229	
8 00 - 8 15	2	60	61	44	1	10	4	47	2	2	0	2	244	
8 15 - 8 30	6	61	49	51	0	3	9	31	0	1	0	1	212	
PHF	0.400	0.831	0.851	0.786	0.500	0.692	0.625	0.738	0.500	0.750	0.500	0.625	Peak	PHF
7 00 - 8 00	16	258	180	328	2	36	25	118	2	9	6	10	969	0.855

Peak Hour

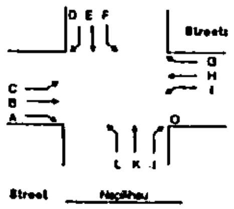
7 00 - 8 00



PARSONS
BRINCKERHOFF

PM COUNT SHEET

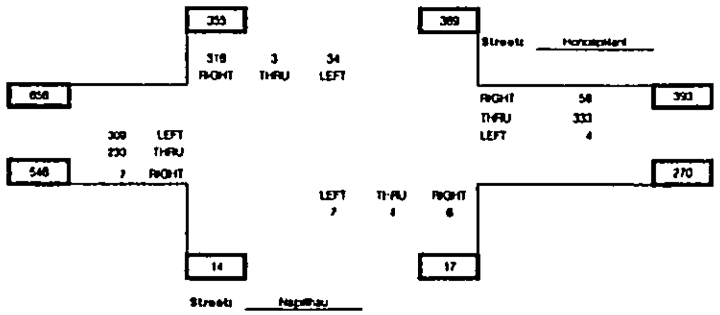
Intersection: Honoapiilani/Napilihau
Date: 5/25/99
By: -
Weather: -



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:30 - 3:45	2	62	66	92	3	8	11	61	3	4	2	7	321	1318
3:45 - 4:00	1	53	71	79	1	12	10	12	2	0	4	8	301	1293
4:00 - 4:15	3	63	70	87	0	14	12	72	1	0	4	2	328	1311
4:15 - 4:30	3	65	63	86	0	8	20	114	2	3	0	2	368	1294
4:30 - 4:45	0	48	90	82	1	7	11	74	0	1	0	2	296	1172
4:45 - 5:00	1	54	86	81	2	5	13	73	1	2	0	1	319	
5:00 - 5:15	0	57	75	81	0	12	12	63	0	0	0	1	301	
5:15 - 5:30	2	38	58	70	2	12	7	61	0	0	3	2	258	
PHF	0.583	0.885	0.858	0.903	0.375	0.607	0.700	0.730	0.500	0.600	0.250	0.875	Peak	PHF
4:00 - 5:00	7	230	309	318	3	34	56	333	4	6	4	7	1311	0.881

Peak Hour

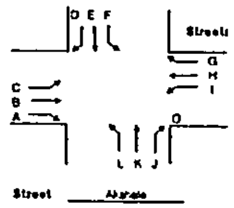
4:00 - 5:00



PARSONS BRINCKERHOFF

AM COUNT SHEET

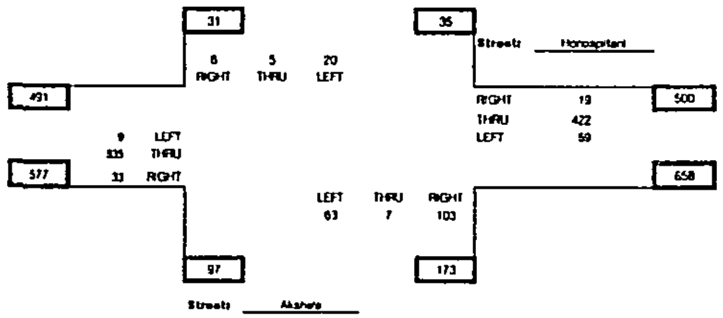
Intersection: Honoapiilani/Akahele
Date: 5/25/99
By: -
Weather: -



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 - 6:45	3	54	1	1	0	0	6	75	6	2	0	5	155	934
6:45 - 7:00	4	77	3	0	0	1	4	112	7	16	1	10	235	1203
7:00 - 7:15	2	125	1	0	1	0	3	73	10	21	1	8	245	1281
7:15 - 7:30	9	161	3	2	2	4	7	105	14	33	3	16	359	1363
7:30 - 7:45	12	140	4	3	2	12	6	120	14	30	3	18	364	1270
7:45 - 8:00	10	109	1	1	0	4	3	124	21	19	0	21	313	
8:00 - 8:15	11	115	2	0	3	6	3	133	14	24	0	18	327	
8:15 - 8:30	7	109	0	1	0	2	2	101	12	18	1	13	266	
PHF	0.688	0.831	0.563	0.500	0.625	0.417	0.679	0.851	0.702	0.780	0.583	0.750	Peak	PHF
7:00 - 8:00	33	535	9	6	5	20	19	422	59	103	7	63	1281	0.890

Peak Hour

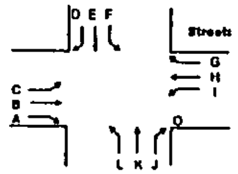
7:00 - 8:00



PARSONS BRINCKERHOFF

PM COUNT SHEET

Intersection: Honoapiilani/Akahele
Date: 5/25/99
By: -
Weather: -

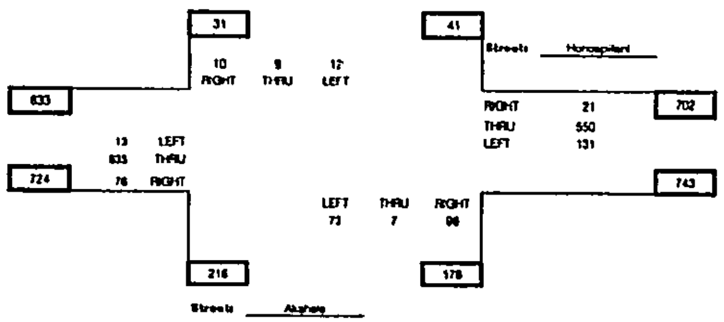


Streets: Honoapiilani
Street: Akahele

TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:30 - 3:45	13	155	3	5	1	1	4	133	20	13	0	15	383	1582
3:45 - 4:00	12	151	2	1	1	2	5	139	32	19	1	7	372	1609
4:00 - 4:15	13	148	4	3	1	6	5	136	21	30	2	16	385	1633
4:15 - 4:30	19	215	2	2	3	1	1	132	31	21	0	14	442	1610
4:30 - 4:45	19	148	3	1	3	3	8	141	41	26	3	17	410	1282
4:45 - 5:00	25	124	4	4	2	2	6	141	38	19	2	26	396	
5:00 - 5:15	18	130	21	4	3	6	7	113	29	21	2	6	382	
5:15 - 5:30	4	35	1	1	2	3	0	24	12	9	0	3	94	
PHF	0.780	0.738	0.813	0.825	0.750	0.500	0.583	0.975	0.799	0.800	0.583	0.702	Peak	PHF
4:00 - 5:00	76	635	13	10	9	12	21	550	131	96	7	73	1633	0.924

Peak Hour

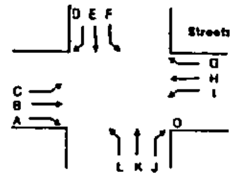
4:00 - 5:00



PARSONS
BRINCKERHOFF

AM COUNT SHEET

Intersection: Honoapiilani/Lower Honoapiilani
Date: 5/26/99
By: -
Weather: -

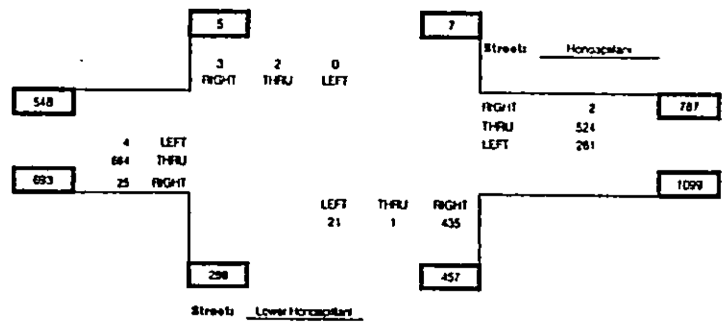


Streets: Honoapiilani
Street: Lower Honoapiilani

TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 - 6:45	1	109	1	0	0	1	1	102	18	69	0	1	303	1567
6:45 - 7:00	4	132	1	1	1	0	1	111	27	88	1	3	370	1795
7:00 - 7:15	10	153	2	0	1	0	0	120	39	95	0	2	422	1942
7:15 - 7:30	3	167	0	3	0	0	1	134	54	103	0	7	472	1981
7:30 - 7:45	5	179	1	0	0	0	1	138	73	121	1	2	521	1939
7:45 - 8:00	7	165	1	0	1	0	0	132	95	118	0	10	527	
8:00 - 8:15	9	134	2	0	0	0	5	117	77	111	1	5	481	
8:15 - 8:30	9	125	0	2	0	2	1	107	62	118	0	4	430	
PHF	0.625	0.927	0.500	0.250	0.500	#DIV/0!	0.500	0.949	0.687	0.899	0.250	0.525	Peak	PHF
7:00 - 8:00	25	664	4	3	2	0	2	524	261	435	1	21	1042	0.921

Peak Hour

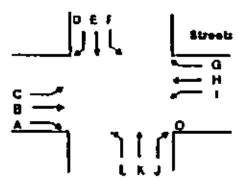
7:00 - 8:00



PARSONS
BRINCKERHOFF

PM COUNT SHEET

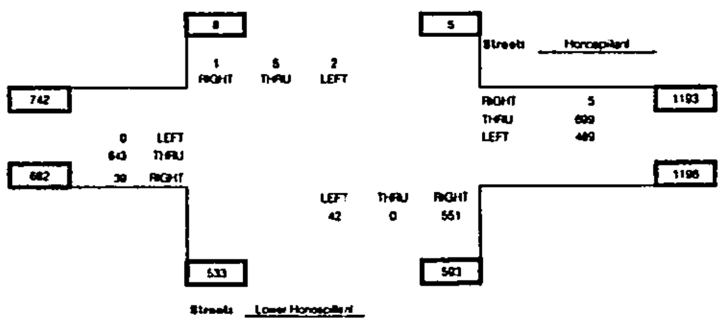
Intersection: Honoapiilani/Lower Honoapiilani
Date: 5/26/99
By: .
Weather: .



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:30 - 3:45	9	152	0	0	1	3	0	130	108	118	1	3	523	2351
3:45 - 4:00	14	164	0	0	2	2	1	159	112	118	1	7	580	2433
4:00 - 4:15	13	188	0	0	0	0	0	179	113	135	0	15	622	2478
4:15 - 4:30	8	162	0	0	1	2	2	168	129	143	0	13	628	2440
4:30 - 4:45	4	151	0	1	2	0	2	197	119	124	0	5	605	2419
4:45 - 5:00	14	182	0	0	2	0	1	154	128	149	0	9	623	
5:00 - 5:15	12	191	0	0	0	0	0	168	90	113	2	12	588	
5:15 - 5:30	11	200	0	0	0	1	0	146	106	128	0	15	605	
PHF	0.696	0.957	#DIV/0!	0.250	0.625	0.250	0.625	0.887	0.948	0.924	#DIV/0!	0.700	Peak	PHF
4:00 - 5:00	39	843	0	1	5	2	5	699	489	551	0	42	2478	0.989

Peak Hour

4:00 - 5:00



PARSONS BRINCKERHOFF

B. Levels-of-Service Definitions

The Highway Capacity Manual defines six Levels-of-Service, labeled A through F, from best to worst conditions. Levels-of-Service for signalized and unsignalized intersections are defined in terms of average user delays. Delay is a measure of driver discomfort, frustration, fuel consumption, and lost travel time.

For unsignalized intersections, the Highway Capacity Manual evaluates gaps in the major street traffic flow and calculates available gaps for left turns across oncoming traffic and for the left and right turns onto the major roadway from the minor street.

LEVEL-OF-SERVICE A: Little or no delay.

LEVEL-OF-SERVICE B: Short traffic delays.

LEVEL-OF-SERVICE C: Average traffic delays.

LEVEL-OF-SERVICE D: Long traffic delays.

LEVEL-OF-SERVICE E: Very long traffic delays.

LEVEL-OF-SERVICE F: Demand volume exceeds capacity, resulting in extreme delays with queuing that may cause severe congestion and affect other movements at the intersection.

C. Intersection Capacity Analysis Worksheets

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	cey	Intersection	Office Road/Honoapiilani Highw
Agency/Co.		Jurisdiction	Maui
Date Performed	future w/ PD-2	Analysis Year	2020
Analysis Time Period	am peak	Project ID	
East/West Street: Plantation Estates III access		North/South Street: Honoapiilani Highway	
Intersection Orientation: North-South		Study Period (hrs): 0.25	

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	165	10	5	125	0
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	0	173	10	5	131	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	1	1	1	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5	0	0	0	0	0
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	5	0	0	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		5	5		0			
C (m) (vph)		1404	681		876			
v/c		0.00	0.01		0.00			
95% queue length		0.01	0.02		0.00			
Control Delay		7.6	10.3		9.1			
LOS		A	B		A			
Approach Delay	--	--	10.3					
Approach LOS	--	--	B					

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	cey	Intersection	Office Road/Honoapiilani Highw
Agency/Co.	PBQD	Jurisdiction	Maui
Date Performed	future w/ PD-2	Analysis Year	2020
Analysis Time Period	pm peak	Project ID	Kapalua PD-2

East/West Street: Plantation Estates access	North/South Street: Honoapiilani Highway
Intersection Orientation: North-South	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	180	10	5	215	0
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	0	189	10	5	226	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	1	1	1	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	10	0	5	0	0	0
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	10	0	5	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R	LT		

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R	LT		
v (vph)		5	10		5			
C (m) (vph)		1385	542		858			
v/c		0.00	0.02		0.01			
95% queue length		0.01	0.06		0.02			
Control Delay		7.6	11.8		9.2			
LOS		A	B		A			
Approach Delay	--	--	10.9					
Approach LOS	--	--	B					

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HCS: Unsignalized Intersections Release 3.1c

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: cey
Intersection: Office Road/Honoapiilani Highway
Count Date: existing
Time Period: am peak

Intersection Orientation: North-South Major St.

Vehicle Volume Data:

Movements:	1	2	3	4	5	6	7	8	9	10	11	12
Volume:	225	110	5	0	50	30	0	0	0	35	0	100
HFR:	237	116	5	0	53	32	0	0	0	37	0	105
PHF:	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
PHV:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Pedestrian Volume Data:

Movements:

Flow:
Lane width:
Walk speed:
% Blockage:

Median Type: None
# of vehicles: 0

Flared approach Movements:

# of vehicles: Eastbound 0
# of vehicles: Westbound 0

Lane usage for movements 1,2&3 approach:

Lane 1 L	Lane 1 T	Lane 1 R	Lane 2 L	Lane 2 T	Lane 2 R	Lane 3 L	Lane 3 T	Lane 3 R
Y	N	N	N	Y	N	N	N	Y

Channelized: N
Grade: 0.00

Lane usage for movements 4,5&6 approach:

Lane 1 L	Lane 1 T	Lane 1 R	Lane 2 L	Lane 2 T	Lane 2 R	Lane 3 L	Lane 3 T	Lane 3 R
Y	N	N	N	Y	N	N	N	Y

Channelized: N
Grade: 0.00

Lane usage for movements 7,8&9 approach:

Lane 1 L	Lane 1 T	Lane 1 R	Lane 2 L	Lane 2 T	Lane 2 R	Lane 3 L	Lane 3 T	Lane 3 R
Y	Y	N	N	N	Y	N	N	N

Channelized: N
Grade: 0.00

ne usage for movements 10,11&12 approach:

	Lane 1			Lane 2			Lane 3	
L	T	R	L	T	R	L	T	R
Y	Y	N	N	N	Y	N	N	N

annelized: N
ade: 0.00

a for Computing Effect of Delay to Major Street Vehicles:

	Northbound	Southbound
ared ln volume, major th vehicles:	0	0
ared ln volume, major rt vehicles:	0	0
flow rate, major th vehicles:	1700	1700
flow rate, major rt vehicles:	1700	1700
ber of major street through lanes:	1	1

gth of study period, hrs: 0.25

ksheet 4 Critical Gap and Follow-up time calculation.

tical Gap Calculations:

ement	1	4	7	8	9	10	11	12
,base	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
c,hv	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
v	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
c,g			0.1	0.2	0.1	0.1	0.2	0.1
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3,lt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
c,T:								
stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2

low Up Time Calculations:

ement	1	4	7	8	9	10	11	12
f,base	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3
f,HV	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

sheet 6 Impedance and capacity equations

1: RT from Minor St.	9	12
licting Flows	116	53
ntial Capacity	942	1021
strian Impedance Factor	1.00	1.00
ment Capacity	942	1021
ability of Queue free St.	1.00	0.90

2: LT from Major St.	4	1
licting Flows	121	84
ntial Capacity	1479	1525
strian Impedance Factor	1.00	1.00
ment Capacity	1479	1525
ability of Queue free St.	1.00	0.84

3: TH from Minor St.	8	11
Conflicting Flows	674	647
Potential Capacity	379	392
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.84	0.84
Movement Capacity	320	331
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows	711	645
Potential Capacity	351	388
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.84	0.84
Maj. L, Min T Adj. Imp Factor.	0.88	0.88
Cap. Adj. factor due to Impeding mvmnt	0.79	0.88
Movement Capacity	277	342

Worksheet 8 Shared Lane Calculations

Shared Lane Calculations

Movement	7	8	9	10	11	12
v(vph)	0	0	0	37	0	105
Movement Capacity	277	320	942	342	331	1021
Shared Lane Capacity				342		

Worksheet 10 delay,queue length, and LOS

Movement	1	4	7	8	9	10	11	12
v(vph)	237					37	105	
C m(vph)	1525	1479		942		342	1021	
v/c	0.16					0.11	0.10	
95% queue length								
Control Delay	7.8					16.8	8.9	
LOS	A					C	A	
Approach Delay							11.0	
Approach LOS							B	

HCS: Unsignalized Intersections Release 3.1c

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

yst: cey
rsection: Office Road/Honoapiilani Highway
t Date: existing
Period: pm peak

rsection Orientation: North-South Major St.

cle Volume Data:

ments:	1	2	3	4	5	6	7	8	9	10	11	12
me:	160	100	5	0	120	45	0	0	5	45	5	260
	168	105	5	0	126	47	0	0	5	47	5	274
	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

strian Volume Data:

ments:

:
width:
speed:
ockage:

an Type: None
vehicles: 0

ed approach Movements:

vehicles: Eastbound 0
vehicles: Westbound 0

usage for movements 1,2&3 approach:

Lane 1			Lane 2			Lane 3		
L	T	R	L	T	R	L	T	R
Y	N	N	N	Y	N	N	N	Y

nelized: N
e: 0.00

usage for movements 4,5&6 approach:

Lane 1			Lane 2			Lane 3		
L	T	R	L	T	R	L	T	R
Y	N	N	N	Y	N	N	N	Y

nelized: N
e: 0.00

usage for movements 7,8&9 approach:

Lane 1			Lane 2			Lane 3		
L	T	R	L	T	R	L	T	R
Y	Y	N	N	N	Y	N	N	N

nelized: N
e: 0.00

Lane usage for movements 10,11&12 approach:

Lane 1			Lane 2			Lane 3		
L	T	R	L	T	R	L	T	R
Y	Y	N	N	N	Y	N	N	N

Channelized: N
Grade: 0.00

Data for Computing Effect of Delay to Major Street Vehicles:

	Northbound	Southbound
Shared ln volume, major th vehicles:	0	0
Shared ln volume, major rt vehicles:	0	0
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Length of study period, hrs: 0.25

Worksheet 4 Critical Gap and Follow-up time calculation.

Critical Gap Calculations:

Movement	1	4	7	8	9	10	11	12
t c,base	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t c,hv	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
P hv	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t c,g			0.2	0.2	0.1	0.2	0.2	0.1
G	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t 3,lt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
t c,T: 1 stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t c 1 stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2

Follow Up Time Calculations:

Movement	1	4	7	8	9	10	11	12
t f,base	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3
t f,HV	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
P hv	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t f	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

Worksheet 6 Impedance and capacity equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	105	126
Potential Capacity	955	929
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	955	929
Probability of Queue free St.	0.99	0.71

Step 2: LT from Major St.	4	1
Conflicting Flows	111	174
Potential Capacity	1492	1415
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1492	1415
Probability of Queue free St.	1.00	0.88

Step 3: TH from Minor St. 8 11

```
-----------------------------------------------------------------------------------
nflicting Flows                                 616          574
tential Capacity                                409          432
destrian Impedance Factor                       1.00         1.00
p. Adj. factor due to Impeding mvmnt            0.88         0.88
vement Capacity                                 360          381
obability of Queue free St.                     1.00         0.99
-----------------------------------------------------------------------------------

ep 4: LT from Minor St.                           7           10
-----------------------------------------------------------------------------------
nflicting Flows                                 732          574
tential Capacity                                340          433
destrian Impedance Factor                       1.00         1.00
j. L, Min T Impedance factor                    0.87         0.86
j. L, Min T Adj. Imp Factor.                    0.90         0.91
p. Adj. factor due to Impeding mvmnt            0.63         0.90
vement Capacity                                 215          391
-----------------------------------------------------------------------------------

kaheet 8 Shared Lane Calculations

ared Lane Calculations
vement                                7      8      9     10     11     12
-----------------------------------------------------------------------------------
                                     |-------------     ||-------------      |
                                     |            ------||            ------|
                                     |                  ||                   |
ph)                                   0      0      5     47      5    274
ement Capacity                      215    360    955    391    381    929
red Lane Capacity                                        390
-----------------------------------------------------------------------------------

ksheet 10 delay,queue length, and LOS

ement                   1      4      7      8      9     10     11     12
-----------------------------------------------------------------------------------
                                     |-------------     ||-------------      |
                                     |            ------||            ------|
                                     |                  ||                   |
ph)                    168                   5                 53    274
(vph)                 1415   1492          955                390    929
                      0.12                0.01               0.13   0.29
 queue length
trol Delay             7.9                 8.8               15.7   10.5
                        A                   A                  C      B
roach Delay                                8.8                      11.3
roach LOS                                   A                         B
-----------------------------------------------------------------------------------
```

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	cey	Intersection	
Agency/Co.	PBQD	Jurisdiction	Maui
Date Performed	4/11/2001	Analysis Year	2020
Analysis Time Period	am peak	Project ID	Kapalua PD-2 future w/o PD-2
East/West Street: Office Road		North/South Street: Honoapiilani Highway	
Intersection Orientation: North-South		Study Period (hrs): 0.25	

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	280	120	5	0	65	45
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	294	126	5	0	68	47
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	1	1	1	1
Configuration	L	T	R	L	T	R
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	0	45	0	140
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	0	0	0	47	0	147
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	1	0	1	1
Configuration	LT		R	LT		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L	LT		R	LT		R
v (vph)	294	0	0		0	47		147
C (m) (vph)	1487	1467	0		930	265		1001
v/c	0.20	0.00			0.00	0.18		0.15
95% queue length	0.74	0.00			0.00	0.63		0.51
Control Delay	8.0	7.5			8.9	21.5		9.2
LOS	A	A	F		A	C		A
Approach Delay	--	--				12.2		
Approach LOS	--	--				B		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	cey	Intersection	
Agency/Co.	PBQD	Jurisdiction	Maui
Date Performed	4/11/2001	Analysis Year	2020
Analysis Time Period	am peak	Project ID	Kapalua PD-2 future w/o PD-2
East/West Street: Office Road		North/South Street: Honoapiilani Highway	
Intersection Orientation: North-South		Study Period (hrs): 0.25	

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	260	105	5	0	130	55
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	273	110	5	0	136	57
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	1	1	1	1
Configuration	L	T	R	L	T	R
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	5	60	10	380
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	0	0	5	63	10	400
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	1	0	1	1
Configuration	LT		R	LT		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L	LT		R	LT		R
v (vph)	273	0	0		5	73		400
C (m) (vph)	1392	1487	0		949	259		918
v/c	0.20	0.00			0.01	0.28		0.44
95% queue length	0.73	0.00			0.02	1.12		2.24
Control Delay	8.2	7.4			8.8	24.3		11.9
LOS	A	A	F		A	C		B
Approach Delay	--	--				13.8		
Approach LOS	--	--				B		

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HCS2000: Signalized Intersections Release 4.1

Analyst: cey
Agency: PBQD
Date: 4/11/2001
Period: am peak
Project ID: Kapalua PD-2
E/W St: Office Road

Inter.:
Area Type: All other areas
Jurisd: Maui
Year : 2020
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	1	0	1	1	1	1	1	1	1	1
LGConfig		LT	R		LT	R	L	T	R	L	T	R
Volume	45	25	145	25	10	5	280	125	65	10	75	45
Lane Width		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	A				NB Left	A	A		
Thru	A				Thru		A	A	
Right	A				Right		A	A	
Peds					Peds				
WB Left	A				SB Left	A			
Thru	A				Thru			A	
Right	A				Right			A	
Peds					Peds				
NB Right					EB Right	A	A		
SB Right					WB Right				
Green	20.0					10.0	10.0	20.0	
Yellow	4.0					0.0	0.0	4.0	
All Red	1.0					0.0	0.0	1.0	

Cycle Length: 70.0 secs

Intersection Performance Summary

pr/ ne p	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
stbound								
	448	1567	0.16	0.29	18.9	B	9.5	A
	1038	1615	0.15	0.64	5.0	A		
stbound								
	449	1571	0.08	0.29	18.4	B	18.3	B
	461	1615	0.01	0.29	17.9	B		
:thbound								
	516	1805	0.57	0.29	22.9	C		
	814	1900	0.16	0.43	12.4	B	18.6	B
	692	1615	0.10	0.43	12.0	B		
ithbound								
	258	1805	0.04	0.14	25.9	C		
	543	1900	0.15	0.29	18.8	B	19.2	B
	461	1615	0.10	0.29	18.5	B		

Intersection Delay = 16.4 (sec/veh) Intersection LOS = B

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OPERATIONAL ANALYSIS

lyst: cey
ncy/Co.: PBQD
e Performed: 4/11/2001
lysis Time Period: am peak
ersection:
a Type: All other areas
isdiction: Maui
lysis Year: 2020
ject ID: Kapalua PD-2

East/West Street	North/South Street
Office Road	Honoapiilani Highway

HCS2000: Signalized Intersections Release 4.1

Analyst: cey
Agency: PBQD
Date: 4/11/2001
Period: pm peak
Project ID: Kapalua PD-2
E/W St: Office Road

Inter.:
Area Type: All other areas
Jurisd: Maui
Year : 2020
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
No. Lanes	0	1	1	0	1	1	1	1	1	1	1	1
LGConfig		LT	R		LT	R	L	T	R	L	T	R
Volume	60	30	385	70	25	15	265	115	60	10	150	65
Lane Width		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	A				NB Left	A	A		
Thru	A				Thru		A	A	
Right	A				Right		A	A	
Peds					Peds				
WB Left	A				SB Left	A			
Thru	A				Thru			A	
Right	A				Right			A	
Peds					Peds				
NB Right					EB Right	A	A		
SB Right					WB Right				
Green	18.0					12.0	10.0	20.0	
Yellow	4.0					0.0	0.0	4.0	
All Red	1.0					0.0	0.0	1.0	

Cycle Length: 70.0 secs

Lane Group	Lane Group Capacity	Adj Sat Flow Rate (s)	v/c	g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
bound								
	374	1455	0.25	0.26	21.0	C	9.0	A
	1038	1615	0.39	0.64	6.2	A		
bound								
	361	1403	0.28	0.26	21.2	C	21.0	C
	415	1615	0.04	0.26	19.5	B		
hbound								
	567	1805	0.49	0.31	20.1	C		
	814	1900	0.15	0.43	12.3	B	17.0	B
	692	1615	0.09	0.43	11.9	B		
hbound								
	309	1805	0.04	0.17	24.2	C		
	543	1900	0.29	0.29	19.8	B	19.7	B
	461	1615	0.15	0.29	18.8	B		

Intersection Delay = 14.8 (sec/veh) Intersection LOS = B

HCS2000: Signalized Intersections Release 4.1

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OPERATIONAL ANALYSIS

yst: cey
cy/Co.: PBQD
Performed: 4/11/2001
ysis Time Period: pm peak
rsection:
Type: All other areas
sdiction: Maui
ysis Year: 2020
ect ID: Kapalua PD-2

East/West Street: Office Road
North/South Street: Honoapiilani Highway

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	cey	Intersection	
Agency/Co.	PBQD	Jurisdiction	Maui
Date Performed	4/11/2001	Analysis Year	2020
Analysis Time Period	am peak	Project ID	Kapalua PD-2 future w/o PD-2
East/West Street:	Site 19	North/South Street:	Honoapiilani Highway
Intersection Orientation:	North-South	Study Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	15	390	0	0	200	5
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	15	410	0	0	210	5
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	2	0	1	1	1
Configuration	L	T	TR	L	T	R
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	0	5	0	15
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	0	0	0	5	0	15
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)	0			0		
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	1	0	1	1
Configuration	LT		R	LT		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L	LT		R	LT		R
v (vph)	15	0	0		0	5		15
C (m) (vph)	1367	1160	0		808	497		802
v/c	0.01	0.00			0.00	0.01		0.02
95% queue length	0.03	0.00			0.00	0.03		0.06
Control Delay	7.7	8.1			9.5	12.3		9.6
LOS	A	A	F		A	B		A
Approach Delay	--	--				10.3		
Approach LOS	--	--				B		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	cey	Intersection	
Agency/Co.	PBQD	Jurisdiction	Maui
Date Performed	4/11/2001	Analysis Year	2020
Analysis Time Period	pm peak	Project ID	Kapalua PD-2 future w/o PD-2

East/West Street: Site 19	North/South Street: Honoapiilani Highway
Intersection Orientation: North-South	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	10	355	0	0	500	5
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	10	373	0	0	526	5
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	2	0	1	1	1
Configuration	L	T	TR	L	T	R
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	0	5	0	15
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	0	0	0	5	0	15
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)	0			0		
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	1	0	1	1
Configuration	LT		R	LT		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L	LT		R	LT		R
v (vph)	10	0	0		0	5		15
C (m) (vph)	1047	1197	0		831	311		502
v/c	0.01	0.00			0.00	0.02		0.03
95% queue length	0.03	0.00			0.00	0.05		0.09
Control Delay	8.5	8.0			9.3	16.8		12.4
LOS	A	A	F		A	C		B
Approach Delay	--	--				13.5		
Approach LOS	--	--				B		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	cey	Intersection	Honoapiilani/Site 19
Agency/Co.	PBQD	Jurisdiction	Maui
Date Performed	12/14/01	Analysis Year	2020
Analysis Time Period	am peak	Project ID	Kapalua PD-2 with Development

East/West Street: Site 19 Access	North/South Street: Honoapiilani Highway
Intersection Orientation: North-South	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	15	460	10	5	230	5
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	15	484	0	0	242	5
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	2	0	0	1	1
Configuration	L	T			T	R
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5	0	5	5	0	15
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	0	0	0	5	0	15
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)	0			0		
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	1	0	1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L					L		R
v (vph)	15					5		15
C (m) (vph)	1331					489		765
v/c	0.01					0.01		0.02
95% queue length	0.03					0.03		0.06
Control Delay	7.7					12.4		9.8
LOS	A					B		A
Approach Delay	--	--				10.5		
Approach LOS	--	--				B		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	cey	Intersection	Honoapiilani/Site 19
Agency/Co.	PBQD	Jurisdiction	Maui
Date Performed	12/14/01	Analysis Year	2020
Analysis Time Period	pm peak	Project ID	Kapalua PD-2 with Development

East/West Street: Site 19	North/South Street: Honoapiilani Highway
Intersection Orientation: North-South	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	10	420	10	5	585	5
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	10	442	0	0	615	5
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	2	0	0	1	1
Configuration	L	T			T	R
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	15	0	5	5	0	15
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	0	0	0	5	0	15
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)	0			0		
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	1	0	1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L					L		R
v (vph)	10					5		15
C (m) (vph)	970					298		439
v/c	0.01					0.02		0.03
95% queue length	0.03					0.05		0.11
Control Delay	8.7					17.3		13.5
LOS	A					C		B
Approach Delay	--	--				14.4		
Approach LOS	--	--				B		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	cey	Intersection	Honoapiilani/South Access
Agency/Co.	PBQD	Jurisdiction	Maui
Date Performed	12/14/01	Analysis Year	2020
Analysis Time Period	am peak	Project ID	Kapalua PD-2 with Development

East/West Street: PD-2 South Access	North/South Street: Honoapiilani Highway
Intersection Orientation: North-South	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	15	470	10	5	240	5
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	0	494	10	5	252	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	2	0	1	1	0
Configuration		T	TR	L	T	
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5	0	5	5	0	15
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	5	0	5	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)	0			0		
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		5	5		5			
C (m) (vph)		1071	344		754			
v/c		0.00	0.01		0.01			
95% queue length		0.01	0.04		0.02			
Control Delay		8.4	15.6		9.8			
LOS		A	C		A			
Approach Delay	--	--	12.7					
Approach LOS	--	--	B					

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	cey	Intersection	Honoapiilani/South Access
Agency/Co.	PBQD	Jurisdiction	Maui
Date Performed	12/14/01	Analysis Year	2020
Analysis Time Period	pm peak	Project ID	Kapalua PD-2 with Development

East/West Street: PD-2 South Access		North/South Street: Honoapiilani Highway	
Intersection Orientation: North-South		Study Period (hrs): 0.25	

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	10	425	10	5	595	5
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	0	447	10	5	626	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	2	0	1	1	0
Configuration		T	TR	L	T	
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	15	0	5	5	0	15
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	15	0	5	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		5	15		5			
C (m) (vph)		1114	212		781			
v/c		0.00	0.07		0.01			
95% queue length		0.01	0.23		0.02			
Control Delay		8.2	23.3		9.6			
LOS		A	C		A			
Approach Delay	--	--	19.9					
Approach LOS	--	--	C					

HC3: Unsignalized Intersections Release 3.1c

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: cey
Intersection: Honoapiilani Highway/Napilihau Street
Count Date: existing
Time Period: am peak

Intersection Orientation: North-South Major St.

