2004 FEIS HAWAII
PALAMANUI DEVELOPMENT 3 OF 3

ORIGINAL

FINAL ENVIRONMENTAL IMPACT STATEMENT

PALAMANUI

A PROJECT BY HILUHILU DEVELOPMENT

North Kona, Hawai'i
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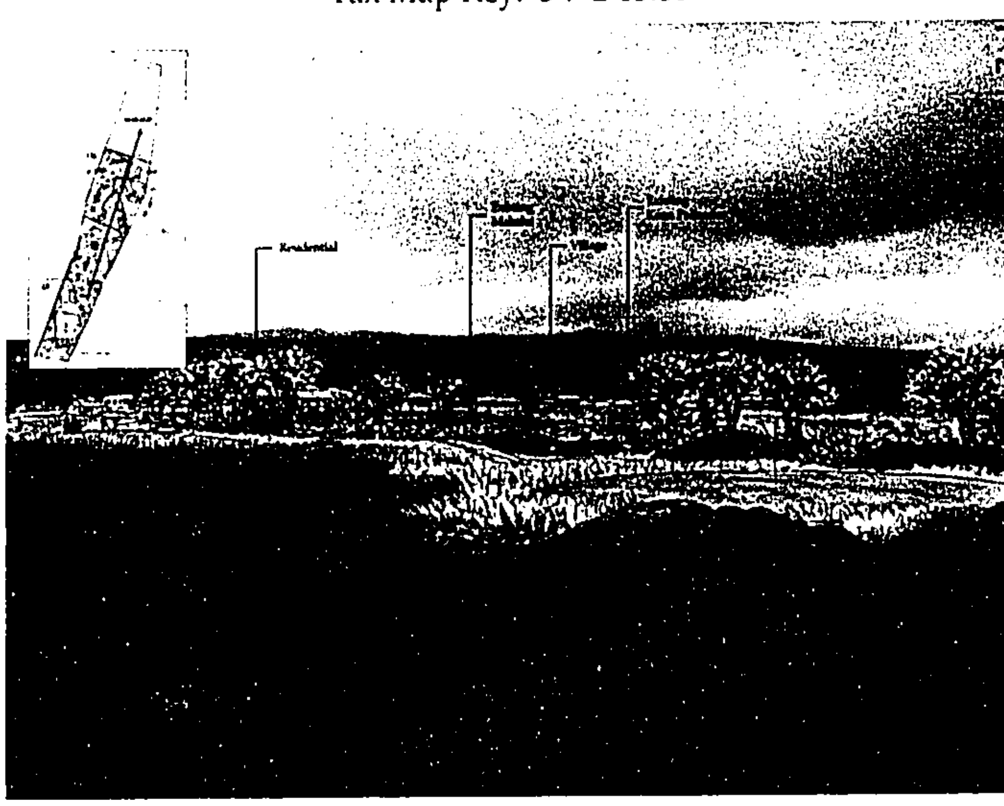

VOLUME 3:
APPENDICES G - T

Applicant: Hiluhilu Development, LLC
Accepting Authority: State of Hawai'i Land Use Commission

September 2004

GROUP 70

Group 70 International, Inc.
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APPENDICES A-T

The Technical Appendices are printed in two separate volumes of the report. Volume 2 contains Appendices A through F. Volume 3 contains Appendices G through T.

Appendix G
Acoustic Study

ACOUSTIC STUDY FOR THE PROPOSED PALAMANUI PROJECT

NORTH KONA, HAWAII

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CHAPTER I. SUMMARY

The existing and future traffic noise levels in the vicinity of the proposed Palamanui Project in North Kona, Hawaii were evaluated for their potential impact on present and future noise sensitive areas. Figure 1 depicts the location of the project site. The future traffic noise levels along the primary access roadways to the project were calculated for the year 2014.

Along the existing Queen Kaahumanu Highway, traffic noise levels are expected to increase by 3.3 to 4.4 DNL between CY 2003 and CY 2014 as a result of both project and non-project traffic. Along Mamalahoa Highway, traffic noise levels are predicted to increase by 2.3 to 3.5 DNL. Traffic noise increases due to project traffic are predicted to range from 0.6 to 2.1 DNL which is within the range of the noise increases caused by non-project traffic on these two roadways. These increases in traffic noise levels associated with project traffic range from the insignificant to the moderately significant. Fortunately, the larger and more significant increases in traffic noise levels are expected to occur along Queen Kaahumanu Highway, where the lands along the highway Rights-of-Way are generally undeveloped.

Based on previously published FAR Part 150 aircraft noise contours for Kona International Airport, the project site is located outside of the existing and forecasted 55 DNL noise contours, and is considered to be acceptable for the development of noise sensitive uses as planned. Noise contours for CY 2010 and CY 2020, which were developed during the last Master Plan and FAR Part 150 Study updates for Kona International Airport, confirm that the project site is outside of the airport noise contours, and special aircraft noise attenuation measures are not required over the project area. The implementation of the airport noise disclosure provisions of Act 208 is not considered to be necessary over the entire project area because the existing and forecasted 55 DNL noise contours are not expected to encompass noise sensitive developments within the project area.

Project residents should not be impacted by traffic noise from Queen Kaahumanu or Mamalahoa Highways since adequate setback distances have been provided from the highways.

Noise impacts from the nearby Keahole Generating Station are not expected to occur due to the large distances between the station and the project site. In addition, sound attenuation measures have been recently incorporated into the station's generating equipment, which have reduced plant noise levels to inaudible levels.

Unavoidable, but temporary, noise impacts may occur during the construction of the proposed project. Because construction activities are predicted to be audible at adjoining properties, the quality of the acoustic environment may be degraded to unacceptable levels during periods of construction. Mitigation measures to reduce

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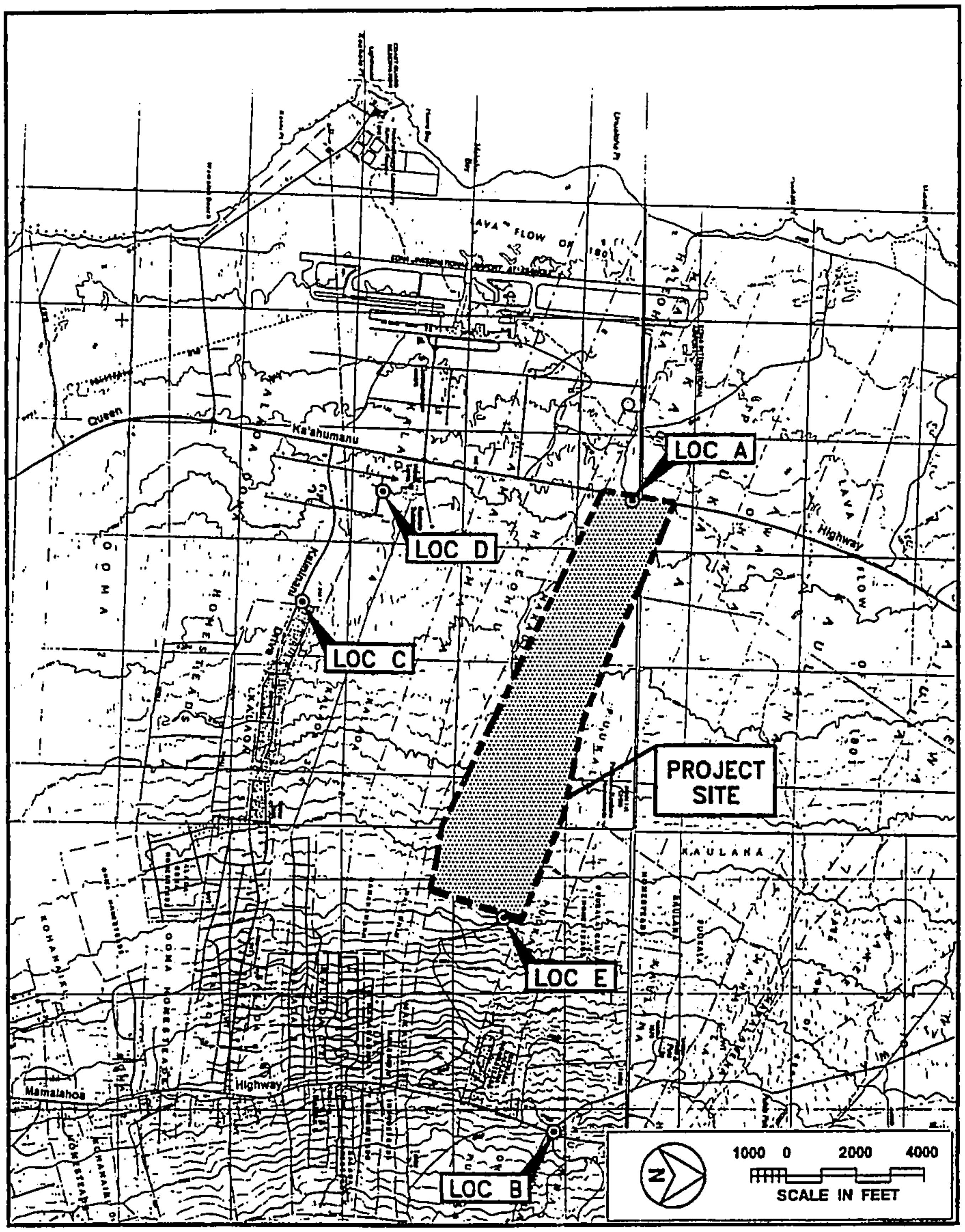


LOCATIONS OF PROJECT SITE AND NOISE MEASUREMENT SITES	FIGURE 1

construction noise to inaudible levels will not be practical in all cases. For this reason, the use of quiet equipment and construction curfew periods as required under the State Department of Health noise regulations are recommended to minimize construction noise impacts.

CHAPTER II. PURPOSE

The objectives of this study were to describe the existing and future noise environment in the environs of the proposed Palamanui Project in North Kona on the island of Hawaii. Traffic noise level increases and impacts associated with the proposed development were to be determined within the project site as well as along the public roadways expected to service the project traffic. A specific objective was to determine the future traffic noise level increases associated with both project and non-project traffic, and the potential noise impacts associated with these increases. Assessments of possible impacts from noise resulting from fixed and rotary wing aircraft operations at nearby Kona International Airport at Keahole, from the nearby Keahole Generating Station, and from short term construction noise at the project site were also included in the noise study objectives. Recommendations for minimizing these noise impacts were also to be provided as required.

CHAPTER III. NOISE DESCRIPTORS AND THEIR RELATIONSHIP TO LAND USE COMPATIBILITY

The noise descriptor currently used by federal agencies to assess environmental noise is the Day-Night Average Sound Level (DNL or Ldn). This descriptor incorporates a 24-hour average of instantaneous A-Weighted sound levels as read on a standard Sound Level Meter. The maximum A-Weighted sound level occurring while a noise source such as a heavy truck or aircraft is moving past a listener (i.e., the maximum sound level from a "single event") is referred to as the "Lmax value". The mathematical product (or integral) of the instantaneous sound level times the duration of the event is known as the "Sound Exposure Level", or Lse, which is analogous to the energy of the time-varying sound levels associated with a single event.

The DNL values represent the average noise during a typical day of the year. DNL exposure levels of 55 or less are typical of quiet rural or suburban areas. DNL exposure levels of 55 to 65 are typical of urbanized areas with medium to high levels of activity and street traffic. DNL exposure levels above 65 are representative of densely developed urban areas and areas fronting high volume roadways.

By definition, the minimum averaging period for the DNL descriptor is 24 hours. Additionally, sound levels which occur during the nighttime hours of 10:00 PM to 7:00 AM are increased by 10 decibels (dB) prior to computing the 24-hour average by the DNL descriptor. Because of the averaging used, DNL values in urbanized areas typically range between 50 and 75 DNL. In comparison, the typical range of intermittent noise events may have maximum Sound Level Meter readings between 75 and 105 dBA. A more complete list of noise descriptors is provided in Appendix B to this report. In Appendix B, the Ldn descriptor symbol is used in place of the DNL descriptor symbol.

Table 1, extracted from Reference 1, categorizes the various DNL levels of outdoor noise exposure with severity classifications. Table 2, also extracted from Reference 1, presents the general effects of noise on people in residential use situations. Figure 2, extracted from Reference 2, presents suggested land use compatibility guidelines for residential and nonresidential land uses. A general consensus among federal agencies has developed whereby residential housing development is considered acceptable in areas where exterior noise does not exceed 65 DNL. This value of 65 DNL is used as a federal regulatory threshold for determining the necessity for special noise abatement measures when applications for federal funding assistance are made.

As a general rule, noise levels of 55 DNL or less occur in rural areas, or in areas which are removed from high volume roadways. In urbanized areas which are shielded from high volume streets, DNL levels generally range from 55 to 65 DNL, and are usually controlled by motor vehicle traffic noise. Residences which front major roadways are generally exposed to levels of 65 DNL, and as high as 75 DNL when the

TABLE 1

EXTERIOR NOISE EXPOSURE CLASSIFICATION (RESIDENTIAL LAND USE)

NOISE EXPOSURE CLASS	DAY–NIGHT SOUND LEVEL	EQUIVALENT SOUND LEVEL	FEDERAL (1) STANDARD
Minimal Exposure	Not Exceeding 55 DNL	Not Exceeding 55 Leq	Unconditionally Acceptable
Moderate Exposure	Above 55 DNL But Not Above 65 DNL	Above 55 Leq But Not Above 65 Leq	Acceptable(2)
Significant Exposure	Above 65 DNL But Not Above 75 DNL	Above 65 Leq But Not Above 75 Leq	Normally Unacceptable
Severe Exposure	Above 75 DNL	Above 75 Leq	Unacceptable

Notes: (1) Federal Housing Administration, Veterans Administration, Department of Defense, and Department of Transportation.

(2) FHWA uses the Leq instead of the Ldn descriptor. For planning purposes, both are equivalent if: (a) heavy trucks do not exceed 10 percent of total traffic flow in vehicles per 24 hours, and (b) traffic between 10:00 PM and 7:00 AM does not exceed 15 percent of average daily traffic flow in vehicles per 24 hours. The noise mitigation threshold used by FHWA for residences is 67 Leq.

TABLE 2

EFFECTS OF NOISE ON PEOPLE
(Residential Land Uses Only)

EFFECTS[1] / DAY-NIGHT AVERAGE SOUND LEVEL IN DECIBELS	Hearing Loss	Speech Interference		Annoyance[2]	Average Community Reaction[4]	General Community Attitude Towards Area
		Indoor	Outdoor			
	Qualitative Description	%Sentence Intelligibility	Distance in Meters for 95% Sentence Intelligibility	% of Population Highly Annoyed[3]		
75 and above	May Begin to Occur	98%	0.5	37%	Very Severe	Noise is likely to be the most important of all adverse aspects of the community environment.
70	Will Not Likely Occur	99%	0.9	25%	Severe	Noise is one of the most important adverse aspects of the community environment.
65	Will Not Occur	100%	1.5	15%	Significant	Noise is one of the important adverse aspects of the community environment.
60	Will Not Occur	100%	2.0	9%	Moderate to Slight	Noise may be considered an adverse aspect of the community environment.
55 and below	Will Not Occur	100%	3.5	4%		Noise considered no more important than various other environmental factors.

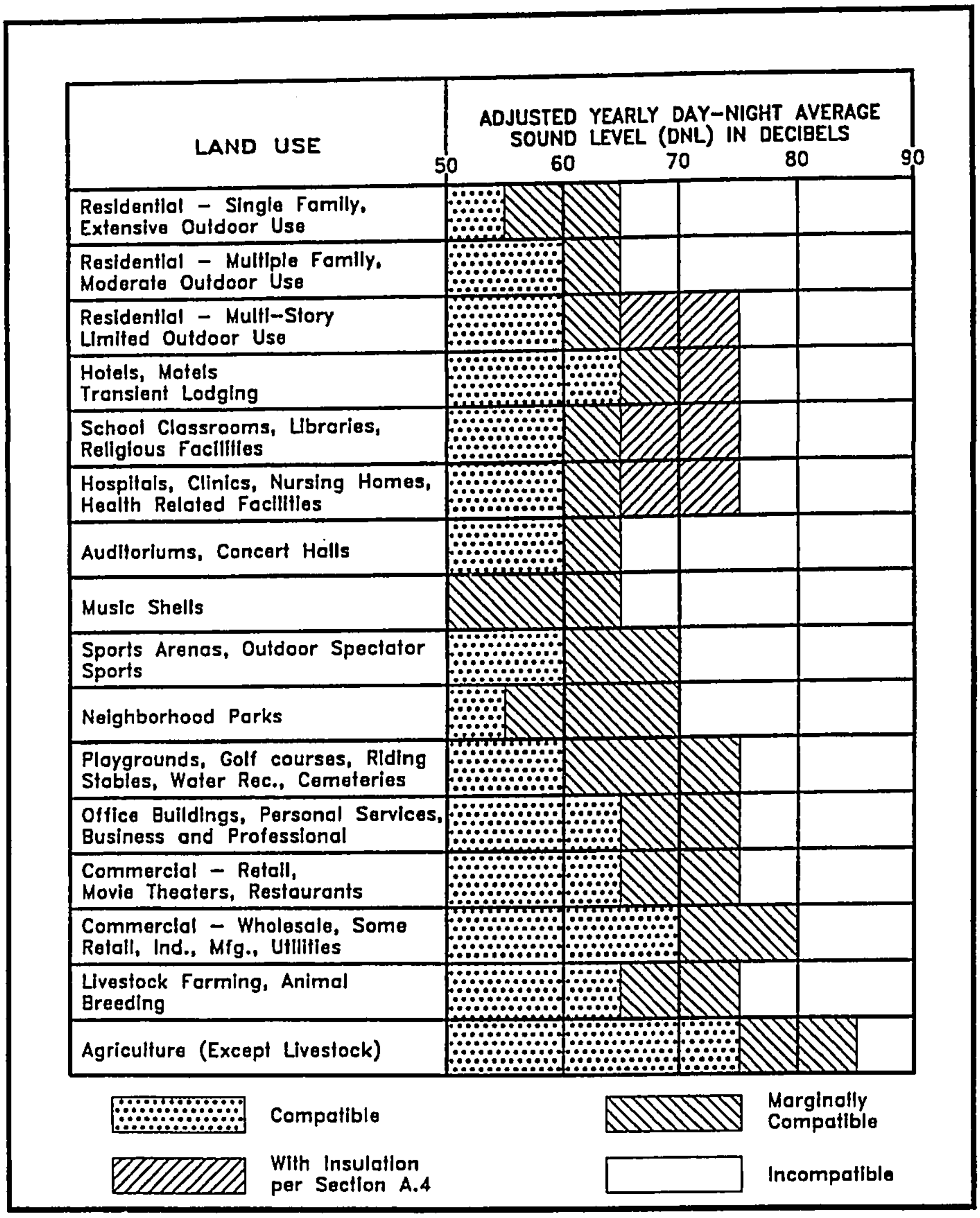
1. "Speech Interference" data are drawn from the following tables in EPA's "Levels Document": Table 3, Fig. D-1, Fig. D-2, Fig. D-3. All other data from National Academy of Science 1977 report "Guidelines for Preparing Environmental Impact Statements on Noise, Report of Working Group 69 on Evaluation of Environmental Impact of Noise."

2. Depends on attitudes and other factors.

3. The percentages of people reporting annoyance to lesser extents are higher in each case. An unknown small percentage of people will report being "highly annoyed" even in the quietest surroundings. One reason is the difficulty all people have in integrating annoyance over a very long time.

4. Attitudes or other non-acoustic factors can modify this. Noise at low levels can still be an important problem, particularly when it intrudes into a quiet environment.

NOTE: Research implicates noise as a factor producing stress-related health effects such as heart disease, high-blood pressure and stroke, ulcers and other digestive disorders. The relationships between noise and these effects, however, have not as yet been quantified.



LAND USE COMPATIBILITY WITH YEARLY AVERAGE DAY-NIGHT AVERAGE SOUND LEVEL (DNL) AT A SITE FOR BUILDINGS AS COMMONLY CONSTRUCTED.
(Source: American National Standards Institute S12.9-1998/Part 5)

FIGURE 2

roadway is a high speed freeway. Due to noise shielding effects from intervening structures, interior lots are usually exposed to 3 to 10 DNL lower noise levels than the front lots which are not shielded from the traffic noise.

For the purposes of determining noise acceptability for funding assistance from federal agencies, an exterior noise level of 65 DNL or lower is considered acceptable. These federal agencies include the Federal Aviation Administration (FAA), Department of Defense (DOD); Federal Housing Administration, Housing and Urban Development (FHA/HUD), and Veterans Administration (VA). This standard is applied nationally (see Reference 3), including Hawaii.

Because of our open-living conditions, the predominant use of naturally ventilated dwellings, and the relatively low exterior-to-interior sound attenuation afforded by these naturally ventilated structures, an exterior noise level of 65 DNL does not eliminate all risks of noise impacts. Because of these factors, a lower level of 55 DNL is considered as the "Unconditionally Acceptable" (or "Near-Zero Risk") level of exterior noise (see Reference 4). For typical, naturally ventilated structures in Hawaii, an exterior noise level of 55 DNL results in an interior level of approximately 45 DNL, which is considered to be the "Unconditionally Acceptable" (or "Near-Zero Risk") level of interior noise. However, after considering the cost and feasibility of applying the lower level of 55 DNL, government agencies such as FHA/HUD and VA have selected 65 DNL as a more appropriate regulatory standard.

For aircraft noise, the Hawaii State Department of Transportation, Airports Division (HDOTA), has recommended that 60 DNL be used as the common level for determining land use compatibility in respect to noise sensitive uses near its airports. Table 3 summarizes the recommendations for compatible land uses at various levels of aircraft noise. For those noise sensitive land uses which are exposed to aircraft noise greater than 55 DNL, the division recommends that disclosure of the aircraft noise levels be provided prior to any real property transactions. Reference 5 requires that such disclosure be provided prior to real property transactions concerning properties located within Air Installation Compatibility Use Zones (AICUZ) or located within airport noise maps developed under Federal Aviation Regulation (FAR) Part 150 - Airport Noise Compatibility Planning (14 CFR Part 150). The most recent FAR Part 150 noise contours for Kona International Airport at Keahole were completed in 1996 and reflect conditions through 2001. Additional airport noise contours for 2010 and 2020 were developed by the HDOTA for information purposes only during the 1996 to 1997 time frame.

For commercial, industrial, and other non-noise sensitive land uses, exterior noise levels as high as 75 DNL are generally considered acceptable. Exceptions to this occur when naturally ventilated office and other commercial establishments are exposed to exterior levels which exceed 65 DNL.

