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STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810

DEC 11 2006

PM-1069.6

MEMORANDUM

TO: Ms. Genevieve K. Y. Salmonson
Director, Office of Environmental Quality Control
Department of Health

FROM: Ernest Y. W. Lau
Public Works Administrator

SUBJECT: Finding of No Significant Impact (FONSI) for
University of Hawaii Center at West Hawaii
Main Street Collector Road
Kalaoa, North Kona District, Island of Hawaii
TMK [3] 7-3-10:45

The Department of Accounting and General Services (DAGS) has reviewed the comments received during the 30-day public comment period which began on January 8, 2006. The agency has determined that this project will not have significant environmental effects and has issued a FONSI. Please publish this notice in the next available *Environmental Notice*.

We have enclosed a completed OEQC Publication Form, two copies of the final EA, and one CD containing an electronic copy of the final EA.

Please contact Mr. Mark Yamabe at 586-0469 if you have any questions.

MY/si
Enclosures
c: Mr. Wil Chee, Planning & Environmental, Inc.
Mr. Chad McDonald, Mitsunaga & Associates, Inc.
Mr. Maynard Young, University of Hawaii

Final Environmental Assessment

University of Hawai`i Center at West Hawai`i

Main Street Collector Road

Portions of TMK [3] 7-3-10: 33, 42, 44 & 45

State of Hawai`i,
Department of Accounting and General Services

Prepared for:

Mitsunaga & Associates, Inc.

Prepared by:

Wil Chee - Planning & Environmental, Inc.

January 2007

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Glossary of Acronyms

ALISH	Agricultural Lands of Importance in the State of Hawaii System
BOR	Board of Regents
DAGS	Department of Accounting and General Services
DHHL	Department of Hawaiian Home Lands
DLNR	Department of Land and Natural Resources
DOFAW	State Department of Fish and Wildlife
DOH	Department of Health
EA	Environmental Assessment
EPA	Environmental Protection Agency
FWS	U.S. Fish and wildlife Service
HELCO	Hawaii Electric Light Company
HRS	Hawaii Revised Statutes
K to K	Keāhole to Kailua Development Plan
LLC	Limited Liability Corporation
LRDP	Long Range Development Plan
LUC	Land Use Commission
M=	magnitude equals
msl	mean sea level
MOU	Memorandum of Understanding
NPDES	National Pollutant Discharge Elimination System
OEQC	Office of Environmental Quality Control
OSP	Office of State Planning
PM	particulate matter
SHPD	State Historic Preservation Division
SMA	Special Management Area
TMK	Tax Map Key
UH	University of Hawai`i
UHCWH	University of Hawai`i Center at West Hawai`i
UHM	University of Hawai`i at Manoa

1.0 Summary

The State of Hawai`i Department of Accounting and General Services (DAGS), in cooperation with the University of Hawai`i, and Hiluhilu Development Company (Palamanui) proposes to construct a new collector road on the portion of Parcel 45, which is located west of the University of Hawaii's 500 acre parcel (TMK: [3] 7-3-10: 42). Parcel 45 also includes a segment that extends from the proposed Main Street to Queen Ka`ahamanu Highway across from the Airport access road.

The roadway will be approximately 6,900 feet long and extend from Kaiminani Drive in the south to the northern boundary of the parcel, where it will intersect with the proposed Palamanui development. The proposed Main Street roadway is located within Kalaoa in the District of North Kona. The current right-of-way lies between the University of Hawai`i property (Parcel 42) to the east and Parcels 33 and 44 to the west. Both Parcels 33 and 44 are owned by the State of Hawai`i and are under the jurisdiction of the Department of Land and Natural Resources (DLNR). To preserve the integrity of archaeological sites the road alignment will be adjusted. The final alignment of the road easement may require a right-of-way adjustment to include portions of TMK: 7-3-10:33, 42 and 44 and a subdivision approval to reconfigure the roadway lot.

As proposed this road will provide a segment for the C-2a proposed Main Street Collector Road that is described in the County of Hawaii General Plan, Keāhole to Kailua Development Plan long range transportation section. Main Street will be located between Queen Ka`ahumanu Highway and Mamalahoa Highway. The 1.3 mile stretch of roadway will parallel the two existing highways running in a north to south direction. The actual road alignment will follow the Mid Level Road right-of-way, however it will not be a straight line. It will curve to provide buffers to preserve and protect the integrity of significant archaeological and cultural sites within or near the road right-of-way.

1.1 Background

Hiluhilu Development LLC. proposes to develop a 725.2 - acre parcel in North Kona on the island of Hawai`i north of the subject roadway. This project called Palamanui includes residential units, mixed uses and an 18-hole golf course on TMK [3] 7-2-05:01. The Hiluhilu parcel is adjacent to a parcel that will be developed for the University of Hawai`i Center West Hawai`i (UHCWH) (Figures 1 & 2). Hiluhilu has expressed a willingness to coordinate its development with that of the University and develop a true public – private cooperative relationship.

On November 21, 2002, with the Board of Regents (BOR) approval, the University entered into a Memorandum of Understanding (MOU) with Hiluhilu Development, LLC, to consult and discuss joint development opportunities for the adjacent properties, with Hiluhilu providing critical infrastructure for the University's development. Hiluhilu will develop a residential/commercial community on its property, with a village town center on a small portion of Hiluhilu lands and a small part of the University's property (Figure 1). This town center is envisioned as a walking village which would link the University's facilities with compatible commercial, recreational and cultural facilities. The University will lease space from Hiluhilu so they can vacate the currently used Kealakekua

facilities. The space will be designed for use by the UHCWH, yet the design will also allow Hiluhilu to convert them to commercial uses after UHCWH builds on its own land. Critical infrastructure includes sharing access roads and one of these access routes is the Main Street Collector Road on State lands.

The project will be coordinated with the Lokahi Makai Development project. The county planning commission required that the developer construct a 2-lane collector road and did not require curbs, gutters and sidewalks to be constructed at this time. Utility poles will not be provided at this time. However future improvements fronting the roadway should conform to easement requirements. OEQC commented that utilities should be installed underground.

The University supports this development because: (a) it offers a unique opportunity to develop a Center with strong community linkages, both physically and programmatically; (b) the ability to lease space from Hiluhilu will allow the University to relocate the UHCWH to a more central site, within a reasonable time frame, and to serve a wider student population with more efficient educational facilities; and (c) Hiluhilu will provide construction of the initial infrastructure needed by the University for its own lands, which will facilitate the completion of the UH West Hawai`i Center.

1.2 Scope and Authority

This EA is prepared pursuant to Chapter 346 Hawaii Revised Statutes (HRS) and associated Title 11 chapter 200, Hawaii Administrative Rules (HAR). Use of government land (State) requires the preparation of an EA.

1.3 Project Information Summary

Project Name:	University of Hawai`i Center at West Hawai`i Main Street Collector Road, North Kona, Island of Hawai`i
Applicant:	Department of Accounting and General Services Project Management Branch Kalanimoku Building, Room 427 Honolulu, Hawai`i 96813 Mark Yamabe, Project Coordinator (808) 586-0469
Applicants Representative:	Mitsunaga & Associates, Inc. 747 Amana Street, Suite 216 Honolulu, Hawai`i 96814 Contact: Chad M. McDonald, P.E. (808) 946-2563
EA Preparer:	Wil Chee - Planning & Environmental, Inc. 1018 Palm Drive

	Honolulu, Hawai`i 96814 Contact: Richard McGerrow (808) 596-4688
Tax Map Key:	Portion of [3] 7-3-10: 33, 42,44 & 45
Land Area:	18.83 acres
Location:	North Kona Judicial District, Island of Hawai`i
Land Owner:	Department of Land and Natural Resources, (DLNR) State of Hawai`i
Existing Uses:	Vacant
Proposed Uses	Road
Land Use Classifications: State Land Use:	Urban
Hawai`i County General Plan:	Urban Expansion
General Land Use Pattern: Allocation Guide (LUPAG)	Urban Expansion
Zoning:	Agricultural 5-acre (A-5a), Open (O)
Special Management Area:	Project is not within the SMA
Permits Required:	Subdivision Approval Grading Permit, Hawai`i County Approvals/Permits related to Road construction National Pollutant Discharge Elimination System (NPDES) Underground Injection Permit, State Dept. of Health

2.0 Description of Proposed Action

Main Street is planned to be a four-lane divided collector road, which will service the west coast communities of the island of Hawai`i. Although four lanes may be ultimately planned in the long range transportation plan for the Main Street Collector Road, this initial phase will consist of constructing two lanes. The primary function of the roadway will be to provide access to the future University of Hawai`i Center at West Hawai`i and the proposed Palamanui development.

2.1 Project Location

The proposed project is located in the North Kona district on the island of Hawai`i (Figures 1 & 2). The road will be *mauka* of the Kona International Airport and the

Keāhole Generating Station and run along the *makai* boundary of the UHCWH parcel (Figure 3 TMK map & Figure 4 Road Alignment).

The major town in the North Kona district is Kailua-Kona which is the second largest city on the Island of Hawai`i. Two major roads pass through the district following north - south alignments. These are the Queen Ka`ahamanu Highway and the upper belt road called the Mamalahoa Highway. Queen Ka`ahamanu Highway was completed and opened for use in 1975 and is the main corridor between Kailua-Kona and West Hawaii's deep water harbor at Kawaihae. Other regional transportation elements are Honokohau small boat harbor and Keāhole International Airport. Main Street collector Road will provide a segment of C-2a Proposed Main Street identified in the County of Hawaii General Plan section on Transportation for roadways from Keāhole to Kailua (Figure 5).

2.2 Existing Land Use

The area is undeveloped open space (Figure 7). Most of the area is covered with scrub grass, small trees and shrubs. Ancient Hawaiians may have used some of the area; however no modern development has occurred in the immediate area. There is no infrastructure in the area because it is undeveloped and currently there is no need for infrastructure.

Kona Palisades is the closest residential development in the area to the south of the UHCWH parcel. As proposed the road alignment is approximately 82 feet from the nearest residence in Kona Palisades.

2.3 Project Features

The existing 120-feet wide right-of-way set aside for the Main Street Road need to be realigned due to archaeological sites encountered within the right-of-way. The realigned roadway will provide an access route acceptable to the County of Hawai`i and conform to the planned development of one of the routes described in the County of Hawaii General Plan that became effective in 2005. The realignment will also allow the County of Hawai`i to avoid archaeological sites recorded within the right-of-way, and it will not increase the length or deviate much from the initially planned alignment.

The initial construction of the roadway will consist of two 12-feet lanes, including shoulders and paved swales. The pavement structure within the travel-way will consist of asphalt concrete pavement, base course, and a layer of select borrow sub-base. The shoulders will be comprised of an aggregate sub-base overlain by a layer of seal coat. Paved swales will be provided in areas of cut, which will assist with roadway drainage. Catch basins and drywell inlets will be utilized within the road right-of-way to collect storm runoff generated within the roadway. An Underground Injection Control Permit from the State Department of Health will be required prior to construction of the drywells. Retaining walls may be required in areas near the Kaiminani intersection due to the close proximity of archaeological sites and existing residential properties.

Recommendations from County and State Agencies suggest that a water transmission line should be added to the overall design plan. Another comment called for the placement of underground utility lines in the right-of-way. Currently there are no plans

to include any utilities along the right-or-way. Future improvements will conform with easement requirements and all utilities will be installed underground.

2.3.1 Technical Characteristics

The road will be designed and constructed in accordance with the "Standard Specifications for Public Works Construction" dated September 1984 of the Department of Public Works, County of Hawai`i. The contractor will obtain and pay for all permits and licenses required and coordinate work with the UHCWH.

Construction methodology is as follows:

1. Install barrier fence at archaeological sites.
2. Install temporary erosion control measures and implementation of best management practices (BMP).
   - Install silt fences as needed to prevent sediment runoff including at any stockpiled materials.
   - Install stabilized access at all construction entry and exit locations (#2 crushed rock shall be utilized).
   - Commence with mass grading operations for roadway construction. The contractor shall minimize the amount of land exposed at any time.
   - Fill slopes steeper than 5:1 shall be keyed.
   - The opening and clearing of land for grading shall be performed incrementally to minimize erosion potential.
   - Install temporary ditches to divert storm water runoff around disturbed areas to temporary sediment detention basins
   - All control measures shall be inspected at least once each week and within 24-hours following any rainfall event of 0.5 inches or greater.
   - Built up sediment shall be removed from silt fence when it has reached one-third the height of the fence. Sediment shall also be removed from other sediment controls such as sediment basins.
   - Silt screens or fences shall be inspected for depth of sediment and tears to verify that the fabric is securely attached to the fence posts and to verify that the fence posts are firmly in the ground. The bottom of the silt screen shall be inspected to insure it is buried a minimum of 6-inches below the existing ground.
   - A maintenance and inspection report shall be made promptly after each inspection by the contractor.
   - All grading operations shall be performed in conformance with the applicable provisions of the Hawaii Administrative Rules, Title 11, Chapter 55, Water Pollution Control and Chapter 54, Water Quality Standards, and to the Erosion and Sediment Control Standards and Guidelines of the Department of Public Works, County of Hawai`i.
   - All grading operations shall be performed in conformance with the applicable provisions of the Hawaii Administrative Rules, Title 11, Chapter 46, Community Noise Control.
   - Material management practice shall be used to reduce the risk of spills or other accidental exposure of materials and substances to storm water runoff.

- Should any unanticipated archaeological sites be uncovered by grading activities, all work shall cease in the immediate area, and the Contractor shall notify the State Historic Preservation Division. No work shall resume until the Contractor obtains clearance from the Historic Preservation Division.
- Concrete trucks shall be allowed to wash out or discharge drum wash water only at a designated site. Water shall not be discharged in the highway drainage system or waters of the United States. The Contractor shall contact the Safe Drinking Water Branch, State Department of Health, for approval of the designated disposal site. The Contractor shall clean disposal site.
- The Contractor shall keep the project and surrounding areas free from dust nuisances. The work shall be in conformance with the air pollution control rules of the State Department of Health, Hawaii Administrative Rules, Title 11, Chapter 60, Section 1, Fugitive Dust.

3. Construct retaining walls, as required.
4. Install catch basins and drywell inlets.
5. Install roadway lighting at Kaiminani intersection.
6. Install roadway lighting at Palamanui intersection.
7. Perform fine grading operations for roadway prism and drainage swale.
8. Install select borrow subbase and base course.
9. Commence with intersection improvements at Kaiminani Drive.
10. Commence with paving operations.
11. Install signing and striping.
12. Demobilization and cleanup.

General technique for roadway construction is anticipated. Heavy equipment which may be utilized during the course of construction is as follows:

1. Excavators
2. Dump Trucks
3. Front Loaders (Crawler)
4. Asphalt Pavers
5. Backhoes
6. Skip Loaders
7. Concrete Trucks
8. Compactors
9. Hoe Rams
10. Crawler Tractors & Dozers

Figure 1 University Village

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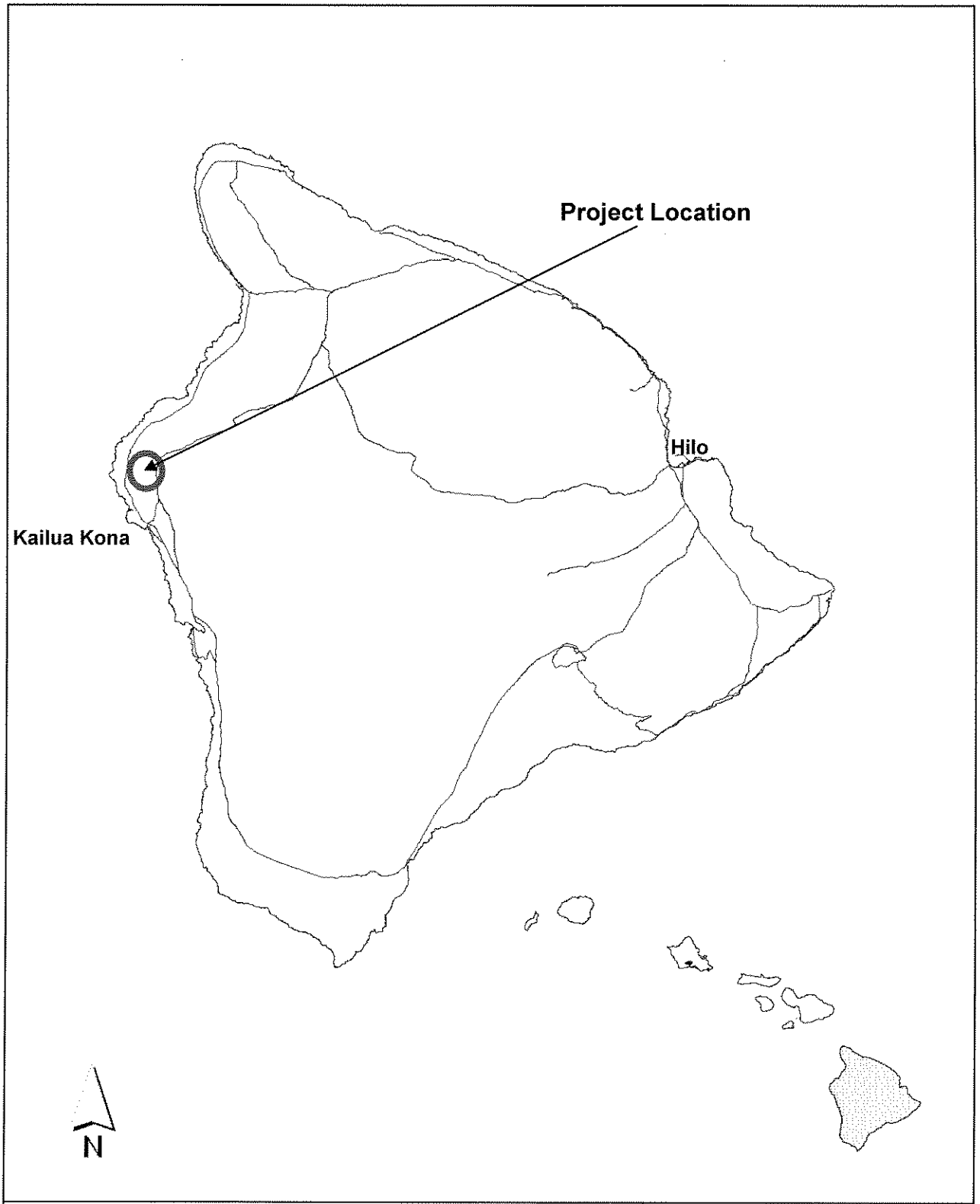

Environmental Assessment for
University of Hawai`i Center at West Hawai`i
Main Street Collector Road

Prepared by Wil Chee – Planning & Environmental, Inc.

Figure 2
Project Location

Figure 3 TMK Map

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Figure 4 Map of Road Alignment

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2.3.2 Economic Characteristics

Construction of the Main Street Collector Road by Hiluhilu Development Company will allow the University of Hawai`i Center at West Hawai`i to open sooner. This can be done because Hiluhilu will provide the funds to construct both the Main Street Collector Road and temporary facilities to be leased by the UHCWH. This defers the cost that UH would have to absorb for constructing the road and building the temporary facilities.

2.3.3 Social Characteristics

The construction of this section of the Main Street Collector road will improve access and enhance traffic flow for residences of existing subdivisions. It will provide alternate routes to reach the UHCWH facilities as well as access to the proposed Palamanui development thus providing strong community linkages. More significant is the fact that it will provide a segment of the proposed Keāhole to Kailua C-2a Main Street Collector Road that is described in the County of Hawaii General Plan and in the Keāhole to Kailua Development Plan. (Figure 5)

2.3.4 Environmental Characteristics

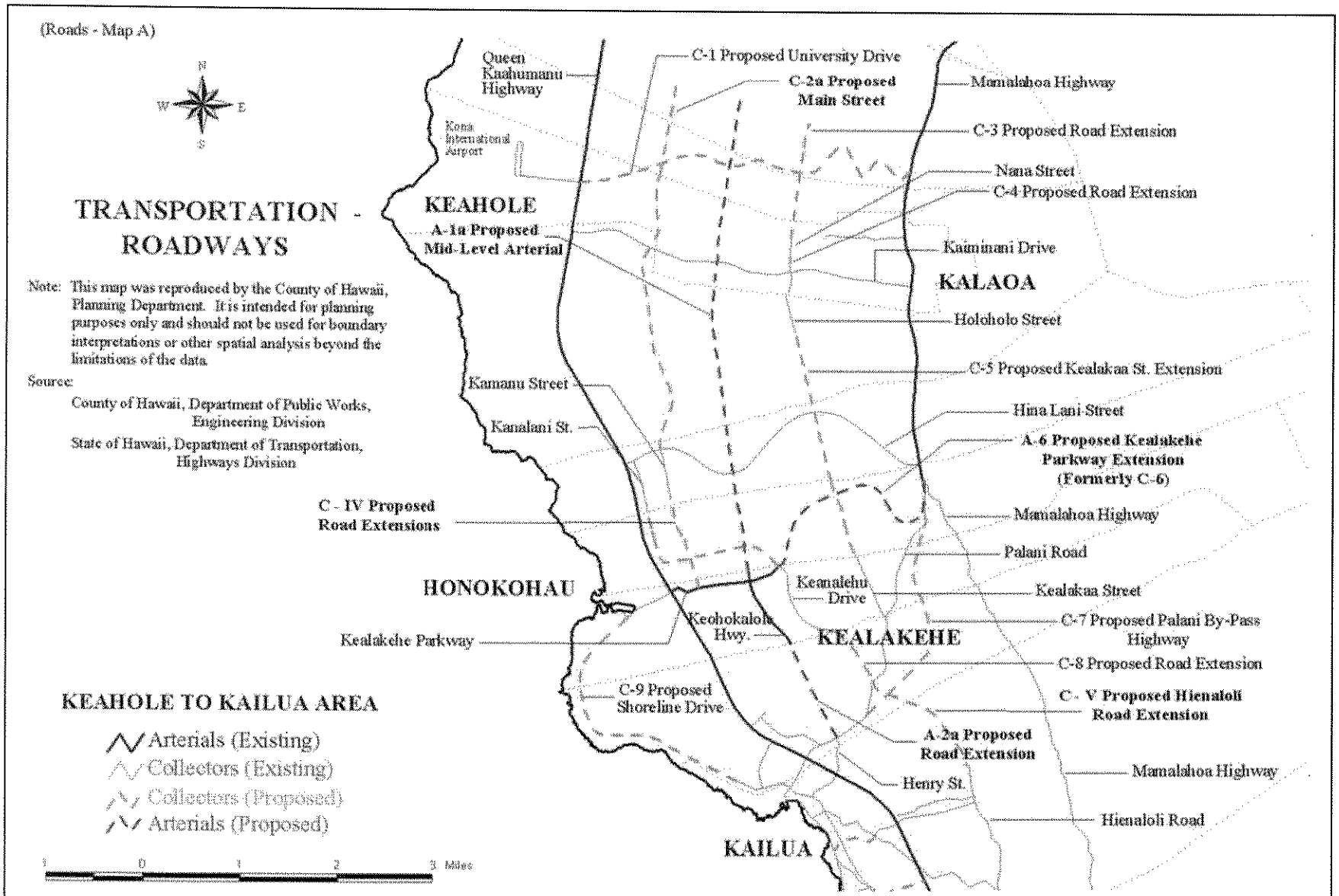
Grading activities and construction of the Main Street Collector Road to connect Kaiminani Drive with the proposed Palamanui development will disrupt the environment along the road corridor. It is anticipated that the effects will be minimal because no listed, threatened, proposed or candidate species were found along the alignment.

3.0 Affected Environment

This section provides background or baseline information on the existing natural and man-made environment. The proposed project is then evaluated on its potential for significant environmental impact using the following information for comparison.

The road site is on State-owned land and is between lands that are designated for use by the University of Hawai`i and the Department of Hawaiian Home Lands. The adjacent property to the south has been sub-divided into many parcels with various owners and the adjacent property to the North is owned by Hiluhilu Development.

Two major vehicular corridors go through the North Kona District, the coastal route is Queen Ka`ahamanu Highway and the upper belt road is Mamalahoa Highway (Figure 5). Queen Ka`ahamanu Highway opened in 1975 and it is the major corridor connecting Kailua-Kona with Kawaihae, the major deep water harbor in West Hawai`i. The North Kona District also has a small boat harbor at Honokohau and Keāhole International Airport. Hawaii Electric Light Company, Inc. (HELCO) operates the Keāhole generating substation and an Airport substation on Queen Ka`ahamanu Highway just *mauka* of the airport. Currently HELCO intends to increase the generating capacity of the plant by installing a steam turbine.

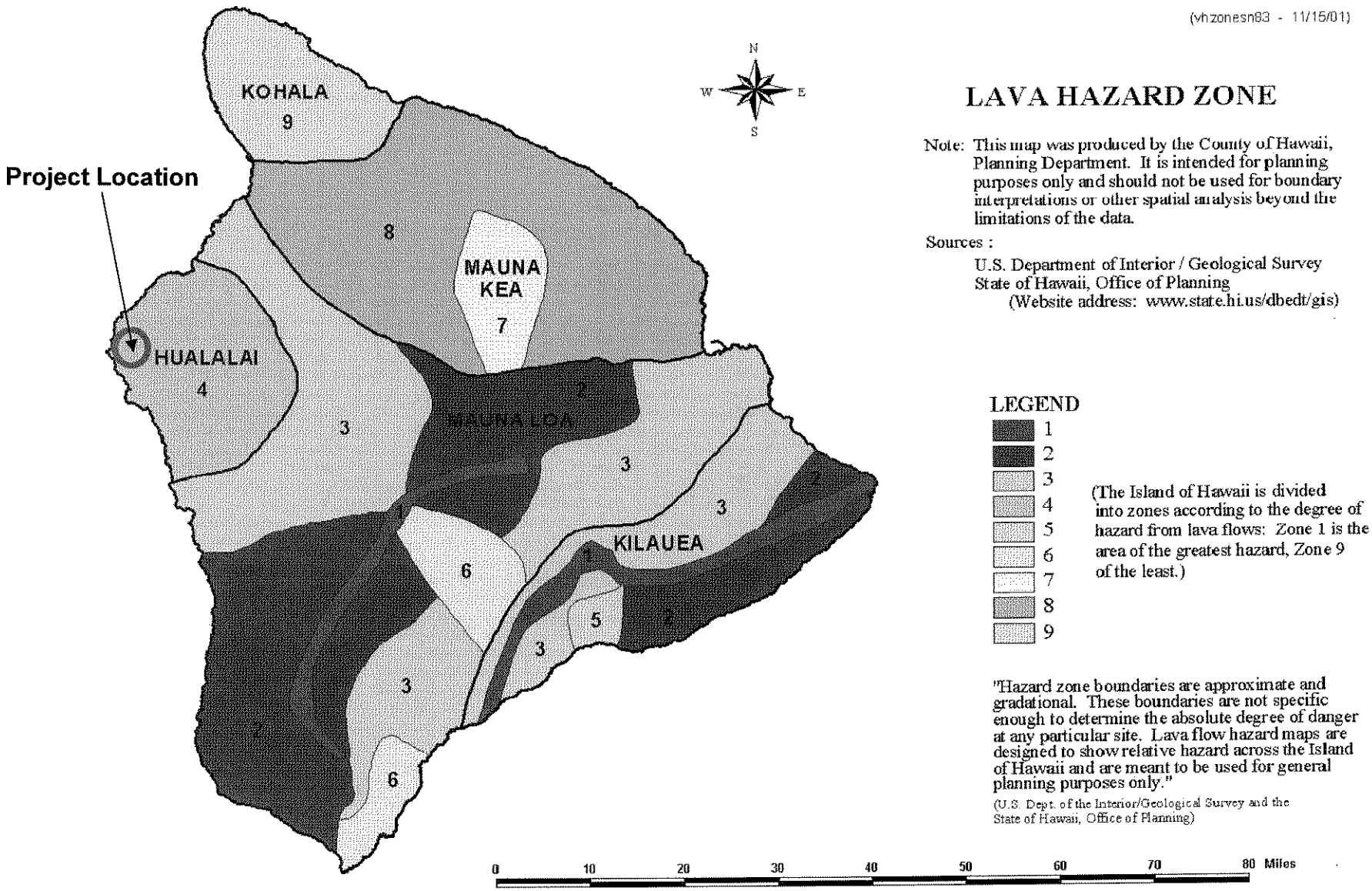


From: County of Hawaii General Plan, February 2005

Environmental Assessment for
University of Hawai`i Center at West Hawai`i
Main Street Collector Road

Prepared by Wil Chee – Planning & Environmental, Inc.

Figure 5
Keahole to Kailua
Transportation – Roadways



Environmental Assessment for
University of Hawai`i Center at West Hawai`i
Main Street Collector Road

Prepared by Wil Chee – Planning & Environmental, Inc.

Figure 6
Lava Hazard Zones

3.1 Geology and Topography

The landscape of the North Kona area is shaped by Hualālai Volcano. The most recent flow from the 1800-1801 eruption and earlier flows have created a harsh landscape that slopes towards the sea. Multiple flows of differing ages overlap each other creating a layered landscape with lava colors that reflect the differences in age, chemical composition and the state of weathering of each flow. Hualālai has been dormant since 1801, but a series of several thousand earthquakes in 1929 and other seismic activity indicate that the eruptive phase may not be over (Macdonald, Abbott & Peterson, 1983).

Geomorphology of the site consists of multiple interbedded pahoehoe and aa flows. Pahoehoe flows harden and form a smooth surface while aa flows harden as a rough jagged surface. Both types of lava can contain buried voids like pockets, blisters, and extensive lava tubes and tunnels that form as the molten rock cooled and residual lava drained beneath the solidified surface. Many of these lava tubes and voids have been found in the area. They can be hazardous if the void or lava tube roof is thin because it can collapse when additional weight is put on it or as a result of natural weathering processes.

3.1.1 Geologic Hazards

There are two major sources of geologic hazards in the area; these are earthquakes and volcanic activity. Another minor hazard is that of lava tube collapse.

Seismic Hazards

The Island of Hawai`i is seismically active and most of the earthquakes occur on the southern flank of the island. However, the Kona area is subject to earthquakes with intensities up to VIII on the Modified Mercalli Scale which roughly corresponds to magnitudes 6.0 to 6.9 on the Richter scale. This intensity can damage un-reinforced structures and buildings with inadequate foundations. The last major earthquake (magnitude 6.9 on the Richter scale) in the Kona area occurred in 1952. Earlier in 1929 there was a series of earthquakes that caused damage in West Hawai`i (Garcia, 2004).

Volcanic Hazards

The area is entirely within the Lava Hazard Zone 4 (Figure 6) that includes the entire region that is affected by Hualālai. Hualālai is the least active volcano on the island of Hawai`i and its eruptions are infrequent and appear to occur in clusters separated by intervals of centuries. Volcanic eruptions may be preceded by a long period of seismic activity (Garcia, 2004).

Lava Tube Collapse

Lava tubes form when the crust of pahoehoe flows crust over and develop a more or less continuous roof and the lava stream flows within the tunnel. When the supply of lava decreases during an eruption the level of the fluid magma drops leaving an open space and the roof of the tube and the remaining magma solidifies and forms the floor. If lava tubes are located close to the surface the roof can collapse if the roof is thin or if significant weight is added at the surface.

3.2 Soils

Land in the vicinity is divided into distinct sections based upon elevation, rainfall, and associated plant species. The road alignment lies at elevations between 300 to 400 feet. This area receives a low amount of rain and is dominated by pahoehoe lava flows and Punalu`u soil series (rPYD) with pockets of aa flows (rLV). The terrain is rough with jagged and clinker aa rocks with very sharp edges that make it difficult to walk on. Very few plants grow on this type of terrain because the soil layer is thin and is thicker in small pockets on the rough uneven surface.

3.3 Hydrology

Hydrology is primarily concerned with surface water and groundwater. The closest class AA water body is the Pacific Ocean and it is approximately 2.5 miles from the proposed roadway. There are no streams or any surface water that flows into the Pacific Ocean from or through the site.

3.3.1 Groundwater

Precipitation on the slopes of Hualālai at an elevation around 2,000-feet above mean sea level is the source of groundwater for most of the Kona area. Over one third of the rain falls within the 4-5 mile wide belt and most of the annual 30 to 75 inches of rain percolates into the ground and recharges the aquifer (Waimea Water Services, Inc., 2003).

The Main Street Collector Road alignment is over a portion of the Keauhou Aquifer System. This consists of a lens of fresh water floating on a layer of salt water. Fresh water is found at an elevation of 1,800 feet above mean sea level. The fresh water layer becomes thinner and more saline (higher level of total chlorides) as it approaches sea level. Wells as much as 1.5 miles inland from the coast have been known to produce saline water. Under ideal conditions fresh groundwater flows down gradient from the recharge area at 2,000-feet to sea level.

3.3.2 Surface Water

The project area has no streams, water courses or ponds and the site is not close to the shore line. The lack of streams is due to the porosity of the interbedded pahoehoe and aa flows that make up the Hualālai volcanic sequence. No surface water directly reaches the coast, or flows into drainage ways that reach the coast.

3.3.3 Flood Potential

Main Street is located in a dry and arid environment where the risks of flooding are low. The combination of low rainfall, thin soil layer and the porosity of the bedrock keep the flood potential very low to almost non existent. During periods of heavy rainfall ponding and some scouring by flowing surface water may occur, but it normally does not last long and rapidly percolates into the substrate. Flood maps indicate that the area is Zone X which represents areas that are determined to be out of the 500 year flood plain.

3.4 Climate

The climate is hot and dry with southerly and southwesterly winds. This is due to the locations of Mauna Loa, Mauna Kea and Hualālai that block the moisture-laden trade winds from the northeast. Air is forced to flow up and around, rather than over the mountains and as a result, orographic rainfall does not reach the area. On most of the Hawaiian Islands orographic rainfall forms as warm moist air is forced up over mountains. The air cools moisture in the air condenses and this mechanism provides most of Hawaii's annual precipitation (Juvik & Juvik, 1998).

On the Kona coast of the Island of Hawai`i a unique summer maximum rainfall pattern exists because the prevailing trade winds are blocked by the large mountains. Without the strong trade winds, ocean-land temperature and pressure differences generate local daily variations in wind. During the day air at the ground surface heats and rises. This forms upslope winds during the day. As the warm air rises, it cools, moisture condenses, and clouds form that provide convectional rainfall at middle elevations in the afternoon. At night the wind direction reverses and cool dry air moves down slope. Increased surface heating during the summer intensifies this process so Kona has its maximum precipitation in the summer.

Rainfall in the project area generally occurs as late afternoon and evening showers and annual precipitation ranges from 10 to 20 inches a year (State of Hawaii, 1998). Average temperatures generally range from a low of 70 to mid 80 degrees Fahrenheit.

3.5 Air Quality

The project site is located within an area that is exposed to natural pollution from volcanic out-gassing and is locally referred to as volcanic haze or vog. In spite of the fact that the volcanic emissions are vented on the other side of a mountain barrier more than 50 miles east of the site, some reaches the Kona area. A source of industrial air pollution is the Hawaii Electric Light Company which is approximately 1.5 miles south. Other sources of pollution are vehicular traffic on Queen Ka`ahumanu Highway and Mamalahoa Highway.

Since the prevailing trade winds are blocked by Mauna Kea, Mauna Loa and Hualālai there is a tendency for pollutants to pool in the area. Local winds such as the land - sea breezes or upslope – down slope breezes dominate the area. During the day the winds move on shore and upslope and at night the winds move down slope and out to sea. Generally this type of wind pattern can result in pooling of atmospheric pollutants in the area. Currently concentrations of pollutants do not exceed Air Quality Standards.

3.6 Noise

Most of the area is exposed to very little noise. Major sources of noise are aircraft operations at Kona International Airport, Keāhole Generating Station and traffic from Queen Ka`ahamanu Highway. Background ambient noise levels at the site reflect the natural setting and the absence of vehicular traffic and development.

Existing traffic and background ambient noise levels currently do not exceed the U.S. Federal Highway Administration (FHWA) and Hawai`i State Department of Transportation Highways Division (HDOT) noise abatement criteria.

3.7 Flora & Fauna

AECOS Consultants conducted a biological survey to assess conditions along the corridor for the routing of the Main Street Collector Road across the state property at the University of Hawai`i Center at West Hawai`i (UHCWH) (Appendix D). Previous studies were made in 1998 and 1999 during the planning efforts for the location of the UHCWH facilities.

3.3.1 Flora

The purpose of the botanical survey was to determine if any federally listed, endangered, threatened, proposed or candidate plants are located within the area proposed for the Main Street Collector Road. During the survey, plant species and vegetation types present were recorded and estimates of relative abundance (abundant, common, rare, etc.) of each species were made (Figure 7).

The route passes through a mixed shrub-grassland in the south and in grassland on the north. Only *maiapilo,* a species of concern was noted in the shrub-grassland in the area. The numbers of maiapilo and other generally rare natives such as *maua,* is greater in the grassland area with the greatest density of native shrubs and trees within the corridor occurring near the northern boundary of the property.

3.3.2 Fauna

Investigations were performed to determine if there were any species of concern. This entailed a search for invertebrates and vertebrates.

Invertebrates

The main purpose of the invertebrate survey was to determine if there are any federally listed endangered, threatened, proposed or candidate species in the area. Both surface and lava tube (cave) investigations were conducted during the day and again at night. Invertebrate populations depend upon host plant availability and absence or low levels of introduced predators.

Only one native snail was seen: *Succinea*. That individual was found on a rotting log. It is possible that if a survey was made immediately following a rain, more would be found since this genus is a very prevalent native snail.

None of the alien species of medical importance (centipedes, scorpions, widow spider, honey bee colonies, and common paper wasp nests) were observed during this survey. These insects are of medical importance because some people may have a severe allergic reaction to their sting.

No native invertebrates on the federal or state endangered, threatened, proposed or candidate lists were observed.

Vertebrates

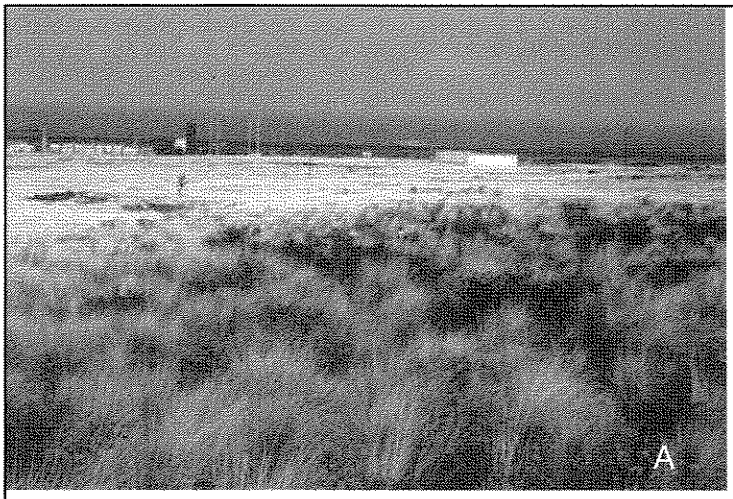
Five alien mammalian species were detected during the survey. Evidence of dogs, cats, goats, pig and cattle were found in the area. No rodents or mongoose were detected during the course of the survey. It is almost a certainty that these species use resources in the area. It is difficult to assess the population densities of these

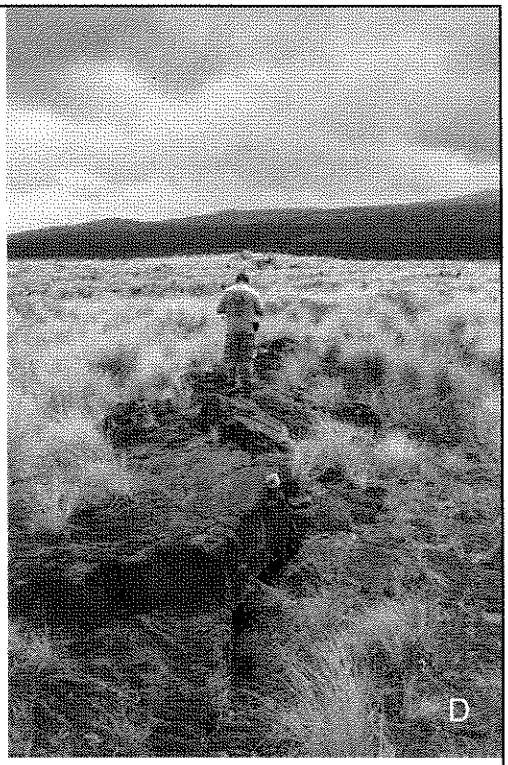
mammals. All of these species are threats to avian and floral components of the remaining native ecosystem.

A total of 121 birds of 10 different species representing 8 separate families were recorded during the course of this survey. All of the species observed are considered to be alien to Hawai`i. The majority of the birds were spotted within 100-meters of existing housing along Kaiminani Drive.

Current survey techniques available for gathering information on the distribution, abundance and usage of resources in a given area by Hawaiian hoary bats are inadequate and/or time and cost prohibitive. Hawaiian hoary bats can be expected to fly over the project site.

The habitat found in the project area is typical of the fountain grass dominated, xeric communities of the North Kona District which are not conducive to supporting native bird species.





A View South West to the sea, Kona International Airport, HELCO plant & tank

B View South toward Kaiminani Drive & residence

C View South East toward the slope of Hualalai and Mamalahoa Highway

D View North East toward the slope of Hualalai and Mamalahoa Highway

Photos from Pacific Legacy, Inc. 2005

Environmental Assessment for
University of Hawai`i Center at West Hawai`i
Main Street Collector Road

Prepared by Wil Chee – Planning & Environmental, Inc.

Figure 7
Vegetation & Views
From the Proposed Road Site

3.8 Historic, Archaeological and Cultural Resources

3.8.1 Historic & Archaeological Resources

Field work was conducted by archaeologists from Pacific Legacy in May 2005 (Appendix C). The purpose of this field work was to run a surface survey of the proposed Main Street Collector Road access corridor. This consisted of locating and assessing the condition of sites near the western boundary of the UH acreage. GPS coordinates were recorded for all of the sites and a total of 10 sites were located during the field investigation.

Ten previously identified sites were located. Two of the previously identified sites do not appear to be archaeological sites and are not addressed in the report. Also two sites could not be relocated because they are on low ground and were obscured by the dense vegetation in those areas.

Sites investigated include:

Site 50-10-28-6418. A lava tube complex that consists of three tube sections. Two of the sections have some potential for excavation to provide important archaeological data.

Site 50-10-28-15262. Three *ahu* (cairns) with an associated terrace are located on a prominent knoll in the northern portion of the project area. Given the location it appears that it is more likely that they were used for religious purposes and not habitation or agricultural sites.

Site 50-10-28-15264. Two modified outcrops and a lava tube are at this location. The site is in good condition and parts are covered with fountain grass.

Site 50-10-28-15287. A *papamu*, or game board for the Hawaiian checker game of *konane* is the major feature at this location. This game board appears to be associated with a habilitation site that is close by.

Site 50-10-28-15288. This is the location of an *ahu* or cairn that is in good condition and it may have been square or circular in shape but it has since deteriorated into an amorphous shape. It may have been a marker along a *mauka-makai* trail.

Site 50-10-28-15298. This location consists of a habitation and refuge cave that is over 700m long and contains numerous features including human burials. It is in good condition and sealing is recommended to protect the integrity of the site.

Site 50-10-28-15302. This site is a large habitation cave that may have also provided a site for ceremonial functions.

Site 50-10-28-15303. The features here consist of a modified lava tube and a modified outcrop or blister with an associated basalt alignment.

Site 50-10-28-15304. A single petroglyph is located here. The petroglyph resembles the letter "X" or a cross. It possibly was created after European contact in 1778 and may be an early surveyor's mark.

Site 50-10-28-21361. This feature is identified as a stepping stone trail on the top of an aa lava flow, it is in poor condition and appears to have been disturbed by grading activities.

Pacific Legacy, Inc. recommends that all sites in the area be avoided if possible and attempts should be made to preserve these sites. All of the sites are significant under criteria "d" of the National Historic Preservation Act and need to be treated appropriately.

3.8.2 Cultural Resources

Interviews and background research indicate that the project area does not support any current traditional cultural uses. The area is not frequented by spiritual and cultural practitioners or any other traditional activity. The area's only cultural significance appears to lie in its archaeological resources. These archaeological sites have interpretative value and the archaeological assessment for the UHCWH recommends protection and preservation.

Hunting and gathering activities continue to be practiced in the area. However the locations of these practices are very general for the area and not site specific. A fauna survey was conducted on the UHCWH site in 2000. The researchers found evidence of larger vertebrates a goat skeleton, goat scat and donkey scat. The investigators did not see or hear any goats, pigs and donkeys, nor was there any recent evidence of their presence. In 1998 Derral Herbst conducted a flora survey of UHCWH site and did not find *ko`oko`olau* (*Bidens micrantha ssp.*), *hala* (*Pandanus tectorius*) and *noni* (*Morinda citrifolia*). Both of these studies support the cultural report that concludes that no known hunting or gathering takes place in the immediate area.

3.9 Land Use

The surrounding area consists of open vacant land. The only proximal roadway is Kaiminani Drive along the southern end of the proposed road alignment. Some low density single family residences have been developed along Kaiminani Drive.

3.10 Circulation and Traffic

This section discusses the existing base conditions on the roadways adjacent to the project. Existing peak levels of traffic are in the morning and late afternoon that coincide with commute traffic. All of the following discussions refer to peak levels of traffic. Currently there are only two ways to get to Kailua-Kona from the Main Street Collector Road area. This is to take Kaiminani to the east or west to get on to Queen Ka`ahamanu Highway or Mamalahoa Highway to Palani Road. One of the major bottlenecks is at the intersection of Queen Ka`ahumanu Highway and Palani Road.

At the intersection of Queen Ka`ahumanu Highway at Palani Road the northbound lane is severely congested with some standing lines on critical approaches. The intersection becomes blocked when the signal does not provide for turning. These conditions occur again in the late afternoon when commuters are returning from work. The intersection of Mamalahoa Highway at Kaiminani Drive operates at the same level of service as the intersection of Queen Ka`ahumanu Highway and Palani Road during peak hours.

3.11 Public Services and Facilities

3.11.1 Water and Wastewater

There is no source of potable water or any water on the site, and there are no facilities for the transport, disposal and treatment of waste water along the proposed roadway.

3.11.2 Solid Waste

The road site does not have a solid waste disposal service because there is no demand for that service on undeveloped land.

3.11.3 Drainage System

Currently there are no man-made drainage systems in the area because the area is undeveloped.

3.11.4 Electrical and Communications

None of the undeveloped parcels along the proposed road have electrical power and communication services. HELCO has an overhead 69 kilovolt transmission line in a utility easement that runs through the area from Keāhole Substation on Queen Ka`ahumanu Highway to Mamalahoa Highway.

3.12 Visual Resources

The site is on the lower slopes of Hualalai Volcano. The area is characterized by expanses of open lava lands covered with grass, shrubs and small trees. Views toward the sea look down on the HELCO power plant, a 0.5 million gallon water tank, Keāhole Agricultural Park and Kona International Airport at Keāhole (Figure 7).

The best views in the vicinity are from the area around the Kona International Airport at Keāhole. From there views encompass the western slopes of Hualalai, the project site and scattered pockets of development along Mamalahoa Highway and Kaiminani Drive.

3.13 Socio Economic Resources

North Kona and South Kohala are among the fastest growing regions of the State. Population predictions for the West Hawai`i region indicate that there is sufficient population to justify the construction of a higher education center and permanent location for the UHCWH Center at West Hawai`i. This area proposed for UHCWH is a logical location because the site is close to the Kona International Airport at Keāhole, high technology developments, residential communities and employment centers in Kailua-Kona and West Hawai`i resorts. The proposed Main Street roadway will provide access to the new UHCWH.

4.0 Environmental Consequences

The proposed action will involve land-disturbing activities that have the potential to affect the environment. The creation of a road to access undeveloped areas will promote development and economic growth.

Discussions in this section examine the environmental impacts of the proposed project on the natural, man-made and socio-economic environments. Mitigation measures have been identified for adverse affects that are unavoidable.

4.1 Geology and Topography

Construction of the Main Street Collector Road will have no affect on the geology of the area. However, localized alteration of the topography from land disturbing activities such as clearing, cutting, excavation and filling for the preparation of the roadbed are inevitable. This will affect the area of the road alignment. Mitigation consists of conforming to grading standards set forth in the Hawai`i County Code which should keep impacts to a minimum level. (See also technical characteristics described in section 2.3.1.)

4.1.1 Geologic Hazards

Seismic Hazards

The island of Hawai`i is subject to earthquakes and the potential for damage as a direct result of a strong earthquake is a concern for the entire County of Hawai`i. Mitigation for seismic activity is included in the Uniform Building Code and the County of Hawai`i Structural Design Standards, including earthquake design provisions.

Volcanic Hazards

The Kailua-Kona Area is located in Zone 4 on volcanic hazard maps. Zone 4 includes all of Hualālai where the recurrence intervals of eruptions are in the centuries. Currently, there are no effective mitigation measures for volcanic eruptions.

Lava Tube Collapse

Lava tubes are in the area and some already have portions of roofs that have collapsed. To eliminate any potential hazards due to the collapse of a lava tube that may be located beneath the road alignment a geotechnical investigation will be performed. This will consist of gathering subsurface information and incorporating design elements that may consist of backfilling the lava tube or constructing a spanning section with reinforced pavement.

4.2 Soils

Impacts to soils can be anticipated along the length of the road easement when it is graded and the roadbed is prepared. All grading activities will be conducted in compliance with dust and erosion control requirements of the County of Hawai`i. A grading permit will be obtained and all grading plans will be reviewed by the Department of Public Works and specific conditions may be attached.

4.3 Hydrology4.3.1 Groundwater

There is some potential for surface runoff to carry oil or petroleum based products from vehicles during the construction of the road and later when the road is in use.

Mitigation using drywells or infiltration areas located along the road right-of-way will eliminate the potential of pollution from runoff. Drywells will be subject to biological

uptake and the deep lava filtration will remove the pollutants from storm water before it enters the aquifer. All drywells will be registered with the state Department of Health and UIC permits obtained.

4.3.2 Surface Water

During construction and once the road is constructed runoff from the impermeable surfaces of the road will increase the amount of surface water along the roadway.

Runoff will not be directed to adjacent properties. A drainage report for the Main Street roadway will be developed at the design phase, and processed with the County of Hawaii. Mitigation using drywells or infiltration areas located along the road will collect the runoff. Due to the porosity of the underlying basalt most of the water that runs off the road into drywells or infiltration areas should readily percolate underground. There should be no significant increase in surface runoff.

4.3.3 Flood Potential

Flood maps indicate that the area is Zone X which represents areas that are determined to be out of the 500 year flood plain. No mitigation is needed for flood potential.

4.4 Climate

No measurable or noticeable impacts to the climate are anticipated as a result of the proposed action. No mitigation measures are warranted or proposed with respect to the overall climate.

4.5 Air Quality

Onsite impacts

Short-term air quality impact will occur during the construction of the road. Construction vehicle activity and stop and go traffic as a result of construction activities can at times increase automotive pollutant concentrations. This will occur particularly during the construction of the intersection of the proposed Main Street with Kaiminani Drive.

Construction vehicle movement on unpaved on-site areas will also generate particulate matter (PM) emissions. EPA studies from dust emissions from construction sites indicate that roughly 1.2 tons/acre per month of activity can be expected under medium activity conditions.

Offsite Impacts

Offsite impacts are due to the operation of concrete and asphalt batching plants needed for road construction. These plants routinely emit particulate material and other gaseous pollutants. The batch plants producing the asphalt and concrete must be permitted by the Department of Health Clean Air Branch under state regulations. Any emissions will be strictly regulated by the Department of Health permit which each plant must have in order to operate.

Mobile Source Activity

The traffic report for the proposed project provided the basis for the mobile source impact analysis. Existing and estimates of future peak-hour traffic volumes for the main roads serving the project site were used. Scenarios with and without the proposed Main

Street Collector Road and without the proposed UHCWH were evaluated. Compliance with federal and state carbon monoxide standards will be met under the worst case conditions of meteorological conditions and peak traffic hours. Therefore no mitigation is required for impacts of mobile source impacts to the regional air quality.

4.6 Noise

Potential short-term construction noise impacts are possible during the project construction period at the south end of the project corridor. However, minimizing these types of noise impacts is possible using standard curfew periods, properly muffled equipment, administrative controls and construction barriers as required. All grading and construction operations shall be performed in conformance with the applicable provisions of the Hawaii Administrative Rules, Title 11, Chapter 46, Community Noise Control.

It is anticipated that potential noise impacts and any future noise sensitive properties located along Main Street may be mitigated through the inclusion of sound walls or other noise mitigation measures within the individual lot development plans. Any future public use facilities or housing units which may be planned alongside the Main Street Collector Road represent areas of potential adverse noise impacts if adequate noise mitigation measures are not incorporated into the planning of these future projects. It is anticipated that the Main Street Collector Road will be completed prior to any development of the open areas. Setbacks, sound attenuating walls or berms, or closure and air conditioning can be incorporated into new developments along the Main Street Collector Road as required.

4.7 Flora and Fauna

The investigation conducted by AECOS in 2005 for the Main Street Collector Road included appropriate mitigation methods.

4.7.1 Flora

Due to the nature of road construction all plants along the proposed Main Street Collector are vulnerable to fire and development. To minimize losses, native trees should be flagged and locations recorded. Information should be transmitted to contractors to avoid inadvertent destruction by grading and construction activities where the route passes close to a plant. Mitigation for plants destroyed by the construction of the road should be their reestablishment on the UHCWH site.

4.7.2 Fauna

Invertebrates

No native invertebrates on the federal or state endangered, threatened, proposed or candidate list were observed. Many invertebrates time their emergence and breeding to overlap or follow seasonal weather to coincide with growth spurts of an important plant or food. Monitoring at a different time of year may produce a longer or different list.

At least two, and possibly three large lava tubes cross the road corridor. Their presence is evidenced by collapsed sections. These were explored to the extent possible and no invertebrates or habitat indicative of their presence was found. It is possible that unknown lava tubes in the area that support significant biota could be found.

Vertebrates

A one time survey for vertebrates cannot provide a total picture of the wildlife utilizing any given area. Certain species will not be detected for one reason or another. Seasonal variations in populations, combined with seasonal use and availability of resources, will create different use patterns throughout the year or over a number of years.

The construction and operation of the proposed roadway is not expected to result in any adverse impacts to the endangered Hawaiian hoary bat, which is the only listed terrestrial mammalian species in Hawai`i.

The main potential impact that the construction and operation of the proposed road and learning center poses is to the Hawaiian petrels and Newell's Shearwaters. There is the increased threat that the birds will be drowned after becoming disoriented by exterior lighting that may be required in conjunction with the construction and operation of the roadway.

Mitigation for interaction between nocturnally flying Hawaiian Petrels and Newel's Shearwaters with external lights and man-made structures is recommended. Mitigation consists of planning to use external lighting and street lights that are shielded. This mitigation serves a dual purpose of minimizing the threat to seabirds, and complying with the Hawai`i County Code that requires the shielding of exterior lights to lower the ambient glare caused by unshielded lights that affect the astronomical observatories on Mauna Kea.

4.8 Historic, Archaeological and Cultural Resources

4.8.1 Historic and Archaeological Resources

Road building activities could damage sites found along the proposed corridor at the western edge of the University of Hawaii's 500 acre parcel. Pacific Legacy was contracted to locate all of the sites within the project area and make recommendations for the preservation of these sites (Appendix C).

Mitigation to insure the protection and preservation of historic, archaeological, and cultural resources will consist of the following.

1. All sites that can be avoided will be avoided and the final road alignment will be designed to avoid sites. There is enough room to shift the alignments of the road.

2. If avoidance is unavoidable a bridge or causeway over the site will be constructed.

3. Since the archaeological sites are on land owned by the State of Hawaii the State is responsible for the preservation of the sites.

4. In all aspects of the planning process, community involvement will continue to be encouraged and in the case of burial sites the Hawai`i Island Burial Council will be contacted for input.

If these recommendations set forth by Pacific Legacy are followed the impacts to historic, archaeological and cultural resources should be minimal.

4.8.2 Cultural Resources

The Cultural Resource Report prepared for this environmental assessment (Appendix G) indicates that the project is not known to support any current traditional cultural resource use. The area's only cultural significance lies in its past history (archaeological resources) and impacts to these resources are mitigated using the recommendations outlined in the archaeological assessment prepared for the Main Street Collector Road in 2005 (Appendix C). Mitigation includes rerouting the road, as well as protection and preservation plans to preserve the integrity of the archaeological sites.

4.9 Land Use

County zoning maps indicate that the Main Street Collector Road easement passes through different designations. Most of the northern portion passes through the county designation as open district, while a small portion the southern area is designated as A-5a. In an area designated as an open district a road is a permitted use when it is a direct accessory to a permitted use such as a community building like UHCWH.

The Main Street Collector Road and the University of Hawai`i property is in an area that is designated Urban Expansion according to the County of Hawaii General Plan Land Use Allocation Guide Map. Also the road will provide a segment of the A-1 Proposed C-2a Main Street Collector Road that is outlined in the Transportation long term plan in the County of Hawaii General Plan (Figure 5).

State land use maps indicate that the entire area is designated as an urban district.

4.10 Circulation and Traffic

A traffic analysis was prepared to analyze the impacts of the Main Street Collector Road. Initially Main Street will be a two-lane two-way roadway. Long range county plans indicate that it may be widened to four lanes. The traffic analysis was prepared for the currently proposed two-lane Main Street Collector Road and includes the increased traffic generated from the Hiluhilu development and UHCWH.

The conclusions of the level-of-service analysis is that poor levels-of-service will be experienced along Queen Ka`ahamanu Highway. Main Street will improve conditions by diverting some traffic from Queen Ka`ahamanu Highway. However, enough traffic will not be diverted to improve the afternoon level-of-service above E or F.

Level E - Service congestion with some standing lines on critical approaches. Blockage of intersection may occur if signal does not provide protected turning movements.

Level F - Total breakdown with stop-and-go operation.

The level-of-service analysis recommends that Queen Ka`ahamanu Highway should be widened from two to four lanes to accommodate traffic demand as soon as possible. The low levels-of-service at these intersections are the result of regional traffic.

Other roadway improvements required include the following:

1. The intersection of Mamalahoa Highway at Kaimi Nani should be signalized to accommodate 2015 conditions with out and with Main Street or UHCWH.
2. The intersection of Kaiminani should also be signalized to accommodate 2015 conditions with Main Street and with UHCWH traffic.

For further information please refer to the Traffic Impact Analysis in Appendix F.

4.11 Public Services and Facilities

Currently there are no public services or utilities in the area and they will have to be developed to accommodate planned growth in the area.

4.11.1 Water and Wastewater

There is no source of potable water in the immediate area and none will be developed until the proposed Palamanui development begins.

During construction of the road, water will more than likely be hauled in to control fugitive dust emissions created by construction activities.

4.11.2 Solid Waste

The construction and use of the Main Street Collector Road should not alter or change the amount of solid waste generated in the area. However this will open the area providing the opportunity for illegal dumping and littering along the roadway. Mitigation for illegal dumping and littering consists of enforcing existing laws, regulations and providing appropriate receptacles and locations for solid waste.

4.11.3 Drainage System

Currently there are no man-made drainage systems in the area because the area is undeveloped. The plans for the road include catch basins, drywells and infiltration areas as needed to accommodate any runoff from the road. The road will have no effect on any regional drainage system.

4.11.4 Electrical and Communications

The construction and use of the proposed Main-Street Collector road will not use any electrical or communications systems.

4.12 Visual Resources

The best views in the vicinity are from the area around the Kona International Airport at Keāhole. From there views encompass the western slopes of Hualālai, the project site and scattered pockets of development along Mamalahoa Highway and Kaiminani Drive. Since the proposed road is on the lower slopes of Hualalai it will be visible from the area around the airport and Queen Ka`ahamanu Highway. During initial construction vehicles and activities will be visible from the road area and mitigation measures will be taken to control fugitive dust.

Once the road is completed it will be visible from the Airport and Highway until the grass, bushes and small trees grow back along the road bed and all that may be visible are an occasional vehicle top moving down the road. There will be some visual impact however it should be minimal and no mitigation measures will be required.

4.13 Socio Economic Impact

Planned improvements such as the Main-Street Collector Road will generate short term employment both on and off site during construction of the road. No mitigation is required for the creation of short term work provided by the construction of the road.

Long term impacts of the road will lead to additional development that leads to growth. This growth will provide University of Hawai`i Center at West Hawai`i with educational buildings, residences, community retail facilities and employment for the community.

5.0 Evaluation of Alternatives

Planning for projects entails consideration of various alternatives including the no-action alternative.

5.1 No-Action Alternative

The no-action alternative is just that: no action, or no change to the status quo. The proposed Main Street Collector Road will not be constructed. A direct North-South connection between the Hiluhilu development and Kaiminani Drive, as well as the proposed University of Hawai`i Center West Hawai`i will not be realized.

Consequently, the 500-acre University of Hawai`i parcel will not be opened up for access along the entire *makai* border. The proposed first increment of the University of Hawai`i Center at West Hawai`i, located on State land will have to be accessed by road segments originating on Hiluhilu land or from Kaiminani Drive.

5.2 Northern Access Road Alternative

The alignment of the proposed Northern Access Road will begin at Queen Ka`ahumanu Highway at the midpoint of the Hiluhilu parcel (Option 1 on Figure 1). From there it will run *mauka* for approximately 2,400 feet on Hiluhilu property. Initially it will run in an easterly direction then veer to the southeast to the boundary with state lands. At that

point it will turn east and run parallel to the boundary for 5,500 feet until it reaches an elevation of 500 feet ending at the proposed University of Hawai`i Center West Hawai`i.

Use of this alternative would require that everyone going to the UHCWH would be dependent upon roads running through the Hiluhilu development. As in the previous alternative this one does not provide access to the *makai* boundary of the UH parcel and It would not open up a segment of the proposed C-2a Main Street Collector Road described in the Keāhole – Kailua section of the County of Hawaii General Plan in the long range transportation section.

5.3 Airport Access Road Alternative

This alternative will access Hiluhilu development by an alignment that will start at Queen Ka`ahamanu Highway across from Keāhole Kona International Airport Road (Option 2 on Figure 1) and continue *mauka* in a northeasterly direction over state lands for approximately 6,300 feet until it reaches the boundary of Hiluhilu land at the proposed University Village at an elevation of 400 feet. The entire alignment of this proposed Airport Access Road Alternative will traverse State Land which is under the jurisdiction of the Department of Hawaiian Home Lands (DHHL).

The proposed first increment of the University of Hawai`i Center West Hawai`i, which is on State land, will have to be accessed by road segments that originate on Hiluhilu land near the *mauka* end where the Collector Road would meet the Hiluhilu property.

This is not a viable alternative because in the long run it would cost more to gain access to the University site because it does not allow access along the *makai* boundary of the UH parcel. Use of this alternative would require an agreement with the Department of Hawaiian Home Lands. Another problem is that it would not provide direct access to the UH site from Kaiminani Drive. It also would not provide a segment of the proposed C-2a Main Street Collector Road described in the Keāhole - Kailua
long range transportation plan.

5.4 Main Street Collector Road

The Main Street Collector road as proposed will be a new road on TMK: [3] 7-3-10: 45, which is located west of the University of Hawai`i 500 acre parcel TMK: [3] 7-3-10: 42. The roadway will be approximately 6,900 feet long and extend from Kaiminani Drive in the south to the northern boundary of the parcel, where it will intersect with the proposed Palamanui development. The proposed Main Street roadway is located within Kalaoa in the District of North Kona. The current right-of-way lies between the University of Hawai`i property (Parcel 42) to the east and Parcels 33 and 44 to the west. Both Parcels 33 and 44 are owned by the State of Hawaii and under the jurisdiction of the Department of Land and Natural Resources (DLNR).

This is the preferred alternative for many reasons. First it will provide the County of Hawai`i with a segment of the C-2a Proposed Main Street described in the Transportation and Roadways section of the County of Hawaii General Plan and will advance the long-term implementation of the General Plan. It will also be in conformance with the County of Hawai`i Keāhole to Kailua Development Plan for North Kona. The most important reason is that it will open up the University of Hawai`i parcel

by providing access to the entire *makai* boundary. This will facilitate the eventual development of the University of Hawai`i Center at West Hawai`i and, as proposed, it presents an example of true public-private cooperation.

6.0 Consistency with Land Use Plans and Regulations

This section involves the consideration and evaluation of the potential impacts of the proposed action on the environment and how it may conflict with, or conform to approved or proposed land use plans, policies and controls for the affected area. Federal regulations regarding endangered species, access issues and historic preservation are discussed. Also addressed are state and county land use regulations, plans and policies.