Vehicle Volume Data:

Movements:	1	2	3	4	5	6	7	8	9	10	11	12
Volume:	180	295	15	5	120	25	10	5	10	35	5	330
HFR:	189	311	16	5	126	26	11	5	11	37	5	347
PHF:	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
PHV:	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02

Pedestrian Volume Data:

Movements:

Flow:
Lane width:
Walk speed:
% Blockage:

Median Type: None
# of vehicles: 0

Flared approach Movements:

# of vehicles: Eastbound 0
# of vehicles: Westbound 0

Lane usage for movements 1,2&3 approach:

Lane 1 L	T	R	Lane 2 L	T	R	Lane 3 L	T	R
Y	N	N	N	Y	N	N	N	Y

Channelized: N
Grade: 0.00

Lane usage for movements 4,5&6 approach:

Lane 1 L	T	R	Lane 2 L	T	R	Lane 3 L	T	R
Y	N	N	N	Y	N	N	N	Y

Channelized: N
Grade: 0.00

Lane usage for movements 7,8&9 approach:

Lane 1 L	T	R	Lane 2 L	T	R	Lane 3 L	T	R
Y	Y	N	N	N	Y	N	N	N

Channelized: N
Grade: 0.00

· usage for movements 10,11&12 approach:

Lane 1 L	Lane 1 T	Lane 1 R	Lane 2 L	Lane 2 T	Lane 2 R	Lane 3 L	Lane 3 T	Lane 3 R
Y	Y	N	N	N	Y	N	N	N

nelized: N
e: 0.00

for Computing Effect of Delay to Major Street Vehicles:

	Northbound	Southbound
ed in volume, major th vehicles:	0	0
ed in volume, major rt vehicles:	0	0
flow rate, major th vehicles:	1700	1700
flow rate, major rt vehicles:	1700	1700
er of major street through lanes:	1	1

th of study period, hrs: 0.25

sheet 4 Critical Gap and Follow-up time calculation.

ical Gap Calculations:

ment	1	4	7	8	9	10	11	12
base	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
,hv	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
,g			0.2	0.2	0.1	0.2	0.2	0.1
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
,lt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
,T:								
tage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
tage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2

ow Up Time Calculations:

ment	1	4	7	8	9	10	11	12
,base	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3
,HV	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

sheet 6 Impedance and capacity equations

1: RT from Minor St.	9	12
licting Flows	311	126
ntial Capacity	730	924
strian Impedance Factor	1.00	1.00
ment Capacity	730	924
ability of Queue free St.	0.99	0.62

2: LT from Major St.	4	1
licting Flows	326	153
ntial Capacity	1233	1428
strian Impedance Factor	1.00	1.00
ment Capacity	1233	1428
ability of Queue free St.	1.00	0.87

3: TH from Minor St.	8	11
Conflicting Flows	853	842
Potential Capacity	297	301
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.86	0.86
Movement Capacity	256	260
Probability of Queue free St.	0.98	0.98

Step 4: LT from Minor St.	7	10
Conflicting Flows	1016	842
Potential Capacity	216	284
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.85	0.85
Maj. L, Min T Adj. Imp Factor.	0.88	0.88
Cap. Adj. factor due to Impeding mvmnt	0.55	0.87
Movement Capacity	119	247

Worksheet 8 Shared Lane Calculations

Shared Lane Calculations

Movement	7	8	9	10	11	12
v(vph)	11	5	11	37	5	147
Movement Capacity	119	256	730	247	260	924
Shared Lane Capacity	145			248		

Worksheet 10 delay,queue length, and LOS

Movement	1	4	7	8	9	10	11	12
v(vph)	189	5	16	11		42	147	
C m(vph)	1428	1233	145	730		248	924	
v/c	0.13	0.00	0.11	0.01		0.17	0.38	
95% queue length								
Control Delay	7.9	7.9	12.8	10.0		22.4	11.2	
LOS	A	A	D	B		C	B	
Approach Delay				23.7			12.4	
Approach LOS				C			B	

HCS: Unsignalized Intersections Release 3.1c

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

alyst: cey
tersection: Honoapiilani Highway/Napilihau Street
unt Date: existing
me Period: pm peak

tersection Orientation: North-South Major St.

hicle Volume Data:

vements:	1	2	3	4	5	6	7	8	9	10	11	12
lume:	310	230	10	5	330	55	5	5	5	30	5	320
:	326	242	11	5	347	58	5	5	5	32	5	337
:	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
:	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02

estrian Volume Data:

ements:

w:
e width:
k speed:
lockage:

ian Type: None
f vehicles: 0

red approach Movements:

f vehicles: Eastbound 0
f vehicles: Westbound 0

e usage for movements 1,2&3 approach:

Lane 1 L	Lane 1 T	Lane 1 R	Lane 2 L	Lane 2 T	Lane 2 R	Lane 3 L	Lane 3 T	Lane 3 R
Y	N	N	N	Y	N	N	N	Y

nnelized: N
de: 0.00

e usage for movements 4,5&6 approach:

Lane 1 L	Lane 1 T	Lane 1 R	Lane 2 L	Lane 2 T	Lane 2 R	Lane 3 L	Lane 3 T	Lane 3 R
Y	N	N	N	Y	N	N	N	Y

nnelized: N
e: 0.00

usage for movements 7,8&9 approach:

Lane 1 L	Lane 1 T	Lane 1 R	Lane 2 L	Lane 2 T	Lane 2 R	Lane 3 L	Lane 3 T	Lane 3 R
Y	Y	N	N	N	Y	N	N	N

nnelized: N
e: 0.00

Lane usage for movements 10,11&12 approach:

Lane 1 L	Lane 1 T	Lane 1 R	Lane 2 L	Lane 2 T	Lane 2 R	Lane 3 L	Lane 3 T	Lane 3 R
Y	Y	N	N	N	Y	N	N	N

Channelized: N
Grade: 0.00

Data for Computing Effect of Delay to Major Street Vehicles:

	Northbound	Southbound
Shared ln volume, major th vehicles:	0	0
Shared ln volume, major rt vehicles:	0	0
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Length of study period, hrs: 0.25

Worksheet 4 Critical Gap and Follow-up time calculation.

Critical Gap Calculations:

Movement	1	4	7	8	9	10	11	12
t c,base	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t c,hv	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
P hv	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
t c,g			0.2	0.2	0.1	0.2	0.2	0.1
G	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t 3,lt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
t c,T:								
1 stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t c								
1 stage	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2

Follow Up Time Calculations:

Movement	1	4	7	8	9	10	11	12
t f,base	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3
t f,HV	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
P hv	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
t f	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

Worksheet 6 Impedance and capacity equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	242	347
Potential Capacity	797	696
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	797	696
Probability of Queue free St.	0.99	0.52

Step 2: LT from Major St.	4	1
Conflicting Flows	253	405
Potential Capacity	1313	1153
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1313	1153
Probability of Queue free St.	1.00	0.72

Step 3: TH from Minor St. 8 11

flicting Flows	1311	1263
ential Capacity	159	170
estrian Impedance Factor	1.00	1.00
. Adj. factor due to Impeding mvmnt	0.71	0.71
ement Capacity	113	121
bability of Queue free St.	0.95	0.96

p 4: LT from Minor St.	7	10
flicting Flows	1453	1263
ential Capacity	108	147
estrian Impedance Factor	1.00	1.00
L, Min T Impedance factor	0.68	0.68
L, Min T Adj. Imp Factor.	0.75	0.75
Adj. factor due to Impeding mvmnt	0.39	0.75
ement Capacity	42	110

ksheet 8 Shared Lane Calculations

red Lane Calculations

ement	7	8	9	10	11	12
ph)	5	5	5	32	5	337
ement Capacity	42	113	797	110	121	696
red Lane Capacity	61			111		

ksheet 10 delay,queue length, and LOS

ement	1	4	7	8	9	10	11	12
ph)	326	5	11	5		37	337	
(vph)	1153	1313	61	797		111	696	
	0.28	0.00	0.17	0.01		0.33	0.48	
queue length								
trol Delay	9.3	7.8	75.3	9.5		52.7	14.9	
	A	A	F	A		F	B	
roach Delay				53.4			18.7	
roach LOS				F			C	

HCS2000: Signalized Intersections Release 4.1

Analyst: cey
Agency: PBQD
Date: 4/11/2001
Period: am peak
Project ID: Kapalua PD-2 future w/o PD-2
E/W St: Napilihau Street

Inter.:
Area Type: All other areas
Jurisd: Maui
Year : 2020
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	1	0	1	1	1	1	1	1	1	1
LGConfig		LT	R		LT	R	L	T	R	L	T	R
Volume	40	5	355	10	5	10	165	365	15	5	185	25
Lane Width		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	A				NB Left	A	A		
Thru	A				Thru		A	A	
Right	A				Right		A	A	
Peds					Peds				
WB Left	A				SB Left	A			
Thru	A				Thru			A	
Right	A				Right			A	
Peds					Peds				
NB Right					EB Right	A	A		
SB Right					WB Right	A			
Green	13.0					8.0	18.0	21.0	
Yellow	4.0					0.0	0.0	4.0	
All Red	1.0					0.0	0.0	1.0	

Cycle Length: 70.0 secs

ɔr/ ıe ɔ	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
ɜtbound								
	268	1443	0.18	0.19	24.3	C	8.5	A
	1015	1615	0.37	0.63	6.5	A		
ɪtbound								
	298	1604	0.05	0.19	23.5	C	19.6	B
	600	1615	0.02	0.37	13.9	B		
·thbound								
	670	1805	0.29	0.37	15.7	B		
	1059	1900	0.36	0.56	8.8	A	11.0	B
	900	1615	0.02	0.56	6.9	A		
ıthbound								
	206	1805	0.02	0.11	27.6	C		
	570	1900	0.34	0.30	19.5	B	19.4	B
	485	1615	0.05	0.30	17.5	B		

Intersection Delay = 11.9 (sec/veh) Intersection LOS = B

HCS2000: Signalized Intersections Release 4.1

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olulu, HI 96813
ne: 808 531-7094 Fax: 808 528-2368
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OPERATIONAL ANALYSIS

lyst: cey
ncy/Co.: PBQD
ɜ Performed: 4/11/2001
lysis Time Period: am peak
ɜrsection:
ɜ Type: All other areas
isdiction: Maui
lysis Year: 2020
ject ID: Kapalua PD-2 future w/o PD-2

East/West Street	North/South Street
Napilihau Street	Honoapiilani Highway

HCS2000: Signalized Intersections Release 4.1

Analyst: cey
ʾgency: PBQD
Date: 4/11/2001
Period: pm peak
Project ID: Kapalua PD-2 future w/o PD-2
E/W St: Napilihau Street

Inter.:
Area Type: All other areas
Jurisd: Maui
Year : 2020
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
No. Lanes	0	1	1	0	1	1	1	1	1	1	1	1
LGConfig		LT	R		LT	R	L	T	R	L	T	R
Volume	35	5	335	5	5	5	360	335	10	5	460	60
Lane Width		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4
EB Left	A			
Thru	A			
Right	A			
Peds				
WB Left	A			
Thru	A			
Right	A			
Peds				
NB Right				
SB Right				
Green	13.0			
Yellow	4.0			
All Red	1.0			

	5	6	7	8
NB Left	A	A		
Thru		A	A	
Right		A	A	
Peds				
SB Left	A			
Thru			A	
Right			A	
Peds				
EB Right	A	A		
WB Right	A			
Green	8.0	13.0	26.0	
Yellow	0.0	0.0	4.0	
All Red	0.0	0.0	1.0	

Cycle Length: 70.0 secs

Intersection Performance Summary

:/ :	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
:bound								
	273	1469	0.15	0.19	24.2	C	10.7	B
	900	1615	0.39	0.56	9.1	A		
:bound								
	317	1707	0.03	0.19	23.4	C	20.2	C
	600	1615	0.01	0.37	13.9	B		
:hbound								
	542	1805	0.70	0.30	25.7	C		
	1059	1900	0.33	0.56	8.6	A	17.3	B
	900	1615	0.01	0.56	6.9	A		
:hbound								
	206	1805	0.02	0.11	27.6	C		
	706	1900	0.69	0.37	21.3	C	20.6	C
	600	1615	0.10	0.37	14.5	B		

Intersection Delay = 16.9 (sec/veh) Intersection LOS = B

HCS2000: Signalized Intersections Release 4.1

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OPERATIONAL ANALYSIS

.yst: cey
icy/Co.: PBQD
: Performed: 4/11/2001
.ysis Time Period: pm peak
ersection:
: Type: All other areas
.sdiction: Maui
.ysis Year: 2020
ject ID: Kapalua PD-2 future w/o PD-2

East/West Street: Napilihau Street
North/South Street: Honoapiilani Highway

HCS2000: Signalized Intersections Release 4.1

Analyst: cey
Agency: PBQD
Date: 4/11/2001
Period: am peak
Project ID: Kapalua PD-2
E/W St: Napilihau Street

Inter.:
Area Type: All other areas
Jurisd: Maui
Year : 2020
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
No. Lanes	0	1	1	0	1	1	1	1	1	1	1	1
LGConfig		LT	R		LT	R	L	T	R	L	T	R
Volume	40	5	365	10	5	10	185	440	15	5	215	25
Lane Width		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	A				NB Left	A	A		
Thru	A				Thru		A	A	
Right	A				Right		A	A	
Peds					Peds				
WB Left	A				SB Left	A			
Thru	A				Thru			A	
Right	A				Right			A	
Peds					Peds				
NB Right					EB Right	A	A		
SB Right					WB Right	A			
Green	13.0					8.0	18.0	21.0	
Yellow	4.0					0.0	0.0	4.0	
All Red	1.0					0.0	0.0	1.0	

Cycle Length: 70.0 secs

Intersection Performance Summary

pr/ ne ?	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
stbound								
	268	1443	0.18	0.19	24.3	C	8.5	A
	1015	1615	0.38	0.63	6.6	A		
itbound								
	298	1604	0.05	0.19	23.5	C	19.6	B
	600	1615	0.02	0.37	13.9	B		
:thbound								
	670	1805	0.29	0.37	15.7	B		
	1059	1900	0.44	0.56	9.4	A	11.2	B
	900	1615	0.02	0.56	6.9	A		
ithbound								
	206	1805	0.02	0.11	27.6	C		
	570	1900	0.40	0.30	19.9	B	19.8	B
	485	1615	0.05	0.30	17.5	B		

Intersection Delay = 12.1 (sec/veh) Intersection LOS = B

HCS2000: Signalized Intersections Release 4.1

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OPERATIONAL ANALYSIS

lyst: cey
ncy/Co.: PBQD
e Performed: 4/11/2001
lysis Time Period: am peak
ersection:
a Type: All other areas
isdiction: Maui
lysis Year: 2020
ject ID: Kapalua PD-2

East/West Street	North/South Street
Napilihau Street	Honoapiilani Highway

HCS2000: Signalized Intersections Release 4.1

Analyst: cey
Agency: PBQD
Date: 4/11/2001
Period: pm peak
Project ID: Kapalua PD-2
E/W St: Napilihau Street

Inter.:
Area Type: All other areas
Jurisd: Maui
Year : 2020
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
No. Lanes	0	1	1	0	1	1	1	1	1	1	1	1
LGConfig		LT	R		LT	R	L	T	R	L	T	R
Volume	35	5	335	10	5	5	360	405	10	5	550	60
Lane Width		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A	A		
	Thru	A					Thru		A	A	
	Right	A					Right		A	A	
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru	A					Thru			A	
	Right	A					Right			A	
	Peds						Peds				
NB	Right					EB	Right	A	A		
SB	Right					WB	Right	A			
Green		13.0						8.0	13.0	26.0	
Yellow		4.0						0.0	0.0	4.0	
All Red		1.0						0.0	0.0	1.0	

Cycle Length: 70.0 secs

Intersection Performance Summary

·/ :	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	g/C	Lane Group Delay	LOS	Approach Delay	LOS
.bound								
	271	1461	0.15	0.19	24.2	C	10.7	B
	900	1615	0.39	0.56	9.1	A		
bound								
	299	1608	0.05	0.19	23.5	C	21.2	C
	600	1615	0.01	0.37	13.9	B		
hbound								
	542	1805	0.70	0.30	25.7	C		
	1059	1900	0.40	0.56	9.1	A	16.8	B
	900	1615	0.01	0.56	6.9	A		
hbound								
	206	1805	0.02	0.11	27.6	C		
	706	1900	0.82	0.37	27.5	C	26.3	C
	600	1615	0.10	0.37	14.5	B		

Intersection Delay = 18.8 (sec/veh) Intersection LOS = B

HCS2000: Signalized Intersections Release 4.1

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OPERATIONAL ANALYSIS

yst: cey
cy/Co.: PBQD
Performed: 4/11/2001
ysis Time Period: pm peak
rsection:
Type: All other areas
sdiction: Maui
ysis Year: 2020
ect ID: Kapalua PD-2
East/West Street: Napilihau Street
North/South Street: Honoapiilani Highway

HCS: Signalized Intersections Release 3.1c

Inter: City/St: Kahana, Maui, Hawaii
ˋnalyst: cey Proj #:
Date: 8/10/2000 Period: am peak existing
E/W St: Hoohui Street N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	T	R	Westbound L	T	R	Northbound L	T	R	Southbound L	T	R
No. Lanes	0	1	1	0	1	1	1	1	1	1	1	1
LGConfig		LT	R		LT	R	L	T	R	L	T	R
Volume	30	5	85	25	10	10	30	440	10	10	425	25
Lane Width		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left	A				NB	Left	A			
Thru	A					Thru	A			
Right	A					Right	A			
Peds						Peds				
WB Left	A				SB	Left	A			
Thru	A					Thru	A			
Right	A					Right	A			
Peds						Peds				
NB Right					EB	Right				
SB Right					WB	Right				
Green	25.0						65.0			
Yellow	4.0						4.0			
All Red	1.0						1.0			

Cycle Length: 100.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	g/C	Lane Group Delay	LOS	Approach Delay	LOS
Eastbound								
LT	378	1513	0.10	0.250	28.9	C	29.7	C
R	404	1615	0.22	0.250	30.0	C		
Westbound								
LT	397	1589	0.09	0.250	28.9	C	28.8	C
R	404	1615	0.03	0.250	28.3	C		
Northbound								
L	565	869	0.06	0.650	6.4	A		
T	1235	1900	0.37	0.650	8.3	A	8.1	A
R	1050	1615	0.01	0.650	6.2	A		
Southbound								
L	554	852	0.02	0.650	6.2	A		
T	1235	1900	0.36	0.650	8.2	A	8.0	A
R	1050	1615	0.02	0.650	6.2	A		

Intersection Delay = 11.3 (sec/veh) Intersection LOS = B

HCS: Signalized Intersections Release 3.1c

:er:
ılyst: cey
:e: 8/10/2000
ł St: Hoohui Street

City/St: Kahana, Maui, Hawaii
Proj #:
Period: pm peak existing
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
Lanes	0	1	1	0	1	1	1	1	1	1	1	1
:onfig		LT	R		LT	R	L	T	R	L	T	R
.ume	45	10	80	10	5	5	160	500	25	5	605	50
ıe Width		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
⁾R Vol			0			0			0			0

'ation 0.25 Area Type: All other areas

Signal Operations

.se Combination	1	2	3	4			5	6	7	8
Left	A				NB	Left	A			
Thru	A					Thru	A			
Right	A					Right	A			
Peds						Peds				
Left	A				SB	Left	A			
Thru	A					Thru	A			
Right	A					Right	A			
Peds						Peds				
Right					EB	Right				
Right					WB	Right				
en	25.0						65.0			
low	4.0						4.0			
Red	1.0						1.0			

le Length: 100.0 secs

Intersection Performance Summary

r/ e	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
tbound								
	378	1511	0.15	0.250	29.4	C	29.7	C
	404	1615	0.21	0.250	29.9	C		
:bound								
	414	1654	0.04	0.250	28.4	C	28.4	C
	404	1615	0.01	0.250	28.2	C		
:hbound								
	446	686	0.38	0.650	8.6	A		
	1235	1900	0.43	0.650	8.7	A	8.6	A
	1050	1615	0.02	0.650	6.2	A		
:hbound								
	512	788	0.01	0.650	6.3	A		
	1235	1900	0.52	0.650	9.6	A	9.3	A
	1050	1615	0.05	0.650	6.4	A		

Intersection Delay = 11.1 (sec/veh) Intersection LOS = B

HCS: Signalized Intersections Release 3.1c

Inter:
Analyst: cey
Date: 8/10/2000
E/W St: Hoohui Street

City/St: Kahana, Maui, Hawaii
Proj #:
Period: am peak w/o PD2
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
No. Lanes	0	1	1	0	1	1	1	1	1	1	1	1
LGConfig		LT	R		LT	R	L	T	R	L	T	R
Volume	30	5	85	25	10	10	30	535	10	10	540	25
Lane Width		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru	A					Thru	A			
	Right	A					Right	A			
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru	A					Thru	A			
	Right	A					Right	A			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		25.0						65.0			
Yellow		4.0						4.0			
All Red		1.0						1.0			

Cycle Length: 100.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LT	378	1513	0.10	0.250	28.9	C	29.7	C
R	404	1615	0.22	0.250	30.0	C		
Westbound								
LT	397	1589	0.09	0.250	28.9	C	28.8	C
R	404	1615	0.03	0.250	28.3	C		
Northbound								
L	486	748	0.07	0.650	6.5	A		
T	1235	1900	0.46	0.650	9.0	A	8.8	A
R	1050	1615	0.01	0.650	6.2	A		
Southbound								
L	489	752	0.02	0.650	6.2	A		
T	1235	1900	0.46	0.650	9.0	A	8.8	A
R	1050	1615	0.02	0.650	6.2	A		

Intersection Delay = 11.4 (sec/veh) Intersection LOS = B

HCS: Signalized Intersections Release 3.1c

r: City/St: Kahana, Maui, Hawaii
.yst: cey Proj #:
: 8/10/2000 Period: pm peak w/o PD2
St: Hoohui Street N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
Lanes	0	1	1	0	1	1	1	1	1	1	1	1
nfig		LT	R		LT	R	L	T	R	L	T	R
me	45	10	80	10	5	5	160	665	25	5	770	50
: Width		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
: Vol			0			0			0			0

.tion 0.25 Area Type: All other areas

Signal Operations

e Combination	1	2	3	4			5	6	7	8
Left	A				NB	Left	A			
Thru	A					Thru	A			
Right	A					Right	A			
Peds						Peds				
Left	A				SB	Left	A			
Thru	A					Thru	A			
Right	A					Right	A			
Peds						Peds				
Right					EB	Right				
Right					WB	Right				
n	25.0						65.0			
ow	4.0						4.0			
Red	1.0						1.0			

e Length: 100.0 secs

Intersection Performance Summary

/	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
bound								
	378	1511	0.15	0.250	29.4	C	29.7	C
	404	1615	0.21	0.250	29.9	C		
bound								
	414	1654	0.04	0.250	28.4	C	28.4	C
	404	1615	0.01	0.250	28.2	C		
hbound								
	359	553	0.47	0.650	9.8	A		
	1235	1900	0.57	0.650	10.3	B	10.1	B
	1050	1615	0.02	0.650	6.2	A		
hbound								
	413	635	0.01	0.650	6.2	A		
	1235	1900	0.66	0.650	12.0	B	11.6	B
	1050	1615	0.05	0.650	6.4	A		

Intersection Delay = 12.4 (sec/veh) Intersection LOS = B

HCS: Signalized Intersections Release 3.1c

Inter: City/St: Kahana, Maui, Hawaii
Analyst: cey Proj #:
Date: 8/10/2000 Period: am peak w/ PD2
E/W St: Hoohui Street N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
No. Lanes	0	1	1	0	1	1	1	1	1	1	1	1
LGConfig		LT	R		LT	R	L	T	R	L	T	R
Volume	30	5	85	25	10	10	30	640	10	10	590	25
Lane Width		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left	A				NB	Left	A			
Thru	A					Thru	A			
Right	A					Right	A			
Peds						Peds				
WB Left	A				SB	Left	A			
Thru	A					Thru	A			
Right	A					Right	A			
Peds						Peds				
NB Right					EB	Right				
SB Right					WB	Right				
Green	25.0						65.0			
Yellow	4.0						4.0			
All Red	1.0						1.0			

Cycle Length: 100.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LT	378	1513	0.10	0.250	28.9	C	29.7	C
R	404	1615	0.22	0.250	30.0	C		
Westbound								
LT	397	1589	0.09	0.250	28.9	C	28.8	C
R	404	1615	0.03	0.250	28.3	C		
Northbound								
L	455	700	0.07	0.650	6.5	A		
T	1235	1900	0.55	0.650	10.0+	B	9.8	A
R	1050	1615	0.01	0.650	6.2	A		
Southbound								
L	426	656	0.03	0.650	6.3	A		
T	1235	1900	0.50	0.650	9.4	A	9.2	A
R	1050	1615	0.02	0.650	6.2	A		

Intersection Delay = 11.8 (sec/veh) Intersection LOS = B

HCS: Signalized Intersections Release 3.1c

:er:
alyst: cey
:e: 8/10/2000
W St: Hoohui Street

City/St: Kahana, Maui, Hawaii
Proj #:
Period: pm peak w/ PD2
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
Lanes	0	1	1	0	1	1	1	1	1	1	1	1
:onfig		LT	R		LT	R	L	T	R	L	T	R
.ume	45	10	80	10	5	5	160	755	25	5	885	50
ie Width		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
)R Vol			0			0			0			0

'ation 0.25 Area Type: All other areas

Signal Operations

ıse Combination	1	2	3	4			5	6	7	8
Left	A				NB	Left	A			
Thru	A					Thru	A			
Right	A					Right	A			
Peds						Peds				
Left	A				SB	Left	A			
Thru	A					Thru	A			
Right	A					Right	A			
Peds						Peds				
Right					EB	Right				
Right					WB	Right				
en	25.0						65.0			
low	4.0						4.0			
Red	1.0						1.0			

le Length: 100.0 secs

Intersection Performance Summary

r/ e	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
tbound								
	378	1511	0.15	0.250	29.4	C	29.7	C
	404	1615	0.21	0.250	29.9	C		
tbound								
	414	1654	0.04	0.250	28.4	C	28.4	C
	404	1615	0.01	0.250	28.2	C		
:hbound								
	309	475	0.54	0.650	11.5	B	11.5	B
	1235	1900	0.64	0.650	11.7	B		
	1050	1615	0.02	0.650	6.2	A		
:hbound								
	367	564	0.01	0.650	6.2	A	14.2	B
	1235	1900	0.75	0.650	14.7	B		
	1050	1615	0.05	0.650	6.4	A		

Intersection Delay = 14.1 (sec/veh) Intersection LOS = B

HCS: Signalized Intersections Release 3.1c

Inter:
Analyst: cey
Date: 8/10/2000
E/W St: Akahele Street

City/St: Kahana, Maui, Hawaii
Proj #:
Period: am peak existing
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
No. Lanes	0	1	1	0	1	1	1	1	1	1	1	1
LGConfig		LT	R		LT	R	L	T	R	L	T	R
Volume	65	10	105	20	5	5	60	410	20	10	490	10
Lane Width		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru	A					Thru	A			
	Right	A					Right	A			
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru	A					Thru	A			
	Right	A					Right	A			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		26.0						64.0			
Yellow		4.0						4.0			
All Red		1.0						1.0			

Cycle Length: 100.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LT	375	1443	0.21	0.260	29.2	C	29.5	C
R	420	1615	0.26	0.260	29.7	C		
Westbound								
LT	402	1546	0.06	0.260	27.9	C	27.8	C
R	420	1615	0.01	0.260	27.5	C		
Northbound								
L	506	791	0.12	0.640	7.2	A	8.3	A
T	1216	1900	0.36	0.640	8.6	A		
R	1034	1615	0.02	0.640	6.6	A		
Southbound								
L	563	879	0.02	0.640	6.6	A	9.0	A
T	1216	1900	0.42	0.640	9.1	A		
R	1034	1615	0.01	0.640	6.5	A		

Intersection Delay = 12.3 (sec/veh) Intersection LOS = B

HCS: Signalized Intersections Release 3.1c

er:
.yst: cey
:: 8/10/2000
St: Akahele Street

City/St: Kahana, Maui, Hawaii
Proj #:
Period: pm peak existing
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
Lanes	0	1	1	0	1	1	1	1	1	1	1	1
nfig		LT	R		LT	R	L	T	R	L	T	R
ime	75	10	150	15	10	10	180	600	20	15	605	75
: Width		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
: Vol			0			0			0			0

tion 0.25 Area Type: All other areas

Signal Operations

e Combination	1	2	3	4			5	6	7	8
Left	A				NB	Left	A			
Thru	A					Thru	A			
Right	A					Right	A			
Peds						Peds				
Left	A				SB	Left	A			
Thru	A					Thru	A			
Right	A					Right	A			
Peds						Peds				
Right					EB	Right				
Right					WB	Right				
n	26.0						64.0			
ow	4.0						4.0			
Red	1.0						1.0			

e Length: 100.0 secs

Intersection Performance Summary

/	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
bound								
	369	1419	0.24	0.260	29.6	C	30.4	C
	420	1615	0.38	0.260	30.9	C		
bound								
	425	1636	0.06	0.260	27.9	C	27.8	C
	420	1615	0.03	0.260	27.6	C		
hbound								
	435	679	0.43	0.640	9.7	A		
	1216	1900	0.52	0.640	10.1	B	9.9	A
	1034	1615	0.02	0.640	6.6	A		
hbound								
	437	683	0.04	0.640	6.7	A		
	1216	1900	0.52	0.640	10.2	B	9.7	A
	1034	1615	0.08	0.640	6.8	A		

Intersection Delay = 12.9 (sec/veh) Intersection LOS = B

HCS: Signalized Intersections Release 3.1c

Inter:
Analyst: cey
Date: 8/10/2000
E/W St: Akahele Street

City/St: Kahana, Maui, Hawaii
Proj #:
Period: am peak w/o PD2
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
No. Lanes	0	1	1	0	1	1	1	1	1	1	1	1
LGConfig		LT	R		LT	R	L	T	R	L	T	R
Volume	65	10	105	20	5	5	60	505	20	10	605	35
Lane Width		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru	A					Thru	A			
	Right	A					Right	A			
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru	A					Thru	A			
	Right	A					Right	A			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		26.0						64.0			
Yellow		4.0						4.0			
All Red		1.0						1.0			

Cycle Length: 100.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LT	375	1443	0.21	0.260	29.2	C	29.5	C
R	420	1615	0.26	0.260	29.7	C		
Westbound								
LT	402	1546	0.06	0.260	27.9	C	27.8	C
R	420	1615	0.01	0.260	27.5	C		
Northbound								
L	435	679	0.14	0.640	7.3	A		
T	1216	1900	0.44	0.640	9.3	A	9.0	A
R	1034	1615	0.02	0.640	6.6	A		
Southbound								
L	496	775	0.02	0.640	6.6	A		
T	1216	1900	0.52	0.640	10.2	B	9.9	A
R	1034	1615	0.04	0.640	6.6	A		

Intersection Delay = 12.3 (sec/veh) Intersection LOS = B

HCS: Signalized Intersections Release 3.1c

ter:
alyst: cey
te: 8/10/2000
N St: Akahele Street

City/St: Kahana, Maui, Hawaii
Proj #:
Period: pm peak w/o PD2
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
. Lanes	0	1	1	0	1	1	1	1	1	1	1	1
:onfig		LT	R		LT	R	L	T	R	L	T	R
lume	75	10	150	15	10	10	180	765	20	15	770	75
ıe Width		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
)R Vol			0			0			0			0

:ation 0.25 Area Type: All other areas

Signal Operations

ıse Combination	1	2	3	4			5	6	7	8
Left	A				NB	Left	A			
Thru	A					Thru	A			
Right	A					Right	A			
Peds						Peds				
Left	A				SB	Left	A			
Thru	A					Thru	A			
Right	A					Right	A			
Peds						Peds				
Right					EB	Right				
Right					WB	Right				
en	26.0						64.0			
low	4.0						4.0			
Red	1.0						1.0			

le Length: 100.0 secs

Intersection Performance Summary

r/ e	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
tbound								
	369	1419	0.24	0.260	29.6	C	30.4	C
	420	1615	0.38	0.260	30.9	C		
:bound								
	425	1636	0.06	0.260	27.9	C	27.8	C
	420	1615	0.03	0.260	27.6	C		
:hbound								
	349	545	0.54	0.640	11.6	B		
	1216	1900	0.66	0.640	12.6	B	12.3	B
	1034	1615	0.02	0.640	6.6	A		
:hbound								
	351	549	0.05	0.640	6.7	A		
	1216	1900	0.67	0.640	12.7	B	12.1	B
	1034	1615	0.08	0.640	6.8	A		

Intersection Delay = 14.5 (sec/veh) Intersection LOS = B

HCS: Signalized Intersections Release 3.1c

Inter:
Analyst: cey
Date: 8/10/2000
E/W St: Akahele Street

City/St: Kahana, Maui, Hawaii
Proj #:
Period: am peak w/ PD2
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
No. Lanes	0	1	1	0	1	1	1	1	1	1	1	1
LGConfig		LT	R		LT	R	L	T	R	L	T	R
Volume	65	10	105	20	5	5	60	610	20	10	655	35
Lane Width		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A			
	Thru	A					Thru	A			
	Right	A					Right	A			
	Peds						Peds				
WB	Left	A				SB	Left	A			
	Thru	A					Thru	A			
	Right	A					Right	A			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		26.0						64.0			
Yellow		4.0						4.0			
All Red		1.0						1.0			

Cycle Length: 100.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LT	375	1443	0.21	0.260	29.2	C	29.5	C
R	420	1615	0.26	0.260	29.7	C		
Westbound								
LT	402	1546	0.06	0.260	27.9	C	27.8	C
R	420	1615	0.01	0.260	27.5	C		
Northbound								
L	407	636	0.15	0.640	7.4	A		
T	1216	1900	0.53	0.640	10.2	B	9.9	A
R	1034	1615	0.02	0.640	6.6	A		
Southbound								
L	432	675	0.03	0.640	6.6	A		
T	1216	1900	0.57	0.640	10.8	B	10.5	B
R	1034	1615	0.04	0.640	6.6	A		

Intersection Delay = 12.7 (sec/veh) Intersection LOS = B

HCS: Signalized Intersections Release 3.1c

ɜr:
lyst: cey
ɜ: 8/10/2000
St: Akahele Street

City/St: Xahana, Maui, Hawaii
Proj #:
Period: pm peak w/ PD2
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
Lanes	0	1	1	0	1	1	1	1	1	1	1	1
ɔnfig		LT	R		LT	R	L	T	R	L	T	R
ıme	75	10	150	15	10	10	180	855	20	15	885	75
: Width		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
₹ Vol			0			0			0			0

ıtion 0.25 Area Type: All other areas

Signal Operations

ıe Combination	1	2	3	4			5	6	7	8
Left	A				NB	Left	A			
Thru	A					Thru	A			
Right	A					Right	A			
Peds						Peds				
Left	A				SB	Left	A			
Thru	A					Thru	A			
Right	A					Right	A			
Peds						Peds				
Right					EB	Right				
Right					WB	Right				
ın	26.0						64.0			
.ow	4.0						4.0			
Red	1.0						1.0			

.e Length: 100.0 secs

Intersection Performance Summary

·/ Lane ı	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
bound								
	369	1419	0.24	0.260	29.6	C	30.4	C
	420	1615	0.38	0.260	30.9	C		
.bound								
	425	1636	0.06	0.260	27.9	C	27.8	C
	420	1615	0.03	0.260	27.6	C		
hbound								
	300	468	0.63	0.640	15.1	B		
	1216	1900	0.74	0.640	14.8	B	14.7	B
	1034	1615	0.02	0.640	6.6	A		
hbound								
	312	487	0.05	0.640	6.8	A		
	1216	1900	0.77	0.640	15.7	B	14.9	B
	1034	1615	0.08	0.640	6.8	A		

Intersection Delay = 16.6 (sec/veh) Intersection LOS = B

HCS: Signalized Intersections Release 3.1c

Inter:
Analyst: cey
Date: 8/10/2000
E/W St: Lower Honoapiilani Highway

City/St: Honokowai Maui, Hawaii
Proj #:
Period: am peak existing
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
No. Lanes	0	1	1	0	1	0	1	2	0	1	2	1
LGConfig		LT	R		LTR		L	TR		L	T	R
Volume	20	5	435	5	5	5	260	465	5	5	585	25
Lane Width		12.0	12.0		12.0		12.0	12.0		12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A	A	A	
	Thru	A					Thru		A	A	
	Right	A					Right		A	A	
	Peds						Peds				
WB	Left		A			SB	Left	A		A	
	Thru		A				Thru			A	
	Right		A				Right			A	
	Peds						Peds				
NB	Right					EB	Right	A	A		
SB	Right					WB	Right				
Green		25.0	5.0					5.0	15.0	55.0	
Yellow		4.0	4.0					0.0	0.0	4.0	
All Red		1.0	1.0					0.0	0.0	1.0	

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LT	380	1826	0.07	0.208	38.2	D	38.1	D
R	606	1615	0.76	0.375	38.1	D		
Westbound								
LTR	67	1598	0.22	0.042	57.3	E	57.3	E
Northbound								
L	527		0.52	0.625	12.5	B		
TR	2103	3605	0.23	0.583	12.1	B	12.2	B
Southbound								
L	486		0.01	0.500	15.1	B		
T	1655	3610	0.37	0.458	21.4	C	21.2	C
R	740	1615	0.04	0.458	17.9	B		