In the State of Hawaii, the State Department of Health (DOH) regulates noise from on-site activities. State DOH noise regulations are expressed in maximum

TABLE 3

HAWAII STATE DEPARTMENT OF TRANSPORTATION RECOMMENDATIONS FOR LOCAL LAND USE COMPATIBILITY WITH YEARLY DAY-NIGHT AVERAGE SOUND LEVELS (DNL)

TYPE OF LAND USE	**** Yearly Day-Night Average Sound Level ****					
	< 60	60-65	65-70	70-75	75-80	80-
RESIDENTIAL						
Low density residential, resorts, and hotels (outdoor facil.)	Y(a)	N(b)	N	N	N	N
Low density apartment with moderate outdoor use	Y	N(b)	N	N	N	N
High density apartment with limited outdoor use	Y	N(b)	N(b)	N	N	N
Transient lodgings with limited outdoor use	Y	N(b)	N(b)	N	N	N
PUBLIC USE						
Schools, day-care centers, libraries, and churches	Y	N(c)	N(c)	N(c)	N	N
Hospitals, nursing homes, clinics, and health facilities	Y	Y(d)	Y(d)	Y(d)	N	N
Indoor auditoriums and concert halls	Y(c)	Y(c)	N	N	N	N
Government services and office buildings serving the general public	Y	Y	Y(d)	Y(d)	N	N
Transportation and Parking	Y	Y	Y(d)	Y(d)	Y(d)	Y(d)
COMMERCIAL AND GOVERNMENT USE						
Offices - government, business, and professional	Y	Y	Y(d)	Y(d)	N	N
Wholesale and retail - building materials, hardware and heavy equipment	Y	Y	Y(d)	Y(d)	Y(d)	Y(d)
Airport businesses - car rental, tours, lei stands, ticket offices, etc.	Y	Y	Y(d)	Y(d)	N	N
Retail, restaurants, shopping centers, financial institutions, etc.	Y	Y	Y(d)	Y(d)	N	N
Power plants, sewage treatment plants, and base yards	Y	Y	Y(d)	Y(d)	Y(d)	N
Studios without outdoor sets, broadcasting, production facilities, etc.	Y(c)	Y(c)	N	N	N	N
MANUFACTURING, PRODUCTION, AND STORAGE						
Manufacturing, general	Y	Y	Y(d)	Y(d)	Y(d)	N
Photographic and optical	Y	Y	Y(d)	Y(d)	N	N
Agriculture (except livestock) and forestry	Y	Y(e)	Y(e)	Y(e)	Y(e)	Y(
Livestock farming and breeding	Y	Y(e)	Y(e)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
RECREATIONAL						
Outdoor sports arenas and spectator sports	Y	Y(f)	Y(f)	N	N	N
Outdoor music shells, amphitheaters	Y(f)	N	N	N	N	N
Nature exhibits and zoos, neighborhood parks	Y	Y	Y	N	N	N
Amusements, beach parks, active playgrounds, etc.	Y	Y	Y	Y	N	N
Public golf courses, riding stables, cemeteries, gardens, etc.	Y	Y	N	N	N	N
Professional/resort sport facilities, locations of media events, etc.	Y(f)	N	N	N	N	N
Extensive natural wildlife and recreation areas	Y(f)	N	N	N	N	N

Numbers in parentheses refer to notes.

KEY TO TABLE 3:

Y(Yes) = Land Use and related structures compatible without restrictions.
N(No) = Land Use and related structures are not compatible and should be prohibited.

TABLE 3 (CONTINUED)

HAWAII STATE DEPARTMENT OF TRANSPORTATION RECOMMENDATIONS FOR LOCAL LAND USE COMPATIBILITY WITH YEARLY DAY-NIGHT AVERAGE SOUND LEVELS (DNL)

NOTES FOR TABLE 3:

(a) A noise level of 60 DNL does not eliminate all risks of adverse noise impacts from aircraft noise. However, the 60 DNL planning level has been selected by the State Airports Division as an appropriate compromise between the minimal risk level of 55 DNL and the significant risk level of 65 DNL.

(b) Where the community determines that these uses must be allowed, Noise Level Reduction (NLR) measures to achieve interior levels of 45 DNL or less should be incorporated into building codes and be considered in individual approvals. Normal local construction employing natural ventilation can be expected to provide an average NLR of approximately 9 dB. Total closure plus air conditioning may be required to provide additional outdoor to indoor NLR, and will not eliminate outdoor noise problems.

(c) Because the DNL noise descriptor system represents a 24-hour average of individual aircraft noise events, each of which can be unique in respect to amplitude, duration, and tonal content, the NLR requirements should be evaluated for the specific land use, interior acoustical requirements, and properties of the aircraft noise events. NLR requirements should not be based solely upon the exterior DNL exposure level.

(d) Measures to achieve required NLR must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.

(e) Residential buildings require NLR. Residential buildings should not be located where noise is greater than 65 DNL.

(f) Impact of amplitude, duration, frequency, and tonal content of aircraft noise events should be evaluated.

allowable property line noise limits rather than DNL (see Reference 6). The noise limits apply on all islands of the State, including Oahu. Although they are not directly comparable to noise criteria expressed in DNL, State DOH noise limits for preservation/residential, apartment/commercial, and agricultural/industrial lands equate to approximately 55, 60, and 76 DNL, respectively.

Because the proposed project site is located on lands designated for single family and multifamily residential, and commercial uses, various DOH noise limits would be applicable along the lot boundary lines or receptor locations for any stationary machinery, or equipment related to commercial or construction activities. These property line limits are 60 dBA and 50 dBA during the daytime and nighttime periods, respectively, for commercial lots or receptors. For multifamily or apartment use, the State DOH limits are also 60 dBA and 50 dBA during the daytime and nighttime periods, respectively. For single family residential and public facility uses, the State DOH limits are 55 dBA and 45 dBA during the daytime and nighttime periods, respectively. These noise limits cannot be exceeded for more than 2 minutes in any 20-minute time period under the State DOH noise regulations. The State DOH noise regulations do not apply to aircraft or motor vehicles.

CHAPTER IV. GENERAL STUDY METHODOLOGY

Existing traffic and background ambient noise levels were measured at five locations in the project environs to provide a basis for developing the traffic noise contours along the roadways which will service the proposed development: Queen Kaahumanu Highway and Mamalahoa Highway; and for determining the existing background ambient noise levels in the project area.

The locations of the measurement sites are shown in Figure 1. Noise measurements were performed during July 2003. The traffic noise measurement results, and their comparisons with computer model predictions of existing traffic noise levels are summarized in Table 4. The results of the traffic noise measurements were compared with calculations of existing traffic noise levels to validate the computer model used.

Traffic noise calculations for the existing conditions as well as noise predictions for the future conditions with and without the project were performed using the Federal Highway Administration (FHWA) Noise Prediction Model (Reference 8). Traffic data entered into the noise prediction model were: hourly traffic volumes, average vehicle speeds, estimates of traffic mix, and loose soil propagation loss factor. The traffic assignments for the project (Reference 9) and Hawaii State Department of Transportation counts on Queen Kaahumanu Highway (Reference 10) were the primary sources of data inputs to the model. For existing and future traffic, it was assumed that the average noise levels, or Leq(h), during the PM peak hour were equal to the 24-hour DNL along each roadway segment. This assumption was based on computations of both the hourly Leq and the 24-hour DNL of traffic noise on Queen Kaahumanu Highway (see Figure 3).

Traffic noise calculations for both the existing and future conditions in the project environs with the northern project access road were developed for ground level receptors without the benefit of shielding effects. Traffic assignments with and without the project were obtained from the project's traffic turning movements (Reference 9). The forecasted increases in traffic noise levels over existing levels were calculated for both scenarios, and noise impact risks evaluated. The relative contributions of non-project and project related traffic to the total noise levels were also calculated, and an evaluation was made of possible traffic noise impacts resulting from the project.

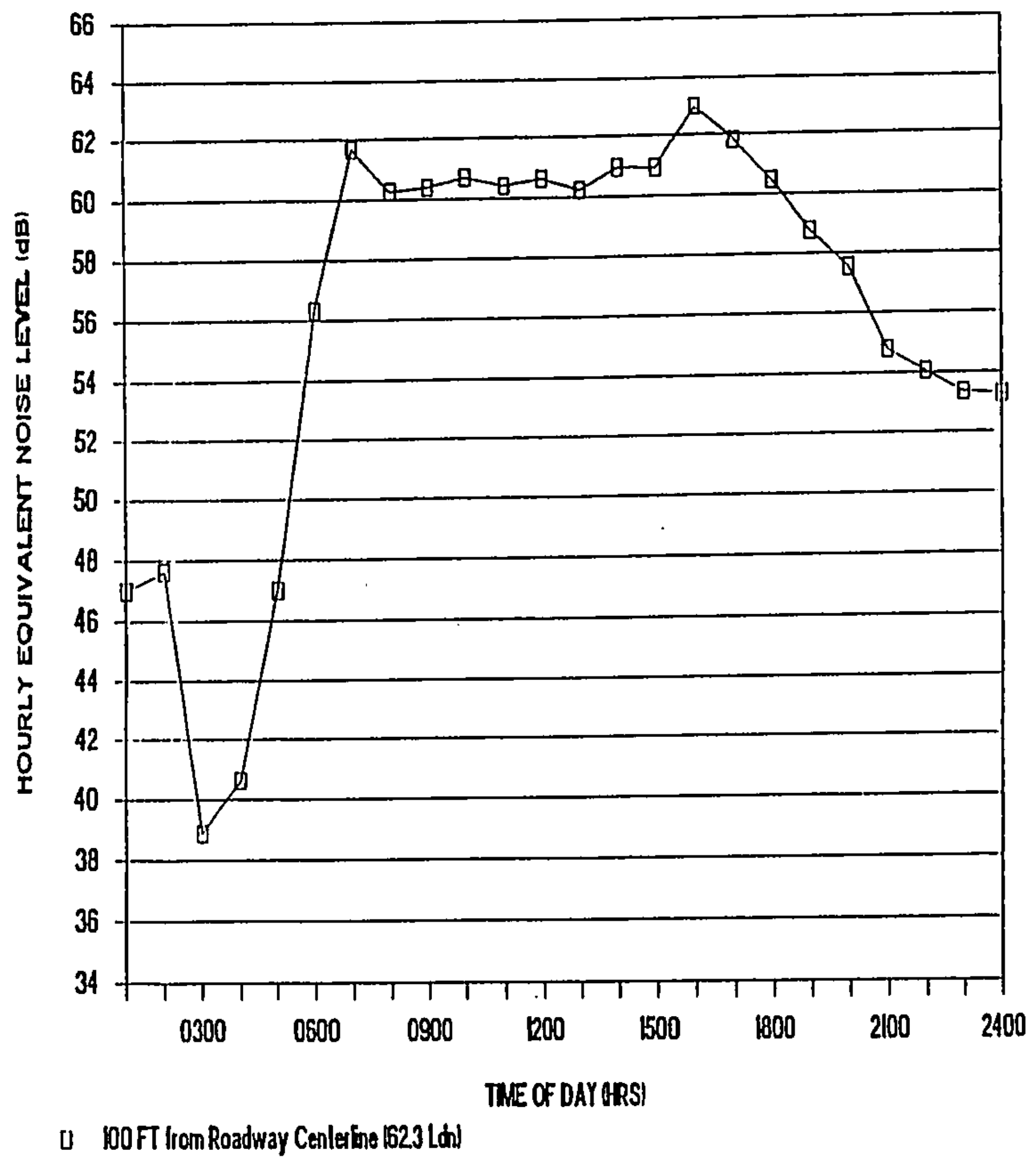
The relationships of the aircraft flight tracks and noise contours for Kona International Airport to the project site and its proposed land uses were examined to determine if potential noise impacts were possible at the project site. The locations of the airport noise contours for 2001, 2010, and 2020 were compared with the location of the project site, and risks of noise impacts were evaluated. The need for special aircraft noise attenuation measures or disclosures of aircraft noise level at the project site was determined by comparing the locations of the 2001 FAR Part 150 airport noise contours with the location of the project site.

TABLE 4
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	66 FT from centerline of Mamalahoa Hwy. (7/01/03)	0841 TO 0940	45	223	9	11	64.1	65.4
B	66 FT from centerline of Mamalahoa Hwy. (7/01/03)	1500 TO 1530	45	288	6	10	65.7	65.8
C	50 FT from centerline of Kaiminani Dr. (7/01/03)	1000 TO 1100	35	294	8	1	61.7	61.8
D	400 FT from Pukiawa St. on Kupaloke St. (7/01/03)	1427 TO 1443	N/A	N/A	N/A	N/A	54.2	N/A
E	At west end of Makalei Estates Subdivision Road (7/02/03)	0856 TO 0956	N/A	N/A	N/A	N/A	32.9	N/A

FIGURE 3

HOURLY VARIATIONS OF TRAFFIC NOISE AT 100 FT SETBACK DISTANCE FROM THE CENTERLINE OF QUEEN KA'AHUMANU HIGHWAY AT KEAHOLE AIRPORT ROAD TOWARD KAWAIHAE (Sta. 8-P, 5/9-10/88)



CHAPTER V. EXISTING NOISE ENVIRONMENT

Traffic Noise. The existing traffic noise levels in the project environs vary from levels of approximately 70 DNL along the makai (west) property boundary, to less than 45 DNL at the mauka (east) property boundary and interior locations of the project site. Traffic noise levels along Queen Kaahumanu Highway are less than 70 DNL at 90 FT or greater setback distances from the highway centerline. Traffic noise levels along Mamalahoa Highway are less than 66 DNL at 66 FT or greater setback distances from the highway centerline. At the east boundary of the project which adjoins the Makalei Estates subdivision, existing background ambient noise levels are very low and less than 45 DNL.

Calculations of existing traffic noise levels during the PM peak traffic hour are presented in Table 5. The hourly Leq (or Equivalent Sound Level) contribution from each roadway section in the project environs was calculated for comparison with forecasted traffic noise levels with and without the project. The existing setback distances from the roadways' centerlines to their associated 65 and 75 DNL contours were also calculated as shown in Table 6. The contour line setback distances do not take into account noise shielding effects or the additive contributions of traffic noise from intersecting street sections. Based on the results of Table 6, it was concluded that the existing 65 DNL traffic noise contour is located approximately 175 FT from the centerline of Queen Kaahumanu Highway, and approximately 102 FT from the centerline of Mamalahoa Highway in the immediate vicinity of the project site.

Existing traffic noise levels at the interior portions of the project site are low (less than 45 DNL) due to their large setback distances from the two highways at the east and west ends of the project area. At these interior locations on the project site, aircraft noise and the natural sounds of birds and winds in foliage are the dominant noise sources. A discussion of existing aircraft noise levels on the project site is provided in the following section. Between aircraft noise events, background ambient noise levels drop to a range of 25 to 45 dB. During calm wind periods, background ambient noise levels decrease to levels less than 40 dB. The minimum background ambient noise levels at these interior locations are controlled by distant traffic and wind noise.

Aircraft Noise. Aircraft noise sources in the project environs are associated with fixed and rotary wing aircraft operations at Kona International Airport at Keahole. Figures 4 through 6 depict aircraft flight tracks in the project environs during CY 2003, which were similar to those reported in Reference 7. Occasionally, depending on weather, visibility, or air traffic conditions, helicopter and light, fixed wing aircraft may cross over the western boundary of project site as indicated by the departure and arrival tracks shown in Figures 4 and 5, respectively. The noisier jet aircraft flight tracks typically remain west of the project site and are aligned with Kona International Airport's single runway. However, large overseas jet aircraft may occasionally overfly the center

TABLE 5

EXISTING (CY 2003) TRAFFIC VOLUMES AND NOISE LEVELS ALONG VARIOUS ROADWAY SECTIONS (PM PEAK HOUR)

LOCATION	SPEED (MPH)	TOTAL VPH	********* VOLUMES (VPH) *********** AUTOS	M TRUCKS	H TRUCKS	50' Leq	100' Leq	200' Leq
Mamalahoa Hwy. - North of Entrance Rd.	45	386	366	10	10	68.5	65.2	59.1
Mamalahoa Hwy. - South of Entrance Rd.	45	398	378	10	10	68.6	65.2	59.2
Mamalahoa Hwy. - North of Kaiminani Dr.	45	980	930	25	25	72.5	69.2	63.1
Mamalahoa Hwy. - South of Kaiminani Dr.	45	1,247	1,185	31	31	73.5	70.2	64.1
Q. Kaahumanu Hwy. - N. of Entrance Rd.	65	1,387	1,317	35	35	73.8	70.4	63.7
Q. Kaahumanu Hwy. - S. of Entrance Rd.	65	1,387	1,317	35	35	73.8	70.4	63.7
Q. Kaahumanu Hwy. - N. of Airport Rd.	65	1,387	1,317	35	35	73.8	70.4	63.7
Q. Kaahumanu Hwy. - S. of Airport Rd.	65	1,622	1,540	41	41	74.6	71.1	64.4
Q. Kaahumanu Hwy. - N. of Kaiminani Dr.	65	1,614	1,534	40	40	74.5	71.1	64.4
Q. Kaahumanu Hwy. - S. of Kaiminani Dr.	65	1,611	1,531	40	40	74.5	70.0	64.3
Kaiminani Dr. - East of Q. Kaahumanu Hwy	35	681	661	17	3	65.3	61.9	55.9
Kaiminani Dr. - West of Mamalahoa Hwy.	35	565	548	14	3	64.5	61.2	55.2
Entrance Rd. - West of Mamalahoa Hwy.	35	30	29	1	0	51.4	48.4	42.1
Entrance Rd. - East of Q. Kaahumanu Hwy	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

TABLE 6

YEAR 2003 AND 2014 DISTANCES TO 65 AND 75 DNL CONTOURS (PM PEAK HOUR)

STREET SECTION	65 DNL SETBACK (FT)		75 DNL SETBACK (FT)	
	CY 2003	CY 2014	CY 2003	CY 2014
Mamalahoa Hwy. - North of Entrance Rd.	102	141	< 20	23
Mamalahoa Hwy. - South of Entrance Rd.	102	152	< 20	27
Mamalahoa Hwy. - North of Kaiminani Dr.	161	214	30	50
Mamalahoa Hwy. - South of Kaiminani Dr.	181	234	36	59
Q. Kaahumanu Hwy. - N. of Entrance Rd.	175	246	39	77
Q. Kaahumanu Hwy. - S. of Entrance Rd.	175	262	39	87
Q. Kaahumanu Hwy. - N. of Airport Rd.	175	262	39	87
Q. Kaahumanu Hwy. - S. of Airport Rd.	188	270	46	92
Q. Kaahumanu Hwy. - N. of Kaiminani Dr.	188	270	45	92
Q. Kaahumanu Hwy. - S. of Kaiminani Dr.	184	264	46	88
Kaiminani Dr. - East of Q. Kaahumanu Hwy.	53	67	< 20	< 20
Kaiminani Dr. - West of Mamalahoa Hwy.	45	57	< 20	< 20
Entrance Rd. - West of Mamalahoa Hwy.	< 20	31	< 20	< 20
Entrance Rd. - East of Q. Kaahumanu Hwy.	N/A	132	N/A	20

Notes:

(1) All setback distances are from the roadways' centerlines.
(2) See TABLE 5 for traffic volume, speed, and mix assumptions.
(3) Setback distances are for unobstructed line-of-sight conditions.

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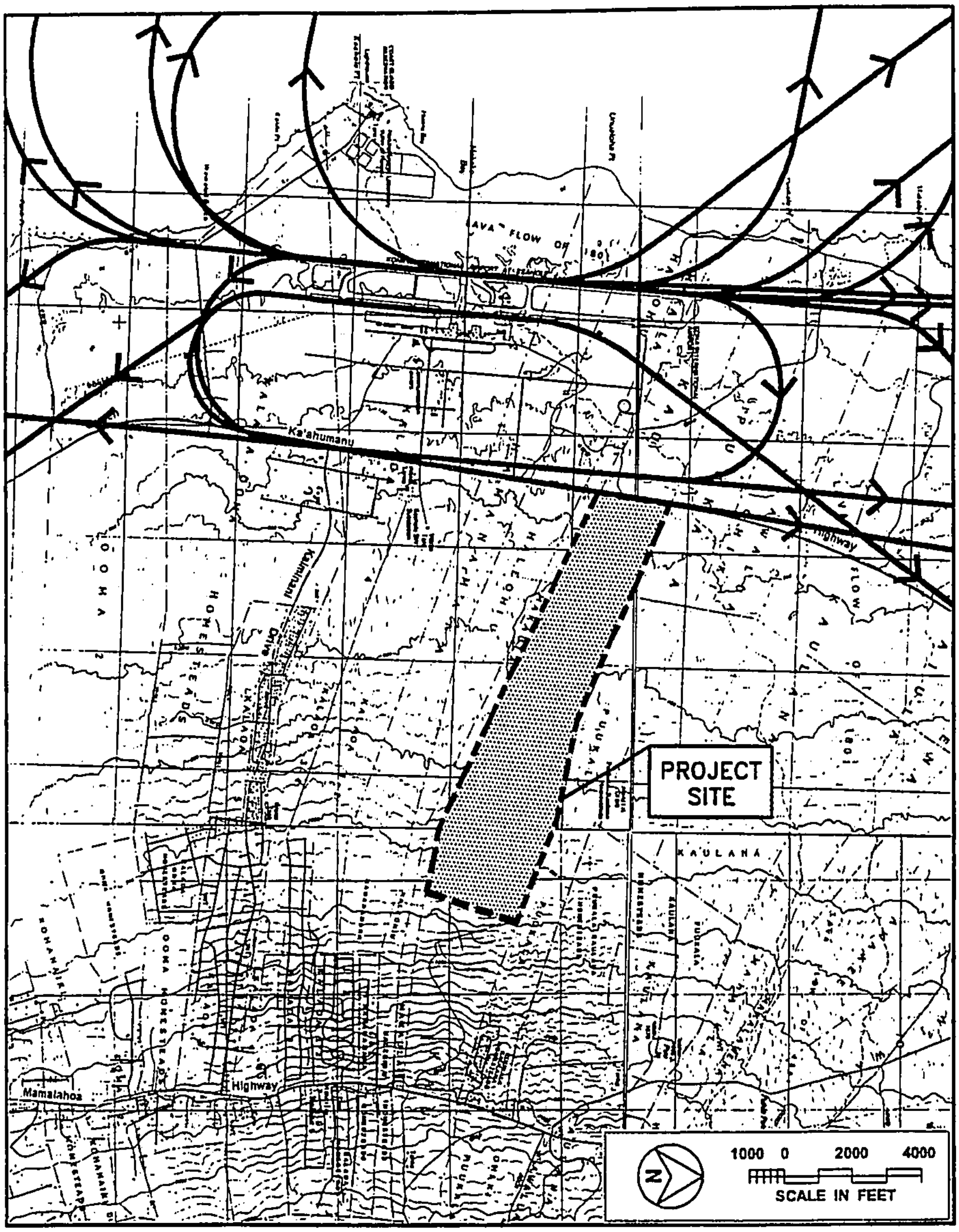