6.1 Federal Plans and Regulations

6.1.1 Endangered Species Act

The endangered species act of 1973 provides measures used to identify and protect ecosystems that are necessary to sustain an endangered or threatened species. Under this act, the U.S. Fish and Wildlife Service in the Department of the Interior is responsible for all terrestrial and freshwater species including migratory birds.

Discussion:
No federally listed endangered, threatened proposed or candidate species are found in the area (See the Biological Resources Survey, Appendix D)

6.1.2 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) of 1972 provides guidelines for development regulations within the coastal zone (CZ). Only land owned by the federal government is directly affected by the CZMA. The State of Hawaii enacted HRS Chapter 205A in response to the Federal Coastal Act of 1972 and the State of Hawaii now has delegated the authority to regulate land use in the coastal zone as Special Management Areas (SMA).

Discussion:
The proposed roadway is not on Federal land or in the CZ or SMA. Therefore this policy does not apply.

6.2 State Plans and Policy

6.2.1 Hawai`i State Plan

The Hawai`i State Plan, chapter 226 HRS (1995) provides guidelines for the future growth of the State of Hawaii. The Plan identifies goals, objectives, policies, and priorities for allocating the state's resources, including public funds, services, human resources, land, energy and water.

Discussion:

The Main Street collector fits into this plan by opening up access to the site for the development of the UHCWH that will provide educational facilities. It also provides a road segment that is a part of long range transportation plans.

6.2.2 State Land Use Districts

State Land Use Law, Chapter 205, Hawai`i Revised Statutes classifies all land into four districts: Urban, Conservation, Agricultural, and Rural.

Discussion:
In December 1993 the LUC issued a decision that reclassified over 2,000 acres of state lands from Agricultural and Conservation to Urban district. Urbanization of the area was recommended for the purpose of allocating land for future urban growth in West Hawai`i. This includes the Main Street Collector road parcel and parcels on both the *mauka* and *makai* sides of the road.

6.2.3 Agricultural Lands of Importance in the State of Hawaii (ALISH) System

No lands in the vicinity of the proposed road are included in the ALISH system. Therefore, this is not applicable.

6.3 County of Hawai`i Plans and Controls

6.3.1 County of Hawaii General Plan

County of Hawaii General Plan, February 2005 is the policy document for the long range comprehensive development of the island of Hawai`i. It contains the land use maps referred to as "General Plan Land Use Pattern Allocation Guides."

Discussion:
The Main Street Collector Road site is within the area designated as "Urban Expansion" and it provides a segment of the proposed Main Street outlined in the General Plan. The General Plan also encourages and supports the development of educational facilities in West Hawai`i, including the University of Hawai`i Center West Hawai`i.

6.3.2 Hawai`i County Zoning

The proposed Main Street Collector Road will pass through portions of land designated as Agricultural A-5a and Open.

Discussion:
The proposed road will provide access to the proposed UHCWH and to the Palamanui urban development. It provides a segment of the Main Street Collector Road outlined in the General Plan. It is also on land designated as urban expansion on the Land Use Pattern Allocation Guide map in the County of Hawaii General Plan.

6.4 Other Programs and Controls

6.4.1 Keahole to Kailua Development Plan (K to K Plan)

The County of Hawai`i established an overall goal related to objectives for the Keahole to Kailua Development Plan: "To develop during the next 10 years an efficient safe, and pleasing road network which operates at level of service C over the next 20 years, and

which interconnects the various land uses within the planning area and accommodates various modes of travel." A modified version of this long-range plan is in the County of Hawaii General Plan completed in February 2005.

Discussion:
The Main Street Collector Road provides a crucial segment of the road network outlined in the K to K Plan.

6.4.2 West Hawai`i Regional Plan

The West Hawai`i Regional Plan was developed by the Office of State Planning in 1989. It was intended to compliment the County of Hawaii's General Plan and Community Development Plan to address the regional issues arising from rapid development in the West Hawai`i area.

Discussion:
The plan includes the project area in the Kailua-Kona to Keāhole Urban Expansion Planning Area.

6.4 List of required Permits and Approvals

Permits or Approvals	Administrating Agency
Subdivision Approval	County of Hawai`i, Planning Department
Construction Permits (Grading & Paving)	County of Hawai`i Department of Public Works
Approvals relating to road construction	State of Hawaii, Department of Transportation
National Pollutant Discharge Elimination System (NPDES)	State of Hawaii, Department of Health
Underground Injection Control (UIC) Permit	State of Hawaii, Department of Health

7.0 Cumulative Impacts

Cumulative impacts are impacts on the environment that result from the action when added to other past, present and foreseeable future actions by other agencies or persons. These cumulative long-term impacts are the need for potable water, more electricity, and regional infrastructure. However; these properties have had or will have an Environmental Impact statement prepared and the development of these projects includes appropriate mitigation measures to address these impacts. The following projects are planned for the immediate vicinity of the Main Street Collector Road and they are briefly discussed individually below:

University of Hawai`i Center at West Hawai`i (UHCWH)

UHCWH plans a future expansion to provide facilities for 750 students by 2006. This will be beneficial to the entire region by providing educational and employment opportunities. The EIS for UHCWH addresses the cumulative impacts in the area.

Palamanui - A Hiluhilu Development Project

Hiluhilu Development plans to develop acreage adjacent to the UHCWH property. This development includes residential uses, mixed uses, an 18-hole golf course and a university village center. An EIS was prepared for the Hiluhilu project that addresses cumulative growth in the area.

Kona International Airport at Keāhole

The Airport has a list of long range improvements that are scheduled in phases to be completed by 2015. These projects include expansion of infrastructure to accommodate the growing needs of the airport as well as adding commercial and industrial uses that support airport activities.

Department of Hawaiian Home Lands (DHHL) Properties

DHHL has jurisdiction over a large amount of acreage in the surrounding area that they eventually plan to develop. Various types of uses are included that range from agricultural lots, industrial lots, commercial lots, a golf course, and residential units.

DLNR Honokōhau

DLNR has circulated an RFP for 300 acres of a mixed-use development at a site next to Honokōhau Boat Harbor that will be planned in conjunction with the DHHL parcel *mauka* of the Harbor.

Queen Lili`uokalani Trust (QLT)

QLT owns 3,500-acres adjacent to Kailua-Kona that includes developed and undeveloped land. Developed areas include shopping centers, light industrial and residential low-rise condominiums. Undeveloped acreage is currently undergoing review for potential land uses and eventual development.

Supporting Infrastructure

To accommodate all the proposed growth additional infrastructure is required. Included are the following projects:

Hawaii Electric Light Company, Inc. (HELCO) plans for the expansion and improvements to Keāhole Generating Station and the Airport Substation in order to provide for future demands. The EIS for HELCO that addresses the expansion of the HELCO facilities was finalized in January 2005.

Keāhole Reservoir was completed on February 1, 2000 and will provide storage for water. The Hina Lani Drive Water Transmission line and Reservoir was completed in 2001.

Lōkahi Subdivision proposes to provide an access road for the Lōkahi Subdivision. The proposed road will intersect with Kaiminani Drive near the Kona Palisades Subdivision providing a north-south segment of the proposed road that will become the new Main Street.

Cumulative Impacts

Impacts from all of the foreseeable projects indicate that the natural environment will be impacted. Established controls require the developers to consider and manage or mitigate the negative long term impacts. Compliance and adherence with established controls are expected to decrease the impact on natural resources.

The man-made environment can also be stressed and severely impacted as all of the proposed projects in the region are implemented. Again the developers must follow established controls and provide appropriate mitigation for project-generated impacts on infrastructure. Many of the proposed developments in the area have already submitted EISs that address the cumulative impacts in the region.

Social-economic impacts resulting from the proposed projects are anticipated to have beneficial impacts. Construction generates employment and economic opportunities. Additional residential areas provide housing and commercial development provides long term employment while UHCWH provides a much needed adult educational facility. All of the projects discussed will result in economic development that will expand employment opportunities for Kona residents and provide additional tax revenue to the State and County governments to fund needed public services. Overall the net cumulative impact is expected to have a positive effect on the Kona community.

8.0 Findings and Determinations

Based upon the previous information presented in this document the proposed permitting and construction of the Main Street Collector Road will have no significant environmental impacts. This determination is based upon the Significance Criteria outlined in Chapter 343, HRS, as amended and Title 11 Chapter 200 HAR 1996.

(1) Involves an irrevocable commitment to loss or destruction of any natural or cultural resources;

All sites located during the Archaeological Assessment conducted by Pacific Legacy for this project are significant under criteria "d" of the National Historic Preservation Act and will be treated appropriately. All sites in the area will be avoided if it is at all possible and every attempt will be made to protect and preserve these sites.

(2) Curtail the range of beneficial uses of the environment;

As proposed the project does not restrict the range of beneficial uses of the environment. Currently there is nothing on the site and no access to the parcels in the area. It will open the UHCWH parcel for the development of a much needed higher education center.

(3) Conflicts with the State's long term environmental policies or goals and guidelines as expressed in Chapter 343, HRS; and any revisions thereof and amendments thereto, court decisions, or executive orders;

As proposed the project is in compliance with the State's long-term goals or guidelines as expressed in Chapter 344, HRS.

(4) Substantially affects the economic or social welfare of the community or state;

As proposed the project will positively affect the economic and social welfare of the community and state. It will provide jobs during the construction of the road and it will open up the University of Hawai`i property for the development of a major educational center in North Kona. There will be more long range gradual changes. Jobs will be provided as the UHCWH site is developed and long term employment will increase when the UH Center is operational.

(5) Substantially affects public health;

As proposed the construction of the Main Street Collector Road will have no permanent effect on public health.

(6) Involves substantial secondary impacts, such as population changes or effects on public facilities;

The construction of the Main Street Collector Road will open up the University of Hawai`i parcel for the University of Hawai`i Center West Hawai`i which subsequently will provide public educational facilities in the area. There will be long range gradual changes as the UHCWH parcel and the adjacent Hiluhilu parcels are developed. These long range changes are part of the County of Hawaii's long range development plans for West Hawai`i.

(7) Involves a substantial degradation of environmental quality;

The construction of the Main Street Collector Road will not substantially degrade the environmental quality along the road corridor. It is anticipated that the impact will be minimal because no listed, threatened, proposed or candidate plant or animal species were found along the road alignment.

(8) Is individually limited but cumulatively has considerable effect on the environment, or involves a commitment for larger actions;

The construction of the Main Street Collector Road has limited effects on the environment. However it will open up the area for the development of the UHCWH and provide access to the adjacent parcel that Hiluhilu Development has plans to develop. Both UHCWH and Hiluhilu Development have submitted Environmental Impact Statements that address the cumulative effects. These long range changes are part of the County of Hawaii's long range development plans for West Hawai`i.

(9) Substantially affects a rare, threatened or endangered species or its habitat;

It is anticipated that the effects will be minimal because no listed, threatened, proposed or candidate species were found along the road alignment.

(10) Detrimentally affects air or water quality or ambient noise levels;

Air Quality:
Construction of the Main Street Collector Road, use of the road once it is constructed and the increase in traffic when UHCWH and Palamanui by Hiluhilu is completed should have no significant impact on the air quality.

Water Quality:
Mitigation using drywells or infiltration areas located along the road right-of-way will eliminate the potential of pollution from runoff. Drywells will be subject to biological

uptake and the deep lava filtration will remove the pollutants from storm water before it enters the aquifer.

Ambient Noise Levels:
Potential short-term construction noise impacts are possible during the project construction period at the south end of the project corridor. However, minimizing these types of noise impacts is possible using standard curfew periods, properly muffled equipment, administrative controls and construction barriers as required. Long-term changes in ambient noise should not exceed County, State and Federal standards.

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

There are no environmentally sensitive areas as described above in the area, therefore there will be no positive or negative affect or damage.

The only concern is geological hazards. The entire island of Hawai`i is subject to earthquakes and the potential for damage as a result of a strong earthquake is a concern for the entire County of Hawai`i. Mitigation for seismic activity is included in the Uniform Building Code and the County of Hawai`i Structural Design Standards, including earthquake design provisions.

The Kailua-Kona Area is located in Zone 4 on volcanic hazard maps. Zone 4 includes all of Hualālai where the recurrence intervals of eruptions are in the centuries. There are no mitigation measures for volcanic eruptions.

(12) Substantially affects scenic vistas and view planes identified in county or state plans or studies;

As proposed the construction of the Main Street collector Road will have a minimal affect on the scenic vista and view planes as identified in county or state plans or studies. The road will have a low profile and it may be noticeable only when there are large vehicles on the road.

(13) Requires substantial energy consumption.

Energy will be consumed during the construction phase of the road to power equipment used for preparing the roadbed and laying asphalt.

9.0 List of Preparers

Preparers	Responsibilities	Affiliation
Wilbert C.F. Chee	Principal-in-Charge	Wil Chee – Planning & Environmental, Inc.
Judy Mariant	Technical Writer / Production Manager	Wil Chee – Planning & Environmental, Inc.
Richard McGerrow	Project Manager	Wil Chee – Planning & Environmental, Inc.
Ivan Tilgenkamp	Senior Planner	Wil Chee – Planning &

10.0 List of Agencies, Organizations and Persons Consulted

The following agencies were consulted during the preparation of the Draft Environmental Assessment

Federal Agencies

Department of the Interior, U.S. Fish and Wildlife Service

State Agencies

Department of Land and Natural Resources, Historic Preservation Division

Department of Land and Natural Resources, Division of Forestry and Wildlife

Department of Land and Natural Resources, Land Division

Department of Hawaiian Homelands

Department of Health, Clean Water Branch

Department of Health, Safe Drinking Water Branch

Department of Transportation

Office of Environmental Quality Control

County Agencies

County of Hawai`i, Planning Department

County of Hawai`i, Department of Public Works

Community Groups

UHCWH Advisory Council on Kalaoa Site Preservation (meeting on October 18, 2005)

Eli K. Nahulu	Community Representative
Fern Pule	Hewahewa Representative
Arthur M. Mahi	Hawai`i Ko Aloha
Curtis Tyler	Cultural Advisory Council
Leilani Mahi	Kona Kupuna
George K. Kahananui Sr.	Kona Kupuna
Annie K. Coelho	Kona Kupuna

Kona Palisades Estates Community Association (meeting on October 18, 2005)

Roy Damron	Kona Palisades Estates
Guy Toyama	Kona Palisades Estates
Maurice Renaud	Kona Palisades Estates
John Scott	Kona Palisades Estates
Richard H. Schenkel	Kona Palisades Estates
Jack Ferguson	Kona Palisades Estates
Amy Rice Reilly	Kona Palisades Estates
Joe Lemmons	Kona Palisades Estates
Donna Lemmons	Kona Palisades Estates

Mary I. Damron	Kona Palisades Estates

The following individuals were contacted during the preparation of this environmental assessment for background information.

Chad McDonald, P.E.	Mitsunaga & Associates, Inc.
Nathan Napoka	State Historic Preservation Office
Kenneth Santana, P.E.	Mitsunaga & Associates, Inc.
Sandra Sakaguchi	Hawai`i Community College University of Hawai`i Center at West Hawai`i

11.0 References Cited

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Yuen, Chris, Planning Director Hawaii County, 2004. *Kona Roads, West Hawaii Traffic Problems.* http://www.hawaii-county.com/planning/konaroads.htm

Appendix A. Correspondence

Pre Draft Consultation Comments

WIL CHEE - PLANNING AND ENVIRONMENTAL, INC

May 16, 2005

Chris Yuen, Director
Planning Department
County of Hawaii
75-5706 Kuakini Hwy Suite 109
Kailua-Kona, Hawaii 96740

Dear Mr. Yuen:

Subject: Environmental Assessment (EA) for
University of Hawai`i Center at West Hawai`i,
Main Street Collector Road
North Kona District, Island of Hawaii
TMK: [3] 7-3-05:045

Wil Chee – Planning & Environmental, Inc., is preparing an Environmental Assessment (EA) for the proposed Main Street Collector Road that runs along the public land parcel that is the site for the University of Hawaii Center at West Hawaii.

The proposed action takes place entirely on State owned lands on the Island of Hawaii in the North Kona District. The site is mauka of Kona International Airport at Keahole between Ka`ahumanu Highway and Mamalahoa Highway.

In compliance with §11-200-9, Hawaii Administrative Rules Department of Health, Title 11 Chapter 200, *Environmental Impact Statement Rules*, this letter is intended to initiate early consultation with agencies or groups having jurisdiction or expertise related to the project. We have enclosed a project information sheet with maps and preliminary sketches describing the proposed project and would appreciate receiving any comments or concerns which might influence the subject EA.

If you have any questions or need more information on this project please call me or Judy Mariant at (808) 596-4688. Thank you for your time and interest.

Sincerely

Richard S. McGerrow
Project Manager

Attachments

WIL CHEE - PLANNING AND ENVIRONMENTAL, INC.

May 17, 2005

Melanie Chinen, Administrator
Department of Land and Natural Resources
State Historic Preservation Division (SHPD)
601 Kamokila Building, Room 555
Kapolei, Hawaii 96707

Dear Ms.Chinen:

Subject: Environmental Assessment (EA) for
University of Hawai`i Center at West Hawai`i,
Main Street Collector Road
North Kona District, Island of Hawaii
TMK: [3] 7-3-05:045

Wil Chee – Planning & Environmental, Inc., is preparing an Environmental Assessment (EA) for the proposed Main Street Collector Road that runs along the public land parcel that is the site for the University of Hawaii Center at West Hawaii.

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Sincerely

Richard S. McGerrow
Project Manager

Attachments

Providing Services Since 1976
Land Use Planners and Environmental Consultants
1018 Palm Drive • Honolulu, Hawai`i 96814 • Phone 808-596-4688 • Fax 808-597-1651 • E-Mail wcp@lava.net

WIL CHEE - PLANNING AND ENVIRONMENTAL, INC.

May 17, 2005

Peter Young, Chairman
Department of Land and Natural Resources
State of Hawaii
1151 Punchbowl, Room 1151
Honolulu, Hawaii 96813

Dear Mr. Young:

Subject: Environmental Assessment (EA) for
University of Hawai'i Center at West Hawai'i,
Main Street Collector Road
North Kona District, Island of Hawaii
TMK: [3] 7-3-05:045

Wil Chee – Planning & Environmental, Inc., is preparing an Environmental Assessment (EA) for the proposed Main Street Collector Road that runs along the public land parcel that is the site for the University of Hawaii Center at West Hawaii.

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Sincerely

Richard S. McGerrow
Project Manager

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WIL CHEE - PLANNING AND ENVIRONMENTAL, INC.

May 19, 2005

Mary Ann Maigret
State Historic Preservation Division (SHPD)
Department of Land and Natural Resources
74-383 Kealakehe Parkway
Kailua-Kona, Hawaii 96740

Dear Ms. Maigret:

Subject: Environmental Assessment (EA) for
University of Hawai'i Center at West Hawai'i,
Main Street Collector Road
North Kona District, Island of Hawaii
TMK: [3] 7-3-05:045

Wil Chee – Planning & Environmental, Inc., is preparing an Environmental Assessment (EA) for the proposed Main Street Collector Road that runs along the public land parcel that is the site for the University of Hawaii Center at West Hawaii.

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Sincerely

Richard S. McGerrow
Project Manager

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Land Use Planners and Environmental Consultants
1019 Palm Drive • Honolulu, Hawai'i 96814 • Phone 808-596-4688 • Fax 808-597-1881 • E-Mail wcp@lava.net

WIL CHEE - PLANNING AND ENVIRONMENTAL, INC.

May 16, 2005

Bruce C. McClure P.E., Director
County of Hawaii, Department of Public Works
45-5706 Kuakine Hwy. Suite 109-111
Kailua - Kona, Hawaii 96740

Dear Mr. McClure:

Subject: Environmental Assessment (EA) for
University of Hawai'i Center at West Hawai'i,
Main Street Collector Road
North Kona District, Island of Hawaii
TMK: [3] 7-3-05:045

Wil Chee – Planning & Environmental, Inc., is preparing an Environmental Assessment (EA) for the proposed Main Street Collector Road that runs along the public land parcel that is the site for the University of Hawaii Center at West Hawaii.

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In compliance with §11-200-9, Hawaii Administrative Rules Department of Health, Title 11 Chapter 200, *Environmental Impact Statement Rules*, this letter is intended to initiate early consultation with agencies or groups having jurisdiction or expertise related to the project. We have enclosed a project information sheet with maps and preliminary sketches describing the proposed project and would appreciate receiving any comments or concerns which might influence the subject EA.

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Sincerely

Richard S. McGerrow
Project Manager

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Land Use Planners and Environmental Consultants
1018 Palm Drive • Honolulu, Hawaii 96814 • Phone 808-596-4688 • Fax 808-597-1531 • E Mail wep@lava.net

Harry Kim
Mayor

Bruce C. McClure
Director

Jiro A. Sumada
Deputy Director

County of Hawai'i
DEPARTMENT OF PUBLIC WORKS
Aupuni Center
101 Pauahi Street, Suite 7 • Hilo, Hawai'i 96720-4224
(808) 961-8321 • Fax (808) 961-8630

June 3, 2005

Richard S. McGerrow, Project Manager
Wil Chee - Planning and Environmental, Inc.
1018 Palm Drive
Honolulu, HI 96814

Subject: Environmental Assessment (EA) for
University of Hawaii Center as West Hawaii
Main Street Collector Road
North Kona, District, Island of Hawaii
TMK: [3] 7-3-010:045

Thank you for your request, dated May 16, 2005, for preliminary comments on the subject. They are as follows:

Please verify that the Planning Director has restored the Mid-Level Road alignment to the location makai of the proposed campus on the General Plan. The Mid-Level Road (Keohokalole Highway) is, according to the Keahole to Kailua Development Plan, a 120- foot wide arterial. The Main Street collector may terminate at Mid-Level Road south of the proposed project. The Mid-Level Road north of Kaiminani Drive was realigned from parcel 45. The new alignment will continue south of Kaiminani Drive as required of Westpro Development.

South of Kaiminani Drive, Westpro Development will provide concrete curb, gutter and sidewalk as in the existing portion of Keohokalole Highway at Kealakehe Parkway. The proposed road should therefore include curb gutter and sidewalk on the mauka side and provide for underground utilities or location of the overhead utilities on the right-of-way property line edge of the sidewalk. An additional utility easement may be needed.

A design speed study and recommendation for the vicinity should be provided in the EA. We have advised others that the road shall have a design speed of 50 mph (45 mph posted).

Thank you for the opportunity to comment. If you have any questions, please contact Kiran Emler of our Kona office at 327-3530.

Galen M. Kuba, Division Chief
Engineering Division
KE
c: ENG - HILO/KONA
Planning Director
Mitsunaga and Assoc.

WIL CHEE - PLANNING AND ENVIRONMENTAL, INC.

May 17, 2005

Genevieve Salmonson, Director
Office of Environmental Quality Control
State of Hawaii
236 South Beretania Street
Honolulu, HI 96822

Dear Ms. Salmonson:

Subject: Environmental Assessment (EA) for
University of Hawai'i Center at West Hawai'i,
Main Street Collector Road
North Kona District, Island of Hawaii
TMK: (3) 7-3-05:045

Wil Chee – Planning & Environmental, Inc., is preparing an Environmental Assessment (EA) for the proposed Main Street Collector Road that runs along the public land parcel that is the site for the University of Hawaii Center at West Hawaii.

The proposed action takes place entirely on State owned lands on the Island of Hawaii in the North Kona District. The site is mauka of Kona International Airport at Keahole between Ka'ahumanu Highway and Mamalahoa Highway.

In compliance with §11-200-9, Hawaii Administrative Rules Department of Health, Title 11 Chapter 200, *Environmental Impact Statement Rules*, this letter is intended to initiate early consultation with agencies or groups having jurisdiction or expertise related to the project. We have enclosed a project information sheet with maps and preliminary sketches describing the proposed project and would appreciate receiving any comments or concerns which might influence the subject EA.

If you have any questions or need more information on this project please call me or Judy Mariant at (808) 596-4688. Thank you for your time and interest.

Sincerely

Richard S. McGerrow
Project Manager

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Land Use Planners and Environmental Consultants
1018 Palm Drive • Honolulu, Hawai'i 96814 • Phone 808-596-4688 • Fax 808-597-1531 • E-Mail wcp@lava.net

LINDA LINGLE
GOVERNOR OF HAWAII

GENEVIEVE SALMONSON
DIRECTOR

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
E-mail: oeqc@health.state.hi.us

May 23, 2005

Richard McGerrow
Wil Chee Planning
1018 Palm Drive
Honolulu, HI 96814

Dear Mr. McGerrow:

Subject: Draft EA pre-consultation, UH Center at West HI (UHCWH) Main St. Collector Road

The collector road was referenced in the 2000 EIS for UHCWH. Be sure to update your discussion of cumulative impacts for this region in the forthcoming EA.

We have nothing to add at this time, but will reserve comments for the draft EA review.

If you have any questions, call Nancy Heinrich at 586-4185.

Sincerely,

GENEVIEVE SALMONSON
Director

WIL CHEE - PLANNING AND ENVIRONMENTAL, INC.

May 17, 2005

Laurence K. Lau, Deputy Director
Environmental Health Administration
Department of Health, State of Hawaii
1250 Punchbowl St.
Honolulu, Hawaii 96813

Dear Mr.Lau:

Subject: Environmental Assessment (EA) for
University of Hawai`i Center at West Hawai`i,
Main Street Collector Road
North Kona District, Island of Hawaii
TMK: [3] 7-3-05:045

Wil Chee – Planning & Environmental, Inc., is preparing an Environmental Assessment (EA) for the proposed Main Street Collector Road that runs along the public land parcel that is the site for the University of Hawaii Center at West Hawaii.

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In compliance with §11-200-9, Hawaii Administrative Rules Department of Health, Title 11 Chapter 200, *Environmental Impact Statement Rules*, this letter is intended to initiate early consultation with agencies or groups having jurisdiction or expertise related to the project. We have enclosed a project information sheet with maps and preliminary sketches describing the proposed project and would appreciate receiving any comments or concerns which might influence the subject EA.

If you have any questions or need more information on this project please call me or Judy Mariant at (808) 596-4688. Thank you for your time and interest.

Sincerely

Richard S. McGerrow
Project Manager

Attachments

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Land Use Planners and Environmental Consultants
1018 Palm Drive • Honolulu, Hawai`i 96814 • Phone 808-596-4688 • Fax 808-487-1551 • E-Mail wcp@lava.net

X-Original-To: wcp@lava.net
Delivered-To: wcp@lava.net
From: "Jiacai Liu" <JLiu@eha.health.state.hi.us>
To: wcp@lava.net
Date: Tue, 31 May 2005 16:07:21 -1000
Subject: Pre-consultation for DEA regarding University of Hawaii Center at West Hawaii, Main Street Collector Road
X-Confirm-Reading-To: "Jiacai Liu" <JLiu@eha.health.state.hi.us>
X-pmrqc: 1
Priority: normal
X-mailer: Pegasus Mail for Windows (v4.11)
Comments: INPUT 132.160.235.53
Comments: HELO eha.health.state.hi.us
Comments: For More Information, please visit: <http://lava.net/support/utilities/spammo/guide.html>

Dear Mr. McGerrow:

Thank you for allowing us to review the subject project. We offer Standard Comments at: http://www.state.hi.us/health/environmental/env-planning/landuse/landuse.html or clicking (Standard Comments) for the EA pre-consultation.

Please send DEA or any subsequent documents to the DOH Environmental Planning Office directly at:

Environmental Planning Office
919 Ala Moana Blvd., Room 312
Honolulu, Hawaii 96814

Mahalo
Jiacai Liu
Land Use Review Coordinator
Environmental Planning Office /DOH
(808) 586-4346

Comments on the Draft EA

LINDA LINGLE
GOVERNOR OF HAWAII

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

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

In reply, please refer to:
EPO-06-010

February 3, 2006

Mr. Mark Yamabe
Department of Accounting and General Services
Project Management Branch
P. O. Box 119
Honolulu, Hawaii 96813

Dear Mr. Yamabe:

SUBJECT: Draft Environmental Assessment for University of Hawaii Center at West Hawaii
Main Street Collector Road, North Kona, Island of Hawaii
TMK: (3) 7-3-10: 45

Thank you for allowing us to review and comment on the subject document. The document was routed to the various branches of the Environmental Health Administration. We have the following Environmental Planning Office comments.

Environmental Planning Office

Please note that some of the following issues may not apply to your particular proposed project or requested action. Should you have any questions about the applicability of the listed concerns or the particular environmental programs administered by our office, please feel free to contact us.

To facilitate Total Maximum Daily Load (TMDL) development and implementation, and to assist with our assessment of the potential impact of proposed actions upon water quality, pollutant loading, and biological resources in receiving waters, we suggest that environmental review documents, permit applications, and related submittals include the following standard information and analyses. Please note that these comments are also listed on our website: www.state.hi.us/health/environmental/env-planning/landuse/landuse.html. We suggest that you also review other Standard Comments on this website.

Waterbody type and class

1. Identify the waterbody type and class, as defined in Hawaii Administrative Rules Chapter 11-54 (http://www.state.hi.us/health/about/rules/11-54.pdf), of all potentially affected water bodies. Potentially affected water bodies means those in which proposed project activities would take place and any others that could receive water discharged by the proposed project activity or water flowing down from the proposed site. These waterbodies can be presented as a chain of receiving waters whose top link is the project site upslope and whose bottom link is in Pacific Ocean "oceanic waters," with all receiving waters named according to conventions established by Chapter 11-54 and the *List of Impaired Waters in Hawaii Prepared under Clean Water Act §303(d)*. For example, a recent project proposed for Nuhelewai Stream, Oahu (a tributary of Kapalama Canal) might potentially affect Nuhelewai Stream, Kapalama Canal, Honolulu Harbor and Shore Areas, and the Pacific Ocean.

Existing water quality management actions

2. Identify any existing National Pollutant Discharge Elimination System (NPDES) permits and related connection permits (issued by permittees) that will govern the management of water that runs off or is discharged from the proposed project site or facility. Please include NPDES and other permit numbers; names of permittees, permitted facilities, and receiving waters (including waterbody type and class as in 1. above); diagrams showing drainage/discharge pathways and outfall locations; and note any permit conditions that may specifically apply to the proposed project.

3. Identify any planning documents, groups, and projects that include specific prescriptions for water quality management at the proposed project site and in the potentially affected waterbodies. Please note those prescriptions that may specifically apply to the proposed project.

Pending water quality management actions

4. Identify all potentially affected water bodies that appear on the current *List of Impaired Waters in Hawaii Prepared under Clean Water Act §303(d)* including the listed waterbody, geographic scope of listing, and pollutant(s) (See Table 5 at http://www.hawaii.gov/health/environmental/env-planning/wqm/303dpcfinal.pdf).

5. If the proposed project involves potentially affected water bodies that appear on the current *List of Impaired Waters in Hawaii Prepared under Clean Water Act §303(d)*, identify and quantify expected changes in the following site and watershed conditions and characteristics
   - surface permeability
   - hydrologic response of surface (timing, magnitude, and pathways)
   - receiving water hydrology
   - runoff and discharge constituents
   - pollutant concentrations and loads in receiving waters
   - aquatic habitat quality and the integrity of aquatic biota

Where TMDLs are already established they include pollutant load allocations for the surrounding lands and point source discharges. In these cases, we suggest that the submittal specify how the proposed project would contribute to achieving the applicable load reductions.

Where TMDLs are yet to be established and implemented, a first step in achieving TMDL objectives is to prevent any project-related increases in pollutant loads. This is generally accomplished through the proper application of suitable best management practices in all phases of the project and adherence to any applicable ordinances, standards, and permit conditions. In these cases we suggest that the submittal specify how the proposed project would contribute to reducing the polluted discharge and runoff entering the receiving waters, including plans for additional pollutant load reduction practices in future management of the surrounding lands and drainage/discharge systems.

Proposed Action and Alternatives Considered

We suggest that each submittal identify and analyze potential project impacts at a watershed scale by considering the potential contribution of the proposed project to cumulative, multi-project watershed effects on hydrology, water quality, and aquatic and riparian ecosystems.

We also suggest that each submittal broadly evaluate project alternatives by identifying more than one engineering solution for proposed projects. In particular, we suggest the consideration of "alternative," "soft," and "green" engineering solutions for channel modifications that would provide a more environmentally friendly and aesthetically pleasing channel environment and minimize the destruction of natural landscapes.

If there are any questions about these comments please contact Jiacai Liu with the Environmental Planning Office at 586-4346.

Sincerely,

KELVIN H. SUNADA, MANAGER
Environmental Planning Office

c: EPO

WIL CHEE - PLANNING AND ENVIRONMENTAL, INC.

April 24, 2006

Kelvin H. Sunada, Manager
Environmental Planning Office
Department of Health, State of Hawaii
P.O. Box 3378
Honolulu, Hawaii 96801-3378

Dear Mr. Sunada,

Subject: Draft Environmental Assessment (DEA), University of Hawaii Center at West Hawaii (UHCWH), Main Street Collector Road, TMK [3] 7-3-10: 45

Dear Mr. Sunada,

Thank you for your comments on the Draft Environmental Assessment (DEA) for Main Street Collector Road. We will answer your comments in the order that they were written.

1. There are no surface water bodies that could receive water discharged by the proposed project or water flowing from the proposed site. Please refer to section 3.3 Hydrology on page 15 of the DEA. The project area has no streams, water courses or ponds on the site and is over 2 miles from the shoreline. The lack of streams is due to the porosity of the interbedded pahoehoe and aa flows that make up the Hualālai volcanic sequence. No surface water directly reaches the coast, or flows into drainage ways that reach the coast.

2. Currently there are no existing National Pollutant Discharge Elimination System permits and related connection permits that will govern the management of water that runs off or is discharged from the proposed project site. Therefore we can not include any permit numbers. Please refer to section 3.3 Hydrology on page 15 of the DEA. The project area has no streams, water courses or ponds on the site and is not close to the shoreline. The lack of streams is due to the porosity of the interbedded pahoehoe and aa flows that make up the Hualālai volcanic sequence. No surface water directly reaches the coast, or flows into drainage ways that reach the coast.

3. Please refer to section 3.3 Hydrology on page 15 of the DEA. The project area has no streams, water courses or ponds on the site and is not close to the shoreline. The lack of streams is due to the porosity of the interbedded pahoehoe and aa flows that make up the Hualālai volcanic sequence. No surface water directly reaches the coast, or flows into drainage ways that reach the coast.

   There is some potential for surface runoff to carry oil or petroleum based products from vehicles during the construction of the road and later when the road is in use. Mitigation using drywells or infiltration areas located along the road right-of-way will eliminate the

potential of pollution from runoff. Drywells will be subject to biological uptake and the deep lava filtration will remove the pollutants from storm water before it enters the aquifer.

During construction and once the road is constructed runoff from the impermeable surfaces of the road will increase the amount of surface water along the roadway. Mitigation using drywells or infiltration areas located along the road will collect the runoff. Due to the porosity of the underlying basalt most of the water that runs off the road into drywells or infiltration areas should readily percolate underground. There should be no significant increase in surface runoff. Flood maps indicate that the area is Zone X which represents areas that are determined to be out of the 500 year flood plain. No mitigation is needed for flood potential.

4. Please refer to numbers 1-3 above.

5. Please refer to numbers 1-3 above.

Again thank you for your comments. If you should have any questions please contact Judy Mariant or myself at (808) 596-4688.

Sincerely,

Richard McGerrow
Senior Planner

Cc Mark Yamabe, DAGS
Chad McDonald, Mitsunaga & Associates, Inc.

LINDA LINGLE
GOVERNOR OF HAWAII

GENEVIEVE SALMONSON
DIRECTOR

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
E-mail: oeqc@health.state.hi.us

January 12, 2006

Ernest Lau, Public Works Administrator
Department of Accounting and General Services
P.O. Box 119
Honolulu, Hawaii 96810

Attention: Mark Yamabe

Dear Mr. Lau:

Subject: Draft Environmental Assessment (EA)
Main Street Collector Road, UH Center at West Hawaii

We have the following comments to offer:

Cumulative impacts: Sections 7.0 and 8.0 discuss cumulative impacts. If there is a possibility of a cumulative effect on the region beyond that caused by the current project, then an EIS must be prepared. If such an effect has previously been disclosed or mitigated to an insignificant level, then modify your discussion of criteria #6 and #8 in section 8.0, *Findings and Determinations*, to justify this.

Cultural impacts assessment: Section 4.8.2 on Cultural Resources gives sufficient background but lacks a conclusion regarding project impacts on existing cultural practices. This analysis is required by Act 50. Please add this in the final EA.

Paving: Hawaii Revised Statutes 103D-407 requires the use of recycled glass in paving materials whenever possible. In the final EA indicate if you will follow this requirement.

Noise: How close are the nearest residences to the proposed road alignment? Will noise to them be a factor during the construction period?

Lava tubes: Large lava tubes are mentioned in section 4.7.2 on invertebrate fauna. Will they present a risk of collapse to the collector road?

Figure 3: The detail in this figure is too small. In the final EA provide an enlarged figure so that the text can be read easily.

Ernest Lau
January 12, 2004
Page 2

Utility lines: We recommend that utility lines, such as power lines, be placed underground in the right of way.

If you have any questions, call Nancy Heinrich at 586-4185.

Sincerely,

Genevieve Salmonson

GENEVIEVE SALMONSON
Director

c: Richard McGerrow, Wil Chee Planning

WIL CHEE - PLANNING AND ENVIRONMENTAL, INC

April 24, 2006

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

Draft Environmental Assessment (DEA), University of Hawaii Center at West Hawaii, Main Street Collector Road, TMK [3] 7-3-10: 45

Dear Ms. Salmonson,

Thank you for your comments on the Draft EA for the Draft Environmental Assessment for the Main Street Collector Road, UH Center at West Hawaii. We will address your comments in the order that they are listed.

Cumulative Impacts: Sections 7.0 & 8.0, that address cumulative impacts have been changed to reflect the fact that cumulative impacts have already been addressed in previous Environmental Impact Statements. It appears that we inadvertently left that out of the Draft EA.

Cultural Impacts Assessment: In Section 4.8.2 a sentence stating, that: "based upon information in the Cultural Resources Report and the mitigation recommended in that report there should be no significant impacts to cultural resources", was added to that paragraph as a conclusion to the discussion.

Paving: A discussion of the requirements outlined in Hawaii Revised Statutes 103D-47 that requires the use of recycled glass in paving materials whenever possible was added to section 2.3.1 Technical Characteristics.

Noise: The proposed road is approximately 82 feet from the nearest residence in Kona Palisades and noise should not be an issue during construction. Please refer to the Section 2.3.1 Technical Characteristics under Best Management practices where it states that: "All grading operations shall be performed in conformance with the applicable provisions of the Hawaii Administrative Rules, Title 11, Chapter 46, Community Noise Control."

Lava Tubes: There may be lava tubes encountered along the roadway alignment and one has already been identified. A geotechnical investigation along the proposed alignment to examine surface conditions and to incorporate design elements required to mitigate the hazard of lava tube collapse will be conducted. A discussion on potential lava tube collapse has been added to the Geologic Hazards discussion in sections 3.1.1 and 4.1.1.

Figure 3: Has been changed to make it more easily read.

Utility Lines: A recommendation to place utility lines underground along the road right-of-way has been added to Section 2.3 Project Features and Section 4.1.2 Visual Resources.

Thank you for your comments. If you should have any questions please contact Judy Mariant or myself at (808) 596-4688.

Sincerely,

Richard McGerrow
Senior Planner

Cc Mark Yamabe, DAGS
Chad McDonald, Mitsunaga & Associates, Inc.

Harry Kim
Mayor

Bruce C. McClure
Director

Jiro Sumada
Deputy Director

County of Hawaii
DEPARTMENT OF PUBLIC WORKS
Aupuni Center
101 Pauahi Street, Suite 7 · Hilo, Hawaii 96720-4224
(808) 961-8321 · Fax (808) 961-8630

February 23, 2006

Honorable Russ K. Saito, Comptroller
Department of Accounting and General Services
Project Management Branch
P.O. Box 119
Honolulu, HI 96813
Attn: Mark Yamabe

Subject: Draft Environmental Assessment
University of Hawaii Center at West Hawaii
Main Street Collector Road
TMK: 7-3-010:045

We reviewed the subject environmental assessment and have the following comments:

1. The current General Plan Facilities Map indicates that the alignment of the subject road is the arterial labeled A-1, Mid-Level Road (Ane Keohokalole Highway). The County Planning Director has informed us that revisions of the map are proposed. A 120-foot wide right-of way is proposed in the Keahole to Kailua Development Plan for the 4-lane divided minor arterial street.

2. Construction plans were recently approved by the Department of Public Works for a portion of Ane Keohokalole Highway from Kaiminani Drive in a southerly direction approximately 650 feet to serve the Lokahi Makai development. The project was designed to line up with the improvements under the subject application. The cross section matches the existing portion in the DHHL Laiopua Village project with 38 feet of pavement and with curb, gutter and a 5-foot wide sidewalk and streetlights on an underground conduit system on the mauka side. We had envisioned the portion of the proposed road to the university site would be constructed with curb gutter and sidewalk as well, providing the neighborhood with a pedestrian route to the campus.

3. We reviewed the TIAR and concur with comments made by HDOT regarding additional information needed in the report to support design and responsibility for recommended improvements. In addition, the projected traffic and the proposed street extension to the south from Kaiminani Drive by and for the Lokaki development should be included. For a conventional type intersection at Kaiminani Drive, dedicated left-turn lanes will be needed in

both directions on Kaiminani Drive. A southbound dedicated right-turn lane should be provided to Kaiminani Drive on the subject street. Conduits for future traffic signalization should be installed and the delays at the intersection should be monitored. The traffic signal (when warranted) and all other traffic mitigation improvements at the intersection shall be installed at no cost to the County A discussion of an alternate roundabout type of intersection should be discussed in the report, as DPW is committed to consider this type of alternate design for County facilities.

4. If sidewalk is provided, we recommend that utility poles be installed out of the right-of- way, otherwise any utility poles in the road right-of-way shall be installed as shown on DPW Standard Detail R-35 (Revised). The applicant shall provide any necessary easements for installation of such utilities.

5. All development-generated runoff shall be disposed of and not directed toward any adjacent properties. A drainage study shall be prepared and the recommended drainage system shall be constructed meeting with the approval of the Department of Public Works.

6. The applicant shall comply with chapter 11-55, Water Pollution Control, Hawaii Administrative Rules, Department of Health, which requires an NPDES permit for certain construction activity.

7. The applicant shall be informed that if they include drywells in the subject development, an Underground Injection Control (UIC) permit may be required from the Department of Health, State of Hawaii.

We appreciate the opportunity to comment and apologize for the belated response. If you have any questions, please contact Kiran Emler of our Kona office at 327-3530.

Galen M. Kuba, Division Chief
Engineering Division

cc: Richard McGerrow, Will Chee Planning and Environmental ✓
Planning Director
ENG-HILO/KONA

WIL CHEE - PLANNING AND ENVIRONMENTAL, INC.

April 24, 2006

Galen M. Kuba, Division Chief,
Engineering Division
Department of Public Works, County of Hawaii
Aupuni Center
101 Pauahi Street, Suite 7
Hilo, Hawaii 96720

Subject: Draft Environmental Assessment (DEA), University of Hawaii Center at West Hawaii (UHCWH), Main Street Collector Road, TMK [3] 7-3-10: 45

Dear Mr. Kuba,

Thank you for your comments on the Draft Environmental Assessment (DEA) for Main Street Collector Road. We will answer your comments in the order that they were written.

1. The name used is found in the *County of Hawaii General Plan*, February 2005. The map illustrated in Figure 45. Transportation - Roadways (Keahole to Kailua) indicates that the road is C-2a Proposed Main Street that is designated as a collector road. The sources of information for this map are from the County of Hawaii, Department of Public Works, Engineering Division and the State of Hawaii, Department of Transportation, Highways Division. The 2005 General plan designates major collector roads as having a minimum right-of-way of 60 feet. Roads designated as collector roads are generally the local roads that move traffic to the arterials.

   The Land Use Commission of the State of Hawaii Petition of Hiluhilu Development, LLC Docket No. A03-744 findings refer to the mid level connection with Kaiminani Drive. On page 90 of that petition the road is described as a two-lane roadway between the Petition Area and Kaiminani Drive in an alignment approved by the County and the University and acceptable to any other State agency with a property interest in the land on which the two-lane roadway is located.

2 The project will be coordinated with the Lokahi Makai Development project. Per Hiluhilu, the County Planning Commissioner required the developer to construct a 2-lane collector road, and did not specifically require a curb, gutter and sidewalks be constructed at this time. It is the developer's (Hiluhilu) assumption that future developments through this corridor will be constructed by those "developers" fronting Main Street.

3 If the comment is in regard to the intersection of Kaiminani Drive at Mamalahoa Highway an analysis of signalized conditions was included because the TIAR for Palamanui Development considered this intersection as signalized for 2008 baseline conditions (page 23 of the TIAR by Austin, Satsuma & Associates). This implies that traffic signals are needed without the Palamanui Development, UHCWH or Main Street. Phillip Rowell and Associates conducted an assessment of the peak hour volume warrants and came to the same conclusion.

4. Utility poles will not be provided at this time, however, intersection lighting will be provided at designated intersections, within the road right-of-way. Future improvements within the right-of-way will conform to easement requirements or all utilities will be installed underground within the road right-of-way. OEQC recommended that utility lines be placed underground to protect the viewshed.

5. Runoff will not be directed to any adjacent properties. A drainage report for the Main Street roadway project will be developed during the design phase, and processed accordingly with the County.

6. An NPDES permit will be prepared and processed with the Department of Health.

7. If applicable, drywells will be registered with the Department of Health and an Underground Injection Control (UIC) permit will be processed.

Again thank you for your comments. If you should have any questions please contact Judy Mariant or myself at (808) 596-4688.

Sincerely,

Richard McGerrow
Senior Planner

cc: Kiran Emler, Department of Public Works, Kailua-Kona
Mark Yamabe, DAGS
Chad McDonald, Mitsunaga & Associates, Inc.

Harry Kim
Mayor

Christopher J. Yuen
Director

Brad Kurokawa, ASLA, LEED™ AP
Deputy Director

County of Hawaii
PLANNING DEPARTMENT
Aupuni Center • 101 Pauahi Street, Suite 3 • Hilo, Hawaii 96720
Phone (808) 961-8288 • Fax (808) 961-8742

January 30, 2006

Mr. Mark Yamabe
Department of Accounting and General Services
Project Management Branch
P. O. Box 119
Honolulu HI 96816

Dear Mr. Yamabe:

Subject: Draft Environmental Assessment
Applicant: Department of Accounting and General Services (DAGS)
Project: University of Hawaii Center at West Hawaii, Main Street Collector Road
Tax Map Key: 7-3-10:45, North Kona, Hawaii

This is in response to your request for comments on the above-referenced project.

The State of Hawaii DAGS, in cooperation with the University of Hawaii and Hiluhilu Development Company, proposes to construct a new collector road on the subject parcel. However, due to archaeological sites, the existing right-of-way will be realigned.

We have the following comments to offer:

1. In reference to Figure 4, *Plan – Main Street*:

   a. Parcel 45 is a roadway lot consisting of two sections. One segment runs parallel to the Queen Kaahumanu Highway and extends from Kaiminani Drive in the south to TMK: 7-2-5:1 in the north. The other segment extends mauka-makai, or from the Queen Kaahumanu Highway to the aforementioned first section.

b. The tax map key number for the University of Hawaii site mauka or east of the existing right-of-way should be denoted as Parcel 42. Parcel 33 is located makai of the eastern segment of the existing right-of-way.

c. Since the existing right-of-way, as approved by Subdivision No. 7159 on August 17, 1999, will be realigned due to archaeological sites encountered within the right-of-way, the project site should also include TMK: 7-3-10:33, 42 and 44.

2. Due to the realignment, subdivision approval is required to reconfigure the roadway lot.

Other than the foregoing, we have no further comments to offer.

If you have questions, please feel free to contact Esther Imamura or Deborah Chang of this office at 961-8288, extension 257 or 254, respectively.

Sincerely,

CHRISTOPHER J. YUEN
Planning Department

ETI:cd
P:\WPWIN60\ETI\EAdraft\Pre-consult\Yamabe Main St Collector Rd 7-3-10-45.doc

cc: Planning Department – Kona

Mr. Richard McGerrow
Will Chee - Planning & Environmental, Inc.
1018 Palm Drive
Honolulu HI 96814

WIL CHEE - PLANNING AND ENVIRONMENTAL, INC.

April 24, 2006

Christopher J. Yuen, Director
Planning Department, County or Hawaii
Aupuni Center
101 Pauahi Street, Suite 3
Hilo, Hawaii 96720

Subject: Draft Environmental Assessment (DEA), University of Hawaii Center at West Hawaii, Main Street Collector Road, TMK [3] 7-3-10: 45

Dear Mr. Yuen,

Thank you for your comments on the Draft Environmental Assessment for Main Street Collector Road. We will answer your comments in the order that they were written.

1. Figure 4, Plan - Main Street:
   a. Thank your for informing us that Parcel 45 roadway lot consists of two sections. The existence of the other segment running mauka-makai from Queen Ka`ahamanu Highway will be noted in the final EA, however, this project is only concerned with the section that runs parallel to the makai boundary of parcel 42.
   b. The TMK number will be changed from 33 to 42 on Figure 4.
   c. When the plans for the alignment of the roadway are finalized the right-of-way will be realigned to include portions of TMK: 7-3-10:33 and 44. We will also change the description of the project site in the EA to include portions of those parcels.
2. When the plans for the alignment of the roadway are finalized a Subdivision Application will be submitted to the County of Hawaii Planning Department.

Again thank you for your comments. If you should have any questions please contact Judy Mariant or myself at (808) 596-4699.

Sincerely,

Richard McGerrow
Senior Planner

Cc Mark Yamabe, DAGS
Chad McDonald, Mitsunaga & Associates, Inc.

LINDA LINGLE
GOVERNOR

RODNEY K. HARAGA
DIRECTOR

Deputy Directors
BRUCE Y. MATSUI
BARRY FUKUNAGA
BRENNON T. MORIOKA
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:
DIR 2371
STP 8.2049

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

February 7, 2006

TO: THE HONORABLE RUSS K. SAITO, COMPTROLLER
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES

ATTN: MARK YAMABE
PROJECT MANAGEMENT BRANCH

FROM: RODNEY K. HARAGA
DIRECTOR OF TRANSPORTATION

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT, MAIN STREET COLLECTOR ROAD, UNIVERSITY OF HAWAII CENTER AT WEST HAWAII

In response to the request for our review of the subject environmental assessment report for the proposed road, we have the following comments:

1. A clarification is needed on the "Main Street" name applied to the subject road. The Final Report, Keahole to Kailua Development Plan, Revised Roadway Plan, Implementation Strategy, dated February 1997, reflects the road as Mid-level Road or Mid-level Arterial.

2. The traffic impact analysis report (TIAR) makes recommendations for the installation of traffic signals. It is necessary to have warrant studies done for the recommended signals and such requirement should have been described in the assessment report. The TIAR should also describe and recommend the lane assignments and storage lengths at the affected intersections to be signalized.

3. The work proposed for Mamalaoha Highway and any on Queen Kaahumanu Highway at the intersection(s) with Kaiminani Drive must have prior review and approval of our Department (DOT), including, but not limited to:

   a. Submittal of an updated and revised TIAR with traffic signal warrant study for our review and approval.

   b. Commitment by the applicant and/or participating-partnering developer to implement the traffic, roadway and intersection improvements, at no cost to the DOT.

4. One of the needs and purposes of the proposed Main Street is to support and supplement the need for lateral connectivity and alleviate burdens placed on Mamalaoha Highway and Queen Kaahumanu Highway as a route for all or most of the local and short trip traffic. We recommend that consideration be given for sizing the right-of-ways of the various mid-level roads, such as Main Street, and number and variety of accesses onto these roads for the full development and build out of the anticipated growth in the area and region so that the highways can better serve the region's traffic.

5. We support the need to have mid-level roads, such as the proposed Main Street, but wish to make you aware of our prior comments and continuing concerns related to the Palamanui Project by Hiluhilu and the University's new West Hawaii Campus, which are the primary reasons for prompting the need for Main Street, as well as the location of the nearby HELCO Keahole Generating and Airport Substation facility, Keahole Airport, the Natural Energy Laboratory complex and its current access and possible access at Kaiminani, and the potential development of the adjacent lands under DHHL. The coordination of the roadway network to serve this area, between the State and County agencies, is very important, as further evidenced in the Land Use Commission's Decision and Order for Palamanui. We are attaching our earlier correspondence and an extract of the LUC's decision for your information and reference.

6. Plans for all construction work, within or adjoining a State highway right-of-way, for mitigation measure and improvements on our highways related to Main Street, must be in accordance with State highway standards and Highway Division requirements and submitted for our review and approval. This shall include no additional storm water runoff or other drainage surface water on to the highway right-of-way and obtaining all appropriate construction and environmental permits, including any applicable permits from our Highways Division.

We appreciate the opportunity to provide our comments and look forward to further discussions and coordination between our agencies, other State agencies, and the County.

Attachment

DS:km

c: Galen Kuba, Hawaii County, Department of Public Works
Christopher Yuen, Hawaii County, Planning Department
Wil Chee – Planning and Environmental, Inc.

bc: HWY, -P, -H, -T
AIR, -H, -EP, -E, STP(DS)

WIL CHEE - PLANNING AND ENVIRONMENTAL, INC.

April 24, 2006

Rodney K. Haraga, Director of Transportation
Department of Transportation, State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

Subject: Draft Environmental Assessment (DEA), University of Hawaii Center at West Hawaii, Main Street Collector Road, TMK [3] 7-3-10: 45

Dear Mr. Haraga,

Thank you for your comments on the Draft Environmental Assessment for Main Street Collector Road. We will answer your comments in the order that they were written.

1. Clarification of the Main Street name applied to the road. We used the name designated in the *County of Hawaii General Plan*, February 2005. The map illustrated in Figure 45, Transportation - Roadways (Keahole to Kailua) indicates that the road is C-2a Proposed Main Street that is designated as a collector road. The sources of information for this map are from the County of Hawaii, Department of Public Works, Engineering Division and the State of Hawaii, Department of Transportation, Highways Division.

2. If the comment is in regard to the intersection of Kaiminani Drive at Mamalahoa Highway an analysis of signalized conditions was included because the TIAR for Palamanui Development considered this intersection as signalized for 2008 baseline conditions (page 23 of the TIAR by Austin, Tsutsumi & Associates). This implies that traffic signals are needed without the Palamanui Development, UHCWH or Main Street. Phillip Rowell and Associates conducted an assessment of the peak hour volume warrants and came to the same conclusion.

3. No work is proposed for Mamalahoa Highway and Queen Ka'ahumanu Highway at this time. This project is for the construction of the portion of Main Street Collector Road that runs along the *makai* boundary of the UHCWH property. Once this segment of the Main Street Collector Road is completed it will be turned over to the County of Hawaii and it will become a county road.

   a. Therefore, a revised TIAR and commitment of the developer to implement the intersection improvements are far beyond the scope of this project.
   b. Commitment by the applicant and/or participating-partnering can only be for the proposed project and that is the construction of the portion of Main Street collector Road that runs along the *makai* boundary of the UHCWH property.

4. The project will be coordinated with the Lokahi Makai Development Project. Per Hilohilu, the County Planning commission required the developer to construct a 2-lane collector road, and did not specifically require that curb, gutter and sidewalks be constructed at this time. It is the developer's (Hilohilu) assumption that future development through this corridor will be constructed by those "developers" fronting Main Street.

5. We appreciate your making us aware of DOT's prior commitments and continuing concerns related to the Palamanui Project by Hilohilu and the University of Hawaii Center at West Hawaii.

6. Construction work for the Main Street Collector Road will be in accordance with State Highway Division requirements, as applicable to the County of Hawaii design criteria, however, the plans will not be submitted for State DOT review because it is not within a state highway right-of-way and it will be turned over to the County of Hawaii. At this point in time this will become a County of Hawaii road.

Again thank you for your comments. If you should have any questions please contact Judy Mariani or myself at (808) 596-4688.

Sincerely,

Richard McGerrow
Senior Planner

Cc Mark Yamabe, DAGS
Chad McDonald, Mitsunaga & Associates, Inc.

LINDA LINGLE
GOVERNOR

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

RODNEY K. HARAGA
DIRECTOR

Deputy Directors
BRUCE Y. MATSUI
BARRY FUKUNAGA
BRENNON T. MORIOKA
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

STP 8.1906

September 28, 2005

Mr. Christopher J. Yuen
Director
Planning Department
County of Hawaii
101 Pauahi Street, Suite 3
Hilo, Hawaii 96720-3043

Dear Mr. Yuen:

Subject: Palamanui by Hiluhilu Development, LLC
Change of Zone Application (REZ 05-010)

Thank you for the opportunity to review the subject application for the proposed project.

This project has gone through several iterations of coordinated reviews with the DOT staff. The following is our understanding of the latest recommendations:

1. The developer will be pursuing the Northern Project Access Road in lieu of the Airport Access Road under Phase 1 of their development. The developer will also be constructing a new two-lane north-south roadway, parallel to Queen Kaahumanu Highway, and connecting the project to Kaiminani Drive in this initial phase.

2. Plans for this northern access and any other work within our rights-of-way will be coordinated with our Highways Division for review and approval.

3. The developer will submit updated Traffic Impact Analysis Report(s) to the DOT for review and approval prior to proceeding with any subsequent phases of its development. This is critical because of the impacts anticipated from the full buildout of the area, including development plans by adjacent land owners and the University of Hawaii.

We appreciate the opportunity to provide our comments.

Very truly yours,

RODNEY K. HARAGA
Director of Transportation

JT:sy

c: Galen Kuba, Hawaii County Department of Public Works

LINDA LINGLE
GOVERNOR

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

RODNEY K. HARAGA
DIRECTOR

Deputy Director
BRUCE Y. MATSUI
BARRY FUKUNAGA
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

STP 8.1492

December 8, 2004

TO: MARY LOU KOBAYASHI, ADMINISTRATOR
OFFICE OF PLANNING
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

FROM: for RODNEY K. HARAGA
DIRECTOR OF TRANSPORTATION

SUBJECT: PALAMANUI – A HILUHILU DEVELOPMENT PROJECT
FINAL ENVIRONMENTAL IMPACT STATEMENT (FEIS), SEPTEMBER 2004

We had been advised that the petitioner would be submitting a revised traffic impact analyses report (TIAR), but have not received the report to date.

In the meantime, we have identified the roadway requirements along Queen Kaahumanu Highway to accommodate the Hiluhilu project and other developments in the vicinity.

The petitioner's proposal is to construct a roadway that crosses land under the jurisdiction of the Department of Land and Natural Resources, to access Queen Kaahumanu Highway at the existing intersection next to the Hawaii Electric and Light Company (HELCO) parcel and the Kona International Airport at Keahole (KOA) access road. The petitioner is also proposing use of its currently permitted access on the western project boundary.

We are amenable to allowing an interim primary access initially only at the HELCO intersection. The petitioner should be responsible for all required improvements, as determined by our Highways Division. When the service level at that intersection deteriorates, our Highways Division may permit the opening of a secondary access at the westerly location. Until this occurs, the access roadways will need to be connected by an internal roadway to funnel traffic to the primary access.

Our long range transportation plan reflects an interchange and new access to KOA, approximately 2,500 feet north of the current access. When the new access to KOA is implemented, the accesses servicing the mauka lands will be closed, with the traffic channeled to a full intersection (or interchange) with the new KOA access. The traffic volumes will determine when an interchange should be implemented.

In light of this implementation strategy for the roadway accesses, Hiluhilu and the other landowners in the area should enter into agreements to ensure that the internal connector roads are constructed, and setbacks for the required future infrastructure are preserved and/or dedicated.

Our prior comments regarding the airport and highway issues discussed in our letter of September 7, 2004, STP 8.1352, are still applicable.

We appreciate this opportunity to provide further input and request that subsequent comments be permitted pending review of the revised TIAR.

c: Christopher Yuen, Hawaii Planning Department
Galen Kuba, Hawaii Public Works
Genevieve Salmonson, Office of Environmental Quality Control
George Atta, Group 70 International, Inc.

LINDA LINGLE
GOVERNOR

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

RODNEY K. HARAGA
DIRECTOR

Deputy Directors
BRUCE Y. MATSUI
LINDEN H. JOESTING
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

STP 8.1352

September 7, 2004

Mr. George Atta, AICP
Chief Community Planner
Group 70 International, Inc.
925 Bethel Street, 5th Floor
Honolulu, Hawaii 96813-4307

Dear Mr. Atta:

Subject: Palamanui – A Hiluhilu Development Project
Draft Environmental Impact Statement (DEIS)
TMK: 3-7-2-05: 01

We have reviewed the July 2004 DEIS for the subject project. The project will have a significant impact on our airport and highway facilities.

All of the comments provided in our earlier letters, from May 2003 to April 2004, on the previous environmental documents for the project are still valid and applicable to this current DEIS. The following comments provide an update or clarification of our earlier comments:

A. Airport Issues

1. The project will be subjected to noise from single event aircraft (jet, fixed-wing propeller and rotor-wing) operations and overflights going to and from Kona International Airport at Keahole (KOA Airport). Disclosure by the developer of such single event noise impacts should be made to prospective buyers and the future occupants of the project. Such disclosure should include existing and potential noise events from increased activity at KOA Airport.

2. The proposed wastewater treatment plant and its associated facilities need further study in its design, operational features and placement in proximity to KOA Airport. The design and construction of the plant should discourage its becoming a bird/wildlife attractant that would create interference or other problems to aircraft operations. The developer should be required to mitigate (e.g., through design of the plant) and control (e.g., population control or use barriers/methods) any bird/wildlife use or habitation of the plant.

This same requirement should apply to the golf course if bird/wildlife attraction on the course grounds is a potential or actual problem to aircraft operations.

The handling and disposal of wastewater and surface/stormwater, such as in the use of underground injection wells, especially from any medical, research or other industrial facilities (including the golf course) needs to be addressed more thoroughly. The migration of contaminants in wastewater and surface/storm water from the development's site downward and into our airport lands needs to be controlled and mitigated. We also recommend that the developer provide a ground water monitoring well program and system on the westernmost boundary of the development to observe and capture any adverse effects generated by the development. The monitoring program should be coordinated with our Airports Division.

B. Highway Issues

1. Queen Kaahumanu Highway needs to function as a limited-access facility. The proposed connection to Queen Kaahumanu Highway at the location of the KOA Airport Access Road is desirable to minimize the number of signalized intersections. However, it is critical that the access be properly designed and implemented. The developer should submit design plans to accommodate the full build-out of its development and adjacent projects that will access at that location, and a phasing plan with appropriate interim improvements as may be required.

   The proposed access to our highway is also subject to a review by our Highways Division Rights-of-Way Branch for any access requirements or consideration charges.

   The plans also need to address the construction impacts to the KOA Airport, as the connection is the only public access to the airport. Any adverse effects to the level of service and traffic movement, causing delays to our airport users must be addressed. This would include provision of an interim access road during the construction of the connection.

2. The developer should be responsible for those portions of the three North-South roads running through its development (Main Street, Mid-level and Kealakaa Extension) which are proposed to be parallel to Queen Kaahumanu and Mamalahoa Highways.

3. If the developer's proposed roadway connection to Makalei Estates occurs and roadway and/or intersection improvements are necessary at the intersection of Mamalahoa Highway and Makalei Drive, the developer should be required to provide and implement the roadway and/or intersection improvements at no cost to the State.

If another or other roadways or routes are being planned to be used as "mauka" connections, comparable to the Makalei Estates route, our department reserves the right to determine and prescribe conditions or requirements on the developer for accessing Mamalahoa Highway.

4. We had earlier requested a submittal of a revised TIAR to adequately address the potentially significant increase of traffic at the Queen Kaahumanu Highway and KOA Airport Access Road.

   The revised TIAR should discuss an interchange to handle the increased traffic. The developer had presented conceptual layout of a potential interchange prepared. The idea and layout of an interchange should be documented and discussed in the environmental document as a future need and lands that may have to be reserved for this type of improvement should be identified.

   Additionally, we noted that the subject DEIS, with the TIAR, did not respond to our earlier comments, particularly our comments provided in letters STP 8.1097 dated April 13, 2004 to the Hawaii County Planning Department and STP 8.1096 dated April 13, 2004 to the State Office of Planning (copies attached), both in response to the developer's State Land Use District boundary amendment petition (A03-744).

   For example, we requested that the traffic from other roads and developments be reviewed. The TIAR did not mention any of the traffic on and around Hina Lani Street at its connections with Queen Kaahumanu Highway and Mamalahoa Highway. The TIAR also made no mention of the potential impact from a proposed Kona Motorsports Park just north of Palamanui.