Intersection Delay = 22.2 (sec/veh) Intersection LOS = C

HCS: Signalized Intersections Release 3.1c

:er:
ılyst: cey
:e: 8/10/2000
ı St: Lower Honoapiilani Highway

City/St: Honokowai Maui, Hawaii
Proj #:
Period: pm peak existing
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
Lanes	0	1	1	0	1	0	1	2	0	1	2	1
'onfig		LT	R		LTR		L	TR		L	T	R
ume	45	5	550	5	5	5	490	750	5	5	725	25
e Width		12.0	12.0		12.0		12.0	12.0		12.0	12.0	12.0
·R Vol			0			0			0			0

ation 0.25 Area Type: All other areas

Signal Operations

se Combination	1	2	3	4			5	6	7	8
Left	A				NB	Left	A	A	A	
Thru	A					Thru		A	A	
Right	A					Right		A	A	
Peds						Peds				
Left		A			SB	Left	A		A	
Thru		A				Thru			A	
Right		A				Right			A	
Peds						Peds				
Right					EB	Right	A	A		
Right					WB	Right				
en	25.0	5.0					5.0	20.0	50.0	
low	4.0	4.0					0.0	0.0	4.0	
Red	1.0	1.0					0.0	0.0	1.0	

le Length: 120.0 secs

Intersection Performance Summary

:/ •	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
:bound								
	379	1818	0.14	0.208	38.9	D	42.5	D
	673	1615	0.86	0.417	42.8	D		
:bound								
	67	1598	0.22	0.042	57.3	E	57.3	E
:hbound								
	510		1.01	0.625	64.7	E		
	2104	3607	0.38	0.583	13.5	B	33.7	C
.hbound								
	353		0.01	0.458	17.7	B		
	1504	3610	0.51	0.417	26.2	C	25.9	C
	673	1615	0.04	0.417	20.8	C		

Intersection Delay = 33.6 (sec/veh) Intersection LOS = C

HCS: Signalized Intersections Release 3.1c

Inter:
Analyst: cey
Date: 8/10/2000
E/W St: Lower Honoapiilani Highway

City/St: Honokowai Maui, Hawaii
Proj #:
Period: am peak w/o PD2
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R
No. Lanes	0	1	1	0	1	0	1	2	0	1	2	1
LGConfig		LT	R		LTR		L	TR		L	T	R
Volume	195	5	260	5	5	5	155	470	5	5	505	130
Lane Width		12.0	12.0		12.0		12.0	12.0		12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A	A	A	
	Thru	A					Thru		A	A	
	Right	A					Right		A	A	
	Peds						Peds				
WB	Left		A			SB	Left	A		A	
	Thru		A				Thru			A	
	Right		A				Right			A	
	Peds						Peds				
NB	Right					EB	Right	A	A		
SB	Right	A				WB	Right				
Green		30.0	5.0					5.0	10.0	55.0	
Yellow		4.0	4.0					0.0	0.0	4.0	
All Red		1.0	1.0					0.0	0.0	1.0	

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
Eastbound								
LT	453	1812	0.46	0.250	38.9	D	33.2	C
R	606	1615	0.45	0.375	28.8	C		
Westbound								
LTR	67	1598	0.22	0.042	57.3	E	57.3	E
Northbound								
L	488		0.33	0.583	12.9	B		
TR	1953	3605	0.26	0.542	14.7	B	14.3	B
Southbound								
L	483		0.01	0.500	15.1	B		
T	1655	3610	0.32	0.458	20.8	C	17.3	B
R	1211	1615	0.11	0.750	4.1	A		

Intersection Delay = 20.7 (sec/veh) Intersection LOS = C

HCS: Signalized Intersections Release 3.1c

r:
yst: cey
: 8/10/2000
St: Lower Honoapiilani Highway

City/St: Honokowai Maui, Hawaii
Proj #:
Period: pm peak w/o PD2
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	T	R	Westbound L	T	R	Northbound L	T	R	Southbound L	T	R
Lanes	0	1	1	0	1	0	1	2	0	1	2	1
nfig		LT	R		LTR		L	TR		L	T	R
me	265	5	330	5	5	5	295	695	5	5	675	235
Width		12.0	12.0		12.0		12.0	12.0		12.0	12.0	12.0
Vol			0			0			0			0

tion 0.25 Area Type: All other areas

Signal Operations

e Combination	1	2	3	4			5	6	7	8
Left	A				NB	Left	A	A	A	
Thru	A					Thru		A	A	
Right	A					Right		A	A	
Peds						Peds				
Left		A			SB	Left	A		A	
Thru		A				Thru			A	
Right		A				Right			A	
Peds						Peds				
Right					EB	Right	A	A		
Right	A				WB	Right				
n	35.0	5.0					5.0	15.0	45.0	
ow	4.0	4.0					0.0	0.0	4.0	
Red	1.0	1.0					0.0	0.0	1.0	

e Length: 120.0 secs

Intersection Performance Summary

/	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	g/C	Lane Group Delay	LOS	Approach Delay	LOS
bound								
	528	1811	0.54	0.292	36.8	D	29.2	C
	740	1615	0.47	0.458	22.9	C		
bound								
	67	1598	0.22	0.042	57.3	E	57.3	E
hbound								
	413		0.75	0.542	25.9	C	21.1	C
	1803	3606	0.41	0.500	19.0	B		
hbound								
	340		0.01	0.417	20.5	C	23.5	C
	1354	3610	0.53	0.375	29.6	C		
	1144	1615	0.22	0.708	6.1	A		

Intersection Delay = 24.1 (sec/veh) Intersection LOS = C

HCS: Signalized Intersections Release 3.1c

Inter:
Analyst: cey
Date: 8/10/2000
E/W St: Lower Honoapiilani Highway

City/St: Honokowai Maui, Hawaii
Proj #:
Period: am peak w/ PD2
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound L	T	R	Westbound L	T	R	Northbound L	T	R	Southbound L	T	R
No. Lanes	0	1	1	0	1	0	1	2	0	1	2	1
LGConfig		LT	R		LTR		L	TR		L	T	R
Volume	195	5	260	5	5	5	155	535	5	5	530	130
Lane Width		12.0	12.0		12.0		12.0	12.0		12.0	12.0	12.0
RTOR Vol			0			0			0			0

Duration 0.25 Area Type: All other areas

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	A				NB	Left	A	A	A	
	Thru	A					Thru		A	A	
	Right	A					Right		A	A	
	Peds						Peds				
WB	Left		A			SB	Left	A		A	
	Thru		A				Thru			A	
	Right		A				Right			A	
	Peds						Peds				
NB	Right					EB	Right	A	A		
SB	Right	A				WB	Right				
Green		30.0	5.0					5.0	10.0	55.0	
Yellow		4.0	4.0					0.0	0.0	4.0	
All Red		1.0	1.0					0.0	0.0	1.0	

Cycle Length: 120.0 secs

Intersection Performance Summary

Appr/ Lane Grp	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	g/C	Lane Group Delay	LOS	Approach Delay	LOS
Eastbound								
LT	453	1812	0.46	0.250	38.9	D	33.2	C
R	606	1615	0.45	0.375	28.8	C		
Westbound								
LTR	67	1598	0.22	0.042	57.3	E	57.3	E
Northbound								
L	476		0.34	0.583	13.0	B		
TR	1953	3605	0.29	0.542	15.0	B	14.6	B
Southbound								
L	457		0.01	0.500	15.1	B		
T	1655	3610	0.34	0.458	20.9	C	17.6	B
R	1211	1615	0.11	0.750	4.1	A		

Intersection Delay = 20.7 (sec/veh) Intersection LOS = C

HCS: Signalized Intersections Release 3.1c

.er:
ılyst: cey
.e: 8/10/2000
' St: Lower Honoapiilani Highway

City/St: Honokowai Maui, Hawaii
Proj #:
Period: pm peak w/ PD2
N/S St: Honoapiilani Highway

SIGNALIZED INTERSECTION SUMMARY

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Lanes	0	1	1	0	1	0	1	2	0	1	2	1
onfig		LT	R		LTR		L	TR		L	T	R
ume	265	5	330	5	5	5	295	750	5	5	745	235
e Width		12.0	12.0		12.0		12.0	12.0		12.0	12.0	12.0
R Vol			0			0			0			0

ation 0.25 Area Type: All other areas

Signal Operations

se Combination	1	2	3	4			5	6	7	8
Left	A				NB	Left	A	A	A	
Thru	A					Thru		A	A	
Right	A					Right		A	A	
Peds						Peds				
Left		A			SB	Left	A		A	
Thru		A				Thru			A	
Right		A				Right			A	
Peds						Peds				
Right					EB	Right	A	A		
Right	A				WB	Right				
:n	35.0	5.0					5.0	15.0	45.0	
:ow	4.0	4.0					0.0	0.0	4.0	
Red	1.0	1.0					0.0	0.0	1.0	

.e Length: 120.0 secs

Intersection Performance Summary

7 Lane Group	Lane Group Capacity	Adj Sat Flow Rate (s)	Ratios v/c	Ratios g/C	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS
bound								
	528	1811	0.54	0.292	36.8	D	29.2	C
	740	1615	0.47	0.458	22.9	C		
bound								
	67	1598	0.22	0.042	57.3	E	57.3	E
hbound								
	392		0.79	0.542	29.7	C		
	1804	3607	0.44	0.500	19.4	B	22.3	C
hbound								
	326		0.02	0.417	20.5	C		
	1354	3610	0.58	0.375	30.6	C	24.7	C
	1144	1615	0.22	0.708	6.1	A		

Intersection Delay = 24.9 (sec/veh) Intersection LOS = C

Appendix J-1

Environmental Noise Assessment Study
Expanded Kapalua Project District 2

D. L. ADAMS ASSOCIATES, LTD.
ACOUSTICAL CONSULTANTS

Project No. 99-07

ENVIRONMENTAL NOISE ASSESSMENT STUDY
KAPALUA PROJECT DISTRICT 2
KAPALUA, MAUI, HAWAII

October 9, 2000

Prepared for
PBR Hawaii
Honolulu, Hawaii

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CONTENTS

1.0 SUMMARY

1.1 The proposed Kapalua Project District 2 Master Plan involves the expansion of an existing golf course and establishment of a new residential community.

1.2 The project area is currently exposed to daytime ambient noise levels of 54 to 67 dBA with the dominant noise sources being traffic, wind, and occasional distant aircraft flybys.

1.3 Existing noise sensitive areas include residential areas, schools, churches, and recreational areas (e.g., golf course) located along Honoapiilani Highway.

1.4 The dominant noise sources during project construction will probably be earth moving equipment, such as bulldozers and diesel powered trucks unless pile driving is necessary. Noise from construction activities will occur on the subject property. The noise from construction and demolition activities could impact nearby residences and will impact the existing golf course. Noise from construction activities should be short term and must comply with State Department of Health noise regulations.

1.5 The main noise source following the completion of the project will be due to vehicular traffic entering and exiting the proposed residential areas and golf course. The noise emanating from these vehicles could impact nearby noise sensitive areas along Honoapiilani Highway.

2.0 PROJECT DESCRIPTION

The Kapalua Project District 2 Master Plan objective is to create a mix of single-family, multi-family, commercial, and recreational (golf course) open space areas. The project location and study area are shown on Figure 1. The development plans entail the expansion of an existing golf course and the construction of residential housing on and adjacent to the golf course. The development site is bordered on the Makai side by Honoapiilani Highway, on the Mauka side by pineapple cultivation, and to the east and west by vacant open gulches. To the east, beyond the gulch, are two residentioal communities; Plantation Estates II and Plantation at Kapalua. There will be two access points to the development along Honoapiilani Highway.

3.0 NOISE STANDARDS

Various local and federal agencies have established guidelines and standards for assessing environmental noise impacts and set noise limits as a function of land use. A brief description of common acoustic terminology used in these guidelines and standards is presented in Appendix A.

3.1 State Department of Health (DOH)

The State DOH defines three classes of zoning districts and specifies corresponding maximum permissible sound levels due to stationary noise sources such as air-conditioning units, exhaust systems, generators, compressors, pumps, etc., and equipment related agricultural, construction, and industrial activities [Reference 1]. These levels are enforced for any location at or beyond the property line and shall not be exceeded for more than 10% of the time during any 20-minute period. The specified noise limits which apply are a function of the zoning and time of day as shown in Figure 2. With respect to mixed zoning districts, DOH specifies the primary land use designation shall be used to determine the applicable zoning district class and the maximum permissible sound level.

3.2 U.S. Environmental Protection Agency (EPA)

The U.S. EPA has identified a range of yearly day-night equivalent sound levels, L_{dn}, sufficient to protect public health and welfare from the effects of environmental noise [Reference 3]. The EPA has established a goal to reduce exterior environmental noise to an L_{dn} not exceeding 65 dBA and a future goal to further reduce exterior environmental noise to an L_{dn} not exceeding 55 dBA. Additionally, the EPA states that these goals are not intended as regulations as it has no authority to regulate noise levels, but rather they are intended to be viewed as levels below which the general population will not be at risk from any of the identified effects of noise.

3.3 U.S. Federal Highway Administration (FHWA)

The FHWA defines four land use categories and assigns corresponding maximum hourly equivalent sound levels, L_{eq}, for traffic noise exposure [Reference 4]. For example, Category B, defined as picnic and recreation areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals, has a corresponding maximum exterior L_{eq} of 67dBA and a maximum interior L_{eq} of 52 dBA. These limits are viewed as design goals, and all projects meeting these limits are deemed in conformance with FHWA noise standards.

The State HDOT has adopted FHWA's design goals for traffic noise exposure in its noise analysis and abatement policy [Reference 5]. According to the policy, a traffic noise impact occurs when the predicted traffic noise levels "approach" or exceed FHWA's design goals or when the predicted traffic noise levels "substantially exceed the existing noise levels." The policy also states that "approach" means at least 1 dB less than FHWA's design goals and "substantially exceed the existing noise levels" means an increase of at least 15dB.

3.4 U.S. Department of Housing and Urban Development (HUD)

HUD's environmental noise criteria and standards in 24 CFR 51 [Reference 6] were established for determining housing project site acceptability. These standards are based on day-night equivalent sound levels, L_{dn}, and are not limited to traffic noise exposure. However, for project sites in the vicinity of highways, the L_{dn} may be estimated to be equal to the design hour $L_{eq(h)}$, provided "heavy trucks (vehicles with three or more axles) do not exceed 10 percent of the total traffic flow in vehicles per 24 hours and the traffic flow between 10:00 pm and 7:00 am does not exceed 15 percent of the average daily traffic flow in vehicles per 24 hours." For these same conditions, L_{dn} may also be estimated as 3 dB less than the design hour L_{10}.

HUD site acceptability criteria rank sites as Acceptable, Normally Unacceptable, or Unacceptable. "Acceptable" sites are those where exterior noise levels do not exceed an L_{dn} of 65 dBA. Proposed housing projects on "Acceptable" sites do not require additional noise attenuation other than that provided by customary building techniques. "Normally Unacceptable" sites are those where the L_{dn} is above 65 dBA, but does not exceed 75 dBA. Housing on "Normally Unacceptable" sites requires some form of noise abatement, either at the property line or in the building construction, to ensure the interior noise levels are acceptable. "Unacceptable" sites are those where the L_{dn} is 75 dBA or higher. The term "Unacceptable" does not necessarily mean that housing cannot be built on those sites. It means that more sophisticated sound attenuation will likely be needed.

4.0 EXISTING ACOUSTICAL ENVIRONMENT

Noise level measurements were conducted on May 25 and August 26, 1999 to assess the existing acoustical environment at the project site and along Honoapiilani Highway. The measurements were obtained at Locations 1 through 4 as shown in Figure 3, using Larson-Davis Laboratories, Models 700, 800, and 820, sound level meters. The following results expressed in terms of equivalent sound levels, L_{eq}, and in units of A-weighted decibels were obtained.

Measurement Location	Date/Time of Measurement	Duration of Measurement	Sound Pressure Levels (dBA)
1 -20' from Honoapiilani Hwy	8/26/99 - 1:45 PM	15 min	67.3
2 - Project Site	8/26/99 - 1:45 PM	15 min	54.9
3 - Honolua Preschool	5/25/99 - 11:00 AM	60 min	56.0
4 - 20' from Honoapiilani Hwy	5/25/99 - 7:00 AM	60 min	71.0

Presently, the dominant noise sources at the above locations include traffic, wind, and occasional distant aircraft flybys. Traffic volumes and vehicle mix were also recorded during measurements at locations 1, 2, and 4.

5.0 POTENTIAL NOISE IMPACT DUE TO THE PROJECT AND NOISE MITIGATION

5.1 Project Construction Noise

Development of Kapalua Project District 2 will involve excavation, grading, and construction of new buildings and infrastructure. The various construction phases of the project may generate significant amounts of noise, which may impact nearby residential and recreational (golf course) areas. The actual noise levels produced will be a function of the methods employed during each stage of the construction process. Typical ranges of construction equipment noise are shown in Figure 4. Earthmoving equipment, e.g., bulldozers and diesel-powered trucks, will probably be the loudest equipment used during construction, assuming that pile driving will not be required.

In cases where construction noise exceeds, or is expected to exceed the DOH's "maximum permissible" property line noise levels [Reference 1], a permit must be obtained from the DOH to allow the operation of vehicles, construction equipment, power tools, etc., which emit noise levels in excess of "maximum permissible" levels. Specific permit restrictions for construction activities are:

> "No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels...before 7:00 a.m. and after 6:00 p.m. of the same day, Monday through Friday."

> "No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels...before 9:00 a.m. and after 6:00 p.m. on Saturday."

> "No permit shall allow any construction activities which emit noise in

excess of the maximum permissible sound levels on Sundays and on holidays."

In addition, construction equipment and on-site vehicles or devices whose operations involve the exhausting of gas or air, excluding pile hammers and pneumatic hand tools weighing less than 15 pounds, must be equipped with mufflers.

Blasting, if required, could also produce noise impacts. However, blasting at construction sites near populated areas is usually accomplished by using numerous small charges detonated with small time delays. Blast mats can also be used to assist in directing the explosive energy into the rock, controlling flying debris, and muffling the noise. Thus, with the appropriate blast design techniques, the noise from blasting can be controlled within acceptable limits at the closest noise sensitive locations.

5.2 Project Generated Traffic Noise

Measured traffic noise levels along with the traffic volume and vehicle mix counts obtained during the measurements were used to calibrate the FHWA's Traffic Noise Prediction Model [Reference 7]. The noise model together with the traffic data [Reference 8] was then used to calculate the peak hour traffic noise levels with and without the project. The results are presented in Table 1.

Table 1
Existing and Projected Future Peak Hour Traffic Noise Levels (L_{eq} in dBA)

With or Without Proposed Project	Year	Location 1 - 20' from Honoapiilani Highway		Location 2 - Project Site		Location 3 - Honolua Preschool		Location 4 - 20' from Honoapiilani Highway	
		AM	PM	AM	PM	AM	PM	AM	PM
Without Proposed Project	existing	67.8	69.9	57.6	58.6	64.0	65.8	70.7	71.8
	2020	68.8	71.2	58.5	60.0	65.1	67.4	71.5	72.8
With Proposed Project	2020	69.7	72.1	59.4	60.8	66.0	68.1	72.1	73.4

From the results of Table 1, traffic noise level increases due to the proposed project were calculated and are presented in Table 2. As can be seen, the predicted maximum traffic noise level increase along the assessed roadways due to the project is less than 1 dB, which is below the threshold of change in noise level that is perceptible to most people with normal hearing.

Table 2
Change in Traffic Noise Levels With and Without the Proposed Project (L_{eq} in dBA)

	Location 1 - 20' from Honoapiilani Highway		Location 2 - Project Site		Location 3 - Honolua Preschool		Location 4 - 20' from Honoapiilani Highway	
	AM	PM	AM	PM	AM	PM	AM	PM
Increase Due to Project - 2020	0.9	0.9	0.9	0.8	0.9	0.7	0.6	0.6

5.3 Residential Areas

Development of the residential areas may temporarily impact nearby residences to the east and makai of the project site. The DOH construction noise regulations discussed above should be adhered to during all phases of construction and renovation.

Traffic noise from Honoapiilani Highway may impact residential properties located within 75 feet of the highway. New residences on the project site should be constructed at least 75 feet from Honoapiilani Highway. Alternatively, noise barriers along Honoapiilani Highway in the vicinity of noise sensitive properties could be employed to mitigate the noise impact.

REFERENCES:

1. Chapter 46, *Community Noise Control*, Department of Health, State of Hawaii, Administrative Rules, Title 11, September 23, 1996.

2. *Section 3.11 Noise Regulations*, Land Use Ordinance, City and County of Honolulu, Oahu, October 22, 1986.

3. *Toward a National Strategy for Noise Control*, U.S. Environmental Protection Agency, April 1977.

4. *Department of Transportation, Federal highway Administration Procedures for Abatement of Highway traffic Noise*, Title 23, CFR, Chapter 1, Subchapter J, Part 772, 38 FR 15953, June 19, 1973; Revised at 47 FR 29654, July 8, 1982.

5. *Noise Analysis and Abatement Policy*, Department of Transportation, Highways Division, State of Hawaii, June 1977.

6. *Department of Housing and Urban Development Environmental Criteria and Standards*, Title 24, CFR, Part 51, 44 FR 40860, July 12, 1979; Amended by 49 FR 880, January 6, 1984.

7. *FHWA Highway Traffic Noise Prediction Model*, FHWA-RD-77-108; U.S. Department of Transportation, December 1978.

8. Traffic Data Received from Parsons Brinckerhoff Quade & Douglas, Inc., August 11, 14 and 27, 1998.

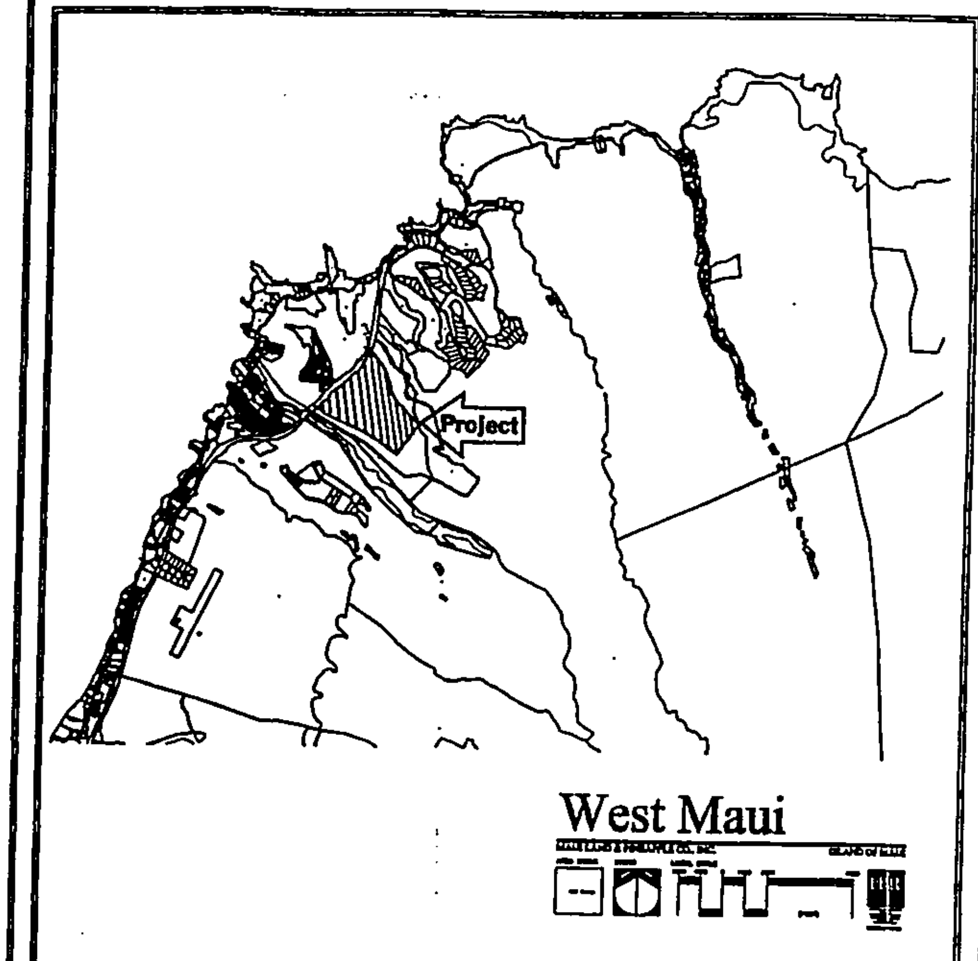

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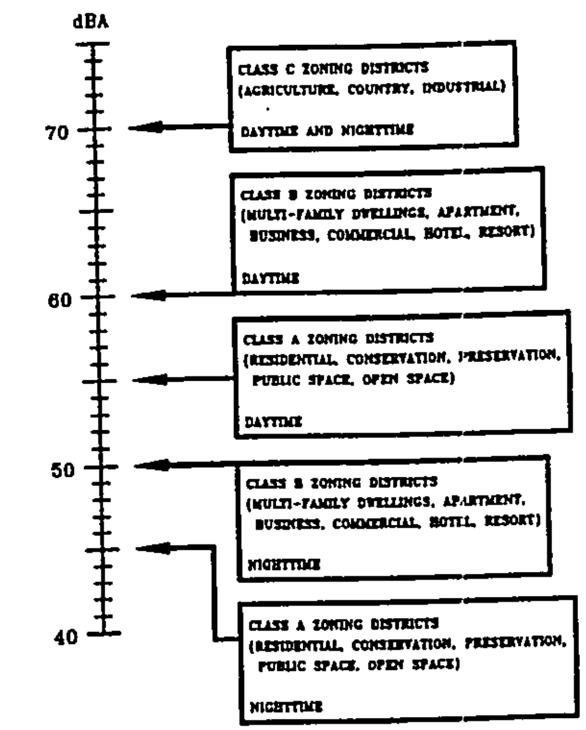
FIGURE 1 - PROJECT LOCATION AND STUDY AREA



NOTE: SOUND LEVELS INDICATED BY ZONING DISTRICT ARE THE "MAXIMUM PERMISSIBLE" SOUND LEVELS DUE TO EXCESSIVE NOISE SOURCES SUCH AS STATIONARY MECHANICAL EQUIPMENT AND EQUIPMENT RELATED TO AGRICULTURAL, CONSTRUCTION AND INDUSTRIAL ACTIVITIES THAT SHALL NOT BE EXCEEDED FOR MORE THAN 10% OF THE TIME WITHIN ANY 20-MINUTE PERIOD DURING THE TIME PERIOD SHOWN (DAYTIME: 7:00 A.M. TO 10:00 P.M., NIGHTTIME: 10:00 P.M. TO 7:00 A.M.)

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FIGURE 2 - MAXIMUM PERMISSIBLE SOUND LEVELS FOR VARIOUS ZONING DISTRICTS

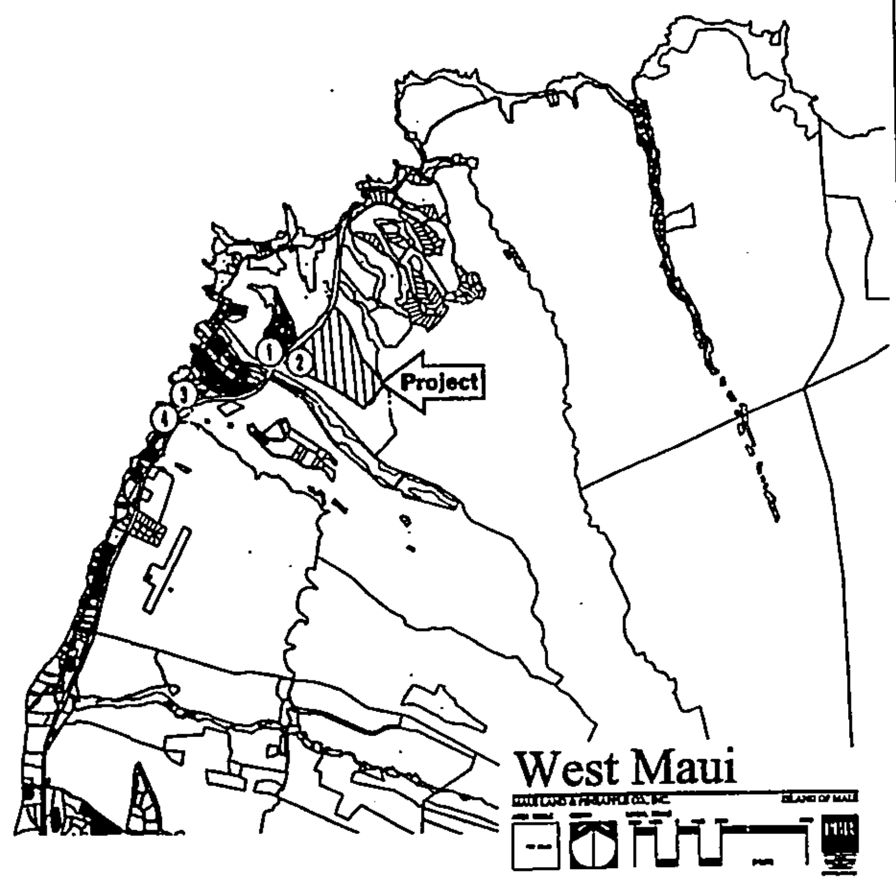

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FIGURE 3 - LOCATIONS OF NOISE MEASUREMENTS

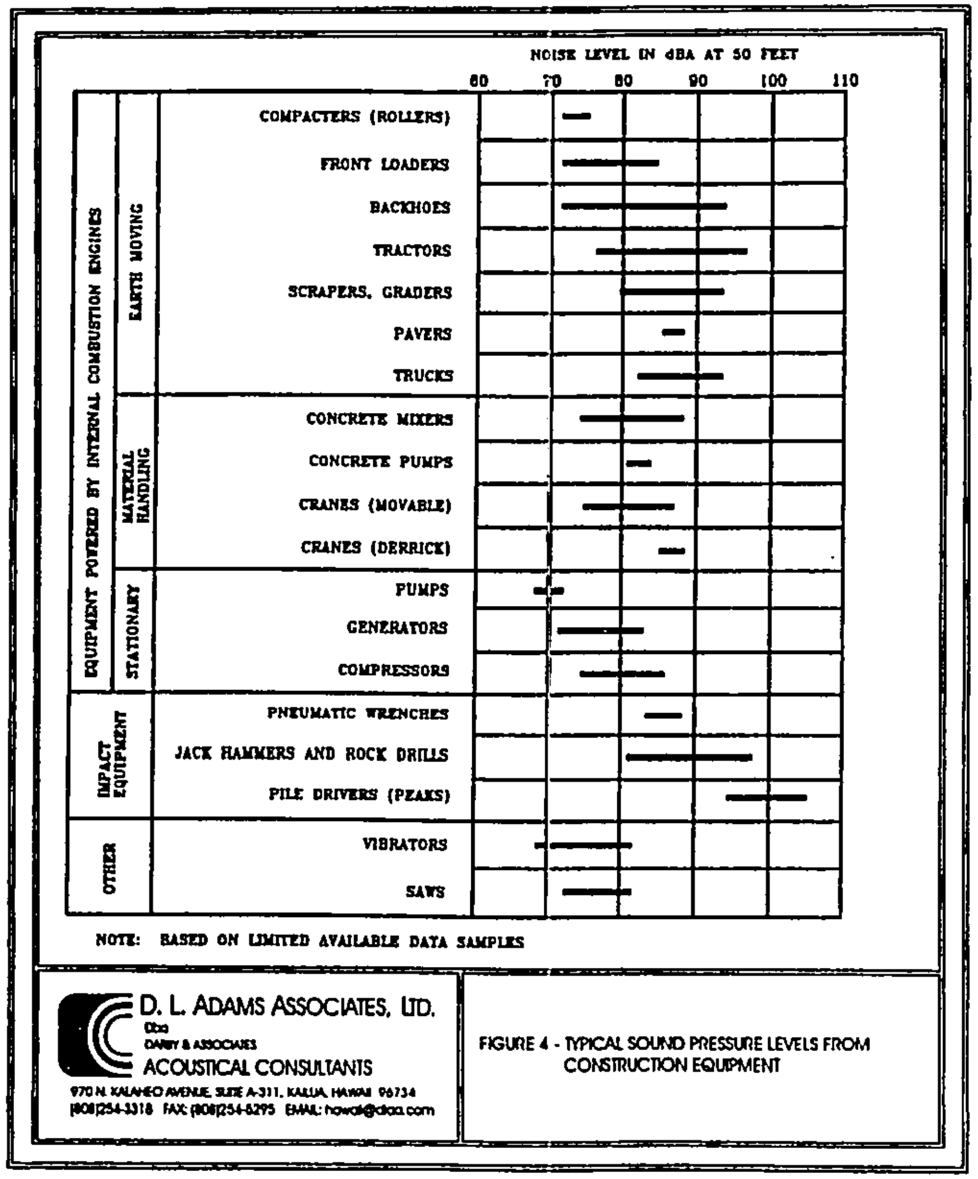

FIGURE 4 - TYPICAL SOUND PRESSURE LEVELS FROM CONSTRUCTION EQUIPMENT

APPENDIX A

ACOUSTICAL TERMINOLOGY

Sound Pressure Level

Sound or noise consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. It is measured in terms of decibels (dB) using precision instruments known as sound level meters. Noise is defined as "unwanted" sound.

Technically, sound pressure level (SPL) is defined as:

$$SPL = 20 \log (P/Pref) \text{ dB}$$

where P is the sound pressure fluctuation (above or below atmospheric pressure) and Pref is the reference pressure, 20 micropascals, which is approximately the lowest sound pressure that can be detected by the human ear. For example, if P is 20 micropascals, then SPL = 0 dB, or if P is 200 micropascals, then SPL = 20 dB. The relation between sound pressure in micropascals and sound pressure level in decibels (dB) is shown in Figure A-1.

The sound pressure level that results from a combination of noise sources is not the arithmetic sum of the individual sound levels, but rather the logarithmic sum. For example, two sound levels of 50 dB produce a combined level of 53 dB, not 100 dB; two sound levels of 40 and 50 dB produce a combined level of 50.4 dB.

Human sensitivity to changes in sound pressure level is highly individualized. Sensitivity to sound depends on frequency content, time of occurrence, duration, and psychological factors such as emotions and expectations. However, in general, a change of 1 or 2 dB in the level of a sound is difficult for most people to detect. A 3 dB change is commonly taken as the smallest perceptible change and a 5 dB change corresponds to a noticeable change in loudness. A 10 dB increase or decrease in sound level corresponds to an approximate doubling or halving of loudness, respectively.

A-Weighted Sound Level

The human ear is more sensitive to sound in the frequency range of 250 Hertz (Hz) and higher, than in frequencies below 250 Hz. Due to this type of frequency response, a frequency weighting system, was developed to emulate the frequency response of the human ear. This system expresses sound levels in units of A-weighted decibels (dBA). A-weighted sound levels de-emphasizes the low frequency portion of the spectrum of a signal. The A-weighted level of a sound is a good measure of the loudness of that sound. Different sounds having the same A-weighted sound level are perceived as being about equally loud. Typical values of the A-weighted sound level of various noise sources are shown in Figure A-1.

<u>Statistical Sound Levels</u>

The sound levels of long-term noise producing activities, such as traffic movement, aircraft operations, etc., can vary considerably with time. In order to obtain a single number rating of such a noise source, a statistically-based method of expressing sound or noise levels developed. It is known as the Exceedence Level, L_n. The Exceedence Level, L_n, represents the sound level which is exceeded for n% of the measurement time period. For example, $L_{10} = 60$ dBA indicates that for the duration at the measurement period, the sound level exceeded 60 dBA 10% of the time. Commonly used Exceedence Levels include L_1, L_{10}, L_{50}, and L_{90}, which are widely used to assess community and environmental noise. Figure A-2 illustrates the relationship between selected statistical noise levels.

<u>Equivalent Sound Level</u>

The Equivalent Sound Level, L_{eq}, represents a constant level of sound having the same total acoustic energy as that contained in the actual time-varying sound being measured over a specific time period. L_{eq} is commonly used to describe community noise, traffic noise, and hearing damage potential. It has units of dBA and is illustrated in Figure A-2.

<u>Day-Night Equivalent Sound Level</u>

The Day-Night Equivalent Sound Level, L_{dn}, is the Equivalent Sound Level, L_{eq}, measured over a 24-hour period. However, a 10 dB penalty is added to the noise levels recorded between 10 pm and 7 am to account for people's higher sensitivity to noise at night when the background noise level is typically lower. The L_{dn} is a commonly used noise descriptor in assessing land use compatibility, and is widely used by federal and local agencies and standards organizations. Qualitative descriptions, as well as local examples of L_{dn}, are shown in Figure A-3.