LOCATIONS OF EXISTING AVERAGE AIRCRAFT DEPARTURE FLIGHT TRACKS IN PROJECT ENVIRONS

FIGURE 4

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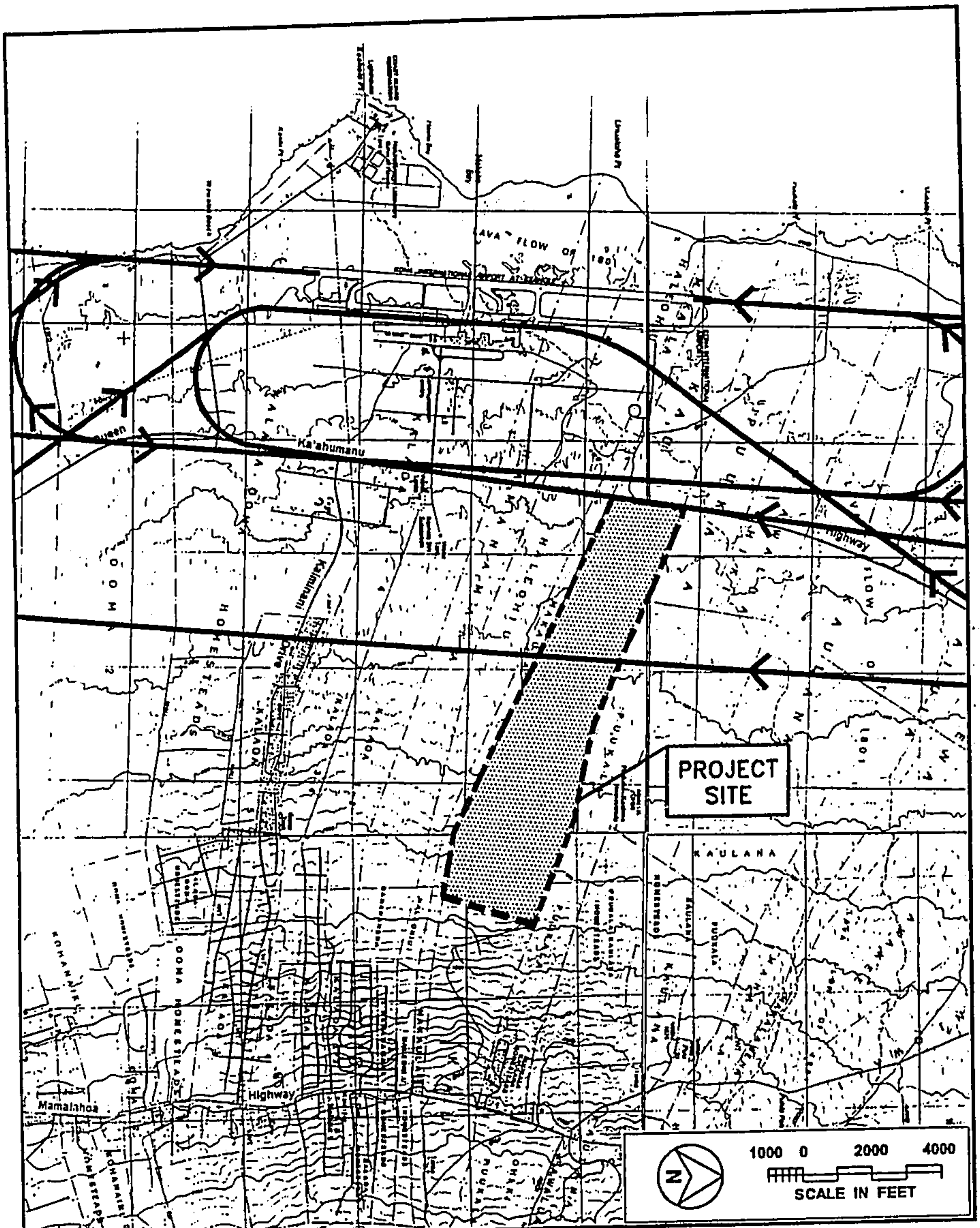

LOCATIONS OF EXISTING AVERAGE AIRCRAFT ARRIVAL FLIGHT TRACKS IN PROJECT ENVIRONS

FIGURE 5

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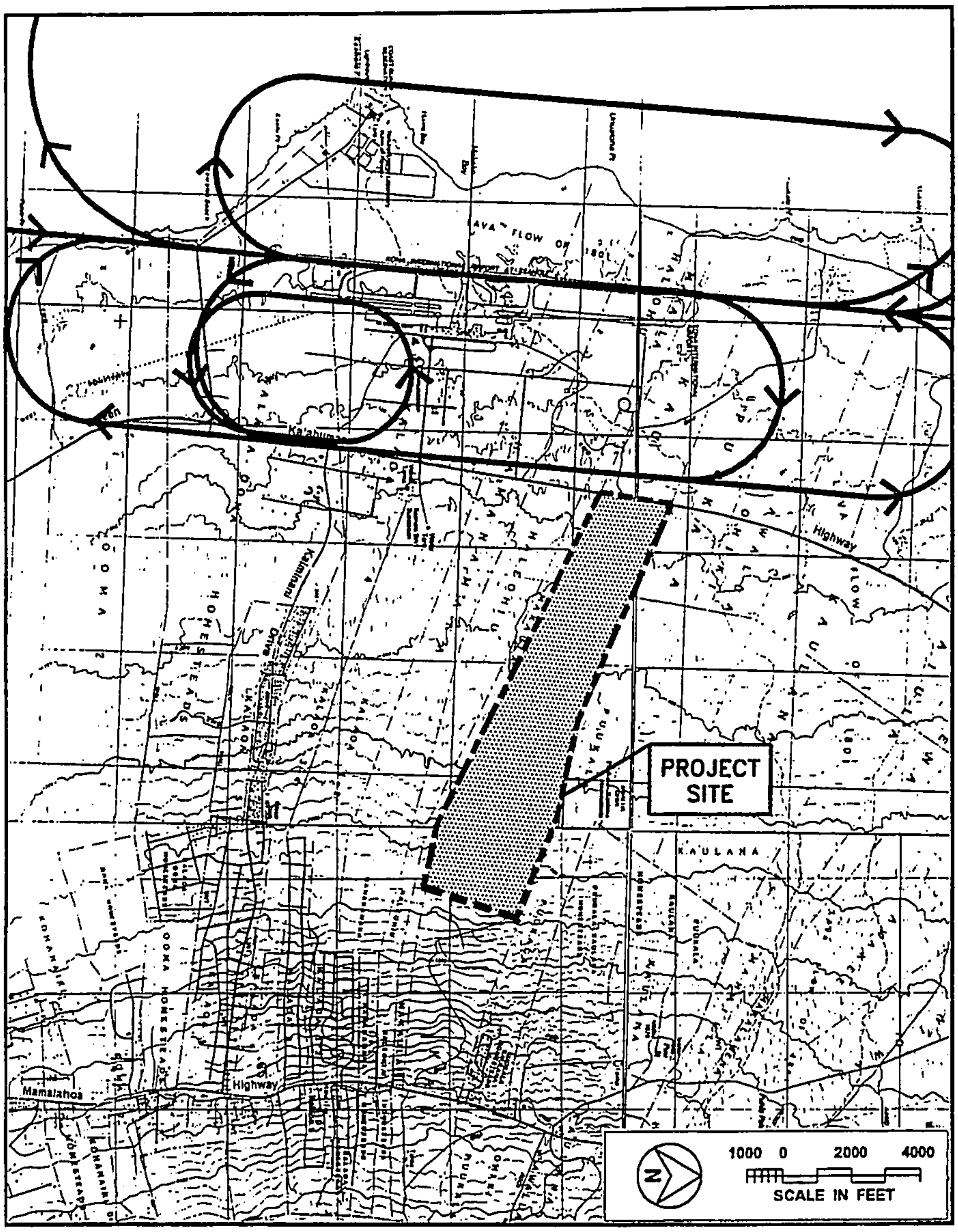

LOCATIONS OF EXISTING AVERAGE AIRCRAFT TRAINING FLIGHT TRACKS IN PROJECT ENVIRONS

FIGURE 6

of the project site where shown in Figure 5 when landing using a right hand turn during north flow pattern conditions (Runway 35 in use). This approach to the airport is used due to the presence of other aircraft traffic approaching the airport from the west.

Figure 7 depicts the locations of the 55 through 75 DNL aircraft noise contours during the CY 2001 period. These noise contours were obtained from the Kona International Airport FAR Part 150 report (Reference 7). From Figure 7, aircraft noise levels over the project site are below 55 DNL, and as such, are considered to be in the "Minimal Exposure, Unconditionally Acceptable" category for the planned land uses on the project site.

The highest, single event, aircraft noise levels over the project site will occur during north wind conditions when aircraft land from the south and depart toward the north using the airport's Runway 35. Typical maximum noise levels from the noisier B-737(200) jet aircraft are expected to range from 75 to 80 dB. The newer, and quieter B-717(200) jet aircraft are typically quieter, and less than 75 dB. Noise levels from helicopters, fixed wing air taxi, and general aviation aircraft are generally less than 70 dB. Higher noise levels of helicopter and light fixed wing aircraft which exceed 70 dB are also possible during flyovers over the project site.

Based on the most current information on aircraft noise levels operations at Kona International Airport, the location of the existing 55 DNL contour is estimated to be west of the project site as shown in Figure 7. The location of the existing 60 DNL contour is estimated to be approximately 2,000 FT west of the project site. Based on these FAR Part 150 noise contours for Kona International Airport and their relationship to the project site, it was concluded that the 60 DNL aircraft noise contour is located outside the project site, with at least 5 DNL of margin for increased contour expansion. The 55 DNL aircraft noise contour also does not cross through the project site, and has a smaller 1 DNL of margin for increased contour expansion. Based on these airport noise contours in the project environs, it was concluded that special aircraft noise mitigation measures are not required, and existing aircraft noise levels do not place special development constraints on the project site.

Generating Station Noise. A possible noise source in the project environs is the Keahole Generating Station, which is operated by Hawaii Electric Light Company, Inc. (HELCO). The location of the generating station is approximately 5,000 FT south of the project site as shown in Figure 1. Six 2.5 megawatt diesel generators and one 14 megawatt combustion turbine generator operate at the generating station. The combustion turbine unit was installed with a silencer package to minimize its noise emissions, and the diesel generators were also silenced with exhaust mufflers.

Predicted worst case noise level from the generating station with all six diesel sets and combustion turbine unit on-line is approximately 38 dBA at the project's south boundary line. This worst case level of noise is considered to be very low, and should not cause adverse noise impacts at the project site.

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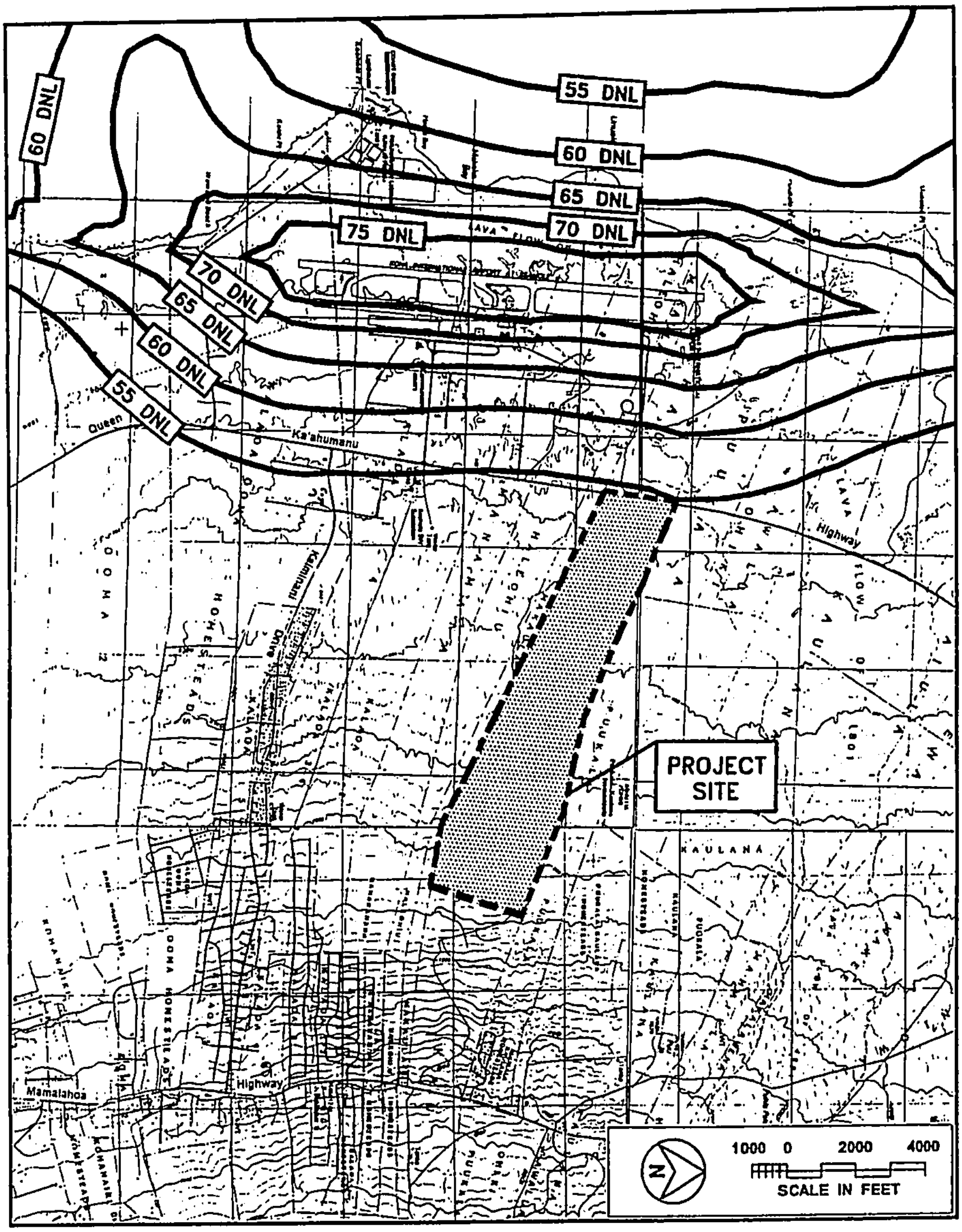

LOCATIONS OF CY 2001 AIRCRAFT NOISE CONTOURS FROM FAR PART 150 REPORT

FIGURE 7

CHAPTER VI. FUTURE NOISE ENVIRONMENT

Traffic Noise. Predictions of future traffic noise levels were made using the traffic volume assignments of Reference 9 for CY 2014 with and without the proposed project. The future assignments of project plus non-project traffic on the roadway sections which would service the project are shown in Table 7 for the PM peak hour of traffic for the northern project access road option, which is expected to produce the highest traffic noise levels along Queen Kaahumanu Highway. As indicated in Table 8, by CY 2014 and following complete project build-out, traffic noise levels on Queen Kaahumanu Highway in the areas fronting the project are predicted to increase by 3.3 to 3.9 DNL. Along Mamalahoa Highway, traffic noise levels are predicted to increase by 2.3 to 3.5 DNL. South of the project, and along Kaiminani Drive, traffic noise levels are predicted to increase by 1.1 to 1.2 DNL. This range of increases in traffic noise levels from 1.1 to 3.9 DNL is considered to be low to moderate, and reflects the growth in forecasted project and non-project traffic in the project environs by CY 2014.

Table 6 summarizes the predicted increases in the future setback distances to the 65 and 75 DNL traffic noise contour lines along the roadways in the project environs and attributable to both project plus non-project traffic in CY 2014. The setback distances in Table 6 do not include the beneficial effects of noise shielding from terrain features and highway cuts, or the detrimental effects of additive contributions of noise from intersecting streets. As indicated in Table 6, the setback distances to the 65 DNL contour are predicted to range from 246 to 270 FT from the centerline of Queen Kaahumanu Highway following project build-out in CY 2014. Along Mamalahoa Highway, setback distances to the 65 DNL contour are predicted to range from 141 to 234 FT from the centerline of Mamalahoa Highway. Along Kaiminani Drive and the project's future East/West connector road, setback distances to the 65 DNL contour are expected to range from 31 to 132 FT.

Table 8 presents the predicted increases in traffic noise levels associated with non-project and project traffic by CY 2014, and as measured by the Leq or DNL descriptor systems. As indicated in Table 8, the increases in traffic noise along Queen Kaahumanu Highway due to project traffic are slightly greater than those resulting from non-project traffic. Along Mamalahoa Highway, project traffic noise contributions are expected to be less than non-project traffic noise contributions by CY 2014. Along Kaiminani Drive, project traffic is expected to increase traffic noise levels above those associated with non-project traffic by 1.1 DNL. The largest increases in traffic noise levels attributable to project traffic are expected to occur along the project's entrance roads at Queen Kaahumanu Highway and Mamalahoa Highway. Overall, the increases in noise levels associated with project traffic are expected to be manageable along Queen Kaahumanu and Mamalahoa Highways, and are expected to be similar to those associated with non-project traffic.

Aircraft Noise. The aircraft noise contours in the project environs for the CY 2010 and 2020 periods were developed during the most recent Master Plan and FAR

TABLE 7

FUTURE (CY 2014) TRAFFIC VOLUMES AND NOISE LEVELS ALONG VARIOUS ROADWAY SECTIONS (PM PEAK HOUR, WITH PROJECT)

LOCATION	SPEED (MPH)	TOTAL VPH	********* VOLUMES (VPH) *********** AUTOS	M TRUCKS	H TRUCKS	50' Leq	100' Leq	200' Leq
Mamalahoa Hwy. - North of Entrance Rd.	45	740	702	19	19	71.3	68.0	61.9
Mamalahoa Hwy. - South of Entrance Rd.	45	880	836	22	22	72.0	68.7	62.6
Mamalahoa Hwy. - North of Kaiminani Dr.	45	1,740	1,652	44	44	75.0	71.7	65.6
Mamalahoa Hwy. - South of Kaiminani Dr.	45	2,110	2,004	53	53	75.8	72.5	66.4
Q. Kaahumanu Hwy. - N. of Entrance Rd.	65	2,975	2,827	74	74	77.2	73.7	67.0
Q. Kaahumanu Hwy. - S. of Entrance Rd.	65	3,380	3,210	85	85	77.7	74.3	67.6
Q. Kaahumanu Hwy. - N. of Airport Rd.	65	3,380	3,210	85	85	77.7	74.3	67.6
Q. Kaahumanu Hwy. - S. of Airport Rd.	65	3,615	3,435	90	90	78.0	74.6	67.9
Q. Kaahumanu Hwy. - N. of Kaiminani Dr.	65	3,629	3,447	91	91	78.1	74.6	67.9
Q. Kaahumanu Hwy. - S. of Kaiminani Dr.	65	3,439	3,267	86	86	77.8	74.4	67.7
Kaiminani Dr. - East of Q. Kaahumanu Hwy	35	880	854	22	4	66.4	63.1	57.0
Kaiminani Dr. - West of Mamalahoa Hwy.	35	720	698	18	4	65.6	62.3	56.3
Entrance Rd. - West of Mamalahoa Hwy.	35	380	368	10	2	62.8	59.5	53.5
Entrance Rd. - East of Q. Kaahumanu Hwy.	35	2,025	1,964	51	10	70.7	67.4	61.4

TABLE 8

CALCULATIONS OF PROJECT AND NON-PROJECT TRAFFIC NOISE CONTRIBUTIONS (CY 2014) (PM PEAK HOUR)

STREET SECTION	NOISE LEVEL (DB) INCREASE DUE TO: NON-PROJECT TRAFFIC	PROJECT TRAFFIC
Mamalahoa Hwy. - North of Entrance Rd.	2.2	0.6
Mamalahoa Hwy. - South of Entrance Rd.	2.5	1.0
Mamalahoa Hwy. - North of Kaiminani Dr.	1.9	0.6
Mamalahoa Hwy. - South of Kaiminani Dr.	1.7	0.6
Q. Kaahumanu Hwy. - N. of Entrance Rd.	1.8	1.5
Q. Kaahumanu Hwy. - S. of Entrance Rd.	1.8	2.1
Q. Kaahumanu Hwy. - N. of Airport Rd.	1.8	2.1
Q. Kaahumanu Hwy. - S. of Airport Rd.	1.7	1.8
Q. Kaahumanu Hwy. - N. of Kaiminani Dr.	1.7	1.8
Q. Kaahumanu Hwy. - S. of Kaiminani Dr.	2.8	1.6
Kaiminani Dr. - East of Q. Kaahumanu Hwy.	0.1	1.1
Kaiminani Dr. - West of Mamalahoa Hwy.	0.0	1.1
Entrance Rd. - West of Mamalahoa Hwy.	6.5	4.6
Entrance Rd. - East of Q. Kaahumanu Hwy.	0.0	67.4

Part 150 Study Updates for Kona International Airport at Keahole. These airport noise contours are shown in Figures 8 and 9. These noise contours may overstate the forecasted aircraft noise levels since they do not include the 100 percent replacement of the noisier DC-9(50) aircraft by the quieter B-717(200) aircraft by Hawaiian Airlines. Nevertheless, the forecasted 2010 and 2020 airport noise contours are expected to remain outside the project area. Based on the relationships of the project site to the forecasted airport noise contours shown in Figures 8 and 9, it was concluded that risks of adverse noise impacts from aircraft noise should be minimal at the project site.

The available forecasts for aircraft noise over the project site indicate that the 55 and 60 DNL contours *will not extend into the project site by CY 2010 or 2020* (see Figures 8 and 9). Therefore, unless significant changes occur in the operational activity and forecasts for Kona International Airport at Keahole, the project site is expected to remain outside the 55 and 60 DNL aircraft noise contours through the CY 2020 time period.

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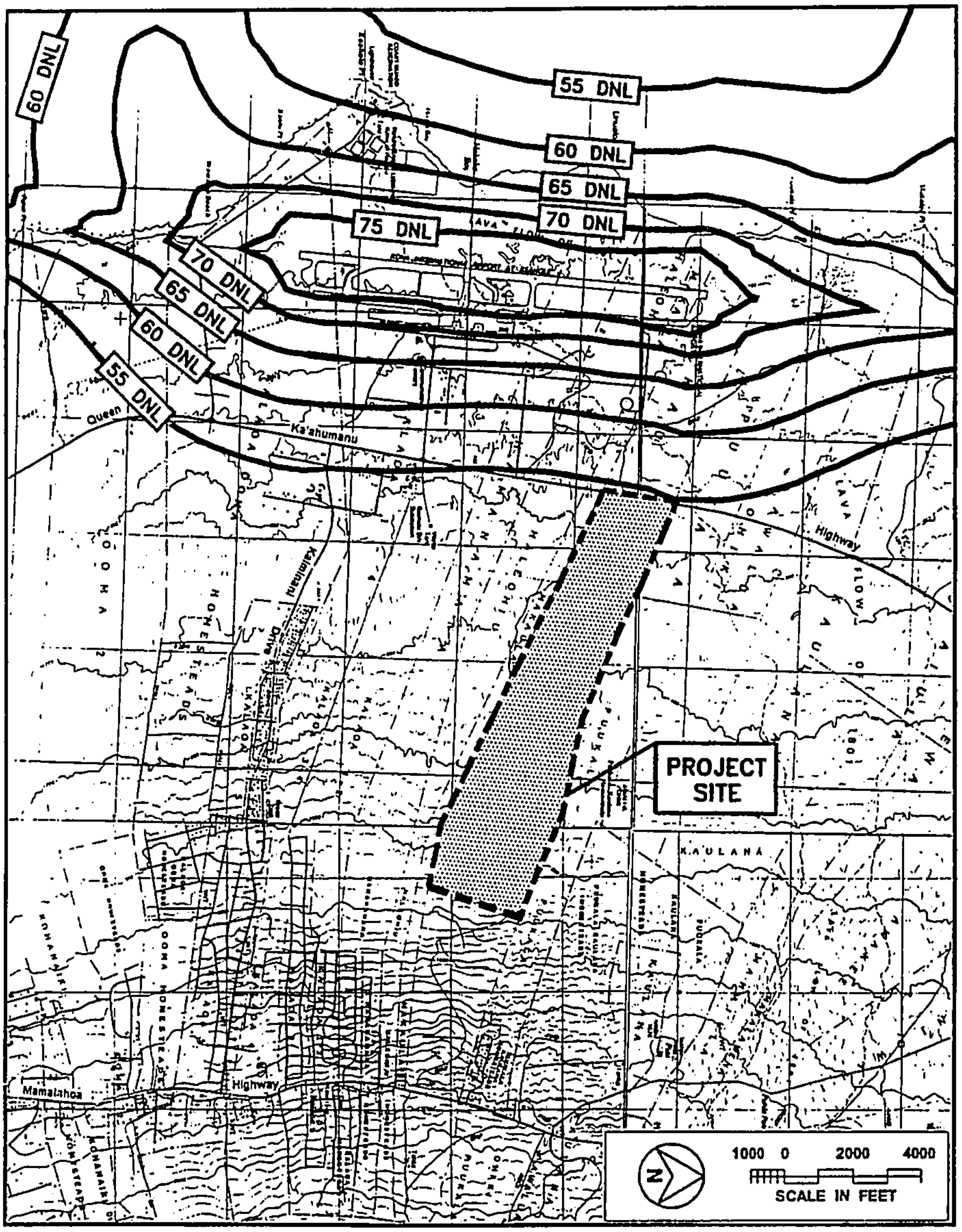

LOCATIONS OF CY 2010 AIRCRAFT NOISE CONTOURS (KONA INTERNATIONAL AIRPORT)