5. The TIAR assumes that the widening of Queen Kaahumanu Highway from Kealakehe Parkway to the KOA Airport Access Road will be completed by 2008 and recommends that the highway be widened up to the proposed development's Northern Project Access by 2008. This highway widening project will go only to the airport access road and is scheduled for completion by 2011. The developer should provide and be responsible to implement interim roadway improvements until the widening project is completed and provide for extending the widening of the highway to the northern access. The developer should also be responsible to contact and coordinate with our Highways Division to ensure that the developer's proposed connection to and intersection at the KOA Airport Access Road will accommodate and match up with our widening project from Kealakehe Parkway to KOA Airport.

6. Additional surface water runoff from the development should not be allowed onto Queen Kaahumanu Highway. The developer should be responsible for any drainage requirements (capital and operating costs) that may be needed due to future development of the project and adjacent properties. The design for the drainage plans should be submitted to our Highways Division for review and approval.

7. All construction plans for the development and plans for any work within or adjacent to our highway right-of-ways, along with required and appropriate environmental permits (e.g., NPDES) and other construction permits, must be submitted both to our Highways and Airports Divisions for prior review and approval.

As mentioned above, the comments we have provided in this letter supplement, or update our prior comments. Please use these comments as well as our prior referenced comments to address the concerns on impact to our facilities. We look forward to your response as part of your development's plans and environmental document.

We appreciate the opportunity to provide our comments.

Very truly yours,

RODNEY K. HARAGA
Director of Transportation

Attach.

DS/JU:km

c: Anthony Ching, State Land Use Commission
Mary Lou Kobayashi, Office of Planning, DBEDT
Nancy Heinrich, Office of Environmental Quality Control
Christopher Yuen, Hawaii County Department of Planning
Galen Kuba, Hawaii County Department of Public Works

ORIGINAL

BEFORE THE LAND USE COMMISSION

OF THE STATE OF HAWAI`I

In the matter of the Petition	)	DOCKET NO. A03-744
	)	
of	)	
	)	
HILUHILU DEVELOPMENT, LLC	)	FINDINGS OF FACT AND
	)	CONCLUSIONS OF LAW, AND
To Amend the State Land Use	)	DECISION AND ORDER FOR A
Agricultural and Conservation Districts	)	STATE LAND USE DISTRICT
to the State Land Use Urban District for	)	BOUNDARY AMENDMENT
Approximately 725.2 Acres of land at	)	
ahupua`a of Kau, North Kona Judicial	)	
District, Island and State of Hawaii, Tax		
Map Key No.: (3) 7-2-005: 001.		

FINDINGS OF FACT AND CONCLUSIONS OF LAW AND DECISION AND ORDER FOR A STATE LAND USE DISTRICT BOUNDARY AMENDMENT

BEFORE THE LAND USE COMMISSION

OF THE STATE OF HAWAI`I

In the Matter of the Petition	)	DOCKET NO. A03-744
	)	
of	)	
	)	
HILUHILU DEVELOPMENT, LLC	)	FINDINGS OF FACT AND
	)	CONCLUSIONS OF LAW,
	)	AND DECISION AND ORDER
To amend the State Land Use	)	FOR A STATE LAND USE
Agricultural and Conservation	)	DISTRICT BOUNDARY
Districts to the State Land Use Urban	)	AMENDMENT
District for approximately 725.2 acres	)	
of land at *ahupua`a* of Kau, North	)	
Kona Judicial District, Island and State	)	
of Hawai`i, Tax Map Key No.	)	
(3) 7-2-005: 001	)	
	)	

FINDINGS OF FACT AND CONCLUSIONS OF LAW AND DECISION AND ORDER FOR A STATE LAND USE DISTRICT BOUNDARY AMENDMENT

HILHUHILU DEVELOPMENT, LLC, a Hawai`i limited liability company ("Petitioner"), filed a Petition For Land Use District Boundary Amendment on December 23, 2003, pursuant to Chapter 205, Hawai`i Revised Statutes ("HRS"), and Title 15, Chapter 15, Subchapter 3, Hawai`i Administrative Rules ("HAR"), to amend the State land use district boundary to reclassify approximately 274.9 acres of land from the Conservation District to the Urban District and 450.3 acres of land from the Agricultural District to the Urban District (total area: 725.2

acres) situate at Kau, North Kona, County and State of Hawai`i, bearing Tax Map Key Number (3) 7-2-5: 001 (the "Petition Area") to develop a master planned village community called Palamanui with a mix of single-family and multi-family residential lots and built units, and commercial spaces (medical, office, classrooms, business hotel and health- related facilities), along with active and passive recreation facilities including an 18-hole golf course with clubhouse and driving range, a lowland dry forest preserve, archaeological and cave preserve areas, active and passive activity parks, and a trail system (the "Project").

The Land Use Commission of the State of Hawai`i ("Commission"), having examined the testimony, evidence and arguments presented during the hearing, hereby makes the following findings of fact, conclusions of law, and decision and order:

FINDINGS OF FACT

PROCEDURAL MATTERS

1. On December 23, 2003, Petitioner filed a Petition For Land Use District Boundary Amendment ("Petition") and Draft Environmental Impact Statement ("DEIS").

2. On February 9, 2004, the Commission filed an order requiring Petitioner to prepare a Final Environmental Impact Statement ("FEIS").

Commission, whether or not the University develops any portion of the 500-acre UHCWH site.

11. Article XI, Section 3, of the Hawai`i Constitution requires the State to conserve and protect agricultural lands, promote diversified agriculture, increase agricultural self-sufficiency, and assure the availability of agriculturally suitable lands.

12. The Project will not have a significant impact on agriculture on the island of Hawai`i or in the State because the land is not suited for commercial agriculture.

13. This reclassification action is consistent with the goals and policies of the Hawai`i County General Plan, Hawai`i State Plans, Hawai`i State Functional Plans and Chapters 205, 205A, 343, HRS, and other applicable rules and regulations.

DECISION AND ORDER

IT IS HEREBY ORDERED that the Petition Area, being the subject of Docket No. A03-477, filed by Petitioner Hiluhilu Development, LLC, consisting of 725.2 acres of land in the State Land Use Conservation and Agriculture Districts at Kau, North Kona, Island, County and State of Hawai`i, identified as Tax Map Key No. (3) 7-5-002: 001 is hereby reclassified into the State

Land Use Urban District, and the State Land Use District Boundaries are amended accordingly.

Based on the Findings of Fact and Conclusions of Law, it is hereby determined that the valued cultural, historical or natural resources and any customary and traditional native Hawai`ian rights and practices within the Petition Area that have been identified herein shall be protected; that the Project shall not significantly affect or impair the continued exercise of those rights and practices; and that the reasonable exercise of those rights and practices shall be protected, to the extent feasible, by the conditions of approval set forth herein.

IT IS FURTHER ORDERED THAT the reclassification of the Petition Area from the State Land Use Conservation and Agriculture Districts to State Land Use Urban District shall be subject to the following conditions:

1. **Affordable Housing.** Petitioner shall provide affordable housing opportunities for residents of the State of Hawai`i to the satisfaction of the County, acting in accordance with the County's Ordinance No. 05-23, Affordable Housing Policy For the County of Hawai`i. Petitioner shall provide no less than 100 onsite affordable units in accordance with the Petitioner's representations to the Commission or whatever number of affordable units is deemed acceptable by the County in accordance with the County's Ordinance No. 05-23, Affordable Housing Policy For the County of Hawai`i, whichever is greater. The location

and distribution of the affordable housing units or other provisions for affordable housing shall be under such terms as may be mutually agreeable between the Petitioner and County.

2. **Public School Facilities.** Petitioner shall contribute to the development, funding and construction of public school facilities as determined by and to the satisfaction of the DOE. Petitioner shall enter into an agreement with the DOE covering the specific terms of such contribution prior to final subdivision approval and file such agreement with the Commission and the County.

3. **Wastewater Facilities.** Petitioner shall design and construct its wastewater disposal system in compliance with the requirements of the County and the DOH.

4. **Wastewater Agreement for Underground Injection Offsite.** Prior to final subdivision approval, Petitioner shall provide the Commission and the County with a copy of the executed agreement to inject wastewater underground offsite and above the UIC line on the adjacent State-owned land to the south of the Petition Area, or with other such landowner and location as approved by DOH.

5. **Traffic Impact and Mitigation.** Petitioner shall fund, design and construct its share of local and regional transportation improvements as determined by the SDOT and the County, which includes but is not limited to:

a. **Midlevel Connection with Ka`iminani Drive.** Petitioner shall provide at its sole cost and expense a two-lane roadway between the Petition Area and Ka`iminani Drive in an alignment approved by the County and the University and acceptable to any other State agency with a property interest in the land on which the two-lane roadway is located.

b. ***Mauka-Makai* Connector Road**. A *mauka-makai* connector road providing public access between Queen Kaahumanu Highway and the Mamalahoa Highway shall be provided at Petitioner's sole cost and expense. Said *mauka-makai* connector road shall connect to Mamalahoa Highway as Petitioner and the County may agree.

c. **Right-Of-Way For An Alternative *Mauka-Makai* Connector Road.** Petitioner shall reserve a right-of-way along the east (*mauka*) portion of the Petition Area to support the possible future connection to the Mamalahoa Highway. Petitioner shall construct at its sole cost and expense all portions of said future road that is within the Petition Area. Any proposed road construction plans and associated utility easements which may impact the Lowland Dry Forest Preserve shall be subject to prior review and approval of the

Commission and shall include consultation with the County, such that County engineering standards or other County requirements do not adversely impact the Lowland Dry Forest Preserve.

d. **Request to Limit Vehicle Traffic on Portions of Makalei Drive.** In the event that the *mauka-makai* connector road utilizes Makalei Drive, to promote greater traffic safety, Petitioner shall prior to final subdivision approval, use reasonable efforts to petition the County to limit motor vehicle traffic on Makalei Drive as a through street, as it transverses Makalei Estates, to only those vehicles that have a gross vehicle weight of less than 10,000 pounds.

6. **Integrated Natural Cultural Resources Management Plan (INCRMP).** Petitioner shall implement the revised INCRMP including completion of all plans (with appropriate approvals), covenants and easements required under the revised INCRMP. Such implementation shall include, but not be limited to the following:

a. **Preservation of Significant Historic, Cultural, and Natural Resources.** Petitioner shall preserve all of the identified significant historic, cultural, and natural resources on the Petition Area as represented by the Petitioner to the Commission.

b. **Historic Preservation Mitigation Plan.** Petitioner shall submit data recovery plans and preservation plans to the SHPD and obtain approval of

those plans within one year of the issuance of this Decision and Order. If said plans as approved vary from those incorporated into the revised INCRMP, Petitioner shall amend the revised INCRMP to reflect SHPD's recommendations and submit the amended revised INCRMP to the Commission for its approval prior to final subdivision approval.

c. **Preservation of Lowland Dry Forest.** Petitioner shall permanently protect the Lowland Dry Forest Preserve. Any proposed road construction plans, irrigation well sites and proposed access and utility easements which may impact the Lowland Dry Forest Preserve shall be subject to prior review and approval of the Commission.

d. **Coordination of Lowland Dry Forest Preservation Efforts.** Petitioner shall use reasonable efforts to coordinate its preservation of the Lowland Dry Forest Preserve with the State of Hawai`i Department of Land and Natural Resources as the Lowland Dry Forest Preserve extends in some places onto the neighboring state-owned property. Such coordination shall include, but not be limited to: sharing information regarding updated biological surveys; coordinating the development of a fire prevention plan; establishing appropriate firebreaks; and exploring contingencies for using the Project's irrigation systems to control brush fires.

e. **Preservation of Flora Outside of Lowland Dry Forest.** Petitioner shall preserve all flora that are federally listed as Endangered Species throughout the Petition Area. Petitioner shall to the extent practicable, preserve flora identified as non-endangered indigenous and Species of Concern by incorporating such plants into the Project's landscaping and exclusionary fenced areas.

f. **Unidentified Archaeological Finds.** If any burials, archaeological or historic sites such as artifacts, marine shell concentrations, charcoal deposits, or stone platforms, pavings or walls are discovered during the course of construction of the Project, then all construction activity in the vicinity of the discovery shall stop until the issuance of an archaeological clearance from the SHPD that mitigative measures have been implemented to its satisfaction.

g. **Preservation of Native Hawai`ian Gathering and Access Rights.** Petitioner shall preserve and protect any established Native Hawai`ian traditional and customary rights exercised for subsistence, cultural and religious practices on the Petition Area.

h. **Updated Biological Survey.** Petitioner shall submit an updated biological survey of the Petition Area to the Commission before construction of the Project begins. The updated biological survey shall include but not be

limited to, detailed information pertaining to any significant invertebrates and Hawai'ian Hoary Bats within the Petition Area.

i. Cultural Monitor for Grubbing and Grading Activities. Petitioner shall retain the services of an appropriate number of qualified cultural monitors such that all grubbing and grading activities within the Petition Area are duly monitored.

7. Open Space Buffer. Petitioner shall maintain an open space buffer on the Petition Area along Queen Kaahumanu Highway with a minimum width of 800 feet. The only man-made structures allowed in this open space buffer shall be the Northern Project Access Road, the Project's wastewater treatment plant, limited portions of the Project's golf course, and a groundwater monitoring well – as represented by the Petitioner to the Commission. Petitioner shall appropriately screen such uses to maintain the visual continuity of such buffer.

8. Civil Defense. Petitioner shall, on a fair-share basis, fund and construct adequate civil defense measures as determined by the State and County Civil Defense Agencies.

9. Air Quality Monitoring. Petitioner shall participate in an air quality-monitoring program as specified by the DOH.

10. Noise and Avigation Easement. Petitioner shall notify all prospective buyers and future occupants of the Petition Area or portions of the Petition Area that overflights can occur from aircraft using KOA Airport. Petitioner shall grant to the State an avigation (right of flight) and noise easement in the form prescribed by the SDOT on any portion of the Petition Area subject to noise levels exceeding 55 Ldn.

11. Notification of Potential Nuisances - Agricultural. Petitioner shall notify all prospective buyers and future occupants of the Petition Area or portions of the Petition Area of potential odor, noise and dust pollution if there are any lands in the Agricultural District surrounding the Petition Area.

12. Notification of Potential Nuisances – HELCO. Petitioner shall notify all prospective buyers and future occupants of the Petition Area or portions of the Petition Area of the potential noise and air quality impacts associated with the existing use and proposed improvements to Hawaii Electric Light Company, Inc.'s Keāhole Generating Station and Airport Substation.

13. Hawai'i Right to Farm Act. Petitioner shall notify all prospective buyers and future occupants of the Petition Area or portions of the Petition Area that the Hawai'i Right to Farm Act, Chapter 165, HRS, limits the circumstances under which pre-existing farm activities may be deemed a nuisance if there are any lands in the Agricultural District surrounding the Petition Area.

14. Drainage Improvements. Petitioner shall fund the design and construction of drainage improvements required as a result of the development of the Petition Area to the satisfaction of the appropriate State and County agencies.

15. Integrated Solid Waste Management Plan. Petitioner shall cooperate with the DOH and the County to conform to the program goals and objectives of Chapter 342G, HRS, and the County's approved integrated solid waste management plans in accordance with a schedule and timeframe satisfactory to the DOH. Petitioner shall, in coordination with appropriate State and County government agencies, assist in the planning and promotion of solid waste recycling facilities for the Project. This condition shall be included in the Project's CC&Rs.

16. Groundwater and Near Shore Water Monitoring. Petitioner shall participate in the coastal water-monitoring program with the SDOT Airports Division. Petitioner shall conduct groundwater monitoring from a monitoring well to be located at the *makai* end of the Petition Area. Monitoring programs and mitigation measures shall be approved by the DOH.

17. Water Service. Petitioner shall fund and construct adequate water source, storage, and transmission facilities and improvements as represented to

the Commission and as required by the County Department of Water Supply to accommodate the Project.

18. Best Management Practices. Petitioner shall implement best management practices to reduce or eliminate soil erosion and groundwater pollution and implement dust control measures during the development process in accordance with DOH guidelines.

19. Water Conservation Measures. Petitioner shall implement water conservation measures and best management practices, such as use of indigenous and drought tolerant plants and to the extent possible, use Species of Concern and Endangered Species, and incorporate such measures into common areas landscape planning, and shall incorporate low flow fixtures into the construction of all residential and commercial units.

20. Energy Conservation Measures. Petitioner shall incorporate solar energy and energy conservation techniques where feasible into design of all residential and commercial units.

21. Hazardous Materials. Storage and/or disposal of hazardous materials on the Petition Area shall comply with all applicable DOH requirements and all necessary permits shall be obtained.

22. Golf Course. Petitioner shall comply with the principles of the DOH's "Guidelines Applicable to Golf Courses in Hawai`i" (July 2002, Version

6). Petitioner shall develop and maintain the golf course in accordance with the Audubon International's Signature Silver Program standard. To the extent practicable, the Petitioner will utilize R-1 recycled wastewater to irrigate the golf course.

23. **University Inn and Conference Center.** As represented before the Commission, the Project shall include an approximate 120-unit University Inn and Conference Center, which shall serve as a business hotel and provide accommodations in conjunction with University operations. The University Inn and Conference Center shall not be designed and operated as resort-type hotel or be used for time-share purposes.

24. **Compliance with Representations to the Commission.** Petitioner shall develop the Petition Area in substantial compliance with the representations made to the Commission. Failure to so develop the Petition Area may result in reversion of the Petition Area to its former classification, or change to a more appropriate classification.

25. **Notice of Change of Ownership.** Petitioner shall provide notice to the Commission of any intent to sell, lease, assign, place in trust, or otherwise voluntarily alter the ownership interests in the Petition Area, prior to development of the Petition Area.

26. **Annual Reports.** Petitioner shall timely provide without any prior notice, annual reports to the Commission, OP and the County in connection with the status of the subject Project proposed for the reclassification area, and Petitioner's progress in complying with the conditions imposed. The annual report shall be submitted in a form prescribed by the executive officer of the Commission. The annual report shall be due prior to or on the anniversary date of the approval of the Petition.

27. **Release of Conditions.** The Commission may fully or partially release the conditions provided herein as to all or any portion of the Petition Area upon timely motion and upon the provision of adequate assurance of satisfaction of these conditions by the Petitioner.

28. **Notice of Imposition of Conditions.** Within seven days of the approval date of the Petition, the Petitioner shall (a) Record with the Bureau of Conveyances a statement that the Petition Area is subject to conditions imposed herein by the Commission; and (b) File a copy of such recorded statement with the Commission.

29. **Recordation of Conditions.** Petitioner shall record the conditions imposed herein by the Commission with the Bureau of Conveyances within sixty days after the receipt of the Decision and Order pursuant to Section 15-15-92, HAR.

ADOPTION OF ORDER

The undersigned Commissioners, being familiar with the record and proceedings, hereby adopt and approve the foregoing ORDER this 13th day of June, 2005. This ORDER and its ADOPTION shall take effect upon the date this ORDER is certified and filed by this Commission.

Done at Honolulu, Hawai`i, this 13th day of June, 2005, per motion on May 19, 2005.

APPROVED AS TO FORM

Deputy Attorney General

LAND USE COMMISSION
STATE OF HAWAI`I

By
P. ROY CATALANI
Chairperson and Commissioner

By
RANDALL SAKUMOTO
Vice-Chairperson and Commissioner

By
STEVEN LEE MONTGOMERY
Vice Chairperson and Commissioner

By
ISAAC FIESTA, JR.
Commissioner

By (absent)
MICHAEL D. FORMBY
Commissioner

By
KYONG SU IM
Commissioner

By (absent)
LISA M. JUDGE
Commissioner

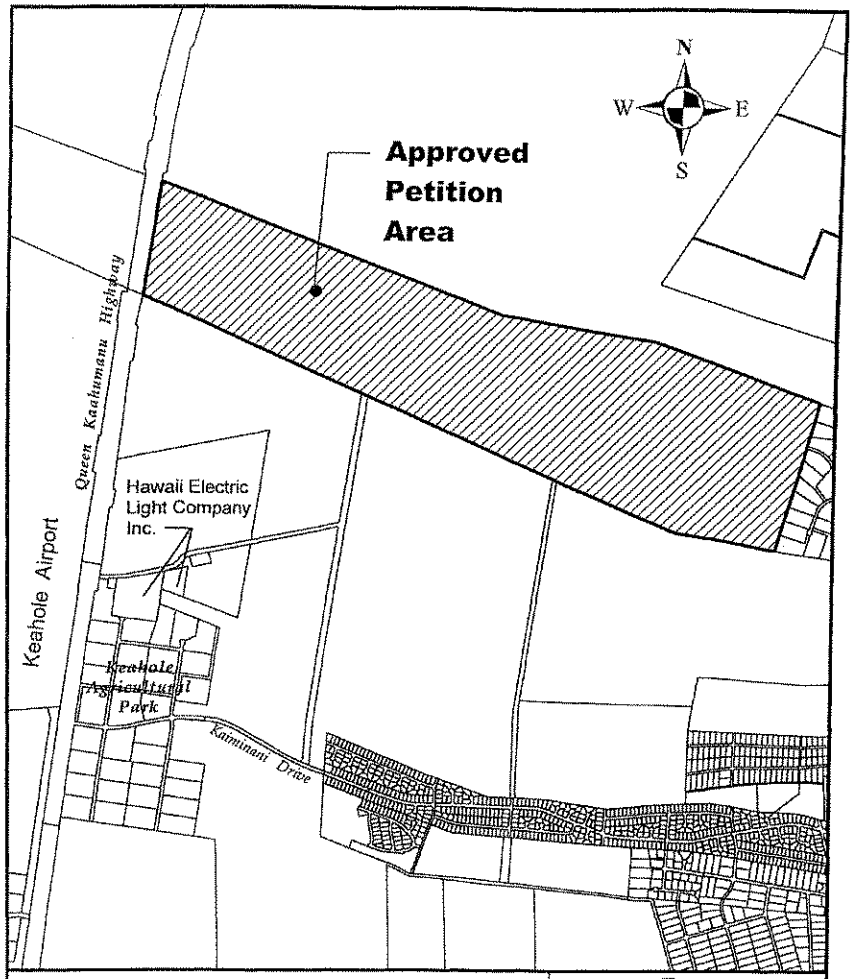
By
RANSOM A.K. PILTZ
Commissioner

Filed and effective on
JUN 13 2005

Certified by:

ANTHONY J. H. CHING

By (absent)
PETER YUKIMURA
Commissioner



A03-744 HILUHILU DEVELPOMENT, LLC

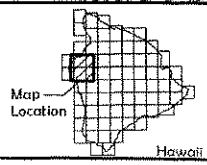
MAP LOCATION

Tax Map Key: 7-2-05: 1

Kau, North Kona, Hawaii

Scale: 1" = 2,000 ft.

EXHIBIT "A"



Appendix B. Air Quality Impact Report

AIR QUALITY IMPACT REPORT (AQIR)

PROPOSED MAIN STREET COLLECTOR ROAD
KAILUA-KONA, HAWAII

15 June 2005

PREPARED FOR:

Wil Chee - Planning, Inc.

PREPARED BY:

J. W. MORROW
Environmental Management Consultant
1481 South King Street, Suite 548
Honolulu, Hawaii 96814

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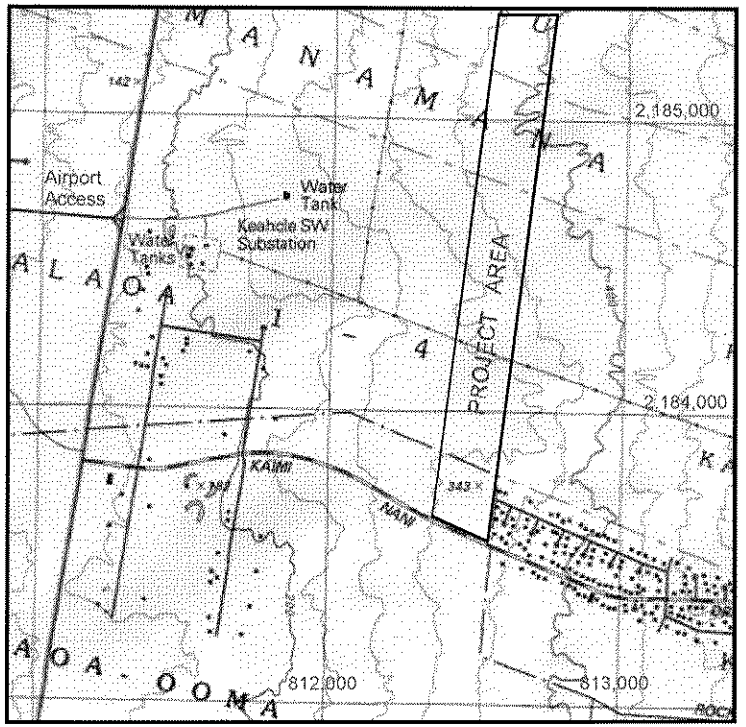
1. INTRODUCTION

A new north-south 2-lane roadway is being proposed between Queen Kaahumanu Highway and Mamalahoa Highway east of the Keahole Airport on the island of Hawaii in Hawaii (Figure 1). The new road will connect the existing Kaimi Nani Drive with the proposed Palamanui Subdivision.

The purpose of this report is to assess the short and long-term impacts of the proposed road on air quality. The overall project can be considered an "indirect source" of air pollution as defined in the federal Clean Air Act[1] since its primary association with air quality is its inherent attraction for mobile sources, i.e., motor vehicles. Much of the focus of this analysis, therefore, is on the project's ability to generate additional traffic and the resultant impact on air quality. Air quality impact was evaluated for existing (2005) and future (2015) conditions with and without the proposed development.

Finally, during construction of the roadway air pollutant emissions will be generated onsite and offsite due to vehicular movement, grading, concrete and asphalt batching, and general dust-generating construction activities. These impacts have also been addressed.

FIGURE 1
PROJECT LOCATION



USGS Quad Keahole Point (1996)
1:24,000 (NAD-83)

2. AIR QUALITY STANDARDS

A summary of State of Hawaii and national ambient air quality standards (NAAQS) is presented in Table 1.[2,3,4] Note that Hawaii's standards are not divided into primary and secondary standards as are the federal standards.

Primary standards are intended to protect public health with an adequate margin of safety while secondary standards are intended to protect public welfare through the prevention of damage to soils, water, vegetation, man-made materials, animals, wildlife, visibility, climate, and economic values [5]. Note that in the case of the principal automotive pollutants [CO, NO_2, and O_3], the primary and secondary standards are identical.

Some of Hawaii's standards (CO, NO_2, and O_3) are clearly more stringent than their federal counterparts and like their federal counterparts in the case of short-term standards, they may be exceeded once per year.

Finally, the State of Hawaii also has fugitive dust regulations for particulate matter (PM) emanating from construction activities [6]. There simply can be no visible emissions from fugitive dust sources.

TABLE 1

SUMMARY OF STATE OF HAWAII AND FEDERAL AMBIENT AIR QUALITY STANDARDS

POLLUTANT	AVERAGING PERIOD	NAAQS PRIMARY	NAAQS SECONDARY	STATE STANDARDS
PM_{10}	Annual 24-hr	50 150	50 150	50 150
$PM_{2.5}$	Annual 24-hr	15 65	15 65	— —
SO_2	Annual 24-hr 3-hr	80 365 —	— — 1,300	80 365 1,300
NO_2	Annual	100	100	70
CO	8-hr 1-hr	10 40	— —	5 10
O_3	1-hr 8-hr	235 156	235 156	100 —
H_2S	1-hr	—	—	35
Pb	Calendar Quarter	1.5	1.5	1.5

KEY: PM_{10} - particulate matter ≤ 10 microns
$PM_{2.5}$ - particulate matter ≤ 2.5 microns
SO_2 - sulfur dioxide
NO_2 - nitrogen dioxide
CO - carbon monoxide
O_3 - ozone
H_2S - hydrogen sulfide
Pb - lead

All concentrations in micrograms per cubic meter ($\mu g/m^3$) except CO which is in milligrams per cubic meter.

3. EXISTING AIR QUALITY

3.1 General. The state Department of Health (DOH) maintains a network of air monitoring stations around the state to gather data on the following regulated pollutants:

- particulate matter ≤ 10 microns (PM_{10})
- sulfur dioxide (SO_2)
- nitrogen dioxide (NO_2)
- carbon monoxide (CO)
- ozone (O_3)

In the case of PM_{10} , measurements are made on a 24-hour basis to correspond with the averaging period specified in state and federal standards. Depending on the sampling equipment and site, samples are collected either continuously or once every six days in accordance with U. S. Environmental Protection Agency (EPA) guidelines. Carbon monoxide, sulfur dioxide, and ozone, however, are measured on a continuous basis due to their short-term (1- and 3-, and 8-hour) standards. Nitrogen dioxide is also measured with continuous instruments and averaged over a full year to correspond to its annual standards. Lead sampling was discontinued in October 1997 with EPA approval. This was largely due to the elimination of lead in gasoline and the resulting reduction of ambient lead levels in Hawaii to essentially zero.

3.2 Department of Health Monitoring. There are no DOH monitoring stations in the vicinity of the project site. A summary of the most recent published air quality data [7] from the nearest site at Kealakekua on the Big Island and other Oahu sites is presented in Table 2. These data are indicative of the generally good air quality in Hawaii County and may be considered reasonably representative of existing air quality in the project area.

4. CLIMATE AND METEOROLOGY

4.1 Climate. Climate in the project area is typical of most of Hawaii with monthly temperatures ranging from the low 70's (°F) in the coolest month to the high 70's in the warmest months. [8] As is also true in much of Hawaii, rainfall varies greatly as one moves "mauka", i.e. towards the mountains, or "makai" towards the shoreline as well is in and out of the "rain shadow" of high mountains. In this instance, annual rainfall is only in the 10 - 20 inches range due in large part to the blocking effect of the 8,000-foot Hualalai and 14,000-foot Mauna Loa mountains east northeast of the site. In accordance with Thornwaite's scheme for climatic classification, this results in a precipitation/evaporation (P/E) index which classifies the area as "semi-arid". [9]

4.2 Surface Winds. Wind data collected in 1993-94 near the Keahole Generating Station were obtained and analyzed to determine annual and seasonal patterns. The predominance of northeast trade winds typical of many sites in Hawaii is not evident in the annual windrose depicted in Figure 2 (see also Table 3). There is a wider distribution of wind directions with two groups appearing to

TABLE 2

AIR QUALITY DATA
DEPARTMENT OF HEALTH MONITORING SITES
2003

Pollutant	Concentration ($\mu g/m^3$)
Particulate matter ≤ 10 microns (PM_{10}) 24-hr (max)	33
Annual	16
Particulate matter ≤ 2.5 microns ($PM_{2.5}$) 24-hr (max)	11
Annual	4
Sulfur dioxide (SO_2) 3-hr (max)	91
24-hr (max)	39
Annual	10
Carbon monoxide (CO) 1-hr (max)	2.17
8-hr (max)	0.84
Ozone (O_3) 1-hr (max)	106
8-hr (max)	79
Nitrogen Dioxide (NO_2) Annual	9

Notes: 1. CO, NO_2 and $PM_{2.5}$ data from the Kapolei, Oahu site.
2. PM_{10} data from the West Beach, Oahu site.
3. SO_2 data from the Kona, Hawaii site.
4. O_3 data from the Sand Island, Oahu site.
4. CO data are milligrams per cubic meter (mg/m^3)

Source: Hawaii Department of Health (Reference 7)

FIGURE 2
ANNUAL WIND ROSE

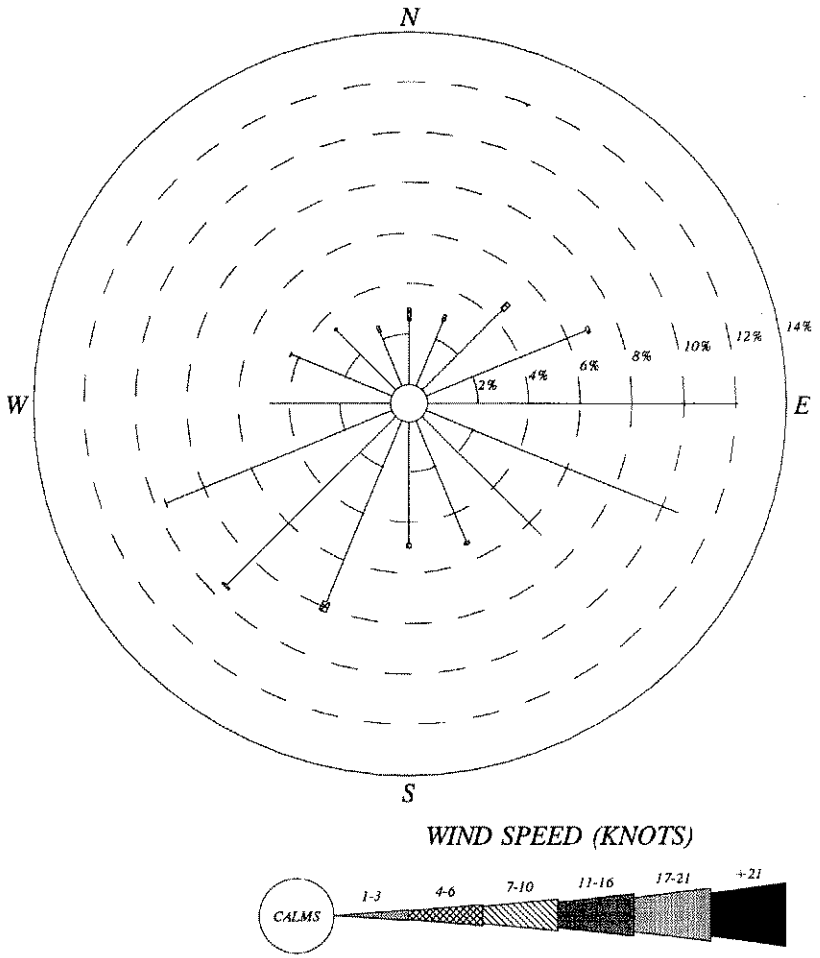


TABLE 3

ANNUAL JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION KEAHOLE, HAWAII

Direction	Wind Speed (knots) 1 - 3	4 - 6	7 - 10	11 - 16	17 - 21	> 21	TOTAL
N	0.02502	0.00524	0.00000	0.00000	0.00000	0.00000	0.03026
NNE	0.02764	0.00262	0.00000	0.00000	0.00000	0.00000	0.03026
NE	0.04479	0.00345	0.00000	0.00000	0.00000	0.00000	0.04824
ENE	0.06814	0.00119	0.00000	0.00000	0.00000	0.00000	**0.06933**
E	0.12102	0.00000	0.00000	0.00000	0.00000	0.00000	**0.12102**
ESE	0.10649	0.00000	0.00000	0.00000	0.00000	0.00000	**0.10649**
SE	0.06683	0.00000	0.00000	0.00000	0.00000	0.00000	**0.06683**
SSE	0.05229	0.00119	0.00000	0.00000	0.00000	0.00000	0.05348
S	0.04848	0.00179	0.00000	0.00000	0.00000	0.00000	0.05027
SSW	0.07778	0.00393	0.00000	0.00000	0.00000	0.00000	**0.08172**
SW	0.09422	0.00083	0.00000	0.00000	0.00000	0.00000	**0.09506**
WSW	0.09589	0.00012	0.00000	0.00000	0.00000	0.00000	**0.09601**
W	0.04789	0.00000	0.00000	0.00000	0.00000	0.00000	0.04789
WNW	0.04312	0.00036	0.00000	0.00000	0.00000	0.00000	0.04348
NW	0.03359	0.00048	0.00000	0.00000	0.00000	0.00000	0.03407
NNW	0.02299	0.00262	0.00000	0.00000	0.00000	0.00000	0.02561
Total	**0.97618**	0.02382	0.00000	0.00000	0.00000	0.00000	1.00000

predominate, i.e., ENE to SE (36%) and SW (27%). As is the case with rainfall, this is in large part due to the blocking effect of the large mountain masses northeast of the site which block the synoptic northeasterly trade winds. Wind speeds are also quite low with over 97% less than 4 knots (4.6 mph).

When seasonal patterns were investigated, results again differed somewhat from what is typically observed. While the "winter" (January) windrose (Figure 3) shows a fairly typical diversity of wind directions due to the weakening of the prevailing trade winds at that time of year, the "summer (July) windrose (Figure 4) shows a predominance of southerly winds in contrast to the northeasterly trade winds which generally prevail during that season of the year.

5. SHORT-TERM IMPACTS

5.1 Onsite Impacts. The principal source of short-term air quality impact will be construction activity. Construction vehicle activity can at times increase automotive pollutant concentrations along adjoining existing streets as well as on the project site itself. Construction activity itself as well as additional construction vehicle traffic may at times cause a temporary reduction in average travel speeds with a concomitant increase in vehicle emissions due to the "stop and go" traffic conditions. This may be particularly true during the construction of the intersection of the proposed Main Street with Kaimi Nani Drive. Construction vehicle movement on unpaved on-site areas will also generate particulate matter (PM) emissions. EPA studies on fugitive dust emissions from construction sites indicate that

FIGURE 3
JANUARY WIND ROSE

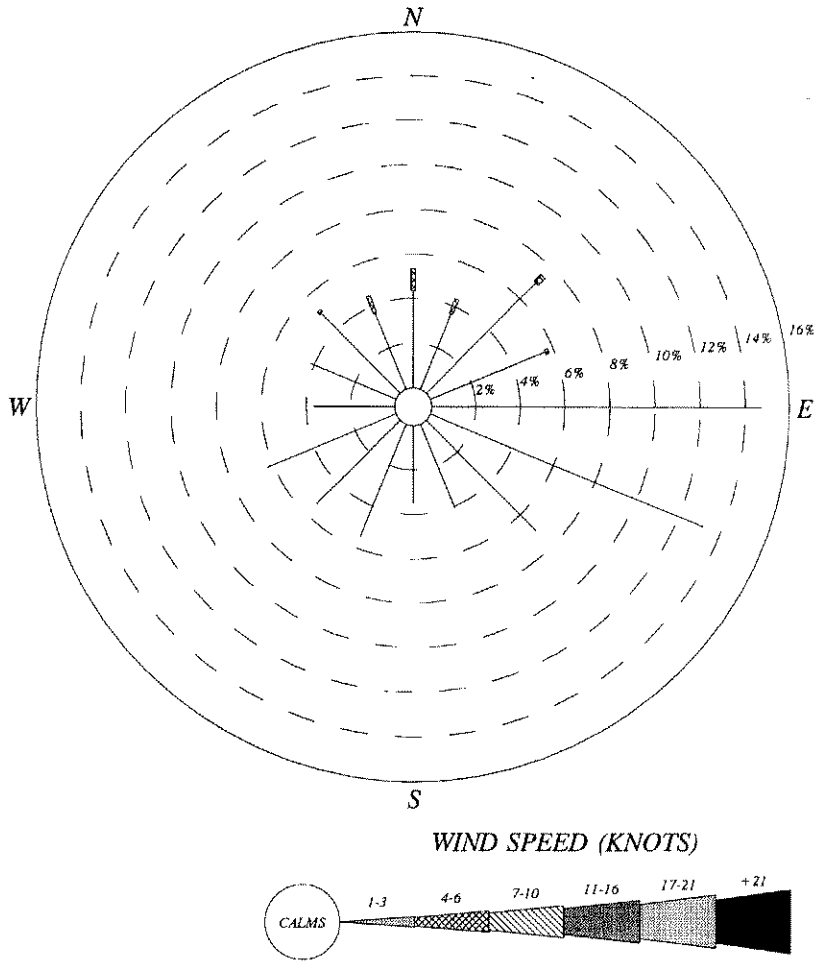
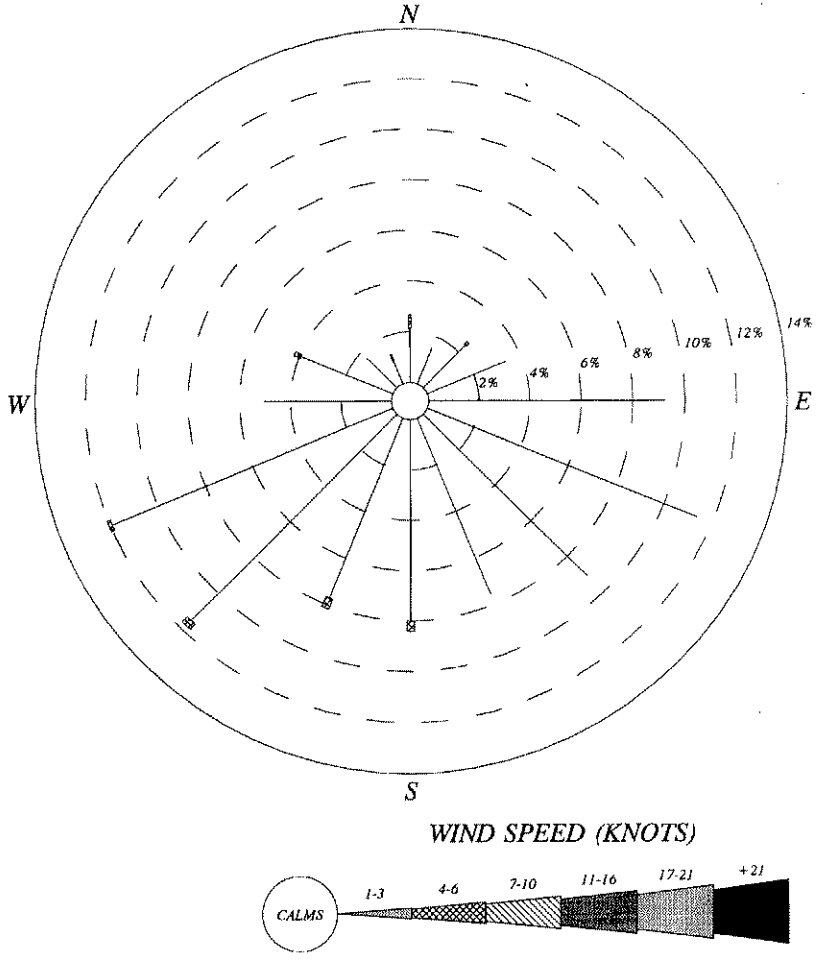


FIGURE 4
JULY WIND ROSE



about 1.2 tons/acre per month of activity may be expected under conditions of medium activity, moderate soil silt content (30%), and a precipitation/ evaporation (P/E) index of 50 [9, 10].

5.2 Offsite Impacts. In addition to the onsite impacts attributable to construction activity, there will also be offsite impacts due to the operation of concrete and asphalt batching plants needed for road construction. Such plants routinely emit particulate matter and other gaseous pollutants; however. it is too early to identify the specific facilities that will be providing these materials and thus the discussion of air quality impacts is necessarily generic. The batch plants which will be producing this concrete and asphalt must be permitted by the Department of Health Clean Air Branch pursuant to state regulations [6]. In order to obtain these permits they must demonstrate their ability to continuously comply with both emission [6] and ambient air quality [4] standards. Under the federal Title V operating permit requirements [11], now incorporated in Hawaii's rules [8], air pollution sources must regularly attest to their compliance with all applicable requirements. A typical concrete batch plant in Hawaii is equipped with fabric filters, i.e., "baghouses" for particulate matter (PM) control. Similarly, a typical asphalt plant is equipped with either a wet venturi scrubber or fabric filters. The efficiency of such controls is normally 95 - 99%.

6. MOBILE SOURCE IMPACTS

6.1 Mobile Source Activity. The traffic analysis report [12] prepared for the proposed project served as the basis for this mobile source impact analysis. Existing and projected future peak-hour traffic volumes for the principal roads serving the project site were obtained from that report. This included

scenarios with and without the proposed Main Street collector road and with and without the proposed University of Hawaii Center - West Hawai (UHCWH).

6.2 Emission Factors. Automotive emission factors for carbon monoxide (CO) were generated for calendar years 2005 and 2015 using EPA's Mobile Source Emissions Model (MOBILE 6.2). [13] To localize the emission factors as much as possible, an age distribution for registered vehicles in the City & County of Honolulu [14] was used in lieu of national statistics. That same age distribution was the basis for the distribution of vehicle miles traveled as well.

6.3 Modeling Methodology. Mobile source air quality modeling has historically focused on estimating concentrations of non-reactive pollutants, primarily carbon monoxide (CO). This has been the case because CO is relatively stable in the atmosphere having a half-life on the order of about one (1) month,[15] and it comprises the largest fraction of automotive emissions. [13]

Using the traffic data provided, modeling was performed for the for the years 2005 and 2015 with and without the project. The latest version of the EPA guideline model CAL3QHC [16, 17] as revised to allow for use of hourly meteorological data files [18, 19] was employed to estimate near-intersection carbon monoxide concentrations. CO concentrations were estimated at an array of 60 - 80 receptor sites, spaced at a distance of 10 meters around the various intersections studied. A background concentration of 0.7 mg/m^3 from the Department of Health's 2003 monitoring data was also used as the background concentration in the modeling. Hourly meteorological data for a.m. and p.m. peak

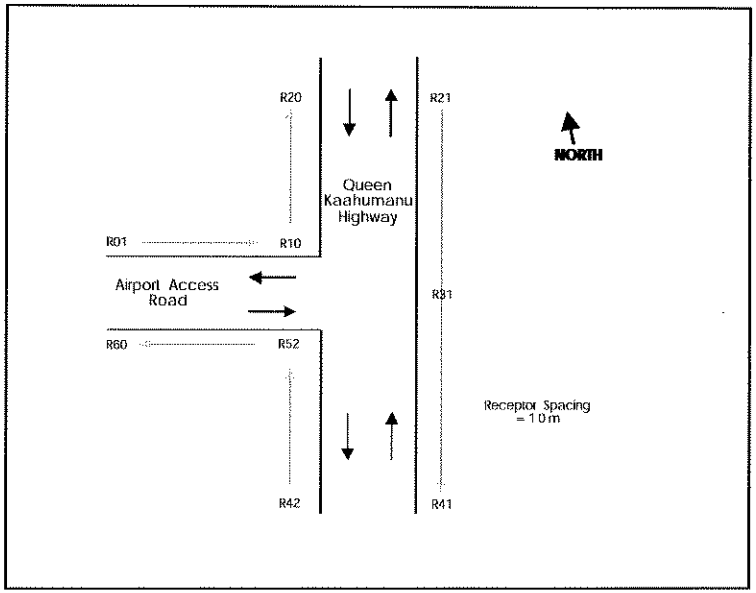
traffic hours used in the model were extracted from data collected at the nearby Keahole Generating Station site and preprocessed with EPA's PCRAMMET program. [20]

6.4 Results: 1-Hour CO Concentrations. The results of this modeling are summarized in Figures 5 - 9. Maximum estimated 1-hour CO concentrations in milligrams per cubic meter (mg/m^3) for each of the evaluated scenarios are presented along with the particular receptor location at which they were predicted. The results suggest that, under *worst case* conditions of meteorology and traffic, both the federal and state 1-hour CO standards would be met at receptor locations 10 meters and beyond the edge of roadways expected to be affected by project-related traffic. The changes in CO levels are insignificant due to the relatively small increase in projected traffic and also the offsetting effect of the federal motor vehicle emissions control program. Vehicle emissions standards for motor vehicles get progressively more stringent over time; thus, older, higher emitting vehicles lost by attrition, are replaced by newer, lower-emitting vehicles which comply with the more stringent standards.

6.5 Results: 8-Hour CO Concentrations. The 8-hour values presented in Figures 5 - 9 are very conservative estimates because they are based on averages of the worst case 1-hour values during a.m. and p.m. peak hour traffic and meteorology. Nevertheless, the results are similar to the 1-hour findings in that compliance with state and federal standards is indicated.

FIGURE 5

ESTIMATES OF MAXIMUM 1- AND 8-HOUR CARBON MONOXIDE CONCENTRATIONS
Queen Kaahumanu Highway at KeaholeAirport
Peak Traffic Hours
2005 - 2015

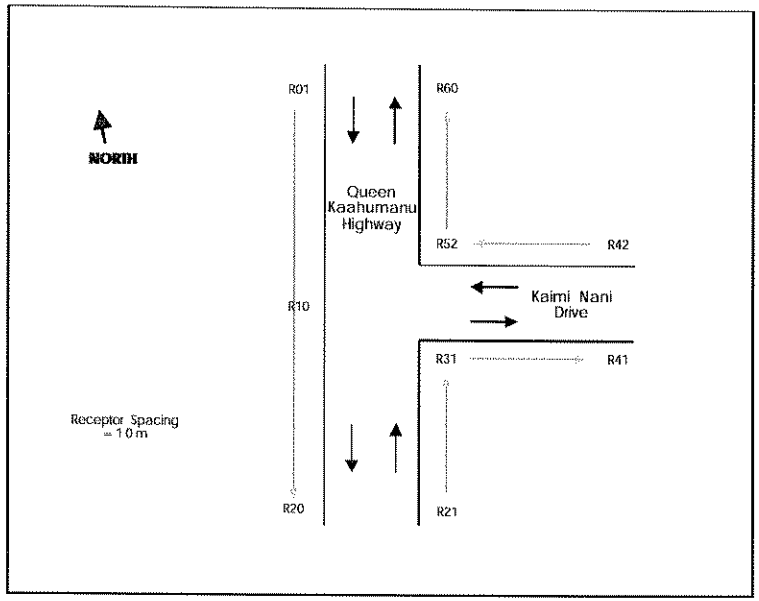


CO Concentration (mg/m^3)

Averaging Time	2005	2015 w/o proj	2015 w/proj w/o UHCWH	2015w/proj w/UHCWH
1-hr AM	1.78 @ R10	1.78 @ R10	1.78 @ R10	1.78 @ R10
1-hr PM	0.87@R32	0.98@R30	0.98@R30	0.98 @ R30
8-hr	0.82	0.87	0.82	0.82

FIGURE 6

ESTIMATES OF MAXIMUM 1- AND 8-HOUR
CARBON MONOXIDE CONCENTRATIONS
Queen Kaahumanu Highway at Kaimi Nani Drive
Peak Traffic Hours
2005 - 2015

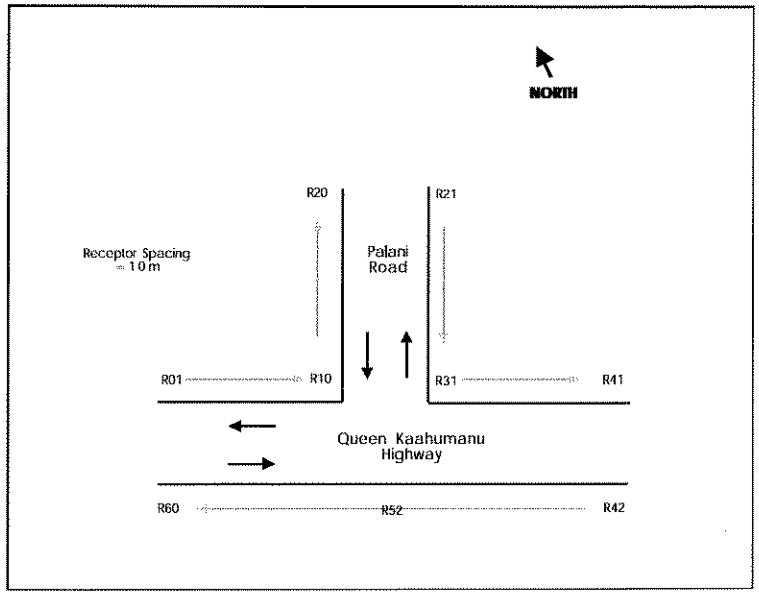


CO Concentration (mg/m ^{3})

Averaging Time	2005	2015 w/o proj	2015 w/proj w/o UHCWH	2015w/proj w/UHCWH
1-hr AM	1.78@R08	1.78 @ R08	1.66 @ R04	1.78 @ R07
1-hr PM	1.09@R51	1.09@R52	1.09@R52	1.09 @ R52
8-hr	0.91	0.96	0.91	0.93

FIGURE 7

ESTIMATES OF MAXIMUM 1- AND 8-HOUR
CARBON MONOXIDE CONCENTRATIONS
Queen Kaahumanu Highway at Palani Road
Peak Traffic Hours
2005 - 2015

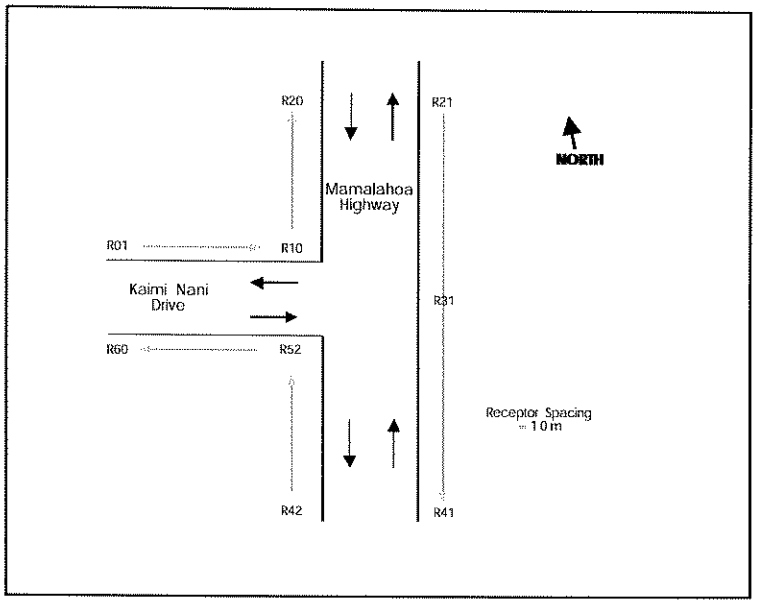


CO Concentration (mg/m ^{3})

Averaging Time	2005	2015 w/o proj	2015 w/proj w/o UHCWH	2015w/proj w/UHCWH
1-hr AM	1.32 @ R09	1.78 @ R08	1.78 @ R08	1.78 @ R08
1-hr PM	1.09@R30	1.32@R30	1.32@R30	1.32 @ R30
8-hr	0.73	1.07	1.07	1.07

FIGURE 8

ESTIMATES OF MAXIMUM 1- AND 8-HOUR
CARBON MONOXIDE CONCENTRATIONS
Kaimi Nani Drive at Mamalahoa Highway
Peak Traffic Hours
2005 - 2015

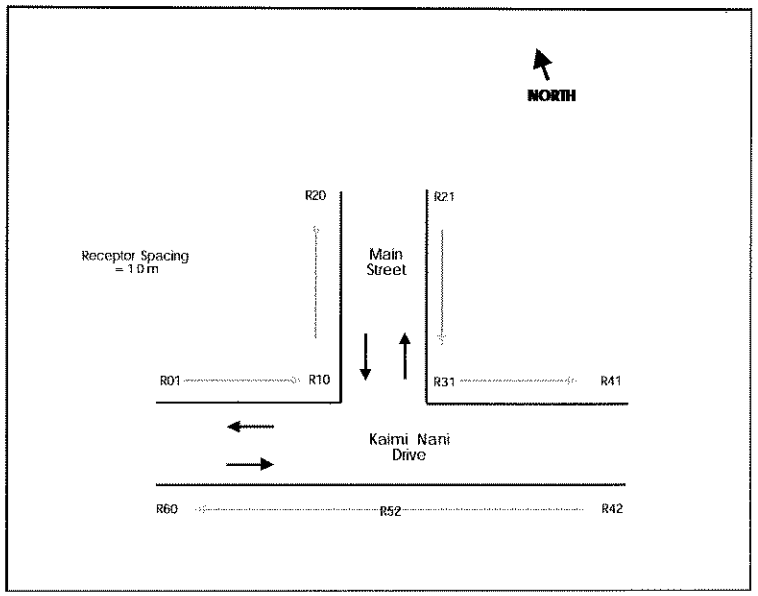


CO Concentration (mg/m ^{3})

Averaging Time	2005	2015 w/o proj	2015 w/proj w/o UHCWH	2015w/proj w/UHCWH
1-hr AM	2.35 @ R09	1.89 @ R08	1.89 @ R08	1.89 @ R08
1-hr PM	1.32@R09	1.09@R09	1.09@R09	1.21 @ R09
8-hr	1.48	1.19	1.19	1.20

FIGURE 9

ESTIMATES OF MAXIMUM 1- AND 8-HOUR
CARBON MONOXIDE CONCENTRATIONS
Kaimi Nani Drive at Proposed Main Street
Peak Traffic Hours
2005 - 2015



CO Concentration (mg/m ^{3})

Averaging Time	2005	2015 w/o proj	2015 w/proj w/o UHCWH	2015w/proj w/UHCWH
1-hr AM	n/a	n/a	1.14 @ R31	1.09 @ R31
1-hr PM	n/a	n/a	0.64@R52	0.64 @ R49
8-hr	n/a	n/a	0.70	0.74

7. CONCLUSIONS AND MITIGATION

7.1 Short-Term Impacts. Since, as noted in Section 4, the project area is considered to be "semi-arid" by Thornwaite's climatic classification system with a P/E index lower than that associated with the EPA fugitive dust emission factor, there appears to be an increased potential for fugitive dust. It will therefore be important to employ adequate dust control measures during the construction period, particularly during the drier summer months. Dust control could be accomplished through frequent watering of unpaved roadways and areas of exposed soil. The EPA estimates that twice daily watering can reduce fugitive dust emissions by as much as 50% [10]. The soonest possible paving of roadways will also help.

Short-term air quality impacts due to offsite activities supporting the proposed development, i.e., concrete and asphalt production, appear to be *de minimus* due in large part to the high removal of control devices typically found on such production facilities. Furthermore, any emissions will be strictly regulated by the Department of Health permit which each batch plant must have in order to operate.

7.2 Mobile Source Impacts. As reported in Section 6, compliance with federal and state carbon monoxide standards is demonstrated under *worst case* conditions of meteorology and peak hour traffic; thus, no special mitigative measures are required.

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Appendix C. Archaeological Assessment

Pacific Legacy

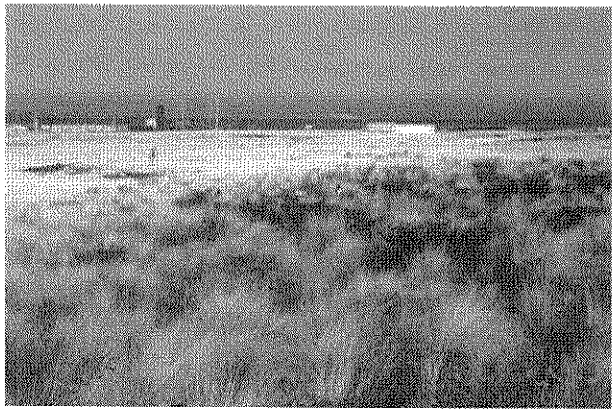
Incorporated

Cultural Resources Consultants

ARCHAEOLOGICAL ASSESSMENT FOR THE UNIVERSITY OF HAWAII CENTER AT WEST HAWAII, MAIN STREET ROADWAY ISLAND OF HAWAI`I (TMK: 7-3-10: 6, 33, 44, 45)

Prepared By:
Pacific Legacy, Inc.

Revised
May 9, 2005



ARCHAEOLOGICAL ASSESSMENT UNIVERSITY OF HAWAII CENTER AT WEST HAWAII, MAIN STREET ROADWAY ISLAND OF HAWAI`I

Prepared by
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Revised
May 9, 2005

ABSTRACT

At the request of Wil Chee-Planning and Environmental, Inc., Pacific Legacy Inc., conducted an archaeological assessment for the proposed University of Hawaii Center at West Hawaii Main Street Roadway located in the *ahupua`a* of Makaula, Hale`ohi`u, Hamanamana, and Kalaoa 1-4, North Kona, Island of Hawaii.

The project area is part of a larger parcel that had been previously archaeologically surveyed. Pacific Legacy was tasked with relocating the previously identified sites, recording their position with GPS, and assessing their condition. A total of ten previously identified sites were relocated during the current study ranging from modified outcrops to large lava tube complexes.

Pacific Legacy has made several recommendations for the proposed Main Street Roadway that would protect the archaeological resources in the area. Given their sensitive nature, it is recommended that any plans for development near Sites 15298 and 15302, be it the Main Street Roadway or the future University Center, be presented to the Hawai`i Island Burial Council and the State Historic Preservation Division for their input. It is further recommended that all sites in the area be avoided and the proposed northern portion of the roadway should extend to the west as far as possible to avoid impacting the known cultural resources.

Sites 21361 and 15288 were previously evaluated as not significant however we believed that it is in the best interest of the University of Hawaii to preserve these sites if possible. Site 21361 could be preserved by shifting the road to the east and providing a minimum of a 3-5 meter buffer. Site 15288 is currently outside of the road corridor and should not be impacted by the proposed road.

We propose a 30 meter (ca. 100 feet) buffer between the edge of the proposed road corridor and all other archaeological sites. All of the sites located during the current study are significant under criteria "d" of the National Historic Preservation Act of 1966 (as amended) with several also significant under criteria "e" of the State of Hawaii's revised statutes (HRS §13-275-6) and need to be treated appropriately.

Evidence of vandalism was documented with the discovery of a *papamū* tied to a handtruck in the middle of a pahoehoe lava flow. This indicates the archaeological sites in the area are known to vandals and steps should be taken to protect them. The sites are susceptible to vandalism and any development in the area should take this into consideration.

Finally, the Appendix at the end of this report presents GPS coordinates for all sites relocated. This appendix should be detached prior to distributing to the public. Having the GPS coordinates of each site would make it far too easy for vandals to destroy these precious resources.

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1.0 INTRODUCTION

Pacific Legacy, Inc., under contract to Wil Chee-Planning and Environmental, Inc., conducted an archaeological assessment for the proposed UH Kona Main Street Roadway located in the *ahupua`a* of Makaula, Hale`ohi`u, Hamanamana, and Kalaoa 1-4, North Kona, Island of Hawaii (Figure 1). The proposed corridor is located on the western edge of The University of Hawai'i's 500 acre parcel owned by the State of Hawaii.

Field work was conducted between April 11-15, 2005 by James McIntosh, B. A. and Solomon Kailihiwa, B.A., with Paul L. Cleghorn, Ph. D., serving as Principal Investigator and main point of contact. The project area has been previously archaeologically surveyed by Head and Rosendahl (1993) and Cleghorn (1998). The current field investigations had the following tasks:

- Conduct an archaeological assessment in the proposed road corridor from Ka`iminani Drive to the northern boundary of the 500-acre parcel. This access road corridor measures ca. 2,133 meters (1.3 miles or 7,000 feet) by 37 meters (ca. 120 feet) and extends from Ka`iminani Street along the western boundary of the project area.

- Relocate the previously recorded archaeological sites along the western boundary of the 500-acre parcel, assess their current condition, re-assess their function and significance, and record their location with Global Positioning System (GPS).

- Prepare a report of the archaeological findings. This report describes the resources present, provides locational information assesses their current condition, evaluates functional interpretations that have been assigned, assesses their significance based on Federal and State significance criteria, and makes appropriate recommendations.

1.1 LOCATION AND ENVIRONMENTAL SETTING

The study area encompasses four *ahupua'a* of Kalaoa 1-4, Hamanamana, Haleohiu and Makaula in the district of North Kona on the leeward side of the island of Hawai'i. The study area extends from about the 350 foot (106.7 m) elevation to the 450 foot (137.2 m) elevation.

The study area consists of gently east to west sloping terrain that is composed of two terrain types – aa and pahoehoe lava flows that are dissected by lava tube systems that are primarily oriented *mauka-makai* (from the mountains to the shore), which is east to west in the study area.

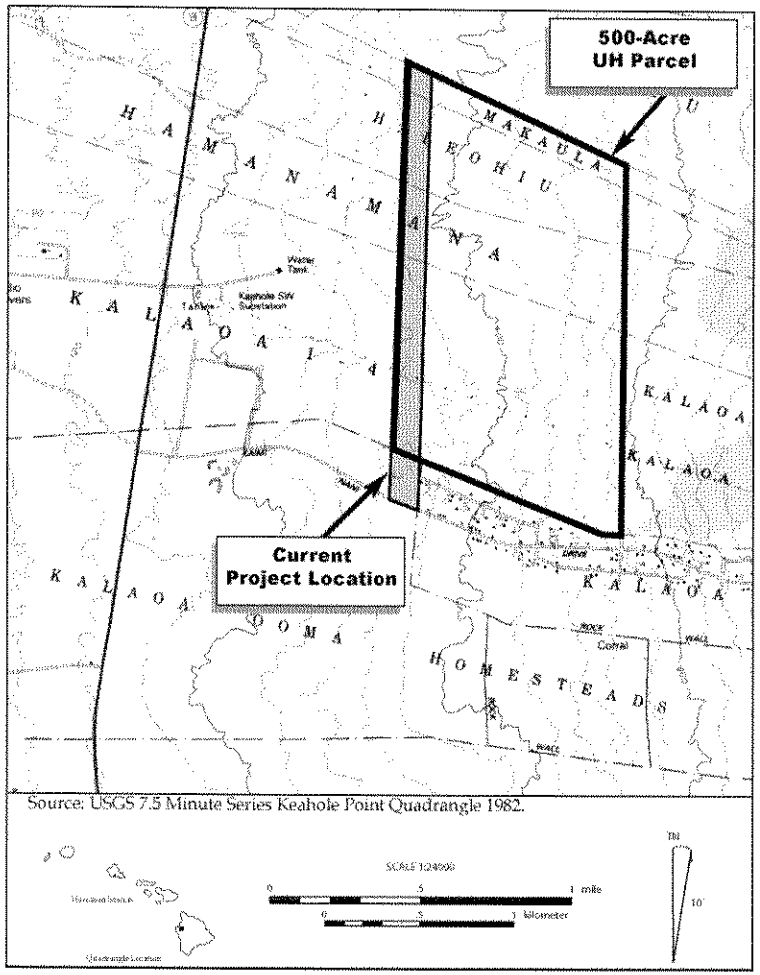

Figure 1. Location of Project Area on USGS Quadrangle Map.