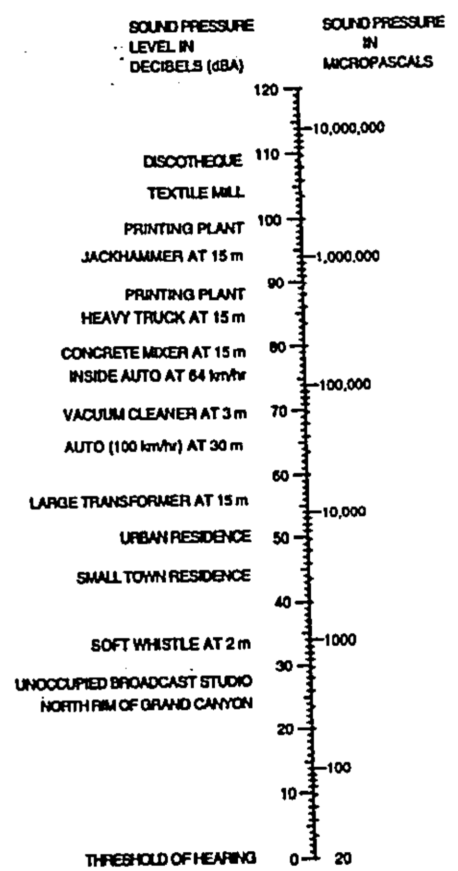

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FIGURE A-1 - THE RELATION BETWEEN SOUND PRESSURE, P, AND SOUND PRESSURE LEVEL, SPL. ALSO SHOWN ARE TYPICAL VALUES OF A-WEIGHTED SOUND LEVELS OF VARIOUS NOISE SOURCES.

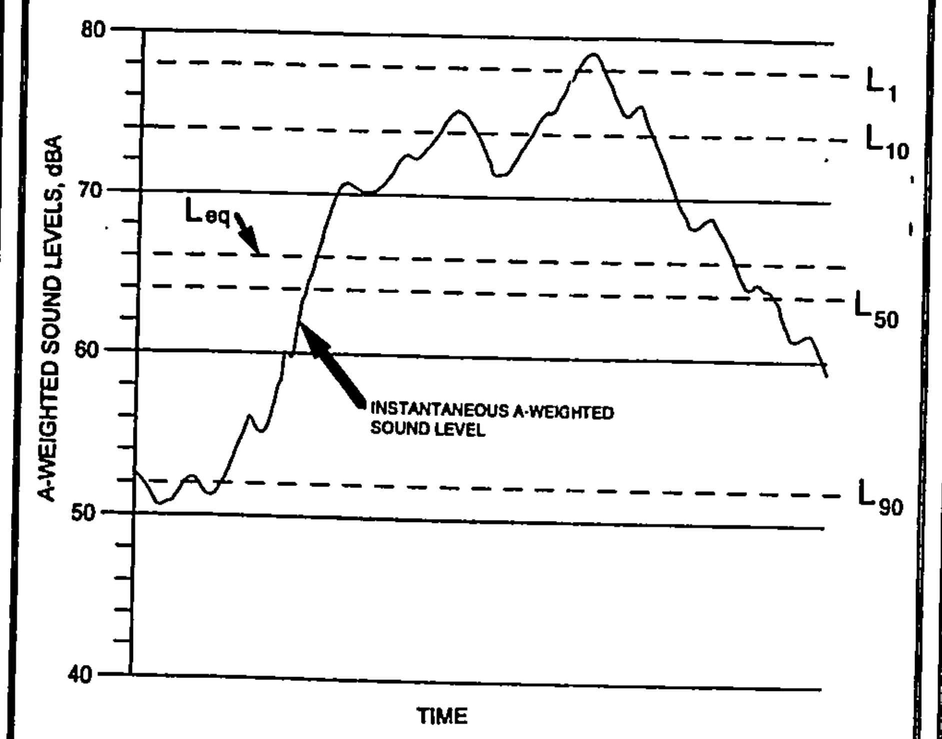

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FIGURE A-2 - COMPARISON OF AN INSTANTANEOUS SOUND LEVEL AND THE CORRESPONDING STATISTICAL SOUND LEVELS

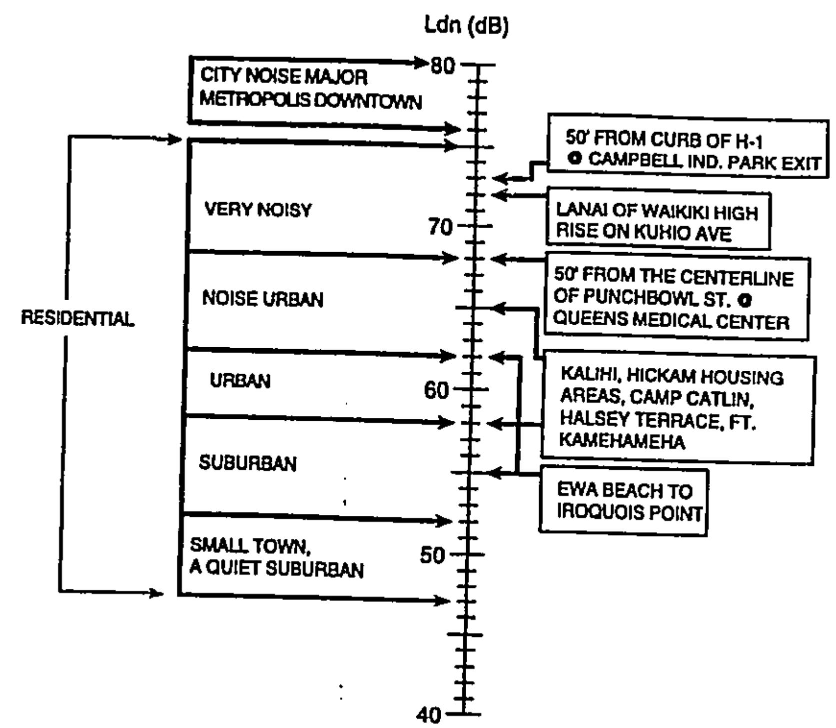

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FIGURE A-3 - QUALITATIVE DESCRIPTION OF THE DAY-NIGHT EQUIVALENT SOUND LEVELS (Ldn) AND EXAMPLE Ldn's AT SELECTED LOCATIONS ON OAHU

Appendix J-2

Environmental Noise Assessment Study
Expanded Kapalua Project District 2

D. L. ADAMS ASSOCIATES, LTD.
ACOUSTICAL CONSULTANTS

Project No. 01-09

ENVIRONMENTAL NOISE ASSESSMENT STUDY
EXPANDED PROJECT DISTRICT 2, KAPALUA EXPANSION AREA
KAPALUA, MAUI, HAWAII

July 24, 2001

Prepared for
Kapalua Land Company
Lahaina, Maui, Hawaii

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CONTENTS

1.0 SUMMARY

1.1 The proposed Kapalua Project District 2 Master Plan has been expanded to include areas not covered in the initial environmental noise assessment completed in October 2000. This expansion involves an additional 585 acres increasing the total project area to 1035 acres.

1.2 The project area is currently exposed to daytime ambient noise levels of 54 to 67 dBA with the dominant noise sources being traffic, wind, and occasional distant aircraft flybys.

1.3 Existing noise sensitive areas include residential areas, schools, churches, and recreational areas (e.g., a golf course) located along Honoapiilani Highway.

1.4 The dominant noise sources during project construction will probably be earth moving equipment, such as bulldozers and diesel powered trucks unless pile driving is necessary. Noise from construction activities will occur on the subject property. The noise from construction and demolition activities could impact nearby residences and will impact the existing golf course. Noise from construction activities should be short term and must comply with State Department of Health noise regulations.

1.5 The main noise source following the completion of the project will be due to vehicular traffic entering and exiting the proposed residential areas and golf course. The noise emanating from these vehicles could impact nearby noise sensitive areas along Honoapiilani Highway.

2.0 PROJECT DESCRIPTION

The Kapalua Project District 2 Master Plan objective is to create a mix of single-family, multi-family, commercial, and recreational (golf course) open space areas. The expanded project expansion location and study area are shown on Figure 1. The expansion plans entail the construction of residential housing adjacent to the original plan. The development site is bordered on the Makai side by Honoapiilani Highway with two access points along Honoapiilani Highway in addition to the two access points of the original plan.

3.0 NOISE STANDARDS

Various local and federal agencies have established guidelines and standards for assessing environmental noise impacts and set noise limits as a function of land use. A brief description of common acoustic terminology used in these guidelines and standards is presented in Appendix A.

3.1 State Department of Health (DOH)

The State DOH defines three classes of zoning districts and specifies corresponding maximum permissible sound levels due to stationary noise sources such as air-conditioning units, exhaust systems, generators, compressors, pumps, etc., and equipment related agricultural, construction, and industrial activities [Reference 1]. These levels are enforced for any location at or beyond the property line and shall not be exceeded for more than 10% of the time during any 20-minute period. The specified noise limits which apply are a function of the zoning and time of day as shown in Figure 2. With respect to mixed zoning districts, DOH specifies the primary land use designation shall be used to determine the applicable zoning district class and the maximum permissible sound level.

3.2 U.S. Environmental Protection Agency (EPA)

The U.S. EPA has identified a range of yearly day-night equivalent sound levels, L_{dn}, sufficient to protect public health and welfare from the effects of environmental noise [Reference 2]. The EPA has established a goal to reduce exterior environmental noise to an L_{dn} not exceeding 65 dBA and a future goal to further reduce exterior environmental noise to an L_{dn} not exceeding 55 dBA. Additionally, the EPA states that these goals are not intended as regulations as it has no authority to regulate noise levels, but rather they are intended to be viewed as levels below which the general population will not be at risk from any of the identified effects of noise.

3.3 U.S. Federal Highway Administration (FHWA)

The FHWA defines four land use categories and assigns corresponding maximum hourly equivalent sound levels, L_{eq}, for traffic noise exposure [Reference 3]. For example, Category B, defined as picnic and recreation areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals, has a corresponding maximum exterior L_{eq} of 67 dBA and a maximum interior L_{eq} of 52 dBA. These limits are viewed as design goals, and all projects meeting these limits are deemed in conformance with FHWA noise standards.

The State HDOT has adopted FHWA's design goals for traffic noise exposure in its noise analysis and abatement policy [Reference 4]. According to the policy, a traffic noise impact occurs when the predicted traffic noise levels "approach" or exceed FHWA's design goals or when the predicted traffic noise levels "substantially exceed the existing noise levels." The policy also states that "approach" means at least 1 dB less than FHWA's design goals and "substantially exceed the existing noise levels" means an increase of at least 15dB.

3.4 U.S. Department of Housing and Urban Development (HUD)

HUD's environmental noise criteria and standards in 24 CFR 51 [Reference 5] were established for determining housing project site acceptability. These standards are based on day-night equivalent sound levels, L_{dn}, and are not limited to traffic noise exposure. However, for project sites in the vicinity of highways, the L_{dn} may be estimated to be equal to the design hour $L_{eq(h)}$, provided "heavy trucks (vehicles with three or more axles) do not exceed 10 percent of the total traffic flow in vehicles per 24 hours and the traffic flow between 10:00 pm and 7:00 am does not exceed 15 percent of the average daily traffic flow in vehicles per 24 hours." For these same conditions, L_{dn} may also be estimated as 3 dB less than the design hour L_{10}.

HUD site acceptability criteria rank sites as Acceptable, Normally Unacceptable, or Unacceptable. "Acceptable" sites are those where exterior noise levels do not exceed an L_{dn} of 65 dBA. Proposed housing projects on "Acceptable" sites do not require additional noise attenuation other than that provided by customary building techniques. "Normally Unacceptable" sites are those where the L_{dn} is above 65 dBA, but does not exceed 75 dBA. Housing on "Normally Unacceptable" sites requires some form of noise abatement, either at the property line or in the building construction, to ensure the interior noise levels are acceptable. "Unacceptable" sites are those where the L_{dn} is 75 dBA or higher. The term "Unacceptable" does not necessarily mean that housing cannot be built on those sites. It means that more sophisticated sound attenuation will likely be needed.

4.0 EXISTING ACOUSTICAL ENVIRONMENT

Noise level measurements were conducted on May 25 and August 26, 1999 to assess the existing acoustical environment at the project site and along Honoapiilani Highway. The measurements were obtained at Locations 1 through 4, as shown in Figure 3, using Larson-Davis Laboratories, Models 700, 800, and 820, sound level meters. The following results expressed in terms of equivalent sound levels, L_{eq}, and in units of A-weighted decibels were obtained.

Measurement Location	Date/Time of Measurement	Duration of Measurement	Sound Pressure Levels (dBA)
1 - 20' from Honoapiilani Hwy	8/26/99 - 1:45 PM	15 min	67.3
2 - Project Site	8/26/99 - 1:45 PM	15 min	54.9
3 - Honolua Preschool	5/25/99 - 11:00 AM	60 min	56.0
4 - 20' from Honoapiilani Hwy	5/25/99 - 7:00 AM	60 min	71.0

Presently, the dominant noise sources at the above locations include traffic, wind, and occasional distant aircraft flybys. Traffic volumes and vehicle mix were also recorded during measurements at locations 1, 2, and 4.

5.0 POTENTIAL NOISE IMPACT DUE TO THE PROJECT AND NOISE MITIGATION

5.1 Project Construction Noise

Development of Kapalua Project District 2 will involve excavation, grading, and construction of new buildings and infrastructure. The various construction phases of the project may generate significant amounts of noise, which may impact nearby residential and recreational (golf course) areas. The actual noise levels produced will be a function of the methods employed during each stage of the construction process. Typical ranges of construction equipment noise are shown in Figure 4. Earthmoving equipment, e.g., bulldozers and diesel-powered trucks, will probably be the loudest equipment used during construction, assuming that pile driving will not be required.

In cases where construction noise exceeds, or is expected to exceed the DOH's "maximum permissible" property line noise levels [Reference 1], a permit must be obtained from the DOH to allow the operation of vehicles, construction equipment, power tools, etc., which emit noise levels in excess of "maximum permissible" levels. Specific permit restrictions for construction activities are:

> "No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels...before 7:00 a.m. and after 6:00 p.m. of the same day, Monday through Friday."

> "No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels...before 9:00 a.m. and after 6:00 p.m. on Saturday."

> "No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels on Sundays and on

holidays."

In addition, construction equipment and on-site vehicles or devices whose operations involve the exhausting of gas or air, excluding pile hammers and pneumatic hand tools weighing less than 15 pounds, must be equipped with mufflers.

Blasting, if required, could also produce noise impacts. However, blasting at construction sites near populated areas is usually accomplished by using numerous small charges detonated with small time delays. Blast mats can also be used to assist in directing the explosive energy into the rock, controlling flying debris, and muffling the noise. Thus, with the appropriate blast design techniques, the noise from blasting can be controlled within acceptable limits at the closest noise sensitive locations.

5.2 Project Generated Traffic Noise

Measured traffic noise levels along with the traffic volume and vehicle mix counts obtained during the measurements were used to calibrate the FHWA's Traffic Noise Prediction Model [Reference 6]. The noise model together with the traffic data [Reference 7] was then used to calculate the peak hour traffic noise levels with and without the project. The future traffic noise levels account for both the original project and the expansion project. The results are presented in Table 1.

Table 1
Existing and Projected Future Peak Hour Traffic Noise Levels (L_{eq} in dBA)

With or Without Proposed Project	Year	Location 1 - 20' from Honoapiilani Highway		Location 2 - Project Site		Location 3 - Honolua Preschool		Location 4 - 20' from Honoapiilani Highway	
		AM	PM	AM	PM	AM	PM	AM	PM
Without Proposed Project Expansion	existing	67.8	69.9	57.6	58.6	64.0	65.8	70.7	71.8
	2020	68.8	70.8	58.4	59.8	68.2	69.6	71.5	72.9
With Proposed Project and Expansion	2020	69.5	71.3	59.1	60.6	68.7	70.1	71.9	73.4

From the results of Table 1, traffic noise level increases due to the proposed project were calculated and are presented in Table 2. As can be seen, the predicted maximum traffic noise level increase along the assessed roadways due to the project is less than 1 dB, which is below the threshold of perceptible change in noise level for most people with normal hearing.

Table 2
Change in Traffic Noise Levels With and Without the Proposed Project (L_{eq} in dBA)

	Location 1 - 20' from Honoapiilani Highway		Location 2 - Project Site		Location 3 - Honolua Preschool		Location 4 - 20' from Honoapiilani Highway	
	AM	PM	AM	PM	AM	PM	AM	PM
Increase Due to Project and Expansion - 2020	0.7	0.5	0.7	0.8	0.5	0.5	0.4	0.5

5.3 Residential

Development of the residential areas may temporarily impact nearby residences to the east and makai of the project site. The DOH construction noise regulations discussed above should be adhered to during all phases of construction and renovation.

Traffic noise from Honoapiilani Highway may impact residential properties located within 75 feet of the highway. New residences on the project site should be constructed at least 75 feet from Honoapiilani Highway. Alternatively, noise barriers along Honoapiilani Highway in the vicinity of noise sensitive properties could be employed to mitigate the noise impact.

REFERENCES:

1. Chapter 46, *Community Noise Control*, Department of Health, State of Hawaii, Administrative Rules, Title 11, September 23, 1996.

2. *Toward a National Strategy for Noise Control*, U.S. Environmental Protection Agency, April 1977.

3. *Department of Transportation, Federal highway Administration Procedures for Abatement of Highway traffic Noise*, Title 23, CFR, Chapter 1, Subchapter J, Part 772, 38 FR 15953, June 19, 1973; Revised at 47 FR 29654, July 8, 1982.

4. *Noise Analysis and Abatement Policy*, Department of Transportation, Highways Division, State of Hawaii, June 1977.

5. *Department of Housing and Urban Development Environmental Criteria and Standards*, Title 24, CFR, Part 51, 44 FR 40860, July 12, 1979; Amended by 49 FR 880, January 6, 1984.

6. *FHWA Highway Traffic Noise Prediction Model*, FHWA-RD-77-108; U.S. Department of Transportation, December 1978.

7. Traffic Data Received from Parsons Brinckerhoff Quade & Douglas, Inc., August 11, 14 and 27, 1998 and April 11, 2001.

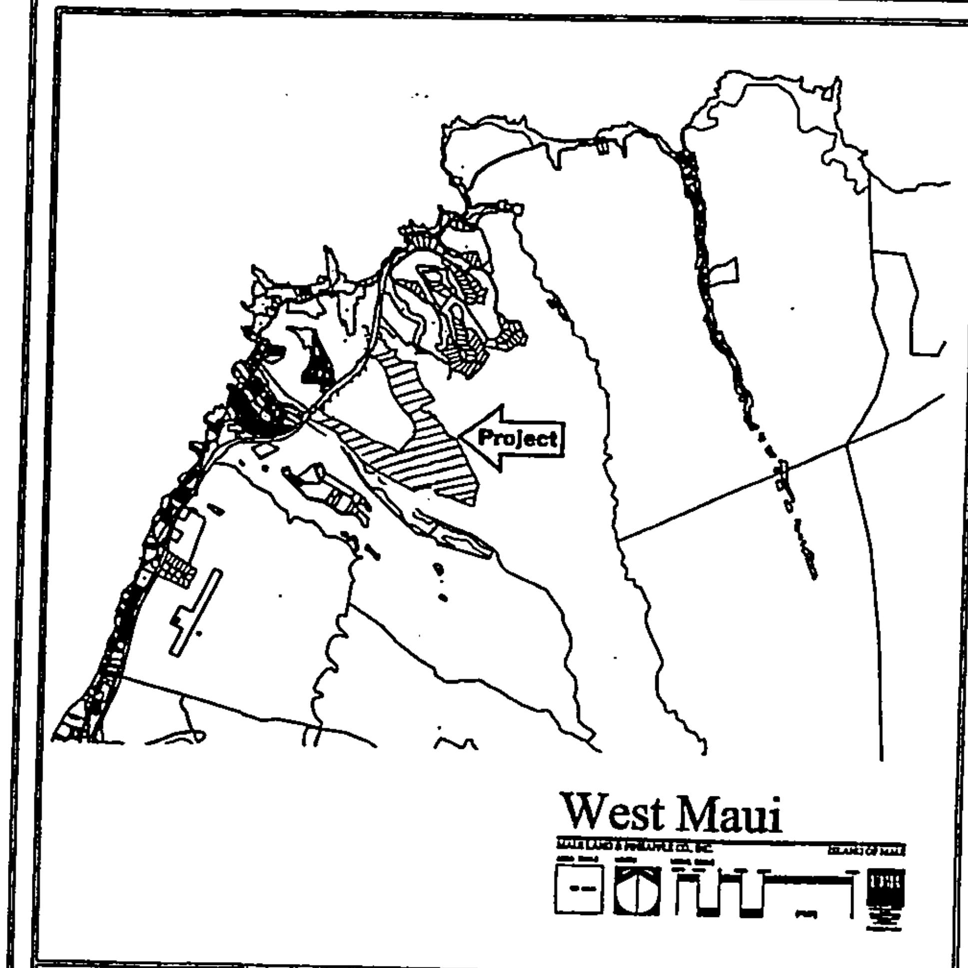

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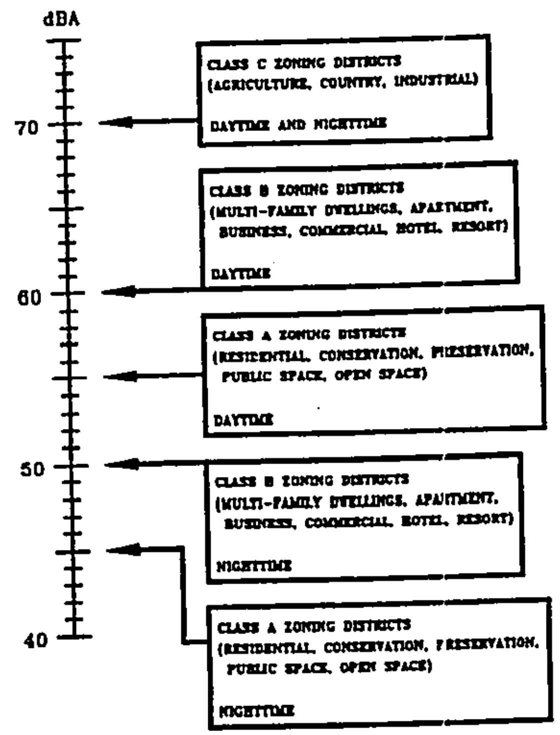
FIGURE 1 - PROJECT LOCATION AND STUDY AREA



NOTE: SOUND LEVELS INDICATED BY ZONING DISTRICT ARE THE "MAXIMUM PERMISSIBLE" SOUND LEVELS DUE TO EXCESSIVE NOISE SOURCES SUCH AS STATIONARY MECHANICAL EQUIPMENT AND EQUIPMENT RELATED TO AGRICULTURAL, CONSTRUCTION AND INDUSTRIAL ACTIVITIES THAT SHALL NOT BE EXCEEDED FOR MORE THAN 10% OF THE TIME WITHIN ANY 20-MINUTE PERIOD DURING THE TIME PERIOD SHOWN (DAYTIME: 7:00 A.M. TO 10:00 P.M., NIGHTTIME: 10:00 P.M. TO 7:00 A.M.)

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FIGURE 2 - MAXIMUM PERMISSIBLE SOUND LEVELS FOR VARIOUS ZONING DISTRICTS

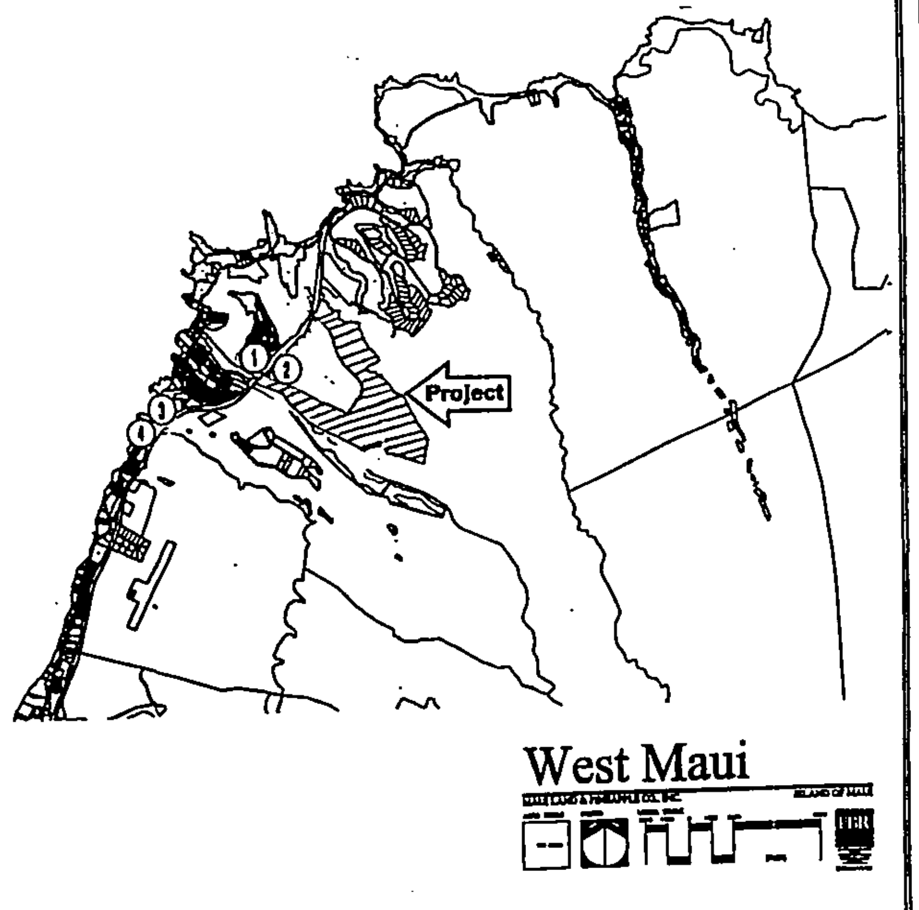

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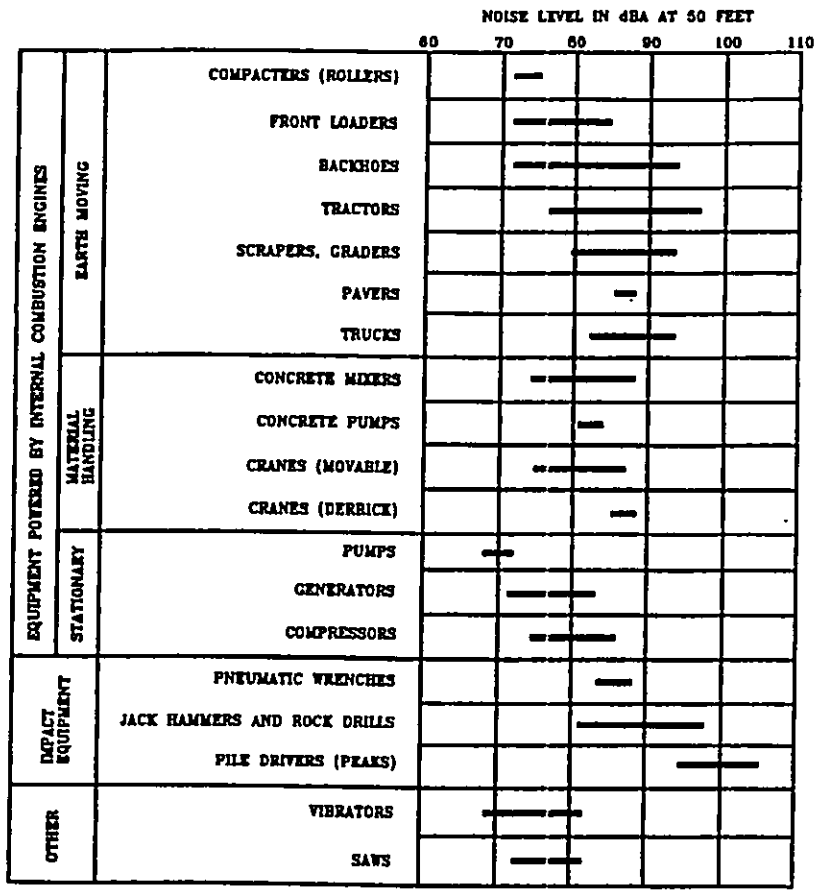
FIGURE 3 - LOCATIONS OF NOISE MEASUREMENTS



NOTE: BASED ON LIMITED AVAILABLE DATA SAMPLES

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FIGURE 4 - TYPICAL SOUND PRESSURE LEVELS FROM CONSTRUCTION EQUIPMENT

APPENDIX A

ACOUSTICAL TERMINOLOGY

Sound Pressure Level

Sound or noise consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. It is measured in terms of decibels (dB) using precision instruments known as sound level meters. Noise is defined as "unwanted" sound.

Technically, sound pressure level (SPL) is defined as:

$$SPL = 20 \log (P/Pref) \text{ dB}$$

where P is the sound pressure fluctuation (above or below atmospheric pressure) and Pref is the reference pressure, 20 micropascals, which is approximately the lowest sound pressure that can be detected by the human ear. For example, if P is 20 micropascals, then SPL = 0 dB, or if P is 200 micropascals, then SPL = 20 dB. The relation between sound pressure in micropascals and sound pressure level in decibels (dB) is shown in Figure A-1.

The sound pressure level that results from a combination of noise sources is not the arithmetic sum of the individual sound levels, but rather the logarithmic sum. For example, two sound levels of 50 dB produce a combined level of 53 dB, not 100 dB; two sound levels of 40 and 50 dB produce a combined level of 50.4 dB.

Human sensitivity to changes in sound pressure level is highly individualized. Sensitivity to sound depends on frequency content, time of occurrence, duration, and psychological factors such as emotions and expectations. However, in general, a change of 1 or 2 dB in the level of a sound is difficult for most people to detect. A 3 dB change is commonly taken as the smallest perceptible change and a 5 dB change corresponds to a noticeable change in loudness. A 10 dB increase or decrease in sound level corresponds to an approximate doubling or halving of loudness, respectively.

A-Weighted Sound Level

The human ear is more sensitive to sound in the frequency range of 250 Hertz (Hz) and higher, than in frequencies below 250 Hz. Due to this type of frequency response, a frequency weighting system, was developed to emulate the frequency response of the human ear. This system expresses sound levels in units of A-weighted decibels (dBA). A-weighted sound levels de-emphasizes the low frequency portion of the spectrum of a signal. The A-weighted level of a sound is a good measure of the loudness of that sound. Different sounds having the same A-weighted sound level are perceived as being about equally loud. Typical values of the A-weighted sound level of various noise sources are shown in Figure A-1.

Statistical Sound Levels

The sound levels of long-term noise producing activities, such as traffic movement, aircraft operations, etc., can vary considerably with time. In order to obtain a single number rating of such a noise source, a statistically-based method of expressing sound or noise levels developed. It is known as the Exceedence Level, L_n. The Exceedence Level, L_n, represents the sound level which is exceeded for n% of the measurement time period. For example, L_{10} = 60 dBA indicates that for the duration at the measurement period, the sound level exceeded 60 dBA 10% of the time. Commonly used Exceedence Levels include L_1, L_{10}, L_{50}, and L_{90}, which are widely used to assess community and environmental noise. Figure A-2 illustrates the relationship between selected statistical noise levels.

Equivalent Sound Level

The Equivalent Sound Level, L_{eq}, represents a constant level of sound having the same total acoustic energy as that contained in the actual time-varying sound being measured over a specific time period. L_{eq} is commonly used to describe community noise, traffic noise, and hearing damage potential. It has units of dBA and is illustrated in Figure A-2.

Day-Night Equivalent Sound Level

The Day-Night Equivalent Sound Level, L_{dn}, is the Equivalent Sound Level, L_{eq}, measured over a 24-hour period. However, a 10 dB penalty is added to the noise levels recorded between 10 pm and 7 am to account for people's higher sensitivity to noise at night when the background noise level is typically lower. The L_{dn} is a commonly used noise descriptor in assessing land use compatibility, and is widely used by federal and local agencies and standards organizations. Qualitative descriptions, as well as local examples of L_{dn}, are shown in Figure A-3.

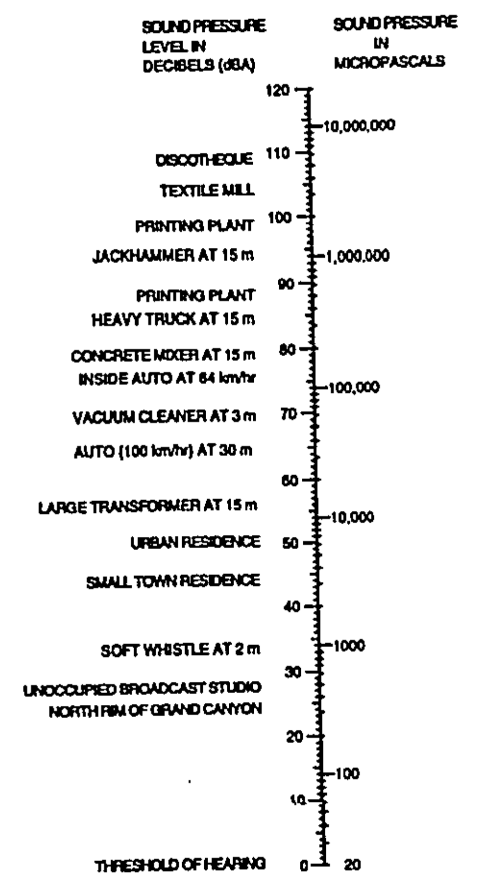

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FIGURE A-1 - THE RELATION BETWEEN SOUND PRESSURE, P, AND SOUND PRESSURE LEVEL, SPL. ALSO SHOWN ARE TYPICAL VALUES OF A-WEIGHTED SOUND LEVELS OF VARIOUS NOISE SOURCES.

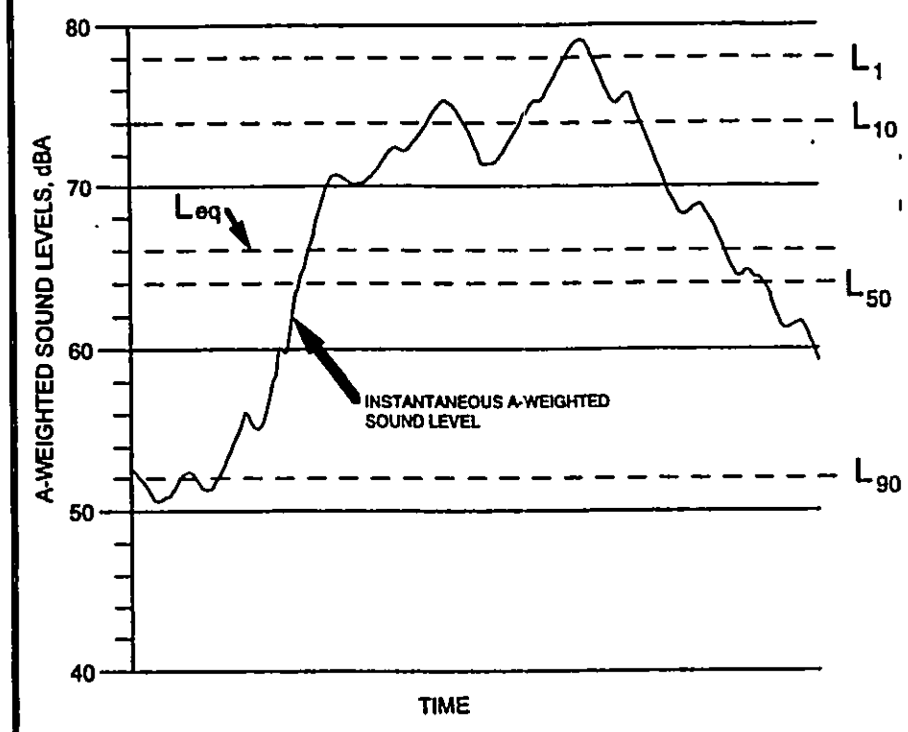

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FIGURE A-2 - COMPARISON OF AN INSTANTANEOUS SOUND LEVEL AND THE CORRESPONDING STATISTICAL SOUND LEVELS

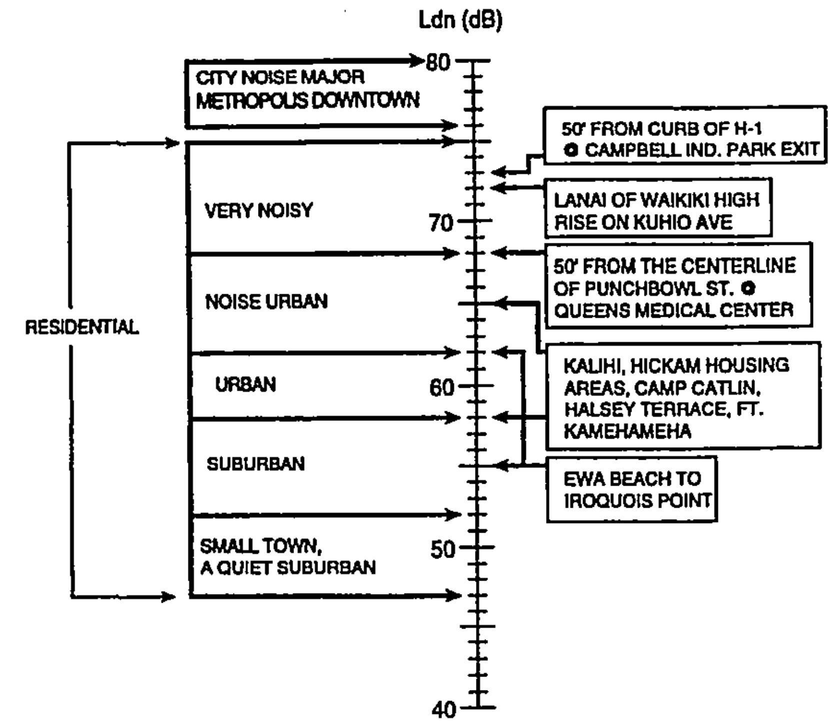

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FIGURE A-3 - QUALITATIVE DESCRIPTION OF THE DAY-NIGHT EQUIVALENT SOUND LEVELS (Ldn) AND EXAMPLE Ldn's AT SELECTED LOCATIONS ON OAHU

Appendix K

Air Quality Study

AIR QUALITY STUDY
FOR THE PROPOSED
KAPALUA PROJECT DISTRICT 2

KAPALUA, MAUI

Prepared for:

Kapalua Land Company, Ltd.