FIGURE 8

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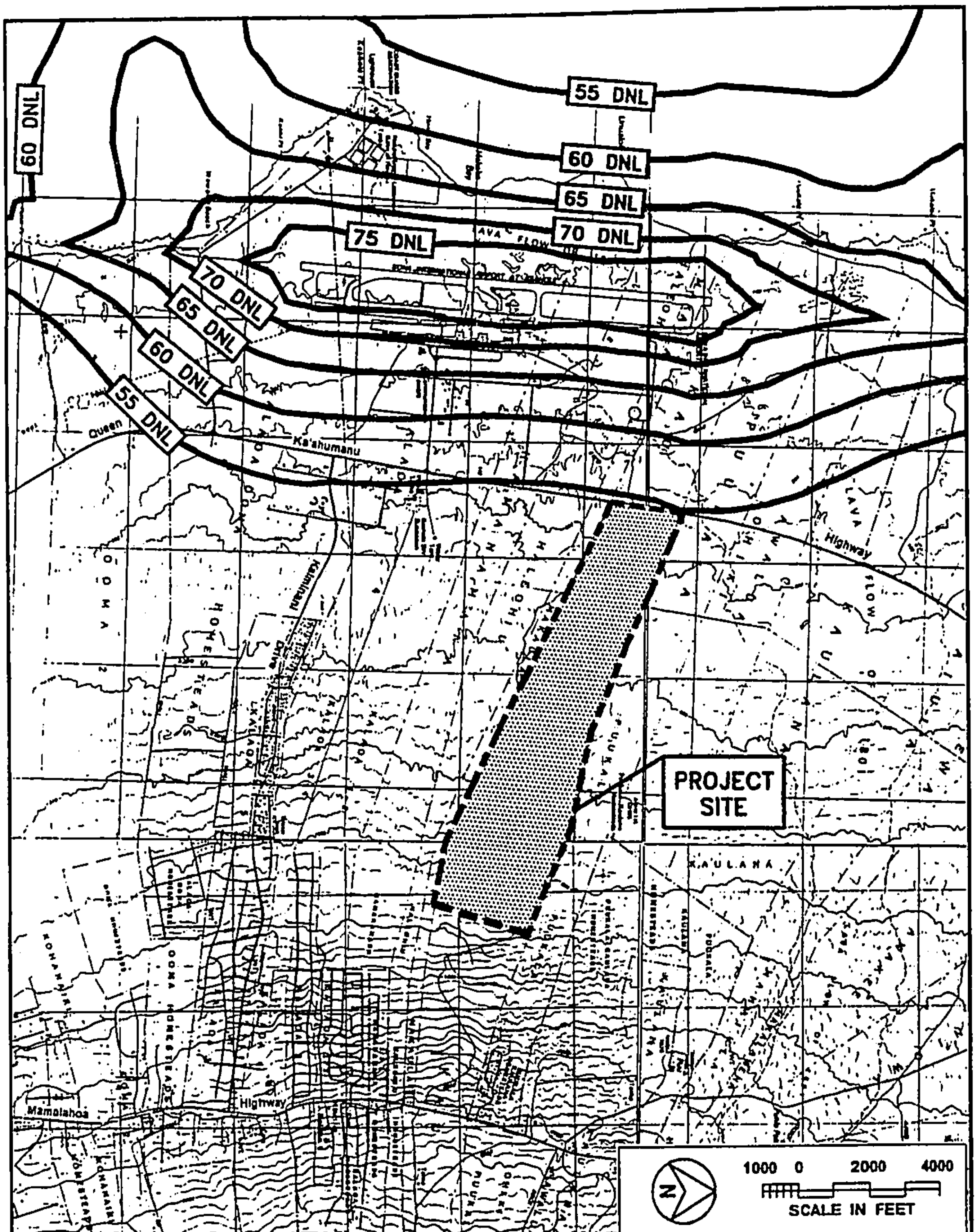


LOCATIONS OF CY 2020 AIRCRAFT NOISE CONTOURS (KONA INTERNATIONAL AIRPORT)

FIGURE 9

CHAPTER VII. DISCUSSION OF PROJECT RELATED NOISE IMPACTS AND POSSIBLE NOISE MITIGATION MEASURES

Traffic Noise. The increases in traffic noise levels attributable to the project from the present to CY 2014 are predicted to range from 1.5 to 2.1 DNL along Queen Kaahumanu Highway, where traffic noise levels are expected to be above 65 DNL along the highway Right-of-Way. These increases in traffic noise levels along Queen Kaahumanu Highway which are attributable to the project are considered to be in the moderate category, and are only slightly higher than the traffic noise increases expected as a result of non-project traffic. In addition, the lands along the highway Right-of-Way are generally vacant in the project environs. For these reasons, traffic noise impacts along Queen Kaahumanu Highway and resulting from project traffic are not considered to be serious. However, setback distances to the 65 DNL contour are expected to increase as a result of both project and non-project traffic.

Relatively small increases (less than 1.0 DNL) in traffic noise levels along the north sections of Mamalahoa Highway are expected to occur as a result of the proposed project. By CY 2014, project traffic is expected to increase traffic noise levels along the north sections of Mamalahoa Highway by approximately 0.6 DNL. This level of increase is not considered significant, and traffic noise impacts resulting from project traffic along these sections of the highway are not expected to occur.

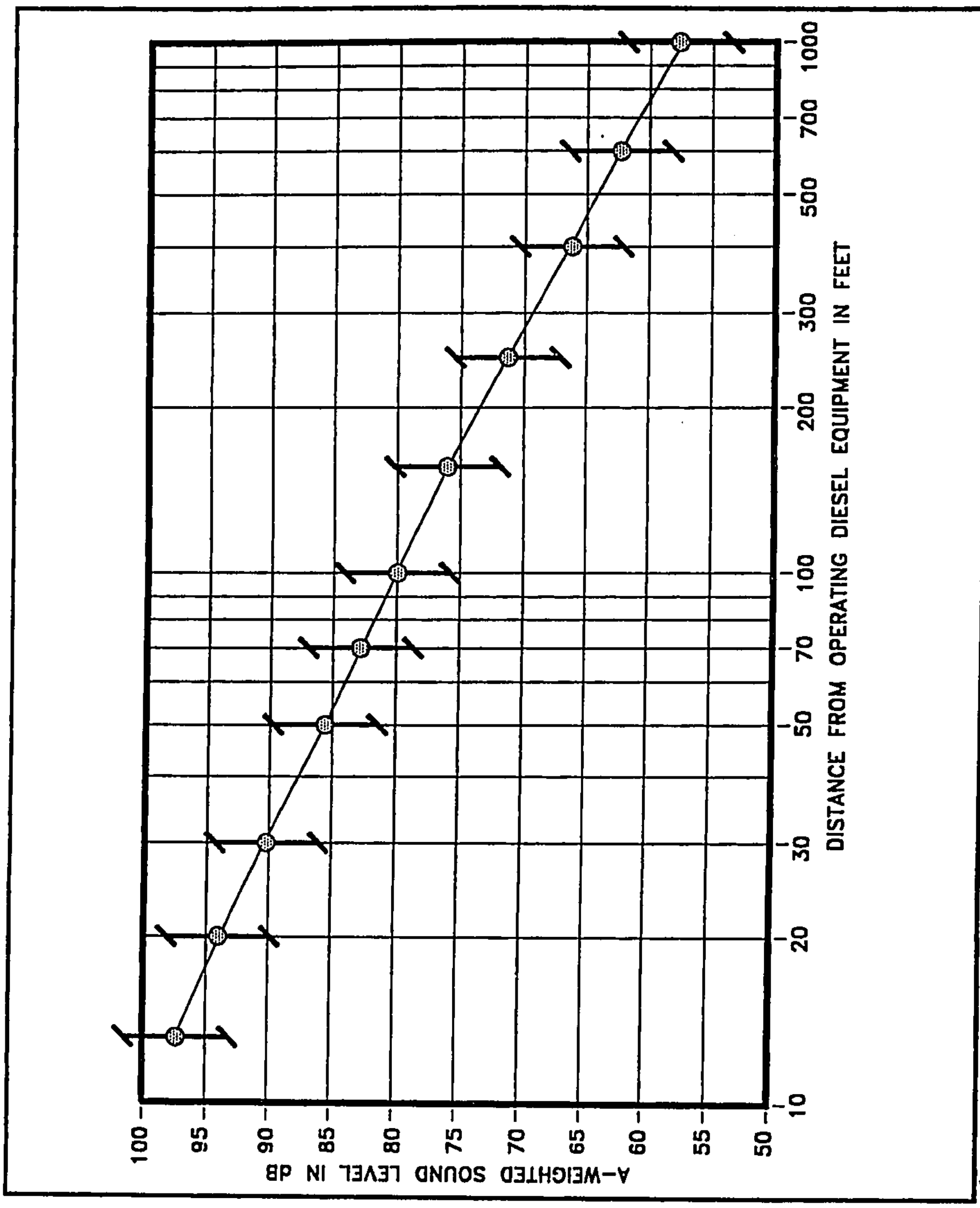
Along the south sections of Mamalahoa Highway, potential noise impacts from project and non-project traffic are possible, both in respect to existing and planned noise sensitive receptors along these roadways. Existing and future residences which are located along the sections of Mamalahoa Highway south of the project's entrance road may be impacted by the future traffic noise along the highway if their setback distances from the highway centerline are less than 152 FT. Because traffic noise along public roadways such as Mamalahoa Highway 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 65 DNL noise contour are not available, the construction of 6 FT 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 FT high sound attenuation walls which are located along the west highway Right-of-Way should be effective for traffic noise mitigation.

Aircraft Noise. Based on currently available existing and forecasted aircraft noise contours over the project site, special aircraft noise attenuation measures are not considered mandatory on the project site. The implementation of the airport noise disclosure provisions of Act 208 is not required because the existing and forecasted 55 DNL noise contours do not enter into the project area.

Combined Traffic and Aircraft Noise. When applying for FHA/HUD financial assistance on residential developments, sound attenuation measures are normally required if total exterior noise levels exceed 65 DNL. Traffic noise levels may exceed 65 DNL along the highway corridors and major thoroughfares which service the project. If the traffic noise level equals 65 DNL and the aircraft noise level equals 60 DNL at a project dwelling, the total noise level will be 66 DNL, which exceeds the FHA/HUD standard of 65 DNL. However, existing and forecasted aircraft noise levels over the project site should not exceed 55 DNL. Under these more favorable conditions with aircraft noise levels less than 55 DNL, combined traffic and aircraft noise levels should not exceed 65 DNL when traffic noise levels are less than 65 DNL. Where traffic noise levels exceed 65 DNL, the combined noise levels will be identical to the traffic noise levels and will not be dependent upon the levels of aircraft noise, as long as aircraft noise levels remain at least 10 DNL units below the traffic noise levels.

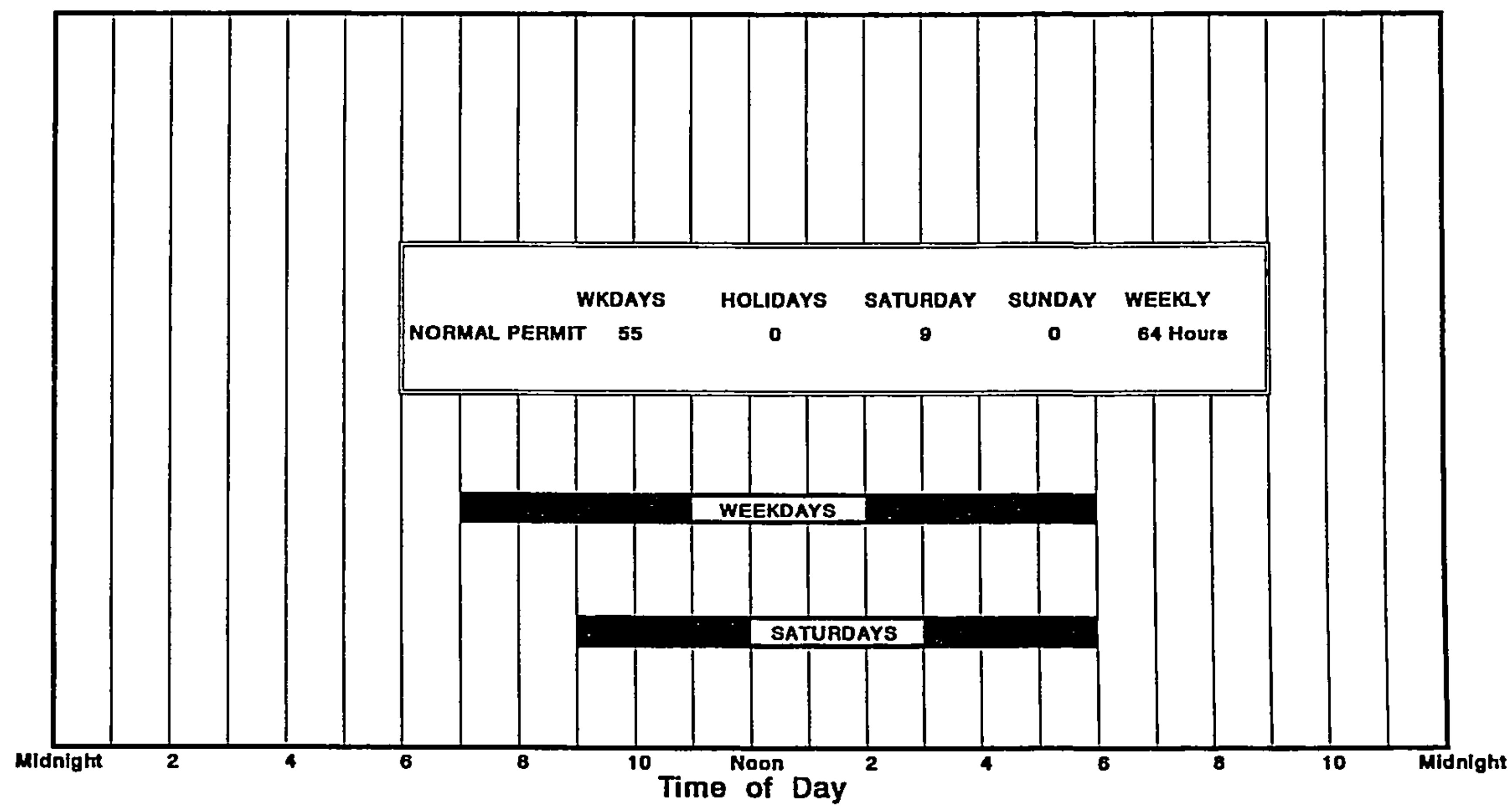
Construction Noise. Audible construction noise will probably be unavoidable during the entire project construction period. The total time period for construction is unknown, but it is anticipated that the actual work will be moving from one location on the project site to another during that period. Actual length of exposure to construction noise at any receptor location will probably be less than the total construction period for the entire project. Typical levels of noise from construction activity (excluding pile driving activity) are shown in Figure 10. The noise sensitive properties which are predicted to experience the highest noise levels during construction activities on the project site are the existing residences along the project entrance road near the eastern end of the project site. 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.

Mitigation of construction noise to inaudible levels will not be practical in all cases due to the intensity of construction noise sources (80 to 90+ dB at 50 FT distance), and due to the exterior nature of the work (grading and earth moving, trenching, concrete pouring, hammering, etc.). The use of properly muffled construction equipment should be required on the job site. The incorporation of State Department of Health construction noise limits and curfew times, which are applicable on the island of Hawaii (Reference 6), is another noise mitigation measure which can be applied to this project. Figure 11 depicts the normally permitted hours of construction for normal construction noise as well as the curfew periods for construction noise. Noisy construction activities are not allowed on on Sundays and holidays under the DOH permit procedures.



ANTICIPATED RANGE OF CONSTRUCTION NOISE LEVELS VS. DISTANCE

FIGURE 10



AVAILABLE WORK HOURS UNDER DOH PERMIT PROCEDURES FOR CONSTRUCTION NOISE

FIGURE 11

APPENDIX A. REFERENCES

(1) "Guidelines for Considering Noise in Land Use Planning and Control;" Federal Interagency Committee on Urban Noise; June 1980.

(2) American National Standard, "Sound Level Descriptors for Determination of Compatible Land Use," ANSI S12.9-1998/ Part 5; Acoustical Society of America.

(3) "Environmental Criteria and Standards, Noise Abatement and Control, 24 CFR, Part 51, Subpart B;" U.S. Department of Housing and Urban Development; July 12, 1979.

(4) "Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety;" U.S. Environmental Protection Agency; EPA 550/9-74- 004; March 1974.

(5) "Mandatory Seller Disclosures in Real Estate Transactions;" Chapter 508D, Hawaii Revised Statutes; July 1, 1996.

(6) "Title 11, Administrative Rules, Chapter 46, Community Noise Control;" Hawaii State Department of Health; September 23, 1996.

(7) "FAR Part 150 Noise Compatibility Program Report; Kona International Airport At Keahole" State Department of Transportation, Airports Division; December 1997.

(8) "FHWA Highway Traffic Noise Model User's Guide;" FHWA-PD-96-009, Federal Highway Administration; Washington, D.C.; January 1998 and Version 2.1 User's Guide (Addendum) of March 2003.

(9) "Traffic Impact Analysis Report; Palamanui Project;" Austin, Tsutumi & Associates, Inc.; January 27, 2004.

(10) 24-Hour Traffic Counts, Station 8-P, Queen Kaahumanu Highway at Keahole Airport Road; State Department of Transportation; June 3, 2002.

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 2003 ***** AM VPH	PM VPH	CY 2014 (NO BUILD) AM VPH	PM VPH	CY 2014 (BUILD) AM VPH	PM VPH
Mamalahoa Hwy. - North of Entrance Rd. (NB)	188	202	325	340	340	385
Mamalahoa Hwy. - North of Entrance Rd. (SB)	216	184	355	315	390	355
Two-Way	404	386	680	655	730	740
Mamalahoa Hwy. - South of Entrance Rd. (NB)	191	207	325	370	425	495
Mamalahoa Hwy. - South of Entrance Rd. (SB)	223	191	400	330	420	385
Two-Way	414	398	725	700	845	880
Mamalahoa Hwy. - North of Kaiminani Dr. (NB)	315	582	505	915	615	1,040
Mamalahoa Hwy. - North of Kaiminani Dr. (SB)	767	398	1,235	645	1,255	700
Two-Way	1,082	980	1,740	1,560	1,870	1,740
Mamalahoa Hwy. - South of Kaiminani Dr. (NB)	409	604	600	940	690	1,045
Mamalahoa Hwy. - South of Kaiminani Dr. (SB)	930	643	1,400	890	1,465	1,065
Two-Way	1,339	1,247	2,000	1,830	2,155	2,110
Q. Kaahumanu Hwy. - N. of Entrance Rd. (NB)	576	507	910	765	1,105	1,210
Q. Kaahumanu Hwy. - N. of Entrance Rd. (SB)	411	880	625	1,400	920	1,765
Two-Way	987	1,387	1,535	2,165	2,025	2,975
Q. Kaahumanu Hwy. - S. of Entrance Rd. (NB)	576	507	910	765	1,355	1,315
Q. Kaahumanu Hwy. - S. of Entrance Rd. (SB)	411	880	625	1,400	915	2,065
Two-Way	987	1,387	1,535	2,165	2,270	3,380
Q. Kaahumanu Hwy. - North of Airport Rd. (NB)	576	507	910	765	1,355	1,315
Q. Kaahumanu Hwy. - North of Airport Rd. (SB)	411	880	625	1,400	915	2,065
Two-Way	987	1,387	1,535	2,165	2,270	3,380
Q. Kaahumanu Hwy. - South of Airport Rd. (NB)	798	547	1,135	805	1,580	1,355
Q. Kaahumanu Hwy. - South of Airport Rd. (SB)	421	1,075	635	1,595	925	2,260
Two-Way	1,219	1,622	1,770	2,400	2,505	3,615
Q. Kaahumanu Hwy. - N. of Kaiminani Dr. (NB)	819	542	1,210	855	1,660	1,404
Q. Kaahumanu Hwy. - N. of Kaiminani Dr. (SB)	437	1,072	690	1,560	980	2,225
Two-Way	1,256	1,614	1,900	2,415	2,640	3,629
Q. Kaahumanu Hwy. - S. of Kaiminani Dr. (NB)	695	725	1,090	1,040	1,515	1,559
Q. Kaahumanu Hwy. - S. of Kaiminani Dr. (SB)	643	886	900	1,375	1,120	1,880
Two-Way	1,338	1,611	1,990	2,415	2,635	3,439

APPENDIX C (CONTINUED)

SUMMARY OF BASE YEAR AND FUTURE YEAR
TRAFFIC VOLUMES

ROADWAY LANES	**** CY 2003 *****		CY 2014 (NO BUILD)		CY 2014 (BUILD)	
	AM VPH	PM VPH	AM VPH	PM VPH	AM VPH	PM VPH
Kaiminani Dr. - E. of Q. Kaahumanu Hwy. (WB)	436	156	440	160	465	190
Kaiminani Dr. - E. of Q. Kaahumanu Hwy. (EB)	106	525	110	530	180	690
Two-Way	542	681	550	690	645	880
Kaiminani Dr. - West of Mamalahoa Hwy. (WB)	212	171	215	175	215	180
Kaiminani Dr. - West of Mamalahoa Hwy. (EB)	281	394	285	395	350	540
Two-Way	493	565	500	570	565	720
Entrance Rd. - West of Mamalahoa Hwy. (WB)	7	14	25	65	160	230
Entrance Rd. - West of Mamalahoa Hwy. (EB)	11	16	70	60	105	150
Two-Way	18	30	95	125	265	380
Entrance Rd. - E. of Q. Kaahumanu Hwy. (WB)	N/A	N/A	N/A	N/A	485	1,110
Entrance Rd. - E. of Q. Kaahumanu Hwy. (EB)	N/A	N/A	N/A	N/A	740	915
Two-Way	N/A	N/A	N/A	N/A	1,225	2,025

Appendix H
Soil Report

Lands of Kau- (North Kona)
Soil Report

By Yusuf N. Tamimi, Ph.D.
(Professor Emeritus of Soil Science)
University of Hawaii at Manoa

Lands of Kau is located immediately above the Kona-Keahole Air Port and extends in a makai-mauka pattern starting at about 200 foot elevation to just below Makalei Estates Subdivision, at an elevation of nearly 1000 feet. The area is composed of about 725 acres of vacant land. This report is based on first hand on-site visits by this investigator on three separate times; twice traversing it from makai to mauka and once from mauka to makai. Observations on several locations along and radiating from a "field road" were recorded, describing the soils, their depth and apparent properties, nature of the terrain, slope, elevation and existing vegetation. Photographs were also taken for documentation. Several sources of information on soils classification, (Soil Survey, Island of Hawaii) land use studies, and report on Agricultural Lands of Importance in the State of Hawaii (ALISH), were also consulted.

Based on soil types, rainfall patterns and the associated plant species, this parcel of the Lands of Kau can be broadly divided into three distinct sections: A. Upper Area, B. Middle Area, and C. Lower Area

A. Upper Area:

This area appears to have been previously cleared. According to the Soil Survey of Island of Hawaii by Sato et al (1973), the upper area is dominated by Punaluu soil series (extremely rocky peat [rPYD] 6-20% slope) with pockets of Kaimu soil series (extremely stony peat [rKED] 6-20% slope) and Pahoehoe land with some weathered volcanic ash and organic residues, which accumulated in low spots. Pockets of lava flows of A'a [rLV] are also observed in this area.

Apparently, the rainfall is sufficient to support the existing biomass, which consists of few tree species, shrubs and some grasses (See picture No.1). This includes ohia, silk oak, mamane, Christmas berry, koa haole, noni, ilima, fountain grass and other unidentified species.