Pahoehoe flows are the dominant terrain type within the study area. According to Sato et al. (1973:34) pahoehoe lava flows have "a billowy, glassy surface that is relatively smooth . . . in some areas, however the surface is rough and broken, and there are hummocks and pressure domes." Barren aa lava flows are prominent landscape features in the project area. Sato et al. (1973:34) describe this lava as "a mass of clinkery, hard, glassy, sharp pieces piled in tumbled heaps."

The primary vegetation in the study area is fountain grass (*Pennisetum setaceum*) measuring between 0.50 to 1.3 meters in height, with interspersed and scattered shrubs. Shrubs include: *'a'ali`i* (*Dodonaea viscosa*), *noni* (*Morinda citrifolia*), *koa haole* (*Leucaena leucocephala*), and Christmas-berry (*Schinus terebinthifolius*).

The area is warm and relatively dry receiving 20 to 30 inches (510 to 760 mm) of rainfall per year (Armstrong 1983:63). The mean low annual temperature is 60 to 65 degrees Fahrenheit (15.6 - 18.3° C), and the mean high annual temperature is 80 to 82 degrees Fahrenheit (26.7 - 27.8° C) (Armstrong 1983:64).

1.2 Previous Archaeological Research

Several archaeological investigations have been conducted in the vicinity of the project area, and the 500 acre project area has been the subject of an extensive archaeological inventory survey (Head and Rosendahl 1993). Head and Rosendahl (1993:4-16) provide an extensive review of previous archaeological studies in the area and provide *ahupua`a* and environmental settlement models for the area. Several pertinent findings are provided:

- most of the archaeological sites that have been recorded in the vicinity of the project area are close to the coast, between the 0 - 40 foot (0 - 12.2 m) elevations which is probably due in large part to the rich marine resources of the area;
- site types found in the coastal zone include temporary and permanent habitation sites, religious sites, burial sites, trails, quarries, etc.;
- the weathered and generally un-vegetated aa and pahoehoe lava flows located inland of the coastal zone, to about the 400 foot (121.9 m) elevation, contain low numbers of sites, the types of sites found in this intermediate zone include trails temporary habitation shelters, and quarries; and
- the upland zone, from about 400 to 2,000 feet (121.9 - 609.6 m), contains isolated agricultural features such as rock mounds, terraces, and modified outcrops, as well as temporary habitation shelters.

From these findings, Head and Rosendahl (1993:16) predicted that they would encounter numerous archaeological sites within the 500 acre project area, including abundant agricultural

features, temporary habitation features, trails, and lava tube sites. Head and Rosendahl (1993) identified and recorded 43 archaeological sites within this 500 acre parcel. These sites included temporary habitation sites, agricultural sites, trails, burials, religious sites, and petroglyphs. It appeared, based on their findings, that the project area may mark the northern extension of the extensive and intensive Kona Field System.

Limited test excavations by Head and Rosendahl (1993) within the 500 acre parcel produced five charcoal samples that were radiocarbon dated. These dates provide initial information on the chronology of use in this area of North Kona. It appears that the sites in this area date to the late prehistoric and early historic periods, possibly from ca. AD 1487 to the late 1800s (Head and Rosendahl 1993: 45-46, 64).

Within the current study area, Head and Rosendahl identified and recorded 11 archaeological sites. Head and Rosendahl's site location map (1993: Figure 3) shows 13 archaeological sites within the study area. However, two of the sites plotted (267 and 301) do not appear to be archaeological sites, as they are not tabulated, described, or evaluated within the report. As a result, these sites were not located during the current survey.

The sites previously recorded in the study area represent a variety of formal and functional types. These include temporary habitation in shelters and lava tubes; possible water catchment in a lava tube; agricultural features such as mounds, excavations, and clearings; a *papamū* (playing board for the game of *kōnane* or "Hawaiian checkers"); and an enclosure that was used for habitation or possibly a religious shrine.

An earlier survey by Davis (1977) extended into the area of the proposed road alignment. Davis recorded a lava tube site that contained petroglyphs along the tube walls (Site 6418). This site was relocated by Cleghorn (1998) and during the current investigations and is described in the results section below.

In 1980, Hammatt and Folk (1980) conducted archaeological investigations in an area west of the 500 acre University of Hawaii parcel. Although a reconnaissance survey was conducted for the area, much of their work centered on testing sites identified by Davis (1977) and reported no new findings in the area where Head and Rosendahl (1993) recorded Sites 15263, 15264, 16265, 15287, 15288, or 15302. This is disturbing since Head and Rosendahl (1993) note that Site 15302 extends west well outside of the 500 acre University parcel and should have been identified by Hammatt and Folk (1980). This questions the adequacy of Hammatt and Folks (1980) coverage.

In 1998, Cleghorn conducted an archaeological assessment for the then proposed location of the University Center at West Hawaii and the "mid-level" road located in approximately the same corridor as the current project (Cleghorn 1998). The investigations were designed to supplement the previous work and reassess the condition of each site and make recommendations for the proposed University Center and road alignment. Further, Cleghorn also prepared a conceptual historic preservation plan for the West Hawai`i campus (Cleghorn 2000). The plan, created with the input of the University of Hawai`i Center at West Hawai`i Advisory Council on Kalaoa Cultural Site Preservation, summarized 18 guidelines which the group wanted to direct all cultural protection activities within the University Center parcel.

1.3 METHODS

The current investigations were conducted by two archaeologists. Since we were identifying known archaeological sites (recorded by Head and Rosendahl 1993 and Cleghorn 1998), the survey was conducted by proceeding to the general location of the known archaeological sites and surveying the vicinity until the sites were relocated (Figure 2). The archaeological sites encountered were recorded by standard archaeological methods--their locations were plotted on a USGS topographic map; flagged with pink flagging, and the location of each site was recorded with a Garmin eTrex Vista hand-held GPS unit with an accuracy of less than 6 meters.

The project area was not staked by land surveyors prior to the current fieldwork making it difficult to determine actual location on the ground. As a result, the current survey may have ventured outside of the project area and into the adjoining parcel to the east

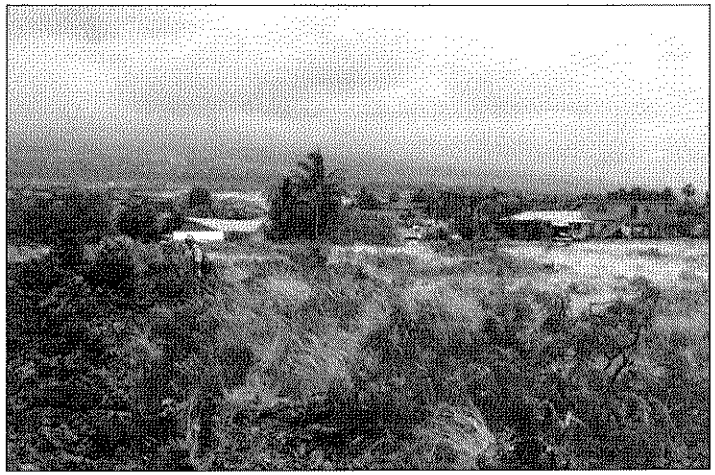

Figure 2. View of southern portion of proposed road corridor adjacent to the Kona Palisades Estates.

2.0 RESULTS

Pacific Legacy, Inc. conducted a survey along the proposed ca. 2,133 meter long corridor for a proposed "mid-level" access road. Previous surveys in the area identified 12 sites that may be impacted by the proposed road. A total of 10 sites were relocated during the course of field investigations (Figure 3). All sites were identified in the field with the exception of Sites 15263 and 15265. These sites are low basalt features (modified outcrop and a filled swale, respectfully) which could not be identified given the tall, dense fountain grass.

SITE 50-10-28-6418

This site is a portion of a lava tube complex that was originally recorded by Davis (1997) and later by Hammatt and Folk (1980). This lava tube complex consists of three tube portions that are described below. Cleghorn (1998) identified a washer which was found in Section 3

> **Section 1** is a large collapsed section of tube (ca. 35 by 30 m) that has several utilized areas and seven total recorded features ranging from a concentration of *opihi* shells to an alignment and two shelter overhangs (Figure 4).
>
> **Section 2** is a section of lava tube that measures ca. 45 by 20 m that contains a large platform (ca. 9.0 by 8.0 m by 1.2 to 2.5 m high) directly beneath the skylight. The platform is roughly paved with basalt cobbles and pebbles and has an alignment of stone dividing it roughly in half. Concentrations of ash, *opihi* shell, and *kukui* endocarp were observed, as was a single piece of coral. A homemade ladder extends from the ground surface into the sink (Figure 5).
>
> **Section 3** is a collapsed section of lava tube that has a panel of petroglyphs in the eastern wall of the collapse. Approximately 40 petroglyph figures are located here (Figure 6). Some of these figures are partially buried by an artificially constructed floor. Davis (1977) conducted test excavations here, but the results have not been reported (Davis 1977:28; SHPD library and GIS inventory search). Four features were previously recorded by Cleghorn (1998) and include a panel of petroglyphs, a natural ramp, a paved area and a midden deposit.

Section 1 appears to have low interpretive value and no further work is recommended. Sections 2 and 3 have excavation potential that could provide important archaeological data. All three sections are recommended for preservation.

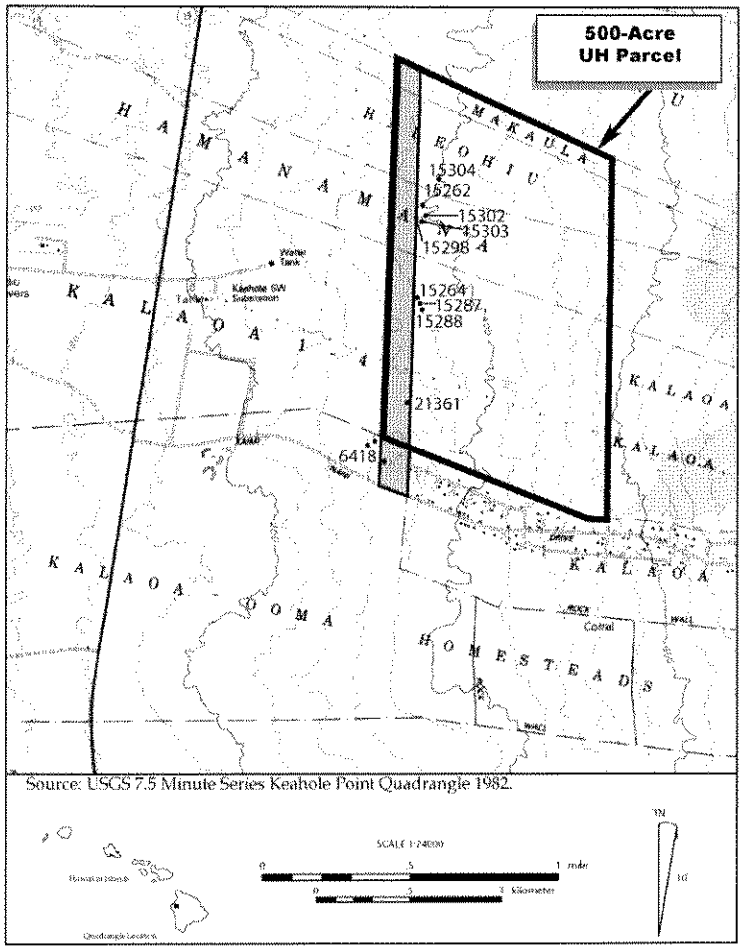

Figure 3. Approximate locations of previously identified archaeological sites relocated during the current investigations.

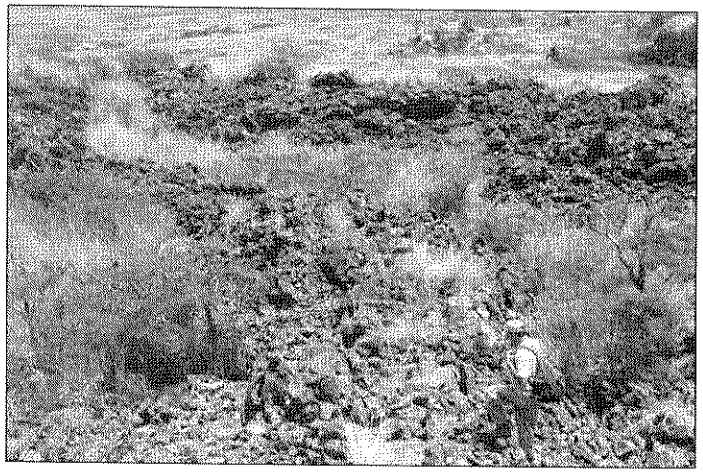

Figure 4. Overview of Site 50-10-28-6418, Section 1.

Figure 5. Entrance to Site 50-10-28-6418, Section 2 (Note homemade ladder).

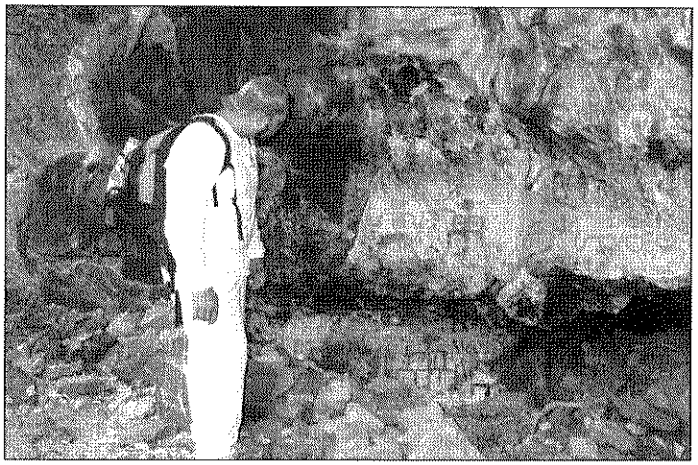

Figure 6. Petroglyphs located at Site 50-10-28-6418, Section 3.

SITE 50-10-28-15262

This site is located on a prominent knoll in the northern portion of the project area (Figure 7). The site measures 16.5 meters by 7. 5 meters in size and consists of three *ahu* (cairns) with an associated terrace (Figure 8). The site is described by Head and Rosandahl (1993) as having multiple functions. Two of the *ahu* are interpreted as agricultural, the terrace is interpreted as habitation, and the third *ahu* is indeterminate. The terrace measures 4.3 x 3.8 x 0.3 meters and is located on the northwest side of the knoll and is roughly level with the top of the knoll.

In reassessing this site, it seems unlikely that this site was used for habitation and agriculture. Given the site's location on a prominent knoll, overlooking Sites 15298 and 15302, and its composition with three *ahu* and a terrace in such a small area, it doesn't appear likely that it functioned for habitation. The *ahu* range in size between 1.3 to 2.9 meters in diameter and seem to be rather large for agricultural use. The terrace, which is constructed of cobbles and boulders, is located just below the top of the bluff and would be subject to the strong trade winds that blow from the down from *mauka*. It seems likely that this site was used for religious purposes and not for habitation or agriculture as Head and Rosendahl (1993) propose.

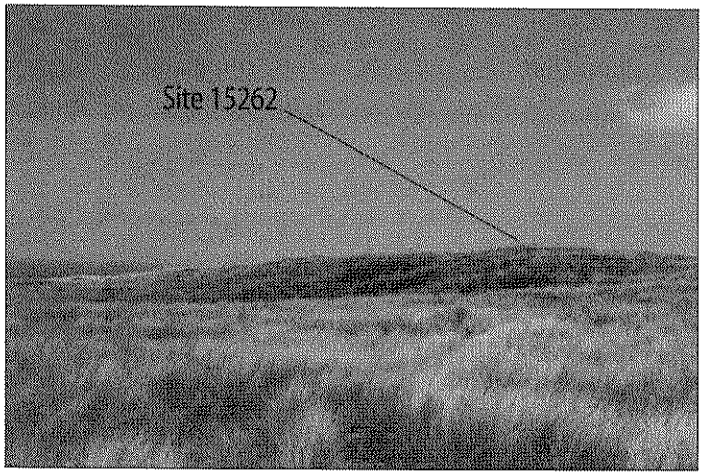

Figure 7. Site 50-10-28-15262 located on top of this knoll in the northern portion of study area.

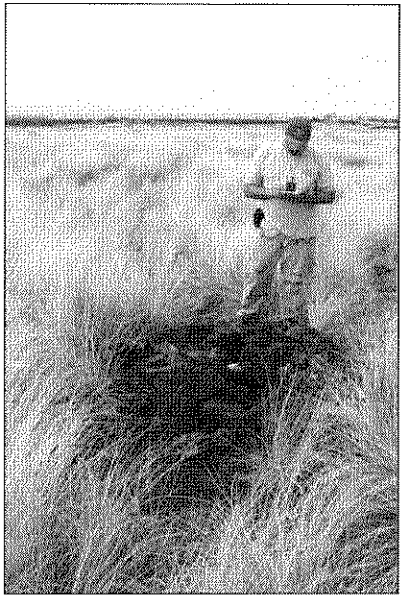

Figure 8. One of three *ahu* located at Site 50-10-28-15262.

SITE 50-10-28-15264
This site consists of two modified outcrops and a lava tube in an area measuring ca. 17.3 by 7.5 m (Figure 9).

Feature A is a pressure ridge with a split top that has been filled with cobbles and boulders. Below this split is a lava tube (Feature C).

Feature B is an excavation in the pahoehoe lava flow that measures ca. 1.7 by 1.1 m. The rocks that were removed were placed into an alignment that partially encloses the excavated area on the N, E, and S sides.

Feature C is a low lava tube that extends from the NE to the SW. Although the tube is very low (ca. 0.6 m) it is about 20 m long with three openings. The interior was carefully inspected for human remains and other cultural material. No human remains or other cultural material were observed, although minimal Aeolian soil deposits were observed near the tube entrances.

This site remains in good condition although Feature B is covered with fountain grass. No additional data appear to be present in these features. No further work is recommended but preservation is advised.

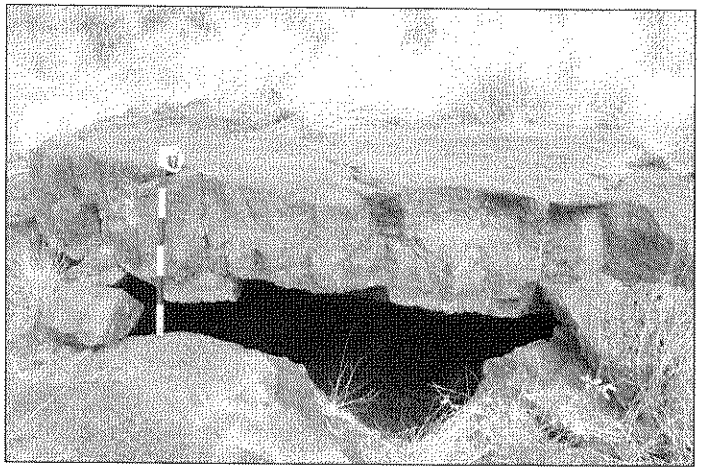

Figure 9. Southern entrance to Site 50-10-28-15264.

SITE 50-10-28-15287
This site is a *papamū*, or game board for the Hawaiian checker game of *kōnane* (Figure 10). It consists of a grid of 150 holes pecked into the pahoehoe lava flow. The 10 rows of 15 holes are spaced about 5 cm apart and have maximum depths of about 1 cm. A short semi-circular alignment of seven cobbles and boulders is adjacent to the *papamū*. This game board may be associated with the nearby temporary habitation site of 15264.

The condition of the site appears unchanged since it was originally recorded in 1992 (Head and Rosendahl 1993: A-32). There does not seem to be any additional data to be recovered from this site, so no further work is recommended. This site should be preserved and has good potential to be interpreted in conjunction with the nearby temporary habitation site 15264.

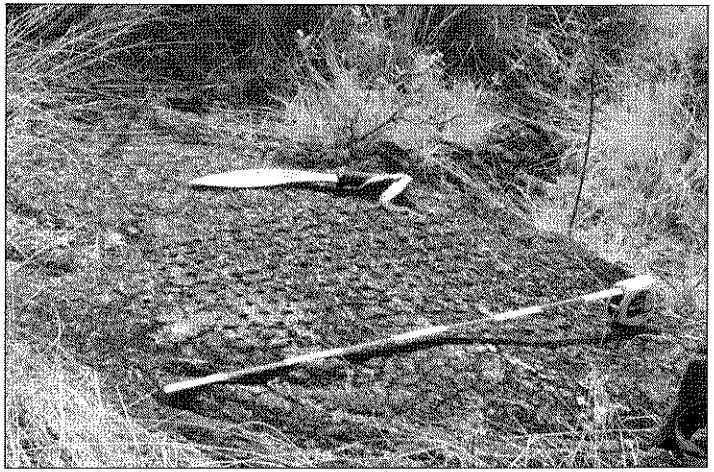

Figure 10. Site 50-10-28-15287, *papamū*.

SITE 50-10-28-15288
This site is an *ahu* or cairn that is in good condition (Figure 11). It may have been square or roughly circular in plan, but has deteriorated into an amorphous shape. The cairn measures ca. 2.1 by 1.8 by 0.9 m. While this type of site may mark the existence of a *mauka-makai* trail, no such trail was found in the vicinity of this site.

The condition of the site appears unchanged since it was originally recorded in 1992 (Head and Rosendahl 1993: A-33). There does not seem to be any additional data to be recovered from this site, no further work is recommended but preservation is advised.

Figure 11. Site 50-10-28-15288, *ahu*.

SITE 50-10-28-15298
Site 15298 is a habitation and refuge cave that is approximately 700 m long and contains over 165 features, including at least four human burials. It is accessed by two collapse areas at the *makai* (22.0 by 8.0 m) and *mauka* (ca. 30.0 by 8.0 m) ends of the tube (Figure 12). The main habitation area (ca. 24.0 by 16.0 m) is located at the western (*makai*) end of the complex and includes numerous terraces, walls, pavements, and middens. The possible refuge area is about 140 m long located in the central portion of the tube with modified roof-fall collapses on either side of this area.

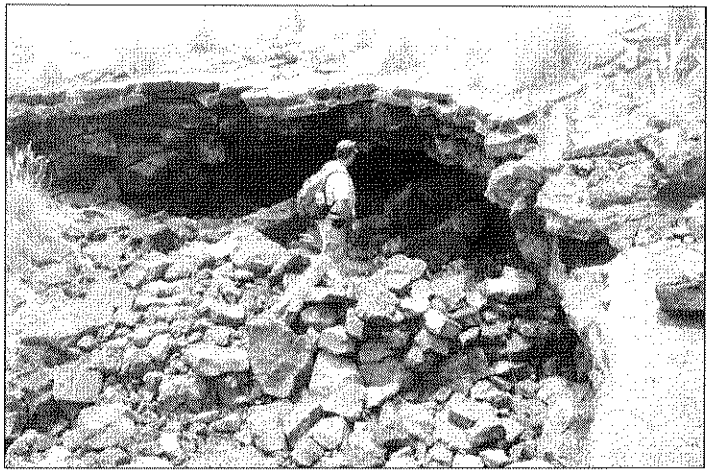

Figure 12. Entrance to Site 50-10-28-15298.

This site is in good condition and maintains a high potential to yield archaeological information. Given the presence of human remains, this is an extremely sensitive and delicate site. It is strongly recommended that this site be preserved, and sealing the openings to the tubes should be considered.

SITE 50-10-28-15302

Site 15302 is a large habitation cave that may have also had ceremonial functions associated with its use. The lava tube consists of two levels, the upper level measures approximately 120 m long and the lower level measures approximately 110 m long (Figure 13). Access into the lava tube is gained through a collapse at the eastern edge of the tube. A skylight (ca. 6 x 4 m) near the west end of the tube provides light to a complex portion of the cave. One of the previously recorded features (Feature BH) was recorded as ceremonial because of the presence of a large upright boulder (1.2 x 0.9 x 0.5 m) which is placed against the N wall of the tube in association with two contiguous enclosures. Shell midden, charcoal, ash, a water worn cobble, and a piece of coral are present in the immediate vicinity of this feature.

Figure 13. Entrance to Site 50-10-28-15302.

Although no human remains were observed within this site it is strongly recommended that this site be preserved due to its potential use as a ceremonial area.

SITE 50-10-28-15303

Head and Rosendahl (1993) recorded this site as a modified lava tube located 25 meters at 144° from the *mauka* entrance to Site 15302. The site consists of a cleared area with a small alignment and a small shelter overhang 0.7 meters high. While attempting to find this site during the current study, we identified two features in the general area that seem to fit various aspects of the site described above but doesn't fit the site entirely. They are described below.

The first feature identified was a lava tube with a modified entrance (on the south side of the entrance) composed of stacked boulder and cobble size pahoehoe chunks (Figure 14). The tube extends in a *mauka/makai* direction with the east bearing at 90° and the west bearing at 250°. The overhang at the entrance is 1.2 meters high with the overall tube entrance measuring 4.8 meters x 2.8 meters. No cultural remains were observed within either of the lava tubes. This feature is located ca. 75 meters at 144° from the *mauka* entrance of Site 15302.

The second feature is a modified outcrop/blister with an associated basalt alignment (Figure 15). It is located 25 meters at 175° from Site 15302. The alignment is situated on the west side of the blister and measures ca. 1.5 meters long. The blister area is cleared out and there is no overhanging shelter.

Both features contain modifications that are similar in description to those reported by Head and Rosendahl (1993). However, neither feature matches the original description. One feature is located at the correct distance from Site 15302 but has the wrong bearing while the other feature has the right bearing but the wrong distance. It is likely that one of these features is Site 15303 although it could not be said for certain exactly which was identified by Head and Rosendahl (1993).

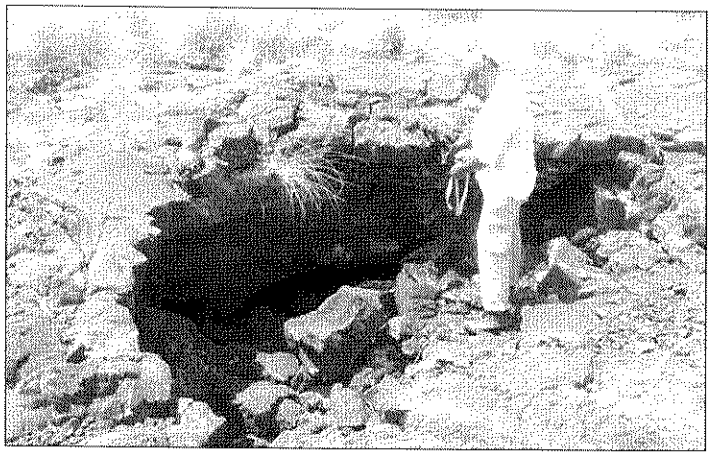

Figure 14. Entrance to Site 50-10-28-15303.

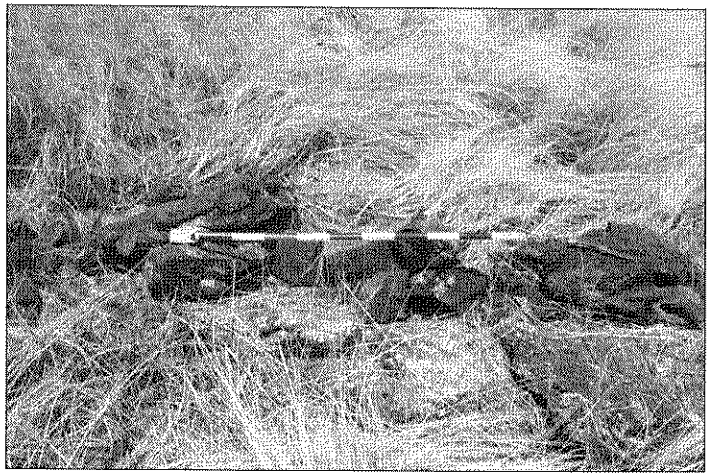

Figure 15. Alignment associated with Site 15303.

SITE 50-10-28-15304

This site consists of a single petroglyph located approximately 100 meters north of Site 50-10-28-262 (Figure 16). The petroglyph resembles the letter "X" or a cross and measures 20 cm long and 18 centimeters wide. Since this design is not a typical Hawaiian petroglyph, it is probable that this was created after European contact in 1778 and maybe an early historic surveyor's mark.

This site appears to have low interpretive value and no further work is recommended. However, preservation of this site is advised.

Figure 16. Site 50-10-28-15304, a single "X" or cross petroglyph.

SITE 50-10-28-21361

Cleghorn (1998) identified a stepping stone trail atop an aa lava flow (Figure 17). The trail segment is ca. 15.0 m long and consists of about 20 pahoehoe lava slabs. The trail begins at the edge of the aa lava flow and abruptly ends in the middle of the flow. The current field investigation reacquired the site; it is in poor condition and appears to have been partially disturbed by recent bulldozing activity.

This site appears to have low interpretive value and no further work is recommended. However, preservation of this site is advised.

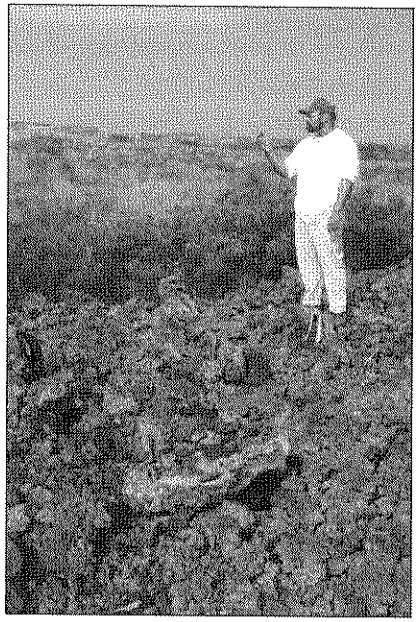

Figure 17. Site 50-10-28-21361, Stepping Stone Trail at center of photo.

EVIDENCE OF VANDALISM

While conducting the survey for the proposed road, we came across evidence of an attempted theft of an artifact. In the middle of a pahoehoe flow, we encountered a handtruck with a large pahoehoe slab tied to it with a clothesline rope (Figure 18). The rope and handtruck appeared to be in fair condition indicating that they have been out in the open for at least several months. After cutting the ropes, the foam padding that was holding the ropes in place fell away to reveal indentations on the pahoehoe slab. The slab was actually a *papamū* that someone was attempting to steal. The original location of the *papamū* is unknown. It appears that the person(s) responsible for this attempt theft had difficulty moving the handtruck and decided to leave it (possibly to come back for it at a latter date). The location of the handtruck was plotted with the GPS and photographs were taken. Ms. Mary Anne Maigret, Hawai`i Island Assistant Archaeologist was notified of the find and was provided with GPS coordinates, photographs, and its location plotted on a TMK map.

Figure 18. Thieves attempted to steal this *papamū* with the aid of a hand truck.

Table 1. Sites recorded during the current field investigations.

SITE NUMBER 50-10-28-	SITE TYPE	CONDITION	DESCRIPTION	COMMENTS/ RECOMMENDATIONS
6418 Section 1	Sinkhole	Fair	Scattered *'ōpihi* and alignments within the sink.	No further work necessary/ Preservation (Cleghorn 1998)
6418 Section 2	Lava tube	Good	Evidence indicates some use of the tube by Native Hawaiians	Excavation potential/ Preservation (Cleghorn 1998)
6418 Section 3	Lava tube	Good	Petroglyphs	Excavation potential/ Preservation (Cleghorn 1998)
15262	*Ahu* (3), Terrace	Fair	Located on a prominent knoll: site measures 16.5 m X 7.5 m	Further Data/Preservation (Head and Rosendahl 1993)
15264	Modified Outcrops	Good	Two outcrops and an unutilized lava tube in a 17.5 x 7.5 m area	No further work necessary (Head and Rosendahl 1993 & Cleghorn 1998)
15287	*Papamū*	Good	Some natural weathering on surface	No further work necessary/ Preservation (Head and Rosendahl 1993 & Cleghorn 1998)
15288	*Ahu* (Cairn)	Good	Amorphous shape measuring 2.1 x 1.8 x 0.9 m	No further work necessary/ (Head and Rosendahl 1993 & Cleghorn 1998)
15298	Lava tube complex	Good	Large lava tube complex w/ burials	Further Data Recovery/ Preservation (Head and Rosendahl 1993)
15302	Lava tube complex	Good	Large ceremonial lava tube complex	Further Data Recovery/ Preservation (Head and Rosendahl 1993)
153037	Lava Tube w/modified entrance	Good	Large lava tube with basalt boulder and cobble stacking near entrance	No further work necessary/ Preservation
153037	Modified outcrop w/alignment	Good	Lava blister with a basalt cobble alignment	No further work necessary/ Preservation
15304	Petroglyph	Good	A single petroglyph depicting the letter "X"	No further work necessary/ Preservation (Head and Rosendahl 1993)
21361	Stepping Stone Trail	Poor	Evidence of recent bull-dozing activity that may have impacted trail.	No further work necessary (Cleghorn 1998)

3.0 HISTORIC SIGNIFICANCE ASSESSMENTS

The National Historic Preservation Act of 1966 (as amended) authorizes the Secretary of Interior to expand and maintain a National Register of Historic Places (NRHP) that contains a listing of districts, sites, buildings, structures and objects significant in American history, architecture, archaeology, engineering and culture. A property may be listed in the NRHP if it meets criteria for evaluation defined at 36 CFR 60.4. A property may be listed on the State Register of Historic Places if it meets criteria listed in HRS 13-275-6 (b). Significance evaluation criteria are presented below:

> The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and
>
> (a) That are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> (b) That are associated with the lives of persons significant in our past; or
>
> (c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> (d) That have yielded, or may be likely to yield, information important in prehistory or history.

The State of Hawaii recognizes the above criteria under HRS 13-275-6(b), and has also added a fifth significance criterion to the evaluation process:

> (e) That have an important value to the Native Hawaiian people or to another ethnic group of the State due to associations with cultural practices once carried out or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts – these associations being important to the group's history and cultural identity.

Site significance is evaluations are summarized in the table below (Table 2). Justifications supporting these evaluations have been presented in the results section (Section 2.0) above.

Table 2. Significance assessments of sites identified during the current study.

SITE NUMBER 50-10-28-	SITE TYPE	CONDITION	SIGNIFICANCE*
6418	Lava tube complex	Good	d, e
15262	*Ahu*/Terrace	Fair	d, e
15264	Modified outcrop	Good	d
15287	*Papamū*	Good	d, e
15288	*Ahu*	Good	d, e
15298	Lava tube complex	Good	d, e
15302	Lava tube complex	Good	d, e
15303	Lava tube/mod outcrop	Good	d
15304	Petroglyph	Good	d, e
21361	Stepping stone trail	Poor	d

* Significance assessments from Head and Rosendahl (1993), Cleghorn (1998), and current investigations.

4.0 DISCUSSION AND RECOMMENDATIONS

At the request of Wil Chee-Planning and Environmental, Inc., Pacific Legacy Inc., conducted an archaeological assessment for the proposed University of Hawaii Center at West Hawaii Main Street Roadway located in the *ahupua`a* of Makaula, Hale`ohi`u, Hamanamana, and Kalaoa 1-4, North Kona, Island of Hawaii. The proposed corridor is located on the western edge of The University of Hawaii 500 acre parcel. Field work was carried out between April 11-15, 2005 by James McIntosh, B. A. and Solomon Kailihiwa, B.A. Paul L. Cleghorn, Ph. D. served as Principal Investigator and main contact.

Previously the project area had been archaeologically surveyed by Head and Rosendahl (1993) who conducted a 500 acre survey for a proposed University Site. Cleghorn (1998) also assessed the current project area for the proposed University Center at West Hawai`i, focusing on the south western portion of the parcel. Pacific Legacy was tasked with relocating the previously identified sites, recording their position with a GPS and assessing their current condition.

A total of 10 previously identified sites were relocated during the current study. Two of the sites (15267 and 15301) plotted on maps by Head and Rosendahl (1993), do not appear to be archaeological sites, as they are not tabulated, described, or evaluated within the report. As a result, these sites were not located during the current survey. Also, Sites 15265 (modified depression) and 15263 (a filled sink) could not be located during the current investigations. Both of these sites are very low to the ground and were obscured by the dense vegetation in these areas.

A pahoehoe slab tied to a handtruck indicates the archaeological sites in the area are known to vandals. The sites are susceptible to vandalism and any development in the area should take this into consideration.

4.1 Specific Recommendations

Pacific Legacy, Inc. recommends that all sites in the area be avoided. These sites provide a unique look into the North Kona's past and every attempt should be made to protect and preserve these sites. All of the sites located during the current study are significant under criterion "d" of the National Historic Preservation Act and need to be treated appropriately. Furthermore, several sites appear to be significant under criterion "e", as promulgated by the State of Hawaii in HRS 13-275-6. Pacific Legacy has several recommendations for the proposed Main Street Roadway that would protect the archaeological resources in the area.

- Given the presence of human remains at Site 15298 and the ceremonial implications at Site 15302, it is strongly recommended that any plans for development near these sites, be it the Main Street Roadway or the campus, be presented to the Hawai`i Island Burial Council for their input. These sites are extremely sensitive and potentially important to Native Hawaiians and their input should be sought. Development near these sites will

provide opportunity and further access to individuals who may want to loot or vandalize these resources. Also, the Hawai`i Island archaeologist (currently Mary Anne Maigret serves as Assistant Archaeologist) and the recognized advisory group, the University of Hawai`i Center at West Hawai`i Advisory Council on Kalaoa Cultural Site Preservation, be included in the discussions and plans.

- It is recommended that the northern and central portion of the proposed Main Street Roadway be placed as far to the west as possible. In the southern portion, the proposed roadway should be situated as far east as possible. This would avoid the majority of the sites and allow them to be preserved for future generations. Issues with the road corridor arise when it nears Sites 15302. This site is a lava tube complex identified by Head and Rosendahl (1993) and described as a habitation cave with ceremonial components. The tube system that forms Site 15302 appears to be a continuation of the tube that forms Site 15298 (a large habitation complex containing human burials). Head and Rosendahl also document that site 15302 extends west outside of the 500 acre parcel and into adjoining property apparently surveyed by Hammatt and Folk (1980) although Hammatt and Folk failed to identify any sites in this area. If the alignment is to extend west around Site 15302, it is recommended that this section of the Site 15302 tube complex be further examined to ensure that no cultural materials be impacted. If possible, the road should extend west around the extent of Site 15302, ensuring its preservation.

- If avoidance of the lava tube complexes is unavoidable, we suggest that a bridge or causeway be constructed over the extent of Site 15302 in the area on the west side of the site where no tube openings are visible. This is contingent upon a geological survey to determine if the lava tube system is strong enough to handle the construction and use of the proposed roadway.

- It is recommended that all development avoid Site 15298. Given the presence of human remains in this lava tube complex, any development near this site should be limited. This includes having the Main Street Roadway extend near it or over it since this would possibly be viewed as disgraceful. As stated above, any plans for development in the vicinity of this site should be presented to the Hawaii Island Burial Council for their input.

- Site 21361, is a stepping stone trail located within the proposed road corridor. Cleghorn (1998) originally recommended that no additional work is necessary and the site not be preserved. However, it would be in the best interest of the University to preserve this site with a small boundary of between 3-5 meters. There appears to be enough space available for the road to shift to the east (*mauka*) and avoid impacting this site. Conversely, if construction will impact the site, consultations with SHPD would be necessary.

- Site 15288 is an *ahu* located to the east (outside) of the road corridor. Like Site 21361, Cleghorn (1998) recommended that no additional work is necessary on this site and that it not be preserved. Again, we think that it is in the University's best interest to preserve

this site as is and not impact it. It appears that this site will not be impacted by the current proposed alignment.

- The sites on the 500 acre parcel should be examined further and considered in any future planning for the University of Hawaii Center. Cleghorn (2000) developed a Conceptual Historic Preservation Plan the University of Hawai`i Center at West Hawai`i Advisory Council on Kalaoa Cultural Site Preservation, which should be considered.

- Any development for the University of Hawai`i Center at West Hawai`i will require a detailed Historic Preservation Plan describing the specific preserve areas, how these sites will be treated, what developments will occur on the parcel, etc.

4.2 General Recommendations

Listed below are several recommendations and further thoughts that should be considered:

- Since the archaeological sites are situated on land owned by the State of Hawaii, the responsibility for care and preservation of the sites rest upon the State.

- Site looting and artifact theft on State property is a problem that needs to be addressed. The *papamū* tied to a handtruck indicates the archaeological sites in the area are known to vandals. The sites are susceptible to vandalism and any development in the area should take this into consideration.

- The State should consider limiting access to Sites 15298 and 15302, possibly sealing them due to their sensitive nature.

- The Appendix at the end of this report contains GPS coordinates for all sites relocated. This appendix should be removed prior to disseminating it to the general public as a means of protecting these sites. The GPS coordinates would lead looters directly to these sites.

- In all aspects of planning, community involvement should continue and be encouraged. This will ensure that no one's voice will be left unheard and when the project is completed, the people of North Kona will have the University Center they wanted and helped create.

5.0 REFFERENCES CITED

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Sato, H. H., W. Ikeda, R. Paeth, R. Smythe, and M. Takehiro, Jr.
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APPENDIX

GPS SITE COORDINATES

*GPS Locations of archaeological sites in the vicinity of the proposed road corridor.

Site 50-10-28-6418, Section 1
0812404/E, 2183816/N

Site 50-10-28-6418, Section 2
0812464/E, 2183792/N
0812464/E, 2183794/N
0812464/E, 2183794/N
0812465/E, 2183795/N

Site 50-10-28-6418, Section 3
0812405/E, 2183816/N
0812405/E, 2183816/N
0812405/E, 2183816/N
0812405/E, 2183816/N

Site 50-10-28-15262
0812849/E, 2185179/N

Site 50-10-28-15264
0812632/E, 2184644/N
0812632/E, 2184643/N
0812632/E, 2184643/N

Site 50-10-28-15287
0812643/E, 2184622/N
0812644/E, 2184622/N
0812644/E, 2184622/N

Site 50-10-28-15288
0812677/E, 2184527/N
0812670/E, 2184523/N
0812673/E, 2184523/N

Site 50-10-28-15298
0813000/E, 2185149/N
0812959/E, 2185140/N
0812919/E, 2185114/N

Site 50-10-28-15302
0812834/E, 2185081/N
0812831/E, 2185081/N
0812764/E, 2185052/N
0812507/E, 2184935/N
0812497/E, 2184931/N
0812498/E, 2184930/N

Site 50-10-28-15303?
0812878/E, 2185035/N
0812879/E, 2185035/N
0812879/E, 2185035/N

Site 50-10-28-15303?
0812839/E, 2185052/N
0812837/E, 2185052/N
0812836/E, 2185052/N

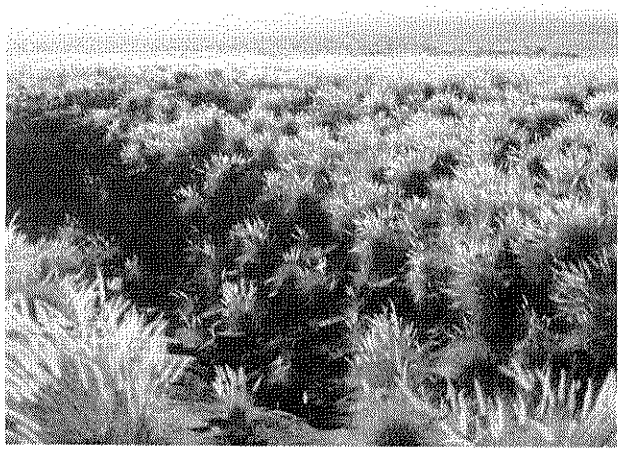
Site 50-10-28-15304
0812858/E, 2185331/N
0812858/E, 2185330/N
0812859/E, 2185330/N

Site 50-10-28-21361
0812562/E, 2183972/N
0812561/E, 2183971/N
0812561/E, 2183972/N

* Site location information is sensitive. Remove this page before public circulation of report.

Appendix D. Biological Surveys

Biological surveys for the
University of Hawaii Center at West Hawaii
(UHCWH) Main Street Collector Road, North
Kona District, Island of Hawaii



Fountaingrass dominates the landscape at UHCWH Photo by Eric Guinther

AECOS Consultants
45-309 Akimala Pl.
Kane`ohe, Hawai`i 96744

August 17, 2005

Biological surveys for the University of Hawaii Center at West Hawaii (UHCWH) Main Street Collector Road, North Kona District, Island of Hawaii[1]

August 17, 2005 Report No. AC047

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Introduction

The purpose of this report prepared by *AECOS* Consultants is to present results of biological surveys for the proposed routing of the so-called Main Street Collector Road across state property at the University of Hawaii Center at West Hawaii (UHCWH), North Kona District on the Island of Hawai`i (Figure 1). This site is located directly upslope on Hualalai from the Keahole Airport (Kona International Airport) between elevations of about 80 and 120 m (260 to 400 ft; Figure 2). Although previous surveys of the UHCWH property were undertaken in 1998 and 1999 (see Herbst, 1998; David and Guinther, 2000; Wil Chee – Planning, 2000), recent attention has focused on final planning for the main north-south corridor through the site partly because earlier discoveries of archaeological sites will need to be avoided by the road. To insure that any rerouting of the roadway would not create problems with respect to natural resources, surveys of this western part of the property were conducted with emphasis on providing assessments for route selection.

Survey Methods

PLANTS — The primary purpose of the botanical survey was to determine if any federally listed endangered, threatened, proposed, or candidate plants are extant within the area proposed for the Main Street Collector Road. Federal and State of Hawaii listed species status follows species identified in the following documents (DLNR, 1998, Federal Register, 1999a, 1999b, 2001, 2002, 2004). The botanical survey was undertaken on April 21, 2005 by Eric Guinther under conditions of very favorable weather and following a period of above average rainfall over preceding months, such that the vegetation was generally healthy and well-developed. Thus,

[1] Report prepared for Wil Chee – Planning, Inc.

no problems arose with regard to identification of plants encountered either due to there being no flowers or fruit or to not encountering resident plants that would simply not be growing during the dry season (that officially starts in May).

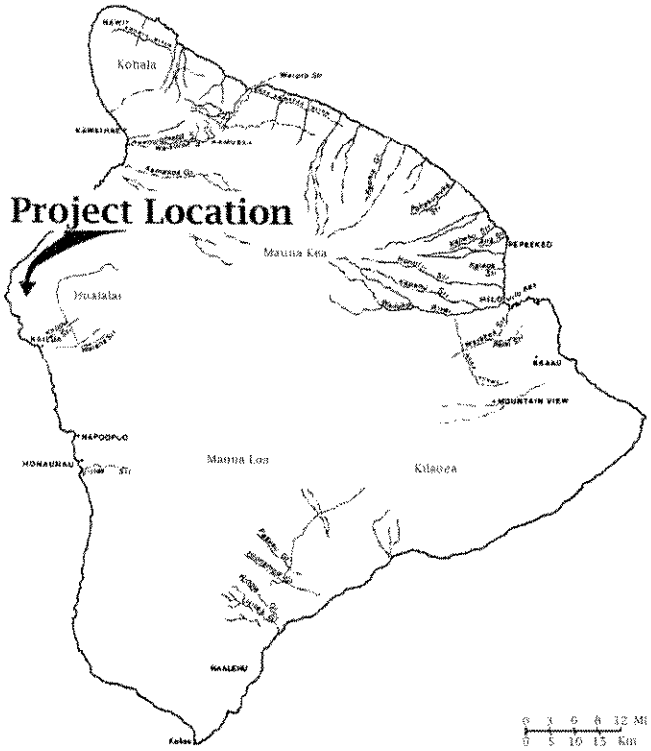

Figure 1. Project location on the Island of Hawai`i.

During the survey, plant species and vegetation types present were recorded and estimates of relative abundance (abundant, common, rare, etc.) of each species made. A handheld GPS unit (Garman III+) was used to record positions at irregular intervals as a check on the survey track against the project area map (see Figure 3).

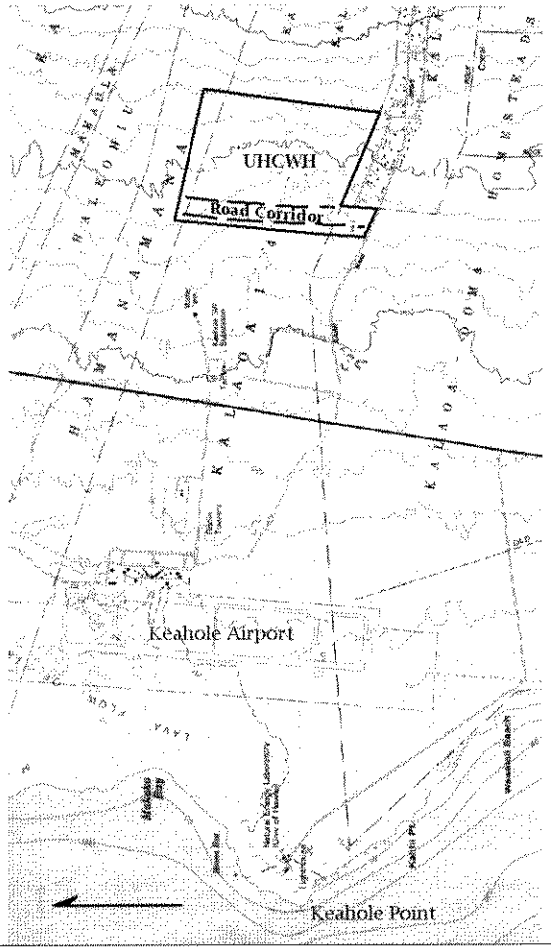

Figure 2. UH Center at West Hawaii parcel. This report encompasses a narrower corridor near the lower or western boundary of the property.

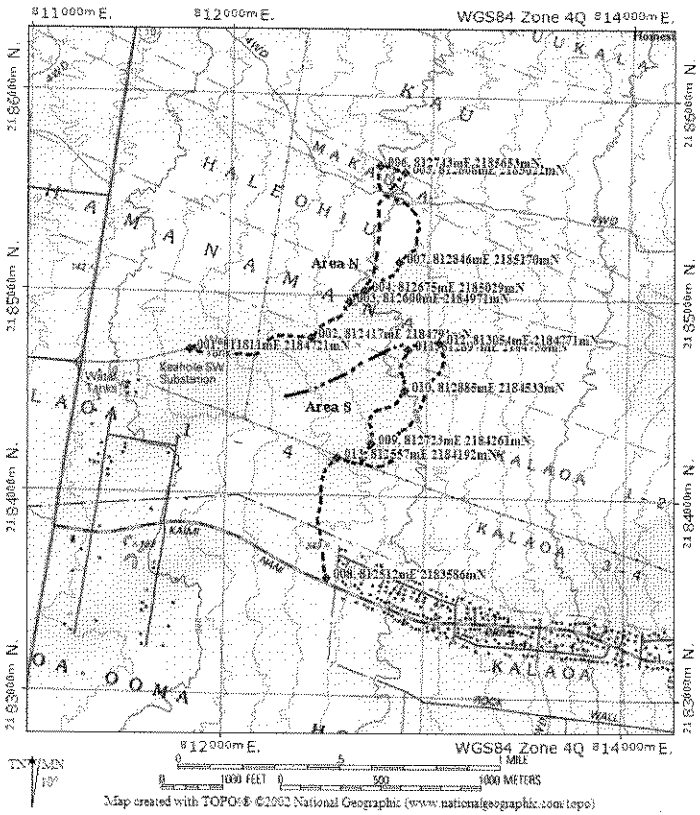

Figure 3. Map centered on the survey area showing botanical survey track (line of short dashes) based upon plotted GPS readings.

A plant checklist was compiled from all of the observations made by traversing the site on April 21. In cases where 100% coverage of an area is difficult or impossible, the botanist relies on acquiring a knowledge of plant habitats present (visiting representative areas for each) and a decreasing rate of discovery of unrecorded species to arrive at a conclusion of reasonable completeness. Results of this survey

were compared with a previous survey of the same area (Herbst, 1998) and nearby properties (Char, 1992, 2003; Hart, 2003; DOFAW, 2005).

Figure 4. Typical aspect of much of the northern half of the Main Street Collector Road corridor showing dominance of fountain grass in Area N.

Entries to the listing of plants present in the survey area are arranged alphabetically under family names (separated by higher taxa, in this case monocots and dicots). Estimated qualitative abundance values are relative to the specified subareas within the survey boundaries. Included are the scientific name, the common name, and status of the species. The nomenclature of the higher plants follows that of Wagner, Herbst, and Sohmer (1990, 1999) for both the native and naturalized plants and follows Palmer (2003) for ferns.

INVERTEBRATES — The primary purpose of the invertebrate survey was to determine if any federally listed endangered, threatened, proposed, or candidate species are extant within the area proposed for the Main Street Collector Road. Federal and State of Hawaii listed species status follows species identified in DLNR (1998) and Federal Register (1999a, 1999b, 2001, 2002, 2004).

The surface invertebrate survey was conducted on April 20-22, 2005 by Steven Lee Montgomery, Ph. D. A preceding period of above average rainfall resulted in healthy and well-developed host plants. The health of many native Hawaiian

invertebrate populations depends upon host plant availability and absence or low levels of introduced continental predators. Consequently, location of the botanical resources and presence of introduced arthropods were considered in survey strategies. The surface area was surveyed on foot along the same transects as used by botanical surveys. Night sampling was done at stations established at both ends of the Main Street Collector Road, as these locations could be reasonably reached after sunset.

Searches were conducted by visual inspection, sweep net, and for two nights by light trapping. Sweeping was concentrated on areas supporting native vegetation such as *maiapilo (Capparis sandwichiana)* and *`ilima (Sida fallax)*.

On April 21 an MV light was run for several hours behind the Volunteer Fire Department shed on Ka`iminani Drive (GPS Waypoint 008 in Figure 3) at the 328 ft (100 m) elevation. On April 22, an MV light was run for 12 hours beside two *`ohi`a lehua* trees (*Metrosideros polymorpha*; GPS Waypoint 005 in Figure 3) at about 400 ft (120 m) elevation off the 4-wheel drive access road on the Palamanui Project site (Kau). Weather was clear and dry both nights, presenting fair collecting opportunities. Night collecting was hampered by a nearly full moon. This competition for the attention of night flying insects no doubt accounts for the failure of certain large, adventive night moths to come to the lights.

Using maps and GPS information a collapsed lava tube was entered on April 21, 2005, with field assistance from Eric Guinther. It was only possible to enter the collapsed sections of the tubes and short passages. Some tubes were blocked by natural flow patterns of the lava. Although there were some twilight areas, no dark zone could be accessed. Consequently, no baits were deployed.

VERTEBRATES — Reginald David provided expertise in vertebrate biology. The primary purpose of the zoological surveys was to determine if there were any federally listed endangered, threatened, proposed, or candidate avian or mammalian species using resources within the proposed right-of-way or within the immediate vicinity of the project site. Federal and State of Hawai'i listed species status follows species identified in the following referenced documents (DLNR, 1998, Federal Register, 1999a, 1999b, 2001, 2002, 2004). Fieldwork was conducted on April 21 and 23, 2005.

All observations of mammalian species were of an incidental nature. With the exception of the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), or *`Ope`ape`a* as it is known locally, all terrestrial mammals currently found on the Island of Hawai`i are alien species. Most are ubiquitous. No trapping program was proposed or undertaken to quantify the use of the area by alien mammalian species. The survey of mammals was limited to visual and auditory detection,

coupled with visual observation of scat, tracks, and other animal sign. A running tally was kept of all vertebrate species observed and heard within the study area.

Following a site visit on April 21, and a rough assay of the different habitats present along the the proposed roadway alignment, two line transects were established within the proposed right-of-way for quantifying birds: the first running from approximately the mid-point of the proposed right-of-way, north to the northern terminus of the project, and the second extending north from Ka`iminani Drive to the start of the previous transect. Each of the line transects was counted twice (Bibby et al. 1993). Field observations were made with the aid of Leitz 10 X 42 binoculars and by listening for vocalizations. Counts were concentrated between 7:00 a.m. and 11:00 a.m., the peak of daily bird activity. An additional two hours were spent within the project area on the evening of April 21 and the morning of April 23, 2005, in an attempt to detect nocturnally flying seabirds and owls over-flying the project area. Time not spent counting was used to search the project area for species and habitats that were not detected during count sessions.

Avian phylogenic order and nomenclature follows *The American Ornithologist's Union Checklist of North American Birds 7th Edition* (American Ornithologist's Union, 1998), and the 42nd through the 45th supplements to *Check-list of North American Birds* (American Ornithologist's Union, 2000, Banks et al., 2002, 2003, 2004). Mammal scientific names follow *Mammals in Hawaii* (Tomich, 1986). Place names follow *Place names of Hawaii* (Pukui et al., 1974).

Survey Results

The site is located on the western slope of Hualalai and characterized by sloping and undulating ground. The generalized slope map for this area (Hawaii County, 1989) designates the general vicinity as "lowlands" with 5 to 10% slopes. The property is a mixture of pahoehoe and `a`a flows and varies considerably in ruggedness, with the southern half of the property in general more variable in relief and appearing more eroded, especially upslope from the Collector Road corridor. At least two, and possibly three large, lava tubes pass through the corridor, evident as a series of depressions and openings where the roof has collapsed. One such lava tube complex is located near the Ka`iminani Drive side of the property and was not surveyed because its recognized archaeological significance will ensure protection of any natural resources within.

FLORA — In the plant survey of April 2005, a total of 42 different species of plants (Table 1) were recorded as growing in the survey area. Of these, ten species (23.8 %) are recognized as native to the Hawaiian Islands, with three endemic (unique to the Islands) and 7 indigenous (native to Hawai`i, but also found naturally elsewhere in the Pacific Basin). One other plant recorded, *noni (Morinda citrifolia)*, is considered

an early Polynesian introduction. Thus, while the majority of species present are alien plants that have become naturalized in this low elevation environment on leeward Hawai`i, the proportion of native species (nearly one-quarter) is moderately high in comparison with most lowland locations in the Islands. Unfortunately, with the exception of *`ilima*, numbers of individuals and total biomass of native species in the corridor are very low in comparison with alien species numbers and biomass.

The percent natives recorded is somewhat less than that for the UHCWH property as a whole, as presented by Herbst (1998) who found 13 (37.1%) native species out of a total of 35 recorded species. At least 4 species not recorded by Herbst are weedy or ruderal species seen by us only along the track through the eastern end of the property from off Ka`imimani Drive. Another species, the Madagascar periwinkle (*Cantharanthus roseus*), seems unlikely to have been missed by Herbst had it been present in 1998 in the numbers seen in April 2005. This plant was also recorded by Hart (2004) from the property adjacent on the north. It seems likely that the somewhat wetter conditions of the past year may have allowed additional alien plants, like periwinkle, to extend into normally very dry areas, increasing species count, but decreasing the percentage of species that are native. Herbst did not list the two large *wiliwili* (*Erythrina sandwicensis*) trees near the upper (east) boundary of the property (David and Guinther, 2000) and neither do we because these trees are well out of the roadway corridor.

VEGETATION — The vegetation in the survey area was noted to change distinctly from the southern part of the property to the northern part within the proposed corridor area. The northern part is characterized by a nearly monotypic stand of fountain grass (*Pennisetum setaceum*) with very widely scattered trees and shrubs, these tending to be natives (mostly *alahe`e, maiapilo, naio,* and *maua*) and most abundant close to the north property boundary. This assemblage is mapped as Area "N" in Figure 3 and the abundance listing column in Table 1. Using the classification of Hawaiian plant communities developed by Gagne and Cuddihy (1990), this assemblage represents a Lowland Dry Grassland; specifically, the alien-dominated *Fountain Grass (Pennisetum) Grassland.* Nearly all of the herbaceous plants recorded (other than fountain grass) from the Lowland Dry Grassland within the corridor were observed within or on the rocky, stepped margins of collapsed lava tubes.

The southern area, designated Area "S" in Figure 3 and Table 1 is probably transitional between a Lowland Dry Grassland and a Lowland Dry Shrubland (Gagne and Cuddihy, 1990). Within this southern half of the corridor, fountain grass is still the most abundant species, but various shrubs approach co-dominancy. At the lower elevation through which the Connector Road would pass, these shrubs are mostly *`ilima* (*Sida fallax*) and indigo (*Indigofera suffruticosa*). In some areas,

Table 1. Listing of plants (flora) for the UHCWH segment of the Main Street Collector Road, North Kona District, Hawai`i

Species	Common name	Status	Abundance AREA N	Abundance AREA S	Notes
	FERNS				
	PTERIDOPHYTA				
DRYOPTERIDACEAE					
Nephrolepis multiflora (Roxb.) Jarrett ex Morton.	Asian sword fern	Nat.	R	—	(1)
	FLOWERING PLANTS				
	DICOTYLEDONE				
AMARANTHACEAE					
Amaranthus spinosus L.	spiny amaranth	Nat.	R	—	(1)
ANACARDIACEAE					
Schinus terebinthifolius L.	Christmas berry	Nat.	—	O	
APOCYNACEAE					
Cantharanthus roseus Raddi	Madagascar periwinkle	Nat.	–	O	
ASTERACEAE (COMPOSITAE)					
Gamochaeta purpurea (L.) Cabr.	—	Nat.	R	—	(1)
Pluchea carolinensis (Jacq.) G. Don	Sourbush	Nat.	R	R	
CACTACEAE					
Opuntia ficus-indica (L.) Mill.	*Panini*	Nat.	R	R	
CAPPARACEAE					
Capparis sandwichiana DC	*maiapilo*	**End.**	O	O	
CHENOPODIACEAE					
Chenopodim ambrosioides L.	Mexican tea	Nat.	R	—	(1)
Chenopodium murale L.	*`aheahea*	Nat.	U	—	(1)
CONVOLVULACEAE					
Ipomoeae indica (J. Burm.) Merr.	*koali`awa*	Ind.	—	R	
CUCURBITACEAE					
Momordica charantia L.	wild bittermelon	Nat.	R	—	(1)
Indet.	?squash	Orn.	R	—	
EUPHORBIACEAE					
Chamaesyce hirta (L.) Millsp.	garden spurge	Nat.	R	—	
Chamaesyce prostrata (Aiton) Small	Prostrate spurge	Nat.	—	R	(2)
FABACEAE					
Acacia farnesiana (L.) Willd.	*Klu*	Nat.	R	—	
Chamaecrista nictitans (L.) Moench	Partridge pea	Nat.	R	O	(2)
Indigofera suffruticosa Mill.	Indigo	Nat.	O	A	
Leucaena leucocephala (Lam.) deWit	*koa haole*	Nat.	O	A	
FLACOURTIACEAE					
Xylosma hawaiiensis Seem.	*maua*	**End.**	U	—	

Table 1. (continued)

Species	Common name	Status	Abundance AREA N	Abundance AREA S	Notes
LAMIACEAE					
Plectranthus parviflorus Willd.	*`ala`ala wai nui wahine*	**Ind.**	U	—	(1)
MALVACEAE					
Abutilon grandifolium (Willd.) Sweet	hairy abutilon	Nat.	R	—	(1)
Malvastrum coromandelianum (L.) Garck	false mallow	Nat.	—	U	(2)
Sida fallax Walp.	*`ilima*	**Ind.**	—	A	
MYOPORACEAE					
Myoporum sandwicense A. Gray	*naio*	**Ind.**	O	—	
MYRTACEAE					
Metrosideros polymorpha Gaud.	*`ohi`a lehua*	**End.**	R	—	(3)
NYCTAGINACEAE					
Boerhavia coccinea Mill.	false alena	Nat.	—	U	(2)
PASSIFLORACEAE					
Passiflora foetida L.	love-in-the-mist	Nat.	—	R	
PHYTOLACCACEAE					
Rivina humils L.	coral berry	Nat.	R	—	(1)
PIPERACEAE					
Peperomia leptostachya Hook & Arnott		**Ind.**	U	—	(1)
PORTULACACEAE					
Portulaca oleracea L.	pigweed	Nat.	U	—	(1)
Portulaca pilosa L.		Nat.	U	U	(1, 2)
Talinum fruticosum (L.) Juss.	—	Nat.	U	—	(1)
PROTEACEAE					
Grevillea robusta A. Cunn. Ex R. Br.	silk oak	Nat.	R	—	
RUBIACEAE					
Morinda citrifolia L.	*noni*, Indian mulberry	**Pol.**	U	U	
Psydrax odoratum	*alahe`e*	**Ind.**	O	—	
SAPINDACEAE					
Dodonaea viscosa Jacq.	*`a`ali`i*	**Ind.**	O	C	
STERCULIACEAE					
Waltheria indica L.	*`uhaloa*	**Ind.**	R	C	
VERBINACEAE					
Lantana camara L.	lantana	Nat.	R	R	
MONOCOTYLEDONES					
COMMELINACEAE					
Commelina benghalensis L.	—	Nat.	R	—	(1)

Table 1. (continued)

Species	Common name	Status	Abundance AREA N	Abundance AREA S	Notes
POACEAE (GRAMINEAE)					
Cenchrus ciliaris L.	buffelgrass	Nat.	—	U	(2)
Melinus repens (Willd.) Zizka	Natal redtop	Nat.	—	U	
Pennisetum setaceum (Forssk.) Chiov.	fountain grass	Nat.	AA	AA	

Legend to Table 1

Status = distributional status
- **End.** = endemic; native to Hawaii and found naturally nowhere else.
- **Ind.** = indigenous; native to Hawaii, but not unique to the Hawaiian Islands.
- Nat. = naturalized, exotic, plant introduced to the Hawaiian Islands since the arrival of Cook Expedition in 1778, and well-established outside of cultivation.
- Orn. = exotic, ornamental or cultivated, plant not naturalized (not well-established outside of cultivation).
- **Pol.** = Polynesian introduction before 1778.