June 2001

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CONTENTS

FIGURES

TABLES

TABLES (cont.)

1.0 SUMMARY

Kapalua Land Company is proposing to develop Project District 2 at Kapalua on the island of Maui. The project site is situated adjacent to Project District 1 and mauka of Honoapiilani Highway. The proposed development will consist of nine additional golf course holes, a clubhouse and 690 single- and multi-family residential units. Development is expected to be completed by the year 2020. This study examines the potential short- and long-term air quality impacts that could occur as a result of construction and use of the proposed facilities and suggests mitigative measures to reduce any potential air quality impacts where possible and appropriate.

Both federal and state standards have been established to maintain ambient air quality. At the present time, seven parameters are regulated including: particulate matter, sulfur dioxide, hydrogen sulfide, nitrogen dioxide, carbon monoxide, ozone and lead. Hawaii air quality standards are more stringent than the comparable national standards except for those pertaining to sulfur dioxide and particulate matter, which are equivalent.

Regional and local climate together with the amount and type of human activity generally dictate the air quality of a given location. The climate of the project area is very much affected by its near coastal situation and by nearby mountains. Winds are variable but are often trade winds from the north or northeast. Temperatures in the project area are generally very consistent and moderate with an average daily temperature range of about 66°F to 85°F. The extreme minimum temperature recorded at nearby Kaanapali is 47°F, while the extreme maximum temperature is 98°F. Average annual rainfall in the area amounts to about 20 to 30 inches.

No ambient air quality data for the Kapalua area has been reported by the state Department of Health. However, except for periodic impacts from distant volcanic emissions (vog) and possibly occasional localized impacts from traffic congestion, the present air quality of the project area is believed to be relatively good.

If the proposed project is given the necessary approvals to proceed, it is inevitable that some short- and long-term impacts on air quality will occur either directly or indirectly as a consequence of project construction and use. Short-term impacts from fugitive dust will likely occur during the project construction phase. To a lesser extent, exhaust emissions from stationary and mobile construction equipment, from the disruption of traffic, and from workers' vehicles may also affect air quality during the period of construction. State air pollution control regulations require that there be no visible fugitive dust emissions at the project property line. Hence, an effective dust control plan must be implemented to ensure compliance with state regulations. Fugitive dust emissions can be controlled to a large extent by watering of active work areas, using wind screens, keeping adjacent paved roads clean, and by covering of open-bodied trucks. Other dust control measures could include limiting the area that can be disturbed at any given time and/or mulching or chemically stabilizing inactive areas that have been worked. Paving and landscaping of project areas early in the construction schedule will also reduce dust emissions. Monitoring dust at the project boundary during the period of construction could be considered as a means to evaluate the effectiveness of the project dust control program. Exhaust emissions can be mitigated by moving construction equipment and workers to and from the project site during off-peak traffic hours.

After construction, motor vehicles coming to and from the proposed development will result in a long-term increase in air pollution emissions in the project area. To assess the impact of emissions from these vehicles, an air quality modeling study was undertaken to estimate current ambient concentrations of carbon monoxide at intersections in the project vicinity and to predict future levels both with and without the proposed project. During worst-case conditions, model results indicated that present 1-hour and 8-hour carbon monoxide concentrations are within both the state and the national ambient air quality standards. In the year 2020 without the project, carbon monoxide concentrations in the area were predicted to decrease somewhat at most locations. With the project in the year 2020, carbon monoxide concentrations were estimated to remain nearly unchanged compared to the without-project case at intersections along Honoapiilani Highway except at Office Road where a substantial increase will likely occur. But even with the substantial increase, concentrations at this location should remain relatively low and well within the standards. Due to the very small impact the project is expected to have, implementing mitigation measures for traffic-related air quality impacts is probably unnecessary and unwarranted.

Depending on the demand levels, long-term impacts on air quality are also possible due to indirect emissions associated with a development's electrical power and solid waste disposal requirements. Quantitative estimates of these potential impacts were not made, but based on the estimated demand levels and emission rates involved, any significant impacts are unlikely. Nevertheless, incorporating energy conservation design features and promoting conservation and recycling programs within the proposed development could serve to further reduce any associated impacts and conserve the island's resources.

2.0 INTRODUCTION

Kapalua Land Company is proposing to continue the development of Kapalua Resort by proceeding with Project District 2 (PD2) at Kapalua, Maui. The project site is located directly mauka of Project District 1 (PD1), across Honoapiilani Highway (see Figure 1 for project location map). The proposed project includes an additional nine golf course holes, a clubhouse and 390 single-family and 300 multi-family resort residential units. Full build-out of the project is expected to occur by the year 2020.

The purpose of this study is to describe existing air quality in the project area and to assess the potential short-term and long-term direct and indirect air quality impacts that could result from construction and use of the proposed facilities. Measures to mitigate these impacts are suggested where possible and appropriate. As background information, the state and national ambient air quality standards are discussed and the regional and local climatology is described.

3.0 AMBIENT AIR QUALITY STANDARDS

Ambient concentrations of air pollution are regulated by both national and state ambient air quality standards (AAQS). National AAQS are specified in Section 40, Part 50 of the Code of Federal Regulations (CFR), while State of Hawaii AAQS are defined in Chapter 11-59 of the Hawaii Administrative Rules. Table 1 summarizes both the national and the state AAQS that are specified in the cited documents. As indicated in the table, national and state AAQS have been established for particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone and lead. The state has also set a standard for hydrogen sulfide.

lead. The state has also set a standard for hydrogen sulfide.
National AAQS are stated in terms of both primary and secondary standards for most of the regulated air pollutants. National primary standards are designed to protect the public health with an "adequate margin of safety". National secondary standards, on the other hand, define levels of air quality necessary to protect the public welfare from "any known or anticipated adverse effects of a pollutant". Secondary public welfare impacts may include such effects as decreased visibility, diminished comfort levels, or other potential injury to the natural or man-made environment, e.g., soiling of materials, damage to vegetation or other economic damage. In contrast to the national AAQS, Hawaii State AAQS are given in terms of a single standard that is designed "to protect public health and welfare and to prevent the significant deterioration of air quality".

Each of the regulated air pollutants has the potential to create or exacerbate some form of adverse health effect or to produce environmental degradation when present in sufficiently high concentration for prolonged periods of time. The AAQS specify a maximum allowable concentration for a given air pollutant for one or more averaging times to prevent harmful effects. Averaging times vary from one hour to one year depending on the pollutant and type of exposure necessary to cause adverse effects. In the case of the short-term (i.e., 1- to 24-hour) AAQS, both national and state standards allow a specified number of exceedances each year.

The Hawaii AAQS are in some cases considerably more stringent than the comparable national AAQS. In particular, the Hawaii 1-hour AAQS for carbon monoxide is four times more stringent than the comparable national limit, and the state 1-hour limit for ozone is more than two times as stringent as the national 1-hour standard. The national 1-hour ozone standard will be phased out (pending court appeal) the next few years in favor of the new (and more stringent) 8-hour standard.

The Hawaii AAQS for sulfur dioxide were relaxed in 1986 to make the state standards essentially the same as the national limits. In 1993, the state also revised its particulate standards to follow those set by the federal government. During 1997, the federal government again revised its standards for particulate, but the new standards have been challenged in federal court. To date, the Hawaii Department of Health has not updated the state particulate standards.

4.0 REGIONAL AND LOCAL CLIMATOLOGY

Regional and local climatology significantly affect the air quality of a given location. Wind, temperature, atmospheric turbulence, mixing height and rainfall all influence air quality. Although the climate of Hawaii is relatively moderate throughout most of the state, significant differences in these parameters may occur from one location to another. Most differences in regional and local climates within the state are caused by the mountainous topography.

The site of the proposed project is located along the western coast of the island of Maui. The topography of Maui Island is dominated by the great volcanic masses of Haleakala (10,023 feet) and the West Maui Mountains (5,788 feet). The island consists entirely of the slopes of these mountains and of a connecting isthmus. Haleakala is still considered to be an active volcano and last erupted about 1790.

Maui lies well within the belt of northeasterly trade winds generated by the semi-permanent Pacific high pressure cell to the north and east. Portions of the western coast of the island of Maui, however, are sheltered from the trade winds by high terrain. The project site lies in an area that is partially sheltered from the trade winds when they are more easterly, but the area may be exposed to the trade winds when they become more northerly. Local winds such as land/sea breezes and/or upslope/downslope winds also influence the wind pattern for the area. During the daytime, when the trade winds are weak or blocked by the terrain, winds typically move onshore because of seabreeze and/or upslope effects. At night, winds generally are land breezes and/or drainage winds that move downslope and out to sea. During winter, occasional strong winds from the south or southwest occur in association with the passage of winter storm systems.

Air pollution emissions from motor vehicles, the formation of photochemical smog and smoke plume rise all depend in part on air temperature. Colder temperatures tend to result in higher emissions of contaminants from automobiles but lower concentrations of photochemical smog and ground-level concentrations of air pollution from elevated plumes. In Hawaii, the annual and daily variation of temperature depends to a large degree on elevation above sea level, distance inland and exposure to the trade winds. Average temperatures at locations near sea level generally are warmer than those at higher elevations. Areas exposed to the trade winds tend to have the least temperature variation, while inland and leeward areas often have the most. The project site's leeward location probably results in a somewhat larger average diurnal temperature variation compared to windward locations at the same elevation. At Kaanapali, located about 5 miles south of the project site, average daily minimum and maximum temperatures are 66°F and 85°F, respectively [1]. The extreme minimum temperature on record at this location is 47°F, and the extreme maximum is 98°F. Temperatures at the project site are very similar.

Small scale, random motions in the atmosphere (turbulence) cause air pollutants to be dispersed as a function of distance or time from the point of emission. Turbulence is caused by both mechanical and thermal forces in the atmosphere. It is often measured and described in terms of Pasquill-Gifford stability class. Stability class 1 is the most turbulent and class 6 is the least. Thus, air pollution dissipates the best during stability class 1 conditions and the worst when stability class 6 prevails. In the Kapalua area, stability classes 5 or 6 typically occur during the nighttime or early morning hours when temperature inversions form due to radiational cooling or to drainage flow from the nearby mountains. Stability classes 1 through 4 occur during the daytime, depending mainly on the amount of cloud cover and incoming solar radiation and the onset and extent of the sea breeze.

Mixing height is defined as the height above the surface through which relatively vigorous vertical mixing occurs. Low mixing heights can result in high ground-level air pollution concentrations because contaminants emitted from or near the surface can become trapped within the mixing layer. In Hawaii, minimum mixing heights tend to be high because of mechanical mixing caused by the trade winds and because of the temperature moderating effect of the surrounding ocean. Low mixing heights may sometimes occur, however, at inland locations and even at times along coastal areas early in the morning following a clear, cool, windless night. Coastal areas also may experience low mixing levels during sea breeze conditions when cooler ocean air rushes in over warmer

land. Mixing heights in Hawaii typically are above 3000 feet (1000 meters).

Rainfall can have a beneficial affect on the air quality of an area in that it helps to suppress fugitive dust emissions, and it also may "washout" gaseous contaminants that are water soluble. Rainfall in Hawaii is highly variable depending on elevation and on location with respect to the trade wind. The climate of the project area is relatively dry due to its leeward location. At Kaanapali, average annual rainfall amounts to about 16 inches with the summer months being the driest [1]. Rainfall at Kapalua is probably somewhat higher than at Kaanapali with annual amounts that are probably in the 20- to 30-inch range.

5.0 PRESENT AIR QUALITY

Present air quality in the project area is mostly affected by air pollutants from vehicular, industrial, natural and/or agricultural sources. Table 2 presents an air pollutant emission summary for the island of Maui for calendar year 1993. The emission rates shown in the table pertain to manmade emissions only, i.e., emissions from natural sources are not included. As suggested in the table, most of the manmade particulate and sulfur oxides emissions on Maui originate from point sources, such as power plants and other fuel-burning industries. Nitrogen oxides emissions are roughly equally divided between point sources and area sources (mostly motor vehicle traffic). The majority of carbon monoxide emissions occur from area sources (motor vehicle traffic and sugar cane burning), while hydrocarbons are emitted mainly from point sources.

The largest sources of air pollution in the project area are probably agricultural operations and automobile traffic using Honoapiilani Highway. Emissions from these sources consist primarily of particulate, carbon monoxide and nitrogen oxides.

The State Department of Health operates a network of air quality monitoring stations at various locations around the state, but only very limited data are available for Maui Island. Particulate data are collected at Kihei and at Paia, but data from these locations probably would not be representative of the project area. No monitoring stations are located in the Kapalua area, and insofar as is known, no air quality data have been reported for this area. Given the limited air pollution sources in the area, it is likely that air pollution concentrations are near natural background levels, except possibly for locations adjacent to agricultural operations or near traffic-congested intersections. Present concentrations of carbon monoxide in the project area are estimated later in this study based on computer modeling of motor vehicle emissions.

6.0 SHORT-TERM IMPACTS OF PROJECT

Short-term direct and indirect impacts on air quality could potentially occur due to project construction. For a project of this nature, there are two potential types of air pollution emissions that could directly result in short-term air quality impacts during project construction: (1) fugitive dust from vehicle movement and soil excavation; and (2) exhaust emissions from on-site construction equipment. Indirectly, there also could be short-term impacts related to slow-moving construction equipment traveling to and from the project site and from a temporary increase in local traffic caused by commuting construction workers.

Fugitive dust emissions may arise from the grading and dirt-moving activities associated with site clearing and preparation work. The emission rate for fugitive dust emissions from construction activities is difficult to estimate accurately. This is because of its elusive nature of emission and because the potential for its generation varies greatly depending upon the type of soil at the construction site, the amount and type of dirt-disturbing activity taking place, the moisture content of exposed soil in work areas, and the wind speed. The EPA [2] has provided a rough estimate for uncontrolled fugitive dust emissions from construction activity of 1.2 tons per acre per month under conditions of "medium" activity, moderate soil silt content (30%), and precipitation/evaporation (P/E) index of 50. Uncontrolled fugitive dust emissions in the project area would likely be somewhere near that level. In any case, State of Hawaii Air Pollution Control Regulations [3] prohibit visible emissions of fugitive dust from construction activities at the property line. Thus, an effective dust control plan for the project construction phase is essential.

Adequate fugitive dust control can usually be accomplished by the establishment of a frequent watering program to keep bare-dirt surfaces in construction areas from becoming significant sources of dust. In dust-prone or dust-sensitive areas, other control measures such as limiting the area that can be disturbed at any given time, applying chemical soil stabilizers, mulching and/or using wind screens may be necessary. Control regulations further stipulate that open-bodied trucks be covered at all times when in motion if they are transporting materials that could be blown away. Haul trucks tracking dirt onto paved streets from unpaved areas is often a significant source of dust in construction areas. Some means to alleviate this problem, such as road cleaning or tire washing, may be appropriate. Paving of parking areas and/or establishment of landscaping as early in the construction schedule as possible can also lower the potential for fugitive dust emissions. Monitoring dust at the project property line could be considered to quantify and document the effectiveness of dust control measures.

On-site mobile and stationary construction equipment also will emit air pollutants from engine exhausts. The largest of this equipment is usually diesel-powered. Nitrogen oxides emissions from diesel engines can be relatively high compared to gasoline-powered equipment, but the standard for nitrogen dioxide is set on an annual basis and is not likely to be violated by short-term construction equipment emissions. Carbon monoxide emissions from diesel engines, on the other hand, are low and should be relatively insignificant compared to vehicular emissions on nearby roadways.

Slow-moving construction vehicles traveling on roadways leading to and from the project site could obstruct the normal flow of traffic to such an extent that overall vehicular emissions are increased, but this impact can be mitigated by moving heavy construction equipment during periods of low traffic volume. Likewise, the schedules of commuting construction workers can be adjusted to avoid peak hours in the project vicinity. Thus, most potential short-term air quality impacts from project construction can be mitigated.

7.0 LONG-TERM IMPACTS OF PROJECT

7.1 Roadway Traffic

After construction is completed, use of the proposed facilities will result in increased motor vehicle traffic on nearby roadways, potentially causing long-term impacts on ambient air quality in the project vicinity. Motor vehicles with gasoline-powered engines are significant sources of carbon monoxide. They also emit nitrogen oxides and other contaminates.

Federal air pollution control regulations require that new motor vehicles be equipped with emission control devices that reduce emissions significantly compared to a few years ago. In 1990, the Clean Air Act Amendments became law. This legislation requires further emission reductions which have been phased in since 1994. Additional restrictions were signed into law during 2000 which will begin to take effect during the next decade. The added restrictions on emissions from new motor vehicles will lower average emissions each year as more and more older vehicles leave the state's roadways. Carbon monoxide emissions, for example, will go down by an average of about 10 percent per vehicle during the next 10 years due to the replacement of older vehicles with newer models.

To evaluate the potential long-term indirect ambient air quality impact of the roadway traffic associated with a project such as this, computerized emission and atmospheric dispersion models can be used to estimate ambient carbon monoxide concentrations along roadways leading to and from the project. Carbon monoxide is selected for modeling because it is both the most stable and the most abundant of the pollutants generated by motor vehicles. Furthermore, carbon monoxide air pollution is generally considered to be a microscale problem that can be addressed locally to some extent, whereas nitrogen oxides air pollution most often is a regional issue that cannot be addressed by a single new development.

For this project, three scenarios were selected for the carbon monoxide modeling study: (1) year 2000 with present conditions, (2) year 2020 without the project, and (3) year 2020 with the project. The year 2020 is the date by which full project buildout is expected to occur. To begin the modeling study, critical receptor areas in the vicinity of the project were identified for analysis. Generally speaking, roadway intersections are the primary concern because of traffic congestion and because of the increase in vehicular emissions associated with traffic queuing. For this study, three of the seven intersections identified by the project traffic engineers as being impacted by the project were selected for air quality analysis. These included the following:

- Honoapiilani Highway at Office Road;
- Honoapiilani Highway at Akahele Street;
- Honoapiilani Highway at Lower Honoapiilani Highway.

These intersections were selected as being representative of locations where air quality impacts may occur. Intersection configurations and traffic conditions at these three locations are detailed in the traffic impact report for the project [4].

The main objective of the modeling study was to estimate maximum 1-hour average carbon monoxide concentrations for each of the three scenarios studied. To evaluate the significance of the estimated concentrations, a comparison of the predicted values for each scenario can be made. Comparison of the estimated values to

the national and state AAQS was also used to provide another measure of significance.

Maximum carbon monoxide concentrations typically coincide with peak traffic periods. The traffic impact assessment report evaluated morning and afternoon peak traffic periods. These same periods were evaluated in the air quality impact assessment.

The EPA computer model MOBILE5A [5] was used to calculate vehicular carbon monoxide emissions for each year studied. One of the key inputs to MOBILE5A is vehicle mix. Unless very detailed information is available, national average values are typically assumed, which is what was used for the present study. Based on national average vehicle mix figures, the present vehicle mix in the project area was estimated to be 61.6% light-duty gasoline-powered automobiles, 27.6% light-duty gasoline-powered trucks and vans, 3.1% heavy-duty gasoline-powered vehicles, 0.3% light-duty diesel-powered vehicles, 6.8% heavy-duty diesel-powered trucks and buses, and 0.6% motorcycles. For the future scenarios studied, the vehicle mix was estimated to change only slightly with fewer light-duty gasoline-powered automobiles and more light-duty gasoline-powered trucks and vans.

Other key inputs to the MOBILE5A emission model are the cold/hot start fractions. Motor vehicles operating in a cold- or hot-start mode emit excess air pollution. Typically, motor vehicles reach stabilized operating temperatures after about 4 miles of driving. For traffic operating on roadways within the project area, it was assumed that about 21 percent of all vehicles would be operating in the cold-start mode and that about 27 percent would be operating in the hot-start mode. These are typical default (national average) values.

Ambient temperatures of 59 and 68 degrees F were used for morning and afternoon peak-hour emission computations, respectively. These are conservative assumptions since morning/afternoon ambient temperatures will generally be warmer than this, and emission estimates given by MOBILE5A are inversely proportional to the ambient temperature.

After computing vehicular carbon monoxide emissions through the use of MOBILE5A, these data were then input to an atmospheric dispersion model. EPA air quality modeling guidelines [6] currently recommend that the computer model CAL3QHC [7] be used to assess carbon monoxide concentrations at roadway intersections, or in areas where its use has previously been established, CALINE4 [8] may be used. Until a few years ago, CALINE4 was used extensively in Hawaii to assess air quality impacts at roadway intersections. In December 1997, the California Department of Transportation recommended that the intersection mode of CALINE4 no longer be used because it was thought the model has become outdated. Studies have shown that CALINE4 may tend to over-predict maximum concentrations in some situations. Therefore, CAL3QHC was used for the subject analysis.

CAL3QHC was developed for the U.S. EPA to simulate vehicular movement, vehicle queuing and atmospheric dispersion of vehicular emissions near roadway intersections. It is designed to predict 1-hour average pollutant concentrations near roadway intersections based on input traffic and emission data, roadway/receptor geometry and meteorological conditions.

Although CAL3QHC is intended primarily for assessing atmospheric dispersion near signalized roadway intersections, it can also be used to evaluate unsignalized intersections. This is accomplished by manually estimating queue lengths and then applying the same techniques used by the model for signalized intersections. Currently, the Office Road intersection with Honoapiilani Highway is unsignalized, and it is expected that it will remain unsignalized in the future without the project. With the project, it is assumed that this intersection will be signalized by the year 2020.

Input peak-hour traffic data were obtained from the traffic study cited previously. This included vehicle approach volumes, saturation capacity estimates, intersection laneage and signal timings. All emission factors that were input to CAL3QHC for free-flow traffic were obtained from MOBILE5A based on assumed free-flow vehicle speeds of 45 mph on Honoapiilani Highway and 25 mph on the other roadways studied.

Model roadways were set up to reflect roadway geometry, physical dimensions and operating characteristics. Concentrations predicted by air quality models generally are not considered valid within the roadway mixing zone. The roadway mixing zone is usually taken to include 3 meters on either side of the traveled portion of the roadway and the turbulent area within 10 meters of a cross street. Model receptor sites were thus located at the edges of the mixing zones near all intersections that were studied, whether or not sidewalks currently exist. All receptor heights were placed at 1.8 meters above ground to simulate levels within the normal human breathing zone.

Input meteorological conditions for this study were defined to provide "worst-case" results. One of the key meteorological inputs is atmospheric stability category. For these analyses, atmospheric stability category 6 was assumed for the morning case, and stability category 4 was assumed for the afternoon case. These are the most conservative stability categories that are generally used for estimating worst-case pollutant dispersion within suburban or rural areas for these periods. A surface roughness length of 100 cm and a mixing height of 1000 meters were used in all cases. Worst-case wind conditions were defined as a wind speed of 1 meter per second (2 mph) with a wind direction resulting in the highest predicted concentration. Concentration estimates were calculated at wind directions of every 5 degrees.

Existing background concentrations of carbon monoxide in the project vicinity are believed to be at low levels. Thus, background contributions of carbon monoxide from sources or roadways not directly considered in the analysis were accounted for by adding a background concentration of 0.5 ppm to all predicted concentrations for 2000. Although increased traffic is expected to occur within the project area within the next several years with or without the project, background carbon monoxide concentrations may not change significantly since individual emissions from motor vehicles are forecast to decrease with time. Hence, a background value of 0.5 ppm was assumed to persist for the future scenarios studied.

Predicted Worst-Case 1-Hour Concentrations

Table 3 summarizes the final results of the modeling study in the form of the estimated worst-case 1-hour morning and afternoon ambient carbon monoxide concentrations. These results can be

compared directly to the state and the national AAQS. Estimated worst-case carbon monoxide concentrations are presented in the table for three scenarios: year 2000 with existing traffic, year 2020 without the project, and year 2020 with the project. The locations of these estimated worst-case 1-hour concentrations all occurred at or very near the indicated intersections.

As indicated in the table, the highest estimated 1-hour concentration within the project vicinity for the present (2000) case was 9.4 mg/m^3. This was projected to occur during the morning peak-traffic hour near the intersection of Honoapiilani Highway and Lower Honoapiilani Highway, primarily due to the queue of eastbound traffic turning right. The next highest value, 7.6 mg/m^3, was estimated to occur during the morning peak-traffic hour at the intersection of Honoapiilani Highway and Akahele Street. Concentrations at other locations and times studied ranged between about 2 and 7 mg/m^3. All predicted worst-case 1-hour concentrations for the 2000 scenario were well within the national AAQS of 40 mg/m^3, but the worst-case concentration at the intersection of Honoapiilani Highway/Lower Honoapiilani Highway meets the more stringent state AAQS of 10 mg/m^3 by only a small margin. It should be noted that because the state 1-hour carbon monoxide standard is set at such a stringent level, it is likely that it is currently exceeded at many locations in the state that have even moderate traffic volumes.

In the year 2020 without the proposed project, a worst-case 1-hour concentration of 8.7 mg/m^3 was predicted to occur during the morning peak-traffic hour near the intersection of Honoapiilani Highway/Lower Honoapiilani Highway. The next highest value for the project area was 6.9 mg/m^3 and occurred during the afternoon at the Honoapiilani Highway/Lower Honoapiilani Highway intersection. Peak-hour worst-case values at the other locations studied for the 2020 without project scenario ranged between about 2 and 7 mg/m^3. These concentrations were either about the same or slightly lower than those for the existing case. Predicted worst-case 1-hour concentrations for the 2020 without project scenario were within both the national and the state AAQS.

Predicted 1-hour worst-case concentrations for the 2020 with-project scenario ranged from 4.1 mg/m^3 during the afternoon at the Honoapiilani Highway/Office Road intersection to 8.9 mg/m^3 during the morning at the Honoapiilani Highway/Lower Honoapiilani Highway intersection. Compared to the 2020 without-project case, predicted worst-case concentrations for 2020 with the project were essentially unchanged except at the intersection of Honoapiilani Highway and Office Road. Concentrations at this intersection were estimated to increase substantially but would still remain at relatively low levels. Similar to the 2020 without-project case, all of the locations studied were predicted to meet both the national and the state AAQS.

Predicted Worst-Case 8-Hour Concentrations

Worst-case 8-hour carbon monoxide concentrations were estimated by multiplying the worst-case 1-hour values by a persistence factor of 0.5. This accounts for two factors: (1) traffic volumes averaged over eight hours are lower than peak 1-hour values, and (2) meteorological conditions are more variable (and hence more favorable for dispersion) over an 8-hour period than they are for a single hour. Based on monitoring data, 1-hour to 8-hour persistence factors for most locations generally vary from 0.4 to 0.8 with 0.6 being the most typical. One recent study based on modeling [9] concluded that 1-hour to 8-hour persistence factors could typically be expected to range from 0.4 to 0.5. EPA guidelines [10] recommend using a value of 0.7 unless a locally

derived persistence factor is available. Considering the location of the project and the traffic pattern for the area, a 1-hour to 8-hour persistence factor of 0.5 will likely yield reasonable estimates of worst-case 8-hour concentrations.

The resulting estimated worst-case 8-hour concentrations are indicated in Table 4. For the 2000 scenario, the estimated worst-case 8-hour carbon monoxide concentrations for the locations studied ranged from 1.0 to 4.7 mg/m^3. These estimated worst-case concentrations comply with both the state standard of 5 mg/m^3 and the national standard of 10 mg/m^3. The state standard is predicted to be met by only a small margin at the worst-case location (Honoapiilani Highway at Lower Honoapiilani Highway), but it should be noted that, because the state 8-hour carbon monoxide standard is set at such a stringent level, it is likely that this standard is currently exceeded at many locations in the state that have even moderate traffic volumes.

For the year 2020 without-project scenario, worst-case concentrations ranged between 1.0 and 4.4 mg/m^3, remaining about the same or slightly decreasing compared to the existing case. The worst-case concentration estimates for all locations studied met both the national and the state 8-hour standard.

For the 2020 with-project scenario, worst-case concentrations ranged from 2.7 to 4.4 mg/m^3, essentially unchanged from the without-project scenario except at the Office Road location where a substantial increase was predicted. Similar to the without-project scenario, all predicted 8-hour concentrations for this scenario were within both the national and the state AAQS.

Conservativeness of Estimates

The results of this study reflect several assumptions that were made concerning both traffic movement and worst-case meteorological conditions. One such assumption concerning worst-case meteorological conditions is that a wind speed of 1 meter per second with a steady direction for 1 hour will occur. A steady wind of 1 meter per second blowing from a single direction for an hour is extremely unlikely and may occur only once a year or less. With wind speeds of 2 meters per second, for example, computed carbon monoxide concentrations would be only about half the values given above. The 8-hour estimates are also conservative in that it is unlikely that anyone would occupy the assumed receptor sites (within 3 m of the roadways) for a period of 8 hours.

7.2 Electrical Demand

The proposed project also will cause indirect air pollution emissions from power generating facilities as a consequence of electrical power usage. The peak electrical demand of the project when fully developed is expected to reach about 8300 kW [11]. Assuming the average demand is approximately one-half the peak demand, the annual electrical demand of the project will reach approximately 36 million kilowatt-hours. Electrical power for the project will most probably be provided mainly by oil-fired generating facilities, but some of the project power may also be derived from wind power or other sources. In order to meet the electrical power needs of the proposed project, power generating facilities will likely be required to burn more fuel and hence more air pollution will be emitted at these facilities. Given in Table 5 are estimates of the indirect air pollution emissions that would result from the project electrical demand assuming all power is provided by burning more fuel oil at local power plants. These values can be compared to the island-wide

emission estimates for 1993 given in Table 2. The estimated indirect emissions from project electrical demand amount to about 1 percent or less of the present air pollution emissions occurring on Maui Island even if all power is assumed to be derived from oil.

7.3 Solid Waste Disposal

Solid waste generated by the proposed development when fully completed and occupied is not expected to exceed about 1000 tons per year based on an estimated 55 lbs per week per household. Currently, all solid waste on the island is buried at solid waste landfills. Thus, assuming this continues to be the method for solid waste disposal, the only associated air pollution emissions that will occur will be from trucking the waste to the landfill and burying it. These emissions should be relatively minor.

8.0 CONCLUSIONS AND RECOMMENDATIONS

The major potential short-term air quality impact of the project will occur from the emission of fugitive dust during construction. Uncontrolled fugitive dust emissions from construction activities are estimated to amount to about 1.2 tons per acre per month, depending on rainfall. To control dust, active work areas and any temporary unpaved work roads should be watered at least twice daily on days without rainfall. Use of windscreens and/or limiting the area that is disturbed at any given time will also help to contain fugitive dust emissions. Wind erosion of inactive areas of the site that have been disturbed could be controlled by mulching or by the use of chemical soil stabilizers. Dirt-hauling trucks should be covered when traveling on roadways to prevent windage. A routine road cleaning and/or tire washing program will also help to reduce fugitive dust emissions that may occur as a result of trucks tracking dirt onto paved roadways in the project area. Paving of parking areas and establishment of landscaping early in the construction schedule will also help to control dust. Monitoring dust at the project boundary during the period of construction could be considered as a means to evaluate the effectiveness of the project dust control program and to adjust the program if necessary.

During construction phases, emissions from engine exhausts (primarily consisting of carbon monoxide and nitrogen oxides) will also occur both from on-site construction equipment and from vehicles used by construction workers and from trucks traveling to and from the project. Increased vehicular emissions due to disruption of traffic by construction equipment and/or commuting construction workers can be alleviated by moving equipment and personnel to the site during off-peak traffic hours.

After the proposed project is completed, emissions from project-related traffic will cause an increase in carbon monoxide concentrations near some roadway intersections in the project area. The greatest impact will likely occur at the intersection of Honoapiilani Highway and Office Road with the installation of a traffic signal at this location, but with or without the project, concentrations should remain well within both state and national ambient air quality standards. The increase in concentrations at other locations along Honoapiilani Highway will likely be negligible. Due to the very small impact the project is expected to have on carbon monoxide levels in the project area and given that the predicted worst-case carbon monoxide concentrations are well within both the national and the state ambient air quality standards, implementing air quality mitigation measures for long-term traffic-related impacts is probably unnecessary and unwarranted.

Any long-term impacts on air quality due to indirect emissions from supplying the project with electricity and from the disposal of waste materials generated by the project will likely be relatively small based on the magnitudes of the estimated emissions compared to the current island-wide emissions. To further moderate any impacts, indirect emissions from project electrical demand could likely be reduced somewhat by incorporating energy-saving features into project design requirements. This might include the use of solar water heaters, water heater timers or possibly hot water on demand systems; designing building space so that window positions maximize indoor light without unduly increasing indoor heat; using landscaping where feasible to provide afternoon shade to cut down on the use of air conditioning; installation of insulation and double-glazed doors to reduce the effects of the sun and heat; movable, controlled openings for ventilation at opportune times; and possibly automated room occupancy sensors. Solid waste related air pollution could likely be reduced somewhat by the promotion of conservation and recycling programs within the proposed development.