Picture No. 1

Representative area of Section A (Upper Area) of Lands of Kau

Part of this section can be utilized as seasonal pasture with very low animal carrying capacity, (possibly 20 acres/head.). If it is to be developed into productive pasture, it requires establishing fences, developing a reliable and adequate source of water as well as constructing internal roads and livestock watering system and improving the grazing forage species. These investments may not be financially rewarding due to the expected high cost of land renovation as well as the marginal production capabilities of such land due to the very shallow soil and the seasonality of rainfall.

B. Middle Area:

This middle portion, which appears to receive lower rainfall, is dominated by Pahoehoe lava flows [rLW] and Punaluu soil series [rPYD] with pockets of A' a Lava flows [rLV]. The terrain is very rough and inhospitable (Sea picture No.2). A'a lava flows with jagged and clinker rocks with very sharp edges make it dangerous to traverse. The biomass in this section is much less than the upper area. Very few scrubby ohia trees, some cactus, noni, koa haole, fountain grass and few shrubs are found here.

Picture No.2

Representative area of Section B (Middle Area) of Lands of Kau

this section unsuitable for any traditional farming.

C. Lower Area:

As we move down the slope rainfall seems to decrease and the A'a [rLV] and Pahoehoe [rLW] flows dominate the "soil" picture. In this section the rock formations are very rugged, jagged and hard to traverse. Rocky gulches and bare small rocky hills are common to this section. The diversity of plant species here is extremely limited. This may be due to the insufficient rainfall as well as the absence of fine soil material and organic residue, which can store moisture, essential for sustaining plant growth. Most of this section is void of vegetation, but where it exists, fountain grass, few rattlebox, some scrubby koa haole and very few ohia trees are found (Sea picture No. 3)

Picture No. 3

Representative area of Section C (Lower Area) of Lands of Kau

Similar to the above Section B, the lack of soil, the rough and un-even terrain and the low rainfall render this section also unfit for any traditional farming.

General Land Use Classifications:

Two published reports on land use for the State of Hawaii were utilized in this report. One by the University of Hawaii Land Study Bureau: *Detailed Lands Classification – Island of Hawaii (L.S. Bulletin No. 6)* and the other by the

Department of Agriculture of the State of Hawaii: *Agricultural Lands of Importance in the State of Hawaii (ALISH).* [See Appendixes 2 and 3]. According to the Land Study Bureau (Maps No. 1, 5 and 11 not attached) the agricultural productivity rating of this parcel of the Lands of Kau (1000 ft. elevation and lower) was designated as class E, which is a classification given to land with very poor productivity, (see description of classes in Appendix 2). As for the ALISH report, practically all of the land in this parcel was designated to have no agricultural importance. [See ALISH relevant maps and photos in Appendix 3]. Detailed maps in the ALISH report consist of lands of agricultural importance, while maps of several sections, which were classified to have no agricultural significance, were not published in the report (assumingly, to save on expenses). All of the Lands of Kau below the 1000-foot elevation fell in this category, so the attached detailed ALISH map includes only a small section of the land below 1000-foot elevation (see maps in Appendix 3).

Conclusion:

Results of the investigation of the suitability (or lack of it) of the Lands of Kau for agricultural use revealed the following:

1. There is no adequate soil in all of the area, and there is a complete absence of cultivable land in all portions of this parcel.
2. Rainfall appears to be marginal at the upper area and very inadequate to sustain agriculture in the middle and lower sections.
3. The dominantly rocky nature of this area makes it nearly impossible to develop into an economically viable agricultural land without huge investments to provide adequate and reliable water resources and a functional water distribution system as well as complete reshaping of

the landmass, and establishment of suitable roads. The expected high cost of developing such amenities and the uncertainties of profitable returns on such investment may preclude such considerations.

4. Since 1989 when the present owners purchased this land parcel, no agricultural activities were attempted, possibly due to the expected economic futility of such an effort.
5. It is apparent that since this land parcel, as is, appears to have no economic agricultural production capabilities, removing it from its classification as Agricultural Land will have no effect on the agricultural industry of the State of Hawaii.

Appendix -1

References:

1) Soil Survey of Island of Hawaii, State of Hawaii, 1973

By H.H. Sato, W. Ikeda, P. Paeth, R. Smythe, and M. Takahiro, Jr.

United States Department of Agriculture, Soil Conservation Service. In Cooperation with the University of Hawaii Agriculture Experiment Station

Soil Series found on site

From Sato et. al.

Symbol:	Description (soil series)
rLV :	A'a lava flows
rLW:	Pahoehoe lava flows
rPYD:	Punaluu, Extremely rocky peat (6-20 % slope) Well-drained organic soil over A'a lava. It occurs on elevations 0-1000 ft. Mean annual rainfall from 40-60 inches. General vegetation includes guava, guinea grass, and lantana, Christmas berry, not suitable for cultivation. (Sato et. Al. page 48)
rKED:	Kaimu, extremely stony peat (6-20 % slope) Well-drained organic soils over Pahoehoe lava. Elevation range from sea level to 1000 ft. Mean annual rainfall: 60-90 inches.. Vegetation includes koa haole, Christmas berry, guinea grass, natal redtop, sand burr. Used for pasture. (Sato et. Al.Page 22)

Appendix - 2

2) Detailed Land Classification – Island of Hawaii, 1965:

By: H. L. Baker, T. Sahara, T. M. Ryan, Jr., E. T Murabayashi, Jr., A. Y. Ching, Jr., F. N. Fujimura, Jr., and I. Kuwahara, Jr.,

Land Study Bureau, University of Hawaii, Honolulu, Hawaii

L. S. Bulletin No. 6, November 1965

Agricultural Land Suitability Classes:

This is based on agricultural productivity ratings (page 45):

A. Very Good

B. Good

C. Fair

D. Poor

E. Very Poor

Appendix - 3

3) Agricultural Lands of Importance in the State of Hawaii (ALISH) –Island of Hawaii (1977)

Department of Agriculture,

State of Hawaii

The ALISH report characterized the Agricultural lands in the State of Hawaii according to their importance as follows:

Prime Agricultural Land:

Land, which has the soil quality, growing season and moisture supply needed to produce sustained high yields of crops economically when treated and managed according to modern farming.

Unique Agricultural Land:

Land that has the special combination of soil quality, location, growing season, and moisture supply and is used to produce sustained high quality and or high yields of specific crop.

Other Important Agricultural Land:

Land other than Prime or Unique Agricultural Land that is also having Statewide or local importance for agricultural use.

Existing Urban Development:

Land, which has been developed for urban type use.

U. S. Government:

Land which is currently under the jurisdiction of the U. S. Government.

All other lands that are mapped different than above are considered to be of no importance for agriculture.

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Appendix – 3

ALISH

AGRICULTURAL LANDS OF IMPORTANCE TO THE STATE OF HAWAII (REVISED)

Department of Agriculture
State of Hawaii
November, 1977

Post-it™ brand fax transmittal memo 7671 | # of pages ▸ 45
To Dr. Tamimi | From Earl
Co. | Co. DOA
Dept. | Phone # 9739466
Fax # 9553101 | Fax # 9739467

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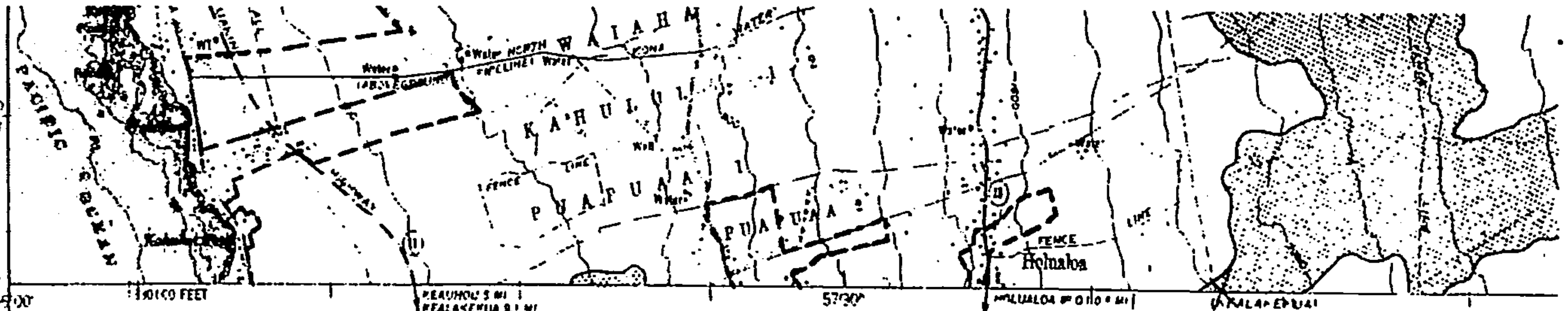
Appendix-3



NOTE.

Base Map taken from photo copy of the published U S Department of Interior Geological Survey Quadrangle Map

Polyconic projection. Old Hawaiian datum
10,000-foot grid based on Hawaiian coordinate system, zone 1
1000-meter Universal Transverse Mercator grid ticks, zone 5

LEGEND:

PRIME AGRICULTURAL LAND - Land which has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed according to modern farming methods

UNIQUE AGRICULTURAL LAND - Land that has the special combination of soil quality, location, growing season, moisture supply, and is used to produce sustained high quality and/or high yields of a specific crop when treated and managed according to modern farming methods.

OTHER IMPORTANT AGRICULTURAL LAND - Land other than Prime or Unique Agricultural Land that is also of state-wide or local importance for agricultural use

EXISTING URBAN DEVELOPMENT - Land which has been developed for urban type use.

U.S. GOVERNMENT Land which is currently under the jurisdiction of the U.S. Government.

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SCALE 1:24000

0 — 1 MILE

2000 3000 4000 5000 6000 7000 FEET

.5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL
IN FEET—DATUM IS MEAN LOWER LOW WATER

ROAD CLASSIFICATION

Medium duty — — — Light duty

Unimproved dirt

State Route

HAWAIIAN ISLANDS — HAWAII

QUADRANGLE LOCATION

KAILUA, HAWAII

1959

DEPARTMENT OF AGRICULTURE
STATE OF HAWAII

AGRICULTURAL LANDS OF IMPORTANCE TO THE STATE OF HAWAII

ISLAND OF HAWAII

NOTE:

Prepared with the assistance of the Soil Conservation Service, United States Department of Agriculture, and the College of Tropical Agriculture, University of Hawaii

JANUARY, 1977

SHEET H-7

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To Dr. Tamimi		From Earl	
Co.		Co. DOA	
Dept.		Phone # 9739466	
Fax # 9553101		Fax # 9735467	

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PREFACE

Nationally, land use management has become a great concern, especially regarding land resources that do or can contribute to our food and fiber needs. The degree of this concern is perhaps best expressed by the efforts of the United States Department of Agriculture's Soil Conservation Service to classify and identify our nation's best farmlands in the interest of preserving these land resources.

Hawaii, having taken the lead in public land use policy with the passage of the nation's first state land use law in 1961, shares this concern and has, as a matter of public policy, worked toward the preservation and development of our agricultural resources. Agricultural Lands of Importance to the State of Hawaii represents further progress in this effort. Adopted by the State Board of Agriculture, this system of identifying agriculturally important lands is intended to provide our decision makers with a valuable tool for use in agricultural preservation, planning and development.

Many thanks go to those who assisted in this project.

John Farias, Jr.
Chairman, Board of Agriculture
State of Hawaii

AGRICULTURAL LANDS OF IMPORTANCE TO THE STATE OF HAWAII

Introduction

In October, 1975, the Soil Conservation Service (SCS) of the United States Department of Agriculture adopted a program to identify the extent and location of the nation's best lands available for the production of food, feed, fiber, forage, and oilseed crops. One of the reasons for such a program was stated as follows:

"Land use decision makers at all levels need a system for identifying, classifying, inventorying, and mapping those lands with highest (agricultural) production potential."[1]

The adoption of this program and the requirement that it be conducted in cooperation with other interested agencies at the national, state, and local levels of government provided the State of Hawaii with the opportunity to classify all its lands from an agricultural perspective, and be the first state in the nation to do so.

A classification system and criteria for classification were developed by an ad hoc committee comprised of representatives from the Soil Conservation Service, the University of Hawaii's College of Tropical Agriculture, the State Rural Development Committee, the State of Hawaii Departments of Agriculture, Planning and Economic Development, and Land and Natural Resources.

The classification system and criteria developed by the committee was adopted by the Board of Agriculture, State of Hawaii, on January 28, 1977. It delineates those lands of the State which are of agricultural importance and, within this delineation, categorizes agricultural lands according to specific criteria.

The three major categories of agricultural land have been plotted on standard USGS quad maps at a scale of 1:24000 for the entire State of Hawaii. The maps are available for reference use at local county Soil Conservation Service offices.

[1] Recommendations on Prime Lands, U. S. Department of Agriculture, July 1975

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The Classification System

The classification system for identification of agriculturally important lands in the State of Hawaii provides for the:

1. Establishment of classes of agricultural lands primarily, but not exclusively, on the basis of soil characteristics;

2. Establishment of criteria for classification of lands; and

3. Identification of lands which meet the criteria for the respective classes.

Three classes of agriculturally important lands were established for the State of Hawaii with the intent of facilitating the SCS effort to inventory prime farmlands nationally and adapting the classification to the types of agricultural activity in Hawaii. These classes and their corresponding SCS (national) equivalents are:

HAWAII CLASSIFICATION SYSTEM	SCS CLASSIFICATION SYSTEM
Prime Agricultural Land	Prime Farmland
Unique Agricultural Land	Unique Farmland
Other Important Agricultural Land	Additional Farmland of Statewide & Local Importance

The criteria for classification of PRIME AGRICULTURAL LAND are identical to the criteria established by SCS for national application. The criteria for UNIQUE AGRICULTURAL LAND and OTHER IMPORTANT AGRICULTURAL LAND were established cooperatively by the Soil Conservation Service in Hawaii, the College of Tropical Agriculture, and the State Department of Agriculture.

Land considered for classification may or may not currently be in agricultural use, or may be in an agricultural use other than that which its classification may indicate as its agricultural capability. An example of the latter situation is land currently being used for grazing but which meets the criteria for Prime Agricultural Land. Lands not considered for classification as agricultural lands of importance to the State of Hawaii are:

1. Developed urban land over 10 acres;

2. Natural or artificial enclosed bodies of water over 10 acres;

3. Forest reserves;

4. Public use (parks and historic sites) lands;

5. Lands with slopes in excess of 35%; and

6. Military installations, except undeveloped areas over 10 acres.

The classification of agriculturally important lands does not in itself constitute a designation of any area to a specific land use. The classification should, however, provide decision makers with an awareness of the long-term implications of various land use options for production of food, feed, forage, and fiber crops in Hawaii.

Over time new areas may be developed for agricultural uses, other areas may be converted to irreversible non-agricultural uses, and new knowledge may be gained regarding soil interpretations. These and other developments will necessitate the periodic review and revision of the classification system and lands identified for the various classes.

The Criteria for Classification

PRIME AGRICULTURAL LAND

PRIME AGRICULTURAL LAND is land best suited for the production of food, feed, forage, and fiber crops. The land has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed, including water management, according to modern farming methods.

PRIME AGRICULTURAL LAND meets the following criteria:

1. The soils have an adequate moisture supply. Included are:

   a. Soils having aquic or udic moisture regimes.[2] These soils commonly are in humid or subhumid climates that have well distributed rainfall or have enough rain in the summer that the amount of stored moisture plus rainfall is approximately equal to or exceeds the amount of potential evapotranspiration. Water moves through the soil at some time in most years.

   b. Soils having xeric or ustic moisture regimes and in which the available water capacity is great enough to provide adequate moisture for the commonly grown crops in 7 or more years out of 10.

   c. Soils having aridic or torric moisture regimes and the area has a developed irrigation water supply that is dependable and of adequate quality. Also included are soils having xeric or ustic moisture regimes in which the available water capacity is limited but the area has a developed irrigation water supply that is dependable and of adequate quality.

   d. Soils having sufficient available water capacity within a depth of 40 inches (1 meter), or in the root zone if the root zone is less than 40 inches deep, to produce the commonly grown crops in 7 or more out of 10 years.

   A dependable water supply is one in which enough water is available for irrigation in 8 out of 10 years for the crops commonly grown.

2 For definitions of moisture regimes see Soil Taxonomy, Agricultural Handbook 436, December 1975

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2. The soils have a soil temperature regime that is isomesic, isothermic, or isohyperthermic. These are soils that, at a depth of 20 inches (50 cm), have a mean annual temperature higher than 47°F (8°C), and the difference between the mean summer and mean winter temperature differ by less than 90°F (5°C).

3. The soils have a pH between 4.5[3] and 8.4 in all horizons within a depth of 40 inches (1 meter) or in the root zone if the root zone is less than 40 inches deep. This range of pH is favorable for growing a wide variety of crops without adding large amounts of amendments.

4. The soils have no water table or a water table that is maintained at a sufficient depth during the cropping season to allow crops common to the area to be grown.

5. The soils can be managed so that in all horizons within a depth of 40 inches (1 meter) or in the root zone if the root zone is less than 40 inches deep, during part of each year the conductivity of saturation extract is less than 4 mmhos/cm and the exchangeable sodium percentage (ESP) is less than 15.

6. The soils are not flooded frequently during the growing season (less often than once in 2 years).

7. The soils have a product of K (erodibility factor) x percent slope of less than 2.0. That is, soils having a serious erosion hazard are not included.

8. The soils have a permeability rate of at least 0.06 inches (0.15 cm) per hour in the upper 20 inches (50 cm) and the mean annual soil temperature at a depth of 20 inches is less than 57°F (14°C). Permeability rate is not a limiting factor if the mean annual soil temperature is 57°F (14°C) or higher.

9. Less than 10 percent of the surface layer in these soils consists of rock fragments coarser than 3 inches (7.6 cm). These soils present no particular difficulty in cultivating with large equipment.

10. Must not be thixotropic and have isomesic temperature regime.

UNIQUE AGRICULTURAL LAND

UNIQUE AGRICULTURAL LAND is land other than PRIME AGRICULTURAL LAND and is used for the production of specific high-value food crops. The land has the special combination of soil quality, growing season, temperature, humidity, sunlight, air drainage, elevation, aspect, moisture supply, or other conditions, such as nearness to market, that favor the production of a specific crop of high quality and/or high yield when the land is treated and managed according to modern farming methods. In Hawaii, some examples of such crops are coffee, taro, rice, watercress and non-irrigated pineapple.

Land that qualifies as PRIME AGRICULTURAL LAND and is used for a specific high-value crop is classified as PRIME AGRICULTURAL LAND rather than as UNIQUE AGRICULTURAL LAND.

OTHER IMPORTANT AGRICULTURAL LAND

OTHER IMPORTANT AGRICULTURAL LAND is land other than PRIME or UNIQUE AGRICULTURAL LAND that is of state-wide or local importance for the production of food, feed, fiber, and forage crops. The lands in this classification are important to agriculture in Hawaii yet they exhibit properties, such as seasonal wetness, erodibility, limited rooting zone, slope, flooding, or droughtiness, that exclude them from the PRIME or UNIQUE AGRICULTURAL LAND classifications. Two examples are lands which do not have an adequate moisture supply to qualify as PRIME AGRICULTURAL LAND and lands which have similar characteristics and properties as UNIQUE AGRICULTURAL LAND except that the land is not currently in use for the production of a "unique" crop. These lands can be farmed satisfactorily by applying greater inputs of fertilizer and other soil amendments, drainage improvement, erosion control practices, flood protection and produce fair to good crop yields when managed properly.

Other criteria which may qualify lands as OTHER IMPORTANT AGRICULTURAL LAND are:

1. The land has slopes less than 20%, is presently in crop or has cropping potential, and is not classified as PRIME or UNIQUE AGRICULTURAL LAND. The soils have a moisture supply which is adequate for the commonly grown crop.

2. The land has slopes less than 35%, is presently used for grazing or has grazing potential, and is not classified as PRIME or UNIQUE AGRICULTURAL LAND. The soils have:

   a. An aquic, udic, xeric, or ustic moisture regime in which the available water capacity is sufficient to produce fair to good yields of adapted forage.

   b. Less than 10% rock outcrops and coarse fragments coarser than 3 inches (7.6 cm) in the surface layer.

3. The soils are thin organic soils underlain by aa lava (typic tropofolists) having aquic, udic, xeric, or ustic moisture regimes and isohyperthermic (greater than 72°F) or isothermic (59°-72°F) soil temperature regimes.

[3] Soils which have a pH of less than 4.5 in surface soil because of use of fertilizers are excluded.