Abundance = occurrence ratings for plants in Areas "N" and "S" on April 21, 2005.
- R – Rare – only one or two plants seen.
- U – Uncommon – several to perhaps a dozen plants observed.
- O – Occasional – found regularly, but not abundant anywhere.
- C – Common – considered an important part of the vegetation and observed numerous times.
- A – Abundant – found in large numbers; may be locally dominant.
- AA – Abundant – abundant and dominant; defining vegetation type.

Notes:
- (1) Observed only in AREA N in or associated with collapsed lava tubes.
- (2) Observed mostly in AREA S along entrance track or powerline track.
- (3) Located off property near the northern boundary

Christmas berry (*Schinus terebinthefolius*) is common. Further upslope from the corridor, the dominant shrub is *`a`ali`i*, forming an *`A`ali`i (Dodonaea) Lowland Shrubland.*

INVERTEBRATES — Few native arthropods were observed during the searches, they did not come to baits, and no tell-tale feeding damage was found with the exception of damage to a caper described below. One abundant, introduced arthropod was the Big-headed ant (*Pheidole megacephala*) which tends sap-sucking insects, as well as eating most other insects. Also plentiful were Long-legged ants (*Anoplolepis longipes*). Table 2 lists arthropods encountered, including the prominent alien species and the few endemic invertebrates collected or observed.

Only one native snail was seen: a *Succinea* sp. Only one individual was located, attached to a rotting log. It is probable that if a survey were made immediately following a rain, many additional individuals would be found, since this genus is a very prevalent native snail..

MEDICALLY IMPORTANT SPECIES — Although a large garden spider (*Argiope appensa*) is plentiful in the area (especially on shrubs in Area S), it is not considered

a human health risk. None of the alien species of medical importance (centipedes, scorpions, widow spiders, honey bee colonies, and common paper wasp nests) were observed during this survey, but could be present in the work area. Employees should always be alert for their presence. Any of the species may pose a serious risk to specific individuals, and supervisors should be aware of any special allergy by employees. Some individuals can experience anaphylactic reactions to venom and should immediately seek medical assistance. When moving stones and debris, use of gloves will greatly reduce the risk of accidental contact and bites. More information can be found in *What Bit Me?* (Nishida & Tenorio, 1993) and *What's Bugging Me* (Tenorio & Nishida, 1995).

Table 2. Listing of invertebrates, May 2005, for the Main Street Collector Road, North Kona District, Hawaii

Species	Common name	Tube or Surface	Status	Abundance	Notes
INSECTA (INSECTS)					
Blattaria: Blattidae					
Periplaneta americana (Linnaeus, 1758)	Cockroach	T & S	Adv	C	
Heteroptera: Lygaeidae					
Nysius nigriscutellatus Usinger, 1942	Seed bug	S	End	O	at light
Heteroptera: Nabidae					
Nabis blackburni White, 1878	Damsel bug	S	End	R	
Homoptera: Cixiidae					
Oliarus (dark sp.)	Planthopper	S	End	R	1 on *Psydrax*, visual only
Diptera: Drosophilidae					
Drosophila melanogaster Meigen, 1830	small species	S	Adv	U	on naio sap
Lepidoptera: Cosmopterigidae					
Hyposmocoma liturata Walsingham, 1907	casebearers	S	End	C	12 at light 6 empty cases
Lepidoptera: Plutellidae					
Plutella nohotio Robinson & Sattler, 2001	caper fruit borer	S	End	R	visual only
Lepidoptera: Crambidae					1
Omiodes blackburni (Butler, 1878)	Sugar cane leafroller	S	End	R	1
Tamsica hyacinthata(Meyrick, 1899)	Grass moth	S	End	R	
Udea species near *bryochloris*				C	6 very common
Hymenoptera: Formicidae					
Pheidole megacephala (Fabricius, 1793)	Big headed ant	S	Adv	O	
Anoplolepis gracilipes (F. Smith, 1857)	Longlegged ant	S	Adv	C	
ARACHNIDA (SPIDERS)					
Araneae: Araneidae					
Argiope appensa (Walckenaer, 1841)	garden spider	S	Adv	A	
Araneae: Pholcidae					
Pholcus phalangiodes (Fuesslins, 1775)	Long legged spider	T	Adv	U	

Table 2 (continued).

MOLLUSCA					
GASTROPODA PULMONATA	Snails & Slugs				
Succineidae					
Succinea sp.		S	End	R	under rotting log

Legend to Table 2

Status = distributional status
End. = endemic; native to Hawaii and found naturally nowhere else.
Adv = adventive; naturalized, introduced to Hawaiian Islands since Capt. Cook Expedition 1778

Abundance = occurrence ratings
R - Rare - only one or two plants seen.
U - Uncommon - several to a dozen plants observed.
O - Occasional - found regularly, but not abundant anywhere.
C - Common - observed numerous times.
A - Abundant - found in large numbers; may be locally dominant.

Name authorities: Hawaii Biological Survey, 2002; Nishida, 2002; Zimmerman, 1948

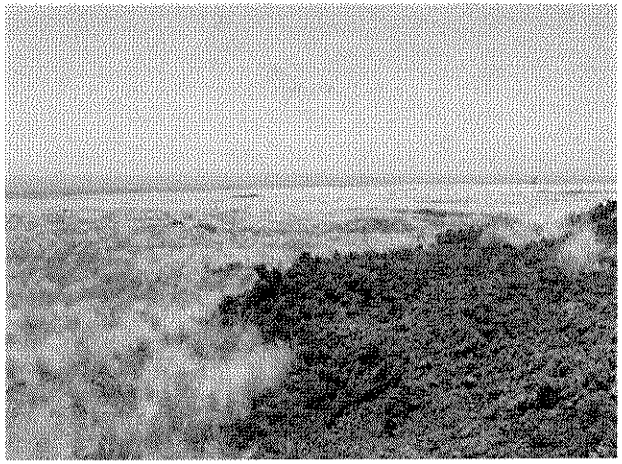

Figure 5. View to the northwest across the property, showing monotypic fountain grass Area N in the background, a mixed `*ilima*, indigo, and fountain grass Area S middle and foreground left, and the sparsely vegetated frontal toe of an `a`a flow.

MAMMALS — Five alien mammalian species were detected during the course of this survey. A number of dogs (*Canis f. familiaris*) were heard barking from within the Palisades subdivision. One cat (*Felis cattus*) and 17 goats (*Capra h. hircus*) were

seen within the proposed alignment corridor. The entire study area was strewn with goat scat and numerous goat trails and bedding areas crisscross the site. Additionally, skeletal remains of pig (*Sus s. scrofa*), cattle (*Bos taurus*), and goat were encountered in several collapsed lava tubes within the project area. All of the alien mammalian species recorded during this survey are deleterious to avian and floristic components of the remaining native ecosystems present on the Island.

BIRDS — A total of 121 individual birds of 10 different species, representing 8 separate families were recorded during the course of this survey (Table 3). All of the species detected are considered to be alien to the Hawaiian Islands. Avian diversity and densities were exceptionally low. Only 17 individual birds representing four species were recorded during two repetitions of the northern transect. Avian diversity and densities were higher on the southern transect, with a total of 104 individual birds representing 9 separate species being recorded during two repetitions of the southern transect. The majority of the birds recorded on the southern transect were detected within 100-meters of existing housing along Ka'iminani Drive. Avian densities north of the housing area mirrored those recorded on the northern transect.

Table 3. Avian species detected within the proposed Main Street Connector Road corridor.

Common Name	*Scientific Name*	*ST*	*RA1*	*RA2*
	GALLIFORMES			
	PHASIANIDAE - Pheasants & Partridges			
	Phasianinae - Pheasants & Allies			
Black Francolin	*Francolinus francolinus*	A	1.75	2.25
	COLUMBIFORMES			
	COLUMBIDAE - Pigeons & Doves			
Spotted Dove	*Streptopelia chinensis*	A	-	0.5
Zebra Dove	*Geopelia striata*	A	-	1.05
	STRIGIFORMES			
	TYTONIDAE - BARN OWLS			
Barn Owl	*Tyto alba*	A	0.5	-
	PASSERIFORMES			
	ZOSTEROPIDAE - White-eyes			
Japanese White-eye	*Zosterops japonicus*	A	-	2.5
	STURNIDAE - Starlings			
Common Myna	*Acridotheres tristis*	A	-	2.75

Table 3 (continued)

Common Name	Scientific Name	*ST*	*RA1*	*RA2*
	CARDINALIDAE - Cardinals Saltators & Allies			
Northern Cardinal	*Cardinalis cardinalis*	A	-	0.25
	Carduelinae - Carduline Finches			
House Finch	*Carpodacus mexicanus*	A	0.5	0.75
	ESTRILDIDAE - Estrildid Finches			
	Estrildinae - Estrildine Finches			
Nutmeg Mannikin	*Lonchura punctulata*	A	1.5	3.0
Java Sparrow	*Padda oryzivora*	A	-	12.5

Legend to Table 3

ST Status:
A Alien Species

RA1 Relative Abundance Transect 1 (Northern) : Number of birds detected divided by the number of repetitions (2)

RA2 Relative Abundance Transect 1 (Southern) : Number of birds detected divided by the number of repetitions (2)

Discussion

PLANTS — Within the general project area, there is an elevational shift in the character of the vegetation related to the rainfall gradient: much drier conditions prevail at the coast (median annual rainfall of around 15 in or 380 mm; Taliaferro, 1959; Waimea Water Services, 2003), giving way to annual rainfall medians of 40 to 50 inches (1000-1300 mm) at the 4000-foot (1200-m) elevation. Even wetter conditions prevail around the southwest side of Hualalai above Kailua-Kona, but the increase in rainfall and fog drip received on average above Keahole Point is sufficient to significantly effect the vegetation. A survey by Hart (2003) of the adjacent Palamanui parcel and covering a wider elevational range than our current survey, described the vegetation patterns thusly:

> *Below 500 ft (<150 m)* – *Pennisetum* grassland with scattered native and introduced trees and shrubs.
>
> *500 to 650 ft (150 - 200 m)* – *Pennisetum* scrub: shrubs (mostly *`a`ali`i, koa-haole,* and Christmas berry) co-dominant with fountain grass; occasional native trees such as *lama, alahe`e, mamane, iliahi,* and *wiliwili*).
>
> *650-900 ft (200-275 m)* – Lowland Dryland Forest (Gagne and Cuddihy, 1990) dominated by *lama, alahe`e,* and *iliahi.*

In consideration of the remnant dryland forest containing many rare native trees reported by Hart (2003) for Palamanui, the State of Hawaii conducted its own informal survey of state-owned lands at Pu`ukala, directly adjacent to Kau on the north (DOFAW, 2005). Again, remnants of a native dry land forest were found with

a number of listed or rare native tree species. It is clear from both of these surveys, that most of the vegetation having high resource value and/or sensitivity occurs above 600 ft (180 m); the Main Street Collector Road corridor lies between 300 and 400 ft (90-120 m) elevation.

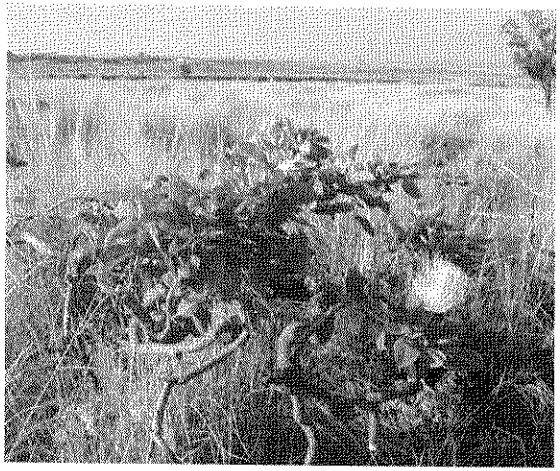

Figure 6. Shruby *maiapilo* (*Capparis sandwichiana*), present in the roadway corridor, is a native endemic whose populations are considered vulnerable throughout the state.

Within the proposed corridor occur a number of shrubs and trees that may be important to preserve (i.e., avoid if possible during construction). The Hawaiian capper or *maiapilo* (*Capparis sandwichiana*; Figure 6 above) is a U.S. Fish and Wildlife (USFWS) Species of Concern (SoC) and this status is discussed at some length for this species in Herbst (1999). Wagner, Herbst, and Sohmer (1990) regard this Hawaiian endemic as "vulnerable" (IUCN category; see Lucas and Synge, 1978): a taxon likely to become endangered in the near future unless threats to survival are removed. The USFWS defines Species of Concern as species that are vulnerable because their habitat is threatened by on-going and future development. Although such a designation has no legal standing (SoC's are not federally listed species), the potential for future listing is great. The *maiapilo* plants are widely scattered across the site, although more conspicuous and possibly more numerous towards the northern boundary with Kau.

Most of the other native trees and shrubs have a distribution similar to that of the *maiapilo*, with the exception of *`ilima*, which is ubiquitous in Area S, and *`a`ali`i*, which is especially abundant in Area S upslope from the proposed road corridor. These shrubs and trees are sometimes associated with depressions (for example, collapsed lava tubes) in the Dry Grassland (Area N), but increase as the north property boundary is approached or crossed within the survey corridor. Indeed, others are located off the UHCWH site, but might be in line with the roadway once it is extended northward into the Hiluhilu Development site of Palamanui at Kau. A color plot of rare trees by Hart (2003) on an aerial photograph of Kau, shows the trees below 200 m are mostly associated with the more barren lava areas (that is, areas of sparse fountain grass, such as seen foreground right in Figure 5). Possibly, this distribution reflects areas at low (barren) and high (grassy) risk for fires, and could explain the pattern we noted of increasing numbers of native trees towards and across the boundary with Kau.

In a 1999 report for the UHCWH project, Herbst included a table of listed and rare plant species found or potentially found on the property. This table is reproduced and modified here as Table 4. Note that only species followed by a Note (1) are known to be present in the Main Street Collector Road corridor.

Table 4. Listed, Species of Concern, and rare or vulnerable plants occurring or potentially occurring in the Main Street Collector Road corridor.

SPECIES (*Hawaiian name*)	STATUS	NOTE
Bidens micrantha ssp. *ctenophylla* (*ko`oko`olau*)	Candidate species	(3)
Caesalpinia kavaiensis (*uhiuhi*)	Listed, endangered	(2)
Capparis sandwichiana (*maiapilo*)	Species of Concern	**(1)**
Colubrina oppositifolia (*kauila*)	Listed, endangered	(3)
Nothocestrum breviflorum (*`aiea*)	Listed, endangered	(2)
Pleomele hawaiiensis (*hala pepe*)	Listed, endangered	(2)

Notes:

(1) Present throughout the corridor (see text).

(2) Reported from off property, at higher elevations.

(3) Not reported in recent surveys on or off property; known from leeward Hawai`i.

INVERTEBRATE FAUNA — Arthropod life cycles often are keyed to seasonal changes, cyclically altering the species collected. Many arthropods time their emergence and breeding to overlap or follow seasonal weather or to coincide with growth spurts of an important plant food. Monitoring at a different time of the year would produce a longer or different arthropod list.

No native arthropods or other invertebrates on the federal or state endangered, threatened, proposed, or candidate lists were seen. The area provides habitat for

only a few native arthropods. Native forest cover accounts for approximately 2% of the vegetation and large areas are dominated by fountain grass (*Pennisetum setaceum*). Although historically, North Kona is known to have supported larvae of Blackburn's hawk moth (*Manduca blackburni*)—a federally listed species—on host plants in the Family Solanaceae, such as introduced tree tobacco (*Nicotiana glauca*) and native *`aiea* (*Nothocestrum* sp.; Riotte, 1987). Neither of these host plants suitable for Blackburn's hawk moth caterpillars was seen within the corridor. *`Aiea* is reported from further upslope (well outside the project corridor) in this area (Hart, 2003).

Without competition from a nearly full moon, a few additional native moths might have resulted from light collecting. A few non-native species reasonably expected to occur on the property were not found. Expected would be the adventive Sweet Potato Hawkmoth (*Agrius cingulata*) and White Line Sphinx (*Hyles lineata*). Difficulties in sampling a large area, at only one season for a diversity of invertebrates results in the probability some species may elude even the most experienced collector. Not finding a species does not mean it is not present. Missing species might be found with further survey work, in a longer or seasonally different survey of the property.

At least two and possibly three large lava tubes cross the roadway corridor, their presence evidenced by collapsed sections. The lava tubes visited are collapsed or sealed off and in a dry environment impacted by feral goat browsing and large stands of fountain grass. These African plants do not generate the kinds of long roots necessary to provide the basis of a healthy native lava tube ecosystem. The lava tube ecosystem is based on herbivorous arthropods feeding on nutrients contained in roots that enter the tube from vegetation growing over it. Carnivorous arthropods may in turn eat plant-feeding ones (Howarth, 1987).

Maiapilo is scattered on land above some lava tubes and is presumed to have roots reaching to the interiors. Its leaves, however, were not chewed by caterpillars of the micromoth in the *Plutella capparidis* complex, but the fruit were mined by a sister species. The dominant over head vegetation for tubes is fountain grass, goat feeding damage to all native species is common, and the presence of predatory ant species combines to provide a setting unlikely to support high native arthropod levels. As lava tube collapses precluded entry, however, it is not possible to determine in this survey if a native ecosystem exists in the dark zones, if any, hidden beneath the Main Street Collector Road corridor.

VERTEBRATES — A one-time survey can not provide a total picture of the wildlife utilizing any given area. Certain species will not be detected for one reason or another. Seasonal variations in populations coupled with seasonal usage and

availability of resources will cause different usage patterns throughout a year or, in fact, over a number of years.

The findings of the mammalian survey are consistent with other surveys conducted on lands near or immediately adjacent to this study site (Brunner, 1992, 2003; David and Guinther, 2000; Hart, 2003) and in the fountain grass dominated lowlands of North Kona and South Kohala Districts within the recent past (David, 1999, 2000a, 2000b, 2000c, 2000d, 2000e, 2000f, 2001, 2002, 2003, 2004a, 2004b, 2005). It is likely that Hawaiian hoary bats over-fly the project site, at least occasionally, as they have been seen in areas both *mauka* and *makai* of the proposed right-of-way corridor on a seasonal basis (Jacobs, 1994; R. David, unpublished field notes, 1985-2004).

It should be noted that current survey techniques available for gathering information on the distribution, abundance and usage of resources within a given area by Hawaiian hoary bats are inadequate and/or time and cost prohibitive. Data gathered by these methods only indicate whether bats are present or not in a given area. The two main methods currently being used to monitor lasiurine bats are heterodyne echolocation detector surveys and mist netting. Biologists currently have no understanding of detection probabilities associated with either method (Carter, et al., 2000). It may be impossible to standardize detection probabilities among surveyors, studies, or over time (O'Shea and Bogen, 2000). The inability to estimate detection probability, limits the usefulness of data collected using un-calibrated indices produced by either mist netting or echolocation surveys.

Unlike nocturnally flying seabirds, which often collide with man-made structures, bats are uniquely adapted to avoid collision with obstacles, man-made or natural. They navigate and locate their prey primarily by using ultrasonic echolocation, which is sensitive enough to allow them to locate and capture small volant insects at night, while avoiding structural hazards.

Although no rodents or mongoose were detected during the course of this survey, it is likely that roof rat (*Rattus r. rattus*), Norway rat (*Rattus norvegicus*), European house mouse (*Mus domesticus*), and possibly Polynesian rat (*Rattus exulans hawaiiensis*) use resources within the general project area. Surprisingly we did not record any small Indian mongoose (*Herpestes a. auropunctatus*) during this survey, although it is almost a certainty that this ubiquitous mammalian species uses resources within the project site. Without conducting a trapping program, it is difficult to assess the population densities of these often hard-to-see mammals. All of these introduced species are deleterious to native ecosystems and the native faunal species that are dependant on them.

The relatively low diversity and densities of avian species detected during this survey was in keeping with the results of at least one other survey conducted within and adjacent to the Collector Road corridor (Brunner, 1992, 2003; David and Guinther, 2000; Hart, 2002) and with several other surveys conducted in the fountain grass dominated lowland areas of the North Kona and South Kohala Districts within the recent past (David, 1999, 2000a, 2000b, 2000c, 2000d, 2000e, 2000f, 2001, 2002, 2003, 2004a, 2004b, 2005).

The habitat currently found within the project area and within the fountain grass dominated xeric communities in the North Kona District is not conducive to supporting native avian species, with the possible exception of Short-eared Owls (*Asio flammeus sandwichesis*), the Hawaiian endemic sub-species of this cosmopolitan diurnal owl. Although not detected on this survey, we have recorded this species on several occasions immediately adjacent to the subject property (R. David, unpublished field notes, 1995-2005).

Although not detected during this survey it is possible that small numbers of the endangered Hawaiian Petrel (*Pterodroma sandwichensis*), and the threatened Newell's Shearwater (*Puffinus auricularis newelli*), over fly the project area between the months of May and November (Banko, 1980a, 1980b; Day, et al., 2003; Harrison 1990).

Hawaiian Petrels were formerly common on the Island of Hawai`i (Wilson and Evans, 1890–1899). This pelagic seabird reportedly nested in large numbers on the slopes of Mauna Loa and in the saddle area between Mauna Loa and Mauna Kea (Henshaw, 1902), as well as at mid- to high elevations on Hualalai. The species, within recent historic times, has been reduced to relict breeding colonies located at high elevations on Mauna Loa and possibly Hualalai (Banko, 1980a; Banko, et al., 2001; Cooper and David, 1995; Cooper, et al., 1995; Day, et al., 2003; Harrison, 1990; Hue, et al., 2001; Simons and Hodges, 1998).

Newell's Shearwaters were formerly common on the Island of Hawai`i (Wilson and Evans, 1890–1899). This species breeds on Kaua`i, Hawai`i and Moloka`i in extremely small numbers. Newell's Shearwater populations have dropped precipitously since the 1880s (Banko, 1980b; Day, et al., 2003). This pelagic species nests high in the mountains in burrows excavated under thick vegetation, especially *uluhe* fern.

The primary cause of mortality in both these species is thought to be predation by alien mammalian species at the nesting colonies (Ainley, et al., 2001; Cooper and Day, 1995, 1998; Day and Cooper, 1997; Hue, et al., 2001). Collision with man-made structures is considered to be the second most significant cause of mortality of these seabird species in Hawai`i. Nocturnally flying seabirds, especially fledglings

on their way to sea in the summer and fall, can become disoriented by exterior lighting. When disoriented, seabirds often collide with manmade structures, and if they are not killed outright, the dazed or injured birds are easy targets of opportunity for feral mammals (Ainley, et al., 1995, 1997, 2001; Cooper and Day, 1995, 1998; Day and Cooper, 1997). There is no suitable nesting habitat within or close to the proposed roadway corridor for either of these pelagic seabird species.

Assessments

Native shrubs and trees

The probable route of the Main Street Connector Road passes through a mixed shrub-grassland on the south and into grassland on the north. Only *maiapilo*, a Species of Concern (see Table 3), was noted in the shrub-grassland community (Area S). The number of *maiapilo* and other generally rare natives such as *maua*, is somewhat greater in the grassland (Area N), with greatest density of native shrubs and trees within the corridor occurring near the northern boundary of the property. Avoiding all of these plants individually would be difficult, and none has legal status (i.e., is listed as threatened or endangered). To some extent, all are vulnerable in this location to fire and future development. To minimize losses, native trees should be flagged and locations recorded and transmitted to contractors so as to avoid inadvertent destruction by grading or other construction activities where the route passes close to a plant. Mitigation for plants destroyed by the construction of the road could include funding plantings of the same species in archaeological preserve areas expected to be established on the UHCWH site.

Cave (Lava tube) Fauna

At least two, and possibly three large lava tubes cross the roadway corridor, their presence evidenced by collapsed sections. These were explored to the extent possible and no native invertebrates, or habitat likely to support native invertebrates, was discovered. However, it remains possible that unknown lava tubes, or inaccessible segments of known lava tubes could be present and contain native cave fauna. Lava tube segments supporting significant biological resources were discovered at adjacent Kau, but all above 500 ft (150 m) elevation and supported by a surface dryland forest with native trees (Howarth, Preston, & James, 2003).

Hawaiian hoary bat

The construction and operation of the proposed roadway is not expected to result in any adverse impacts to the endangered Hawaiian hoary bat, the only listed terrestrial mammalian species present in Hawai'i.

Hawaiian Petrel and Newell's Shearwater

The principal potential impact that the construction and operation of the proposed learning center poses to Hawaiian Petrels and Newell's Shearwaters is the increased threat that birds will be downed after becoming disoriented by exterior lighting that may be required in conjunction with the construction and operation of the roadway.

To reduce the potential for interactions between nocturnally flying Hawaiian Petrels and Newell's Shearwaters with external lights and man-made structures, it is recommended that any external lighting planned to be used during construction or being proposed as permanent street lights be shielded (Reed, et al., 1985; Telfer, et al., 1987). This mitigation would serve the dual purpose of minimizing the threat of disorientation and downing of Hawaiian Petrels and Newell's Shearwaters, while at the same time complying with the Hawaii County Code § 14 – 50 *et seq.* which requires the shielding of exterior lights, so as to lower the ambient glare caused by unshielded lighting to the astronomical observatories located on Mauna Kea.

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Appendix E. Acoustic Study

ACOUSTIC STUDY FOR THE PROPOSED MAIN STREET COLLECTOR ROAD

NORTH KONA, HAWAII

Prepared for:

WIL CHEE - PLANNING & ENVIRONMENTAL, INC.

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CHAPTER I. SUMMARY

The existing and future traffic noise levels in the environs of the proposed Main Street Collector Road Project on the island of Hawaii (see Figure 1) were studied to evaluate potential noise impacts associated with the Build Alternative. Noise measurements were obtained, traffic noise predictions developed, and noise abatement alternatives described.

Existing traffic and background ambient noise levels in the project area currently do not exceed the U.S. Federal Highway Administration (FHWA) and Hawaii State Department of Transportation, Highways Division (HDOT) noise abatement criteria. Future (CY 2015) traffic noise levels are not expected to exceed the "66 Leq" and "15 dB increase" HDOT noise abatement criteria at existing residences at the south end of the Main Street Collector Road. No residences or park lands are expected to be adversely impacted by future traffic noise levels from the proposed roadway within the limits of project construction. Traffic noise mitigation measures should not be required.

The following general conclusions can be made in respect to the number of impacted structures which can be expected by CY 2015 under the Build Alternative. These conclusions are valid for a future traffic volume of 615 vehicles per hour, for a traffic mix of 98.0% automobiles, 1.0% medium trucks, and 1.0% heavy trucks and buses, and for an average speed of 45 miles per hour.

- The HDOT's "66 Leq(h)" and/or the "15 dB increase" criteria for substantial change in traffic noise levels will not be exceeded at the west end of the existing Kona Palisades Estates under the Build Alternative.
- No parks within the limits of project construction should be affected by the proposed project or require noise mitigation measures under the Build Alternative.
- No public use facility within the limits of project construction should be affected by the proposed project or require noise mitigation measures under the Build Alternative.
- Potential short term construction noise impacts are possible during the project construction period at the south end of the project corridor where noise sensitive receptors are located. However, minimizing these types of noise impacts is possible using standard curfew periods, properly muffled equipment, administrative controls, and construction barriers as required.

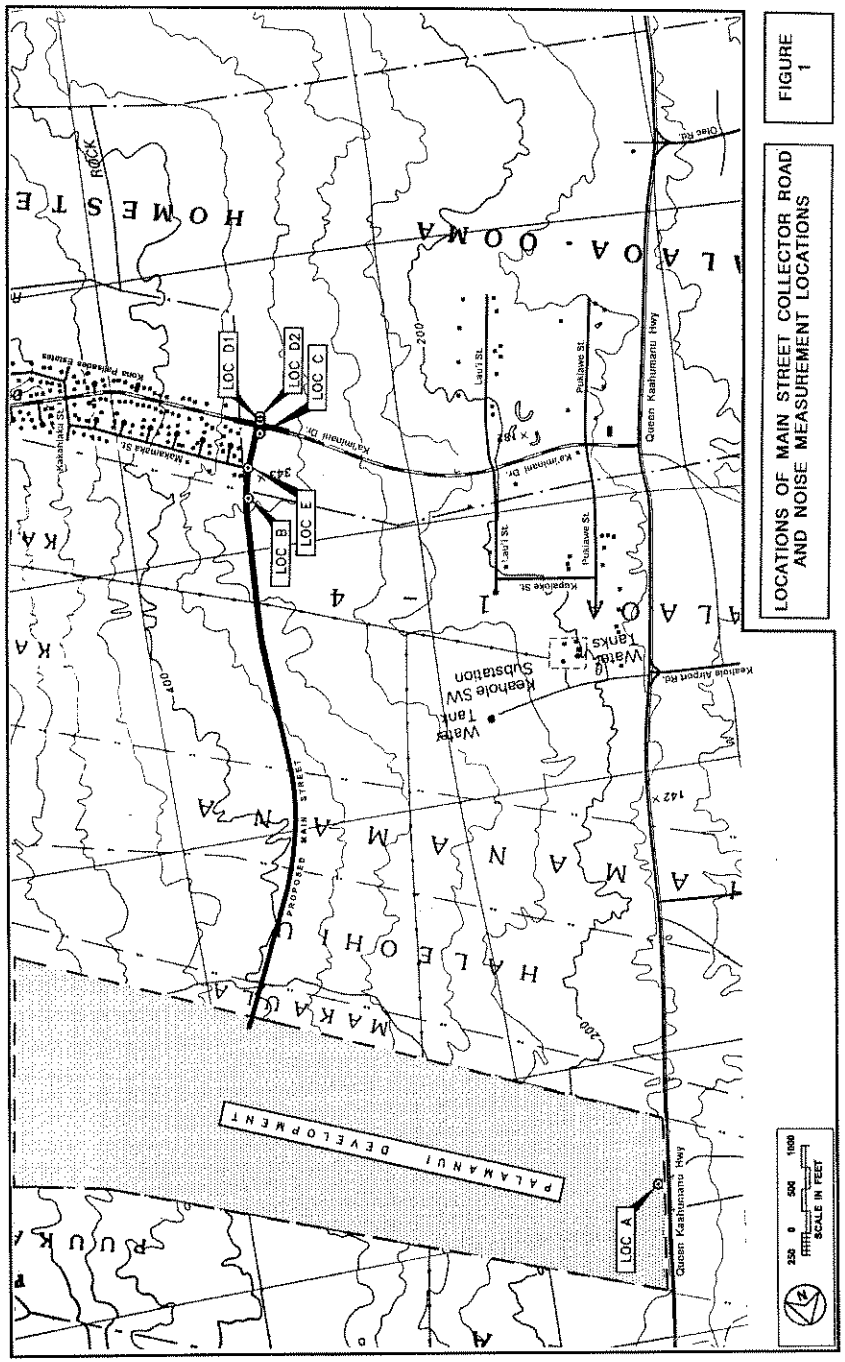

FIGURE 1

LOCATIONS OF MAIN STREET COLLECTOR ROAD AND NOISE MEASUREMENT LOCATIONS

CHAPTER II. GENERAL STUDY METHODOLOGY

Noise Measurements. Existing traffic and background ambient noise levels at four locations in the project area were measured in April 2005. In addition, traffic noise measurements obtained in July 2003 were also used to supplement the 2005 measurements. The traffic noise measurements were used to calibrate the traffic noise model which was used to calculate the Base Year (CY 2005) and future (CY 2015) traffic noise levels under the Build Alternative. The background ambient noise measurements were used to define existing noise levels at noise sensitive receptors which may be affected by the project. Also, the measurements were used in conjunction with forecast traffic noise levels to determine if future traffic noise levels are predicted to "substantially exceed" existing background ambient noise levels at these noise sensitive receptors, and therefore exceed FHWA and HDOT noise standards and criteria.

The noise measurement locations ("A" through "E") are shown in Figure 1. The results of the traffic and background ambient noise measurements are summarized in Table 1. In Table 1 and subsequent tables, Leq represents the average (or equivalent), A-Weighted, Sound Level. A list and description of the acoustical terminology used are contained in Appendix B.

Traffic Noise Predictions. The Federal Highway Administration (FHWA) Traffic Noise Model, Version 2.5 (or TNM, see Reference 1) was used as the primary method of calculating Base Year and future traffic noise levels, with model parameters adjusted to reflect terrain, ground cover, and local shielding conditions. The traffic noise measurement Locations "A", "C", "D1", and "D2" were located along Queen Kaahumanu Highway and Kaiminani Drive. At these traffic noise measurement locations, the measured traffic noise levels were compared with TNM model predictions to determine if the measured and calculated noise levels for the existing conditions were consistent and in general agreement. As indicated in Table 1, spot counts of traffic volumes were also obtained during the measurement periods and were used to generate the Equivalent Sound Level (Leq) predictions shown in the table. Hourly variations in traffic volumes, traffic mix by vehicle types, and average vehicle speeds for the various sections of the existing and future roadways were derived from observations during the noise monitoring periods and from References 2 and 3.

The overall agreement between measured and predicted traffic noise levels at Locations "C", "D1", and "D2" was considered to be fair. The TNM 2.5 noise model predictions were generally lower than measured traffic noise levels at Location "D1", and the TNM 2.5 noise model predictions were generally higher than measured traffic noise levels at Location "D2" for the traffic volume and speed conditions shown in Table 1. Nevertheless, the TNM 2.5 traffic noise model was used to predict future traffic noise levels along the proposed Main Street Collector Road.

TABLE 1
TRAFFIC AND BACKGROUND NOISE MEASUREMENT RESULTS

	LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	Hourly Traffic Volume AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
A	90 FT from centerline of Q. Kaahumanu Hwy. (7/01/03)	0716 TO 0816	65	846	26	49	68.5	68.8
A	90 FT from centerline of Q. Kaahumanu Hwy. (7/01/03)	1546 TO 1646	65	1,296	24	20	68.6	68.9
B	At Northwest corner of Kona Palisades Estates. (4/24/05)	0936 TO 1016	N/A	N/A	N/A	N/A	42.8	N/A
C	50 FT from centerline of Kaiminani Dr. (7/01/03)	1000 TO 1100	44	294	8	1	61.7	61.7
D1	50 FT from centerline of Kaiminani Dr. (4/25/05)	0650 TO 0750	44	674	6	8	65.5	64.6
D2	100 FT from centerline of Kaiminani Dr. (4/25/05)	0650 TO 0750	44	674	6	8	56.9	58.5
D1	50 FT from centerline of Kaiminani Dr. (4/25/05)	1600 TO 1700	44	631	8	8	65.8	66.3

TABLE 1 (CONTINUED)
TRAFFIC NOISE MEASUREMENT RESULTS

	LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	Hourly Traffic Volume AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
D2	100 FT from centerline of Kaiminani Dr.	1600 TO 1700 (4/25/05)	44	631	8	8	56.9	58.9
E	At west end of Kona Palisades Estates.	0759 TO 0859 (4/25/05)	N/A	N/A	N/A	N/A	45.1	N/A
E	At west end of Kona Palisades Estates.	1422 TO 1522 (4/25/05)	N/A	N/A	N/A	N/A	47.0	N/A

Base Year background ambient noise levels at existing noise sensitive properties at the west end of Kona Palisades Estates were estimated from the noise measurements shown in Table 1 at Locations "B" and "E" as well as from the measured traffic noise levels along Kaiminani Drive. Existing background ambient noise levels at these properties are controlled by traffic along Kaiminani Drive and Queen Kaahumanu Highway, activities at the house lots and along the subdivision roadways, by aircraft flyby events, and by the natural sounds of birds and foliage.

Determinations of the periods of highest hourly traffic volumes along the project corridor were made after reviewing the AM and PM peak hour traffic volumes during the noise measurement periods and from References 2 and 4. Total two-way traffic volumes were highest during the AM peak hour along Kaiminani Drive during the noise measurement periods on April 25, 2005. By Reference 4, traffic volumes along Kaiminani Drive and along Queen Kaahumanu Highway are normally highest during the PM peak hour. Also from Reference 4, traffic volumes along Mamalahoa Highway are normally highest during the AM peak hour. Predictions of future traffic noise levels along the proposed Main Street Collector Road, Kaiminani Drive, Mamalahoa Highway, and Queen Kaahumanu Highway were based on the traffic volume forecasts contained in Reference 4.

The Equivalent (or Average) Hourly Sound Level [Leq(h)] noise descriptor was used to calculate the Base Year and CY 2015 traffic noise levels as required by Reference 5. The project plans (where available) of the area and visual survey of the area were used to determine terrain, ground cover, and local shielding effects and distances from building structures, which were entered into the noise prediction model. Topographic maps of the areas outside the Main Street's Rights-of-Way were not available, so receptor elevations were estimated from visual observations.

Future year (2015) traffic noise levels were then developed for the Build (roadway improvement) Alternative using the future traffic volumes shown in Appendix C. Under the Build Alternative, worst case traffic volumes including traffic associated with the University of Hawaii Center at West Hawaii (UHCWH) were used, and are shown under the Build Alternative in Appendix C. Along the proposed Main Street, the PM peak hourly volume of 615 vehicles per hour and assumed speed of 45 miles per hour were used in modeling traffic noise along that roadway. A future traffic mix of 98.0% automobiles, 1.0% medium trucks, and 1.0% heavy trucks and buses and "Loose Soil" propagation loss factor were also used to calculate future traffic noise along the Main Street Collector Road.

Impact Assessments and Mitigation. Following the calculation of the future traffic noise levels, evaluations were made of the future traffic noise levels and impacts at noise sensitive receptor locations along the preferred alignment for the Main Street roadway within the limits of construction. Comparisons of predicted future traffic noise levels with FHWA and HDOT noise abatement criteria (see Table 2) were made to

TABLE 2

FHWA & HDOT NOISE ABATEMENT CRITERIA
[Hourly A–Weighted Sound Level––Decibels (dBA)]

ACTIVITY CATEGORY	LEQ (h)*	DESCRIPTION OF ACTIVITY CATEGORY
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the areas are to continue to serve their intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, playgrounds, activity sports areas, parks, residences, motels, hotels, churches, libraries, and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	------	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

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* The Hawaii State Department of Transportation, Highways Division, utilizes Leq criteria levels which are 1 Leq unit less than the FHWA values shown.

determine specific locations where the noise abatement criteria are expected to be exceeded.

The HDOT 66 Leq(h) noise abatement threshold criteria and the HDOT "15 dB increase" criteria were applied to all noise sensitive buildings along the project corridor. By Reference 6, the HDOT has replaced the FHWA 67 Leq(h) criteria with their 66 Leq(h) criteria. Along the preferred alignment for the Main Street Collector Road, the locations of the 66 Leq(h) traffic noise contour, without the benefit of shielding from natural terrain or man-made sound barriers, were also used to identify noise sensitive receptor locations where the HDOT's 66 Leq(h) noise abatement criteria would not be exceeded, and which would not require more detailed evaluations. In addition, the HDOT's criteria of "15 dB increase or more above existing background noise levels" was also used as a noise abatement criteria for this project (from Reference 6). Where noise mitigation measures were indicated for this project, the effectiveness of sound attenuating walls and other possible noise mitigation measures would need to be evaluated. The use of sound attenuation walls as noise mitigation measures would be possible as long as the walls provide at least 5 dBA noise reduction. Evaluations of possible noise mitigation measures are only required within the limits of project construction and when either the 66 Leq(h) or the "15 dB increase" criteria is exceeded.

CHAPTER III. EXISTING ACOUSTICAL ENVIRONMENT

For the purposes of this study, 2005 was used as the Base Year for calculating changes in traffic and background ambient noise levels between the Base Year and 2015 under the Build Alternative. The Base Year noise environment along the project corridor where future traffic noise impacts may occur was described by measuring the Hourly Equivalent Sound Levels [Leq(h)] at noise sensitive receptor locations west of Kona Palisades Estates. Other locations along the Main Street corridor are currently uninhabited. The measured hourly sound levels, expressed in decibels, represent the average levels of background ambient or traffic noise during the study's Base Year. Table 1 contains the Base Year noise levels measured at Locations "B" and "E". Measured background ambient noise levels were lowest at Location "B", and ranged between 42.8 to 47.0 Leq(h) at Locations "B" and "E".

Figures 2 and 3 are strip charts of the measured traffic noise levels at Location "D1" during the AM and PM peak traffic periods, respectively. The noise levels associated with the louder vehicles exceeded 80 dB, while the noise levels between vehicle movements declined to background ambient levels of approximately 40 dB.

Figure 4 presents the hourly variation of traffic noise levels along Queen Kaahumanu Highway as determined from Reference 2. Daytime traffic noise levels along the highway typically exceed the FHWA and HDOT noise abatement criteria level of 66 Leq(h) at a setback distance of 100 feet or less from the highway centerline.

Table 3 presents the Base Year background ambient noise levels at the various receptor locations along the preferred alignment for the Main Street Collector Road. The relationships of these receptor locations to the alignment of the Main Street Collector Road are shown in Figure 5. Receptor locations near the south end of the proposed Main Street alignment include residences at the west end of the existing Kona Palisades Estates. No other existing noise sensitive receptors are located along the preferred alignment for the Main Street Collector Road.

It should be noted that existing background ambient noise levels at noise sensitive receptor locations along the preferred alignment for the Main Street roadway are currently less than the FHWA and HDOT noise abatement criteria level of 66 Leq(h). At noise sensitive receptor locations along Kaiminani Drive, which are outside the limits of project construction, existing background ambient noise levels are slightly less than the FHWA and HDOT noise abatement criteria level of 66 Leq(h). At noise sensitive receptor locations along Mamalahoa Highway, which are outside the limits of project construction, existing background ambient noise levels are higher than the FHWA and HDOT noise abatement criteria level of 66 Leq(h) at a setback distance of 100 feet or less from the highway centerline. At noise sensitive receptor locations along Queen Kaahumanu Highway, which are outside the limits of project construction,

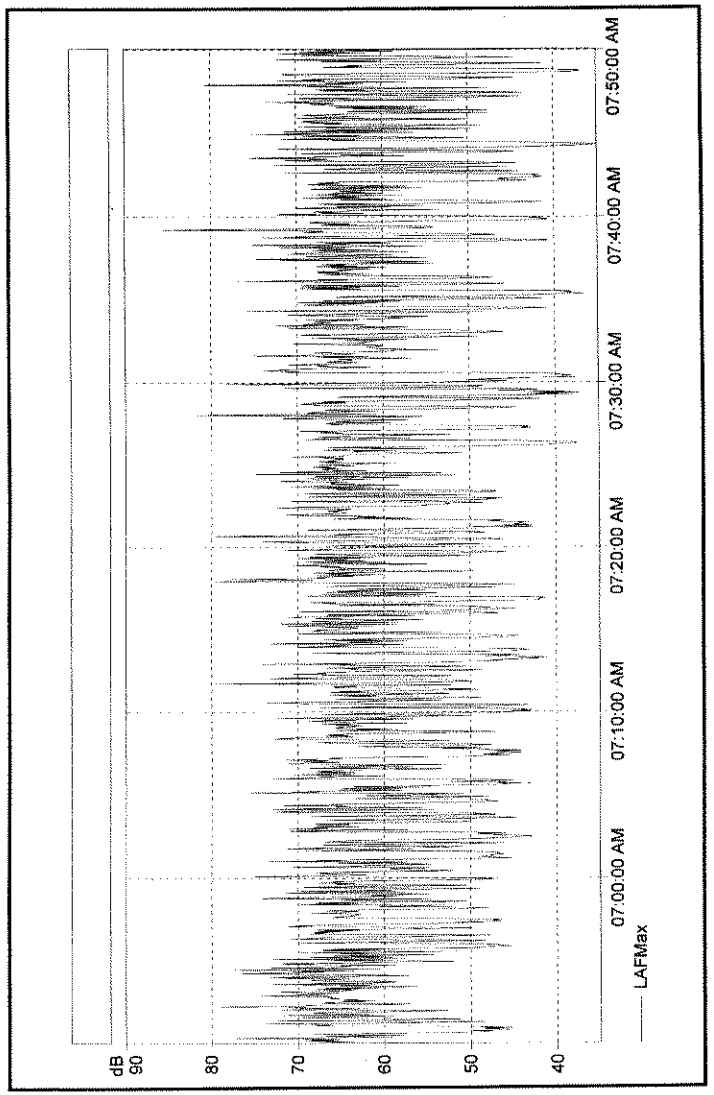


FIGURE 2

DBA VS. TIME HISTORY OF NOISE LEVELS
AT LOCATION "D1" (0650 TO 0750 HOURS; 4/25/05)

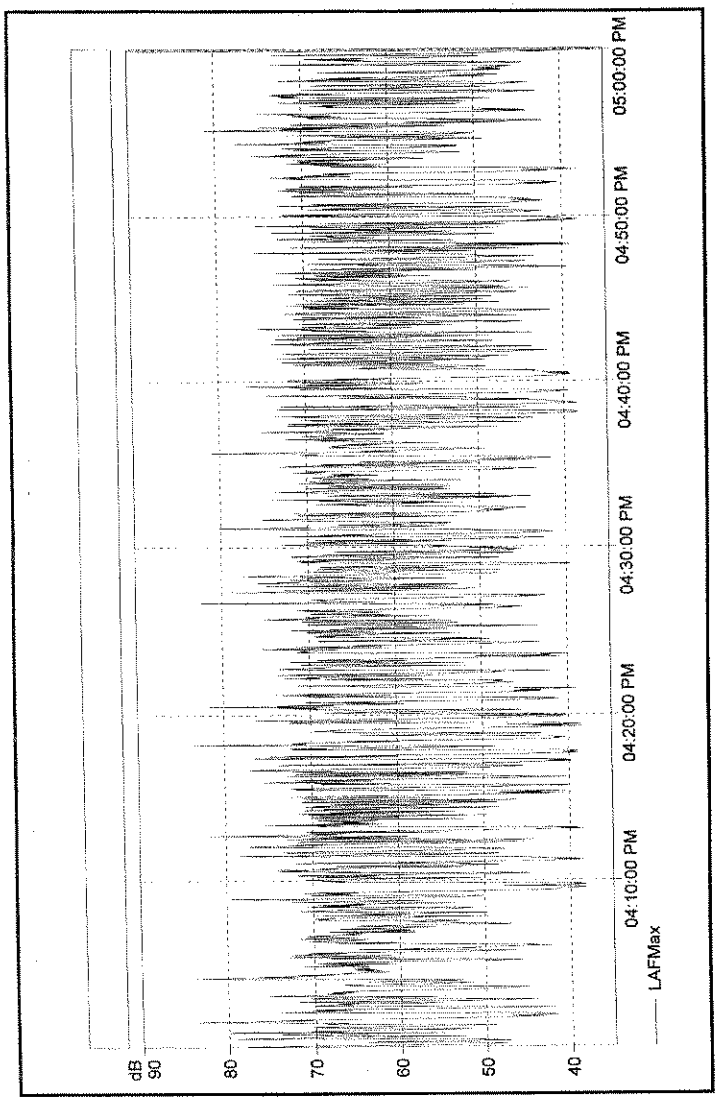


FIGURE 3

DBA VS. TIME HISTORY OF NOISE LEVELS
AT LOCATION "D1" (1600 TO 1700 HOURS; 4/25/05)

FIGURE 4

HOURLY VARIATIONS OF TRAFFIC NOISE AT 100 FT SETBACK DISTANCE FROM THE CENTERLINE OF QUEEN KAAHUMANU HIGHWAY AT KEAHOLE AIRPORT ROAD TOWARD PALANI ROAD
(Sta. 8-P, 6/01-02/04)

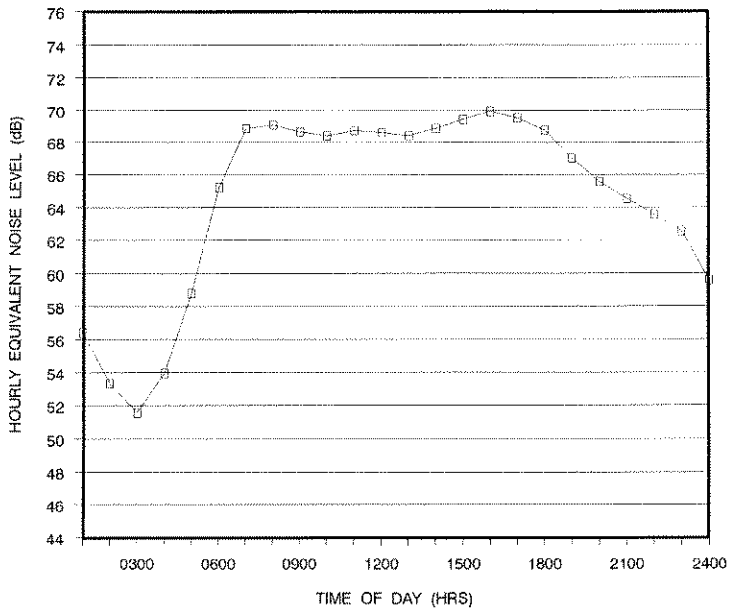


TABLE 3

EXISTING AND FUTURE TRAFFIC NOISE LEVELS AT NOISE SENSITIVE RECEPTOR LOCATIONS (4.92 FT RECEPTOR, AM OR PM PEAK HOUR)

RECEPTOR LOCATION	PEAK HOUR	EXISTING (CY 2005) Leq	-- FUTURE (CY 2015) Leq --- NO BUILD / (CHANGE)	BUILD / (CHANGE)
Receiver 1 (7-3-42:047)	AM	42.8	45.3 / 2.5	55.4 / 12.6
Receiver 2 (7-3-42:046)	AM	45.1	47.6 / 2.5	55.3 / 10.2
Receiver 3 (7-3-42:044)	AM	51.8	54.3 / 2.5	55.4 / 3.6
Receiver 4 (7-3-42:043)	AM	55.0	57.5 / 2.5	58.1 / 3.1
Receiver 1 (7-3-42:047)	PM	44.8	47.5 / 2.7	57.5 / 12.7
Receiver 2 (7-3-42:046)	PM	47.0	49.7 / 2.7	57.5 / 10.5
Receiver 3 (7-3-42:044)	PM	52.8	55.5 / 2.7	56.9 / 4.1
Receiver 4 (7-3-42:043)	PM	56.0	58.7 / 2.7	59.5 / 3.5

Note:

1. All receivers were assumed to be at 4.92 feet above ground level.

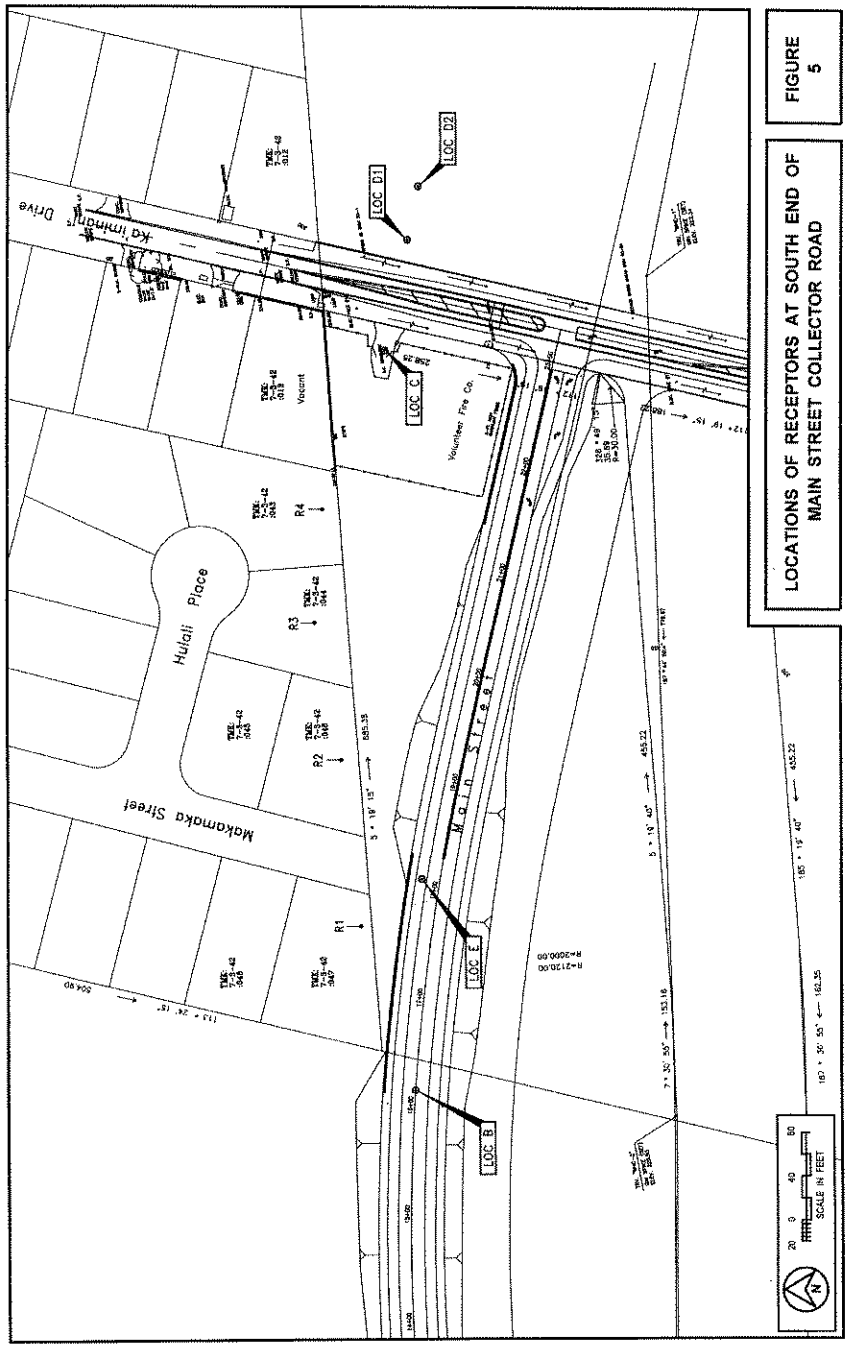


FIGURE 5

LOCATIONS OF RECEPTORS AT SOUTH END OF MAIN STREET COLLECTOR ROAD

existing background ambient noise levels are less than the FHWA and HDOT noise abatement criteria level of 66 Leq(h) because of their relatively large setback distances of 150 feet or more from the highway centerline.

CHAPTER IV. DESCRIPTION OF FUTURE TRAFFIC NOISE LEVELS

The traffic noise levels along the proposed Main Street Collector Road during CY 2015 were evaluated for the preferred Build Alternative. The same methodology that was used to validate the measured Base Year traffic noise levels in Table 1 was also used to calculate the Year 2015 noise levels under the Build Alternative. Predictions of future traffic noise levels were based on an hourly volume of 615 vehicles per hour and assumed average speed of 45 miles per hour for the PM peak hour. For the AM peak hour, predictions of future traffic noise levels were based on an hourly volume of 405 vehicles per hour and assumed average speed of 45 miles per hour. A future traffic mix of 98.0% automobiles, 1.0% medium trucks, and 1.0% heavy trucks and buses was used to calculate future traffic noise along the Main Street Collector Road for both the AM and PM peak hours.

The predicted future traffic noise levels at receptor locations along the preferred alignment for the Main Street Collector Road are shown in Table 3. Also indicated in Table 3 are the increases in existing noise levels predicted under the No-Build and Build Alternatives. As indicated in Table 3, the closest receptor locations to the Main Street alignment should not experience traffic noise levels greater than 66 Leq(h) or future traffic noise levels which exceed existing background ambient noise levels by at least 15 dB.

The following general conclusions can be made in respect to the potential noise impacts which can be expected by CY 2015 under the Build Alternative. These conclusions are valid as long as the future vehicle mixes and average speeds do not differ from the assumed values.

- Under the Build Alternative with UHCWH traffic included, the HDOT's "66 Leq(h)" and/or "15 dB increase" criteria for substantial change in traffic noise levels are not predicted to be exceeded at the west end of the Kona Palisades Estates subdivision.

- No public use facilities or park lands should experience traffic noise levels from the Main Street Collector Road which exceed 66 Leq(h) or which exceed existing background ambient noise levels by 15 dB.

- Traffic noise mitigation measures should not be required within the limits of project construction for the Main Street Collector Road project.

CHAPTER V. FUTURE TRAFFIC NOISE IMPACTS AND POSSIBLE NOISE MITIGATION MEASURES

Predictions of future traffic noise levels along Mamalahoa Highway, Kaiminani Drive, and Queen Kaahumanu Highway were made using the traffic volume assignments of Reference 4 for CY 2015 with and without the proposed project. The future assignments of non-project and project plus non-project traffic on the roadway sections beyond the limits of project construction are shown in Appendix C for the AM and PM peak hours of traffic. Tables 4A and 4B present the predicted contributions to future traffic noise levels along these existing roadways from non-project and project traffic. As indicated in Tables 4A and 4B, traffic noise level increases are expected to range from 2.4 to 4.0 dB by 2015 without construction of Main Street. Construction of the Main Street Collector Road should result in much smaller incremental increases in future traffic noise levels along the existing roadways. Along the sections of Queen Kaahumanu Highway north of Kaiminani Drive, future traffic noise levels should decrease slightly (or not increase as much) due to construction of the Main Street Collector Road. The range of increases in traffic noise levels of 0.0 to 1.1 dB attributable to construction of Main Street is considered to be low, and would be difficult to perceive.

Future traffic noise levels are predicted to exceed the HDOT "66 Leq(h)" noise abatement criteria by CY 2015 under the No Build or Build Alternatives along Mamalahoa Highway, and along Kaiminani Drive east of the Main Street intersection at those homes which are within 60 feet of the Kaiminani Drive centerline. These conditions are anticipated to occur by CY 2015 with or without construction of the Main Street Collector Road. Future traffic noise levels at existing dwelling units along Queen Kaahumanu Highway are predicted to remain below the HDOT "66 Leq(h)" noise abatement criteria by CY 2015 because of their adequate setback distances.

Because traffic noise along public roadways such as Mamalahoa Highway and Kaiminani Drive are generated by non-project as well as project traffic, mitigation of offsite traffic noise impacts are generally performed by individual property owners along the roadways' Rights-of-Way or by public agencies during roadway improvement projects. These mitigation measures generally take the form of increased setbacks, sound attenuating walls, total closure and air conditioning, or the use of sound attenuating windows. Where adequate setbacks beyond the 66 dB noise contour are not available, the construction of 6 feet high sound walls is generally effective for attenuating traffic noise at single story structures, or at the ground floors of multistory structures. Whenever mitigation of traffic noise at the upper floors are required, the use of closure and air conditioning, or the use of sound attenuating windows are the more appropriate sound attenuation measures. Along Mamalahoa Highway, the homes are generally well below the highway grade due to the sloped terrain, and for this reason, 6 feet high sound attenuation walls which are located along the west highway Right-of-Way should be effective for traffic noise mitigation.

TABLE 4A

CALCULATIONS OF PROJECT AND NON-PROJECT TRAFFIC NOISE CONTRIBUTIONS (CY 2015) (AM PEAK HOUR)

STREET SECTION	NOISE LEVEL (DB) INCREASE DUE TO: NON-PROJECT TRAFFIC	PROJECT TRAFFIC
Mamalahoa Hwy. - North of Kaiminani Dr.	2.4	-0.0
Mamalahoa Hwy. - South of Kaiminani Dr.	2.4	0.1
Q. Kaahumanu Hwy. - N. of Kaiminani Dr.	3.5	-0.3
Q. Kaahumanu Hwy. - S. of Kaiminani Dr.	3.3	0.2
Q. Kaahumanu Hwy. - N. of Airport Rd.	3.8	-0.4
Kaiminani Dr. - West of Mamalahoa Hwy.	2.5	0.4
Kaiminani Dr. - East of Q. Kaahumanu Hwy.	2.6	1.1

TABLE 4B

CALCULATIONS OF PROJECT AND NON-PROJECT TRAFFIC NOISE CONTRIBUTIONS (CY 2015) (PM PEAK HOUR)

STREET SECTION	NOISE LEVEL (DB) INCREASE DUE TO: NON-PROJECT TRAFFIC	PROJECT TRAFFIC
Mamalahoa Hwy. - North of Kaiminani Dr.	2.6	-0.0
Mamalahoa Hwy. - South of Kaiminani Dr.	2.7	0.1
Q. Kaahumanu Hwy. - N. of Kaiminani Dr.	3.8	-0.5
Q. Kaahumanu Hwy. - S. of Kaiminani Dr.	3.6	0.1
Q. Kaahumanu Hwy. - N. of Airport Rd.	4.0	-0.6
Kaiminani Dr. - West of Mamalahoa Hwy.	2.7	0.4
Kaiminani Dr. - East of Q. Kaahumanu Hwy.	2.8	0.6

It is anticipated that potential noise impacts at any future noise sensitive properties located along Main Street may be mitigated through the inclusion of sound walls or other noise mitigation measures within the individual lot development plans. In addition, any future public use facilities or housing units which may be planned alongside the Main Street Collector Road represent areas of potential adverse noise impacts if adequate noise mitigation measures are not incorporated into the planning of these future projects. It is anticipated that the Main Street project's roadway improvements will be completed prior to any redevelopment of the presently open areas adjacent to the future roadway, and that noise abatement measures such as adequate setbacks, sound attenuating walls or berms, or closure and air conditioning will be incorporated into these new developments along the Main Street Collector Road as required. In any event, new structures whose building permits were obtained after the date of this noise study will not qualify for noise abatement measures under existing HDOT procedures.