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Figure 1 - Project Location Map

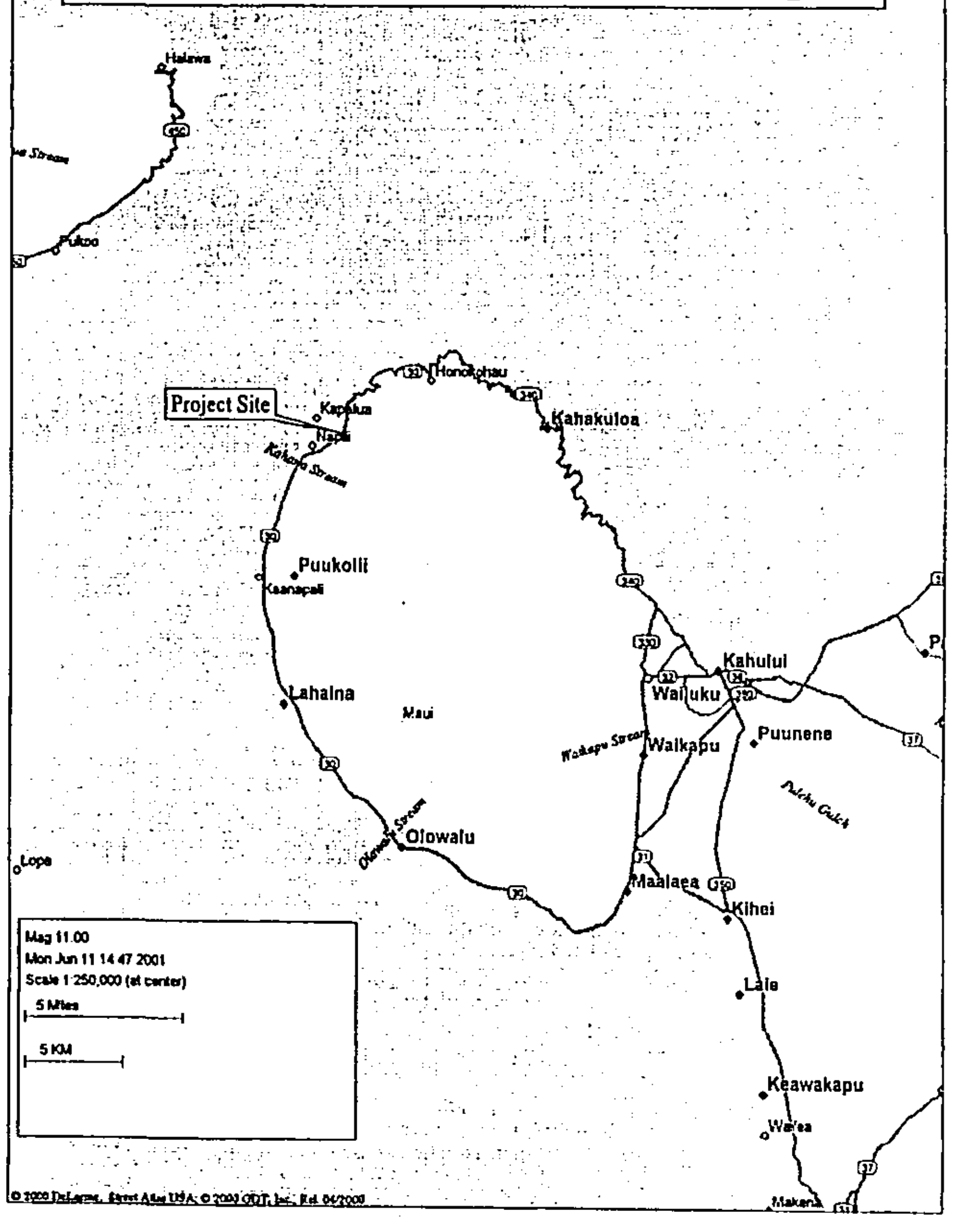

Table 1

SUMMARY OF STATE OF HAWAII AND NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Units	Averaging Time	Maximum Allowable Concentration		
			National Primary	National Secondary	State of Hawaii
Particulate Matter (<10 microns)	$\mu g/m^3$	Annual 24 Hours	50[a] 150[b]	50[a] 150[b]	50 150[c]
Particulate Matter (<2.5 microns)	$\mu g/m^3$	Annual 24 Hours	15[a] 65[d]	15[a] 65[d]	- -
Sulfur Dioxide	$\mu g/m^3$	Annual 24 Hours 3 Hours	80 365[c] -	- - 1300[c]	80 365[c] 1300[c]
Nitrogen Dioxide	$\mu g/m^3$	Annual	100	100	70
Carbon Monoxide	mg/m^3	8 Hours 1 Hour	10[c] 40[c]	- -	5[c] 10[c]
Ozone	$\mu g/m^3$	8 Hours 1 Hour	157[e] 235[f]	157[e] 235[f]	- 100[c]
Lead	$\mu g/m^3$	Calendar Quarter	1.5	1.5	1.5
Hydrogen Sulfide	$\mu g/m^3$	1 Hour	-	-	35[c]

[a] Three-year average of annual arithmetic mean.
[b] 99th percentile value averaged over three years.
[c] Not to be exceeded more than once per year.
[d] 98th percentile value averaged over three years.
[e] Three-year average of fourth-highest daily 8-hour maximum.
[f] Standard is attained when the expected number of exceedances is less than or equal to 1.

Note: Standards for particulate matter (<2.5 microns) and for 8-hour ozone are subject to court appeal.

Table 2

AIR POLLUTION EMISSIONS INVENTORY FOR ISLAND OF MAUI, 1993

Air Pollutant	Point Sources (tons/year)	Area Sources (tons/year)	Total (tons/year)
Particulate	63,275	7,030	70,305
Sulfur Oxides	6,419	nil	6,419
Nitrogen Oxides	7,312	8,618	15,930
Carbon Monoxide	4,612	20,050	24,662
Hydrocarbons	1,991	234	2,225

Source: Final Report, "Review, Revise and Update of the Hawaii Emissions Inventory Systems for the State of Hawaii", prepared for Hawaii Department of Health by J.L. Shoemaker & Associates, Inc., 1996

Table 3

ESTIMATED WORST-CASE 1-HOUR CARBON MONOXIDE CONCENTRATIONS AT SELECTED INTERSECTIONS NEAR KAPALUA PROJECT DISTRICT 2 (milligrams per cubic meter)

Roadway Intersection	Year/Scenario					
	2000 Present		2020 Without Project		2020 With Project	
	AM	PM	AM	PM	AM	PM
Honoapiilani Highway at Office Road	2.0	1.5	2.1	1.7	5.4	4.1
Honoapiilani Highway at Akahele Street	7.6	6.9	6.7	5.3	6.8	5.3
Honoapiilani Highway at Lower Honoapiilani Hwy	9.4	7.4	8.7	6.9	8.9	7.0

Hawaii State AAQS: 10
National AAQS: 40

Table 4

ESTIMATED WORST-CASE 8-HOUR CARBON MONOXIDE CONCENTRATIONS AT SELECTED INTERSECTIONS NEAR KAPALUA PROJECT DISTRICT 2 (milligrams per cubic meter)

Roadway Intersection	Year/Scenario		
	2000 Present	2020 Without Project	2020 With Project
Honoapiilani Highway at Office Road	1.0	1.0	2.7
Honoapiilani Highway at Akahele Street	3.8	3.4	3.4
Honoapiilani Highway at Lower Honoapiilani Hwy	4.7	4.4	4.4

Hawaii State AAQS: 5
National AAQS: 10

Table 5

ESTIMATED INDIRECT AIR POLLUTION EMISSIONS FROM KAPALUA PROJECT DISTRICT 2 ELECTRICAL DEMAND[a]

Air Pollutant	Emission Rate (tons/year)
Particulate	10
Sulfur Dioxide	90
Carbon Monoxide	8
Volatile Organics	<1
Nitrogen Oxides	40

[a]Based on U.S. EPA emission factors for utility boilers [2]. Assumes electrical demand of 36 million kilowatt-hrs per year and low-sulfur oil used to generate power.

Appendix L-1

Preliminary Engineering Report

Established 1969

Preliminary Engineering Report

Project District 2 at Kapalua

Kapalua, Lahaina, Maui, Hawaii
TMK: (2) 4-2-01: Portion of 01
(2) 4-2-05:50 and Portion of 51
(2) 4-3-01:06 and 08 (State of Hawaii-Owner)

Prepared For:

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Kapalua, Lahaina, Maui, Hawaii 96761

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Date: Revised June, 2002

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TABLE OF CONTENTS

PRELIMINARY ENGINEERING REPORT
FOR
PROJECT DISTRICT 2 AT
KAPALUA, MAUI, HAWAII

1. INTRODUCTION

The West Maui Community Plan, which was adopted by Ordinance No. 2476 and became effective February 27, 1996, has designated approximately 450 acres above Honoapiilani Highway in Kapalua as Project District 2. The applicant, Kapalua Land Company, Ltd. (KLC) would like to increase the PD-2 area to 925 acres. It is intended to provide a mix of recreational activities including an expanded golf course, a clubhouse, a pro shop, restaurant and bars, tennis courts, swimming pool, and other related recreational and commercial activities and services. The Project District is to also include 690 residential units in a mixture of single and multi-family units resulting in an overall density of 0.746 units/acre.

This report briefly describes and evaluates existing infrastructure in the project vicinity. It also provides a brief summary of probable infrastructural improvements that will be needed to support the development of the proposed project district.

2. TOPOGRAPHY

The PD-2 project site is located on the mauka (southeasterly) side of Honoapiilani Highway, FAP RF-030-1(3), and contains an area of 925 acres. The site rises from an elevation of 100 feet at the northeasterly corner of the project site adjacent to fairways 7 and 8 of Plantation Golf Course to around 1250 feet at the southeasterly corner. The grade, exclusive of the gulches, varies between 10.0 and 15.0%. Honokahua Gulch bisects the project site along the northeasterly boundary and an unnamed gulch located approximately 600 feet east of the southwesterly boundary bisects the site in a mauka to makai direction also. Two smaller unnamed drainageways are located in the central portion of the project site between these two major gulches. The project site presently contains 16 holes of the Village Golf Course and approximately 325 acres of abandoned pineapple fields.

3. EXISTING INFRASTRUCTURE

3.1 Water

Kapalua Resort is served by a dual water system. Both systems are owned and operated by Kapalua Water Company (KWC).

The source of their potable water are two deep wells located between elevations 768 and 796 feet above Mean Sea Level (MSL), approximately one-half mile southeast of the PD-2 project site. These wells have a capacity of around 1.0 MGD each.

A third well at around elevation 800 feet was also drilled, successfully tested, cased and capped. The development of this well is being held in abeyance until needed. According to test results it too has a potential capacity of 1.0 MGD.

Water is pumped from these deep wells into a 100,000 gallon glass-lined steel control tank at elevation 820 feet. This tank was recently installed to replace the 16,000 gallon tank previously used for the same purpose. Water is then transmitted by gravity into a 1.0 MG reinforced concrete storage reservoir at elevation 428 feet through a 16-inch line. From this 1.0 MG storage reservoir water is conveyed to Kapalua Resort in PD-1 by means of a 16-inch transmission line on Office Road and Kapalua Drive. This line is augmented by a 12-inch line that runs along Village Road and Lower Honoapiilani Road. The average daily demand on this potable water system between May of 2001 and April of 2002 was slightly under 600,000 gpd.

The source of non-potable irrigation water for Kapalua Resort is the Honolua Ditch. According to ML&P the flows in Honolua ditch varies between a high of 60 MGD to a low of 5 MGD with a 94 percentile average daily flow of 26 MGD. From this ditch water is conveyed to a 5.5 million gallon open reservoir at elevation 660 feet within PD-2 by means of 16 and 12-inch lines across Honokahua Gulch.

Non-potable water for the Plantation Course is fed off another reservoir located above Plantation Estates east of Honokahua Gulch.

From the open reservoir in PD-2 a series of 16, 12, and 8-inch lines deliver the non-potable water to the resort areas below Honoapiilani Highway by way of Office Road, Village Road and Lower Honoapiilani Road for golf course and landscape irrigation. According to KWC records the average daily demand for non-potable water for the period between May 2001 and April 2002 was around 1,900,000 gpd.

3.2 Sewer System

The sewer system within Kapalua Resort is owned, operated and maintained by Kapalua Land Company. Wastewater from Kapalua Resort is collected and directed into the County's sewer pump station No. 6 located in TMK 4-2-04:25 west of Kapalua Bay. From this point a series of County-owned pump stations, force mains and gravity collectors on Lower Honoapiilani Road transport the wastewater to the Lahaina Wastewater Reclamation Facility located north of Kaanapali, mauka of the Honoapiilani Highway/Lower Honoapiilani Road intersection for processing and disposal.

There is no sewer system in PD-2. All the collection systems in Kapalua Resort are located in PD-1 below Honoapiilani Highway.

There are two 15-inch sewer interceptor lines within the resort area. The first, located between 100 to 150 feet inland of the shoreline, receives wastewater from Kapalua Bay Hotel, Bay Villas, Ironwoods, and other projects along the coastline. The second handles flows from the Ridge, Pineapple Hill, Golf Villas, Ritz Carlton Hotel, and the commercial and office buildings along Office Road.

3.3 Drainage

Runoff from the 925 acre PD-2 site presently sheet flows into Honokahua Gulch to the east and the previously mentioned unnamed gully to the west. The current onsite peak runoff for a 100-year, 24-hour rainstorm from PD-2, which includes 16 holes of the Village Golf Course, and former pineapple fields is estimated to be around 1873 cfs. Of this total, approximately 72% ends up in Honokahua Gulch and 28% flows into the unnamed gulch to the west. This 72/28 split is based on contributory drainage areas and not on volume of runoff. Referring to Exhibit 5 in the Drainage Report, Areas 1 and 2 comprise a contributory drainage area of approximately 667 acres. This represents 667/925=72%±of PD-2. Presently runoff from this area flow toward and into Honokahau Gulch. Area 3 containing an area of around 258 acres (or 258/925=roughly 28%) of PD-2 drains into the unnamed gulch. Runoff in this unnamed gulch ends up in a detention basin located west of Pineapple Hill and mauka of fairways no. 11 and 12 of the Bay Course. Any overflow from this first basin ends up in a retention basin

within the Bay Course, 1,000 feet upstream of Lower Honoapiilani Road.

3.4 Roadway

Honoapiilani Highway is the main traffic artery that links Kapalua to Lahaina and the rest of Maui.

Although Honoapiilani Highway is a limited access highway, several access permitted openings have been provided along the PD-2 frontage. Presently the main access is opposite the Office Road/Honoapiilani Highway intersection at the crest of Honoapiilani Highway. This access point was provided with left turn as well as accel and decel lanes when Honoapiilani Highway was constructed. A second access permitted point is located opposite the present service vehicle entrance to Pineapple Hill. This access point could be fully improved to provide a second vehicular access to PD-2 when the west ridge is developed. There is also a third permitted access point at the most westerly corner of PD-2. This access is presently being used to access TMK 4-3-01 parcels 6 and 8 and is fully improved. A fourth permitted-access point located north of Honokahua Gulch presently provides access to the ridge located mauka of the highway.

3.5 Electrical, Telephone, and CATV Systems

The main electrical, telephone, and CATV overhead transmission lines are located on the mauka side of Honoapiilani

Highway along the PD-2 frontage. Maui Electric Company also has a substation adjacent to the PD-2 site west of Honokeana Gulch.

Electricity for West Maui is provided by MECO's Maalaea Power Plant. This facility has a normal generating capacity of 196.5 megawatts. The island-wide generating capacity for MECO, including power that they buy from HC&S is 246.5 megawatts.

4. PROPOSED INFRASTRUCTURAL IMPROVEMENTS

4.1 Water System

According to water consumption records at Kapalua Resort for 1996, the average potable water usage for multi-family units and single family units were 250 gpud and 450 gpud, respectively. Non-potable or irrigation demands were tabulated separately and amounted to 470 gpud and 280 gpud for multi-family and single family units, respectively.

Based on a total density of 690 residential units projected for PD-2, the total potable water demand is expected to range between 250,000 and 350,000 gpd. Non-potable water demand for landscape irrigation and irrigation of the 27 hole golf course is projected to be between 900,000 and 1,000,000 gpd.

The existing 1.0 MG potable water storage tank at elevation 428 feet is situated too low to serve most of PD-2 by gravity. Kapalua's water master plan calls for the construction of a 0.50 MG storage tank

at elevation 820 feet above their well fields. A 0.50 MG storage tank at this elevation would be able to provide storage and adequate pressure for all consumers below elevation 700 feet in PD-2. Because of the significant differences in elevation in PD-2, other storage and pressure breaker tanks will be required. Consumers in PD-2 above this elevation would be served by a hi-level tank to be constructed at elevation 1310 feet. A series of booster pumps will have to be installed to pump water from a mid-level tank that will be constructed at elevation 620 feet to this upper tank. The area adjoining fairways 7 and 8 of the Plantation Golf Course will be served by the existing 1.0 MG storage tank at elevation 428 feet.

A new 16-inch transmission line will be extended from the new 0.50 MG storage tank at the well site to PD-2. Within PD-2 lines will be sized to provide the max day demand of the project. Each unit will also be metered separately. The existing well source and transmission system have sufficient capacity to meet the daily potable water demands of PD-2.

A non-potable distribution system will also be installed in PD-2 for irrigation and fire protection utilizing the existing 5.5 MG open reservoir at elevation 660 feet. Although this open reservoir and Honolua Ditch source have sufficient capacity to meet the non-potable demands of PD-2, a new distribution system with booster pumps and additional open reservoir or tanks will be needed to provide water to the areas above this reservoir. It is estimated that approximately 337 acres of land above elevation 600 feet will have to be fed by a second reservoir. At the 1200 foot level, the size of this open reservoir for non-potable irrigation water and fire protection storage will have to be around 2,000,000 gallons. This reservoir will be lined with a HDPE liner to prevent water loss through seepage. Fire hydrants will be installed at appropriate intervals along the internal roadways for accessibility of fire fighting apparatus. This non-potable system will also be metered to discourage excessive use and waste.

4.2 Sewer System

A new sewer collection system will be installed within PD-2. The sewer system for the central portion of PD-2 will be connected to the gravity interceptor on Office Road. Sewer from the ridge west of the unnamed gully along the western boundary will be piped across Honoapiilani Highway and connected to the sewer system in Pineapple Hill Phase II. The gravity collector for Phase II is connected to the County's gravity interceptor on Lower Honoapiilani Road approximately 2,000 feet below Phase II. The easterly portion of PD-2 adjacent to Plantation Estates Golf Course will be directed into the existing pump station near D.T. Fleming Park.

PD-2 comprised of 690 residential units and a golf course clubhouse is projected to generate around 176,000 gallons of wastewater per day when fully developed.

According to the Division of Wastewater Management (DWM) for the County of Maui, the average daily flow through the Lahaina Wastewater Reclamation Facility (LWRF) is around 6.38 MGD. The facility has an average daily flow capacity of 9.00 MGD. Its design peak flow capacity is 19.8 MGD. When the LWRF was constructed, Kapalua Land Company paid for an average daily flow allocation of around 219,800 gallons in the new facility. Allowing for projects completed since then, KLC has approximately 184,000 gpd of average daily flow capacity left in their allocation. The remainder of capacity has been allocated to Amfac and the State Housing and Community Development Corporation of Hawaii (HCDCH) for the Villages of Leiali'i. However by agreement if HCDCH doesn't use their allocation by year 2006 their allocation reverts to the County. Also, according to the DWM the transmission system between Kapalua and the LWRF is currently operating at about 50% of capacity. Therefore it is reasonable to conclude that the existing facilities have ample capacity to handle the additional wastewater that will be generated by PD-2.

4.3 Drainage

The present pattern of flow in PD-2 will be maintained after development. Post development runoff from PD-2 is expected to increase from 1873 cfs to 1934 cfs as indicated in the attached drainage report. Runoff from the northeasterly portion of PD-2 will be collected by catch basins within the internal roads and parking lots and directed toward Honokahua Gulch. Runoff from development on both sides of the unnamed gulch will be collected by catch basins and piped into detention basins in the unnamed gulch. These onsite detention basins will be designed to suppress the peak flows and to serve as desilting basins to minimize the conveyance of waterborne silt and debris downstream.

Post development runoff from the northeasterly half of PD-2 will be collected and directed into onsite detention and desilting facilities before being discharged into Honokahua Gulch. Runoff from both sides of the unnamed gulch will be routed through detention basins onsite and then into the existing detention basin west of Pineapple Hill Estates and within the Bay Course. Based on the foregoing it is reasonable to conclude that properties and ecosystems downstream will not be adversely impacted by the development of PD-2.

4.4 Roadway

A Traffic Impact Analysis Report (TIAR) was prepared for the project by Parsons Brinckerhoff Quade and Douglas. According to the report the traffic generated by PD-2 can be accommodated by the existing roadway system.

PD-2 will have at least three accesses off of Honoapiilani Highway. As stated earlier the main access will be opposite the main entrance to Kapalua Resort at the intersection of Office Road and Honoapiilani Highway. A second access may be developed across from the present driveway for Pineapple Hill on Honoapiilani Highway, or the existing access serving TMK 4-3-01 parcels 6 and 8 may be used as is to serve the westerly ridge. The Ridge north of Honokahua Gulch will be provided access from the existing driveway located on the northeast side of Honokahua Gulch Bridge. Internally a collector road will be extended from the main entrance up the middle of the east ridge of PD-2 to the various development modules. A secondary road across the unnamed gulch will link the southwest portion of PD-2 to the main collector road. The secondary access opposite Pineapple Hill or the existing access mentioned previously will also provide access to the southwesterly half of PD-2 from Honoapiilani Highway. Connecting roads will be built across the unnamed gulch. Detention basins will be constructed upstream of these road embankments.

4.5 Electrical, Telephone and CATV Systems

Based on current usages at Kapalua, MECO estimates instantaneous peak power demand to range between 4500 kw and 6900 kw when PD-2 project is fully built out. In all probability the electrical substation located west of Honokeana Gulch will have to be up-sized to meet this demand.

According to Verizon, they are planning to construct a universal equipment facility in Kapalua this year. When completed, this facility will be able to handle between 2000 to 3000 more customers in Kapalua.

Electrical, telephone and CATV distribution systems for the project will be extended underground to each development module from the existing overhead transmission and distribution mains located on the mauka side of Honoapiilani Highway. The distribution system will be installed along the interior roads. Localized, non-glare, street and walkway lighting will also be included.

4.6 Solid Waste

When completed, the project will be served by a private refuse collection company contracted by the Homeowner's Association. Solid waste generated from the project will be disposed at the County's Central Maui Landfill at Puunene.

According to the County's Solid Waste Division, they estimate each household to generate around 55 lbs. of solid waste per week. This translates to 37,950 lbs. or approximately 18.9 tons per week.

5. CONCLUSION

Based on the foregoing it is reasonable to conclude that any project related impact can and will be readily mitigated with the installation of appropriate improvements such as those being proposed.

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Appendix L-2

Preliminary Drainage Report

Established 1969

Preliminary Drainage Report

Project District 2 at Kapalua

Kapalua, Lahaina, Maui, Hawaii
TMK: (2) 4-2-01: Portion of 01
(2) 4-2-05:50 and Portion of 51
(2) 4-3-01:06 and 08 (State of Hawaii-Owner)

Prepared For:

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Date: Revised June, 2002

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TABLE OF CONTENTS

Preliminary Drainage Report
for
Project District 2 at Kapalua

I. INTRODUCTION

This report has been prepared to examine both the pre-development and post-development drainage runoff from the project site.

II. PROPOSED PROJECT

A. Site Location:

The project site is located in Kapalua, on the island of Maui, and in the State of Hawaii. Honoapiilani Highway (FAP No. RF-030-1 (3)), borders its westerly boundary and The Plantation at Kapalua (File Plan 2006) borders a portion of its northerly boundary (see Exhibit 1).

The project site occupies an area of approximately 925 acres.

B. Project Description:

The proposed plan for the Project District 2 (PD-2) at Kapalua is to expand the existing PD-2 plan from 450 acres to approximately 925 acres. Proposed land development will include the renovation and expansion of the existing Village Golf Course along with the construction of a new clubhouse, pro shop, restaurant and bars, tennis courts, swimming pool, and other related recreational and commercial activities and services. Project District 2 will also include 690 residential units in a mixture of single and multi-family units resulting in an overall density of 0.746 units/acre.

Proposed improvements within the residential development will include asphalt paved roadways, concrete curb and gutter, concrete sidewalks and landscaping. Utility improvements will consist of underground sewer, drainage and water distribution systems and underground electrical, telephone and cable-television distribution systems.

Parks, golf course, and open space areas will make up the remainder of the PD-2 land use.

III. EXISTING CONDITIONS:

A. Topography and Soil Conditions:

The majority of the project site is undeveloped land which consist of two major gulches, which bisect the project site in a southeast to northwesterly direction. Honokahua Gulch is located along the northeasterly portion of the project site. And a large unnamed drainageway is located along the southwest portion of the project site. Two smaller unnamed drainageways are located in the central portion of the project site between these two major gulches.

The remainder of the project site includes 16 holes of the Village Golf Course and abandoned pineapple fields

Exclusive of the four gulches, the project site generally slopes from an elevation of approximately (+) 100± feet M.S.L. to approximately (+) 1250± feet M.S.L. with an average slope which varies between 10 and 15%.

According to the *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii* [1], prepared by the United States Department of Agriculture, Soil Conservation Service, there are 9 different soil types found on the project site.

Conservation Service, there are 9 different soil types found on the project site. The soil types are the Kahana silty clay (7 to 15% slopes, KbC), Kahana silty clay (3 to 7% slopes, KbB), Kahana silty clay (15 to 25% slopes, KbD), Alaeloa silty clay (15 to 35% slopes, AeE), Alaeloa silty clay (7 to 15% slopes, AeC), Honolua silty clay (7 to 15% slopes, HwC), Honolua silty clay (15 to 25% slops, HwD), Rough Broken Land (rRR), and Rough Broken and Stony Land (rRS).

The Kahana silty clay (KbC), Alaeloa silty clay (AeC) and Honolua silty clay (HwC) are characterized as having slow to medium runoff with a slight to moderate erosion hazard. The Kahana silty clay (KbB) is characterized as having slow runoff and a slight erosion hazard. The Kahana silty clay (KbD), Alaeloa silty clay (AeE) and Honolua silty clay (HwD) are characterized as having medium runoff and a moderate erosion hazard. Rough Broken Land (rRR) is defined as an area which consists of very steep land broken by numerous intermittent drainage channels. Rough Broken and Stony Land (rRS) is defined as an area which consist of very steep and stony gulches where runoff is rapid. (See Exhibit 2).

B. Drainage:

Using the NRCS (SCS) TR-20 Hydrograph Method for a 100 year-24 hour recurrence interval storm, surface runoff from the project site is calculated to be approximately 1873.1 cfs. The onsite surface runoff sheet flows across the project site via Honokahua Gulch and the existing unnamed natural drainageways.

As shown in Exhibit 5, Honokahua Gulch and the existing unnamed drainageways which include offsite contributory drainage areas, have drainage areas that cover

approximately 1750 acres. Table 1 summarizes the existing onsite and offsite runoff volume presently generated by each drainage area.

TABLE 1

Drainage Area	Pre-Development Surface Runoff Volume (cfs)
Area 1 (including offsite flows)	2251.1
Area 2	301.8
Area 3	520.3

Surface runoff generated from Drainage Area 1 sheet flows across the project site via Honokahua Gulch and crosses under Honoapiilani Highway via a concrete bridge crossing. From there, the surface runoff sheet flows overland across an existing grassed channel area before discharging into the Pacific Ocean.

Surface runoff generated from Drainage Area 2 sheet flows across the project site via two existing natural drainageways that separate a few of the holes in The Village Golf Course. Surface runoff is conveyed under Honoapiilani Highway via an existing 72" and a 108" culvert. The storm water then drains across the golf academy driving range and discharges downstream into an existing detention basin located adjacent to the green of the 18th hole of The Village Golf Course. From there, the storm water is released into the grassed channel area previously mentioned before discharging into the Pacific Ocean.

Surface runoff generated from Drainage Area 3 flows across the project site into the existing unnamed natural drainageway and under Honoapiilani Highway via an existing 108" culvert into an existing detention basin located between Pineapple Hill Phase I (File

Plan 1886) and Pineapple Hill Phase II At Kapalua (File Plan 2280). The overflow from this basin travels downstream through an existing 84" outlet pipe discharging into an existing retention basin located adjacent to the 16th hole of The Bay Golf Course.

C. Flood and Tsunami Zone:

According to Panel Number 150003 0138 B dated June 1, 1981 and Panel Number 150003 0139 B dated June 1, 1981 of the Flood Insurance Rate Map [3], prepared by the United States Federal Emergency Management Agency, the project site is situated within Zone C, which is designated as an area that is subject to minimal flooding. (See Exhibit 3)

IV. DRAINAGE PLAN

A. General:

The criteria that will be utilized to minimize the impact of increased surface runoff on the existing downstream properties are as follows:

a. There will be no significant change to the natural drainage pattern in the onsite and offsite drainage areas. Drainage Areas 1, 2 and 3 will continue to direct surface runoff downstream and into the existing concrete bridge and culvert crossings under Honoapiilani Highway.

b. Impermeable surfaces will be minimized in order to limit the increase in surface runoff.

i. The mixture of single and multi-family units will be kept to a maximum of 0.746 units/acre.

ii. The renovation and expansion of the existing Village Golf Course to include 9 new holes will create more permeable area.

c. It is expected that an increase in surface runoff will be generated due to the proposed development. However, the increase in surface runoff will be mitigated by new onsite detention/desilting basins which will be designed to suppress the peak flows and to minimize the transmission of silt and debris to the downstream properties.

According to our calculations, the post development peak runoff from the project site is expected to be approximately 1934.0 cfs, using the NRCS (SCS) TR-20 Hydrograph Method for a 100 year-24 hour recurrence interval storm. This translates to a net increase of approximately 60.9 cfs due to the project, an increase of approximately 3.3%.

A tabulation of pre-development and post-development onsite peak discharges is shown below:

Drainage Area	Pre.-Dev. Q (cfs)	Post-Dev. Q (cfs)	Increase (cfs)
Project Site	1873.1	1934.0	+ 60.9

B. Hydrologic Calculations:

All hydrologic calculations are based on procedures by the U.S. Department of Agriculture, Soil Conservation Service (SCS). This procedure is described in detail in the SCS National Engineering Handbook, Section 4, Hydrology (NEH-4).

The hydrologic calculations for this project may be found in Appendix A.

C. Conclusion:

The proposed development is not expected to have a significant adverse effect on either the existing watershed or the downstream properties. The expected low density of residential units and an increase in permeable area of The Village Golf Course will minimize the increase in surface runoff generated by the project site. Detention/desilting basins will be constructed to intercept, temporarily store, and slowly release the surface runoff to the downstream properties so as not to exceed the pre-development peak discharges. By doing all this, it is our professional opinion that the natural drainage pattern of the watershed will be preserved and there will be no significant adverse effect to the downstream properties.

Report Prepared By:

Carlos R. Rivera

Carlos R. Rivera

Report Reviewed By:

Warren S. Unemori, P.E.

V. REFERENCES

1. *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii.* August 1972. United States Department of Agriculture, Soil Conservation Service.

2. *Flood Insurance Rate Map, Maui County, Hawaii.* Community-Panel Number 150003 0138 B, June 1, 1981 and 150003 0139 B, June 1, 1981 Federal Emergency Management Agency, Federal Insurance Administration.

3. *Rainfall Frequency Atlas of the Hawaiian Islands, Technical Paper No. 43.* 1962. U.S. Department of Commerce, Weather Bureau.

4. *Rules for the Design of Storm Drainage Facilities in the County of Maui.* July 1995. Department of Public Works and Weste Management, County of Maui.