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Ad Hoc Committee Membership

Dr. Harold L. Baker, Agricultural Economist, College of Tropical Agriculture, and former Director, Land Study Bureau, University of Hawaii

Dr. Haruyoshi Ikawa, Associate Soil Scientist, College of Tropical Agriculture, University of Hawaii

Blaine Bradshaw, Community Development Specialist, Cooperative Extension Service, College of Tropical Agriculture, University of Hawaii and Executive Secretary, State Rural Development Committee

Oran F. Bailey, Former State Soil Scientist (Hawaii), Soil Conservation Service, United States Department of Agriculture

Richard Huff, State Soil Scientist (Hawaii), Soil Conservation Service, United States Department of Agriculture

Harry Sato, Soil Specialist, Soil Conservation Service, United States Department of Agriculture

Tatsuo Fujimoto, Chief, Land Use Division, Department of Planning and Economic Development, State of Hawaii

Robert Merriam, Resource Management Forester, Division of Forestry, Department of Land and Natural Resources, State of Hawaii

Robert K. Miura, Agricultural Analyst, Planning and Development Office, Department of Agriculture, State of Hawaii

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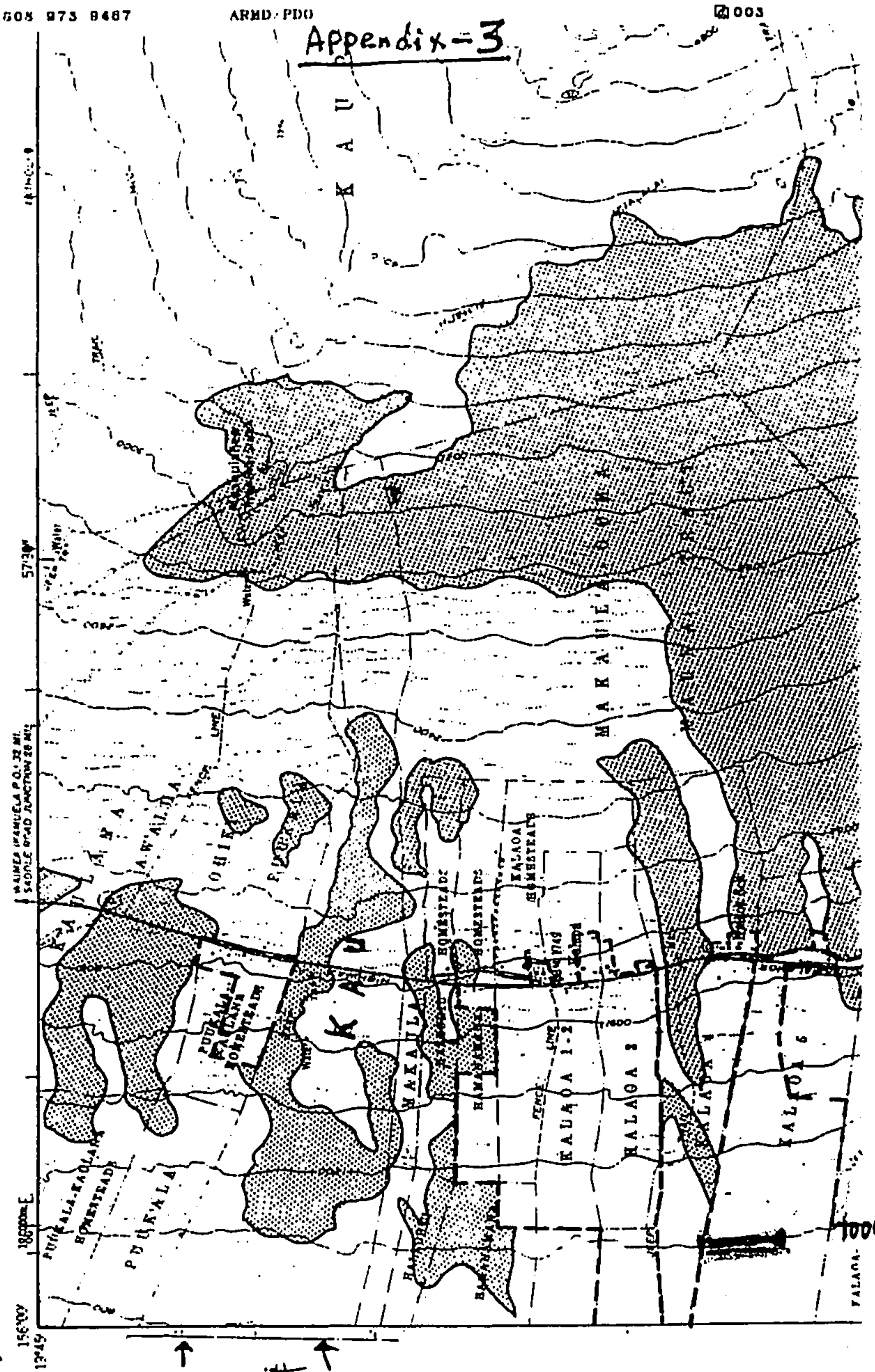

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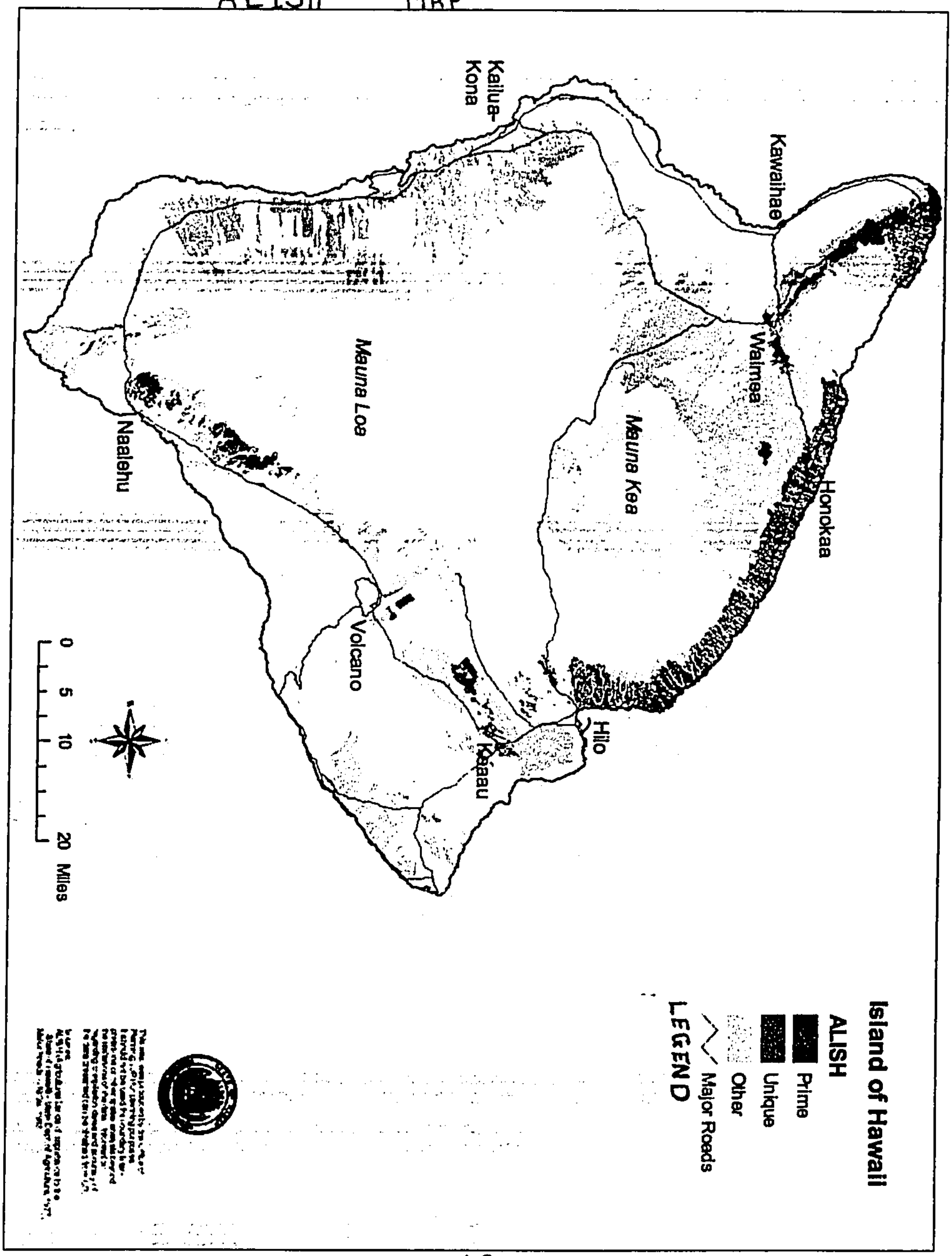
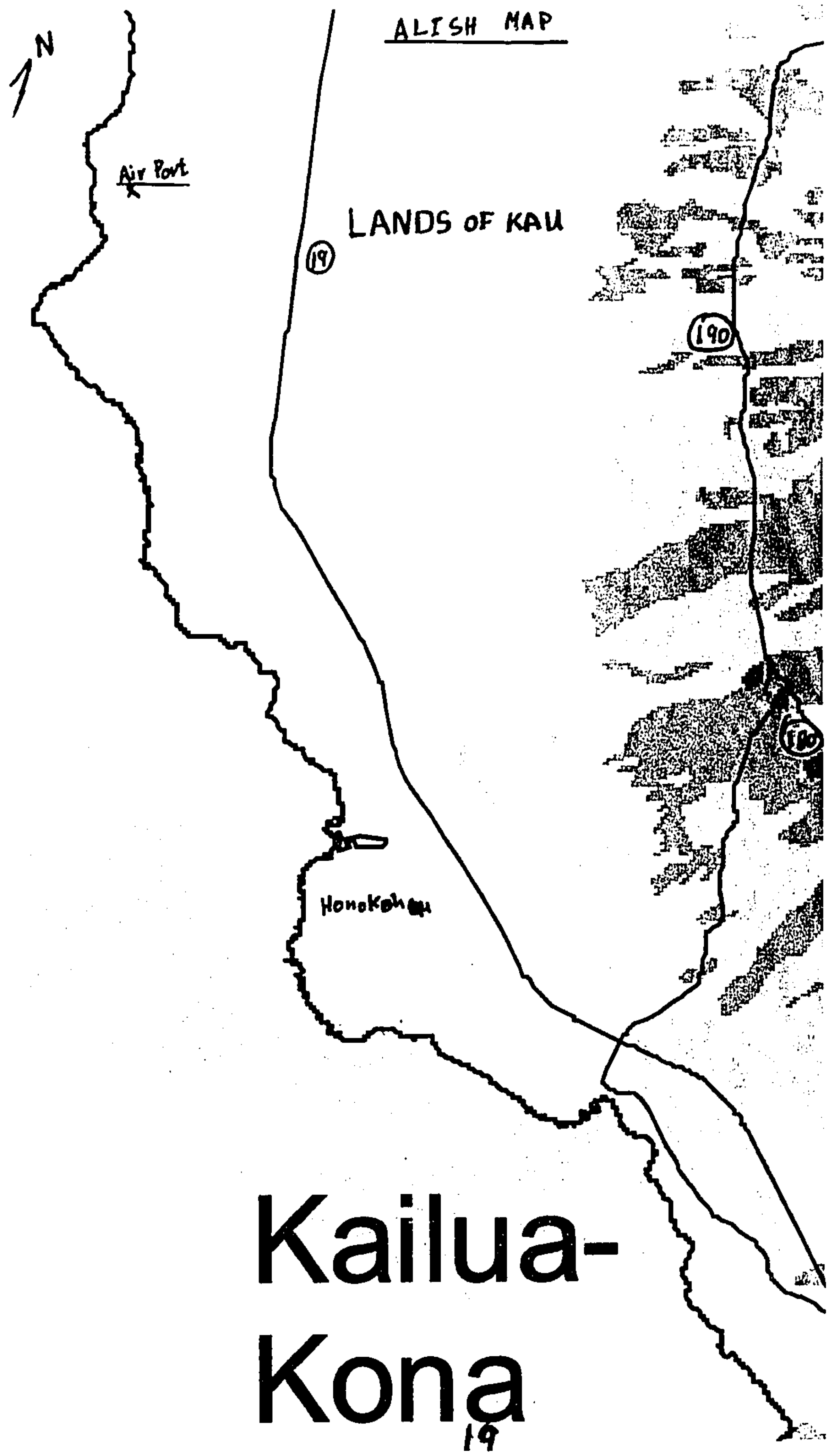
Appendix - 3

ALISH MAP



Appendix-5

ALISH MAP



Appendix - 4

Some vegetation found in the investigated area:

Common Name	Scientific Name
Cactus	Opuntia ficus-indica
Christmas berry	Schinus terebinthifolius
Fountain grass	Pennisitum setaceum
Ilima	Sida fallax
koa haole	Leucaena leucocephala
Mamane	Sophora chrisophylla
Noni.	Morinda citrifolia
Ohia	Metrosideros polymorpha
Rattlebox	Crotalaria mucronata
Silk oak	Gravillea robusta

Appendix I

Market Evaluation, Economic and Fiscal Impact Assessment

Appendix I: Market Evaluation and Fiscal Impact Assessment for Palamanui

NOTE: Appendix I consists of 3 studies. Discrepancies do exist between these reports. These reports represent efforts to identify the existing market demands for the project area.

FISCAL IMPACT ASSESSMENT. Hiluhilu Development Project, County of Hawaii (THK Associates, Inc., July 2003)

Summary of Economic and Fiscal Impacts for Palamanui Project
Executive Summary of Fiscal Impact Analysis
I. Introduction
II. Fiscal Analysis
- A. Development Program
- B. Market and Assessed Value
- C. Tax Rates
- D. County of Hawaii
- E. State of Hawaii
- F. Job Creation
- G. Construction Spending and Employment
- H. Construction Excise and Other Taxes
- I. Indirect Impact

MARKET EVALUATION OF PALAMA NUI AND UNIVERSITY VILLAGE DEVELOPMENT OPPORTUNITIES (Knowledge Based Consulting Group, in association with THK Associates, July 2003)

- I. Introduction
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RESIDENTIAL AND UNIVERSITY OF HAWAII TOWN CENTER MARKET ANALYSIS UPDATE. LANDS OF KAU, KAILUA-KONA, HAWAII (THK Associates, Inc., December 6 2002)

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FISCAL IMPACT ANALYSIS

HILUHILU DEVELOPMENT PROJECT
COUNTY OF HAWAII, HAWAII

PREPARED FOR:
HILUHILU DEVELOPMENT

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JULY 18, 2003

Economic & Market Research / Land & Development Planning
Landscape Architecture / Community Planning & Design
Golf Feasibility Analysis

Summary of Economic and Fiscal Impacts for Palamanui Project

Program

Population of 2,800 persons in 845 housing units, including 590 single family homes, 100 apartments, 75 student housing units, and 80 units for seniors

Commercial Area of 14 acres in University Village (includes 6 acres reserved for classrooms and teaching labs) plus a 120 room University Inn, 10 acre medical campus, 20 acre community commercial center, and 50 acre low density research and development facility.

Investment

The Palama Nui project will have a project cost/ investment of just over $300 million over a ten-year period (2004 to 2014).

Impact on Hawaii County

The County of Hawaii would receive annual property taxes of $6.4 million at project buildout (2014) as well as other county revenue of $3.4 million. This total revenue of $9.8 million will be offset by county service costs of $4.6 million.

The net annual County surplus is $2.7 million in 2010, increasing to $5.3 million by 2014. The cumulative surplus from project opening to final buildout is $25.5 million

Impact on State of Hawaii

The State of Hawaii would receive an estimated $3.9 million per year in excise tax, income tax, and other revenues from residents at buildout (2014). This will be supplemented by $4.7 million in revenue from excise taxes on commercial operations, including retail sales, hotel taxes, and taxes on commercial rents.

Total State revenues at buildout will be approximately $8.6 million, while service costs are estimated at $5.2 million. This provides for a surplus of $3.4 million in 2014, and a cumulative surplus of $17.7 million over the buildout period.

During construction, the State will receive additional excise tax, revenue on finished development and building materials, conveyance taxes, and income taxes on construction wages and businesses. These will amount to $13.9 million over the buildout period.

Employment

Palama Nui will create 1,000 permanent jobs by 2010 and around 1,850 jobs by 2014.

Construction at Palamanui will support nearly 2,600 person years of employment or about 250 jobs per year over the life of the project.

Indirect Impact

Including indirect impacts of construction expenditures recirculating in the Hawaii economy, construction of the Palama Nui project will generate:

- $370 million in economic output
- 3,638 jobs
- $172 million in household income

EXECUTIVE SUMMARY

THK Associates, Inc. and Knowledge Based Consulting Group (KBCG) prepared the following fiscal impact analysis for the Palama Nui development project located in the County of Hawaii, Hawaii. The Palama Nui property is an approximately 725-acre parcel, which is six miles north of Kailua-Kona, just east and inland of Kona International Airport, and fronts Queen Kaahumanu Highway, extending upward to Makalei Estates subdivision. The development will be comprised of 845 residential units, a 120 unit University Inn, 60,000 square feet of classrooms and teaching labs, and approximately 620,000 square feet of business and commercial space. It is anticipated that the Palama Nui property will be developed over a 10-year timeframe and should commence development in the beginning of 2004. The following are highlights from the analysis:

The Palama Nui development project is proposed for three different types of for-sale residential product (single-family detached, townhome, condominium, and multi-family units). The starting prices for single-family and townhome/ condominium units range from $275,000 to $1,000,000. Values for the multi-family rental units range from $150,000 to $200,000.

Population will peak after residential build-out in 2012 at approximately 2,816 persons. In addition, over 1,800 permanent jobs will be created.

The County of Hawaii could receive surplus revenues of approximately $25.5 million over the development period (2004 to 2014), after receiving all revenues from property taxes and other sources (includes revenues from fuel taxes, utility taxes, license fees, permits, and state and federal grants) and incurring all expenses to serve the community.

The State of Hawaii could receive surplus revenues of $17.7 million over the development period from a combination of excise taxes, accommodations tax, transfer taxes, utility taxes, and income taxes on individuals and businesses.

Total construction costs are just over $305 million, creating some 2,500 person-years of employment. State revenues from excise taxes, conveyance fees and income taxes on construction workers and businesses should amount to $13.9 million over the buildout period.

INTRODUCTION

This assessment has been prepared by THK Associates and Knowledge Based Consulting Group (KBCG) in response to the need to evaluate the impact on community services and facilities to the County of Hawaii and other service providers that would result from the development of the Palama Nui development project. The Palama Nui golf course and residential development is in North Kona on the Big Island of Hawaii. The approximately 725- acre parcel is six miles north of Kailua-Kona, just east and inland of Kona International Airport, and fronts Queen Kaahumanu Highway, extending upward to Makalei Estates subdivision. The site slopes from an elevation of 150 feet to 1,000 feet. The upper 454-acre section is zoned for an agricultural district, while the lower 272 acres are zoned for conservation. The total parcel is designated for "urban expansion." *The following analysis concentrates on the development of 845 residential units, a 120-unit* University Inn, 60,000 square feet of University of Hawaii and Community College classrooms and teaching labs, and approximately 620,000 square feet of business and commercial space. The Palama Nui development project is proposed to be developed over a 10-year timeframe starting in 2004.

By applying the appropriate tax rates to the assessed valuation, the analysis illustrates real estate tax revenues to be received over time to the county and State of Hawaii. This report also examines the costs that will be incurred in order to estimate whether there will be a surplus or deficit.

Positive impacts to the County of Hawaii and other providers of service could result from the Palama Nui/ University Village community and golf course. Although some impacts are difficult to measure, positive impacts to the entire community would include:

- The initiation of a permanent UH and Community College campus
- A range of housing types that will allow entities such as schools, police and fire departments, etc. to attract employees that can be a part of their community.

At build-out, 2,816 permanent residents will reside in the Palama Nui community, and approximately 1,841 permanent jobs will be generated.

Palamanui Office, Retail, and R & D Space Needs

Projected Trade Area Annual Employment Growth, 2002 - 2012		810
Annual Retail Job Growth	25%	203
Annual Office Job Growth	35%	284
Annual Medical Campus Employment Growth		30
Annual R & D Flex Space Job Growth	15%	122

Use	Annual Job Growth	Required Square Foootage Over 10 Years	Site Capture	Rounded	Acreage Required	Total Acreage Allowed
Demand for Retail Space at Palamanui	203	708,750	106,313	110,000	10	15
Demand for Office Space at Palamanui	284	850,500	170,100	170,000	11	13
Total Commercial	486	1,559,250	276,413	280,000	21	28
Village Commercial Allocation			80,000	80,000		8
Community Commercial			196,413	200,000		20
Demand for Medical Space at Palamanui	30.0	120,000	120,000	120,000	8	10
Demand for R & D/ Flex Space at Palamanui	121.5	729,000	218,700	220,000	33	50

Planning Parameters	Retail	Office	Medical	R & D
Space Per Employee	350	300	400	600
Site Capture	15%	20%	100%	30%
F. A. R.	25%	35%	35%	15%
Speculative Factor	50%	20%	30%	50%

Source: THK Associates, Knowledge Based Consulting Group

TABLE 1
Hilu Hilu Development Plan

Development Program for Palama Nui

	Total Units	Acres	Average Price @
Single Family Residential (lots)			
Ocean View Estates	70	70.0	$400,000
Ocean View Lots	200	100.0	$300,000
Golf View Lots	120	46.2	$200,000
Single Family Residential (built)			
Patio Homes	80	16.0	$350,000
Two Bedroom Condos	60	7.5	$275,000
Three Bedroom Condos	60	7.5	$350,000
Subtotal Single Family	590	247.2	
Multi Unit Residential			
Apartments	100	8.0	
International Student Housing	75	5.0	
Senior Housing	80	5.0	
Subtotal Multi Family	255	18.0	
Total Residential	845	265.2	
Commercial (acres)	Rooms	Acres	Sq. Ft.
University Leases		6.0	60,000
Village Commercial		8.0	80,000
University Village Inn	120	8.0	60,000
Medical, R&D, & Community Commercial			
Medical Campus		10.0	120,000
R&D		50.0	220,000
Community Commercial		20.0	200,000
Golf Course		180.0	
Open Space, Parking, & Preservation		177.8	
Subtotal Commercial & Other	120	459.8	
TOTAL UNITS AND ACREAGE	965	725.0	

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II. FISCAL ANALYSIS

A. Development Program

The program for development shown in the following table is based on an average development scenario in terms of absorption for the Palama Nui property. The expected production schedule is illustrated in Table I, including an estimated build-out period for the property. It is estimated that the project will be built out over a 10-year period.

Residential

Based on market data from comparable subdivisions, THK and KBCG anticipate annual demand for residential units at Palama Nui to range from 50 to 115 units a year for single-family and town home units. Rental units (apartments, student housing, and senior housing) would be developed in 2007 and 2008.

Commercial

The commercial development will begin with the construction of the first element of the University Village commercial area as well as the initial component of UH classrooms and teaching labs in 2006. The University Inn will be developed in 2007, along with the initial phase of the research and development program. Full development of the commercial program will be completed in 2014.

TABLE I

Estimated Residential Absorption at Palamanui

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Single Family Detached												
Ocean View Estates												
Annual			30	20	20							
Cumulative			30	50	70	70	70	70	70	70	70	70
Ocean View Lots												
Annual			20	30	35	35	40	40				
Cumulative			20	50	85	120	160	200	200	200	200	200
Golf View Lots												
Annual				20	20	20	30	30				
Cumulative				20	40	60	90	120	120	120	120	120
Patio Homes												
Annual				20	20	20	20					
Cumulative				20	40	60	80	80	80	80	80	80
Multi Family												
Two Bedroom Condos												
Annual					10	20	10	20				
Cumulative					10	30	40	60	60	60	60	60
Three Bedroom Condos												
Annual					10	20	10	20				
Cumulative					10	30	40	60	60	60	60	60
Subtotal For Sale Housing												
Annual			50	90	115	115	110	110	0	0	0	0
Cumulative			50	140	255	370	480	590	590	590	590	590
Rentals												
Apartments												
Annual					100							
Cumulative					100	100	100	100	100	100	100	100
International Student Housing												
Annual					75							
Cumulative					75	75	75	75	75	75	75	75
Senior Housing												
Annual						80						
Cumulative						80	80	80	80	80	80	80
Total Residential Units			50	140	430	625	735	845	845	845	845	845
Seasonal			5	14	43	63	74	85	85	85	85	85
Permanent			45	126	387	563	662	761	761	761	761	761

Commercial Absorbtion Schedule	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
University Village Inn												
Annual					60,000							
Cumulative					60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
University Leases												
Annual				30,000				30,000				
Cumulative				30,000	30,000	30,000	30,000	60,000	60,000	60,000	60,000	60,000
Village Commercial												
Annual				20,000		20,000		40,000				
Cumulative				20,000	20,000	40,000	40,000	80,000	80,000	80,000	80,000	80,000
Medical Campus												
Annual				30,000	30,000	30,000	30,000					
Cumulative				30,000	60,000	90,000	120,000	120,000	120,000	120,000	120,000	120,000
R&D												
Annual					10,000	10,000	15,000	20,000	30,000	40,000	45,000	50,000
Cumulative					10,000	20,000	35,000	55,000	85,000	125,000	170,000	220,000
Community Commercial												
Annual							25,000	25,000	25,000	35,000	40,000	50,000
Cumulative							25,000	50,000	75,000	110,000	150,000	200,000
Golf Course												
Annual			0.5	0.5								
Cumulative			0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Commercial Square Feet												
Annual				80,000	100,000	60,000	70,000	115,000	55,000	75,000	85,000	100,000
Cumulative				80,000	180,000	240,000	310,000	425,000	480,000	555,000	640,000	740,000

B. Market and Assessed Value

The proposed Palama Nui development project is planned for three different types of residential units (single-family detached, townhome/condominium, and multi-family units). The starting prices for single-family and townhome/condominium units range from $275,000 to $1,000,000 +/-. Values for the multi-family rental units range from $150,000 to $200,000. This analysis has utilized a 4% inflation rate, and, for lot sales, assumes that homes are built an average of two years after lot purchase.

Residential market values for the project will be $19.5 million in the first year of occupancy (2005), including both seasonal and permanent residents. As the residential product is built-out, the residential market value will increase to $715.6 million in 2012. By 2014, residential values will equal $774 million.

Non-residential market value for the project will start at $8.7 million in 2005. As the non-residential product is built-out by 2014, the non-residential market value will increase to $184 million. The total real estate value of the Palama Nui project at buildout (2014) is estimated at $958 million.