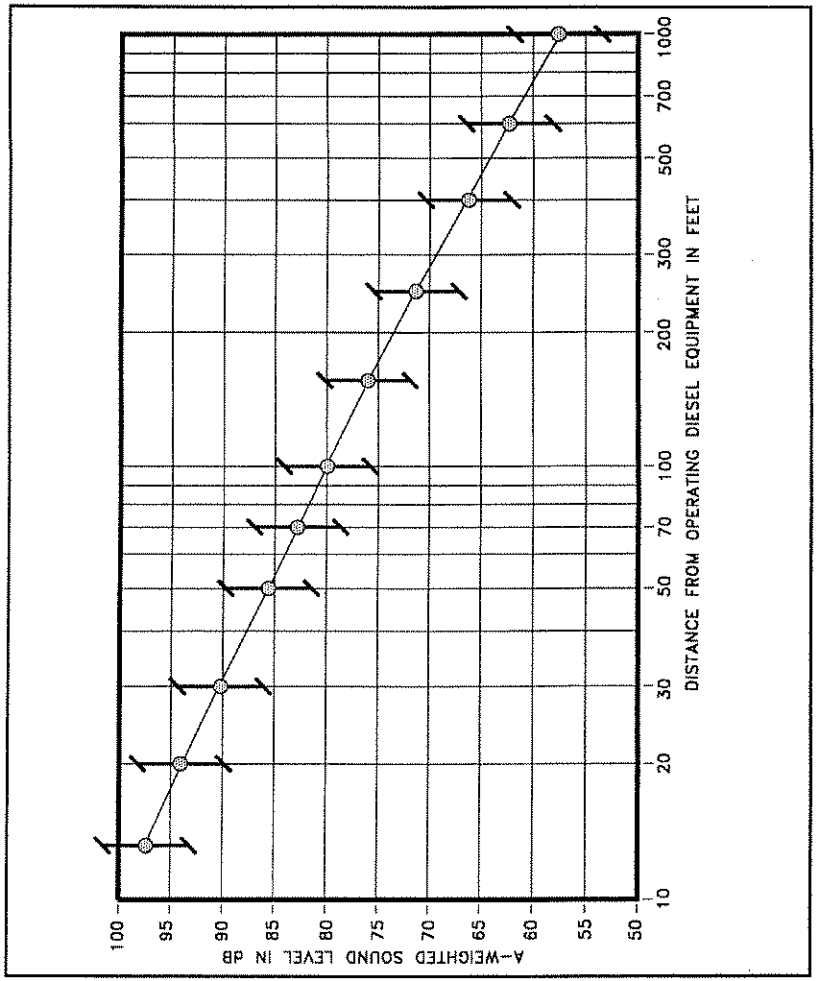
CHAPTER VI. CONSTRUCTION NOISE IMPACTS

Short-term noise impacts associated with construction activities at the south end of the proposed Main Street Collector Road may occur. These impacts can occur as a result of the short distances (less than 100 FT) between existing noise sensitive buildings to the anticipated construction corridor. The total duration of the construction period for the proposed project is not known, but noise exposure from construction activities at any one receptor location is not expected to be continuous during the total construction period.

Noise levels of diesel powered construction equipment typically range from 80 to 90 dB at 50 FT distance. Typical levels of noise from construction activity (excluding pile driving activity) are shown in Figure 6. Adverse impacts from construction noise are not expected to be in the "public health and welfare" category due to the temporary nature of the work and due to the administrative controls available for its regulation. Instead, these impacts will probably be limited to the temporary degradation of the quality of the acoustic environment in the immediate vicinity of the project site.

Construction noise levels at existing structures can intermittently exceed 85 dB when work is being performed at close distances in front of these structures. Along the roadway construction project, distances between the construction sites and receptors are expected to be as close as 20 feet, and construction noise levels may intermittently exceed 90 dB. The State Department of Health currently regulates noise from construction activities under a permit system (Reference 7). Under current permit procedures (see Figure 7), noisy construction activities are restricted to hours between 7:00 AM and 6:00 PM, from Monday through Friday, and exclude certain holidays. Noisy construction activities are normally restricted to the hours of 9:00 AM to 6:00 PM on Saturdays, with construction not permitted on Sundays. These restrictions would minimize construction noise impacts on noise sensitive residences along the roadway project corridor, and have generally been successfully applied. In this way, construction noise impacts on noise sensitive residences can be minimized.

In addition, the use of quieted portable engine generators and diesel equipment should be specified for use on this project. Heavy truck and equipment staging areas should also be located at areas which are as far from noise sensitive properties as feasible. Truck routes which avoid residential communities should be identified wherever possible. The use of 8 to 12 FT high construction noise barriers may also be used where close-in construction work to noise sensitive structures is unavoidable.



ANTICIPATED RANGE OF CONSTRUCTION NOISE LEVELS VS. DISTANCE

FIGURE 6

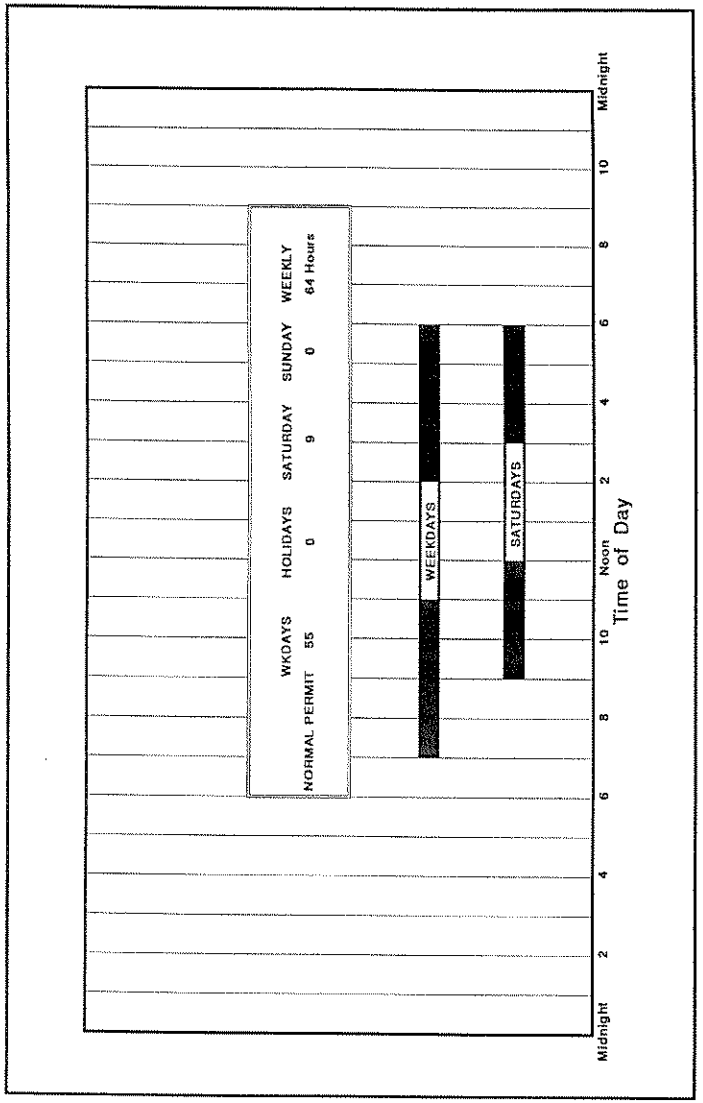


FIGURE 7

AVAILABLE WORK HOURS UNDER DOH PERMIT PROCEDURES FOR CONSTRUCTION NOISE

APPENDIX A. REFERENCES

(1) "FHWA Highway Traffic Noise Model User's Guide;" FHWA-PD-96-009, Federal Highway Administration; Washington, D.C.; January 1998 and Version 2.5 Upgrade (April 14, 2004).

(2) 24-Hour Traffic Counts, Station 8-P, Queen Kaahumanu Highway at Keahole Airport Road; State Department of Transportation; June 1-2, 2004.

(3) 24-Hour Traffic Counts, Station T-8-M, Queen Kaahumanu Highway Approximately 850' North of NELHA/OTEC Access Road; State Department of Transportation; June 1-2, 2004.

(4) "Draft Traffic Impact Analysis Report for Main Street Collector Road;" Phillip Rowell and Associates; May 19, 2005.

(5) Federal Highway Administration; "Procedures for Abatement of Highway Traffic Noise and Construction Noise;" 23 CFR Chapter I, Subchapter H, Part 772;" April 1, 1995.

(6) "Noise Analysis and Abatement Policy;" Hawaii State Department of Transportation, Highways Division, Materials Testing and Research Branch; June 1997.

(7) "Title 11, Administrative Rules, Chapter 46, Community Noise Control;" Hawaii State Department of Health; September 23, 1996.

APPENDIX B

EXCERPTS FROM EPA'S ACOUSTIC TERMINOLOGY GUIDE

Descriptor Symbol Usage

The recommended symbols for the commonly used acoustic descriptors based on A-weighting are contained in Table I. As most acoustic criteria and standards used by EPA are derived from the A-weighted sound level, almost all descriptor symbol usage guidance is contained in Table I.

Since acoustic nomenclature includes weighting networks other than "A" and measurements other than pressure, an expansion of Table I was developed (Table II). The group adopted the ANSI descriptor-symbol scheme which is structured into three stages. The first stage indicates that the descriptor is a level (i.e., based upon the logarithm of a ratio), the second stage indicates the type of quantity (power, pressure, or sound exposure), and the third stage indicates the weighting network (A, B, C, D, E.....). If no weighting network is specified, "A" weighting is understood. Exceptions are the A-weighted sound level and the A-weighted peak sound level which require that the "A" be specified. For convenience in those situations in which an A-weighted descriptor is being compared to that of another weighting, the alternative column in Table II permits the inclusion of the "A". For example, a report on blast noise might wish to contrast the LCdn with the LAdn.

Although not included in the tables, it is also recommended that "Lpn" and "LepN" be used as symbols for perceived noise levels and effective perceived noise levels, respectively.

It is recommended that in their initial use within a report, such terms be written in full, rather than abbreviated. An example of preferred usage is as follows:

The A-weighted sound level (LA) was measured before and after the installation of acoustical treatment. The measured LA values were 85 and 75 dB respectively.

Descriptor Nomenclature

With regard to energy averaging over time, the term "average" should be discouraged in favor of the term "equivalent". Hence, Leq, is designated the "equivalent sound level". For Ld, Ln, and Ldn, "equivalent" need not be stated since the concept of day, night, or day-night averaging is by definition understood. Therefore, the designations are "day sound level", "night sound level", and "day-night sound level", respectively.

The peak sound level is the logarithmic ratio of peak sound pressure to a reference pressure and not the maximum root mean square pressure. While the latter is the maximum sound pressure level, it is often incorrectly labelled peak. In that sound level meters have "peak" settings, this distinction is most important.

"Background ambient" should be used in lieu of "background", "ambient", "residual", or "indigenous" to describe the level characteristics of the general background noise due to the contribution of many unidentifiable noise sources near and far.

With regard to units, it is recommended that the unit decibel (abbreviated dB) be used without modification. Hence, DBA, PNdB, and EPNdB are not to be used. Examples of this preferred usage are: the Perceived Noise Level (Lpn was found to be 75 dB. Lpn = 75 dB). This decision was based upon the recommendation of the National Bureau of Standards, and the policies of ANSI and the Acoustical Society of America, all of which disallow any modification of bel except for prefixes indicating its multiples or submultiples (e.g., deci).

Noise Impact

In discussing noise impact, it is recommended that "Level Weighted Population" (LWP) replace "Equivalent Noise Impact" (ENI). The term "Relative Change of Impact" (RCI) shall be used for comparing the relative differences in LWP between two alternatives.

Further, when appropriate, "Noise Impact Index" (NII) and "Population Weighed Loss of Hearing" (PHL) shall be used consistent with CHABA Working Group 69 Report Guidelines for Preparing Environmental Impact Statements (1977).

APPENDIX B (CONTINUED)

TABLE I

A-WEIGHTED RECOMMENDED DESCRIPTOR LIST

	TERM	SYMBOL
1.	A-Weighted Sound Level	L_A
2.	A-Weighted Sound Power Level	L_{WA}
3.	Maximum A-Weighted Sound Level	L_{max}
4.	Peak A-Weighted Sound Level	L_{Apk}
5.	Level Exceeded x% of the Time	L_x
6.	Equivalent Sound Level	L_{eq}
7.	Equivalent Sound Level over Time (T) (1)	$L_{eq(T)}$
8.	Day Sound Level	L_d
9.	Night Sound Level	L_n
10.	Day-Night Sound Level	L_{dn}
11.	Yearly Day-Night Sound Level	$L_{dn(Y)}$
12.	Sound Exposure Level	L_{SE}

(1) Unless otherwise specified, time is in hours (e.g. the hourly equivalent level is $L_{eq(1)}$). Time may be specified in non-quantitative terms (e.g., could be specified a $L_{eq(WASH)}$ to mean the washing cycle noise for a washing machine).

SOURCE: EPA ACOUSTIC TERMINOLOGY GUIDE, BNA 8-14-78,

APPENDIX B (CONTINUED)

TABLE II

RECOMMENDED DESCRIPTOR LIST

	TERM	A-WEIGHTING	ALTERNATIVE[1] A-WEIGHTING	OTHER[2] WEIGHTING	UNWEIGHTED
1.	Sound (Pressure)[3] Level	L_A	L_{pA}	L_B, L_{pB}	L_p
2.	Sound Power Level	L_{WA}		L_{WB}	L_W
3.	Max. Sound Level	L_{max}	L_{Amax}	L_{Bmax}	L_{pmax}
4.	Peak Sound (Pressure) Level	L_{Apk}		L_{Bpk}	L_{pk}
5.	Level Exceeded x% of the Time	L_x	L_{Ax}	L_{Bx}	L_{px}
6.	Equivalent Sound Level	L_{eq}	L_{Aeq}	L_{Beq}	L_{peq}
7.	Equivalent Sound Level[4] Over Time(T)	$L_{eq(T)}$	$L_{Aeq(T)}$	$L_{Beq(T)}$	$L_{peq(T)}$
8.	Day Sound Level	L_d	L_{Ad}	L_{Bd}	L_{pd}
9.	Night Sound Level	L_n	L_{An}	L_{Bn}	L_{pn}
10.	Day-Night Sound Level	L_{dn}	L_{Adn}	L_{Bdn}	L_{pdn}
11.	Yearly Day-Night Sound Level	$L_{dn(Y)}$	$L_{Adn(Y)}$	$L_{Bdn(Y)}$	$L_{pdn(Y)}$
12.	Sound Exposure Level	L_S	L_{SA}	L_{SB}	L_{Sp}
13.	Energy Average Value Over (Non-Time Domain) Set of Observations	$L_{eq(e)}$	$L_{Aeq(e)}$	$L_{Beq(e)}$	$L_{peq(e)}$
14.	Level Exceeded x% of the Total Set of (Non-Time Domain) Observations	$L_{x(e)}$	$L_{Ax(e)}$	$L_{Bx(e)}$	$L_{px(e)}$
15.	Average L_x Value	L_x	L_{Ax}	L_{Bx}	L_{px}

(1) "Alternative" symbols may be used to assure clarity or consistency.

(2) Only B-weighting shown. Applies also to C,D,E,.....weighting.

(3) The term "pressure" is used only for the unweighted level.

(4) Unless otherwise specified, time is in hours (e.g., the hourly equivalent level is Leq(1). Time may be specified in non-quantitative terms (e.g., could be specified as Leq(WASH) to mean the washing cycle noise for a washing machine.

APPENDIX C

SUMMARY OF BASE YEAR AND FUTURE YEAR TRAFFIC VOLUMES

ROADWAY LANES	***** CY 2005 ***** AM VPH	PM VPH	CY 2015 (NO BUILD) AM VPH	PM VPH	CY 2015 (BUILD) AM VPH	PM VPH
Mamalahoa Hwy. - North of Kaiminani Dr. (NB)	315	582	620	1,080	595	1,055
Mamalahoa Hwy. - North of Kaiminani Dr. (SB)	767	398	1,270	700	1,280	720
Two-Way	1,082	980	1,890	1,780	1,875	1,775
Mamalahoa Hwy. - South of Kaiminani Dr. (NB)	409	604	750	1,090	775	1,115
Mamalahoa Hwy. - South of Kaiminani Dr. (SB)	930	643	1,590	1,210	1,600	1,220
Two-Way	1,339	1,247	2,340	2,300	2,375	2,335
Q. Kaahumanu Hwy. - N. of Kaiminani Dr. (NB)	819	542	1,780	1,450	1,675	1,285
Q. Kaahumanu Hwy. - N. of Kaiminani Dr. (SB)	437	1,072	1,020	2,420	950	2,150
Two-Way	1,256	1,614	2,800	3,870	2,625	3,435
Q. Kaahumanu Hwy. - S. of Kaiminani Dr. (NB)	695	725	1,560	1,720	1,620	1,810
Q. Kaahumanu Hwy. - S. of Kaiminani Dr. (SB)	643	886	1,280	1,950	1,320	1,980
Two-Way	1,338	1,611	2,840	3,670	2,940	3,790
Q. Kaahumanu Hwy. - N. of Airport Rd. (NB)	576	507	1,390	1,390	1,325	1,230
Q. Kaahumanu Hwy. - S. of Airport Rd. (SB)	411	880	980	2,110	830	1,835
Two-Way	987	1,387	2,370	3,500	2,155	3,065
Kaiminani Dr. - At Mamalahoa Hwy. (EB)	281	394	530	780	545	795
Kaiminani Dr. - At Mamalahoa Hwy. (WB)	212	171	340	280	405	355
Two-Way	493	565	870	1,060	950	1,150
Kaiminani Dr. - At Q. Kaahumanu Hwy. (EB)	106	525	250	1,020	420	1,100
Kaiminani Dr. - At Q. Kaahumanu Hwy. (WB)	436	156	730	280	845	405
Two-Way	542	681	980	1,300	1,265	1,505
Main Street - At Kaiminani Dr. (NB)	N/A	N/A	N/A	N/A	295	295
Main Street - At Kaiminani Dr. (SB)	N/A	N/A	N/A	N/A	110	320
Two-Way	N/A	N/A	N/A	N/A	405	615

Appendix F. Traffic Impact Analysis

TRAFFIC IMPACT ANALYSIS REPORT FOR

MAIN STREET COLLECTOR ROAD

IN KAILUA-KONA, HAWAII

FINAL REPORT

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May 19, 2005
Revised June 8, 2006

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LIST OF TABLES

1. INTRODUCTION

Phillip Rowell and Associates prepared this Traffic Impact Analysis Report for the proposed Main Street Collector Road in the Kailua-Kona area of the Island of Hawaii. This introductory chapter describes the proposed project, purposes of the traffic study, study methodology and order of presentation.

Project Location and Description

The proposed project is a new collector roadway with a north-south orientation between the proposed Palamanui Subdivision and Kaimi Nani Drive. The roadway will be parallel to and between Queen Kaahumanu Highway and Mamalahoa Highway. The roadway has been referred to as the Mid-Level Road in previous documents, but has been renamed Main Street.

Main Street will initially be a two-lane, two-way roadway. It may be widened to four-lanes in the future but for purposes of this study, it was assumed that Main Street will be two-lanes wide through the design year of the project.

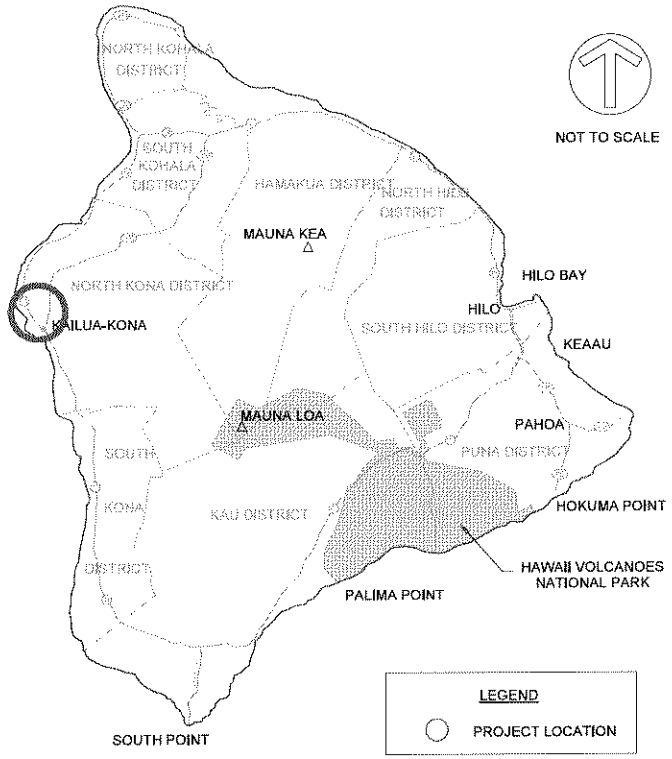


Figure 1
PROJECT LOCATION MAP

Purpose and Objectives of Study

1. Determine and describe the traffic characteristics of project.
2. Quantify and document the traffic related impacts of project.
3. Identify and evaluate traffic related improvements required to provide adequate access to and egress from the project and to mitigate the project's traffic impacts.

Study Area

The study area is shown in Figure 2. The study area includes the following intersections, which are shown in the figure:

1. Queen Kaahumanu Highway at Keahole Airport Road
2. Queen Kaahumanu Highway at Kaimi Nani Drive
3. Queen Kaahumanu Highway at Palani Road
4. Mamalahoa Highway at Kaimi Nani Drive
5. Mamalahoa Highway at Makalei Access Road
6. Main Street at Kaimi Nani Drive

Design Year

The design, or horizon, year of a project is the future year for which background traffic conditions are estimated.

After a review of the traffic studies for other projects in the area, it was decided that 2015 would be the appropriate design, or horizon, year. This design year would allow for completion of Main Street as well as the projected build-out of Palamanui. Accordingly, traffic forecasts would be consistent with those provided by other studies.

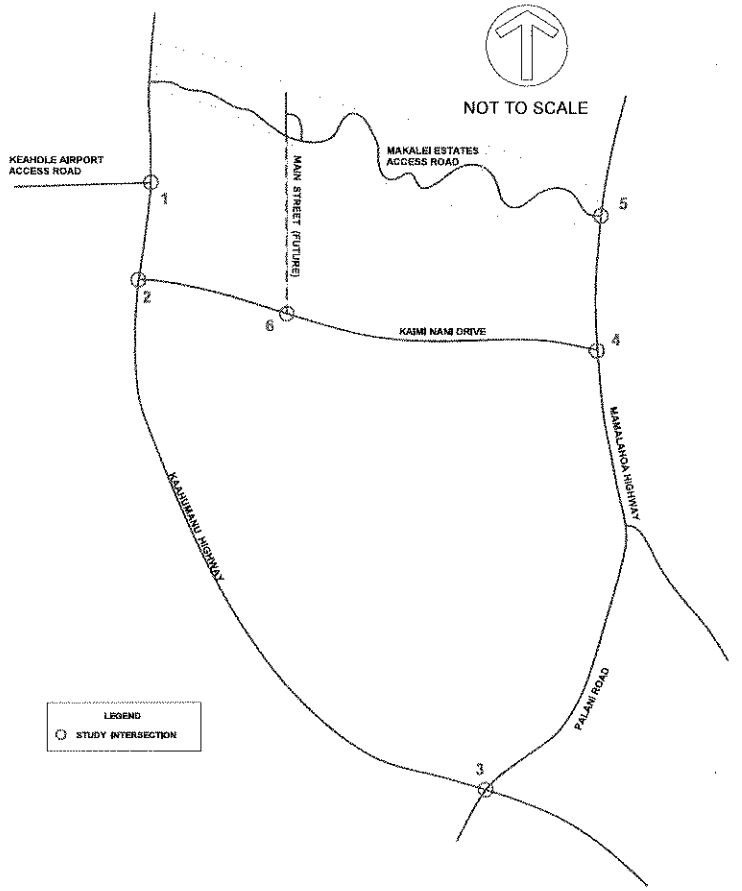


Figure 2
STUDY AREA AND STUDY INTERSECTIONS

Study Methodology

The following is a summary list of the tasks performed:

1. A site reconnaissance was performed to identify existing roadway cross-sections, intersection lane configurations, traffic control devices, and surrounding land uses.

2. Existing peak-hour traffic volumes for the study intersections were obtained and summarized.

3. Existing levels-of-service of the study intersections were determined using the methodology described in the *Highway Capacity Manual.*

4. A list of related development projects within and adjacent to the study area that will impact traffic conditions at the study intersections was compiled. This list included both development projects and anticipated roadway improvement projects.

5. Future background traffic volumes at the study intersections without and with Main Street were estimated.

6. Traffic forecast associated with the University of Hawaii Center at West Hawaii (UHCWH) was obtained and summarized.

7. A level-of-service analysis for future traffic conditions with Main Street and UHCWH was performed.

8. Locations with unacceptable traffic operating conditions were identified.

9. Recommendations, improvements or modifications necessary to mitigate the traffic impacts of project generated traffic and to provide adequate access to and egress from the site were formulated.

10. A report documenting the conclusions of the analyses performed and recommendations was prepared.

Order of Presentation

Chapter 2 describes existing traffic conditions, the Level-of-Service (LOS) concept and the results of the LOS analysis of existing conditions.

Chapter 3 describes the process used to estimate 2015 background traffic projections. Background conditions are defined as future background traffic conditions without the project. For this study, this condition did not include traffic diverted by Main Street or UHCWH.

Chapter 4 describes the methodology used to estimate the traffic conditions as a result of Main Street or UHCWH.

Chapter 5 describes the results of the LOS analysis, identifies potential mitigation measures and summarizes the traffic impact study.

2. EXISTING CONDITIONS

This chapter presents the existing traffic conditions on the roadways adjacent to the project site. The Level-of-Service (LOS) concept and the results of the LOS analysis for existing conditions are also presented. The purpose of this analysis is to establish the base conditions for the determination of the impacts of the project which are described in a subsequent chapter.

Existing Roadway and Traffic Conditions

A schematic of the existing roadway network serving the project is shown in Figure 3. Shown are the existing lane configurations and right-of-way controls of the study intersections. The traffic characteristics of the roadways serving the project are summarized in Table 1.

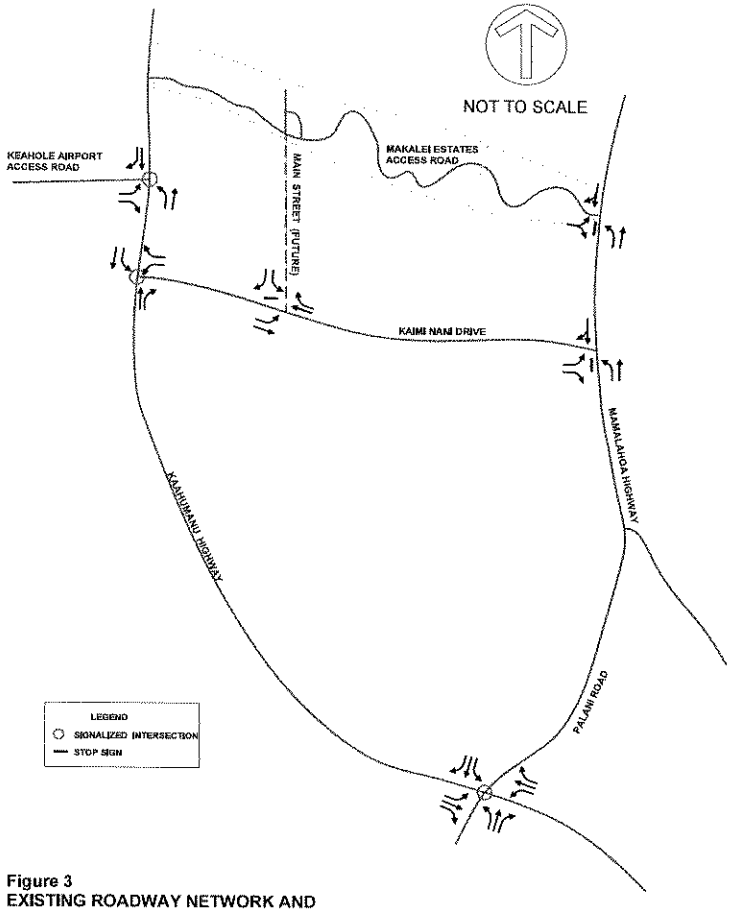


Figure 3
EXISTING ROADWAY NETWORK AND INTERSECTION CONFIGURATIONS

Table 1 Summary of Existing Roadways

Roadway	Section	Jurisdiction	Number of Lanes	Divided	Approximate ADT
Queen Kaahumanu Highway	Palani Road to North of Keahole Airport Road	State	2	No	
Mamalahoa Highway	Palani Road to North of Keahole Airport Road	State	2	No	
Palani Road	Queen Kaahumanu Highway to Mamalahoa Highway	State	2	No	
Kaimi Nani Drive	Queen Kaahumanu Highway to Mamalahoa Highway	County	2	No	

Existing Peak Hour Traffic Volumes

The morning and afternoon peak hourly traffic volumes are shown in Figures 4 and 5, respectively. The peak hourly traffic volumes were obtained from the traffic study for Palamanui [1]. These counts were used as they are current and use of these volumes would result in conclusions consistent with the findings of the Palamanui traffic study.

[1] Austin, Tsutsumi & Associates, *Traffic Impact Analysis Report for Palamanui*, January 2004

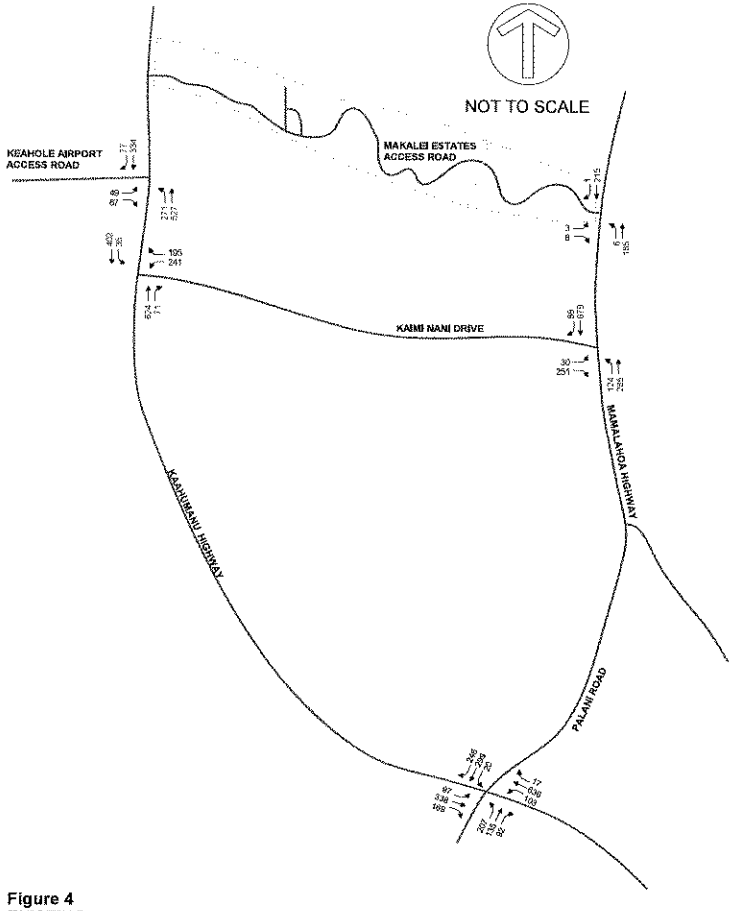


Figure 4
EXISTING (2005) AM PEAK HOUR TRAFFIC VOLUMES

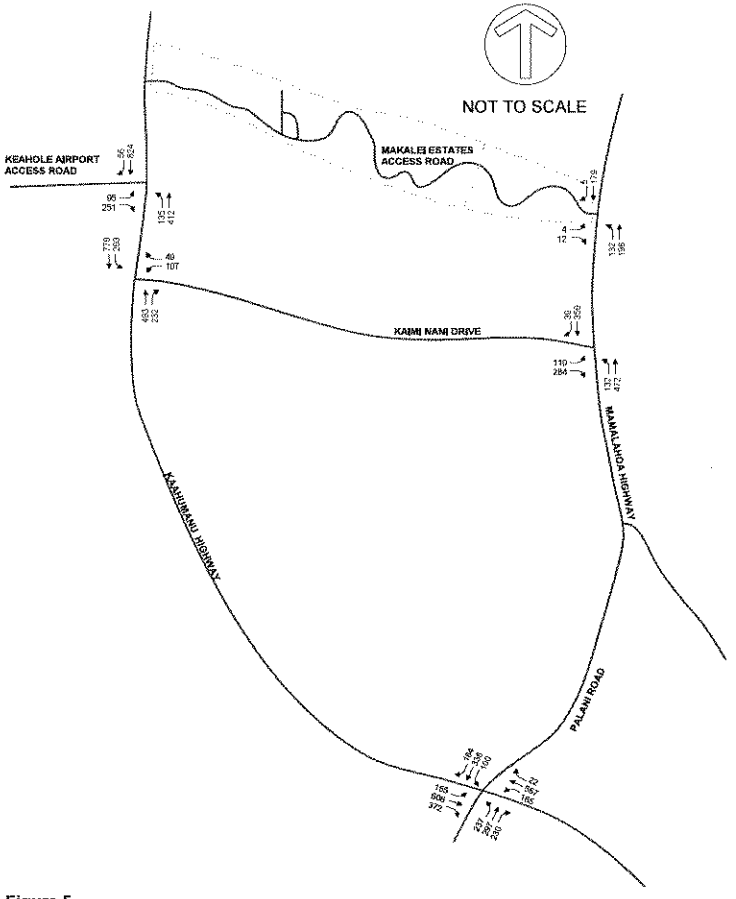


Figure 5
EXISTING (2005) PM PEAK HOUR TRAFFIC VOLUMES

Level-of-Service Concept

Signalized Intersections

"Level-of-Service" is a term which denotes any of an infinite number of combinations of traffic operating conditions that may occur on a given lane or roadway when it is subjected to various traffic volumes. Level-of-Service (LOS) is a qualitative measure of the effect of a number of factors which include space, speed, travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience.

There are six levels-of-service, A through F, which relate to the driving conditions from best to worst, respectively. The characteristics of traffic operations for each Level-of-Service are summarized in Table 2. In general, LOS A represents free-flow conditions with no congestion. LOS F, on the other hand, represents severe congestion with stop-and-go conditions. Level-of-Service D is typically considered acceptable for peak hour conditions in urban areas.

Corresponding to each Level-of-Service shown in the table is a volume/capacity ratio. This is the ratio of either existing or projected traffic volumes to the capacity of the intersection. Capacity is defined as the maximum number of vehicles that can be accommodated by the roadway during a specified period of time. The capacity of a particular roadway is dependent upon its physical characteristics such as the number of lanes, the operational characteristics of the roadway (one-way, two-way, turn prohibitions, bus stops, etc.), the type of traffic using the roadway (trucks, buses, etc.) and turning movements.

Table 2 Level-of-Service Definitions for Signalized Intersections[1]

Level of Service	Interpretation	Volume-to-Capacity Ratio[2]	Control Delay (Seconds)
A, B	Uncongested operations; all vehicles clear in a single cycle.	0.000-0.700	<10.0
C	Light congestion; occasional backups on critical approaches	0.701-0.800	10.1-20.0
D	Congestion on critical approaches but intersection functional. Vehicles must wait through more than one cycle during short periods. No long standing lines formed.	0.801-0.900	20.1-35.0
E	Severe congestion with some standing lines on critical approaches. Blockage of intersection may occur if signal does not provide protected turning movements.	0.901-1.000	35.1-80.0
F	Total breakdown with stop-and-go operation	>1.001	>80.0

Notes:
(1) Source: *Highway Capacity Manual*, 2000.
(2) This is the ratio of the calculated critical volume to Level-of-Service E Capacity.

Unsignalized Intersections

Like signalized intersections, the operating conditions of intersections controlled by stop signs can be classified by a Level-of-Service from A to F. However, the method for determining Level-of-Service for unsignalized intersections is based on the use of gaps in traffic on the major street by vehicles crossing or turning through that stream. Specifically, the capacity of the controlled legs of an intersection is based on two factors: 1) the distribution of gaps in the major street traffic stream, and 2) driver judgement in selecting gaps through which to execute a desired maneuver. The criteria for Level-of-Service at an unsignalized intersection is therefore based on delay of each turning movement. Table 3 summarizes the definitions for Level-of-Service and the corresponding delay.

Table 3 Level-of-Service Definitions for Unsignalized Intersections[1]

Level-of-Service	Expected Delay to Minor Street Traffic	Control Delay (Seconds)
A	Little or no delay	>10
B	Short traffic delays	10.1 to 15.0
C	Average traffic delays	15.1 to 25.0
D	Long traffic delays	25.1 to 35.0
E	Very long traffic delays	35.1 to 50.0
F	See note (2) below	>50.1

Notes:
(1) Source: *Highway Capacity Manual*, 2000.
(2) When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection. This condition usually warrants improvement of the intersection.

Level-of-Service Analysis of Existing Conditions

The results of the Level-of-Service analysis for the signalized intersections are shown in Table 4. Shown in the table are the volume-to-capacity ratios, average control delays and the levels-of-service for each lane group and the overall intersection.

The results of the Level-of-Service analysis for unsignalized intersections are also shown in Table 4. The average control delays and levels-of-service are shown for controlled movements only. Volume-to-capacity ratios are not shown for unsignalized intersections. Overall intersection volume-to-capacity ratios, delays and levels-of-service are not calculated for unsignalized intersections.

Table 4 Existing (2004) Levels-of-Service

Intersection, Approach and Movement	AM Peak Hour			PM Peak Hour		
	V/C	Delay [1]	LOS [2]	V/C	Delay	LOS
1. Queen Kaahumanu Highway at Keahole Airport Road	***0.42***	***14.0***	***B***	***0.67***	***19.6***	***B***
Eastbound Left	0.25	36.9	D	0.30	33.7	C
Eastbound Right	0.00	33.1	C	0.18	31.9	C
Northbound Left	0.56	29.5	C	0.67	52.5	D
Northbound Thru	0.38	3.5	A	0.33	5.2	A
Southbound Thru	0.39	14.6	B	0.79	19.1	B
Southbound Right	0.02	11.0	B	0.00	7.2	A
2. Queen Kaahumanu Highway at Kaimi Nani Drive	***0.58***	***16.6***	***B***	***0.58***	***17.3***	***B***
Westbound Left	0.65	31.6	C	0.43	34.7	C
Westbound Right	0.20	25.4	C	0.22	33.0	C
Northbound Thru	0.65	15.7	B	0.52	14.7	B
Northbound Right	0.00	8.1	A	0.11	10.0+	B
Southbound Left	0.17	31.6	C	0.81	44.0	D
Southbound Thru	0.34	6.2	A	0.59	6.3	A
3. Queen Kaahumanu Highway at Palani Road	***0.79***	***36.5***	***D***	***0.68***	***40.5***	***D***
Eastbound Left	0.45	38.3	D	0.64	41.7	D
Eastbound Thru	0.44	19.9	B	0.86	46.8	D
Eastbound Right	0.11	15.7	B	0.87	58.9	E
Westbound Left	0.48	38.6	D	0.69	43.9	D
Westbound Thru	0.84	32.9	C	0.81	42.8	D
Westbound Right	0.00	14.7	B	0.01	28.1	C
Northbound Left	0.88	67.0	E	0.86	57.5	E
Northbound Thru	0.38	32.0	C	0.44	20.7	C
Northbound Right	0.05	29.4	C	0.14	17.9	B
Southbound Left	0.09	34.5	C	0.36	34.0	C
Southbound Thru	0.83	48.8	D	0.49	21.3	C
Southbound Right	0.15	30.1	C	0.00	16.8	B
4. Mamalahoa Highway at Kaimi Nani Drive						
Northbound Left		10.2	B		8.5	A
Eastbound Left		35.7	E		49.9	E
Eastbound Right		28.5	D		15.0+	B
5. Mamalohoa Highway at Makalei Estate Access						
Northbound Left		7.7	A		7.9	A
Eastbound Left		11.2	B		14.4	B
Eastbound Right		9.4	A		9.2	A

The finding of the Level-of-Service analysis is that all the study intersections operate at Level-of-Service D or better, which is considered acceptable for urban peak hour conditions. All traffic movements also operate at Level-of-Service D, or better, except for the following movements:

1. At the intersection of Queen Kaahumanu Highway at Palani Road, the northbound left turn operates at Level-of-Service E during both peak hours.

2. Also at the intersection of Queen Kaahumanu Highway at Palani Road, the eastbound right turn operates at Level-of-Service E during the afternoon peak hour.

3. At the intersection of Mamalahoa Highway at Kaimi Nani Drive, the eastbound left turn operates at Level-of-Service E during both peak hours.

3. BACKGROUND TRAFFIC CONDITIONS

The purpose of this chapter is to discuss the assumptions and data used to estimate 2015 background traffic conditions. Background traffic conditions are defined as future traffic volumes without the proposed project.

Future traffic growth consists of two components. The first is ambient background growth that is a result of regional growth and cannot be attributed to a specific project. The second component is estimated traffic that will be generated by other development projects in the vicinity of the proposed project.

Background Traffic Growth

Information provided in the traffic study for Palamanui and the *Keahole to Honaunau Regional Circulation Plan*[2] concluded that traffic along the adjacent sections of Queen Kaahumanu and Mamalahoa Highways would increase approximately 4.5% per year. Accordingly, this growth rate was used to estimate the background growth between 2004 and 2015, which is the design year for this project. The growth factor was calculated to be 1.623 using the following formula:

$$F = (1 + i)^n$$

where F = Growth Factor
i = Average annual growth rate, or 0.045
n = Growth period, or 11 years

This growth factor was applied to all traffic movements at the study intersections.

[2] Austin, Tsutsumi & Associates, *Traffic Impact Analysis Report for Palamanui*, January 2004, p. 19

Related Projects

The second component in estimating background traffic volumes is traffic resulting from other proposed projects in the vicinity. Related projects are defined as those projects that are under construction, have been approved for construction or have been the subject of a traffic study and would significantly impact traffic in the study area. Related projects may be development projects or roadway improvements.

It was determined that there are four projects in the area that will generate additional traffic within the study area. The locations of these projects are shown on Figure 6. The traffic characteristics of these projects are summarized in Table 5.

Table 5 Trip Generation Summary of the Related Projects

	AM Peak Hour			PM Peak Hour		
Related Project	Total	In	Out	Total	In	Out
Palamanui[1]	1,704	1,027	677	2,918	1,391	1,527
Makalei Estates[3]	71	17	54	75	47	28
HELCO Generating Station[2]	21	15	6	14	3	11
Lokahi Subdivision[3]	154	32	122	162	93	69
TOTAL	1,950	1,091	859	3,169	1,534	1,635

Notes:
(1) Austin, Tsutsumi & Associates, *Traffic Impact Analysis Report for Palamanui*, January 2004
(2) Belt Collins Hawaii, Ltd., *Traffic Impact Analysis Study for HELCO Keahole Generation Station and Airport Substation*, October, 2004
(3) Wilcher Engineering, LLP, Lokahi Subdivision Traffic Impact Analysis, June, 2003.

There was a question whether the UHCWH should be considered a related project or part of the project. As the UHCWH would not be constructed unless Main Street is built, it is not possible to include the traffic associated with UHCWH until the background traffic along Main Street has been analyzed. Accordingly, traffic associated with UHCWH was added to the traffic system after Main Street and therefore is discussed in the following chapter.

2015 Background Traffic Projections

2015 background traffic projections were calculated by expanding existing traffic volumes by the appropriate growth rates and then superimposing traffic generated by the related project. The resulting 2015 background weekday morning and afternoon peak hourly traffic volumes are shown in Figures 7 and 8, respectively. The traffic projections shown represent 2015 peak hourly projections without Main Street and without UHCWH.

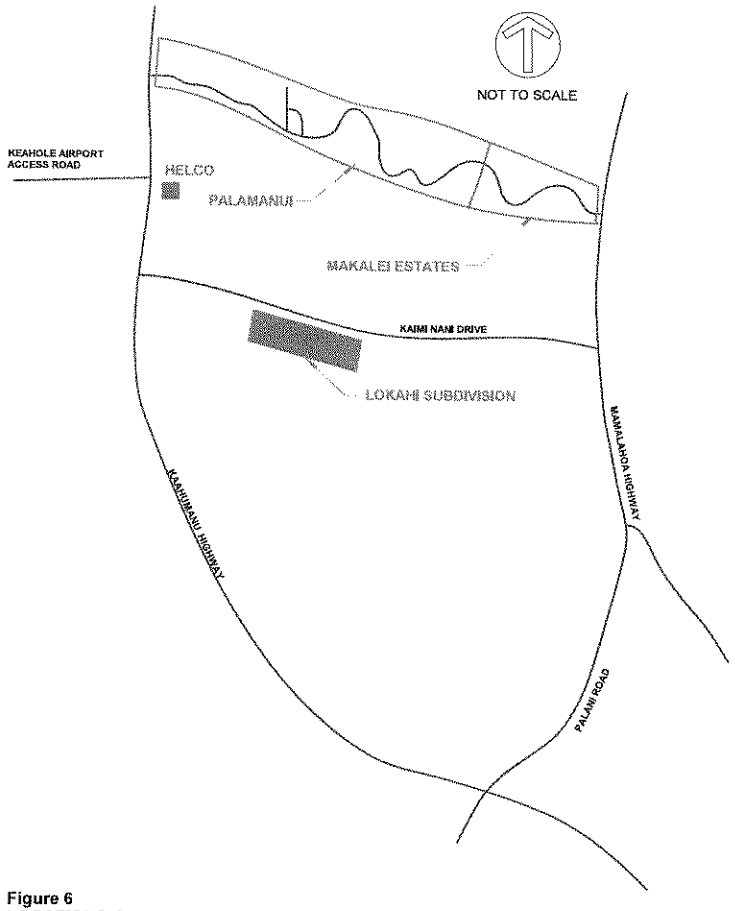


Figure 6
LOCATIONS OF RELATED PROJECTS

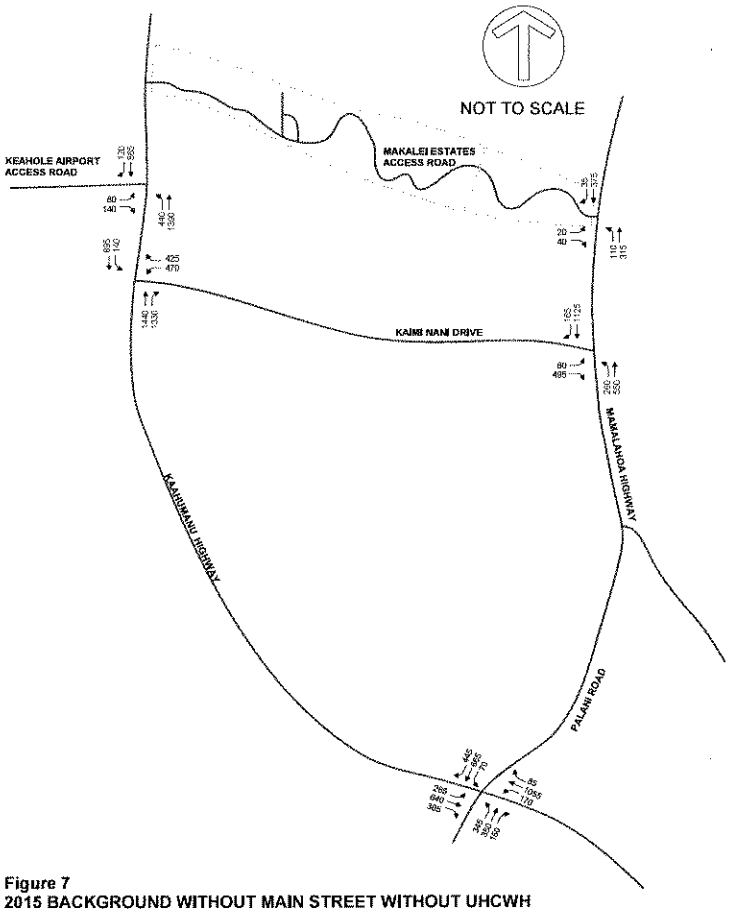


Figure 7
2015 BACKGROUND WITHOUT MAIN STREET WITHOUT UHCWH
AM PEAK HOUR TRAFFIC PROJECTIONS

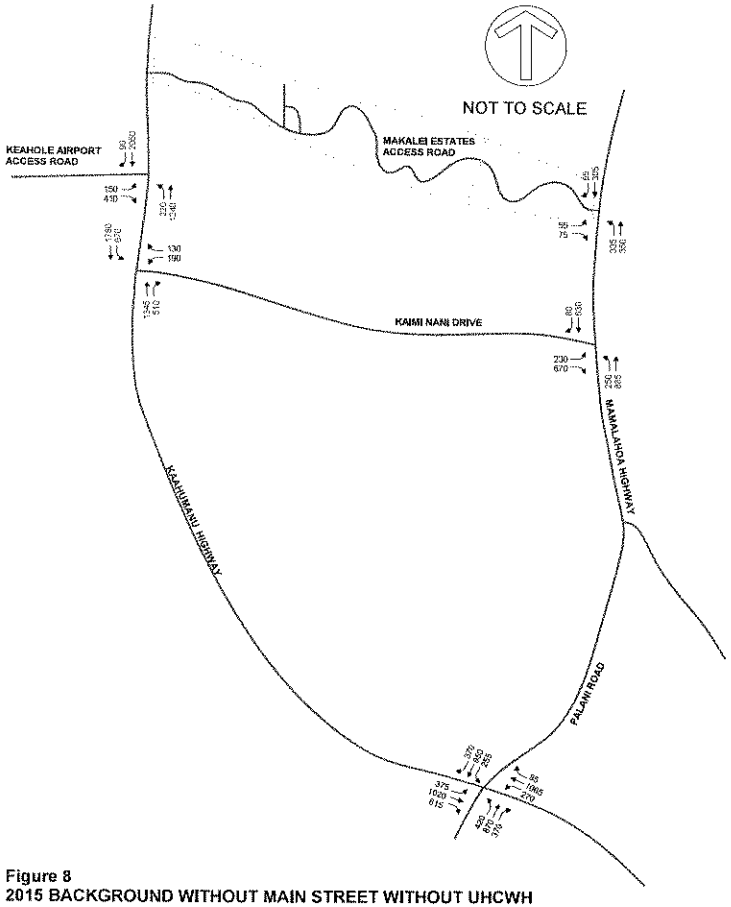


Figure 8
2015 BACKGROUND WITHOUT MAIN STREET WITHOUT UHCWH
PM PEAK HOUR PROJECTIONS

4. PROJECT-RELATED TRAFFIC CHARACTERISTICS

This chapter discusses the methodology used to estimate 2015 peak hour traffic projects with traffic associated with the project. In this case, this involves estimating the traffic diverted to Main Street from the adjacent roadnet, assigning traffic from the related projects described in the previous chapter and then assigning traffic generated by the new UHCWH. This chapter presents the resulting traffic projections. The results of the Level-of-Service analysis of background plus project conditions is presented in the following chapter.

2015 Traffic Projections With Main Street and Without UHCWH

Figures 9 and 10 represent the morning and afternoon peak hour traffic volumes upon completion of Main Street between Makalei Estates and Kaimi Nani Drive. These projections do not include traffic associated with UHCWH.

The traffic projections shown were estimated by diverting traffic from Queen Kaahumanu Highway and Mamalahoa Highway and then reassigning traffic generated by the related project described in the previous chapter.

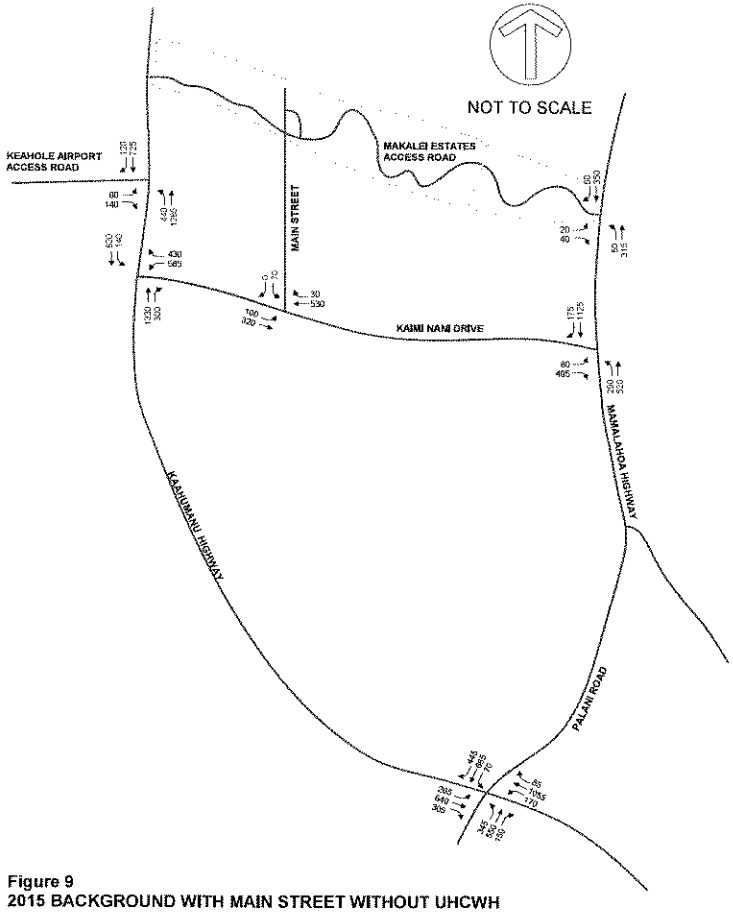


Figure 9
2015 BACKGROUND WITH MAIN STREET WITHOUT UHCWH
AM PEAK HOUR PROJECTIONS

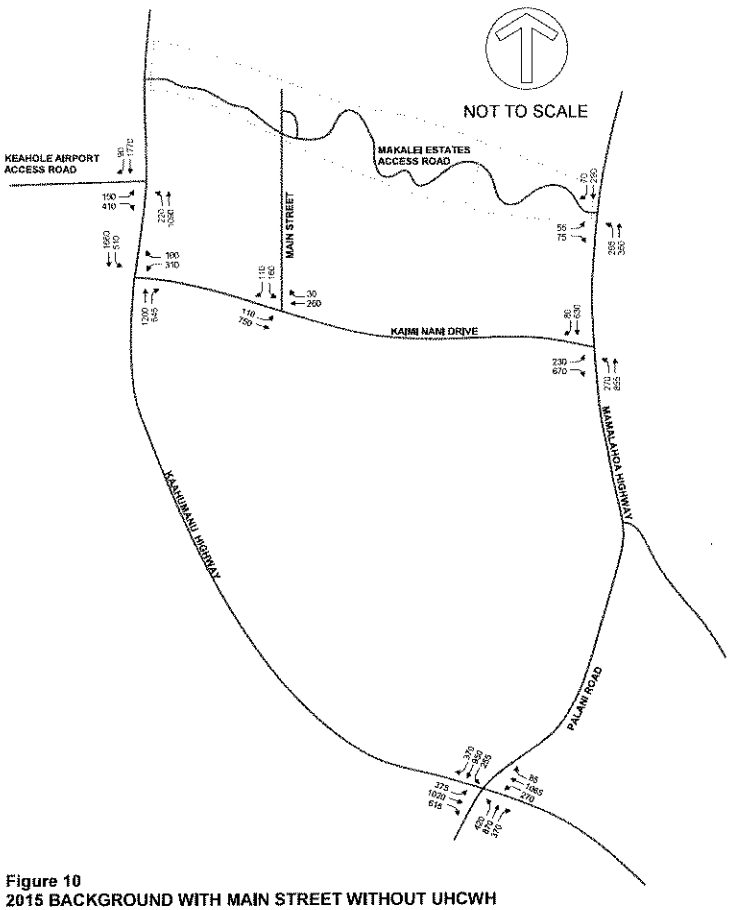


Figure 10
2015 BACKGROUND WITH MAIN STREET WITHOUT UHCWH
PM PEAK HOUR PROJECTIONS

2015 Traffic Projections With Main Street and Without UHCWH

Figures 11 and 12 present the morning and afternoon peak hour traffic volumes upon completion of Main Street between Makalei Estates and Kaimi Nani Drive and UHCWH. These projections represent estimated traffic conditions upon completion of both projects (Main Street and UHCWH) plus traffic associated with the related projects described in the previous chapter.

The traffic projections shown were estimated by adding traffic generated by UHCWH onto the traffic projections presented in the previous section of this chapter.

The traffic assignments associated with UHCWH were obtained from the traffic study for UHCWH.[3]

[3]Phillip Rowell and Associates, *Traffic Impact Analysis Report for University of Hawaii Center at West Hawaii*, October, 2000.

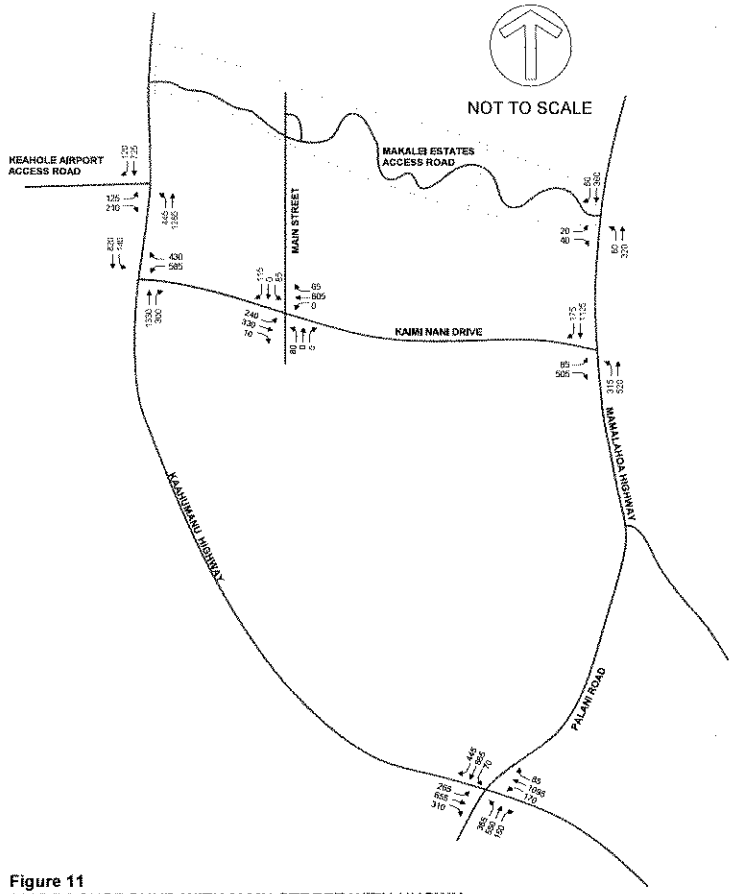


Figure 11
2015 BACKGROUND WITH MAIN STREET WITH UHCWH
AM PEAK HOUR PROJECTIONS

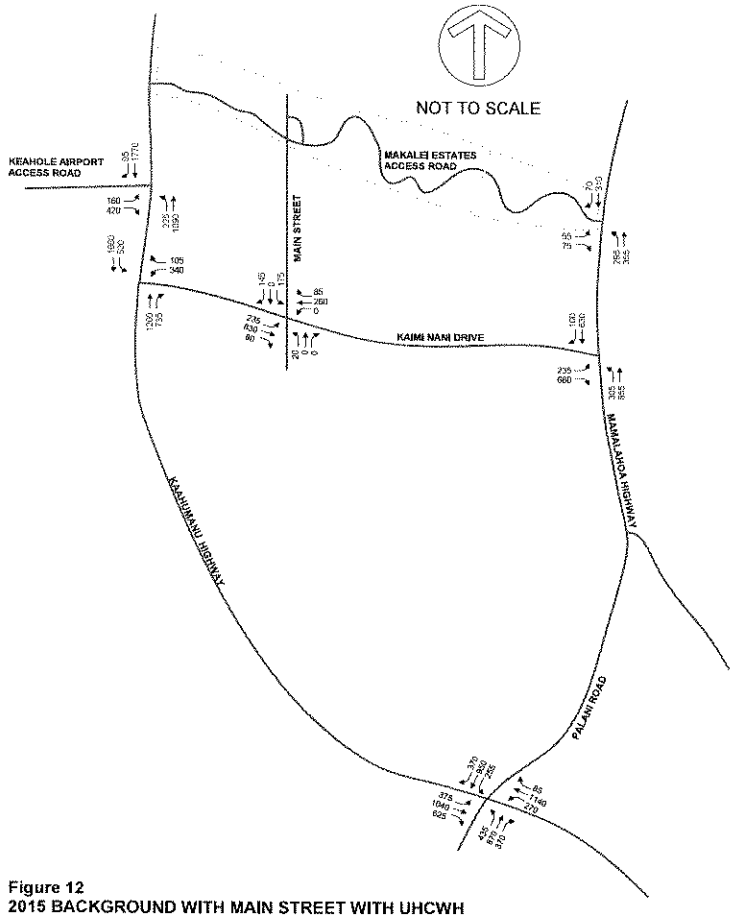


Figure 12
2015 BACKGROUND WITH MAIN STREET WITH UHCWH
PM PEAK HOUR PROJECTIONS

5. TRAFFIC IMPACT ANALYSIS

The purpose of this chapter is to summarize the results of the Level-of-Service analysis of future conditions with Main Street and with UHCWH. The results are discussed separately for each of the study intersections. This analysis identifies any potential traffic operational deficiencies. If deficiencies are anticipated, mitigation measures are identified and assessed.

Volume-to-Capacity and Level-of-Service Impact Analysis

The Level-of-Service analysis was performed for three conditions: 2015 background conditions, 2015 background with Main Street and 2015 background with Main Street and With UHCWH. The Level-of-Service analysis calculates the volume-to-capacity ratio and average vehicle delay of each movement. The change in the volume-to-capacity ratio and delay quantifies the impact of the project.

As previously noted in Chapter 2, Level-of-Service D is generally considered an acceptable level-of-service. The *Highway Capacity Manual* defines level-of-service by delay rather than the volume-to-capacity ratio. Accordingly, the following analysis also determines the level-of-service based on the calculated delay. This means that a particular traffic movement may be described as Level-of-Service D and therefore acceptable, even though the volume-to-capacity ratio may be greater than 0.901.

Also, the intersections Queen Kaahumanu Highway at Keahole Airport Road and Kaimi Nani Drive were analyzed for two conditions: Queen Kaahumanu Highway as a two-lane highway and as a four-lane highway.

The results of the Level-of-Service analysis is presented separately for each of the study intersections.

1. Queen Kaahumanu Highway at Keahole Airport Road

The level-of-service analysis of the intersection of Queen Kaahumanu Highway at Keahole Airport Road with Queen Kaahumanu Highway as a two-lane highway is summarized in Table 6. Overall, the intersection will operate at Level-of-Service C during the morning peak hour and Level-of-Service F during the afternoon peak hour. It should be noted that the Level-of-Service C for the morning peak hour is an improvement over the 2015 peak hour without Main Street.

Table 6 Level-of-Service Analysis - Queen Kaahumanu Highway at Keahole Airport Road (Queen Kaahumanu Highway as Two-Lane Highway)

Peak Hour, Approach and Movement	2015 Background			2015 With Main St Without UHCWH			2015 With Main St With UHCWH		
	V/C[2]	Delay[3]	LOS[4]	V/C	Delay	LOS	V/C	Delay	LOS
AM Peak Hour	0.93	41.5	D	0.86	27.3	C	0.89	29.1	C
Eastbound Left	0.41	40.6	D	0.41	40.6	D	0.64	49.8	D
Eastbound Right	0.23	36.7	D	0.23	36.7	D	0.63	50.6	D
Northbound Left	0.90	49.7	D	0.90	49.7	D	0.91	51.3	D
Northbound Thru	1.01	34.4	C	0.93	19.1	B	0.93	19.1	B
Southbound Thru	1.00	51.1	D	0.84	27.5	C	0.84	27.5	C
Southbound Right	0.08	11.5	B	0.08	11.5	B	0.08	11.5	B
PM Peak Hour	1.59	258.8	F	1.41	187.0	F	1.42	186.6	F
Eastbound Left	0.48	37.3	D	0.48	37.3	D	0.51	38.1	D
Eastbound Right	0.75	49.9	D	0.75	49.9	D	0.78	52.8	D
Northbound Left	1.08	123.4	F	1.08	123.4	F	1.11	132.2	F
Northbound Thru	1.00	36.4	D	0.86	16.6	B	0.86	16.6	B
Southbound Thru	1.95	450.7	F	1.59	331.3	F	1.69	331.3	F
Southbound Right	0.03	7.4	A	0.03	7.4	A	0.03	7.4	A

NOTES:
1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. V/C denotes ratio of volume to capacity. V/C ratio is not calculated for unsignalized intersections.
3. Delay is in seconds per vehicle.
4. LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. LOS is based on delay.

Table 7 summarizes the results of the level-of-service analysis with Queen Kaahumanu Highway at a four-lane highway. The results indicate that the intersection will operate at Level-of-Service B during the morning peak hour and Level-of-Service C during the afternoon peak hour. All movements will operate at Level-of-Service D or better. This is an improvement versus 2015 conditions without Main Street. Without Main Street this intersection will operate at Level-of-Service E during the afternoon peak hour and the southbound through movement will operate at Level-of-Service F.