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EXHIBITS

1 Location Map

2 Soil Survey Map

3 Flood Insurance Rate Map

4 Onsite Drainage Area Map

5 Offsite Drainage Area Map

PRELIMINARY DRAINAGE REPORT

DOCUMENT CAPTURED AS RECEIVED

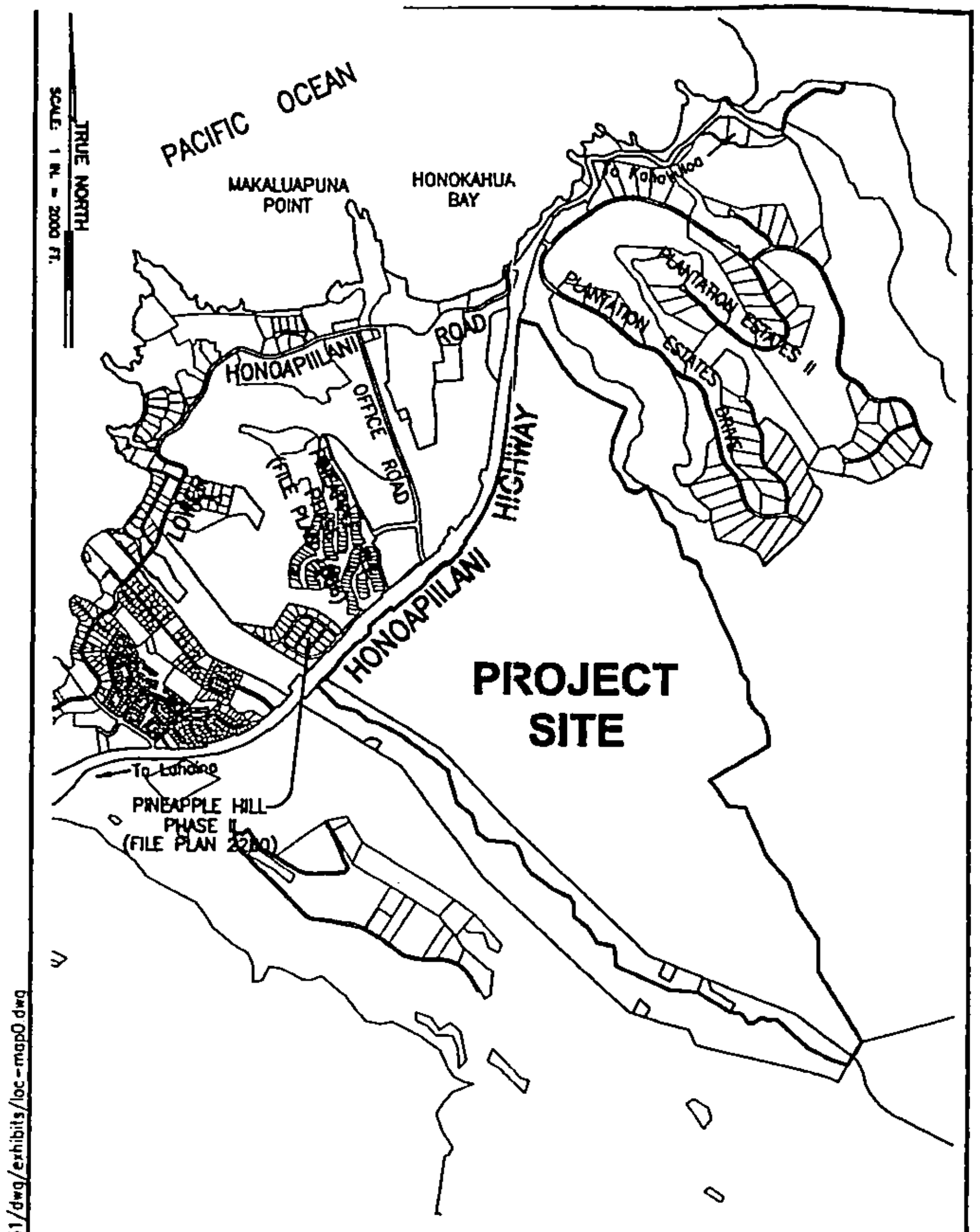

EXHIBIT 1
LOCATION MAP

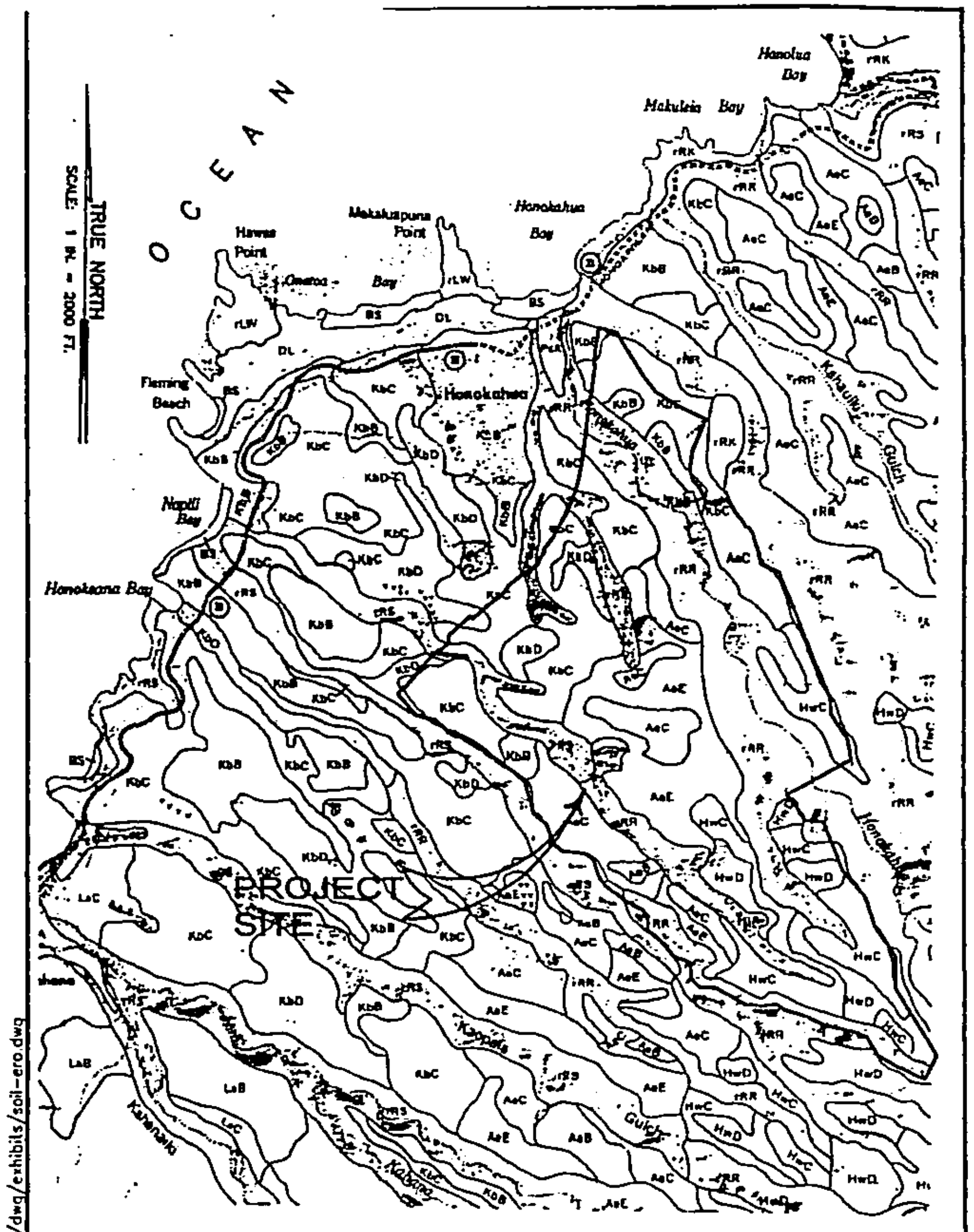

EXHIBIT 2
SOIL SURVEY MAP

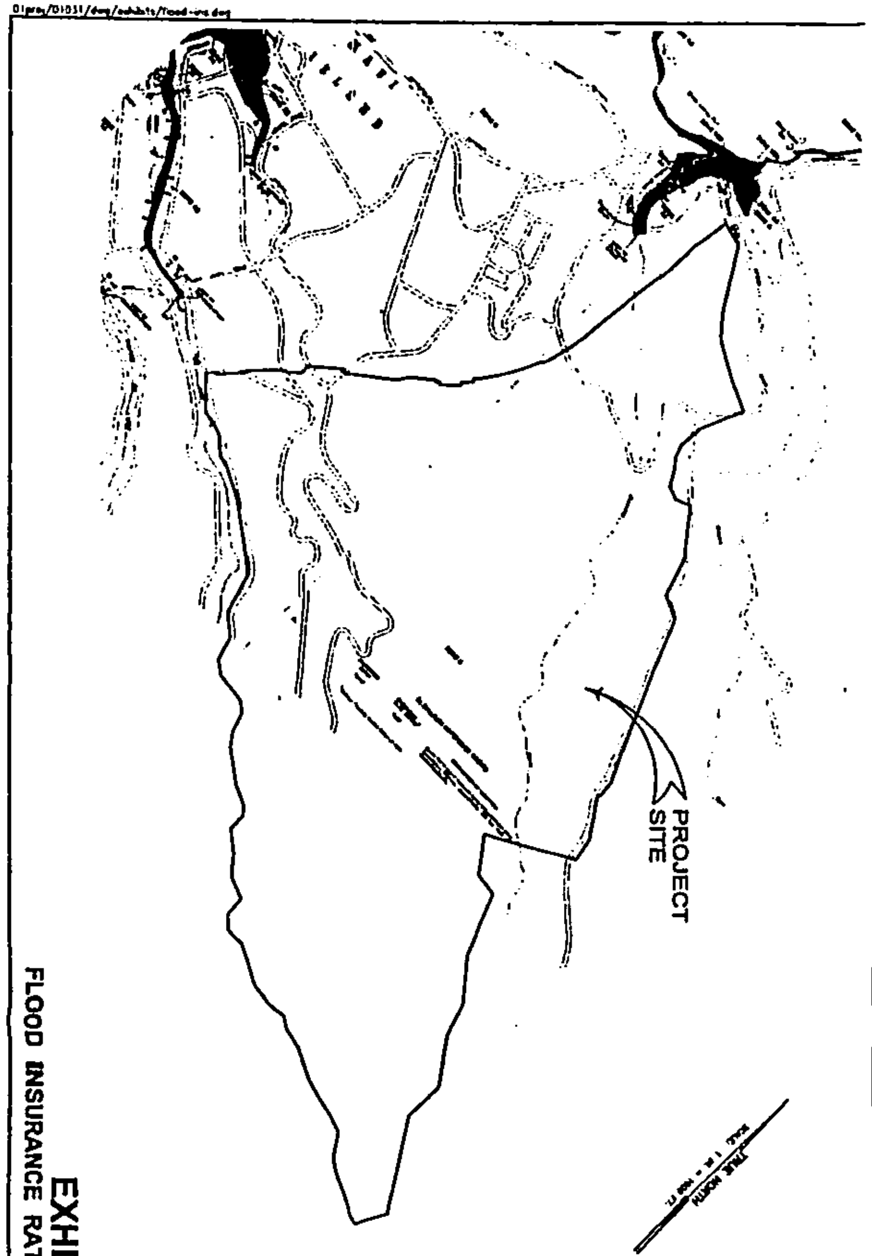

EXHIBIT 3
FLOOD INSURANCE RATE MAP

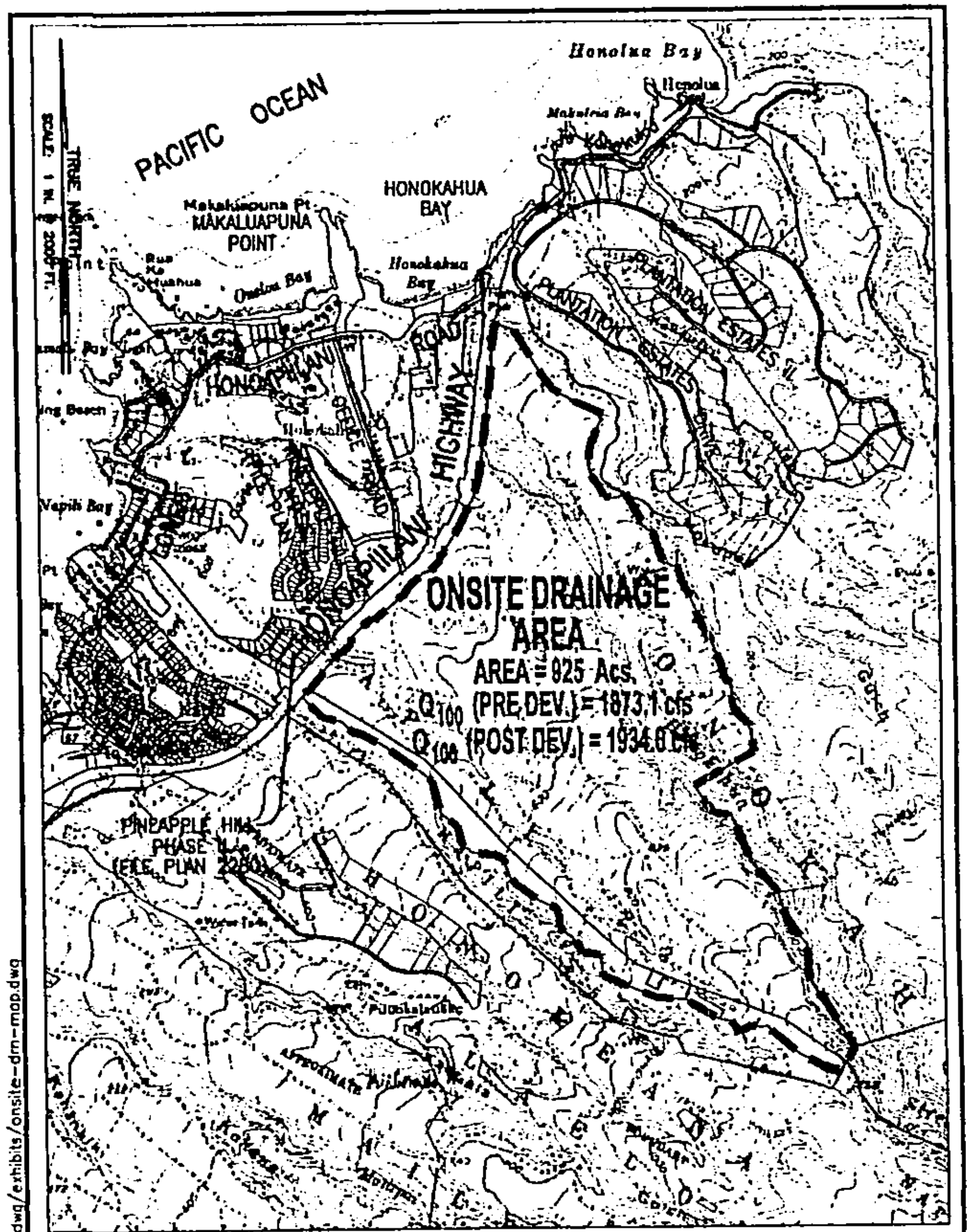

EXHIBIT 4
ONSITE DRAINAGE AREA MAP

DOCUMENT CAPTURED AS RECEIVED

DOCUMENT CAPTURED AS RECEIVED

APPENDIX A

HYDROLOGIC CALCULATIONS

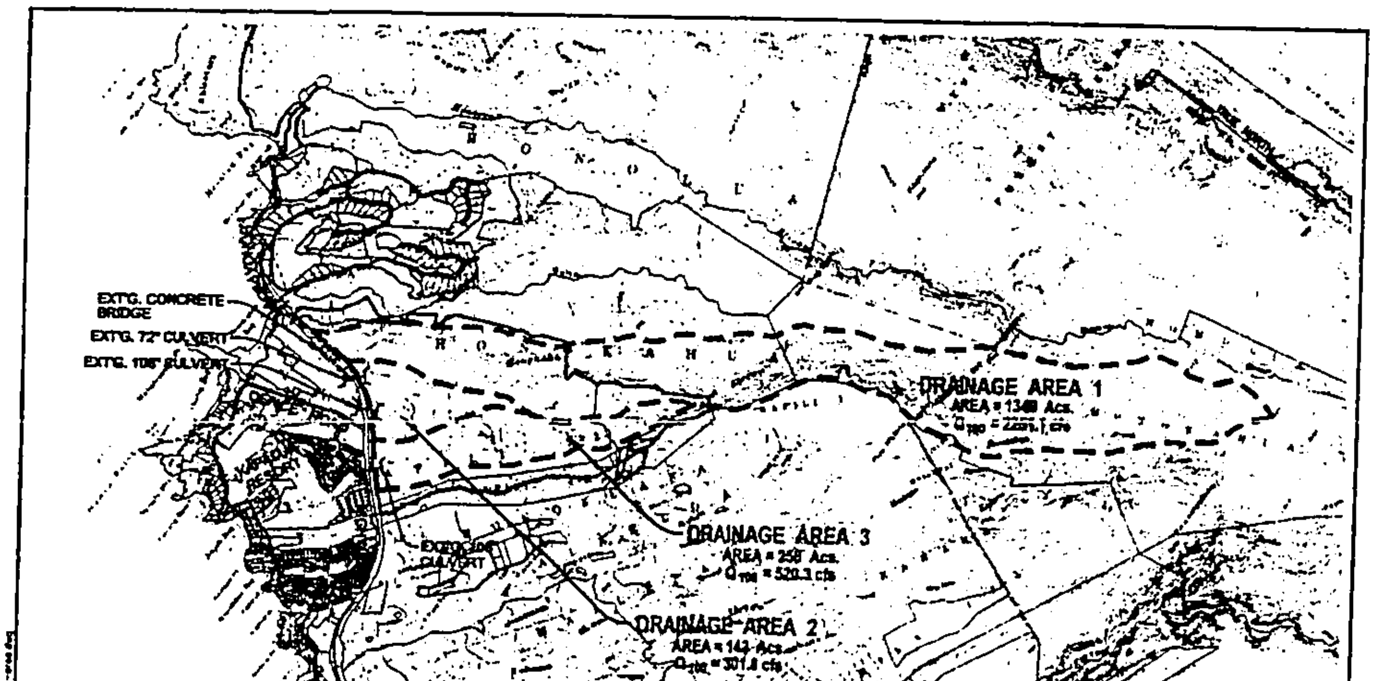

EXHIBIT 5
OFFSITE DRAINAGE AREA MAP

ONSITE DRAINAGE CALCULATIONS

PRE DEVELOPMENT

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::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::
:::                                    :::
:::  Full Microcomputer Implementation :::
:::               by                   :::
:::       Haestad Methods, Inc.        :::
:::                                    :::
::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::
```

1666 37 Brookside Road • Waterbury, Connecticut 06708 • (203) 755-

```
*****************80-80 LIST OF INPUT DATA FOR TR-20
HYDROLOGY*****************

JOB TR-20
TITLE 001 KAPALUA PD2 PRE DEV. ONSITE 100YR 24 HR
TITLE 002 FILE: V:/PROJDATA/01PROJ/01031/TR20/PREON1.DAT
 6 RUNOFF 1 001         1 1.44          69.0          1.41          1 1   1   1
   ENDATA
 7 INCREM 6                0.10
 7 COMPUT 7 001    001     0.0           12.5           1.0          1 2   01  01
   ENDCMP 1
   ENDJOB 2

*****************************END OF 80-80
LIST******************************
```

```
TR20 XEQ  9/04/**
JOB  1    PASS   1                  KAPALUA PD2 PRE DEV. ONSITE 100YR 24 HR
     REV 09/01/83                   FILE:
V:/PROJDATA/01PROJ/01031/TR20/PREON1.DAT
PAGE   1
```

FILE NO. 1

FORMULATION - HYDROLOGY USER NOTES COMPUTER PROGRAM FOR PROJECT

THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1982 DRAFT OF TR-20. CHANGES FROM THE 2/14/74 VERSION INCLUDE:

REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE REPLACES THE CONVEX METHOD. INPUT DATA PREPARED FOR PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING COEFFICIENTS WILL NOT RUN ON THIS VERSION.

THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA REPRESENTATIVE OF A REACH. IT IS RECOMMENDED THAT THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED. THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M" VALUES USED IN THE ROUTING PROCEDURE.

GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS MANUAL. SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE INTERNAL TIME INCREMENT AND PEAK TIME OF THE UNIT HYDROGRAPH HAVE BEEN IMPROVED. PEAK DISCHARGES AND TIMES MAY DIFFER FROM THE PREVIOUS VERSION. OUTPUT HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED AT THE USER SELECTED MAIN TIME INCREMENT.

INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT AND NUMEROUS MODIFICATIONS TO THE OUTPUT. USER OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB RECORD, RAINTABLES ADDED, ERROR AND WARNING MESSAGES EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED. THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:

CHESTER, PA (NORTHEAST) -- 215-499-3933, FORT WORTH, TX (SOUTH) -- 334-5242 (FTS) LINCOLN, NE (MIDWEST) -- 541-5318 (FTS), PORTLAND, OR (WEST) -- 423-4099 (FTS) OR HYDROLOGY UNIT, ENGINEERING DIVISION, LANHAM, MD - - 436-7383 (FTS).

PROGRAM CHANGES SINCE MAY 1982:

12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED DIMHYD

CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED WITH FULLPRINT OPTION

5/02/83 - CORRECT COMPUTATIONS FOR ---

1. DIVISION OF BASEFLOW IN DIVERT OPERATION
2. HYDROGRAPH VOLUME SPLIT BETWEEN BASEFLOW AND ABOVE BASEFLOW
3. CROSS SECTION DATA PLOTTING POSITION
4. INTERMEDIATE PEAK WHEN "FROM" AREA IS LARGER THAN "THRU" AREA
5. STORAGE ROUTED REACH TRAVEL TIME FOR MULTIPEAK HYDROGRAPH
6. ORDERING "FLOW-FREQ" FILE FROM SUMMARY TABLE #3 DATA
7. BASEFLOW ENTERED WITH READHYD PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS
8. LOW FLOW SPLIT DURING DIVERT

ENHANCEMENTS ---

1. REPLACE USER MANUAL ERROR CODES (PAGE 4-9 TO 4-11) WITH MESSAGES
2. LABEL OUTPUT HYDROGRAPH FILES WITH CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S

09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR INTERMEDIATE PEAKS

CORRECT COMBINATION OF RATING TABLES FOR DIVERT

CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE LIMITS

ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-KIN COEFFICIENT EQUALS ONE

```
TR20 XEQ  9/04/**              KAPALUA PD2 PRE DEV. ONSITE 100YR 24 HR
JOB  1   PASS   1
    REV 09/01/83               FILE:
V:/PROJDATA/01PROJ/01031/TR20/PREON1.DAT
PAGE   2


EXECUTIVE CONTROL OPERATION INCREM
RECORD ID                                                    MAIN TIME
INCREMENT =    .10 HOURS

EXECUTIVE CONTROL OPERATION COMPUT
RECORD ID                                                    FROM XSECTION
1                                                              TO XSECTION
1
        STARTING TIME =   .00    RAIN DEPTH = 12.50    RAIN DURATION=
1.00    RAIN TABLE NO.= 1     ANT. MOIST. COND= 2
        ALTERNATE NO.= 1          STORM NO.= 1     MAIN TIME INCREMENT =
.10 HOURS

OPERATION RUNOFF   CROSS SECTION   1

           PEAK TIME(HRS)                 PEAK DISCHARGE(CFS)
PEAK ELEVATION(FEET)
              10.78                           1873.10
(RUNOFF)

TIME(HRS)          FIRST HYDROGRAPH POINT =    .00 HOURS      TIME
INCREMENT =  .10 HOURS       DRAINAGE AREA =   1.44 SQ.MI.
   3.00    DISCHG           .00        .00        .00        .00        .00
.00        .00       .00        .00        .01
   4.00    DISCHG           .03        .09        .21        .44        .81
1.36       2.14      3.15       4.43       5.95
   5.00    DISCHG          7.72       9.74      11.98      14.42      17.04
19.83      22.79     25.89      29.14      32.51
   6.00    DISCHG         35.99      39.58      43.26      46.98      50.73
54.49      58.26     62.07      65.96      69.96
   7.00    DISCHG         74.12      78.49      83.12      87.99      93.09
98.46     104.11    110.04     116.19     122.55
   8.00    DISCHG        129.14     136.05     143.37     151.17     159.52
168.58     178.62    189.86     202.43     216.47
   9.00    DISCHG        232.23     250.13     270.43     293.10     318.15
346.22     384.27    440.20     519.54     629.90
  10.00    DISCHG        778.25     959.96    1160.85    1363.83    1549.46
1700.53   1804.94   1860.46    1872.39    1845.60
  11.00    DISCHG       1784.38    1697.01    1595.58    1488.00    1382.39
1285.80   1199.05   1119.36    1046.51     980.85
  12.00    DISCHG        921.63     868.64     821.43     778.97     740.97
707.05     676.70    649.45     624.97     602.92
  13.00    DISCHG        582.93     564.74     548.10     532.78     518.68
505.72     493.63    482.19     471.32     460.92
  14.00    DISCHG        450.82     440.93     431.28     422.14     413.60
405.67     398.36    391.60     385.27     379.34
  15.00    DISCHG        373.79     368.61     363.79     359.33     355.28
351.65     348.41    345.49     342.78     340.22
  16.00    DISCHG        337.71     335.17     332.52     329.74     326.84
323.77     320.53    317.14     313.64     310.10
  17.00    DISCHG        306.50     302.89     299.33     295.89     292.68
289.73     287.04    284.54     282.17     279.86
  18.00    DISCHG        277.56     275.16     272.60     269.89     267.01
263.97     260.85    257.81     254.99     252.59
  19.00    DISCHG        250.75     249.43     248.51     247.84     247.28
246.67     245.87    244.77     243.36     241.61
  20.00    DISCHG        239.49     237.07     234.47     231.82     229.24
226.84     224.67    222.73     221.02     219.55
  21.00    DISCHG        218.34     217.35     216.54     215.88     215.33
214.86     214.41    213.91     213.28     212.47
  22.00    DISCHG        211.40     210.06     208.50     206.82     205.09
203.38     201.77    200.28     198.95     197.80
  23.00    DISCHG        196.84     196.07     195.44     194.92     194.49
194.13     193.77    193.34     192.77     192.00
  24.00    DISCHG        190.87     188.93     185.74     180.98     174.25
165.17     153.76    140.50     126.13     111.43
  25.00    DISCHG         96.99      83.25      70.71      59.40      49.58
41.40      34.71     29.15      24.50      20.60
  26.00    DISCHG         17.29      14.50      12.16      10.19       8.53
7.14       5.96      4.97       4.15       3.46
  27.00    DISCHG          2.87       2.38       1.96       1.61       1.31
1.06        .86       .68        .53        .41
  28.00    DISCHG           .31        .22        .14        .09        .04
.02        .00

  RUNOFF VOLUME ABOVE BASEFLOW =  8.36 WATERSHED INCHES,    7770.60 CFS-
HRS,    642.16 ACRE-FEET;    BASEFLOW =     .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP
RECORD ID                                                    COMPUTATIONS
COMPLETED FOR PASS   1


TR20 XEQ  9/04/**              KAPALUA PD2 PRE DEV. ONSITE 100YR 24 HR
JOB  1   PASS   2
    REV 09/01/83               FILE:
V:/PROJDATA/01PROJ/01031/TR20/PREON1.DAT
PAGE   3


EXECUTIVE CONTROL OPERATION ENDJOB
RECORD ID


TR20 XEQ  9/04/**              KAPALUA PD2 PRE DEV. ONSITE 100YR 24 HR
JOB  1   SUMMARY
    REV 09/01/83               FILE:
V:/PROJDATA/01PROJ/01031/TR20/PREON1.DAT
PAGE   4
```

```
SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL
INSTRUCTIONS IN THE ORDER PERFORMED
                  (A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE
(CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
                   A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK
AS LAST POINT.)

SECTION/     STANDARD                    RAIN  ANTEC  MAIN
PRECIPITATION                                      PEAK DISCHARGE
STRUCTURE     CONTROL    DRAINAGE  TABLE  MOIST  TIME   -----------------
-------  RUNOFF    ----------------------------------------
  ID        OPERATION     AREA        #      COND  INCREM  BEGIN     AMOUNT
DURATION  AMOUNT      ELEVATION   TIME         RATE         RATE
                           (SQ MI)                    (HR)   (HR)
(HR)      (IN)        (FT)       (HR)       (CFS)     (CSM)         (IN)

  ALTERNATE     1    STORM     1
XSECTION    1  RUNOFF     1.44        1        2      .10       .0   12.50
24.00      8.36        ---       10.78      1873.10     1300.8


TR20 XEQ  9/04/**                KAPALUA PD2 PRE DEV. ONSITE 100YR 24 HR
JOB  1    SUMMARY
     REV 09/01/83                FILE:
V:/PROJDATA/01PROJ/01031/TR20/PREON1.DAT
PAGE    5


SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL
STORMS AND ALTERNATES

XSECTION/             DRAINAGE
STRUCTURE               AREA          STORM NUMBERS..........
  ID                  (SQ MI)                1

XSECTION     1           1.44
  ALTERNATE     1                  1873.10
 END OF   1 JOBS IN THIS RUN
Stop - Program terminated.
```

ONSITE DRAINAGE CALCULATIONS

POST DEVELOPMENT

```
**********************************************************************
********
*                                       * TR 20 S/N     :
*
*                                       * HMVersion     :  3.40
*
*             TR 20                     * Date          :  9/04/**
*
*                                       * Time          :  15:21:15
*
*    Project Formulation Hydrology      * Input file    :
v:\projdata\01proj\0103*
*                                       * Output file   :
v:\projdata\01proj\0103*
*                                       *
*
*                                       *
*
**********************************************************************
*******
```

```
xxxxxxx  xxxxxx    xxxxx    xxxxx
   x     x     x  x     x  x    xx
   x     x     x        x  x   x x
   x     xxxxxx      x     x  x  x
   x     x   x     x       x x   x
   x     x    x   x        xx    x
   x     x     x  xxxxxxx   xxxxx
```

```
:::::::::::::::::::::::::::::::::::::::::::
:::::::::::::::::::::::::::::::::::::::::::
:::                                     :::
:::  Full Microcomputer Implementation  :::
:::                 by                  :::
:::          Haestad Methods, Inc.      :::
:::                                     :::
:::::::::::::::::::::::::::::::::::::::::::
:::::::::::::::::::::::::::::::::::::::::::

      37 Brookside Road * Waterbury, Connecticut  06708 * (203) 755-
1666
```

```
*****************80-80 LIST OF INPUT DATA FOR TR-20
HYDROLOGY*****************

JOB TR-20
TITLE 001 KAPALUA PD2 POST DEV. ONSITE 100YR 24 HR
TITLE 002 FILE: V:/PROJDATA/01PROJ/01031/TR20/POSTON1.DAT
 6 RUNOFF 1 001       1 1.44        70.0        1.38        1 1   1   1
   ENDATA
 7 INCREM 6             0.10
 7 COMPUT 7 001   001   0.0         12.5         1.0        1 2  01  01
   ENDCMP 1
   ENDJOB 2

*****************************END OF 80-80
LIST********************************
```

```
TR20 XEQ  9/04/**              KAPALUA PD2 POST DEV. ONSITE 100YR 24 HR
JOB  1   PASS   1
     REV 09/01/83               FILE:
V:/PROJDATA/01PROJ/01031/TR20/POSTON1.DAT
PAGE   1


FILE NO.  1

                                    COMPUTER PROGRAM FOR PROJECT
FORMULATION - HYDROLOGY   USER NOTES

              THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1982 DRAFT OF
TR-20.  CHANGES FROM THE 2/14/74 VERSION INCLUDE:

              REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE
REPLACES THE CONVEX METHOD.  INPUT DATA PREPARED FOR
                 PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING
COEFFICIENTS WILL NOT RUN ON THIS VERSION.

                 THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA
REPRESENTATIVE OF A REACH.  IT IS RECOMMENDED THAT
                 THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE
OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED.
                 THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND
ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M"
                 VALUES USED IN THE ROUTING PROCEDURE.

                 GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS
AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS
                 MANUAL.  SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS
AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

              HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE
INTERNAL TIME INCREMENT AND PEAK TIME OF THE UNIT
                 HYDROGRAPH HAVE BEEN IMPROVED.  PEAK DISCHARGES AND
TIMES MAY DIFFER FROM THE PREVIOUS VERSION.  OUTPUT
                 HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED
```

```
AT THE USER SELECTED MAIN TIME INCREMENT.

            INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT
INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

            OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT
AND NUMEROUS MODIFICATIONS TO THE OUTPUT.  USER
              OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB
RECORD, RAINTABLES ADDED, ERROR AND WARNING MESSAGES
              EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED.
THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

            PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO
HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:

               CHESTER, PA (NORTHEAST)  -- 215-499-3933,        FORT
WORTH, TX (SOUTH) -- 334-5242 (FTS)
               LINCOLN, NB (MIDWEST)    -- 541-5318 (FTS),
PORTLAND, OR (WEST)    -- 423-4099 (FTS)
               OR HYDROLOGY UNIT, ENGINEERING DIVISION, LANHAM, MD -
- 436-7383 (FTS).

        PROGRAM CHANGES SINCE MAY 1982:

            12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED
DIMHYD
                    CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED
WITH FULLPRINT OPTION
            5/02/83 - CORRECT COMPUTATIONS FOR ---
                            1. DIVISION OF BASEFLOW IN DIVERT
OPERATION
                            2. HYDROGRAPH VOLUME SPLIT BETWEEN
BASEFLOW AND ABOVE BASEFLOW
                            3. CROSS SECTION DATA PLOTTING
POSITION
                            4. INTERMEDIATE PEAK WHEN "FROM" AREA
IS LARGER THAN "THRU" AREA
                            5. STORAGE ROUTED REACH TRAVEL TIME
FOR MULTIPEAK HYDROGRAPH
                            6. ORDERING "FLOW-FREQ" FILE FROM
SUMMARY TABLE #3 DATA
                            7. BASEFLOW ENTERED WITH READHYD
                            8. LOW FLOW SPLIT DURING DIVERT
PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS
                    ENHANCEMENTS ---
                            1. REPLACE USER MANUAL ERROR CODES
(PAGE 4-9 TO 4-11) WITH MESSAGES
                            2. LABEL OUTPUT HYDROGRAPH FILES WITH
CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S
            09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR
INTERMEDIATE PEAKS
                    CORRECT COMBINATION OF RATING TABLES FOR
DIVERT
                    CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE
LIMITS
                    ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-
KIN COEFFICIENT EQUALS ONE
--
--
```

```
TR20 XEQ  9/04/**                    KAPALUA PD2 POST DEV. ONSITE 100YR 24 HR
JOB  1   PASS   1
    REV 09/01/83                      FILE:
V:/PROJDATA/01PROJ/01031/TR20/POSTON1.DAT
PAGE   2


EXECUTIVE CONTROL OPERATION INCREM
RECORD ID          O
INCREMENT =    .10 HOURS                                        MAIN TIME

EXECUTIVE CONTROL OPERATION COMPUT
RECORD ID          C
1O                                                           FROM XSECTION
1                                                              TO XSECTION
         STARTING TIME =    .00    RAIN DEPTH = 12.50     RAIN DURATION=
1.00     RAIN TABLE NO.= 1     ANT. MOIST. COND= 2
         ALTERNATE NO.= 1            STORM NO.= 1     MAIN TIME INCREMENT =
.10 HOURS

OPERATION RUNOFF    CROSS SECTION   1

           PEAK TIME(HRS)                     PEAK DISCHARGE(CFS)
PEAK ELEVATION(FEET)
             10.75                                1934.02
(RUNOFF)

TIME(HRS)          FIRST HYDROGRAPH POINT =    .00 HOURS        TIME
INCREMENT =   .10 HOURS      DRAINAGE AREA =    1.44 SQ.MI.
   3.00     DISCHG         .00          .00          .00
.00         .00        .00         .01          .05                .00        .00
   4.00     DISCHG         .15          .34          .66
2.86        4.08       5.56        7.29         9.25               1.17       1.89
   5.00     DISCHG       11.44        13.84        16.43
25.17       28.37      31.72       35.19        38.77             19.19      22.10
   6.00     DISCHG       42.46        46.25        50.10
61.78       65.67      69.60       73.61        77.73             54.00      57.89
   7.00     DISCHG       82.04        86.57        91.36
107.27      113.13     119.27      125.64       132.21            96.40     101.70
   8.00     DISCHG      139.01       146.13       153.69
179.77      190.20     201.92      215.04       229.69           161.76     170.40
   9.00     DISCHG      246.18       264.95       286.27
365.79      405.72     464.56      548.37       665.43           310.06     336.31
  10.00     DISCHG      823.70      1017.23      1229.37
1782.78     1881.36    1928.28     1929.60      1890.43         1441.44    1631.96
  11.00     DISCHG     1816.14      1718.54      1608.68
1289.06     1200.59    1119.55     1045.74       979.14         1495.13    1386.92
  12.00     DISCHG      919.44       866.35       819.05
705.15      675.15     648.25      624.13       602.32           776.61     738.79
  13.00     DISCHG      582.60       564.68       548.23
506.54      494.56     483.19      472.35       461.89           533.10     519.28
  14.00     DISCHG      451.67       441.67       432.09
406.94      399.83     393.13      386.83       380.95           423.05     414.67
  15.00     DISCHG      375.46       370.33       365.53
353.53      350.35     347.48      344.81       342.28           361.10     357.09
  16.00     DISCHG      339.78       337.22       334.53           331.71     328.74
```

```
325.60     322.30     318.85     315.29     311.69
  17.00     DISCHG        308.04     304.39     300.79     297.33     294.11
291.17     288.51     286.04     283.69     281.41
  18.00     DISCHG        279.11     276.68     274.08     271.31     268.37
265.24     262.04     258.94     256.11     253.73
  19.00     DISCHG        251.93     250.69     249.85     249.26     248.75
248.19     247.39     246.26     244.80     242.97
  20.00     DISCHG        240.74     238.22     235.54     232.83     230.23
227.82     225.65     223.72     222.04     220.62
  21.00     DISCHG        219.45     218.49     217.72     217.07     216.54
216.09     215.65     215.15     214.51     213.67
  22.00     DISCHG        212.56     211.17     209.55     207.81     206.04
204.30     202.66     201.17     199.84     198.72
  23.00     DISCHG        197.80     197.06     196.46     195.96     195.54
195.20     194.85     194.41     193.83     193.03
  24.00     DISCHG        191.85     189.83     186.50     181.52     174.44
164.87     152.88     139.04     124.19     109.11
  25.00     DISCHG         94.41      80.60      68.01      56.82      47.25
39.37      32.92      27.56      23.09      19.33
  26.00     DISCHG         16.14      13.47      11.25       9.38       7.82
6.50       5.41       4.49       3.73       3.09
  27.00     DISCHG          2.55       2.10       1.71       1.39       1.13
.90        .72        .56        .43        .32
  28.00     DISCHG           .23        .15        .09        .05        .02
.00

  RUNOFF VOLUME ABOVE BASEFLOW =  8.51 WATERSHED INCHES,    7908.15 CFS-
HRS,    653.53 ACRE-FEET;   BASEFLOW =     .00 CFS


EXECUTIVE CONTROL OPERATION ENDCMP
RECORD ID                                                   COMPUTATIONS
COMPLETED FOR PASS   1


TR20 XEQ  9/04/**               KAPALUA PD2 POST DEV. ONSITE 100YR 24 HR
JOB  1   PASS   2
    REV 09/01/83                FILE:
V:/PROJDATA/01PROJ/01031/TR20/POSTON1.DAT
PAGE    3


EXECUTIVE CONTROL OPERATION ENDJOB
RECORD ID


TR20 XEQ  9/04/**               KAPALUA PD2 POST DEV. ONSITE 100YR 24 HR
JOB  1   SUMMARY
    REV 09/01/83                FILE:
V:/PROJDATA/01PROJ/01031/TR20/POSTON1.DAT
PAGE    4


SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL
INSTRUCTIONS IN THE ORDER PERFORMED
                    (A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE
(CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
                     A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK
AS LAST POINT.)