Table II
Estimated Market Values for Palamanui

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Single Family Detached												
Ocean View Estates												
Average Lot Value	$ 400	$ 416	$ 433	$ 450	$ 468	$ 487	$ 506	$ 526	$ 547	$ 569	$ 592	$ 616
Average Improvement Value	$ 1,000	$ 1,040	$ 1,082	$ 1,125	$ 1,170	$ 1,217	$ 1,265	$ 1,316	$ 1,369	$ 1,423	$ 1,480	$ 1,539
Cumulative	$ -	$ -	$ 12,979	$ 22,497	$ 67,852	$ 94,899	$ 124,001	$ 128,961	$ 134,120	$ 139,485	$ 145,064	$ 150,866
Ocean View Lots												
Average Lot Value	$ 300	$ 312	$ 324	$ 337	$ 351	$ 365	$ 380	$ 395	$ 411	$ 427	$ 444	$ 462
Average Improvement Value	$ 750	$ 780	$ 811	$ 844	$ 877	$ 912	$ 949	$ 987	$ 1,026	$ 1,067	$ 1,110	$ 1,155
Cumulative	$ -	$ -	$ 6,490	$ 16,873	$ 47,379	$ 89,424	$ 141,399	$ 197,390	$ 246,342	$ 298,895	$ 310,851	$ 323,285
Golf View Lots												
Average Lot Value	$ 200	$ 208	$ 216	$ 225	$ 234	$ 243	$ 253	$ 263	$ 274	$ 285	$ 296	$ 308
Average Improvement Value	$ 500	$ 520	$ 541	$ 562	$ 585	$ 608	$ 633	$ 658	$ 684	$ 712	$ 740	$ 770
Cumulative	$ -	$ -	$ -	$ 4,499	$ 9,359	$ 26,766	$ 48,082	$ 71,060	$ 94,431	$ 119,558	$ 124,341	$ 129,314
Patio Homes	$ 350	$ 364	$ 379	$ 394	$ 409	$ 426	$ 443	$ 461	$ 479	$ 498	$ 518	$ 539
Total	$ -	$ -	$ -	$ 7,874	$ 16,378	$ 25,550	$ 35,429	$ 36,846	$ 38,320	$ 39,853	$ 41,447	$ 43,105
Multifamily												
Two Bedroom Condos	$ 275	$ 286	$ 297	$ 309	$ 322	$ 335	$ 348	$ 362	$ 376	$ 391	$ 407	$ 423
Total	$ -	$ -	$ -	$ -	$ 3,217	$ 10,037	$ 13,919	$ 21,713	$ 22,581	$ 23,485	$ 24,424	$ 25,401
Three Bedroom Condos	$ 350	$ 364	$ 379	$ 394	$ 409	$ 426	$ 443	$ 461	$ 479	$ 498	$ 518	$ 539
Total	$ -	$ -	$ -	$ -	$ 4,095	$ 12,775	$ 17,714	$ 27,635	$ 28,740	$ 29,890	$ 31,085	$ 32,329
Apartments	$ 200	$ 208	$ 216	$ 225	$ 234	$ 243	$ 253	$ 263	$ 274	$ 285	$ 296	$ 308
Total	$ -	$ -	$ -	$ -	$ 23,397	$ 24,333	$ 25,306	$ 26,319	$ 27,371	$ 28,466	$ 29,605	$ 30,789
International Student Housing	$ 150	$ 156	$ 162	$ 169	$ 175	$ 182	$ 190	$ 197	$ 205	$ 213	$ 222	$ 231
Total	$ -	$ -	$ -	$ -	$ 13,161	$ 13,687	$ 14,235	$ 14,804	$ 15,396	$ 16,012	$ 16,653	$ 17,319
Senior Housing	$ 175	$ 182	$ 189	$ 197	$ 205	$ 213	$ 221	$ 230	$ 239	$ 249	$ 259	$ 269
Total	$ -	$ -	$ -	$ -	$ -	$ 17,033	$ 17,714	$ 18,423	$ 19,160	$ 19,926	$ 20,723	$ 21,552
Total Residential Values	$ -	$ -	$ 19,469	$ 51,744	$ 184,838	$ 314,505	$ 437,800	$ 543,151	$ 626,462	$ 715,570	$ 744,193	$ 773,961
Seasonal			$ 1,947	$ 5,174	$ 18,484	$ 31,450	$ 43,780	$ 54,315	$ 62,646	$ 71,557	$ 74,419	$ 77,396
Permanent			$ 17,522	$ 46,569	$ 166,354	$ 283,054	$ 394,020	$ 488,836	$ 563,816	$ 644,013	$ 669,774	$ 696,564
Commercial (acres)												
University Village Inn (per room ($000))	$ 125	$ 130	$ 135	$ 141	$ 146	$ 152	$ 158	$ 164	$ 171	$ 178	$ 185	$ 192
Total					$ 17,548	$ 18,250	$ 18,980	$ 19,739	$ 20,529	$ 21,350	$ 22,204	$ 23,092
University Leases (value per SF)	$ 125	$ 130	$ 135	$ 141	$ 146	$ 152	$ 158	$ 164	$ 171	$ 178	$ 185	$ 192
Total				$ 4,218	$ 4,387	$ 4,562	$ 4,745	$ 9,869	$ 10,264	$ 10,675	$ 11,102	$ 11,546
Village Commercial (value per SF)	$ 125	$ 130	$ 135	$ 141	$ 146	$ 152	$ 158	$ 164	$ 171	$ 178	$ 185	$ 192
Total				$ 2,812	$ 2,925	$ 6,083	$ 6,327	$ 13,159	$ 13,686	$ 14,233	$ 14,802	$ 15,395
Medical Campus (value per SF)	$ 200	$ 208	$ 216	$ 225	$ 234	$ 243	$ 253	$ 263	$ 274	$ 285	$ 296	$ 308
Total				$ 6,749	$ 14,038	$ 21,900	$ 30,368	$ 31,582	$ 32,846	$ 34,159	$ 35,526	$ 36,947
R&D (value per SF)	$ 100	$ 104	$ 108	$ 112	$ 117	$ 122	$ 127	$ 132	$ 137	$ 142	$ 148	$ 154
Total					$ 1,170	$ 2,433	$ 4,429	$ 7,238	$ 11,633	$ 17,791	$ 25,164	$ 33,868
Community Commercial (value per SF)	$ 125	$ 130	$ 135	$ 141	$ 146	$ 152	$ 158	$ 164	$ 171	$ 178	$ 185	$ 192
Total							$ 3,954	$ 8,225	$ 12,830	$ 19,571	$ 27,755	$ 38,486
Golf Course ($000)	$ 16,000	$ 16,640	$ 17,306	$ 17,998	$ 18,718	$ 19,466	$ 20,245	$ 21,055	$ 21,897	$ 22,773	$ 23,684	$ 24,631
Total			$ 8,653	$ 17,998	$ 18,718	$ 19,466	$ 20,245	$ 21,055	$ 21,897	$ 22,773	$ 23,684	$ 24,631
Total Commercial Values	$ -	$ -	$ 8,653	$ 31,777	$ 58,785	$ 72,695	$ 89,047	$ 110,867	$ 123,684	$ 140,552	$ 160,236	$ 183,965
Total Project Value	$ -	$ -	$ 28,122	$ 83,521	$ 243,623	$ 387,200	$ 526,847	$ 654,018	$ 750,147	$ 856,122	$ 904,429	$ 957,925

C. Tax Rates

Below is a listing of tax rates that effect residents and commercial entities. Tax rates for residents are broken down to seasonal and permanent residents.

TAX CATEGORY	TAX RATE
Permanent Residents	$5.55 per $1,000
Seasonal Residents	$9.10 per $1,000
Commercial Properties	$9.85 per $1,000

Source: County of Hawaii - Real Property Tax Division

Note: The permanent resident category includes an allowance for owner occupant exemptions.

D. County of Hawaii

Table III illustrates the projected population for the Palama Nui development project through 2014. Population will peak after residential build-out in 2010 at 2,816 persons.

Table III also summarizes the revenues and expenses to the County of Hawaii that will result from development of the Palama Nui property. THK Associates, Inc. estimates that after residential build-out in 2010, the County of Hawaii can expect to receive approximately $4.3 million in annual real estate tax revenues. At buildout of the commercial areas (2014), annual real estate revenues would total $6.4 million. In addition to real estate taxes, other revenues are received. These other revenues include fuel taxes, utility taxes, license fees, permits, and state and federal grants. Other revenues historically have represented 35% of total county revenues, with property taxes at 65% of total. This ratio has been assumed to be constant in this model. It is estimated that total revenue after residential and commercial build-out will be $9.8 million.

THK Associates, Inc. also estimates that county expenses to provide services including law enforcement are approximately $1,050/person with an inflation factor of 4%. County of Hawaii expenses to serve the Palama Nui development project will be $3.9 million in 2010 and $4.5 million by 2014. Expenses are based on current county expenses per person. It should be noted that this development will provide significant infrastructure improvements that will serve the entire community, and many of these improvements will not require county maintenance. Therefore, actual county costs could be less than the amounts illustrated in this model.

Moreover, THK calculates that the County of Hawaii will have a cumulative surplus of $7.5 million by 2010 (residential build-out), and this surplus will grow to a cumulative $25.5 million by Year 2014 (commercial buildout).

TABLE III

REVENUES AND COSTS TO THE COUNTY OF HAWAII

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Real Estate Taxes												
Residential												
Permanent (w/ Owner Occupant Allowance)	$ -	$ -	$ 97,247	$ 258,460	$ 923,264	$ 1,570,951	$ 2,186,813	$ 2,713,038	$ 3,129,180	$ 3,574,272	$ 3,717,243	$ 3,865,933
Seasonal	$ -	$ -	$ 17,717	$ 47,087	$ 168,202	$ 286,199	$ 398,398	$ 494,267	$ 570,081	$ 651,169	$ 677,215	$ 704,304
Commercial	$ -	$ -	$ 85,230	$ 313,007	$ 579,036	$ 716,046	$ 877,111	$ 1,092,042	$ 1,218,292	$ 1,384,438	$ 1,578,329	$ 1,812,053
Total Real Estate Taxes	$ -	$ -	$ 200,193	$ 618,554	$ 1,670,502	$ 2,573,197	$ 3,462,322	$ 4,299,348	$ 4,917,553	$ 5,609,879	$ 5,972,788	$ 6,382,290
Other Revenue	$ -	$ -	$ 107,796	$ 333,067	$ 899,499	$ 1,385,564	$ 1,864,323	$ 2,315,029	$ 2,647,907	$ 3,020,697	$ 3,216,109	$ 3,436,610
Total Revenue	$ -	$ -	$ 307,990	$ 951,621	$ 2,570,002	$ 3,958,761	$ 5,326,646	$ 6,614,377	$ 7,565,460	$ 8,630,576	$ 9,188,897	$ 9,818,900
Estimated Population												
Single Family												
Permanent	-	-	180	432	702	900	1,152	1,404	1,404	1,404	1,404	1,404
Seasonal	-	-	20	48	78	100	128	156	156	156	156	156
Patio Home												
Permanent	-	-	-	67	133	200	266	266	266	266	266	266
Seasonal	-	-	-	7	15	22	30	30	30	30	30	30
Townhome/ Condo												
Permanent	0	0	0	0	63	189	252	378	378	378	378	378
Seasonal	0	0	0	0	7	21	28	42	42	42	42	42
Apartments												
Permanent	0	0	0	0	243	243	243	243	243	243	243	243
Seasonal	0	0	0	0	27	27	27	27	27	27	27	27
Student	0	0	0	0	150	150	150	150	150	150	150	150
Senior	0	0	0	0	0	120	120	120	120	120	120	120
Total Population	-	-	200	554	1,418	1,972	2,396	2,816	2,816	2,816	2,816	2,816
Cost to Serve (per person	$ 1,050	$1,092	$ 1,136	$ 1,181	$ 1,228	$ 1,277	$ 1,329	$ 1,382	$ 1,437	$ 1,494	$ 1,554	$ 1,616
Total Expenditure	$ -	$ -	$ 227,136	$ 654,333	$ 1,741,802	$ 2,519,201	$ 3,183,290	$ 3,890,947	$ 4,046,585	$ 4,208,448	$ 4,376,786	$ 4,551,858
Surplus or Deficit												
Annual	$ -	$ -	$ 80,854	$ 297,288	$ 828,199	$ 1,439,559	$ 2,143,356	$ 2,723,430	$ 3,518,875	$ 4,422,128	$ 4,812,111	$ 5,267,042
Cumulative		$ -	$ 80,854	$ 378,141	$ 1,206,341	$ 2,645,900	$ 4,789,257	$ 7,512,686	$ 11,031,561	$ 15,453,689	$ 20,265,800	$ 25,532,842

E. State of Hawaii

Revenues to the State of Hawaii will be generated from excise taxes, accommodations tax, transfer taxes, utility taxes, and income taxes on individuals and businesses. These revenues go directly to the State General Fund. Sales per square foot of $300 to $400 are expected for the commercial areas. Other state taxes include a 0.5% excise tax on construction materials, a 1/10 of one percent transfer of fee interest, including leases of five years or greater, state corporate and individual income taxes, state utility taxes, and liquor taxes. Hotel taxes on the University Inn revenues should add another $834,000 annually in State revenue. This revenue is allocated to a variety of funds, with a portion (18.6% of hotel fund) returned to the County of Hawaii.

As shown in Table IV, annual state revenues from residents is expected to reach $3.9 million in 2010, while revenues from commercial operations should reach $4.7 million at buildout in 2014. Over the life of the project, state revenues should exceed expenditures by $17.7 million.

TABLE IV

ONGOING REVENUES AND COSTS TO THE STATE OF HAWAII

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Revenues From Residents												
Household Income ($000)	$ -	$ -	$ 2,850	$ 7,980	$ 24,510	$ 35,625	$ 41,895	$ 48,165	$ 48,165	$ 48,165	$ 48,165	$ 48,165
Excise Tax	-	-	$ 74,100	$ 207,480	$ 637,260	$ 926,250	$ 1,089,270	$ 1,252,290	$ 1,252,290	$ 1,252,290	$ 1,252,290	$ 1,252,290
Income Tax			$ 85,500	$ 239,400	$ 735,300	$ 1,068,750	$ 1,256,850	$ 1,444,950	$ 1,444,950	$ 1,444,950	$ 1,444,950	$ 1,444,950
Other Revenues			$ 84,000	$ 232,680	$ 595,560	$ 828,240	$ 1,006,320	$ 1,182,720	$ 1,182,720	$ 1,182,720	$ 1,182,720	$ 1,182,720
Excise Tax on Rents						$ 12,600	$ 18,360	$ 18,360	$ 18,360	$ 18,360	$ 18,360	$ 18,360
Subtotal	$ -	$ -	$ 243,600	$ 679,560	$ 1,968,120	$ 2,835,840	$ 3,370,800	$ 3,898,320	$ 3,898,320	$ 3,898,320	$ 3,898,320	$ 3,898,320
Revenues From Commercial Sources												
University Village Inn												
State Accommodations Tax - General Fund					$ 232,315	$ 241,608	$ 251,272	$ 261,323	$ 271,776	$ 282,647	$ 293,953	$ 305,711
State Accommodations Tax - Hotel Fund					$ 404,876	$ 421,071	$ 437,914	$ 455,431	$ 473,648	$ 492,594	$ 512,298	$ 532,790
Commercial Operations (Excise Tax on Sales)												
Village Commercial				$ 320,000	$ 320,000	$ 640,000	$ 640,000	$ 1,280,000	$ 1,280,000	$ 1,280,000	$ 1,280,000	$ 1,280,000
Community Commercial							$ 300,000	$ 600,000	$ 900,000	$ 1,320,000	$ 1,800,000	$ 2,400,000
Golf Course			$ 40,000	$ 83,200	$ 86,528	$ 89,989	$ 93,589	$ 97,332	$ 101,226	$ 105,275	$ 109,486	$ 113,865
Commercial Operations (Excise Tax on Rents)	$ -	$ -	$ -	$ 7,200	$ 16,200	$ 21,600	$ 27,900	$ 38,250	$ 43,200	$ 49,950	$ 57,600	$ 66,600
Subtotal	$ -	$ -	$ 40,000	$ 410,400	$ 1,059,919	$ 1,414,268	$ 1,750,675	$ 2,732,336	$ 3,069,849	$ 3,530,465	$ 4,053,336	$ 4,698,965
Total State Revenues	$ -	$ -	$ 283,600	$ 1,089,960	$ 3,028,039	$ 4,250,108	$ 5,121,475	$ 6,630,656	$ 6,968,169	$ 7,428,785	$ 7,951,656	$ 8,597,285
Total Population	-	-	200	554	1,418	1,972	2,396	2,816	2,816	2,816	2,816	2,816
Cost to Serve (per person)	$ 1,200	$ 1,248	$ 1,298	$ 1,350	$ 1,404	$ 1,460	$ 1,518	$ 1,579	$ 1,642	$ 1,708	$ 1,776	$ 1,847
Total Expenditure	$ -	$ -	$ 259,584	$ 747,810	$ 1,990,631	$ 2,879,087	$ 3,638,045	$ 4,446,797	$ 4,624,669	$ 4,809,655	$ 5,002,041	$ 5,202,123
Net Surplus (Deficit)	$ -	$ -	$ 24,016	$ 342,150	$ 1,037,408	$ 1,371,021	$ 1,483,430	$ 2,183,859	$ 2,343,501	$ 2,619,130	$ 2,949,614	$ 3,395,162
Cumulative	$ -	$ -	$ 24,016	$ 366,166	$ 1,403,575	$ 2,774,595	$ 4,258,025	$ 6,441,884	$ 8,785,385	$ 11,404,515	$ 14,354,130	$ 17,749,292

Source: THK Associates, Knowledge Based Consulting Group

F. Job Creation

As shown in Table V, ongoing employment in the commercial, business, and educational activities at Palama Nui is expected to reach 1,841 jobs at full buildout in 2014.

TABLE V
JOB CREATION AT PALAMA NUI

	Square Feet per employee	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Commercial Uses													
University Leases	500				60	60	60	60	120	120	120	120	120
Village Commercial	319				63	63	125	125	251	251	251	251	251
University Village Inn	1000				0	60	60	60	60	60	60	60	60
Medical Campus	400				75	150	225	300	300	300	300	300	300
R&D	600				0	17	33	58	92	142	208	283	367
Community Commercial	319				0	0	0	78	157	235	345	470	627
Golf Course				20	46	46	46	46	46	46	46	46	46
Total Direct Employment				**20**	**244**	**395**	**550**	**728**	**1,025**	**1,153**	**1,330**	**1,530**	**1,770**
Community Maint. and Admin	4%			3	10	16	22	29	41	46	53	61	71
Total Ongoing Employment				**23**	**253**	**411**	**572**	**757**	**1,066**	**1,199**	**1,383**	**1,591**	**1,841**

Source: THK Associates, Knowledge Based Consulting Group

Construction Impacts at Palama Nui

G. Construction Spending and Employment

As shown in Table VI, total construction spending at Palama Nui is expected to be just over $304 million. This spending supports over 2,500 person years of construction employment over the life of the project.

H. Construction Excise and Other Taxes

In addition to the creation of construction jobs, the State of Hawaii will receive excise tax revenue on finished development and building materials, conveyance taxes, and income taxes on construction wages. As shown in Table VII, these will amount to an additional $13.9 million in State revenue over the life of the project.

I. Indirect Impact

In 2000, DBED developed a model of the impact of construction on the Hawaii economy. On the basis of the factors developed in that model, the construction expenditures of $305 million on the Palama Nui project will result in an increase in total output of $375 million, an additional 3,700 person years of employment, and an additional $175 million in household income (See Table VIII)

Table 3-5: Project Costs

SUMMARY OF PROJECT COSTS FOR PALAMA NUI ($000)

	Assumptions	2003	2004	2005	2006	2007	2008	2009	2010	Total
Inflation Factor	2%	1.00	1.02	1.04	1.06	1.08	1.10	1.13	1.15	
Infrastructure & Development Costs										
Queen K Intersection		$ -	$ 1,020	$ 1,365	$ -	$ -	$ -	$ -	$ -	$ 2,385
Roads		$ -	$ 1,020	$ 3,121	$ 1,413	$ -	$ -	$ -	$ -	$ 5,554
Storm Drain Drywells		$ -	$ 696	$ -	$ -	$ -	$ -	$ -	$ -	$ 696
Sewer pipe w/manholes		$ -	$ 1,020	$ 3,121	$ 1,120	$ -	$ -	$ -	$ -	$ 5,261
Sewage Treatment Plant		$ -	$ 2,040	$ 2,081	$ -	$ 2,165	$ 2,208	$ -	$ -	$ 8,494
Water lines		$ -	$ 1,020	$ 1,843	$ -	$ -	$ -	$ -	$ -	$ 2,863
Reservoirs		$ -	$ -	$ 1,040	$ 2,122	$ 1,483	$ -	$ -	$ -	$ 4,646
Power & Tel--undergrd		$ -	$ 1,020	$ 2,081	$ 918	$ -	$ -	$ -	$ -	$ 4,019
Street lights		$ -	$ -	$ 556	$ -	$ -	$ -	$ -	$ -	$ 556
Golf Course w/clubhse		$ -	$ 6,120	$ 12,485	$ 9,551	$ -	$ -	$ -	$ -	$ 28,156
Subtotal:		$ -	$ 13,956	$ 27,693	$ 15,124	$ 3,648	$ 2,208	$ -	$ -	$ 62,629
Design, Permits, Engineering	12.0%	$ -	$ 1,675	$ 3,323	$ 1,815	$ 438	$ 265	$ -	$ -	$ 7,516
Contingency @	10.0%	$ -	$ 1,396	$ 2,769	$ 1,512	$ 365	$ 221	$ -	$ -	$ 6,263
Total Infrastructure Costs:		$ -	$ 17,026	$ 33,785	$ 18,452	$ 4,450	$ 2,694	$ -	$ -	$ 76,408
On-Going Maintenance, Operations, and Management Costs										
General & Administration		$ 600	$ 2,500	$ 2,500	$ 2,000	$ 1,500	$ 1,000	$ 750	$ 250	$ 11,100
Common Area / Security/ Homeowner Services		$ -	$ -	$ 1,912	$ 1,664	$ 1,327	$ 976	$ 529		$ 6,409
Total On-Going Costs:		$ 600	$ 2,500	$ 4,412	$ 3,664	$ 2,827	$ 1,976	$ 1,279	$ 250	$ 17,509
PROJECT COSTS:		$ 600	$ 19,526	$ 38,198	$ 22,116	$ 7,277	$ 4,670	$ 1,279	$ 250	$ 93,916
Direct Parcel Costs										
Sales and Marketing		$ -	$ -	$ 1,093	$ 2,725	$ 3,472	$ 3,584	$ 3,093	$ 2,811	$ 16,778
On Sites		$ -	$ 2,907	$ 4,682	$ 5,518	$ 4,817	$ 4,913	$ 4,505	$ -	$ 27,342
Residence and Commercial Construction		$ -	$ -	$ 3,569	$ 12,289	$ 20,255	$ 19,029	$ 17,153	$ 21,719	$ 94,015
Total Parcel Costs		$ -	$ 2,907	$ 8,250	$ 17,807	$ 25,072	$ 23,942	$ 21,658	$ 21,719	$ 121,356
All Costs		$ 600	$ 22,433	$ 46,448	$ 39,923	$ 32,350	$ 28,612	$ 22,937	$ 21,969	$ 215,272

Note: Commercial Construction includes University Village Leases and Commercial Space