Table 7 Level-of-Service Analysis - Queen Kaahumanu Highway at Keahole Airport Road (Queen Kaahumanu Highway as Four-Lane Roadway)

Peak Hour, Approach and Movement	2015 Background			2015 With Main St Without UHCWH			2015 With Main St With UHCWH		
	V/C[2]	Delay[3]	LOS[4]	V/C	Delay	LOS	V/C	Delay	LOS
AM Peak Hour	0.63	17.2	B	0.59	16.4	B	0.62	17.4	B
Eastbound Left	0.27	31.3	C	0.27	31.3	C	0.42	34.0	C
Eastbound Right	0.15	29.7	C	0.15	29.7	C	0.41	34.3	C
Northbound Left	0.76	32.2	C	0.76	32.2	C	0.77	32.7	C
Northbound Thru	0.58	6.4	A	0.54	6.0	A	0.54	6.0	A
Southbound Thru	0.70	25.0	C	0.58	22.7	C	0.58	22.7	C
Southbound Right	0.10	17.2	B	0.10	17.2	B	0.10	17.2	B
PM Peak Hour	0.97	61.0	E	0.88	30.3	C	0.89	30.6	C
Eastbound Left	0.51	37.4	D	0.51	37.4	D	0.55	38.5	D
Eastbound Right	0.73	48.0	D	0.73	48.0	D	0.76	50.6	D
Northbound Left	0.66	40.6	D	0.66	40.6	D	0.68	41.3	D
Northbound Thru	0.52	5.8	A	0.45	5.2	A	0.45	5.2	A
Southbound Thru	1.17	100.8	F	1.01	42.2	D	1.01	42.2	D
Southbound Right	0.03	9.6	A	0.03	9.6	A	0.04	9.7	A

NOTES:
1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. V/C denotes ratio of volume to capacity. V/C ratio is not calculated for unsignalized intersections.
3. Delay is in seconds per vehicle.
4. LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. LOS is based on delay.

2. Queen Kaahumanu Highway at Kaimi Nani Drive

The Level-of-Service analysis of this intersection with Queen Kaahumanu Highway as a two-lane highway is summarized in Table 8. Overall, the intersection will operate at Level-of-Service F during the morning and afternoon peak hour.

Table 8 Level-of-Service Analysis - Queen Kaahumanu Highway at Kaimi Nani Drive (Queen Kaahumanu Highway as Two-Lane Roadway)

Peak Hour, Approach and Movement	2015 Background			2015 With Main St Without UHCWH			2015 With Main St With UHCWH		
	V/C[2]	Delay[3]	LOS[4]	V/C	Delay	LOS	V/C	Delay	LOS
AM Peak Hour	1.32	138.7	F	1.27	139.8	F	1.33	140.7	F
Westbound Left	1.26	166.0	F	1.51	274.0	F	1.57	297.6	F
Westbound Right	0.88	51.9	D	0.88	51.9	D	0.90	54.2	D
Northbound Thru	1.50	247.0	F	1.38	196.7	F	1.38	196.7	F
Northbound Right	0.16	9.3	A	0.12	8.9	A	0.19	9.5	A
Southbound Left	0.67	41.0	D	0.34	32.9	C	0.67	41.0	D
Southbound Thru	0.76	12.9	B	0.69	11.1	B	0.69	11.1	B
PM Peak Hour	1.42	200.3	F	1.30	135.4	F	1.33	139.1	F
Westbound Left	0.77	48.0	D	1.25	175.7	F	1.37	225.5	F
Westbound Right	0.59	38.1	D	0.45	35.1	D	0.47	35.3	D
Northbound Thru	1.42	216.9	F	1.27	149.7	F	1.27	149.7	F
Northbound Right	0.46	13.9	B	0.62	17.2	B	0.74	20.7	C
Southbound Left	1.85	425.2	F	1.41	231.4	F	1.43	243.4	F
Southbound Thru	1.34	169.5	F	1.25	129.8	F	1.25	129.8	F

NOTES:
1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. V/C denotes ratio of volume to capacity. V/C ratio is not calculated for unsignalized intersections.
3. Delay is in seconds per vehicle.
4. LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. LOS is based on delay.

Table 9 summarizes the results of the level-of-service analysis with Queen Kaahumanu Highway at a four-

lane highway. The results indicate that the intersection will operate at Level-of-Service C during the morning and Level-of-Service D afternoon peak hour. All movements will operate at Level-of-Service D, or better, except the westbound left, northbound right and southbound left. This is an improvement versus 2015 conditions without Main Street. Without Main Street this intersection will operate at Level-of-Service E during the afternoon peak hour.

Table 9 Level-of-Service Analysis - Queen Kaahumanu Highway at Kaimi Nani Drive (Queen Kaahumanu Highway as Four-Lane Roadway)

Peak Hour, Approach and Movement	2015 Background			2015 With Main St Without UHCWH			2015 With Main St With UHCWH		
	V/C[2]	Delay[3]	LOS[4]	V/C	Delay	LOS	V/C	Delay	LOS
AM Peak Hour	0.89	33.9	C	0.87	30.9	C	0.93	32.6	C
Westbound Left	0.82	31.6	C	0.98	56.7	E	1.02	66.9	E
Westbound Right	0.57	22.3	C	0.57	22.3	C	0.58	22.5	C
Northbound Thru	1.02	52.1	D	0.95	35.1	D	0.95	35.1	D
Northbound Right	0.21	14.9	B	0.15	14.3	B	0.25	15.3	B
Southbound Left	0.66	39.1	D	0.33	31.8	C	0.66	39.1	D
Southbound Thru	0.49	11.6	B	0.45	11.2	B	0.45	11.2	B
PM Peak Hour	1.02	61.4	E	0.94	35.3	D	1.01	43.0	D
Westbound Left	0.50	30.7	C	0.82	45.0	D	0.90	55.7	E
Westbound Right	0.21	27.9	C	0.12	27.1	C	0.13	27.3	C
Northbound Thru	1.11	90.1	F	0.99	51.1	D	0.99	51.1	D
Northbound Right	0.68	29.8	C	0.93	49.5	D	1.09	92.7	F
Southbound Left	1.27	164.1	F	0.97	58.4	E	0.98	63.2	E
Southbound Thru	0.79	12.2	B	0.73	10.9	B	0.73	10.9	B

NOTES:
1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. V/C denotes ratio of volume to capacity. V/C ratio is not calculated for unsignalized intersections.
3. Delay is in seconds per vehicle.
4. LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. LOS is based on delay.

3. Queen Kaahumanu Highway at Palani Road

The results of the Level-of-Service analysis for the intersection of Queen Kaahumanu Highway at Palani Road is summarized in Table 10. It is anticipated that Queen Kaahumanu Highway will be widened to four lanes through this intersection. Overall, the intersection will operate at Level-of-Service F during both peak periods, without and with the proposed project.

Table 10 Level-of-Service Analysis - Queen Kaahumanu Highway at Palani Road (Queen Kaahumanu Highway as Four-Lane Roadway)

Peak Hour, Approach and Movement	2015 Background			2015 With Main St Without UHCWH			2015 With Main St With UHCWH		
	V/C[2]	Delay[3]	LOS[4]	V/C	Delay	LOS	V/C	Delay	LOS
AM Peak Hour	1.17	85.7	F	1.17	85.7	F	1.20	92.5	F
Eastbound Left	1.20	160.0	F	1.20	160.0	F	1.20	160.0	F
Eastbound Thru	0.69	33.0	C	0.69	33.0	C	0.71	33.5	C
Eastbound Right	0.50	31.1	C	0.50	31.1	C	0.51	31.4	C
Westbound Left	0.77	51.5	D	0.77	51.5	D	0.77	51.5	D
Westbound Thru	1.14	109.2	F	1.14	109.2	F	1.19	126.6	F
Westbound Right	0.16	25.3	C	0.16	25.3	C	0.16	25.3	C
Northbound Left	1.17	141.0	F	1.17	141.0	F	1.24	167.5	F
Northbound Thru	0.98	60.7	E	0.98	60.7	E	0.98	60.7	E
Northbound Right	0.16	21.9	C	0.16	21.9	C	0.16	21.9	C
Southbound Left	0.24	32.1	C	0.24	32.1	C	0.24	32.1	C
Southbound Thru	1.18	128.1	F	1.18	128.1	F	1.18	128.1	F
Southbound Right	0.51	25.6	C	0.51	25.6	C	0.51	25.6	C
PM Peak Hour	1.50	219.9	F	1.50	219.9	F	1.52	234.3	F
Eastbound Left	1.56	309.8	F	1.56	309.8	F	1.56	309.8	F
Eastbound Thru	1.46	247.7	F	1.46	247.7	F	1.48	259.8	F
Eastbound Right	1.64	337.4	F	1.64	337.4	F	1.67	351.6	F
Westbound Left	1.12	131.2	F	1.12	131.2	F	1.12	131.2	F
Westbound Thru	1.52	276.1	F	1.52	276.1	F	1.63	323.2	F
Westbound Right	0.21	30.7	C	0.21	30.7	C	0.21	30.7	C
Northbound Left	1.52	287.1	F	1.52	287.1	F	1.57	310.2	F
Northbound Thru	1.28	163.8	F	1.28	163.8	F	1.28	163.8	F
Northbound Right	0.38	20.1	C	0.38	20.1	C	0.38	20.1	C
Southbound Left	0.92	68.9	E	0.92	68.9	E	0.92	68.9	E
Southbound Thru	1.40	214.7	F	1.40	214.7	F	1.40	214.7	F
Southbound Right	0.33	19.6	B	0.33	19.6	B	0.33	19.6	B

NOTES:
1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. V/C denotes ratio of volume to capacity. V/C ratio is not calculated for unsignalized intersections.
3. Delay is in seconds per vehicle.
4. LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. LOS is based on delay.

4. Mamalahoa Highway at Kaimi Nani Drive

The results of the Level-of-Service analysis for the intersection of Mamalaho Highway at Kaimi Nani Drive are summarized in Table 11. Shown are the results for unsignalized conditions. As shown, the intersection will operate at Level-of-Service F with very long delays.

Table 11 Level-of-Service Analysis - Mamalahoa Highway at Kaimi Nani Drive (Unsignalized Conditions)

Peak Hour, Approach and Movement	2015 Background			2015 With Main St Without UHCWH			2015 With Main St With UHCWH		
	V/C[2]	Delay[3]	LOS[4]	V/C	Delay	LOS	V/C	Delay	LOS
AM Peak Hour		919.7	F		988.5	F			F
Northbound Left		19.7	C		21.8	C		24.4	C
Eastbound Left			F			F			F
Eastbound Right		732.7	F		732.7	F		759.9	F
PM Peak Hour		918.0	F		963.8	F			F
Northbound Left		10.9	B		11.1	B		11.7	B
Eastbound Left			F			F			F
Eastbound Right		304.5	F		304.5	F		324.4	F

NOTES:
1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. V/C denotes ratio of volume to capacity. V/C ratio is not calculated for unsignalized intersections.
3. Delay is in seconds per vehicle.
4. LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. LOS is based on delay.

Analysis of the traffic volumes concluded that the peak hour warrants for traffic signals are satisfied. Accordingly, a level-of-service analysis was performed for signalized conditions. The results are summarized in Table 12. During the morning peak hour several movements will operate at Level-of-Service E or F, but the overall intersection will operate at Level-of-Service D, which is an acceptable level-of-service. During the afternoon peak hour, all movements will also operate at Level-of-Service E or F, but the overall intersection will operate at Level-of-Service D, which is considered acceptable.

Table 12 Level-of-Service Analysis - Mamalahoa Highway at Kaimi Nani Drive (Signalized Conditions)

Peak Hour, Approach and Movement	2015 Background			2015 With Main St Without UHCWH			2015 With Main St With UHCWH		
	V/C[2]	Delay[3]	LOS[4]	V/C	Delay	LOS	V/C	Delay	LOS
AM Peak Hour	1.06	56.6	E	1.08	61.3	E	1.10	67.5	E
Eastbound Left	0.32	35.4	D	0.32	35.4	D	0.33	35.6	D
Eastbound Right	1.08	119.7	F	1.08	119.7	F	1.13	134.5	F
Northbound Left	0.96	80.5	F	1.07	111.2	F	1.16	142.7	F
Northbound Thru	0.41	4.7	A	0.39	4.5	A	0.39	4.5	A
Southbound Thru	1.08	68.4	E	1.08	68.4	E	1.08	68.4	E
Southbound Right	0.11	8.2	A	0.11	8.2	A	0.12	8.3	A
PM Peak Hour	0.87	36.1	D	0.89	36.4	D	0.92	39.4	D
Eastbound Left	0.51	27.9	C	0.51	27.9	C	0.52	28.1	C
Eastbound Right	1.04	85.3	F	1.04	85.3	F	1.06	92.1	F
Northbound Left	0.74	40.4	D	0.79	44.6	D	0.90	58.2	E
Northbound Thru	0.80	17.3	B	0.77	16.1	B	0.77	16.1	B
Southbound Thru	0.84	32.1	C	0.84	32.1	C	0.84	32.1	C
Southbound Right	0.05	14.6	B	0.05	14.6	B	0.08	14.9	B

NOTES:
1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. V/C denotes ratio of volume to capacity. V/C ratio is not calculated for unsignalized intersections.
3. Delay is in seconds per vehicle.
4. LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. LOS is based on delay.

5. Mamalahoa Highway at Makalei Estates Access/Hana Highway

The results of the Level-of-Service analysis for the intersection of Mamalahoa Highway at Makalei Estates Access are summarized in Table 13. The intersection was analyzed for unsignalized conditions only. During the morning peak hour, all movements will operate at Level-of-Service C, or better. During the afternoon peak hour, the left turn from Makalei Estates to northbound Mamalahoa Highway will operate at Level-of-Service F. An analysis was performed to determine the impact of a left turn refuge lane. This analysis determined that the level-of-service would improve from F to D with installation of a left turn refuge lane.

Table 13 Level-of-Service Analysis - Mamalahoa Highway at Makalei Estates Access (Unsignalized Conditions)

Peak Hour, Approach and Movement	2015 Background			2015 With Main St Without UHCWH			2015 With Main St With UHCWH		
	V/C[2]	Delay[3]	LOS[4]	V/C	Delay	LOS	V/C	Delay	LOS
AM Peak Hour									
Northbound Left		8.5	A		8.4	A		8.3	A
Eastbound Left		20.1	C		19.5	C		18.1	C
Eastbound Right		10.9	B		10.8	B		10.8	B
PM Peak Hour									
Northbound Left		9.2	A		9.0	A		9.1	A
Eastbound Left		69.9	F		52.7	F		55.9	F
Eastbound Right		10.7	B		10.7	B		10.9	B

NOTES:
1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. V/C denotes ratio of volume to capacity. V/C ratio is not calculated for unsignalized intersections.
3. Delay is in seconds per vehicle.
4. LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. LOS is based on delay.

6. *Kaimi Nani Drive at Main Street*

The results of the Level-of-Service analysis of the intersection of Kaimi Nani Drive at Main Street are tabulated in Table 14. During the morning peak hour, the northbound to westbound left turn will operate at Level-of-Service F. During the afternoon peak hour, the northbound and southbound left turns will operate at Level-of-Service F. This implies that mitigation will be required. As it was already assumed that the intersection would have a separate left turn lane and a left turn refuge lane, additional improvements are needed.

Table 14 Level-of-Service Analysis - Kaimi Nani Drive at Main Street (Unsignalized Conditions)

	2015 With Main St Without UHCWH			2025 With Main St With UHCWH		
Peak Hour, Approach and Movement	V/C[2]	Delay[3]	LOS[4]	V/C	Delay	LOS
AM Peak Hour						
Eastbound Left		10.5	B		10.8	B
Westbound Left		8.2	A		8.2	A
Northbound Left		287.6	F		961.4	F
Southbound Left		28.0	D		32.1	D
Southbound Thru &Right		19.1	C		21.9	C
PM Peak Hour						
Eastbound Left		8.7	A		9.6	A
Westbound Left		11.2	B		11.2	B
Northbound Left		47.6	E		196.6	F
Southbound Left		449.5	F			F
Southbound Thru &Right		12.2	B		13.5	B

NOTES:
1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. V/C denotes ratio of volume to capacity. V/C ratio is not calculated for unsignalized intersections.
3. Delay is in seconds per vehicle.
4. LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. LOS is based on delay.

An assessment of the afternoon peak hour volumes concluded that the peak hour warrant for a traffic signal is satisfied. Accordingly, a level-of-service analysis was performed for signalized conditions. This analysis concluded that if signalized, this intersection would operate at Level-of-Service C, or better.

In response to comments for Public Works, an analysis of the intersection as a roundabout was performed. The analysis concluded that the intersection would operate at Level-of-Service D during the morning peak hour and Level-of-Service F during the afternoon peak hour.

Conclusions of the Level-of-Service Analysis

The conclusion of the level-of-service analysis is that poor levels-of-service will be experienced at the intersections along Queen Kaahumanu Highway. Main Street will improve conditions by diverting traffic from Queen Kaahumanu Highway. However, enough traffic will not be diverted to improve the afternoon level-of-service above E or F. Queen Kaahumanu Highway should be widened from two to four lanes to accommodate traffic demand as soon as possible. The low levels-of-service at these intersections are the result of regional traffic.

Other roadway improvements required include the following:

1. The intersection of Mamalahoa Highway at Kaimi Nani should be signalized to accommodate 2015 conditions without and with Main Street or UHCWH.

2. The intersection of Kaimi Nani Drive at Main Street should also be signalized to accommodate 2015 conditions with Main Street and with UHCWH traffic.

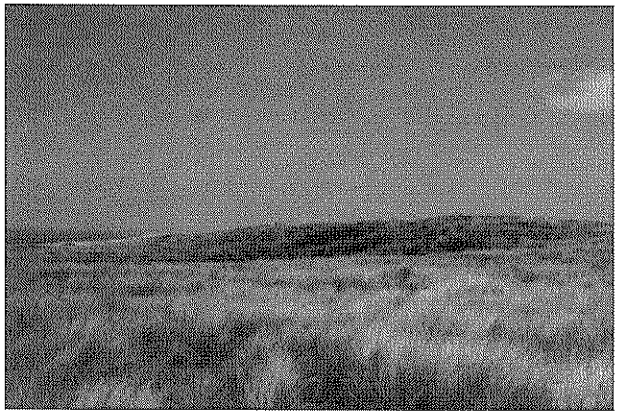
Appendix G. Cultural Impact Assessment

CULTURAL
RESOURCES
CONSULTANTS

CULTURAL IMPACT ASSESSMENT (CIA)
FOR THE
UH KONA MAIN STREET COLLECTOR ROAD
DISTRICT OF NORTH KONA
HAWAI'I ISLAND

Prepared By:

Pacific Legacy, Inc.



CULTURAL IMPACT ASSESSMENT (CIA) FOR THE UH KONA MAIN STREET COLLECTOR ROAD DISTRICT OF NORTH KONA HAWAI'I ISLAND

by:
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November 2005

ABSTRACT

This Cultural Impact Assessment (CIA) was undertaken by Pacific Legacy to obtain information required for the Environmental Assessment (EA) being prepared for the UH Kona Main Street Collector Road in West Hawai`i.

Based on archival research and interviews, the project area is not known to significantly support any current traditional resource utilization. However, the project area has a number of archaeological sites, and the area is part of a larger cultural landscape. Most of the adverse impacts from the development of the road have been anticipated and discussed, and recommendations have been presented which would mitigate and minimize the impacts.

The Archaeological Assessment for the UH Kona Main Street Collector Road (McIntosh 2005) and the Conceptual Historic Protection Plan (Cleghorn 2000) have addressed many of the negative cultural impacts of the project and have proposed effective protection measures. Those recommendations have been included in this report.

The following is a brief summary of recommendations:

1) All sites should be preserved/protected as recommended by the informants, the Archaeological Assessment for the Main Street Roadway (McIntosh 2005) and the Conceptual Historic Protection Plan (Cleghorn 2000).

2) The Hawai`i Burial Council should be consulted for guidance regarding burials.

3) The final road alignment should be guided by the recommendations of the Archaeological Assessment for the Main Street Roadway (McIntosh 2005) and the Conceptual Historic Protection Plan (Cleghorn 2000).

4) The road design should incorporate the buffer zone recommendations of the Archaeological Assessment for the Main Street Collector Road (McIntosh 2005) and the Conceptual Historic Protection Plan (Cleghorn 2000). The design should further protect the sites from any run-off.

5) The recommendations in the Historic Protection Plan should be incorporated during the planning, design and construction phases of the road development project.

6) The Historic Preservation Plan should incorporate recommendations set forth in the Archaeological Assessment for the Main Street Collector Road (McIntosh 2005), and should add to its existing list of guidelines, the following recommendations discussed in this report:

- the planning, design and implementation stages of the road development should be sensitive to any possible impacts on the cultural landscape
- proper recognition of *ahupua`a* boundaries

7) Any changes to the Historic Preservation Plan should be made in consultation with the University of Hawai`i Advisory Council on Kalaoa Cultural Site Preservation, *kupuna*, and other identified stakeholders. Guidance should be sought from the Hawai`i Burial Council, Office of Hawaiian Affairs, and the State Historic Preservation Division.

8) The University of Hawai`i Center at West Hawai`i Advisory Council on Kalaoa Cultural Site Preservation (Kalaoa Advisory Council) gives the impression that the cultural sites are exclusively in Kalaoa. The name should be changed to reflect the inclusion of all affected *ahupua`a*.

An alternate revised access road alignment (see Figure 2) has been proposed in part to "avoid archaeological sites" (Wil Chee 2000:24). To ensure minimal negative impact from the development of the road to the archaeological sites, the proposed realignment of the road should incorporate the recommendations set forth in the Archeological Assessment for the Main Street Roadway (McIntosh 2005) and the Conceptual Historic Protection Plan (Cleghorn 2000).

It is crucial that the recommendations be considered and incorporated in the design of the final road alignment and during the construction of the road to ensure that any adverse impacts from the project would be minimal.

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1.0 INTRODUCTION

This Cultural Impact Assessment (CIA) was undertaken by Pacific Legacy to obtain information required for the Environmental Assessment (EA) being prepared for the UH Kona Mid-Level Road in West Hawai`i.

The CIA was conducted in compliance with Act 50 that has the stated purpose to:

- Require that environmental impact statements include the disclosure of the effects of a proposed action on the cultural practices of the community and State; and
- Amend the definition of "significant effect" to include adverse effects on cultural practices.

Specifically, the following tasks were undertaken:

- Identify and consult with individuals and organizations knowledgeable about cultural practices being conducted and/or may have taken place in the area;
- Conduct archival research about traditional practices that may have been conducted in the area;
- Describe the cultural practices that took place within the potentially affected area; and;
- Assess the impact of the proposed development on the cultural practices that may have taken place within the potentially affected area.

This CIA includes summary data compiled from archival and record searches in the following repositories:

- Hawai`i State Archives
- Hawai`i State Law Library
- University of Hawai`i Library System
- State of Hawai`i Public Library
- County of Hawai`i Finance Department, Real Property Tax Office
- County of Hawai`i Planning Department
- National Park Service, Honokohau
- Waihona Aina Corporation

Accounts of personal experiences and knowledge about traditional cultural practices and traditional uses of the proposed project area were obtained from traditional oral historians, as well as, other sources identified by the community as having information on the traditional uses of the proposed project area.

1.1 Environmental Setting

The UH Mid-Level Road project area is located on the west or leeward side of the island of Hawai`i in the region of Kekaha in North Kona. It is approximately 7 to 8 miles north of Kailua-Kona, and approximately 3 miles west (*mauka*) of the Kona Airport.

Figure 1 shows the location of the project site in Kona. The proposed road development will start at Ka'imi Nani Drive, almost midway between Mamalahoa Highway and Queen Ka'ahumanu Highway, and "extend along the western edge and end at the northern boundary of the 500-acre UH parcel. This corridor is approximately 2.2 km long (ca. 1.4 miles) and will be about 36.5 m (120 feet) wide" (SOW: 2005:1).

The project site is on the Southwestern slope of Mt. Hualalai at an elevation ranging from approximately 300 – 400 feet above sea level.

The land is predominantly comprised of pahoehoe and aa lava from Mt. Hualalai eruptions. "A *pahoehoe* lava flow hardens to form a generally smooth surface whereas the *a'a* type forms splintered or jagged fragments. Both flow types can contain buried voids such as pockets, blisters, extensive lava tubes and tunnels that formed as molten rock cooled and residual lava drained from primary flow pathways" (Wil Chee 2000:28).

The area is described as hot and dry. It is estimated that the area receives less than 20 inches per year (Wil Chee – Planning 2000:29). Further, "soils in the project area are generally described as rare and thin in extent because the volcanic flows of Hualalai...are relatively young" (Wil Chee - Planning 2000:28). The region is often referred to as "*Kekaha wai ole*", the land without water, referring to this arid hot climate and barren lava terrain.

The landscape is dominated by grasses, predominantly fountain grass (*Pennisetum setaceum*) and less commonly by *pili* (*Heteropogeon contortus*). Shrubs and small trees found interspersing the landscape were identified in Cleghorn (2000):

> "Native species present in the area include: *`a`ali`e* (*Dodonaea viscose*), *noni* (*Morinda citrifolia*), *iliahi* (*Santalum ellipticum*), naio (*Myoporum sandwicense*), *walah'e'* (*Canthium odoratum*), *huehue* (*Cocculus ferrandianus*), *'ilima* (*Sida fallax*), and *'uhaloa* (*Waltheria Americana*)...Alien shrubs observed include: *koa haole* (*Leucaena leucocephala*), and Christmas berry (*Schinus terebinthifolius*)" (Cleghorn 2000:2)

1.1.1 Land Divisions and Resource Management

Traditionally, the islands were divided into land units called *moku*. The *moku* were socio-political units or separate chiefdoms, which later came to be referred as districts (Handy and Handy 1972:46). The island of Hawai`i was divided into 6 *moku* -- Kohala, Hamakua, Hilo, Puna, Ka'u, and Kona.

Legend has it that the division of the islands into *moku* was initiated on the island of Hawai`i by Umi-a-Liloa, first to unite the entire island through conquest ca. A.D. 1600 (Kamakau 1961:19).

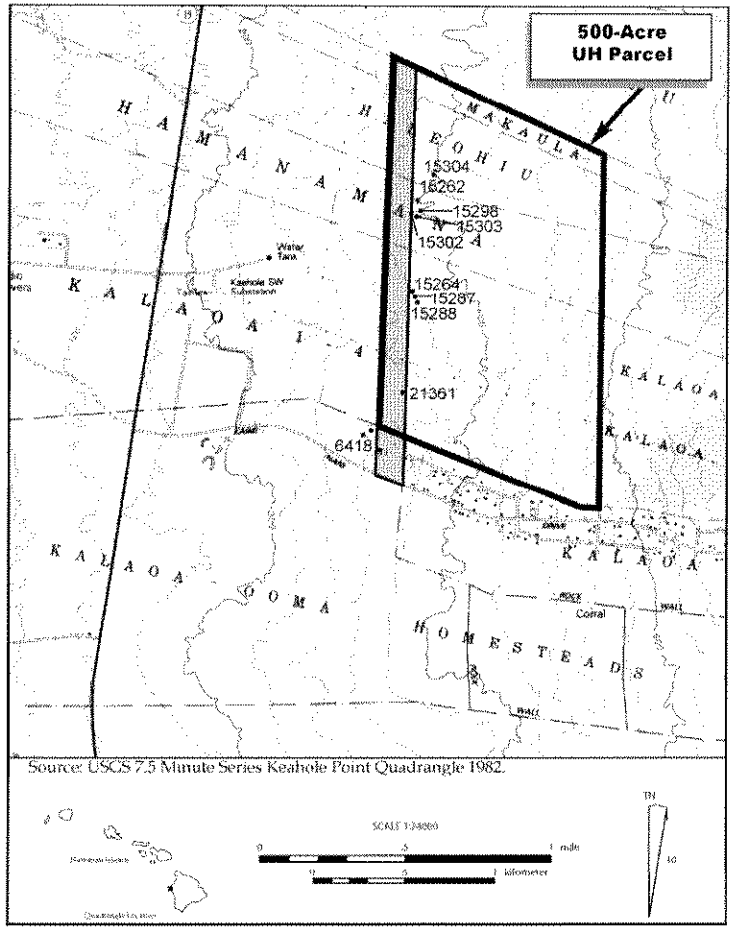

Figure 1. Project Area in North Kona.

Each *moku* was made up of smaller divisions and sub-divisions of land units, creating progressively smaller inclusive land units for resource management; and social, economic, and political organization. For example, the *moku* of Kona was divided into South Kona and North Kona. These districts were further divided into smaller units called *kalana* (Maly 2000:6). The southern section of North Kona was called Kona Kai 'opua and the northern section, Kekaha.

Kekaha is the section in which the project site is located. The region of Kekaha extends from Honokohau to the south to Pu'uanahulu to the north.

Kalana were divided into smaller units called *ahupua`a*. Probably the most significant land division in Hawaiian society was the *ahupua`a*. There were as many as 600 *ahupua`a* on the island prior to the end of the reign of Kamehameha I (Cordy 2000:31). The *ahupua`a* is typically described as a "pie-shaped" land unit which extends from the mountain to the sea. In reality, few resemble the pie shape description. However, the majority did run from sea to the upland slopes, dividing the islands into vertical sections.

The size and shape of the *ahupua`a* reflect "...a mix of historical factors keyed to handle special resources (fisheries, meat birds, *koa* trees, etc.), population, and political factors. Importantly, size does not necessarily reflect population size nor power of a community. Rather in some cases it simply means that special resources were included within the *ahupua`a*, with those resources controlled by the resident or absentee landlord—the ruler or a high chief. Or, in arid regions, larger size may have compensated for poorer or more scattered farming soils..." (Cordy 2000:33).

The *ahupua`a* became the equivalent of a community. It was generally a self-contained social unit and economically self-supporting. It was a political unit under the authority of a resident chief (*konohiki)* and had an independent identity.

The project site cuts across several *ahupua`a* in Kekaha - Kalaoa (1-4), Hamanamana, Hale`ohi`u, and Maka`ula and a very small portion of O`oma.

Each *ahupua`a* was further divided into parcels called *'ili, ko'ele, mala,* and *kihapai,* etc., in which cultivated or natural resources could be harvested (Maly 2000:7). "As long as sufficient tribute was offered and *kapu* (sanctioned restrictions) were observed, the common people, who lived in a given *ahupua`a* had access to most of the resources from mountain slopes to the ocean. These access rights were almost uniformly tied to residency on a particular land, and earned as a result of taking responsibility for stewardship of the natural environment and supplying the needs of ones' *ali'i"* (Maly 2000:7).

1.1.2 Environmental terrestrial Zones

The majority of the *ahupua`a*, running vertically on the landscape from the sea to the mountain, sliced though the naturally occurring horizontal bands of environmental zones determined by elevation, rainfall, vegetation, geology, etc . The zones represented cultural perspective of the

environment and the different available resources. The following is a summary of the traditional environmental zones in North Kona as discussed by Handy and Handy (1972:55,56) and Maly (2000:8,9):

1. *Ko Kaha Kai*: "Land by the Sea" or coastal region
   "*Kaha* was a special term applied to areas facing the shore but not favorable for planting. Kekaha in Kona, Hawai`i, was one so named..." (Handy and Handy 1972:55).

2. *Kula*: The plains or sloping lands above the coastal region
   Kula kai: Seaward plains. In Kekaha this is the dry barren lava covered terrain: "volcanic desert" (Maly 2000:8)
   Kula uka: inland or upland slopes (towards the mountains)

3. *Wao kanaka*: "region of man" Upland zones between and elevation of 1200 to 2400 ft and received increased rainfall (30 - 40 in. annually) providing suitable agricultural sites and abundant naturally occurring resources which were used for religious, domestic, and economic purposes

4. *Wao akua*: "region or zone of deities"
   "...remote, awesome, seldom penetrated, source of supernatural influences, both evil and beneficent." (Handy and Handy 1972:56)

5. *Wao ma'ukele*: rain forest
   "Here grew giant trees and tree ferns ('ama'u) under almost perpetual cloud and rain." (Handy and Handy 1972:56)

These traditional environmental zones correspond somewhat to the environmental terrestrial zones distinguished by Cordy, et al. (1991) in Kaloko. These zones were based on elevation, vegetation and geology. The zones are: 1) Coastal; 2) Middle, 3) Lower Upland Forest, and; 4) Upland-Forest Zone:

Characteristics of each zone are summarized below:

1) Coastal Zone: Elevation 0 - 15 feet above sea level. Low rainfall, 10 inches or less. Beach sand, and minimal soils.

2) Middle Zone: Between 15 - 900 feet above sea level. The terrain below 400 - 600 feet is almost void of soil; minimal soil above 400 - 600 feet. Very sparse grass-dominated vegetation below 400 - 600 feet; secondary growth of trees, shrubs and grass above 400 - 600 feet. Rainfall is between 10 - 30 inches.

3) Lower Upland Forest Zone: 900 - 1500 foot elevations. Soils are 4 inches deep and extensive, interspersed with rocky patches of pahoehoe and aa. 40 - 50 inches of rainfall.

4) Upland-Forest Zone: 1,500 – 6,000 foot elevations. Rainfall is 70+ inches at the 2,600 foot elevation. 5 – 10 inches thick soils. Vegetation lush.

The project site is located in the environmental zone of *Kula Kai* or the Middle Zone. This zone supported temporary habitations and limited agricultural activity in prehistoric times.

2.0 RESULTS OF ARCHIVAL RESEARCH

This section is a summary of archival data of Native Hawaiian traditional cultural practices, prehistory and history in the project area and general Northern Kona vicinity.

2.1 TRADITIONAL ORAL HISTORY

The corpus of traditional legends was reviewed in order to assess the early significance of the project area to its inhabitants and their culture (Maguire 1966, Foranander 1916 – 1919, Armitage, 1944). The legends were not specifically of the project area *ahupua`a*, but of Kekaha in general. Besides entertainment value, the legends provide a snapshot of the place and the people. They told of historical events and the history of places. Daily activities from rituals to recreational activities were described in the legends, providing a ethnography of the early Hawaiian culture which is supported by the archaeological records and historical writings.

The social order of society were evident in many of the stories (*ali`i* and commoners). The legends also provided descriptions of economic activities, such as fishing (and what kinds of fishes and sea life were harvested), and farming (and what crops were planted).

The ocean or seashore was a predominant setting for many of the legends of Kekaha. Upland villages and the practice of *mauka/makai* travel between the ecological zones were mentioned. *"Kekaha wai ole"*, "the desolate land without water" (Maguire 1966:7), refers to the barren and dry lava covered terrain characteristic of the area. It is understandable that Pele, "who has literally eaten the heart out of this section" (Maguire 1966:7), would be the subject of several legends.

2.2 SOCIAL AND CULTURAL CHANGE

In the early 1800's, Kona witnessed drastic social and cultural changes. Cordy et al (1991) summarizes the events as follows:

> "Kona's harbors – Kailua and Kealakekua – became port-towns, drawing in workers and residents from outlying areas (cf. Kelly 1983:5) …Agricultural production and marine resource exploitation fell off in the outlying lands. Diseases led to an island-wide population crash (Schmitt 1971; Stannard 1989), even further reducing the population, field areas and marine exploitation in outlying *ahupua`a*. Religion was abolished, and heiau went out of use. The ruling center was removed to O`ahu and Maui, and the presence and demands of the high chiefs altered. Kuakini, as governor of Hawai`i, and his retinue partly filled this void, but the vast numbers of high chiefs were no longer on island. The missionaries arrived and established churches at the main population centers – the port town areas – further focusing the remaining populace into these areas" (Cordy et al 1991:579).

Cordy et al (1991) conclude that "a major result of these changes in the early 1800s was drastic depopulation – even more drastic in the areas outside Central Kona and its ports and fertile lands," which would be areas such as Kekaha (Cordy et al 1991:579).

Based on the censuses the missionaries conducted, the population of the island of Hawai`i in 1823 was estimated at 85,000 individuals (Schmitt 1973:8). In 1835, the missionary estimated population for the region of Kekaha was 1,244 individuals (Schmitt 1973:31). The total population of North Kona in 1835 was 5,957 individuals, a recorded four year decline of 692 persons since the census conducted in 1831 which estimated the population to be 6,649 individuals for the same area (Schmitt 1973:31).

The implementation of the 1848 *Mahele 'Aina* (land division) had a crucial impact on Hawaiian society and culture. It was "the most important event in the reformation of the land system in Hawai`i...the separation and identification of the relative rights of the king, the chiefs, and the *konohiki*, in the lands within the islands. This event led to the end of the feudal system in the kingdom" (Chinen 1958:15).

During the middle to late historic period (post mahele ca. 1985's) there was a major shift in settlement pattern due to depopulation and change in economic base, the once populated centers along the Coastal zone in Kekaha were abandoned for the economic centers and *mauka* Upland zones (Cordy et al 1991:580).

The economy focused on cash crops, wage labor and small business. The vacated lands of Kekaha were converted to pasture lands. The development of large-scale commercial ranching during the later half of the 1800s extended throughout Kekaha. The project area was included in the lands of Hu`ehu`e Ranch. Orr (2003) writes of the history of Hu`ehu`e Ranch:

> In 1888 and 1896 John Avery Maguire acquired Land Grants 3438 and 3953...Then in 1906...obtained a 21-year lease (General Lease No. 590) of grazing land in North Kona from the Territorial Government; and other parcels of land in Holualoa and North Kona in 1913...By 1929 Hu`ehu`e Ranch owned 15,000 acres and leased another 25,000 acres" (Orr 2003:47)

2.3 Early Written Accounts of Kekaha

The earliest written historical account of this part of the North Kona area is that of Archibald Menzies, who traveled with Capt George Vancouver in 1792. He wrote: "barren and rugged with volcanic dregs and fragments of black lava...in consequence of which the inhabitants were obliged to have recourse to fishing for their sustenance" (Menzies 1920:99).

Menzies also wrote of the dry land farming in the area:

> "...But the taro being naturally an aquatic plant required in this dry soil a very different treatment. There were generally two or three of them planted together in the hole about nine inches below the surface of the ground. These holes were about four feet apart, and as the plants grow up, the earth is gathered round their stems in the form of a basin to retain the water, wither from rain or otherwise, about their roots" (Menzies 1920:75-76).

John Papa I`i, a member of Kamehameha III's court, describes his impressions of the lands of Kekaha as seen from a ship when he was a youth (1973):

> "...the ship arrived outside of Kaelehuluhulu, where the fleet for aku fishing had been since the early morning hours. The sustenance of those lands was fish" (I`i 1973:109).
>
> "Soon the fishing canoes from Kawaihai, the Kaha lands, and O`oma drew close to the ship to trade for pa'i'ai (hard poi) carried on board, and shortly a great quantity of aku lay silvery hued on the deck (I`i 1973:109).
>
> "When the sun was rather high, the boy (I`i) exclaimed, "How beautiful that flowing water is!" Those who recognized it, however, said, "That is not water, but pahoehoe. When the sun strikes it, it glistens, and you mistake it for water..." (I`i 1973:109)
>
> "The gentle Eka sea breeze of the land was blowing when the ship sailed past the lands of Mahaiulas, Awalua, Haleohiu, Kalaoas, Hoona, on to O`omas, Konaiki, Kaloko, Honokohaus, and Kealakehe, then around the cape of Hiiakanoholae...." (I`i 1973:110)

William Ellis, visited and toured the island in 1823 as a member of the American Board of Commissioners for Foreign Missions to seek out suitable sites for missions and schools. He writes of the consequence of the 1801 lava flow in Kekaha(1963):

> "...inundated several villages, destroyed a number of plantations and extensive fish-ponds, filled up a deep bay twenty miles in length and formed the present coast...Stone walls, trees, and houses, all gave way before it..." (Ellis 1963:30).

Ching (1971) provides further comments on Ellis's tour to the North Kona coast:

> "...Ellis took a canoe trip from Kawaihae in South Kohala to Kailua...Along the way he stopped off at Kaparaoa (Kapalaoa). Here he mentioned a 'small village on the beach, containing twenty-two houses,...carved wooden idols...' (1917:306), an abandoned heiau. He also visited the village of Wainanarii (Wainana'lii) and mentioned the name of its chief, Waipo. Late that day his canoe put in at Kihoro (Kiholo) which he described as 'a struggling village, inhabited principally by fishermen (1917:306). The Fishpond of Wainana'lii at Kiholo Bay must have been quite impressive as this is the only one of the nineteen fishponds along this coast which he described. This pond was destroyed thirty-six years later by the Mauna Loa pahoe'hoe flow of 1859. However, in 1823 when Ellis saw it, this fishpond was still in operation, 'well stocked with fish' (Ellis 1917:308)" (Ching 1971:37).

Wilkes (1845) a member of the United States Exploring Expedition, made the following early observation about the Kona area:

> "The natives during the rainy season...plant, in excavations among the lava rocks, sweet potatoes, melon, and pineapples...The...staple commodities are sweet potatoes, upland taro, and yams. Sugar cane, bananas,...breadfruit, cocoanuts, and melons are also cultivated. The Irish potato, Indian corn, beans,

coffee, cotton, figs, oranges, guavas, and grapes have been introduced. ...Two miles back of the coast...in a belt half a mile wide, the breadfruit is met with and abundance, and above this the taro is cultivated with success. At an elevation of between two and three thousand feet, and at a distance of five miles, the forest is first met with...A considerable trade is kept up between the south and north end of this district. The inhabitants of the barren portion of the latter are principally occupied in fishing and the manufacture of salt, which articles are bartered with those who live in more fertile regions of the south, for food and clothing" (Wilkes 1845:91).

Maly (2000) translates an excerpt of Kekaha from a 1875 newspaper, *Ku 'Oko'a*:

"...The people who live in the area around Kailua are not bothered by the famine. They all have food. There are sweet potatoes and taro. These are the foods of these lands. There are at this time, breadfruit bearing fruit at Honokohau on the side of Kailua, and at Kaloko, Kohanaiki, O`oma and the Kaloas where lives J.P. (the author). All these lands are cultivated. There is land on which coffee is cultivated, where taro and sweet potatoes are cultivated, and land livestock is raised. All of us living from Kailua to Kalaoa are not in a famine, there is nothing we lack for the well being of out bodies" (J.P. Puuokupa, in *Ku Oko'a* November 27, 1975; translated and in Maly 2000:50).

Bowser's (1880) record of commercial activities in the areas of the islands and his impressions of North Kona and the foliage of the area were sited in Rosendahl (2004):

"Presently I reached the ridge of the mountain, and had a fine view of the surrounding country. Fronting the sea for many miles in North Kona there is a rich tract of bottom land which might be turned to good account. Large areas of the mountain land might also be cultivated for coffee. It is a shame to see so many hundred square miles of country lying waste for want of enterprise on the part of its owners" (Bowser 1880:547 in Rosendahl 2004:A3).

Notes from a June 7, 1882, letter of J.S. Emerson written from the field during a mapping survey discusses the camp site at Lae o Keahole, Kalaoa 4 (in Maly 2000):

"...Our animals enjoyed the richest pasture, such as they will not see again during this campaign. The country about there appears to be in its primitive freshness without the curse of cattle, horses, and goats. Pohas were very abundant and luscious... "(Emerson 1882 in Maly 2000:103).

2.4 Land Distribution and Use

2.4.1 Late A.D. 1700 to Early A.D. 1800

Kamakau (1961) describes Kekaha land distribution prior to Kamehameha I up to the Mahele:

Waimea was given to the Pa'ao kahuna class in perpetuity and was held by them up to the time of Kamehameha III when titles had to be obtained. But there was one land title held by the kahuna class for many years and that was Puuepa in Kohala. In the same way the land of Kekaha was held by the kahuna class of Kauahi and Nahulu (Kamakau 1961:231).

Further, he writes:

During the 1770s, Kekaha and the lands of that section were held by descendants of the Nahulu line, the Ka-me'e-ia-moku and Ka-manawa, the twin half brothers of Ke'e-au-moku, the Hawai`i island chief" (Kamakau 1961:310).

2.4.2 The *Mahele* of 1848

The *Mahele* refers to the historic land division initiated during the reign of Kamehameha III. Prior to the *Mahele*, all lands were held in trust by the *ali'i*. The *Mahele* divided the land into three categories: 1) Crown Lands, 2) Government Lands, and 3) *Konohiki* Lands (Chinen 1961:13).

A Commission on Boundaries was created by the Hawaiian Legislature in August of 1862 to settle boundaries of larger parcels of lands awarded without survey in the Mahele.

The awarding of royal Patents is the final process of Mahele land claims from 1848 to 1853. Land Grants refer to land sold by the Government.

It has been noted that "Many of the *ahupua`a* in Kekaha were Crown lands, especially those with fishponds or springs" (Orr 2003:64). Other possible considerations in royal land claims within Kekaha may be ownership of fishing grounds (i.e., the off shore fishing grounds belonged to Haleohiu), sacred sites (burials and *heiau*), forest resources (trees and birds), etc. One interviewee suggests that the accessibility to trails or strategic routes, such as from Kona to Hilo, may have been important to the *ali'i*. Finally, there are intangible cultural attributes of the land which are not obvious observations, but may make a property desirable. For example, the concept of *mana* which is an integral part of Hawaiian culture and belief, is believed to exist in varying degrees within the land or certain features. These spiritually charged lands would be culturally valuable.

Kamehameha III subdivided his own reserved lands during the mahele and gave a larger portion of it to the Hawaiian Government. Among the *ahupua`a* Kamehameha III set apart and gave to the Government were *ahupua`a* Maka`ula, Kalaoa (1-4) and O`oma (1-2) (Government 1859:379). Her Excellency Ruth Ke`elikolani filed claim for Hamanamana and Hale`ohi`u in 1873.

2.4.3 Commission on Boundaries Proceedings: Ahupua`a of Hamanamana and Haleohiu

Commission on Boundaries testimonies are available for Hamanamana and Haleohiu due to Her Excellency R. Ke`ekikalani's claim. These testimonies provide valuable historic information on residence, habitation, vegetation, horticultural practices, and land use. The Commission on Boundaries testimonies were probably the first oral histories recorded in Hawai`i. These accounts were taken from actual residents of the area who had intimate knowledge of the *ahupua`a*.

The Ahupua`a of Hamanamana, District of North Kona, Island of Hawai`i, Boundary Commission, Hawaii. Vol. A, No. 1, pps 382-383.

On this 13th day of August A.D. 1873 the Commission of Boundaries for the Island of Hawai`i, 3d Judicial Circuit, met at Kalaoa, North Kona, Hawai`i for the hearing of the application of J.O. Dominis, acting for Her Excellency, R. Ke`elikolani, for the settlement of the boundaries of Hamanamana situated in North Kona, Hawai`i.

Testimony
Moa, kane, sworn. I was born at Kaula, North Kona, Hawai`i at the time of Peleleau; have lived here at Kalaoa since the time of Governor Adams, and know the land of Hamanamana and its boundaries. I have seen the natives setting up idols and worshipping on some of the boundaries.

Kalaoa 1st and 2nd bound Hamanaman on the South side, the boundary at shore between Hamanamana and Kalaoa 1st is at a rocky point called Unuhoaloha. Kalaoa 1st begins somewhere on the kula (pahoehoe and aa on flat land below the fishing ground...). I can point out the boundary on the mauka Government road, but do not know the names of points on the line. I know a few points on the ...boundary between Hamanamana and Haleohiu, a place called Kaua, on the North side of Unuhoalua, is the boundary at the sea shore and the boundary line runs a little to the South of it.

Vol. B, pps 263 – 265
Case continued from Aug. 13 A.D. 1873

On this the 9th day of June A.D. 1874, the Commission of Boundaries for the Island of Hawai`i, 3 Judicial Circuit met at Kailua for the examination of witness as to the boundaries of Hamanamana....

Kaukaliinea, kane, sworn. I was born on Kalaoa 1st after the kaua-ia-kekuaokalani, have always lived there; am a kamaaina of Hamanamana and know the boundaries. The boundary between this land and Haleohiu, is at Kalaeula; thence mauka to Kipukaiki; thence mauka to Naipuakahiona; thence to a cave called Papapo; thence to Kapahee; thence to Paepaiomalama, a lua kanaka; thence to the Government road; thence to Kalualapa, thence along to Nakiakauhikoa, the mauka corner of Hamanamana and Haleohiu on the boundary of Kaupulehu. Thence towards Kona on the boundary of Kaupulehu to an ohia tree on the Kohala side of a place called Kapulehu at the junction of old roads from our land and the bird catchers road. This is a long distance from Kaupulehu. Then makai along Kalaoa 1st down to a kipuka (opening, clearing) in the middle of the woods, called Kipuka. The boundary is on the South side, a small portion of the Kipuka belonging to Kalaoa, there used to be an old trail from the ohia tree along this boundary to a place called Kanakamake. At Kipuka the boundary leaves the woods and runs down a wall to the...Government road. Thence along the North side of Huea's and along to Kukaimelemele; there is a punawai there; thence along the Government potion of Kalaoa to a place called Laeakailio on the Kona side of the aa. Thence to Kelehua, an ahua and Kipuka the boundry running through the kipuka, thence to

Kahua, a lae at the seashore. Bounded makai by the sea. I have heard that the Ancient fishing rights belonged to Haleohiu. The people from Hamanamana had their fishing confined to the rocks.

Kanehailua, kane sworn. I was born in North Kona just before King Kamehameha I died and have always lived there,. A kamaaina of Hamanamana and know the boundaries. Haleohiu bounds it on the North side. Kaleulua is the boundary at shore; said place is a small point and the boundary is on the Northern side of this point; thence mauka to Kipukaiki, a kihapai in the aa; the boundary passing through it; thence the boundary runs between two hills called Naipuakahiona; thence mauka to Papapo, a cave; thence to Kapahee, a puuhala (pandanus) grove; the boundary passes through it; thence to Paepaeonialama, a lauhala (pandanus leaf) grove, the boundary is on the Kau side; thence to Keahuapua at the maukapulehu; thence along Kaupulehu towards Kona towards a place called Kapulehu; thence makai along Kalaoa is a mahina ai (farm) called Aki, the boundry runs through it....Thence to the side of Kipuka, the iwiaina runs along through the enclosed lot to the Government road to Ahupuaa; thence along Huea's land; thence makai to Kaiwiholehole, the makai corner of Huea's land; a part of a place called Kukaimelemele is on Haleohiu and a part on Hamanamana, and not on the boundary between Hamanamana and Kalaoa. Kaiwiholehole is a large hala (pandanus) grove; thence to Kalaekailio;thence to Kelehua, ohia trees growing on the aa; thence makai to Kahua at the seashore. Bounded makai by the sea. The ancient fishing rights was limited to the rocks at shore. The sea belonging to Haleohiu.

The Ahupuaa of Haleohiu, District of North Kona, Island of Hawai`i, Boundary Commission, Hawaii. Vol. A, No. 1, pps. 238-240.

On this 9th day of June A.S. 1874, the Commission of Boundaries for the Island of Hawai`i, 3 Judicial Circuit, met at Kailua, North Kona, on the application of J.O. Dominis, Agent for the Crown Lands for the settlement of the boundaries of Haleohiu, situated in the District of North Kona, Island of Hawai`i.....

Testimony
Kanehailua, kane, sworn. I was born in North Kona just before King Kamehameha I died. I have always lived there and know the boundaries of Haleohiu, Hamanamana bounds it on the south side. Kalaeulua is the boundary at shore. Said place is a small point and the boundary is on the Northern side of this point. Thence mauka to Kipukaiki, a kihapai in the aa; the boundary passing through it. Thence the boundary runs between the two hills called Naipukahiona; thence mauka to Papaapoo, a cave; thence to Kapahee, a puuhala (pandanus) grove, the boundary passes through it; thence to Paepaeomalama, a lauhala (pandanus leaf) grove; the boundary is on the Kau side of it; thence to Keahuapua, at the mauka road; thence mauka to Kalualapa, a hill and crater, the boundary running on the Kau side of the crater. Thence mauka passing Kaaipuaa (a mahina ai (farm) that used to belong to my parents) to a large ohia tree that is on the road from Kaupulehu towards Kohala to Nakiakauhikoa; thence to Puuliolio...along Kau, thence along Makaula to the upper side of Maialoa. The boundary is on the Kona side of Maialoa, thence to Kapapai, where a piece of land is

sold to Hewahewa (a kanaka that is now dead); thence makai to Puukamanu, a resting place; thence the boundary runs to the Kohala side of a kihapai (small land division) called Kanihokeke; thence to the Kona side of Makaula, a kaulale; thence to Pahakuloa; thence to Leohapu; thence to Kuula, a puu pohaku, where we used to worship. Bounded makai by the sea. Ancient fishing rights extending out to sea.

Kaukaliinea, kane, sworn was born on Kalaoa 1st after the time of He Kauai a Kekuokalani and have always lived there; know the land of Haleohiu and its boundaries. My parents showed them to me. When Fuller surveyed the land they showed him the boundaries. Makaula bounds it on the Kohala side at Kuula.

The boundary between Hamanamana and Haleohiu is Kalaeulua; thence mauka to Kipukaiki; thence mauka to Naipuakahiona; thence to Papaapoo, a cave; thence to Kapahee; thence to Paepaeomalama, a lua kanaka; thence to the Government road; thence to Kalualapa; thence along Kaupulehu; to Nakaiakauhikoa; Ki grows there. Thence to a large ohia tree at the corner of Maukalua; thence makai to Maialoa, thence to Kapapai; thence to Puukamana; thence to ahupuaa at the Government road; thence to Makaula; thence to Kuula at the seashore. Bounded makai by the sea. Ancient fishing rights extending out to sea. The land of Kau does not join this land. There are only

2.5 Land Survey

In 1888, J.S. Emerson surveyed the Kekaha region. The map of Akahipuu Section, North Kona, Hawai`i, Reg. Map #1449, P.H. 20, clearly shows the lava covered terrain from the flow of 1801 along the coast and immediately inland – areas of *ahupua`a* Kalaoa, Hamanamana, Haleohiu, and Makaula. His notation of this area: "Barren waste of rocks, fit for goats". Of the area in which the road project is proposed, Emerson notes that this area is "fit for goats". Above the project site, the land use comments graduate to "good grazing land". Of the Upland Forest zones, he describes it variously as "*kukui* and *ohia* forest fine coffee and fruit lands"; "heavy *ohia* forest with rich soil, quite free from rocks"; and, "*ohia* forest and dense *ie'ie* jungle with soils suitable for coffee" (Emerson:1888).

Emerson also mapped out and indicated various land grant parcels on his map. The grant parcels were in *Kula uka* upward or in the Upland zones and not within the project zone.

2.6 Prehistoric Background

2.6.1 Settling of Kekaha Region

It is estimated that Hawai`i was first settled by Polynesian voyagers as early as A.D. 300 (Kirch 1985:296-308, Cordy 2000:109). It is hypothesized that the more "ecologically favorable" windward side of the islands were settled first. It is widely accepted that only after windward areas were fully developed and populated, did movement in search for new resources establish permanent settlements on the drier leeward side of the islands.

It would be almost 600 years later, around A.D. 900 during the Expansion Period of Hawaiian History (A.D. 1100 – A.D. 1650), that permanent settlements would be established on the leeward side of the island of Hawai`i. These early settlements were concentrated around coastal bays where marine and shoreline subsistence resources, and drinking water sources were available. Evidence of these early settlements was found at Anaehoomalu in South Kohala at the northern most boundary of North Kona (Barrera 1971:71, Oaks 2003:12), and at Kaloko in North Kona (Cordy et al. 1991:465 and Cordy 2000:130).

The earliest settlement dates recovered within one of the *ahupua`a* of the project road were also coastal and from *ahupua`a* Kalaoa – A.D. 1400 for temporary habitation and A.D. 1510 for permanent habitation sites. It is believed that the lava flow of 1801 effectively destroyed any seashore settlements with earlier dates within the coastal Kekaha areas of the *ahupua`a* of Kalaoa, Hamanamana, Hele`ohi`u and Makaula. But, the dates found still coincide with the estimated timeframe of windward-to-leeward population movement.

The lands of the leeward side of the island provided a challenge to the first settlers who were basically farmers and depended on agriculture for much of their subsistence. The coastal and immediate inland plains where they first settled were not suitable for agriculture. The region was dry, the terrain rocky and soil scarce.

Horticultural activities were limited in the coastal areas of Kekaha as described by Handy and Handy (1972):

> "Wherever a little soil could be heaped together along the dry lava coast of North Kona, a few sweet potatoes were planted by fishermen at such places as Honokohau, Mahai'ula, Makalavena, Kaupulehu, Kiholo, Keawaiki, and Kapalaoa. Doubtless potatoes were planted on the upland of North Kona, on the lower slopes of Hualalai toward Pu'uWa'awa'a, up to a considerable altitude in rainy seasons..." (Handy and Handy 1972:527-528).

On the leeward side of the island taro and other subsistence crops had to be cultivated at higher elevation areas where rainfall measured 40-80 inches per year. In Kekaha, the Lower Upland Zone or *Kula Uka* Zone beginning at an elevation of approximately 900 feet had sufficient rainfall to sustain non-irrigated intensive agriculture.

Handy and Handy (1972) describe several methods of dry-land planting practices in Kona: "prodding" (*ohiki*), "steering" (*okupe*), "covering" (*puelii*), "mounding" (*pu'epu'e*), "stopping-up"

('*umoki*), and "leaf-filling" (*pakukui*) (Handy and Handy 1972:105). The planting method used depended on the condition of the soil, terrain and/or weather of the area. The land was usually cleared by weeding or burning (slash and burn technology). Composting, mulching and fertilizing were common practices of the farmers (Handy and Handy 1972:105-109).

In the Kekaha, the earliest settlement date recorded in the Lower Upland Zone or *Kula Uka* zone is A.D. 1280, obtained from a midden of a temporary habitation site in Kalaoa by Walker and Haun in 1988 (Rosendahl 2004:5). Cordy (1991) suggests that the establishment of permanent settlements in the Lower Upland zones in Kekaha started in the A.D. 1400s (Cordy 1991:576).

The Coastal and Upland environmental terrestrial zones were desirable areas of permanent settlement in Kekaha. The following 'Olelo no'eau (traditional proverb) as translated and explained by Kepa Maly (1998) illustrates the seasonal subsistence activities movement between zones within an *ahupua`a* of the Kekaha residents:

Proverb:	*Ola aku la ka 'aina kaha, ua pua ka lehua I ke kai.*
Translation:	The natives of *Kaha* lands have like, the *lehua* blossoms are upon the sea!
Maly's explanation:	This saying describes the seasonal practice of natives of the Kekaha region, who during the winter planting season, lived in the uplands, where they cultivated their crops under the shelter of the *lehua* trees. Then when the fishing season arrived with the warmer weather, the natives would travel to the shore, where the fishing canoe fleets could be seen floating upon the sea like *lehua* blossoms. It was as a result of this knowledge of seasons, and the relationship between land, ocean, and community, that the residents of Kekaha were sustained by the land (Maly: 2000:124)

The Middle Zone or *Kula Kai* where the project is located was not conductive to permanent habitation and agriculture. The archaeological evidence support the occurrence of prehistoric temporary habitation shelters, scattered horticulture, ceremonial activities (including burials), and resources utilization and extraction (mining) in this area (Cleghorn 1998:4).

Communication within the *ahupua`a*, especially between the Coastal and Upland zones was provided by *mauka-makai* trails, such as the *Alanui Kauhini*, occurring throughout this middle section (Cordy 1985:2,5). These trails were the lifeline of the *ahupua`a*, transporting people and goods between the Coastal and Upland areas.

The earliest date recovered from the sites in the Middle Zone is from the late prehistoric period, ca. A.D. 1487 (Cleghorn 1988:4).

It is believed that all the major environmental zones were utilized to some degree or another by A.D. 1280 (Rosendahl 2004:5). This correlates to the Expansion Period of Hawaiian history characterized by geographical settlement expansion and population increase.

2.6.2 Settlement Expansion in Kekaha

As the settlements and population were expanding in the Kekaha region, major changes were evolving in Hawaiian society. It is believed that by A.D. 1200 Hawai`i had developed an initial Chiefdom society, which had evolved into the classic Hawaiian four strata society: ruler, high chiefs, local chiefs, and commoner, during the reign of Liloa ca. A.D. 1580 (Cordy et al. 1991:575).

Social and political inequality became institutionalized. The *ahupua`a* evolved into a political-based "feudal" land system (Cordy et al. 1991:575) and was the "chief political subdivision... for the purpose of taxation" (Handy and Handy 1972:48).

"By at least the sixteenth century, the Hawaiian Islands had numerous families of high status individuals who ruled their separate domains by birthright, by genealogical affinity to the major gods, and by the right of conquest. Everything on the land and in the sea in their domains belonged to these high chiefs. Since the high chiefs were the closest living relatives of the major gods, the right to conspicuous ownership was never challenged or denied them" (Apple and Kikuchi 1975:42).

It was during the reign of Liloa, ca. A.D.1580 - A.D. 1600 that Kekaha region was given to his *kahuna nui*, Laeanuikaumanamana (Kamakau 1961:2). This illustrates the absolute authority of the *ali`i* over matters of land distribution and utilization and established Kekaha's reputation as "*kahuna lands*".

By the end of Liloa's rule most of the upland permanent habitation sites in Kekaha were occupied. Fishpond construction and intensive agricultural system development had also begun. (Cordy et al 1991: 576)

It is believed that development of the intensive upland agricultural system occurred between ca. A.D. 1400 and A.D. 1650, exploiting the lands at elevations where rainfall and soil levels were sufficient for productive cultivation.

Umi-a-lihoa, Liloa's son, united the island under one rule through wars in ca. A.D. 1600 (Kamakau 1961:1). He moved his royal court from windward Waipio to Kona. 'Umi's practice of moving his court around, but focusing it in Kona area, started a tradition that lasted through Kamehameha's reign 200 years later" (Oaks 2003: 15).

Kekaha had many desirable assets which played a significant part in maintaining the royal centers and supporting its population in Kona.

Kekaha was famous for its offshore fishing. Kamakau (1961) makes specific mention of the participation in fishing by Umi-a-lihoa off the coast of Maka'ula:

> "'Umi-a-Liloa did two things with his own hands, farming and fishing... Much of this was done in Kona. He was noted for his skill in fishing and was called *Pu'ipu'i a ka lawai'a* (a stalwart fisherman). *Aku* fishing was his favorite occupation, and it often took

him to the beaches from Kalahuipua'a to Makaula. He also fished for *ahi* and *kala"* (Kamakau 1961:20).

Kamakau (1961) also writes that "fishing was the occupation of Kamahameha's old age....He would often go out with his fishermen to Kekaha ..." (Kamakau 1961: 203).

Kekaha was desired not only for its natural resources -- fishing, sheltered bays, trees (*koa*, sandalwood), etc. - but, also for its constructed cultural features -- fishponds (*loko*), *heiau*, and inland field systems.

Apple and Kikuchi (1975) write that according to Kamakau (1869) "Fishponds were another means of prosperity to the land. A land was called rich according to the number of fishponds it contained"(Apple and Kikuchi 1975:41).

"The large fishpond construction in Kona ca. A.D. 1500 - A.D. 1700, was almost completely restricted to the Kekaha area" (Cordy 1991:578). The accessibility to the ponds and their products was strictly for the *ali`i*. The *loko* were likened to "their terrestrial equivalents, the royal gardens (*ko`ele*)", products of which were taboo to the commoners (Apple and Kikuchi 1975:2).

Probably the most famous fishpond is one that no longer exists. "The fishpond of Paaiea, which was inundated by the 1801 Hualalai lava flow, was reported to be about three miles long -- extending from Kaelehuluu in Mahaiula to Wawaloli on the southern boundary of O`oma. This pond was not far from Keahole Point, and the fisherman going north or south often crossed the pond in their canoe to save time and avoid the strong off shore current at Keahole" (Maguire 1966).

"While royal fishponds probably produced a relatively low but dependable yield in terms of the total food needs of a royal establishment, ownership of them increasingly became a symbol of high status within Hawaiian society" (Apple and Kikuchi 1975:63)

'Umi is credited in building "the area's first heiau (Ahu a 'Umi) in the mountains, 5,200 feet above Keauhou. Later he moved to Kailua, and possibly Kahalu`u, where additional *heiau* are attributed to him" (Oaks 2003:15). J. F. G. Stokes conducted a survey of *heiau* on the island in 1906-1907. Thirteen *heiau* were recorded in North Kona (Stokes 1991:40-93).

The political climate was not all peaceful during this period of social and cultural development. "...Traditions dating probably from the 1500's to the mid-1700s tell of the stresses and battles between opposing district chiefs of Hawai`i island, and Maui and the chiefs of leeward Hawai`i. It was probably during this time that many caves in leeward Hawai`i island were extensively modified to become underground places of refuge (Schilt 1984:22).

The archaeological record indicates that there was a significant increase in upland settlements between A.D. 1600 - A.D. 1779 (Schilt 1984). This coincided with the continued population increase, and improved developments in dry land intensive agricultural practices in the area.

It is believed that the upland regions of the project area in Kekaha may represent the northern extension of the Kona Field System -- an extensive upland network of intensive dry land agricultural system (Cleghorn 1988:3). "Generally defined by the grid-like layout of stone field/garden walls covering an estimated area of 139 sq km. between Kealakekua Bay and Kailua Bay" (Kirch 1985:225), the field system is believed to have been developed from the 1600s to the time of European contact" (Cordy et al 1991:577-578).