SECTION/    STANDARD                 RAIN  ANTEC  MAIN
PRECIPITATION                                    PEAK DISCHARGE
STRUCTURE    CONTROL   DRAINAGE  TABLE  MOIST  TIME   ------------------
-------  RUNOFF   ----------------------------------------
  ID       OPERATION    AREA      #     COND  INCREM  BEGIN      AMOUNT
DURATION  AMOUNT     ELEVATION   TIME       RATE       RATE
                      (SQ MI)                    (HR)   (HR)      (IN)
(HR)      (IN)        (FT)      (HR)       (CFS)      (CSM)


  ALTERNATE    1   STORM    1
XSECTION   1  RUNOFF      1.44       1       2      .10       .0     12.50
24.00      8.51       ---        10.75     1934.02      1343.1


TR20 XEQ  9/04/**               KAPALUA PD2 POST DEV. ONSITE 100YR 24 HR
JOB  1   SUMMARY
    REV 09/01/83                FILE:
V:/PROJDATA/01PROJ/01031/TR20/POSTON1.DAT
PAGE    5


SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL
STORMS AND ALTERNATES

XSECTION/           DRAINAGE
STRUCTURE             AREA        STORM NUMBERS..........
  ID                (SQ MI)             1

 XSECTION    1          1.44
  ALTERNATE    1                       1934.02
 END OF  1 JOBS IN THIS RUN
Stop - Program terminated.
```

OFFSITE DRAINAGE CALCULATIONS

DRAINAGE AREA 1

```
TR 20                                    * TR 20 S/N    :
                                         * HMVersion    :  3.40
                                         * Date         :  8/28/**
                                         * Time         :  7:39:05
    Project Formulation Hydrology        * Input file   :
v:\projdata\01proj\0103*
                                         * Output file  :
v:\projdata\01proj\0103*
```

```
xxxxxxx  xxxxxx    xxxxx    xxxxx
   x     x     x  x     x  x    xx
   x     x     x        x  x   x x
   x     xxxxxx       x    x  x  x
   x     x   x      x      x x   x
   x     x    x   x        xx    x
   x     x     x  xxxxxxx   xxxxx
```

```
:::::::::::::::::::::::::::::::::::::::::::
:::::::::::::::::::::::::::::::::::::::::::
:::                                     :::
:::  Full Microcomputer Implementation  :::
:::                 by                  :::
:::        Haestad Methods, Inc.        :::
:::                                     :::
:::::::::::::::::::::::::::::::::::::::::::
:::::::::::::::::::::::::::::::::::::::::::
```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

```
*****************80-80 LIST OF INPUT DATA FOR TR-20
HYDROLOGY*****************

JOB TR-20
TITLE 001 KAPALUA PD2 PRE DEV. HONOKAHUA STREAM 100YR 24 HR
TITLE 002 FILE: V:/PROJDATA/01PROJ/01031/TR20/PRE1.DAT
 6 RUNOFF 1 001         1 2.11        73.0          3.32          1 1    1    1
   ENDATA
 7 INCREM 6                  0.10
 7 COMPUT 7 001    001    0.0           14.9            1.0           1 2   01   01
   ENDCMP 1
   ENDJOB 2

******************************END OF 80-80
LIST*******************************
```

```
TR20 XEQ  8/28/**                  KAPALUA PD2 PRE DEV. HONOKAHUA STREAM
100YR 24 HR                                          JOB  1    PASS   1
      REV 09/01/83                 FILE:
V:/PROJDATA/01PROJ/01031/TR20/PRE1.DAT
PAGE    1
```

FILE NO. 1

FORMULATION - HYDROLOGY USER NOTES COMPUTER PROGRAM FOR PROJECT

THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1982 DRAFT OF TR-20. CHANGES FROM THE 2/14/74 VERSION INCLUDE:

REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE REPLACES THE CONVEX METHOD. INPUT DATA PREPARED FOR PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING COEFFICIENTS WILL NOT RUN ON THIS VERSION.

THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA REPRESENTATIVE OF A REACH. IT IS RECOMMENDED THAT THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED. THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M" VALUES USED IN THE ROUTING PROCEDURE.

GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS MANUAL. SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE INTERNAL TIME INCREMENT AND PEAK TIME OF THE UNIT HYDROGRAPH HAVE BEEN IMPROVED. PEAK DISCHARGES AND TIMES MAY DIFFER FROM THE PREVIOUS VERSION. OUTPUT HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED AT THE USER SELECTED MAIN TIME INCREMENT.

INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT AND NUMEROUS MODIFICATIONS TO THE OUTPUT. USER OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB RECORD, RAINTABLES ADDED, ERROR AND WARNING MESSAGES EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED. THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:

CHESTER, PA (NORTHEAST) -- 215-499-3933, FORT WORTH, TX (SOUTH) -- 334-5242 (FTS) LINCOLN, NB (MIDWEST) -- 541-5318 (FTS), PORTLAND, OR (WEST) -- 423-4099 (FTS) OR HYDROLOGY UNIT, ENGINEERING DIVISION, LANHAM, MD - - 436-7383 (FTS).

PROGRAM CHANGES SINCE MAY 1982:

12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED DIMHYD
CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED WITH FULLPRINT OPTION
5/02/83 - CORRECT COMPUTATIONS FOR ---
1. DIVISION OF BASEFLOW IN DIVERT OPERATION
2. HYDROGRAPH VOLUME SPLIT BETWEEN BASEFLOW AND ABOVE BASEFLOW
3. CROSS SECTION DATA PLOTTING POSITION
4. INTERMEDIATE PEAK WHEN "FROM" AREA IS LARGER THAN "THRU" AREA
5. STORAGE ROUTED REACH TRAVEL TIME FOR MULTIPEAK HYDROGRAPH
6. ORDERING "FLOW-FREQ" FILE FROM SUMMARY TABLE #3 DATA
7. BASEFLOW ENTERED WITH READHYD
8. LOW FLOW SPLIT DURING DIVERT PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS
ENHANCEMENTS ---
1. REPLACE USER MANUAL ERROR CODES (PAGE 4-9 TO 4-11) WITH MESSAGES
2. LABEL OUTPUT HYDROGRAPH FILES WITH CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S
09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR INTERMEDIATE PEAKS
CORRECT COMBINATION OF RATING TABLES FOR DIVERT
CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE LIMITS
ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-KIN COEFFICIENT EQUALS ONE

```
TR20 XEQ  8/28/**              KAPALUA PD2 PRE DEV. HONOKAHUA STREAM
100YR 24 HR                                  JOB  1   PASS   1
    REV 09/01/83               FILE:
V:/PROJDATA/01PROJ/01031/TR20/PRE1.DAT
PAGE   2


EXECUTIVE CONTROL OPERATION INCREM
RECORD ID          ᴝ                                      MAIN TIME
INCREMENT -   .10 HOURS

EXECUTIVE CONTROL OPERATION COMPUT
RECORD ID          ᴝ                                   FROM XSECTION
1ᴝ                                                       TO XSECTION
1
        STARTING TIME -    .00    RAIN DEPTH - 14.90    RAIN DURATION-
1.00    RAIN TABLE NO.- 1     ANT. MOIST. COND- 2
        ALTERNATE NO.- 1             STORM NO.- 1    MAIN TIME INCREMENT -
.10 HOURS

OPERATION RUNOFF   CROSS SECTION   1

            PEAK TIME(HRS)                PEAK DISCHARGE(CFS)
PEAK ELEVATION(FEET)
              12.18                            2251.12
(RUNOFF)

TIME(HRS)         FIRST HYDROGRAPH POINT -     .00 HOURS        TIME
INCREMENT -   .10 HOURS       DRAINAGE AREA -    2.11 SQ.MI.
   2.00     DISCHG          .00        .00        .00        .00        .00
 .00       .00        .00        .00        .01
   3.00     DISCHG          .02        .04        .09        .16        .27
 .42       .64        .92       1.29       1.77
   4.00     DISCHG         2.37       3.11       4.01       5.08       6.33
7.77      9.42      11.28      13.37      15.67
   5.00     DISCHG        18.20      20.96      23.94      27.15      30.58
34.23     38.10      42.19      46.49      51.02
   6.00     DISCHG        55.75      60.68      65.81      71.12      76.59
82.23     88.04      93.99     100.11     106.38
   7.00     DISCHG       112.79     119.35     126.06     132.92     139.95
147.16    154.56     162.16     170.00     178.07
   8.00     DISCHG       186.40     195.02     203.95     213.23     222.89
232.97    243.53     254.65     266.43     278.94
   9.00     DISCHG       292.26     306.55     321.96     338.66     356.79
377.02    400.66     429.09     463.93     506.54
  10.00     DISCHG       557.35     616.07     682.65     756.82     838.63
928.59   1026.80    1133.27    1246.88    1365.04
  11.00     DISCHG      1484.62    1602.26    1714.33    1818.18    1912.35
1995.52  2066.74    2125.83    2173.16    2209.35
  12.00     DISCHG      2234.09    2247.77    2250.95    2244.17    2228.26
2204.83  2175.28    2139.64    2097.83    2049.83
  13.00     DISCHG      1995.90    1937.69    1876.94    1815.44    1755.40
1698.18  1643.84    1592.32    1543.31    1496.46
  14.00     DISCHG      1451.93    1409.76    1369.86    1331.93    1295.76
1260.93  1227.25    1194.74    1163.35    1133.27
  15.00     DISCHG      1104.59    1077.27    1051.17    1026.21    1002.29
979.36    957.40     936.41     916.37     897.22
  16.00     DISCHG       878.91     861.37     844.65     828.68     813.42
798.91    785.15     772.02     759.38     747.23
  17.00     DISCHG       735.55     724.36     713.59     703.16     693.06
683.24    673.72     664.44     655.39     646.58
  18.00     DISCHG       638.02     629.71     621.63     613.75     606.05
598.48    591.07     583.84     576.80     569.98
  19.00     DISCHG       563.37     556.94     550.66     544.50     538.50
532.67    527.01     521.53     516.21     511.05
  20.00     DISCHG       506.02     501.13     496.33     491.60     486.91
482.27    477.70     473.23     468.88     464.68
  21.00     DISCHG       460.63     456.70     452.87     449.15     445.55
442.08    438.74     435.50     432.35     429.26
  22.00     DISCHG       426.23     423.27     420.38     417.55     414.78
412.08    409.43     406.81     404.22     401.66
  23.00     DISCHG       399.14     396.67     394.25     391.88     389.55
387.27    385.04     382.85     380.70     378.57
  24.00     DISCHG       376.44     374.23     371.87     369.25     366.31
362.97    359.20     354.91     350.05     344.56
  25.00     DISCHG       338.34     331.34     323.49     314.79     305.28
295.07    284.26     272.96     261.28     249.33
  26.00     DISCHG       237.22     225.07     212.97     200.95     189.09
177.48    166.23     155.36     144.90     134.87
  27.00     DISCHG       125.31     116.24     107.68      99.68      92.28
85.48     79.25      73.54      68.28      63.41
  28.00     DISCHG        58.89      54.69      50.80      47.19      43.84
40.71     37.80      35.07      32.53      30.17
  29.00     DISCHG        27.98      25.96      24.08      22.34      20.72
19.21     17.80      16.50      15.28      14.16

  RUNOFF VOLUME ABOVE BASEFLOW - 11.21 WATERSHED INCHES,  15270.03 CFS-
HRS,  1261.92 ACRE-FEET;   BASEFLOW -    .00 CFS


EXECUTIVE CONTROL OPERATION ENDCMP
RECORD ID          ᴝ                                    COMPUTATIONS
COMPLETED FOR PASS   1

ᴝ


TR20 XEQ  8/28/**              KAPALUA PD2 PRE DEV. HONOKAHUA STREAM
100YR 24 HR                                  JOB  1   PASS   2
    REV 09/01/83               FILE:
V:/PROJDATA/01PROJ/01031/TR20/PRE1.DAT
PAGE   3


EXECUTIVE CONTROL OPERATION ENDJOB
RECORD ID
ᴝ


TR20 XEQ  8/28/**              KAPALUA PD2 PRE DEV. HONOKAHUA STREAM
100YR 24 HR                                  JOB  1   SUMMARY
    REV 09/01/83               FILE:
```

```
V:/PROJDATA/01PROJ/01031/TR20/PRE1.DAT
PAGE    4


SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL
INSTRUCTIONS IN THE ORDER PERFORMED
                  (A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE
(CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
                  A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK
AS LAST POINT.)

SECTION/     STANDARD                   RAIN  ANTEC  MAIN
PRECIPITATION                                   PEAK DISCHARGE
STRUCTURE     CONTROL   DRAINAGE  TABLE  MOIST  TIME  ------------------
-------  RUNOFF    ---------------------------------------
   ID       OPERATION     AREA      #      COND  INCREM  BEGIN     AMOUNT
DURATION  AMOUNT      ELEVATION   TIME           RATE          RATE
                        (SQ MI)                        (HR)   (HR)      (IN)
(HR)       (IN)       (FT)        (HR)        (CFS)        (CSM)


   ALTERNATE     1    STORM     12
XSECTION    1  RUNOFF      2.11      1         2       .10        .0    14.90
24.00      11.21          ---      12.18     2251.12       1066.9


TR20 XEQ  8/28/**                 KAPALUA PD2 PRE DEV.  HONOKAHUA STREAM
100YR 24 HR                                      JOB  1    SUMMARY
     REV 09/01/83                 FILE:
V:/PROJDATA/01PROJ/01031/TR20/PRE1.DAT
PAGE    5


SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL
STORMS AND ALTERNATES

XSECTION/            DRAINAGE
STRUCTURE              AREA        STORM NUMBERS..........
  ID                 (SQ MI)              1


XSECTION     1            2.11
  ALTERNATE      1                   2251.12
END OF  1 JOBS IN THIS RUN
Stop - Program terminated.
```

OFFSITE DRAINAGE CALCULATIONS

DRAINAGE AREA 2

```
*********************************************************************
* TR 20                              * TR 20 S/N    :
*                                    * HMVersion    :  3.40
*                                    * Date         :  8/28/**
*                                    * Time         :  7:34:19
*   Project Formulation Hydrology    * Input file   :
v:\projdata\01proj\0103*             * Output file  :
v:\projdata\01proj\0103*             *
*                                    *
*********************************************************************
```

```
xxxxxxx  xxxxxx    xxxxx    xxxxx
   x     x    x  x     x  x    xx
   x     x    x       x   x   x x
   x     xxxxxx      x    x  x  x
   x     x  x       x     x x   x
   x     x   x    x       xx    x
   x     x    x  xxxxxxx   xxxxx
```

```
:::::::::::::::::::::::::::::::::::::::::
:::                                   :::
:::  Full Microcomputer Implementation :::
:::               by                  :::
:::        Haestad Methods, Inc.      :::
:::                                   :::
:::::::::::::::::::::::::::::::::::::::::
```

1666 37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-

```
*****************80-80 LIST OF INPUT DATA FOR TR-20
HYDROLOGY*****************

JOB TR-20
TITLE 001 KAPALUA PD2 PRE DEV. UNNAMED DRWWAY. SMALL 100YR 24 HR
TITLE 002 FILE: V:/PROJDATA/01PROJ/01031/TR20/PRE2.DAT
 6 RUNOFF 1 001       1 0.22        62.0        0.94        1 1   1   1
   ENDATA
 7 INCREM 6            0.10
 7 COMPUT 7 001    001 0.0          12.5        1.0         1 2  01  01
   ENDCMP 1
   ENDJOB 2

******************************END OF 80-80
LIST*******************************
```

```
TR20 XEQ  8/28/**              KAPALUA PD2 PRE DEV. UNNAMED DRWWAY.
SMALL 100YR 24 HR                             JOB  1   PASS   1
    REV 09/01/83               FILE:
V:/PROJDATA/01PROJ/01031/TR20/PRE2.DAT
PAGE   1

FILE NO.  1
```

COMPUTER PROGRAM FOR PROJECT FORMULATION - HYDROLOGY USER NOTES

THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1982 DRAFT OF TR-20. CHANGES FROM THE 2/14/74 VERSION INCLUDE:

REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE REPLACES THE CONVEX METHOD. INPUT DATA PREPARED FOR PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING COEFFICIENTS WILL NOT RUN ON THIS VERSION.

THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA REPRESENTATIVE OF A REACH. IT IS RECOMMENDED THAT THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED. THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M" VALUES USED IN THE ROUTING PROCEDURE.

GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS MANUAL. SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE INTERNAL TIME INCREMENT AND PEAK TIME OF THE UNIT HYDROGRAPH HAVE BEEN IMPROVED. PEAK DISCHARGES AND TIMES MAY DIFFER FROM THE PREVIOUS VERSION. OUTPUT HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED

```
AT THE USER SELECTED MAIN TIME INCREMENT.

              INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT
INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

              OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT
AND NUMEROUS MODIFICATIONS TO THE OUTPUT.  USER
                 OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB
RECORD, RAINTABLES ADDED, ERROR AND WARNING MESSAGES
                 EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED.
THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

              PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO
HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:

                   CHESTER, PA (NORTHEAST)  -- 215-499-3933,        FORT
WORTH, TX (SOUTH) -- 334-5242 (FTS)
                   LINCOLN, NB (MIDWEST)     -- 541-5318 (FTS),
PORTLAND, OR (WEST)     -- 423-4099 (FTS)
                   OR HYDROLOGY UNIT, ENGINEERING DIVISION, LANHAM, MD -
- 436-7383 (FTS).


         PROGRAM CHANGES SINCE MAY 1982:

               12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED
DIMHYD
                          CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED
WITH FULLPRINT OPTION
                5/02/83 - CORRECT COMPUTATIONS FOR ---
                                 1. DIVISION OF BASEFLOW IN DIVERT
OPERATION
                                 2. HYDROGRAPH VOLUME SPLIT BETWEEN
BASEFLOW AND ABOVE BASEFLOW
                                 3. CROSS SECTION DATA PLOTTING
POSITION
                                 4. INTERMEDIATE PEAK WHEN "FROM" AREA
IS LARGER THAN "THRU" AREA
                                 5. STORAGE ROUTED REACH TRAVEL TIME
FOR MULTIPEAK HYDROGRAPH
                                 6. ORDERING "FLOW-FREQ" FILE FROM
SUMMARY TABLE #3 DATA
                                 7. BASEFLOW ENTERED WITH READHYD
                                 8. LOW FLOW SPLIT DURING DIVERT
PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS
                          ENHANCEMENTS ---
                                 1. REPLACE USER MANUAL ERROR CODES
(PAGE 4-9 TO 4-11) WITH MESSAGES
                                 2. LABEL OUTPUT HYDROGRAPH FILES WITH
CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S
               09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR
INTERMEDIATE PEAKS
                          CORRECT COMBINATION OF RATING TABLES FOR
DIVERT
                          CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE
LIMITS
                          ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-
KIN COEFFICIENT EQUALS ONE
::
```

```
TR20 XEQ  8/28/**                    KAPALUA PD2 PRE DEV. UNNAMED DRWWAY.
SMALL 100YR 24 HR                                  JOB  1   PASS   1
     REV 09/01/83                    FILE:
V:/PROJDATA/01PROJ/01031/TR20/PRE2.DAT
PAGE   2


EXECUTIVE CONTROL OPERATION INCREM
RECORD ID          :                                              MAIN TIME
INCREMENT =    .10 HOURS


EXECUTIVE CONTROL OPERATION COMPUT
RECORD ID          C                                            FROM XSECTION
1C                                                                TO XSECTION
1
         STARTING TIME =    .00    RAIN DEPTH = 12.50     RAIN DURATION=
1.00     RAIN TABLE NO.= 1     ANT. MOIST. COND= 2
         ALTERNATE NO.= 1           STORM NO.= 1     MAIN TIME INCREMENT =
.10 HOURS


OPERATION RUNOFF    CROSS SECTION    1

             PEAK TIME(HRS)                PEAK DISCHARGE(CFS)
PEAK ELEVATION(FEET)
               10.43                             301.81
(RUNOFF)
               19.30                              35.34
(RUNOFF)

TIME(HRS)          FIRST HYDROGRAPH POINT =    .00 HOURS       TIME
INCREMENT =  .10 HOURS       DRAINAGE AREA =    .22 SQ.MI.
   5.00     DISCHG          .00        .01         .02         .06         .14
.28         .46        .71       1.01       1.35
   6.00     DISCHG         1.74       2.16        2.60        3.06        3.52
3.99        4.47       4.97       5.50       6.07
   7.00     DISCHG         6.68       7.31        7.99        8.70        9.45
10.23       11.04      11.88      12.76      13.67
   8.00     DISCHG        14.62      15.62       16.71       17.93       19.29
20.80       22.47      24.37      26.58      29.16
   9.00     DISCHG        32.04      35.22       38.77       42.81       47.45
52.59       60.68      74.47      97.28     131.62
  10.00     DISCHG       174.56     219.50      259.45      287.94      300.88
298.58      285.29     265.80     243.51     220.97
  11.00     DISCHG       200.27     182.47      166.79      152.81      140.29
129.53      120.40     112.60     105.90     100.10
  12.00     DISCHG        95.19      91.02       87.44       84.27       81.40
78.82       76.50      74.40      72.49      70.76
  13.00     DISCHG        69.22      67.87       66.62       65.41       64.22
63.08       61.98      60.92      59.84      58.73
  14.00     DISCHG        57.64      56.61       55.64       54.73       53.86
53.08       52.37      51.72      51.09      50.46
  15.00     DISCHG        49.87      49.34       48.86       48.47       48.15
47.91       47.71      47.51      47.28      46.98
  16.00     DISCHG        46.63      46.24       45.83       45.37       44.87
44.37       43.87      43.36      42.83      42.28
  17.00     DISCHG        41.73      41.21       40.75       40.36       40.04
```

```
39.79     39.59     39.37     39.12     38.80
  18.00     DISCHG       38.43     38.02     37.57      37.09      36.57
36.05     35.58     35.20     34.97     34.91
  19.00     DISCHG       35.00     35.15     35.29      35.34      35.28
35.10     34.83     34.49     34.09     33.63
  20.00     DISCHG       33.15     32.69     32.26      31.88      31.57
31.34     31.16     31.03     30.93     30.86
  21.00     DISCHG       30.81     30.77     30.75      30.74      30.73
30.72     30.69     30.61     30.44     30.19
  22.00     DISCHG       29.86     29.51     29.17      28.86      28.60
28.40     28.26     28.15     28.07     28.01
  23.00     DISCHG       27.96     27.93     27.91      27.89      27.88
27.88     27.85     27.77     27.61     27.34
  24.00     DISCHG       26.97     26.34     25.30      23.63      21.25
18.37     15.32     12.36      9.69      7.44
  25.00     DISCHG        5.68      4.36      3.36       2.59       1.98
1.52      1.16       .89       .67       .51
  26.00     DISCHG         .39       .29       .22        .16        .12
.08       .06       .03       .02       .01
  27.00     DISCHG         .00

  RUNOFF VOLUME ABOVE BASEFLOW =  7.29 WATERSHED INCHES,   1035.75 CFS-
HRS,    85.59 ACRE-FEET;   BASEFLOW =    .00 CFS


EXECUTIVE CONTROL OPERATION ENDCMP
RECORD ID                                                    COMPUTATIONS
COMPLETED FOR PASS   1



TR20 XEQ  8/28/**             KAPALUA PD2 PRE DEV. UNNAMED DRWWAY.
SMALL 100YR 24 HR                           JOB  1   PASS   2
     REV 09/01/83             FILE:
V:/PROJDATA/01PROJ/01031/TR20/PRE2.DAT
PAGE   3


EXECUTIVE CONTROL OPERATION ENDJOB
RECORD ID


TR20 XEQ  8/28/**             KAPALUA PD2 PRE DEV. UNNAMED DRWWAY.
SMALL 100YR 24 HR                           JOB  1   SUMMARY
     REV 09/01/83             FILE:
V:/PROJDATA/01PROJ/01031/TR20/PRE2.DAT
PAGE   4


SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL
INSTRUCTIONS IN THE ORDER PERFORMED
                  (A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE
(CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
```

```
                    A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK
AS LAST POINT.)

SECTION/    STANDARD                 RAIN  ANTEC  MAIN
PRECIPITATION                                  PEAK DISCHARGE
STRUCTURE     CONTROL   DRAINAGE  TABLE  MOIST  TIME   -----------------
------- RUNOFF  --------------------------------------
  ID         OPERATION     AREA       #     COND  INCREM  BEGIN     AMOUNT
DURATION  AMOUNT     ELEVATION   TIME          RATE        RATE
                          (SQ MI)                   (HR)    (HR)      (IN)
(HR)      (IN)        (FT)      (HR)       (CFS)      (CSM)


  ALTERNATE    1   STORM    1
XSECTION   1  RUNOFF      .22        1       2     .10       .0     12.50
24.00      7.29       ---       10.43      301.81      1371.9



TR20 XEQ  8/28/**             KAPALUA PD2 PRE DEV. UNNAMED DRWWAY.
SMALL 100YR 24 HR                           JOB  1   SUMMARY
     REV 09/01/83             FILE:
V:/PROJDATA/01PROJ/01031/TR20/PRE2.DAT
PAGE   5


SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL
STORMS AND ALTERNATES

XSECTION/          DRAINAGE
STRUCTURE            AREA        STORM NUMBERS..........
  ID               (SQ MI)             1

 XSECTION    1           .22
   ALTERNATE    1                       301.81
 END OF  1 JOBS IN THIS RUN
Stop - Program terminated.
```

OFFSITE DRAINAGE CALCULATIONS

DRAINAGE AREA 3

```
*********************************************************************
*                                      * TR 20 S/N      :
*                                      * HMVersion      :  3.40
*            TR 20                     * Date           :  8/28/**
*                                      * Time           :  7:45:35
*    Project Formulation Hydrology     * Input file     :
v:\projdata\01proj\0103*               * Output file    :
v:\projdata\01proj\0103*               *
*                                      *
*********************************************************************

                 xxxxxxx  xxxxxx   xxxxx   xxxxx
                    x     x     x x     x x    xx
                    x     x     x       x x   x x
                    x     xxxxxx       x  x  x  x
                    x     x   x      x    x x   x
                    x     x    x   x      xx    x
                    x     x     x xxxxxxx  xxxxx

          ::::::::::::::::::::::::::::::::::::::::::
          ::::::::::::::::::::::::::::::::::::::::::
          :::                                    :::
          :::  Full Microcomputer Implementation :::
          :::                by                  :::
          :::        Haestad Methods, Inc.       :::
          :::                                    :::
          ::::::::::::::::::::::::::::::::::::::::::
          ::::::::::::::::::::::::::::::::::::::::::

        37 Brookside Road * Waterbury, Connecticut  06708 * (203) 755-
1666
```

```
******************80-80 LIST OF INPUT DATA FOR TR-20
HYDROLOGY*****************

JOB TR-20
TITLE 001 KAPALUA PD2 PRE DEV. UNNAMED DRWWAY. LARGE 100YR 24 HR
TITLE 002 FILE: V:/PROJDATA/01PROJ/01031/TR20/PRE3.DAT
 6 RUNOFF 1 001        1 0.40         69.0          1.41          1 1   1   1
   ENDATA
 7 INCREM 6              0.10
 7 COMPUT 7 001    001   0.0          12.5           1.0          1 2  01  01
   ENDCMP 1
   ENDJOB 2

******************************END OF 80-80
LIST*******************************
```

```
TR20 XEQ  8/28/**               KAPALUA PD2 PRE DEV. UNNAMED DRWWAY.
LARGE 100YR 24 HR                              JOB  1    PASS   1
    REV 09/01/83                FILE:
V:/PROJDATA/01PROJ/01031/TR20/PRE3.DAT
PAGE   1
```

FILE NO. 1

COMPUTER PROGRAM FOR PROJECT FORMULATION - HYDROLOGY USER NOTES

THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1982 DRAFT OF TR-20. CHANGES FROM THE 2/14/74 VERSION INCLUDE:

REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE REPLACES THE CONVEX METHOD. INPUT DATA PREPARED FOR PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING COEFFICIENTS WILL NOT RUN ON THIS VERSION.

THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA REPRESENTATIVE OF A REACH. IT IS RECOMMENDED THAT THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED. THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M" VALUES USED IN THE ROUTING PROCEDURE.

GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS MANUAL. SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE INTERNAL TIME INCREMENT AND PEAK TIME OF THE UNIT HYDROGRAPH HAVE BEEN IMPROVED. PEAK DISCHARGES AND TIMES MAY DIFFER FROM THE PREVIOUS VERSION. OUTPUT HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED AT THE USER SELECTED MAIN TIME INCREMENT.

INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT AND NUMEROUS MODIFICATIONS TO THE OUTPUT. USER OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB RECORD, RAINTABLES ADDED, ERROR AND WARNING MESSAGES EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED. THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:

CHESTER, PA (NORTHEAST) -- 215-499-3933, FORT WORTH, TX (SOUTH) -- 334-5242 (FTS)
LINCOLN, NB (MIDWEST) -- 541-5318 (FTS), PORTLAND, OR (WEST) -- 423-4099 (FTS)
OR HYDROLOGY UNIT, ENGINEERING DIVISION, LANHAM, MD - - 436-7383 (FTS).

PROGRAM CHANGES SINCE MAY 1982:

```
             12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED
DIMHYD
                        CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED
WITH FULLPRINT OPTION
              5/02/83 - CORRECT COMPUTATIONS FOR ---
                                  1. DIVISION OF BASEFLOW IN DIVERT
OPERATION
                                  2. HYDROGRAPH VOLUME SPLIT BETWEEN
BASEFLOW AND ABOVE BASEFLOW
                                  3. CROSS SECTION DATA PLOTTING
POSITION
                                  4. INTERMEDIATE PEAK WHEN "FROM" AREA
IS LARGER THAN "THRU" AREA
                                  5. STORAGE ROUTED REACH TRAVEL TIME
FOR MULTIPEAK HYDROGRAPH
                                  6. ORDERING "FLOW-FREQ" FILE FROM
SUMMARY TABLE #3 DATA
                                  7. BASEFLOW ENTERED WITH READHYD
                                  8. LOW FLOW SPLIT DURING DIVERT
PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS
                        ENHANCEMENTS ---
                                  1. REPLACE USER MANUAL ERROR CODES
(PAGE 4-9 TO 4-11) WITH MESSAGES
                                  2. LABEL OUTPUT HYDROGRAPH FILES WITH
CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S
             09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR
INTERMEDIATE PEAKS
                        CORRECT COMBINATION OF RATING TABLES FOR
DIVERT
                        CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE
LIMITS
                        ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-
KIN COEFFICIENT EQUALS ONE
```

```
TR20 XEQ  8/28/**                 KAPALUA PD2 PRE DEV. UNNAMED DRWWAY.
LARGE 100YR 24 HR                                JOB  1   PASS   1
     REV 09/01/83                 FILE:
V:/PROJDATA/01PROJ/01031/TR20/PRE3.DAT
PAGE   2


EXECUTIVE CONTROL OPERATION INCREM
RECORD ID        -                                              MAIN TIME
INCREMENT =    .10 HOURS


EXECUTIVE CONTROL OPERATION COMPUT
RECORD ID        -                                              FROM XSECTION
1C                                                                TO XSECTION
1
        STARTING TIME =    .00    RAIN DEPTH = 12.50    RAIN DURATION=
1.00    RAIN TABLE NO.= 1     ANT. MOIST. COND= 2
        ALTERNATE NO.= 1              STORM NO.= 1    MAIN TIME INCREMENT =
.10 HOURS


OPERATION RUNOFF   CROSS SECTION   1

            PEAK TIME(HRS)              PEAK DISCHARGE(CFS)
PEAK ELEVATION(FEET)
               10.78                          520.31
(RUNOFF)

TIME(HRS)          FIRST HYDROGRAPH POINT =    .00 HOURS        TIME
INCREMENT =  .10 HOURS       DRAINAGE AREA =    .40 SQ.MI.
   4.00     DISCHG          .01        .02        .06        .12         .22
.38        .59        .88        1.23       1.65
   5.00     DISCHG         2.15       2.70       3.33       4.00        4.73
5.51       6.33       7.19       8.09       9.03
   6.00     DISCHG        10.00      11.00      12.02      13.05       14.09
15.14      16.18      17.24      18.32      19.43
   7.00     DISCHG        20.59      21.80      23.09      24.44       25.86
27.35      28.92      30.57      32.28      34.04
   8.00     DISCHG        35.87      37.79      39.83      41.99       44.31
46.83      49.62      52.74      56.23      60.13
   9.00     DISCHG        64.51      69.48      75.12      81.42       88.38
96.17     106.74     122.28     144.32     174.97
  10.00     DISCHG       216.18     266.65     322.46     378.84      430.41
472.37     501.37     516.79     520.11     512.67
  11.00     DISCHG       495.66     471.39     443.22     413.33      384.00
357.17     333.07     310.93     290.70     272.46
  12.00     DISCHG       256.01     241.29     228.17     216.38      205.83
196.40     187.97     180.40     173.60     167.48
  13.00     DISCHG       161.93     156.87     152.25     148.00      144.08
140.48     137.12     133.94     130.92     128.03
  14.00     DISCHG       125.23     122.48     119.80     117.26      114.89
112.69     110.66     108.78     107.02     105.37
  15.00     DISCHG       103.83     102.39     101.05      99.81       98.69
97.68      96.78      95.97      95.22      94.51
  16.00     DISCHG        93.81      93.10      92.37      91.59       90.79
89.94      89.04      88.09      87.12      86.14
  17.00     DISCHG        85.14      84.14      83.15      82.19       81.30
80.48      79.73      79.04      78.38      77.74
  18.00     DISCHG        77.10      76.43      75.72      74.97       74.17
73.32      72.46      71.61      70.83      70.16
  19.00     DISCHG        69.65      69.29      69.03      68.84       68.69
68.52      68.30      67.99      67.60      67.11
  20.00     DISCHG        66.52      65.85      65.13      64.39       63.68
63.01      62.41      61.87      61.39      60.99
  21.00     DISCHG        60.65      60.37      60.15      59.97       59.81
59.68      59.56      59.42      59.25      59.02
  22.00     DISCHG        58.72      58.35      57.92      57.45       56.97
56.50      56.05      55.63      55.26      54.94
  23.00     DISCHG        54.68      54.46      54.29      54.14       54.02
53.92      53.83      53.71      53.55      53.33
  24.00     DISCHG        53.02      52.48      51.60      50.27       48.40
45.88      42.71      39.03      35.04      30.95
  25.00     DISCHG        26.94      23.14      19.64      16.50       13.77
11.50       9.64       8.10       6.81       5.72
  26.00     DISCHG         4.80       4.03       3.38       2.83        2.37
1.98        1.66       1.38       1.15        .96
  27.00     DISCHG          .80        .66        .54        .45         .36
.30         .24        .19        .15        .11
  28.00     DISCHG          .09        .06        .04        .02         .01
.00

  RUNOFF VOLUME ABOVE BASEFLOW =  8.36 WATERSHED INCHES,    2158.50 CFS-
HRS,    178.38 ACRE-FEET;    BASEFLOW =     .00 CFS


EXECUTIVE CONTROL OPERATION ENDCMP
RECORD ID        -                                          COMPUTATIONS
COMPLETED FOR PASS   1

II


TR20 XEQ  8/28/**                 KAPALUA PD2 PRE DEV. UNNAMED DRWWAY.
LARGE 100YR 24 HR                                JOB  1   PASS   2
     REV 09/01/83                 FILE:
V:/PROJDATA/01PROJ/01031/TR20/PRE3.DAT
PAGE   3


EXECUTIVE CONTROL OPERATION ENDJOB
RECORD ID
II


TR20 XEQ  8/28/**                 KAPALUA PD2 PRE DEV. UNNAMED DRWWAY.
LARGE 100YR 24 HR                                JOB  1   SUMMARY
     REV 09/01/83                 FILE:
V:/PROJDATA/01PROJ/01031/TR20/PRE3.DAT
PAGE   4


SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL
```

```
INSTRUCTIONS IN THE ORDER PERFORMED
                    (A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE
(CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
                    A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK
AS LAST POINT.)

SECTION/    STANDARD                   RAIN  ANTEC  MAIN
PRECIPITATION                                   PEAK DISCHARGE
STRUCTURE     CONTROL    DRAINAGE  TABLE  MOIST  TIME  ------------------
-------  RUNOFF    --------------------------------------
   ID        OPERATION      AREA       #      COND  INCREM  BEGIN     AMOUNT
DURATION  AMOUNT       ELEVATION   TIME          RATE            RATE
                           (SQ MI)                     (HR)    (HR)      (IN)
(HR)       (IN)          (FT)       (HR)          (CFS)       (CSM)

   ALTERNATE    1   STORM    1
XSECTION   1  RUNOFF      .40      1          2      .10        .0      12.50
24.00      8.36          ---        10.78      520.31      1300.8


TR20 XEQ  8/28/**                KAPALUA PD2 PRE DEV. UNNAMED DRNWAY.
LARGE 100YR 24 HR                                JOB  1   SUMMARY
     REV 09/01/83                FILE:
V:/PROJDATA/01PROJ/01031/TR20/PRE3.DAT
PAGE   5


SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL
STORMS AND ALTERNATES

XSECTION/             DRAINAGE
STRUCTURE               AREA        STORM NUMBERS..........
  ID                  (SQ MI)              1

 XSECTION    1           .40
   ALTERNATE     1                   520.31
END OF  1 JOBS IN THIS RUN
Stop - Program terminated.
```