The debate on population estimates of Kekaha during this time (ca. A.D. 1600 - A.D. 1800) is ongoing (Cordy 1885, Ching 1971, and Schmitt 1977). Suffice it to say, Ching (1971) argues that the fishponds, fishing grounds and the large number of archaeological sites, refuge caves, *holua* slides are evidence in support of the existence of a large population. The mauka-makai trails suggests the occurrence of a network of inland permanent settlements (Ching 1971).

3.0 ARCHAEOLOCIAL RECORD OF PROJECT AREA

3.1 ARCHEOLOGICAL INVESTIGATIONS OF THE PROPOSED UNIVERSITY CENTER PROPERTY

This section summarizes the surveys which were conducted in the immediate project area. Two of the surveys were conducted in direct relation to the planning of the slated UH Center at West Hawai`i.

Cleghorn (1988) succinctly summarizes the data from Head and Rosendahl (1993) review of archaeological investigations within the *ahupua`a* of the project area:

- site types found in the coastal zone include temporary and permanent habitation sites, religious sites, burial sites, trails, quarries, etc.;
- the weathered and generally unvegetated aa and pahoehoe lava flows located inland of the coastal zone, to about the 400 foot (121.9) elevation, contain low numbers of sites;
- site types found in this intermediate zone include trails, temporary habitation shelters, and quarries; and
- the upland zone, from about 400 to 12,000 feet (121.9 – 609.6 m), contains isolated agricultural features such as rock mounds, terraces, and modified outcrops as well as temporary habitation shelters. (Cleghorn 1988:4)

Davis, in his 1977 survey, recorded a lava tube site in the area of the road project (site 6518). It contained petroglyphs on the walls of the lava tube. (Cleghorn 1998:3).

Head and Rosendahl (1993) conducted a survey of the 500 acre parcel reserved for the UH Center in West Hawai`i. Forty-three sites were recorded, which included: temporary habitation sites, agricultural sites, trails, burials, religious sites, and petroglyphs (Head and Rosendahl 1993: 45-46). "It appears that the sites in this area date to the late prehistoric to early historic periods, possibly from ca. A.D. 1487 to the late 1800s" (Cleghorn 1998:4).

Cleghorn (1998) conducted an investigation in ca. 275 acre portion of the 500 acre designated property of the UH Center at West Hawai`i. The survey included the then proposed access road. Fifteen archaeological sites were recorded and the summary of the sites provided below is from Cleghorn (1998:7-23):

Site 262. Lava tube with petoglyphs	This site was previously recorded by Bert Davis in 1997. It is a large lava tube with approximately 40 petroglyphs carved into the walls of the tube. Midden and an ash deposit are present as well.
Utilized sinkhole	This is a large sinkhole that contains eight features, including a midden, an alignment, a wall, 3 overhang shelters and an excavation.
Utilized lava tube	This is a large lava tube with a large platform under the skylight. Cultural materials observed include: several large *opihi* shells, coral, and an ash deposit. Evidence of owl, goat, and human children present in the lava tube.
Site 15263. Modified depression	This is a pahoehoe channel that has been partially filled with cobbles and boulders. No artifacts or cultural deposits observed.
Site 15264. Complex of two modified outcrops	This site consists of two modified outcrops. Feature A is a crevice in a pahoehoe pressure ridge that has been partially filled with cobbles and boulders. The crevice opens into a small lava tube that contains no cultural material. Feature B is a cleared hole in pahoehoe.
Site 15265. Modified depression	This is a crevice in pahoehoe that has been filled with cobbles and boulders creating a relatively flat surface.
Site 15268. Two parallel walls	This site contains two roughly parallel walls with the between area being possibly cleared. This is a possible trail segment across aa lava. It may be of recent construction.
Site 15281. Temporary habitation site complex	This site consists of five features that probably functioned as a temporary habitation complex. The features include a modified lava tube, an alignment atop a pahoehoe lava flow, a circular alignment, an excavation in the pahoehoe, and a modified depression.
Site 15282. Utilized lava blister	This is a small lava blister containing a slight scatter of cowrie shell that was probably used for temporary shelter or storage.
Site 15283. Agricultural complex	This is an agricultural complex of 72+ features. Features present include terraces, walls, modified outcrops, and mounds. One of the modified outcrops (Feature N) appears to be a sealed crevice or lava tube entrance, which we suspect may contain human burial remains.
Site 15284. Utilized lava tube	This small lava tube contains a possible alignment along one wall and a thin deposit of soil near the opening.
Site 15285. Enclosure	This is a small roughly square stone enclosure located on an elevated point of land. There is a possible cupboard in the NE corner and one piece of branch coral was observed on the exterior side of the eastern wall near the SE corner. While the original interpretation was that this was a habitation site, it may have been a religious site.

Site 15286. Temporary habitation complex	This site complex consists of a small lava tube that contains an alignment, a possible water catchment support feature, and a shallow soil deposit; and two modified outcrops.
Site 15287. *Papamu* with associated semicircle alignment of stone	The *papamu* consists of a grid of 150 holes pecked into the pahoehoe lava flow. The alignment may have been the beginnings of a wind break wall.
Site 15288. Cairn	This cairn was probably a marker of some sort and was probably circular or square in plain view.
Site 15300. Overhang shelter	A large collapsed lava tube contains a small overhang shelter, that contains a shallow deposit of soil containing burned and broken kukui endocarp fragments.
Site 21361. Stepping stone trail	This is a short (ca. 15 m) section of trail, formed of pahoehoe slabs, on aa lava. The trail ends in the middle of the flow.

Two additional site clusters were investigated. They exist outside of Cleghorn's 275 acre study area, but within the 500 acre UH parcel (Cleghorn: 1998:23,24):

Eastern Site Cluster:	**Sites 15290, 15291, 15292, 15293, 15294, 15295**, 15296, and **15297**. Composed of eight sites that probably functioned as temporary habitation sites. Consisting of 2 extensively modified lava tubes, several platforms, enclosures, terraces, and pavements.
Northern Site Cluster:	**Sites 15298** and **15302**, which are two extensively modified lava tubes. One of the lave tubes contains at least four human burials.

3.2 Proposed Preserve Areas and the Conceptual Historic Protection Plan

Based on the investigation of the ca. 275 acre parcel, five protect/preserve areas were recommended designated as the sites had significant 'interpretive value' (see Figure 2). "These sites have the potential to educate the current and future residents and visitors of Kona about the hardiness and adaptiveness of the original inhabitants of the area" (Cleghorn 2000:5). A Conceptual Historic Protection Plan was developed for the five protect/preserve parcels.

The descriptions of the five protect/preserve parcels are reproduced below from the Conceptual Historic Protection Plan for these parcels (Cleghorn 2000:5):

Preserve 1: This is the eastern site cluster composed of sites 15290, 15291, 15292, 15293, 15294, 15295, and 15296 [and 15297]. This cluster consists of two

extensively modified lava tubes (15292 and 15297), and several platforms, enclosures, terraces, and pavements. This site cluster is an excellent example of how temporary habitations were situated and constructed in the area. This complex should be accessed by a walking trail from the proposed University Center Campus, and developed (using signs, brochures, etc.) into an interpretive and educational venue.

Preserve 2: This is the northern site cluster composed of sites 15298 and 15302, which are two extensively modified lava tubes. Because these sites contain human burials (15298) and possible ceremonial areas (15302), they should be barricaded or sealed, and protected from public access.

Preserve 3: This cluster of features in the central portion of the proposed campus. The cluster consists of site 15281, a linear portion of site 15283, site 15282, and site 15285. Sites 18281 and 15282 are temporary habitation areas, and site 15285 is a possible religious shrine. Site 15283 is a large complex of agricultural features. It is proposed that a linear preserve extending from site 15281, through the southern portion of site 15283, and incorporating sites 15282 and 15285 be established in the central portion of the proposed campus. The sites could be accessed from sidewalks and other walkways in the campus and have interpretive signage explaining the function and antiquity of the sites and how they exemplify the original Hawaiian adaptation to this area.

Preserve 4: This is a small cluster of two sites (15264 and 15287) located on the west edge of the study area. The cluster consists of a small temporary habitation complex and a papam'u, or game board for a konane, or Hawaiian checkers. This small complex could be incorporated into the campus landscaping and identified with appropriate signage.

Preserve 5: This is a complex of lava tubes (site 6418) at the SW corner of the study area. This complex consists of three sections – a collapsed section of lava tube, a lava tube containing a large stone platform, and a lava tube section with a platform and panels of petroglyphs. The original plans showed an access road to be constructed over these sites. It is recommended that the road be rerouted to avoid these sites and that they be preserved. Interpreting these features by means of established walkways and interpretive signs may be the most feasible way of preserving these sites and protecting them from vandalism. Petroglyphs are extremely fragile and can be destroyed by even well-intentioned visitors. (Cleghorn 2000:5,8)

Three of the five preserve parcels are within the Main Street Collector Road right-of-way. The Conceptual Historic Protection Plan (Cleghorn 2000) addresses the impacts and the Environmental Impact Statement (Wil Chee 2000) proposed an alternate revised road realignment to by-pass the sites.

3.3 ARCHAEOLOGICAL ASSESSMENT FOR THE MAIN STREET ROADWAY

An archaeological assessment was conducted in the proposed road corridor by McIntosh, Solomon and Cleghorn in April 2005. Previously recorded sites were relocated and their condition recorded and assessed (McIntosh 2005:6).

Ten of previously recorded sites were relocated. They are listed and described below (McIntosh 2005:22):

Site 6418. Sinkhole and lava tube	Section 1: Sinkhole. Scattered *`opihi* within the sink Section 2: Lava tube. Evidence indicates some use of the tube by Native Hawaiians Section 3: Lava tube. Petroglyphs
Site 15262. *Ahu* (3), Terrace	Located on a prominent knoll: site measures 16.5 X 7.5 m
Site 15264. Modified outcrops	Two outcrops and an unutilized lava tube in a 17.5 X 7.5 m area
Site 15287. *Papamu*	Some natural weathering on surface
Site 15288. *Ahu* (Cairn)	Amorphous shape measuring 2.1 x 1.8 x 0.9 m
Site 15298. Lava tube complex	Large lava tube complex w/ burials
Site 15302. Lava tube complex	Large ceremonial lava tube complex
Site 15303 Lava tube w/ modified entrance and modified outcrop	Large lava tube with basal boulder and cobble stacking near entrance Lava blister with a basalt cobble alignment
Site 15304. Petroglyph	A single petroglyph depicting the letter "X"
Site 21361. Stepping Stone Trail	Evidence of recent bull-dozing activity that may have impacted trail.

All ten sites have been evaluated and meet the criteria to be listed with the National Register of Historic Places. Seven of the ten sites qualify to be listed on the State Register of Historic Places (McIntosh 2005:23).

The State of Hawaii requires that sites meet an added significance criterion to qualify for the State Register of Historic Places. The site should "have an important value to the Native Hawaiian people or to another ethnic group of the State due to associations with cultural practices once carried out or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts – these associations being important to the group's history and cultural identity" (McIntosh 2005:23).

The seven sites qualifying for the State Register of Historic Places are: 6418, 15262, 15287, 15288, 15298, 15302, and 15304.

4.0 CONTACTS, INTERVIEWEES AND INTERVIEWS

4.1 METHODS

Interviews were conducted to obtain and document accounts of personal experiences and knowledge of the project area. Particularly, information was sought pertaining to traditional cultural practices, prehistory and history associated with the area.

The interviews were informal interviews conducted between 6 July to 6 August 2005. A list of *kupuna* and knowledgeable informants as possible interviewees was developed by contacting community leaders, researchers and people involved with the project.

Two informants from the recommended list declined deferring to others they felt were more knowledgeable of the area. One *kupuna* declined due to illness.

Seven informant interviews were conducted. A basic questionnaire (Appendix 2) was used as a guide to solicit interviewees' biographical information, relationship and knowledge of the area. A map of the project area was used in explaining the project to the interviewees. Copies of their Personal Release of Interview Records forms are provided in Appendix 3.

All of the informants interviewed were personally associated with the area and were repeatedly recommended by various sources in the community. They are all active in the Hawaiian community and well respected for their leadership and knowledge of the project area and its history.

4.2 CONTACTS

Following is a list of people contacted for interviewee recommendations and/or information regarding the project area:

CONTACTS	ROLE	DESIGNATION	COMMENTS
Sandra Sakaguchi	Contacted for information, interviewees	Former Chancellor, Hawaii Community College	Organized Advisory Committee
Leina'ala Lightner	Contacted for information and interviewees	Advisory Council Member	
Eli Nahuhu	Contacted for information	Former Member of Burial Council, DLNR; Member of Advisory Council	Provided guidance on the statues pertaining to the treatment of burials.

Ruby McDonald	Contacted for information	Office of Hawaiian Affairs
Harry Ruddle	Contacted for interviewees	Former County Council Member

4.3 INTERVIEWEES AND INTERVIEWS

The following seven individuals were interviewed about traditional cultural practices and occurred in the general area of the project:

- Iris Napaepae Kunewa
- Karin Haleamau
- George Kinolu Kahananui
- Norman Keanaina
- Arthur Mahi
- Hannah Springer
- Curtis Tyler

Following pages summarize the information obtained from the above listed individuals.

IRIS NAPAEPAE KUNEWA

INTERVIEW SUMMARY

Born Iris Marie Naleialoha Napaepae, May 22, 1954 in Kalaoa, a Kona Akau. Able to trace her ancestry in Kalaoa area back to the 1700s. Raised in the area. Except for a brief period of employment away she has lived in the area most of her adult life.

Ahupua`a residence: Kalaoa

Designation: Advisory Committee Member and UH Lecturer

KNOWLEDGE OF TRADITIONAL PRACTICES SPECIFIC TO THE PROJECT AREA:

None. "Probably utilized even prior to time grandparents."

GENERAL KNOWLEDGE OF TRADITIONAL PRACTICES IN VICINITY OF PROJECT SITE AREA:

The area was used for burials. During the construction phase of Kona Palisades, burials were discovered.

Just *mauka* of the project area, but makai of Hawai`i Belt Rd., was actively utilized from her grandmother's time to the 1970's. It was considered a "green belt" with established *lauhala* or pandanus trees and some mango. It was the 'half-way' shady cool stop during travels mauka-makai and back. Knows the area as Waena but referred to as Kula by her grand mother. Water was left/available for travelers. (Traverler's going makai could find drinking water in the containers in caves left by people going *makai*.) People lived in the area during her grandmother's time. *Lauhala* and later some mangos were gathered from the area.

Related to her by her grandmother and also found in *Kona Legends* by Eliza Maguire, about Pa`aie`a fishpond. The area was well populated. She was told of canoes going north and south used the fishpond to avoid the deep and very rough waters off Keahole Point. The pond connected to Makalawena. Makalawena was a busy place since it was a port. (It was the port for the commoners. Kaupulehu and Kailua were the ports more for the *ali`i*.) People coming from Maui and Oahu used the port at Makalawena. They were transported on canoes through the pond on their way south.

After the 1946 tidal wave, Makalawena was almost completely vacated.

The cinder cone, Kuili, was a landmark for ships. South of it was Makawena and north of it is Kaupulehu. Kamehameha used Kaupulehu as one of the places to "rejuvenate" his fleet. It was comfortable and secluded. When he was engaged in attacks on Maui and Kaikili, Kaupulehu was the port used.

In her youth trails were used to go *mauka-makai*. Going to and from the beach (Ho`ona and Kaupulehu, not beaches at Kalaoa) and in-between, even coming from Kalaoa, the Hamanamana trail was used. The grade

above the project site is very steep. (Relates of difficulty in climbing up the slope from Waena after picking mangos.)

Her grandmother, who was born in 1903 related to her that when she was a girl, she was sent on their horse to Kaupulehu with taro and other goods to exchange with one of the families– dried fish, salt, etc. From Kalaoa mauka, it took a day to go down and a day back. The people she stayed with makai would load the horse with goods and sent her back mauka a couple of days later. The horse 'knew the way' (stayed on the trail), so she would often fall asleep.

With all the activity *mauka – makai* and between Makalawena and Kailua (laterally), the area of the project can be assumed to have been utilized. But, in her recollection, no real activity there during her time – no access. The activity was concentrated in the mauka area– Waena area, and Wonderview Subdivision.

The development of ranching occurred during her great great grandparent's time. Remember cattle being driven to Honokohau and Kailua by way of Mamalahoa highway and Palani Rd (when it was not paved). But, don't remember seeing cattle down in the project area. The area was open range.

No know hunting and gathering activity in the project site area. Recalls that the area was part of Hu`ehu`e Ranch's open range, but cattle in the area.

CONCERNS:

Protection of what is there. Worked at Puuhonua at Honaunau National Historical Park for 30 years. Observed and learned how development can be "friendly" and also how sites can be preserved and used for education.

Involve community as stewards of sites. Educate the people that it is a heritage for all and the need to take care of the area and the sites.

Karin Haleamau

INTERVIEW SUMMARY

Ahupua`a residence: Kau

Designation: Kupuna

Born and raised in the area. Related to land grant recipients in the area such as Kupono, Heueu, etc. Father and grandfather were employed as milkmen at Hu`ehu`e Ranch.

Grew up in Kalaoa and Kohanaiki area. (From the base yard to Hu`ehu`e.)

KNOWLEDGE OF TRADITIONAL PRACTICES SPECIFIC TO THE PROJECT SITE AREA:

None specific to the project area. Knows it was pasture for cattle of Hu`ehu`e Ranch, but also knows that others like Matsumoto who raised cattle used the area.

GENERAL KNOWLEDGE OF TRADITIONAL PRACTICES IN THE VICINITY OF THE PROJECT SITE AREA:

The project site area was part of Hu`ehu`e Ranch and open range. Matsumoto had *pipi*...cattle mauka side, but because it was open range, the cattle would roam into that area. Hu`ehu`e and Matsumoto used to be right between everybody (Mauka and makai). Matsumoto had his own road to access the area makai.

Grew up mauka of project site. Would go down to hunt in the general kula area during his youth for donkey, pig and goat. Sometime, wild cattle...the ranch used to say it was for the men for the people.

Did not gather in the project site property. Family gathered in Palamanui in particular makai and Makalei. Had hala grove before. Mom used to get the lauhala from there to make the mats and things for the house. They used to go down there to gather lauhala and whatever they made was for home use...that was the lifestyle.
The area makai in general had lots of trees...*kukui* trees and plenty *ilema*. Lots of *ohia* trees...all the way *makai*. But they all died...maybe because of the drought. Lots of mango trees, *ulu* trees...that's what people used to live on.

Do not remember anyone living in that area. There were trails through the general area, but people used to use them to go to the beach. Used to ride horseback to go down to the beach...even through Palamanui.

Know quite a bit of historical sites and burials in the area. The people buried in the area still have plenty of power...*mana*. Tell everyone not to touch...believe that the burials belong to the *ali`i*, royal family.

The elders used to tell them don't go down and touch anything. Always be careful and respect the land. If you know you're in the wrong place and somewhere you don't know, excuse yourself...*kalamai*.

People see the area and they think that the place is nothing...all lava, but they don't know the background. But, the place is very important. There were a lot of people there in the past.

Participated in hunting during his youth for donkey, pig, and goat. On occasion, wild cattle. It was a gathering place for healing. *Lauhala* was gathered and used for their home and subsistence. Mats were woven for home use.

The land, such as Palamanui, had lots of good resources in there. The villages used to be makai, but they used to go there to pick and gather herbs, etc. They knew where the medicine was, and how to get...that's why it is called Palamanui, healing place. Other plants in the area were *ilema, panini, noni, kukui, ohia, ulu*, mangos and medicinal herbs.

The area in general had fruit trees which were harvested from: *ilama, panini, noni*, and herbs (medicinal).

CONCERNS:

Burials should not be moved unless the family approves. Other archaeological sites should be preserved.

George Kinoulu Kahananui

Ahupua`a residence: Kalaoa

Designation: Kupuna

INTERVIEW SUMMARY

Born in Holualoa. From the day he was born he lived with his kau hanai, Kinoulu and Hattie Kahananui. He lived in the vicinity all his life. Attended Kalaoa School up to the eighth grade. Mr. Kahananui was employed by Hu'ehu'e Ranch for most of his adult life.

KNOWLEDGE OF TRADITIONAL PRACTICES SPECIFIC TO THE PROJECT SITE AREA:

None. The area was part of Hu'ehu'e Ranch. It was open range. Besides cattle ranging in the area, donkeys and goats roamed the area. There was no hunting that he is aware of in the area. The area was also not accessible to gathering.

GENERAL KNOWLEDGE OF TRADITIONAL PRACTICES IN THE VICINITY OF THE PROJECT AREA:

As employee and superintendent of the Ranch he is familiar with all of the lands the ranch occupied. Cattle did not frequent the project site area, difficult terrain, but the *mauka-makai* trails were used to transport cattle up to the ranch from the shore areas (i.e., around Kaloko ponds). The cattle were corralled in rock walled features for staging.

Cattle were driven *makai* to be shipped out from Kailua. Hu'ehu'e would arrange for the ship and shared the ship with other ranchers to transport cattle to Honolulu.

I started working for Hu'ehu'e in 1941. I was hired by Mr. Writtenberg. He also was the one who appointed me as an assistant at Hu'ehu'e. I was grateful he had that much trust in me.

Need to know the past, to understand the present and future. Am willing to share anything and any knowledge. Know area from Holualoa to Hu'ehu'e very well. I worked from Hu'ehu'e to Honokohau pond.

Know of no utilization of the project site today or in the recent past. The whole parcel used to belong to Hu'ehu'e as open range...open field. We did clean it once, but not much cattle pastured in the area.

Hunting and gathering were practiced, but in the upland areas. There was no hunting that he is aware of in the area. The area was also not accessible to gathering. Lauhala used to be gathered in Makaula, but the groves are all gone.

Hu'ehu'e used to go from the mountain to the sea. The fish ponds at Kaloko were part of the Ranch (Owned by Maguire. Maguire property

went to Stillman). A quarter of a mile Kailua side from the Queen Ka`ahumanu and Ka`iminani intersection on the makai side is one of the roads that go down to the ocean.

Used to go down to the ocean to fish while growing up. The fish was plentiful and easier to find and catch. While working for Hu'ehu'e the area was under my supervision. It was a big responsibility.

But the mauka-makai trails were used to transport cattle up to the ranch from the shore areas (i.e., around Kaloko pond). The Kaloko area had rock walls and the cattle were corralled in them for staging.

With development...part of progress. In the old days, it was a hard life. You cannot stop progress. You cannot live in the past; we have to work for the future. You cannot discriminate in Hawaii...all the ethnic groups. It is easy to plan and draw, the concern is, are we on the right tract.

Cattle were driven makai to be shipped out from Kailua. Hu`ehu`e would arrange for ship and shared the ship with other ranchers to transport cattle to Honolulu.

CONCERNS:

The sites should be protected. The burial should not be disturbed.

The people who built the sites were our ancestors. It would be a shame if the sites were destroyed. It should be saved for the future generations. It is a heritage for everyone.

The past did not have sophisticated equipment, Now a days, we have the equipment to do almost anything. There is no reason why a road couldn't be built to go around the sites.

Norman Keanaaina

Ahupua`a residence:
Kalaoa (1-4)

Designation:
Kupuna

INTERVIEW SUMMARY
Born Norman Akahai in 1940 at Kealakekua. He was raised and live in the area (Kalaoa 1-4). Family managed the Kaloko pond. Father was from Honokohau. Mother is from Kapanui.

KNOWLEDGE OF TRADITIONAL PRACTICES SPECIFIC TO THE PROJECT SITE AREA:
Not location specific but in general area.

GENERAL KNOWLEDGE OF TRADITIONAL PRACTICES IN THE VICINITY OF THE PROJECT SITE AREA:
Area still being used. Used to hunt for pigs and goats. And, the ranch utilized the area - Hu'ehu'e. Open range and family had cattle also. Related to Hu`ehu`e, so could use the range. Cattle were mixed, but branded, so owners could be identified.

Gathered *Ko`oko`olau* for tea on the general area of property.

Shelter of the cave was used for half-way between beach and mauka. They used to spend the night, as they used to walk to and from the beach.

The project site area was part of the general non-restricted area. No *kapu* signs. Where people would come as a settlement to spend time on the property and move on again. People would come and stay temporarily, some would stay maybe 6 mo. If you were there first, others would respect your use of the area.

Ho`okipa - half-way. People traveling around the island could use the area without fear - place where they can be comfortable with, where they won't be thrown out, where they were not trespassing.

Water could be collected in the caves. People staying in the area would usually plant something...tamarind, avocado, guava. The reason for planting was to have something there the next time and also to be able to "brag" about it.

Grand parents talked about the temporary nature of settlement in the project site area back to the late 1800s to 1900. Learned from their parents and grandparents. Some would stay for 6 months to a year then move on.

A lot of times, they talked about survival. Money was not a problem until American schools came along. Needed to buy supplies.

There were only 2 doctors, Dr. Seymore and Dr. Hayashi. They would travel around the whole Kona and West Hawai`i. Probably saw the doctors every 3 months. There were mid-wives... There were a lot of prayers.

All of the nationalities - Filipino, Japanese, Chinese, Hawaiian and others - were close because of survival. Even the different religions were close. If there was a function at the Catholic Church, all other church members would go...Mormons, Protestants, etc. We're all related any way.

In the days of old, before the missionaries. During a certain time of the year, they would plant on the "rocks" and everything would grow. Before they plant, they would pray first. They also watched the clouds and know what the season would be and would decide what to plant.

It was more to feed the family while the family was there. They would plant chili pepper, *ti*, *taro*, potato - *hoa`a* - gather other plants and vegetables. They would bring dirt and plant in holes. Everything began with prayer and ended in prayer.

A lot of story telling was done in the area. After a cook out, plants were planted right into the ashes - such as onions.

In the caves there used to be water which was collected for drinking. Washing and bathing were done down at the ocean.

No flies in the area. Kept food covered. Used oil - coconut, *kukui* - for cooking and preserving. Meat was dried, but also soaked in oil and flies wouldn't come.

People would plant things, like fruit trees - tamarind, guava, avocado. Reason why was so that they could say that they planted it, and have it available to use.

Fishing was shoreline, net and pole. In the '40s would ride down to the ocean on the horse. Where the sand meets the ocean, a lot of fish. "We would throw the net right from the horse."

Farming, fishing, hunting was the lifestyle. In the 50s, started picking coffee. Mother did weaving *lauhala*. Leis were made with ginger that lined the old Palani Rd.

A lot of families did sewing and weaving. *Lauhala* gathered above project site around where Laui St. is now. Palolo St. between Kalaoa and Hamanamana was another area for *lauhala*. *Lauhala* clusters all over.

As a boy remember cleaning out old lauhala at the hala patch and stacking the newly picked leaves aside. Then knocked the leaves down and picked up only the good ones.

No known ceremonial activities were conducted in or associated with the area of the project site. Ceremonial activities were conducted in surrounding areas of the project site—burials and even witchcraft.

There was a lot of donkey and goats in the area. Jerk meat came from the donkey. The best time to hunt for goats was when it rained. They would go into the caves and caught when they were chased or smoked out.

If there were goats down by the ocean, they would be chased into the ocean and caught.

The trails used were likely formed by cattle.

CONCERNS:
Burials should not be disturbed. As much as it is possible, all of the archaeological sites should be protected.

Arthur Mahi

Ahupua`a residence:
Hamanamana

Designation:
Kupuna

INTERVIEW SUMMARY
Born Kuliena Kuakahela (mo. father name) in July 5, 1933 in Laupahoehoe. Father moved to Kona to work on road construction. Moved to Haleohiu right after birth to live with grandparents. He has lived in the area for 72 years.

KNOWLEDGE OF TRADITIONAL PRACTCES SPECIFIC TO THE PROJECT SITE AREA:
Not specifically in the designated project site.

GENERAL KNOWLEDGE OF TRADITIONAL PRACTICES IN THE VICINITY OF THE PROJECT SITE AREA:
Still use area for resources.

The archaeological sites should be preserved for the future generations…We didn't do that, the people of old did that.

Preserve, protect and take care of the old sites, especially the burials, they are the owners of the land. They were buried in the *ahupua`a* which they belonged to. Shouldn't be moved, especially to another *ahupua`a*. The *Kula* area has a lot of burials. My *kupuna* are buried there.

Kupuna were here before your time and still here today. The bones are still *mana* 'til today. Better to respect the place and the site. They lived there for years and the *mana* is still there…until the land itself is gone.

When you see petroglyph, the symbol on the rock, must leave it alone. Because, they put it there to tell the future what life was like…and, for you to look at and respect not to eradicate it. Like in development, they destroy all the trees which were planted by people in the past. People worked hard for the area and planted everything, and then people come and get rid of everything. In Hawaiian, all your *ho`u lui* went down the drain.

Malama ka `aina, does not only mean love the land, but love and take care of whatever is part of the land, or whatever you do on it or build on it…love it. Respect the land and everything on it. Take care of the land and the land will take care of you.

Use the land to make it productive…*momona*…fruit trees, vegetables. Nothing was wasted. Raised pigs, chickens, donkey and horse. Hunted all year round.

This road is a good idea, but...like us being, *"keike 'o ka aina"*, we call – people of the land, we rather see ...what you have done over there,.....but looking on paper, we cannot take the paper. That's our way...would like to see the actual product on the aina. Then we don't have to believe you (take your word),...we can see the truth about it, and we can see it with our own eyes and own mind. "Then we can pin point where that thing stay and we have to say a few words, not to you, but to the land, the spirit of the land. Say a few words...respect them, thank you for what you guys did....But you leave something for the people to see what we had before and what we have today. This is a respect for the culture."

Can't forget your culture, because that is where you come from.

Don't like the word ancestors. Don't have ancestors, have kupuna...not only kupuna, ohana. When the tree grows... it is your grandparent. The first branches are the children, and the smaller branches from those are grandchildren, etc.....all family, ohana...your kupuna, your *anake*, your *anakala..kekei hanauna*.... Do not call cousins, 1st, 2nd...all are brothers and sisters.

Traveled on the ala nui to go up and down. Maybe in the early '30s. Walk down or sometimes ride the donkey...sometime, fall sleep on the donkey. When the donkey stops, you get up. Used to get dried fish. But prefer fresh fish, so go *kamakoi* (pole fishing). Used to gather opihi, sea cucumber, *limu*. Also gathered drift wood for fire wood. (Tie the fish up with *malina* (sisal) out of the reach of dogs, cats.)

Prior to fountain grass, the project area, all kinds of grasses...pili grass, kokio...mango trees, all kinds of things people planted. And the area down there had lots of people. They used the caves for temporary habitation. They used to burn the grass to be able to plant. The ashes were used for fertilizer.

The caves were used as shelters from the storm also. My grandfather used to take care of the lighthouse and if the storm was bad enough, it would take the lighthouse. Six or seven times I remember. (The lighthouse was made of wood during that time.)

Hunting – wild pigs, goats, donkey. And the ranch utilized the area in the past. Still plentiful in the wild. But, hunted only for subsistence, not for sport and to waste.

Gathering is still being practiced. *Koko`olau* tea and *noni*. Particularly in the Kula area, Kaloko side. *'a'ali'i* leaves, wili wili, flowers, and medicinal. Flowers for *leipo'o*. Most of the plants are eatable. Like the

keawe beans. If the animals eat it, you can eat it. There were a lot of mango, coconut., bananas through the area. Gathered medicinal plants and herbs. Everything you do for medicinal, you have to pray before you use. The value is there when you make your own.

Gather drift wood for fire wood. The beaches used to be covered with coconut. *Keawe* beans found *makai* were edible.

Regarding the *papamu*. The game is referred to as "kill time". Played while waiting. For example, when the family go fishing and when its time for the boats to return, the women play while waiting. When boat returns, everyone help out.

Fishing: shoreline and deep sea fishing from canoe. When a big fish is caught. Share with everyone and what is left may be little.

Used to use the fishponds when the ocean was rough...Honokohau, Kaloko and along the shore north. In the olden days, my grandfather explained that all around the island they have water in between the land and the ocean. That water inland was brackish water. Fish which could stand fresh water stayed in the brackish water...like *moi*, milkfish. You can drink the water inside. That's where the life was.

Lots of ways to plant sweet potato in area called Kula.

CONCERNS:
Regarding the burials and other sites, should be respected because they were there before our time. Respect for culture and the land, "You don't own the land, the land owns you".

People were buried in a particular place because this was their land, and *ahupua`a*. People who have lived in an area for years, their *mana* is still there and will be there until the land itself is gone.

Hannah Springer

INTERVIEW SUMMARY

Ahupua`a residence: Ka`upulehu

Born in Kona in 1952. Actually raised on Oahu, but returned every summer. Retuned to live in Kona 3 years after high school.

Designation: Advisory Committee Member, Former OHA Board Member

Traces ancestry back to the founders of Hu`ehu`e Ranch. Daughter of Thelma Kihalani Springer and Pilipo Springer. Thelma is the daughter of Eilene Ruth Kihalani Maguire Stillman and Arthur Kahiwahiwa Stillman. Eilene is the daughter of Charles Uhemalama and Mary Kihalaninui Parker Maguire. Charles is the son of Luka Hokula`au, wife of John Avery Maguire.

KNOWLEDGE OF TRADITIONAL PRACTCES SPECIFIC TO THE PROJECT SITE AREA:

Not specifically in the designated project site.

GENERAL KNOWLEDGE OF TRADITIONAL PRACTICES IN THE VICINITY OF THE PROJECT SITE AREA:

Hale`ohi`u was one of only two lands in Kekaha that was chosen by Kaukeahuli, Kamehameha III, at the time of the Mahele. Puuwa`awa`a was the other one. There are two dozen plus *ahupua`a* in the region. Hale`ohi`u was one chosen by the chief. So this is truly crown land.

The area is generally associated with a number of *kahuna* lineages. Also, in O`oma, there is *kahuna* association. O`oma is where Kaukeahuli spent some time as a young toddler. Some of the values of these lands may be in the off shore waters or up in the forested area.

Recollection of these lands is that it was savannah - vast grassland - open range, and there were feral goats and there may have been wild cattle. Families would go into these areas to hunt on a subsistence level. Summer time our family did participate in hunting for goats.

No wild pigs would have been down at the project site area, a bit too dry. They would be found closer down in the wet lands by the ocean. "I remember one occasion, particular, this *pua`a* came out of this lava tube and scared us all. Because, we were down by the surfing beach, Pine Trees, down by Konahiki. There were a lot of habitations there. Habitations into the 19th century, so it could be a feral pig from the homestead right there."

Used *mauka-makai* trails, but don't know the names of any or the age.

Kekaha - *Kekaha wai ole* didn't have the density of population as in other location. But find half-way spots or rest stations out in the lava lands. In

this zone in particular, people were probably passing through between *mauka-makai*. The topography in this area looks fairly even... a little bit to the north there's a very low *pali* like topographic feature and on the crest of that...about 200 ft in elevation but along that topographic line we see a lot of features. And, if you were going between *mauka-makai*, its where the breeze starts...you're off the coastal plain...starting to get a little bit cooler so it seems that there were a lot of temporary ... habitation...sites along there. There's nothing more welcome than a lava tube...get out of the sun and cool off.

Gathering in the region: The landscape now looks like a place that has been heavily gathered from in the past, and then deeply impacted by the feral browsing animals. A little bit to the south around Kaloko, probably find *koko`olau*...may be more moisture, may be less fountain grass, maybe it's younger lava..but for what ever reason, we see *koko`olau* on Hina Lani. Even on the empty lots where some times native species remain or come up, I don't recall seeing any off of Ka`imi Nani.

"...Don't know that gathering per se would have occurred in the corridor...if there are any trails where the corridor crosses, than certainly there would have been *mauka-makai* accesses, but today's practitioner, unless they are lineal or even a cultural descendents of the *iwi* or have a family tradition of returning to the lava lands to seek balance in their personal lives. And, there you are not gathering stuff...you're gathering spirit, you're gathering intangible comfort. ...Use the trails to go out onto the land...sometimes it is as whimsical or romantic as to wanting to walk on the path that ancestors walked on "literally..."

CONCERNS:

Consider the use of any of the *mauka-makai* trails, if they exist...so that they are being preserved with a purpose and intention ... not to freeze them in time...but to stabilize them...and allow for the traversing of them. That retains the opportunity for that traditional and customary access to this cultural landscape.

With the caves and any that may be revealed during construction,...because of caves being what they are...especially those which contain burials concern should be taken with both irrigation and rain run off...and directed away from the caves, because of the porosity of the lava...liquid percolates so easily through it. Lava is also like a sponge, has a wicking effect. The run off will have a leaching effect and may encourage the growth of moss and molding.

There may be interpretive opportunities that we could capitalize on in partnership with developer of the road--if county or state road. For example, is this a place where we could put *ahupuaa* boundary markers as

road signs. The Kona Historical Society has long advocated for this. Look for ways to link the past to the present always.

Think of the land in context. Do not separate the Tax map key impact from the surrounding landscape. Broadening of the context of the site. Do not separate what was going on at the top and below...if we were looking at the lands in the Hawaiian sense. Lands that are considered as wilderness because of our cultural and social biases, may be cultural landscapes.

Curtis Tyler

Ahupua`a residence:
Kalaoa

Designation:
Advisory Committee Member, Former County Council Board Member

INTERVIEW SUMMARY:
Born 1946 in Kealakekua. Moved to Kailua around age 5. Moved to Kaloko mauka at 15 - 16 years of age, 1961. Lived in Kalaoa for about 33 years - (in Kona Acres for 1 year)

KNOWLEDGE OF TRADITIONAL PRACTCES SPECIFIC TO THE PROJECT SITE AREA:
Not specifically in the designated project site.

GENERAL KNOWLEDGE OF TRADITIONAL PRACTICES IN THE VICINITY OF THE PROJECT SITE AREA:
There was no Queen Ka`ahumanu when growing up in the area. No development in this area at all. It was not until the first portion of the road was built to Honokohau, and the next portion went to the airport and than to Kawaihae. Recall no residences in the area at all.

The construction of Queen Ka`ahamanu changed things radically in terms of land use around the makai area. Shortly there after, Kona Palisades was developed, 1973-'74, Ka`iminani Rd did not connect to Queen Ka`ahamanu. Now the land on either side is being developed.

The stage land use conservation line runs nearby to this area. I support the development of this university project. There needs to be a university presence. It needs to be in an area accessible to people. New residential developments are out in this area. It is in close proximity to the Kona International Airport and the HOST Park and OTEC and other scientific opportunities.

Historically and traditionally each *ahupua`a* had its own *mauka-makai* trails.

There was activity *makai* because there was the Keahole Lighthouse. Have been told by residents and families that lived in Makaula, Kalaoa, Hamanamana, Haleohiu for generations that there was *mauka-makai* activity – the trails and the burials and activities along the *kaha kai* area (shoreline area).

Told by descendents of people who lived there before the Mahele that there was a lot of activity *mauka-makai*, especially by people who had *ilina* (burials) *makai*.

There were two trails along the shorelines -Ala Kahakai—used by fisherman and people traversing the land. And *makai* of Queen

Ka`ahumanu is the Ala Loa, a.k.a. King's trail—significantly impacted by development *makai*---airport and HOST park.

The trail is relatively good shape due to Kealakehe Intermediate School has been taking care of it for well over a decade.

There was ranching activity up into the late 70s, but not a lot. Project area is covered with lava and not conducive to ranching activity.

Each *ahupuaa* is unique—concept of self sufficiency and sustainability or complementary activity so what one *ahupuaa* doesn't have, they work in tandem and partnership. Important and ancient concept and one that is not well understood by *malihini*.

Prior to 1778 looking at population of over 1 million people, comparable to the population today. They were totally 100% self-sufficient. This is a model we can learn from.

The area makai of these *ahupua`a* prior to 1801 contained a large fishpond. This was first of the great destructions within 60 year period. After the destruction of this *loko hia*, a much larger improved one was built. 1859 flow from Mauna Loa came and wiped this one out.

Prior to 1801 huge amount of activity in area to take care of these fishponds and the land use activities of *mauka-makai* -- areas of Kalaoa, Hamanamana, Haleohiu, Maka`ula.

CONCERNS:

Consider the cultural landscape. The land is not just physical attribute (geographical, geological), people give it meaning. The land may be seen as inanimate by many, but from Hawaiian cultural perspective, the land is not inanimate. The life of the land—encompassed in it is the spiritual aspect.

Land is being divided up that you loose perspective of the life giving energy which is part of the land and landscape—the cultural landscape. The views of the *mauka, makai, hema,* 'akau views are important part of landscape and important to the people of old. View plains are important part of landscape.

Preserve as many sites as possible. The Advisory Council agreed that the development needed to be sensitive and if there are any burials in the right-of-way of the road---change the right of way.

Traditionally once burial was put into the *'aina,* – not supposed to be disturbed, ever. To build the road straight for expediency makes no sense. All sites should be protected.

The disturbance to the burials should be none. To the extent that the sites can be protected, they all should be. Because not only will the member of the host cultures will be students at the university, there will be many visitors from afar, who will be interested in this area and how the ancient Hawaiians were doing and able to survive in what was regarded as being remote "waste lands".

The campus is being built in conjunction with Hilu Hilu Development project. The access road plan was actually for a *makai-mauka* road and it was planned to connect Makalei Dr. and Queen Ka`ahumanu. I support that. It makes no sense at this point to spend millions of dollars to build this north-south road, when in fact what they need is a *mauka-makai* road.

Recollect from land use proceedings…that the road will join up with either of the intersections existing on Queen Ka`ahamanu below the Hilu Hilu development. A *mauka-makai* road has been on the map since the K-K plan.

Projects like this where the development spans more than one *ahupua`a,* the walls are impacted. Disturbance to the *iwi aina* should be minimal. The iwi `aina actually defined the land use pattern for over a thousand years.

5.0 RESEARCH AND INTERVIEW REVIEW

The project site is in the heart of *Kekaha wai ole* – land without water. All accounts – prehistoric, historic and interviews – agree that this area is not conducive to permanent settlement or agriculture. Not only because it is dry, but because much of the terrain is covered with lava.

All accounts also agree that not all of Kekaha is dry and barren. We know from the record that the environmental zones *makai* and *mauka* of the project site – coastal (*kaha kai*), and upland (*kula uka*, and *wao kanaka)* – are rich in resources. These areas sustained the settlements and supported the economic and political developments in the area.

The land was divided into socio-political units, *ahupua`a*, which included a slice of environmental zones from sea to mountain. By all accounts, the *ahupua`a* was a self contained and self sustaining unit. The *ahupua`a* as a land unit was "the thread which bound all things together in Hawaiian life" (Maly 2000: 124).

The prehistoric records documented the existence of numerous *mauka-makai* trails, compared to the lateral trails. This fact attests to the predominant and primary importance of *mauka- makai* communication within the *ahupua`a* over inter-*ahupua`a* interaction.

The road project will cut across four *ahupua`a* and intrude very slightly into another. The archaeological record indicate that the area was used for burials, temporary habitation, small scale gardening, ceremonial activities, and recreation. Portions of trails were also recorded in the vicinity.

Kona was residence of the *ali`i* for over 200 years – from the reign of Umi Liloa to Kamehameha I. The area of Kekaha was owned by the kahuna class up to the Mahele. During the Mahele all of the *ahupua`a* in the project area were reserved for the Crown. Kamehameha III eventually gifted the *ahupua`a* of Makaula, Kalaoa, and O`oma to the Government.

Although the interviewees and *kupuna* did not have knowledge of current traditional practices specific to the project site, they all agreed that wider general area was used in very much the same way as their ancestors – temporary habitation/shelter, small scale gardening, ceremonial (burials, rituals and personal "healing") and recreation. In addition, they were able to tell of hunting and gathering practices, and ranching in the area. They all used trails traversing the "lava lands" *makai* and *mauka*. The caves were not only used as shelter, but for burials and as a source of water. Water dripping through the ceiling would be collected for drinking.

In general, the information the current interviewees provided of the project area, was consistent with the archival data on past traditional use of the project area. In addition, the interviewees were able to articulate the traditional beliefs pertaining to the land. The land is perceived to be a life giving source and imbued with the essence called *mana*. The relationship the people have with the land is characteristically one of kinship and spiritual in nature.

6.0 IMPACT ANALYSIS AND ASSESSMENT

The following discussion of the impacts and analysis is provided based on the results and findings from interviews and archival research:

Archaeological and Burial sites. The recent archaeological assessment of the roadway identified ten sites within the road corridor (McIntosh 2005). The ten sites qualify for the National Register of Historic Places. Seven of the ten sites met the added significance criterion of evaluation to qualify for the State Register of Historic Places.

Further, three of the identified protect/preserve archaeological sites parcels of the Conceptual Historic Protection Plan intrude into the road corridor (Cleghorn 2000). The three parcels are listed below with a description of the sites:

Preserve 2: Composed of sites 15298 and 15302, which are two extensively modified lava tubes. These sites contain human burials (15298) and possible ceremonial areas (15302).

Preserve 4: Cluster of two sites (15264 and 15287) located on the west edge of the study area. The cluster consists of a small temporary habitation complex and a papam'u, or game board for a konane, or Hawaiian checkers.

Preserve 5: This is a complex of lava tubes (site 6418) at the SW corner of the study area. This complex consists of three sections – a collapsed section of lava tube, a lava tube containing a large stone platform, and a lava tube section with a platform and panels of petroglyphs.

The conclusion of the archaeological assessment is that all of the ten identified sites within the road corridor be avoided and protected (McIntosh 2005:25). Specific recommendations by McIntosh et al (2005) are:

- Given the presence of human remains at Site 15298 and the ceremonial implications at Site 15302, it is strongly recommended that any plans for development near these sites, be it the Main Street Roadway or the campus, be presented to the Hawai`i Burial Council for their input. These sites are extremely sensitive and potentially important to Native Hawaiians and their input should be sought. Development near these sites will provide opportunity and further access to individuals who may want to loot or vandalize these resources. Also, the Hawai`i Island archaeologist (currently Mary Ann Maigret serves as Assistant Archaeologist) and the recognized advisory group, the University of Hawai`i Center at West Hawai`i Advisory Council on Kalaoa Cultural Site Preservation, be included in the discussions and plans (McIntosh 2005:25)

- It is recommended that the northern and central portion of the proposed Main Street Roadway be placed as far to the west as possible. In the southern portion,

the proposed roadway should be situated as far east as possible. This would avoid the majority of sites and allow them to be preserved for future generations. Issues with the road corridor arise when it nears Site 15302. This site is a lava tube complex identified by Head and Rosendahl (1993) and described as a habitation cave with ceremonial components. The tube system that forms Site 15302 appears to be a continuation of the tube that forms Site 15298 (a large habitation complex containing human burials). Head and Rosendahl also document that Site 15302 extends west outside of the 500 acre parcel and into adjoining property apparently surveyed by Hammatt and Folk (1980) although Hammatt and Folk failed to identify any sites in this area. If the alignment is to extend west around Site 15302, it is recommended that this section of the Site 15302 tube complex be further examined to ensure that no cultural materials be impacted. If possible, the road should extend west around the extent of Site 15302, ensuring its preservation (McIntosh 2005:26).

- If avoidance of the lava tube complexes is unavoidable, we suggest that a bridge or causeway be constructed over the extent of Site 15302 in the area on the west side of the site where no tube openings are visible. This is contingent upon a geological survey to determine if the lava tube system is strong enough to handle the construction and use of the proposed roadway (McIntosh 2005:26).

- It is recommended that all development avoid Site 15298. Given the presence of human remains in this lava tube complex, any development near this site should be limited. This includes having the Main Street Roadway extend near it or over it since this would possibly be viewed as disgraceful. As stated above, any plans for development in the vicinity of his site should be presented to the Hawaii Burial Council for their input (McIntosh 2005:26).

- Site 21361, is a stepping stone trail located within the proposed road corridor. Cleghorn (1998) originally recommended that no additional work is necessary and the site not be preserved. However, it would be in the best interest of the University to preserve this site with a small boundary of between 3-5 meters. There appears to be enough space available for the road to shift to the east (*mauka*) and avoid impacting this site. Conversely, if construction will impact the site, consultation with SHPD would be necessary (McIntosh 2005:26).

- Site 15288 is an *ahu* located to the east (outside) of the road corridor. Like 21361, Cleghorn (1998) recommended that no additional work is necessary on this site and that it not be preserved. Again, we think that it is in the University's best interest to preserve this site as is and not impact it. It appears that this site will not be impacted by the current proposed alignment (McIntosh 2005:26).

- There should be a minimum of a 3-5 meter buffer for Sites 21361 and 15288 and a 30 meter (ca. 100 feet) buffer between the edge of the proposed road corridor and all other archaeological sites (McIntosh 2005:i).

The Historic Protection Plan (Cleghorn 2000) developed with the University of Hawai`i Center at West Hawai`i Advisory Council on Kalaoa Cultural Site Preservation recommends the following protective measures for the parcels intruding within the road corridor:

Preserve 2:

Recommended Form of Protection
Because this site has been assessed to be culturally significant, it is recommended that the site be protected with no public access, with the exception of visitation by lineal descendants, if any are located.

Buffer Zone
It is suggested that a minimum buffer of 50 meters (165 feet) be established around this preserve. However, guidance regarding an appropriate buffer should be sought from the Hawai`i Island Burial Council.

Preserve 4:

Recommended Form of Protection
This archaeological site complex should be protected and conserved as an interpretive venue, where educational and interpretive facilities can be developed to augment the educational experience at the University Center. These educational and interpretive facilities must be sensitive to traditional cultural practices.

Buffer Zone
It is recommended that a buffer zone of 30 to 50 m (100 – 165 feet) be established around this site complex. This buffer zone shall follow the natural topography of the land incorporating natural features as appropriate. The proposed buffer zone is presented as a range (30 – 50 m) because it will follow the natural contours of the area. Prior to any construction activities in the area, the representative, who will perform a field check for this purpose. No construction or other mechanized land altering activities should take place within this buffer zone.

Preserve 5:

Recommended Form of Protection
this archaeological site complex should be protected and conserved as an interpretive venue, where educational and interpretive facilities can be developed to augment the educational experience at the University Center. There educational and interpretive facilities must be sensitive to traditional cultural practices.

Buffer Zone
It is recommended that a buffer zone of 30 to 50 m (100 – 165 feet) be established around this site complex. This buffer zone shall follow the natural topography of the land incorporating natural features as appropriate. The proposed buffer zone is presented as a range (30 – 50 m) because it will follow the natural contours of the area. Prior to any construction activities in the area, the boundaries of the buffer zone will

be physically staked and approved by a SHPD representative, who will perform a field check for this purpose. No construction or other mechanized land altering activities should take place within this buffer zone.

The interviewees indicated that they know of many relatives and others who have been interred in the *kula* area. Although there is no evidence of, nor knowledge of any recent visitation to the burial caves, they concur with the recommendations of the archaeological assessment that the burials should not be disturbed. They further concur with the recommendation that all of the archaeological sites be protected.

One of the interviewee further recommends that the potential hazards of run-off from the road or any irrigation system should be considered in the protection plan for the sites.

An alternate revised access road alignment (Figure 2) has been proposed in part to "avoid archaeological sites" (Wil Chee – Planning 2000:24). To ensure minimal negative impact from the development of the road, the proposed realignment of the road should meet the recommendations above to by-pass the archaeological sites and maintain the buffer zones recommended in the Archeological Assessment and the Historic Protection Plan. .

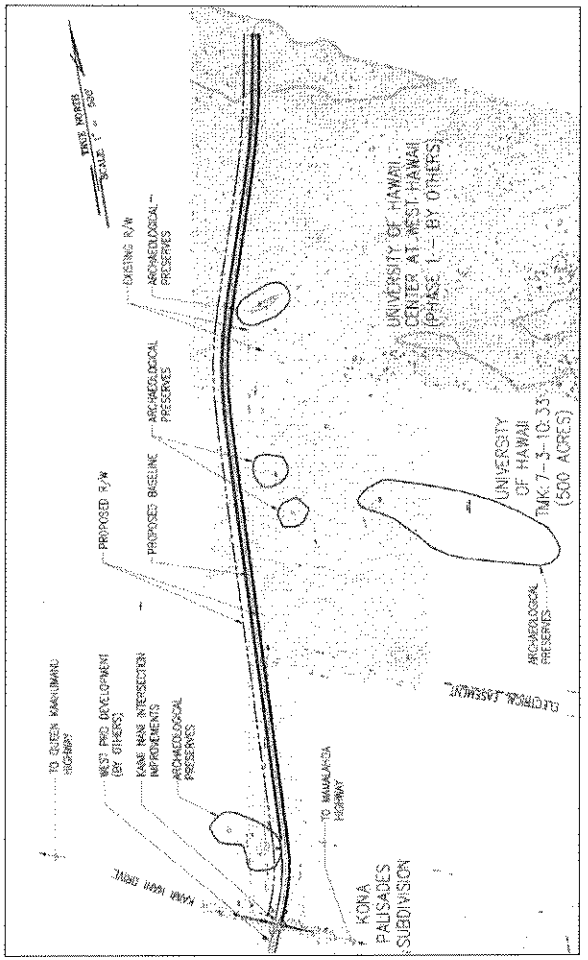

Figure 2. Proposed Project road Realignment.

Hunting and gathering activities. The interviewees indicated that hunting and gathering continue to be practiced in the area. However, the location of the practices is in the general *kula* area and not site specific.

The occurrence of two of the animals identified by the interviewees who claim to hunt was recorded in the project site area. A faunal survey of the proposed 500 acre site of the University of Hawai`i Center at West Hawai`i, which included the right-of-way of the road, was conducted by Reginald David and Eric Guinther in 2000. Their survey encountered the scat of goat and donkey in numerous places in the 500 acre area and the skeletal remains of one goat. The population density of these species could not be assessed because none were seen nor heard during the survey (David and Guinther 2000).

The faunal survey reported the minimal occurrence of species which were hunted in the *kula* area. However, knowing that the project site is in a very dry and barren area, the informants who claimed to hunt and gather, indicated that it is unlikely that they would have hunted and gathered in that area. The project site area would also have been difficult to access because of the lack of present-day trails through the area.

The plant species that interviewees indicated they gathered in the *kula* area were not found to occur in the project site. In 1998, Derral Herbst conducted a floral survey of the 500 acre proposed University of Hawai`i Center parcel and had no citing of *ko'oko'olau* (*Bidens micr*antha ssp. *Ctenophyllha*), *hala* (*Pandanus tectorius*), and *noni* (*Morinda citrifolia*) (Herbst 1998), the plants identified as being gathered in the general area. This supports the informants' information of no known gathering being conducted in the area of the road project.

The road project would have no impact on the gathering practice in the area, since the species of plants being gathered do no occur in the area.

Temporary habitation. It has been recorded above that when traveling between *mauka* and *makai*, the caves in the *kula* area were used as rest stops. One of the interviewees mentioned the use of the caves as short-term temporary habitation for travelers. The archaeological record in the project area provide evidence of caves being modified for temporary habitation.

However, there is no evidence of recent use of the caves within the project site as rest stops or temporary habitation. The reason again may be the inaccessibility of the area (no trails) and the "inhospitable" nature of the site.

The ability of the caves to be used as rest stops or temporary habitation will not be impacted by the development of the road project.

Trails. The interviewees have indicated the use of *mauka-makai* trails in the *kula* area. According to the informants, they know of no known trails through the project site. Emerson's 1888 survey of the area did not show any trails within the vicinity of the project area. Further, many of the trails used could not be identified by age and many of the interviewees indicated that the trails they used were very likely created by cattle or other free roaming animals.

A stepping stone trail, Site 21361, discussed above, is located within the road corridor (McIntosh 2005 and Cleghorn 2000). This trail is made of pahoehoe slabs and is only 15 m long. It does not appear to have been part of a trail used for traversing the area in the recent past.

The development of the road will have no impact on the continued practice of traversing the area *mauka-makai*.

***Ahupua`a* boundaries**. The *ahupua`a* was the fundamental social, economic, and political unit in Hawaiian traditional practice. They were independent units: self-sufficient within its boundaries by managing, exploiting and developing the resources of the different environmental zones.

The *ahupua`a* concept is still viable, i.e., people still identify with their *ahupua`a*. In pre-historic times communication, transportation and mobility were primarily intra-*ahupua`a* activities. There was not much inter-*ahupua`a* movement. This is inferred by the numerous *mauka-makai* trails which were contained with *ahupua`a*. There were only 3 trails known to exist in the area that transected or crossed *ahupua`a* boundaries – one *mauka* and two *makai* (covered by the 1801 lava flow).

It follows from the discussions above, that the traditional Hawaiian cultural orientation was *mauka-makai*.

A road is the modern equivalent of a trail. The construction of a road across *ahupua`a* is not within the frame of traditional Hawaiian practice or model. In the Hawaiian tradition, the road would be violating the integrity of the *ahupua`a* boundaries.

As a recommended guideline in the Historic Protection Plan: "Any interpretation of cultural resources in the parcel should focus on *mauka/makai* distribution of sites, and traditional cultural practices; the location of a site within a specific *ahupua`a* needs to be included and stressed (Cleghorn 2000: 11). Also, a few of the interviewees suggested placing signage along the road to identify and demarcate *ahupua`a* boundaries.

Along this line and in the spirit of maintaining *ahupua`a* integrity, it is suggested that the name of any Advisory Council on the cultural resources protection of this project be one that will reflect the inclusion of all affected *ahupua`a* and not just Kalaoa.

Beliefs, values, world view and cultural landscape. Beliefs and values are fundamental components of a culture, which determine how a culture views the world and everything in it.

The landscape is described and understood by its physical features. However, people from different cultures view the landscape through different "cultural glasses" (beliefs and values) and will tend to "see" the landscape differently. One's cultural perspective adds a non-physical dimension to the landscape, and the landscape becomes imbued with cultural meaning and value.

The Western perspective views the landscape as a static material resource. The landscape, to the native Hawaiian, is dynamic, animated with spiritual energy (*mana*), and believed to be a source (not just a resource) – it is life giving, one's life is tied to it. As one interviewee said, "You don't own the land, the land owns you."

The native Hawaiians had a spiritual relationship with the environment. One can understand the significance prayer and praying to the land and its products in thanksgiving have in traditional Hawaiian practice. The land not only provides physical sustenance, but is also a source of spiritual sustenance. One interviewee talked of seeking personal "comfort" in the "lava lands".

This is one area where the impact of the road development is not obvious. It is difficult to assess the impact of the road on intangible non-quantitative cultural beliefs and practices.

The road development impact analysis and assessment on the cultural landscape is made from the information received from the informants, the "*keike o ka aina*" – children of the land. They have articulated the Hawaiian perspective of the environment and the nature of the cultural landscape.

All of the interviewees were in support of the project. However, the concern of the project's potential impact on the cultural landscape was expressed by several of the interviewees who talked about the spiritual, life giving and healing nature of the cultural landscape. The expressed concern was more of a request for an understanding and respect of the culture and the land.

We know that the project area was not frequented by present day spiritual and cultural practitioners, nor was it for any other traditional activity. The area's cultural significance seems to lie in its past history (archaeological record), the burials and the fact that it is part of the greater cultural landscape. So the project's relationship with the people and the cultural landscape will determine the nature of its impact.

As discussed above, the Hawaiian cultural landscape is not static. It is spiritually "alive" and is able to "react" negatively or positively, depending on how it is treated or impacted. As one informant said, "if you take care of the land, it will take care of you". A project's impact could have an adverse or positive value-added consequence to the cultural landscape depending on the nature of the project, the manner in which it was constructed, the manner in which it will be used, and the manner in which it is maintained. The development of the University of Hawaii Center, the proposed preservation plan for the archaeological sites, and the proposed interpretive program of the sites for educational purpose may be viewed as value-added initiatives for the cultural landscape. The access road is a necessary element in those initiatives.

Further, the following discussion points are provided to minimize any negative impact to the cultural landscape:

1) The burials and other archaeological sites are cultural artifacts and properties, and are part and parcel of the cultural landscape. The informants were unanimous in the

belief that the burials should not be disturbed and that every effort should be made to protect/preserve the other sites.

2) The *ahupua`a* boundaries are a cultural construct on the landscape. The *ahupua`a* determined much of the ancient Hawaiian lifestyle, including the traditional *mauka-makai* orientation. Their boundaries should be recognized. Again, as recommended above, the *mauka-makai* orientation in site interpretation, and the identification of *ahupua`a* boundaries should be explored.

3) Development by its meaning involves change. Any change to the environment/land will cause a change to the cultural landscape. Efforts to minimize the destruction of the land during construction will be one way of showing respect of the land and the culture. As recommended in the Conceptual Historic Protection Plan: "The natural pahoehoe and aa lava landscape is an extraordinarily important aspect of the parcel. It provides the natural context for all of the activities that have taken place and will take place here. Every effort needs to be taken to preserve the integrity of this landscape. In this regard strict controls need to be exercised with bulldozing activities that will be needed during construction activities on the parcel. All bulldozing activities need to be restricted to only those specific areas that are to be developed" (Cleghorn 2000:12).

4) Another valuable intangible asset of the cultural environment is the vantage point the land provides to view its surroundings. We can all appreciate the view and value of the Kona coastline or of Mt Hualalai, and understand how it can increase the monetary value of a property. In the traditional perspective, the scenery is not only valuable in the material sense, but in the spiritual sense as well. As a naturally occurring environmental element, it too becomes an integral make up of the traditional cultural landscape.

It seems unlikely that the road would obstruct the views, but a couple of the informants specifically expressed their hope that the view plain be maintained. As recommended in the Conceptual Historic Protection Plan: The HPP should take view plains into effect. These view plains should be both from the cultural resources and towards the cultural resources. The concern is that modern structures should not be built in such a way that the view plains are obscured. Buildings and other constructed facilities should be built so that they blend in with the surrounding landscape; particular attention needs to be paid to building height, roof color, types of walls and shape of buildings" (Cleghorn 2000:11).

5) Cultural spiritual practitioners, the *kupuna* and/or the Advisory Council should be consulted to ensure that proper traditional practices are incorporated during the implementation phase of development (i.e., the offering of prayer).

7.0 RECOMMENDATIONS

The discussion above considered and assessed the possible areas of impact from the development of the road. Based on the discussion, the following list of recommendations is summarized and provided to minimize any negative impact of the road development on the cultural resources and cultural landscape:

1) All sites should be preserved/protected as recommended by the interviewees, the Archaeological Assessment for the Main Street Roadway (McIntosh 2005) and the Historic Protection Plan (Cleghorn 2000).

2) The Hawai`i Burial Council should be consulted regarding burials.

3) The final road alignment should be guided by the recommendations of the Archaeological Assessment for the Main Street Roadway (McIntosh 2005) and the Conceptual Historic Protection Plan (Cleghorn 2000).

4) The road design should incorporate the buffer zone recommendations of the Archaeological Assessment for the Main Street Roadway (McIntosh 2005) and the Conceptual Historic Protection Plan (Cleghorn 2000). The design should further protect the sites from any run-off.

5) The Historic Protection Plan should incorporate recommendations set forth in the Archaeological Assessment for the Main Street Roadway (McIntosh 2005).

6) The Historic Protection Plan should add to its existing list of guidelines, the following recommendations discussed in this report:

- the planning, design and implementation stages of the road development should be sensitive to any possible impacts on the cultural landscape
- proper recognition of *ahupua`a* boundaries

7) Any changes to the Historic Preservation Plan should be made in consultation with the Advisory Council, *kupuna*, and other identified stakeholders. Guidance should be sought from the Hawai`i Burial Council, the Office of Hawaiian Affairs, and the State Historic Preservation Division.

8) The University of Hawai`i Center at West Hawai`i Advisory Council on Kalaoa Cultural Site Preservation (Kalaoa Advisory Council) gives the impression that the cultural sites are exclusively in Kalaoa. The name should be changed to reflect the inclusion of all affected *ahupua`a*.

The Archaeological Assessment for the Main Street Roadway (McIntosh 2005) and the Conceptual Historic Protection Plan (Cleghorn 2000) have addressed most of the negative cultural impacts of the project and have recommended effective protection measures which have been included in the discussion above.

It is crucial that the recommendations be considered and incorporated in the design of the final road alignment and during the construction of the road to ensure that any adverse impacts from the project would be minimal.

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APPENDIX A

QUESTIONNAIRE FOR MID-LEVEL UH ROAD PROJECT

The following questions were used as a guide in the informal interviews.

Name: Birth Name:
Birth Date: Birth Place:
If not born here, when did you move here?
Current Address:
Where did you grow up?
Parents:

What is your relationship to the area?

How familiar are you of the subject area?

What is this area called (What do you call this area)?

What are the physical characteristics of the area?

Any significant or special features in this area as it related to land use and/or history?

Land Use:

What kinds of activities have you observed in the area?

Activities	What	Season	Who
Hunt			
Gather			
Habitation			
Ceremonial (Burials)			
Agriculture			

Intensity of land and/or resource use?

What have you heard of this area?

Have you observed land/resource modification in the area? Why?

What are your thoughts about the project proposal?

APPENDIX B

PERSONAL RELEASE OF INTERVIEW INFORMATION