Source: Hiluhilu Development; Knowledge Based Consulting Group

TABLE VI

CONSTRUCTION AND PROJECT DEVELOPMENT EMPLOYMENT AT PALAMA NUI

Developer Construction		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Total Infrastructure Costs:		$ -	$ 17,026	$ 33,785	$ 18,452	$ 4,450	$ 2,694	$ -	$ -		$ -	$ -	$ -	$ 76,408
Labor as % of Const Cost	42%	$ -	$ 7,151	$ 14,190	$ 7,750	$ 1,869	$ 1,131	$ -	$ -		$ -	$ -	$ -	$ 32,091
Jobs at Average Wage of	$ 52,000	-	138	273	149	36	22	-	-		-	-	-	617
Total Parcel Costs		$ -	$ 2,907	$ 8,250	$ 17,807	$ 25,072	$ 23,942	$ 21,658	$ 21,719		$ -	$ -	$ -	$ 121,356
Labor as % of Const Cost	40%	$ -	$ 1,163	$ 3,300	$ 7,123	$ 10,029	$ 9,577	$ 8,663	$ 8,688	$ -	$ -	$ -	$ -	$ 48,542
Jobs at Average Wage of	$ 52,000	-	22	63	137	193	184	167	167	-	-	-	-	934
Buildout of Residential Rentals														-
Apartments		0	0	0	0	100	0	0	0	0	0	0	0	100
Intl. Student Housing		0	0	0	0	75	0	0	0	0	0	0	0	75
Senior Housing		0	0	0	0	0	80	0	0	0	0	0	0	80
	Total	0	0	0	0	175	80	0	0	0	0	0	0	255
Construction Cost	$ 80,000	$ -	$ -	$ -	$ -	$ 14,000	$ 6,400	$ -	$ -	$ -	$ -	$ -	$ -	$ 20,400
Labor as % of Const Cost	42%	$ -	$ -	$ -	$ -	$ 5,880	$ 2,688	$ -	$ -	$ -	$ -	$ -	$ -	$ 8,568
Jobs at Average Wage of	$ 52,000	-	-	-	-	113	52	-	-	-	-	-	-	165
Buildout of Commercial Area														-
University Village Inn		-	-	-	30,000	-	-	-	30,000	-	-	-	-	60,000
Medical Campus		-	-	-	30,000	30,000	30,000	30,000	-	-	-	-	-	120,000
R&D		-	-	-	-	10,000	10,000	15,000	20,000	30,000	40,000	45,000	50,000	220,000
Community Commercial		-	-	-	-	-	-	25,000	25,000	25,000	35,000	40,000	50,000	200,000
	Total	-	-	-	60,000	40,000	40,000	70,000	75,000	55,000	75,000	85,000	100,000	600,000
Construction Cost	$ 115	$ -	$ -	$ -	$ 6,900	$ 4,600	$ 4,600	$ 8,050	$ 8,625	$ 6,325	$ 8,625	$ 9,775	$ 11,500	$ 69,000
Labor as % of Const Cost	42%	$ -	$ -	$ -	$ 2,898	$ 1,932	$ 1,932	$ 3,381	$ 3,623	$ 2,657	$ 3,623	$ 4,106	$ 4,830	$ 28,980
Jobs at Average Wage of	$ 52,000	-	-	-	56	37	37	65	70	51	70	79	93	557
Total Construction Jobs		-	160	336	342	379	295	232	237	51	70	79	93	2,273
On-Going Developer Costs:		$ 600	$ 2,500	$ 4,412	$ 3,664	$ 2,827	$ 1,976	$ 1,279	$ 250		$ -	$ -	$ -	$ 17,509
Labor as % of Ongoing Cos	60%	$ 360	$ 1,500	$ 2,647	$ 2,198	$ 1,696	$ 1,186	$ 768	$ 150	$ -	$ -	$ -	$ -	$ 10,505
Jobs at Average Wage of	$ 35,000	10	43	76	63	48	34	22	4	-	-	-	-	300
Total Construction and Developer Emp		10	203	412	405	428	329	254	241	51	70	79	93	2,573
Total Construction Value		$ 600	$ 22,433	$ 46,448	$ 46,823	$ 50,950	$ 39,612	$ 30,987	$ 30,594	$ 6,325	$ 8,625	$ 9,775	$ 11,500	$ 304,672

TABLE VII

Construction and Project Development Tax ($000)

Developer Construction		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Total Infrastructure Costs:		-	17,026	33,785	18,452	4,450	2,694	-	-		-	-	-	76,408
Non Labor Costs as % of Const Cost	58%	-	9,875	19,596	10,702	2,581	1,562	-	-		-	-	-	44,316
Excise Tax on Finished Developme	4.0%	-	681	1,351	738	178	108	-	-	-	-	-	-	3,056
Excise Tax on Building Materials	0.5%	-	49	98	54	13	8	-	-	-	-	-	-	222
Total Parcel Costs		-	2,907	8,250	17,807	25,072	23,942	21,658	21,719		-	-	-	121,356
Non Labor Costs as % of Const Cost	40%	-	1,163	3,300	7,123	10,029	9,577	8,663	8,688	-	-	-	-	48,542
Excise Tax on Finished Developme	4.0%	-	47	132	285	401	383	347	348	-	-	-	-	1,942
Excise Tax on Building Materials	0.5%	-	6	17	36	50	48	43	43	-	-	-	-	243
Buildout of Residential Rentals														
Apartments														-
Intl. Student Housing		0	0	0	0	100	0	0	0	0	0	0	0	100
Senior Housing		0	0	0	0	75	0	0	0	0	0	0	0	75
		0	0	0	0	0	80	0	0	0	0	0	0	80
	Total	0	0	0	0	175	80	0	0	0	0	0	0	255
Construction Cost	$80,000	-	-	-	-	14,000	6,400	-	-	-	-	-	-	20,400
Non Labor Costs as % of Const Cost	58%	-	-	-	-	8,120	3,712	-	-	-	-	-	-	11,832
Excise Tax on Finished Developme	4.0%	-	-	-	-	560	256	-	-	-	-	-	-	816
Excise Tax on Building Materials	0.5%	-	-	-	-	41	19	-	-	-	-	-	-	59
Buildout of Commercial Areas														
University Village Inn														-
Medical Campus		-	-	-	30,000	-	-	-	30,000	-	-	-	-	60,000
R&D		-	-	-	30,000	30,000	30,000	30,000	-	-	-	-	-	120,000
Community Commercial		-	-	-	-	10,000	10,000	15,000	20,000	30,000	40,000	45,000	50,000	220,000
		-	-	-	-	-	-	25,000	25,000	25,000	35,000	40,000	50,000	200,000
	Total	-	-	-	60,000	40,000	40,000	70,000	75,000	55,000	75,000	85,000	100,000	600,000
Construction Cost	$ 115	-	-	-	6,900	4,600	4,600	8,050	8,625	6,325	8,625	9,775	11,500	69,000
Non Labor Costs as % of Const Cost	58%	-	-	-	4,002	2,668	2,668	4,669	5,003	3,669	5,003	5,670	6,670	40,020
Excise Tax on Finished Developme	4.0%	-	-	-	276	184	184	322	345	253	345	391	460	2,760
Excise Tax on Building Materials	0.5%	-	-	-	20	13	13	23	25	18	25	28	33	
On-Going Developer Costs:		600	2,500	4,412	3,664	2,827	1,976	1,279	250		-	-	-	17,509
Material as % of Ongoing Cost	40%	240	1,000	1,765	1,466	1,131	790	512	100	-	-	-	-	7,003
Building Materials	0.5%	1	5	9	7	6	4	3	1	-	-	-	-	35
Summary														
Excise Tax on Finished Development		-	728	1,483	1,299	1,323	931	669	693	253	345	391	460	8,574
Excise Tax on Building Materials		1	60	123	116	123	92	69	69	18	25	28	33	759
Conveyance Taxes	0.1%		-	28	55	160	144	140	127	96	106	48	53	958
Income Taxes	3.0%	-	251	530	544	606	474	374	382	80	109	123	145	3,618
Total Taxes on Construction		1	1,039	2,165	2,015	2,212	1,640	1,252	1,271	447	585	591	692	13,908

TABLE VIII

Indirect Impacts of Palamanui Construction

Value of Construction ($millions)		$	305
Output	**Multiplier**	**($millions)**	
Construction	1.000	$	305
Manufacturing	0.070	$	21
Engineering and Arch	0.032	$	10
Communications	0.030	$	9
Retail Trade	0.028	$	8
Wholesale Trade	0.026	$	8
Other Services	0.014	$	4
Business Services	0.011	$	3
Oher Transportation	0.011	$	3
Finance	0.008	$	2
Total		$	375
Employment		**Jobs**	
Construction	0.942		2,870
Retail Trade	0.059		180
Engineering and Arch	0.041		125
Other Services	0.034		103
Manufacturing	0.033		101
Wholesale Trade	0.032		98
Business Services	0.028		84
Communications	0.018		55
Oher Transportation	0.016		48
Finance	0.007		22
Total			3,687
Household Income ($millions)		**($millions)**	
Construction	0.484	$	147
Engineering and Arch	0.018	$	5
Manufacturing	0.015	$	5
Retail Trade	0.013	$	4
Wholesale Trade	0.011	$	3
Communications	0.010	$	3
Other Services	0.008	$	2
Business Services	0.007	$	2
Oher Transportation	0.004	$	1
Finance	0.003	$	1
Total		$	175

Figure 2. Estimated Impact of Construction on Economy in the Year 2000

IMPACT OF $1 BILLION IN CONSTRUCTION
(direct and indirect impact)

Output
$12.7 million

Top 10 Affected Industries Output ($ million)

Construction	*1,007.8*
Misc Manufacturing	69.9
Engineering and Architectural Services	31.8
Communications	30.4
Retail Trade	27.5
Wholesale Trade	25.9
Other Services	14.1
Business Services	11.2
Other Transportation	11.2
Finance	7.8

Employment
12,436 jobs

Top 10 Affected Industries Jobs (number)

Construction	*9,423*
Retail Trade	596
Engineering and Architectural Services	412
Other Services	337
Misc Manufacturing	332
Wholesale Trade	323
Business Services	277
Communications	182
Other Transportation	159
Finance	71

Household Income
$583 million

Top 10 Affected Industries Income ($ million)

Construction	*483.5*
Engineering and Architectural Services	17.9
Misc Manufacturing	15.2
Retail Trade	13.4
Wholesale Trade	10.8
Communications	9.9
Other Services	8.2
Business Services	6.7
Other Transportation	4.4
Finance	3.0

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Market Evaluation of Palama Nui and University Village Development Opportunities

Prepared for

Hiluhilu Development Company

Prepared by

Knowledge Based Consulting Group, in association with THK Associates

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SECTION I

INTRODUCTION

Knowledge Based Consulting Group (KBCG) and THK Associates were retained by Hiluhilu Development to prepare an analysis of residential and commercial development opportunities associated with its proposed golf course community and University Village project on the island of Hawaii. The scope of work for this project, preliminarily called Palama Nui included

- Prepare a market analysis for *residential and commercial* land uses at the Palama Nui Development site.
- Recommend real estate development programming and marketing guidelines as well as modifications to the concept plan that could increase market value and acceptance.
- Consider the inclusion of a University of Hawaii magnet campus on adjacent property and how it would augment the Palama Nui Development program.
- Estimate the economic impact of the project

Following this Introduction, Section II presents an overview of Hawaii real estate trends. Section III presents the market analysis, while Section IV provides a summary of the consumer response to the University Village concept. Section V summarizes expected product absorption and pricing recommendations.

KBCG and THK appreciate the opportunity to present these findings and recommendations.

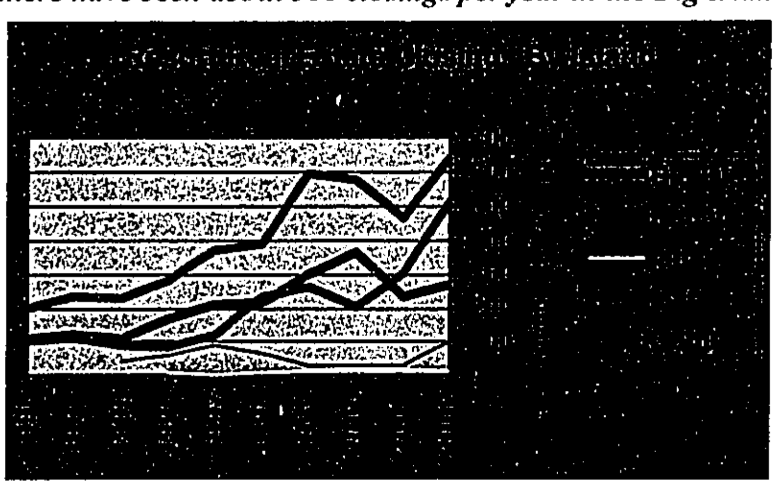
SECTION II

MARKET OVERVIEW, REAL ESTATE TRENDS IN HAWAII MASTER PLANNED COMMUNITIES

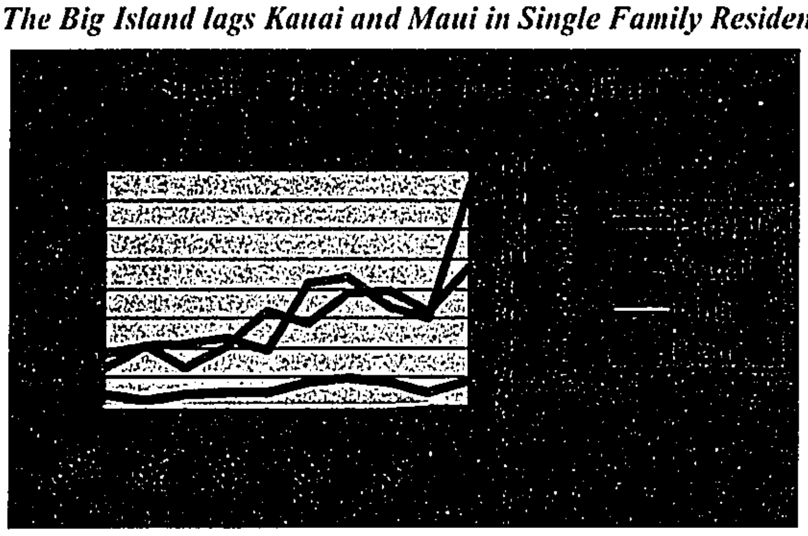
Since the focus of this research is to understand the market opportunities for a new master planned community on the Big Island, KBCG reviewed both long and short term real estate trends for master planned communities on the Big Island and the rest of Hawaii. For the Big Island, these communities included Hokulia, Hualalai, Keauhou, Kukio, Mauna Kea, Mauna Lani, and Waikoloa. Importantly, by nearly every measure, the Big Island has seen good growth in its real estate activity in recent years, however it has been losing market share to Maui and Kauai over the past two years.

REAL ESTATE CLOSINGS

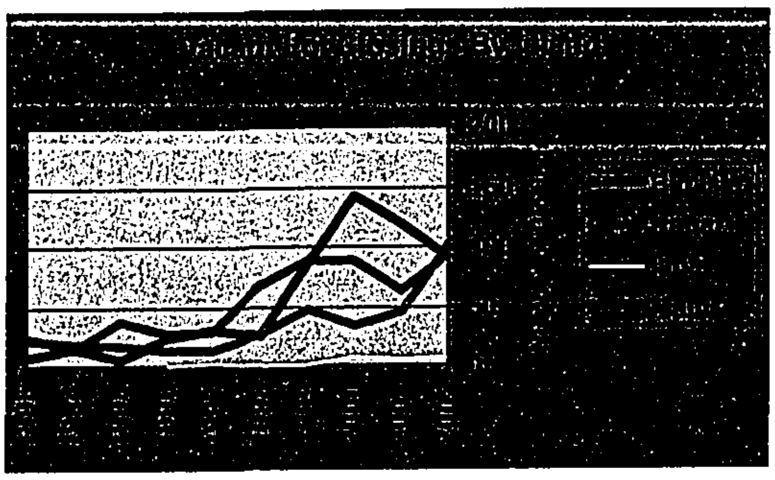
The Big Island is #3 in overall real estate closings, behind Maui and Kauai. Since 1999, there have been about 300 closings per year in the Big Island master planned communities.



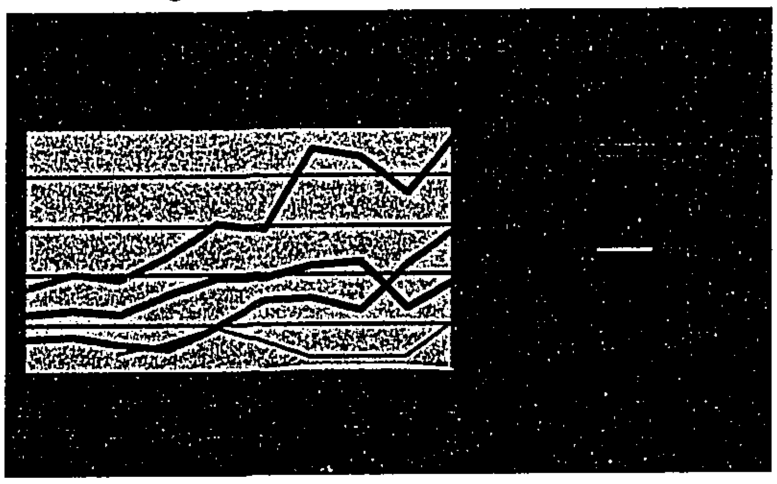
The Big Island lags Kauai and Maui in Single Family Residence Closings



For vacant lots, Kauai, Maui, and Big Island closings were essentially the same in 2002, with the Big Island coming off a peak in 2000.



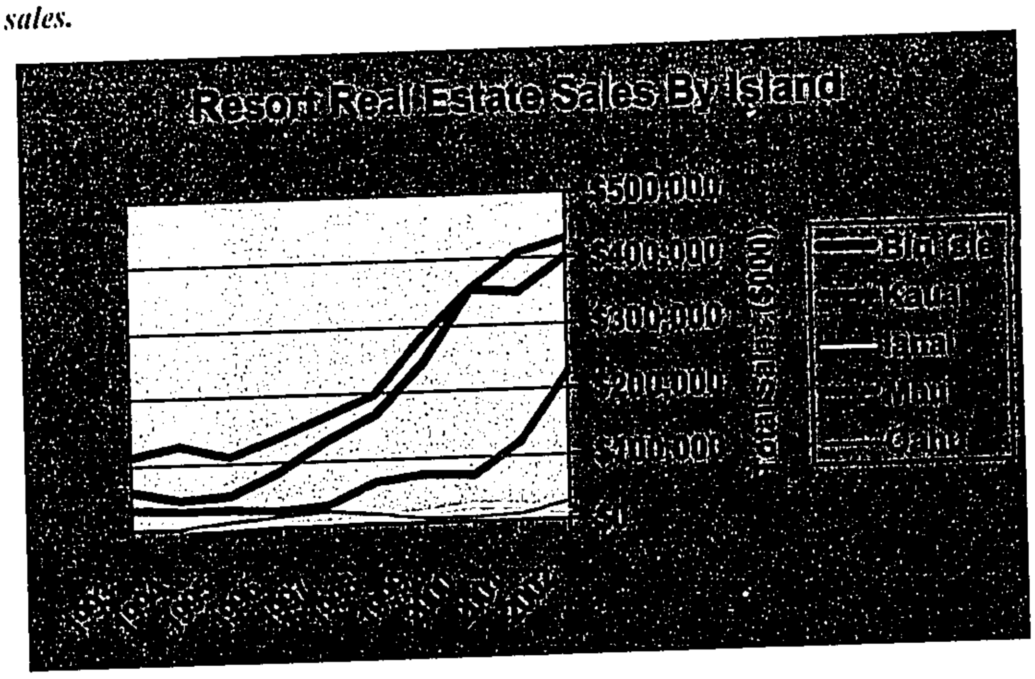
Maui continues to lead in condominium closings, but Kauai has shown healthy gains since 2000. The Big Island has been relatively stable since 1997



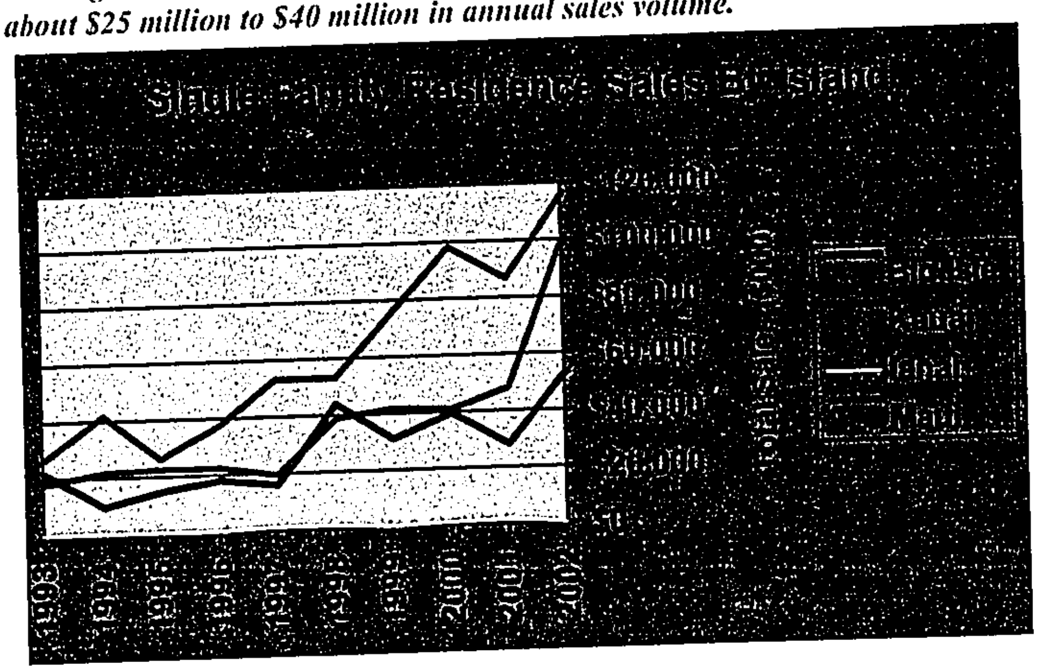
REAL ESTATE SALES VOLUME

For the first time, in 2002 total real estate sales exceeded $1 billion for the selected master planned communities.

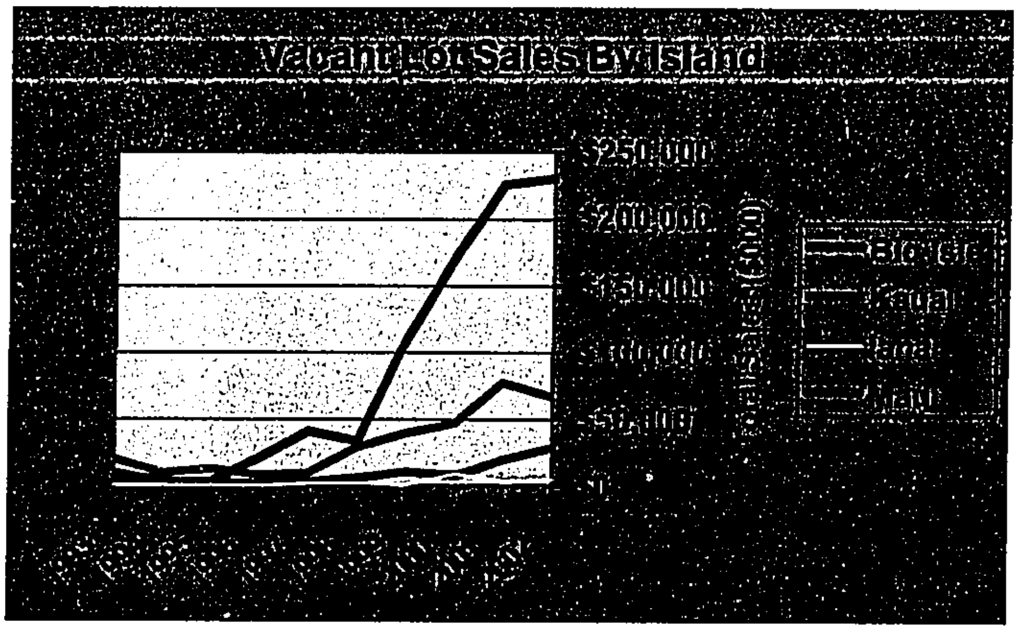
The Big Island and Maui are relatively equal in overall master planned community real estate sales.



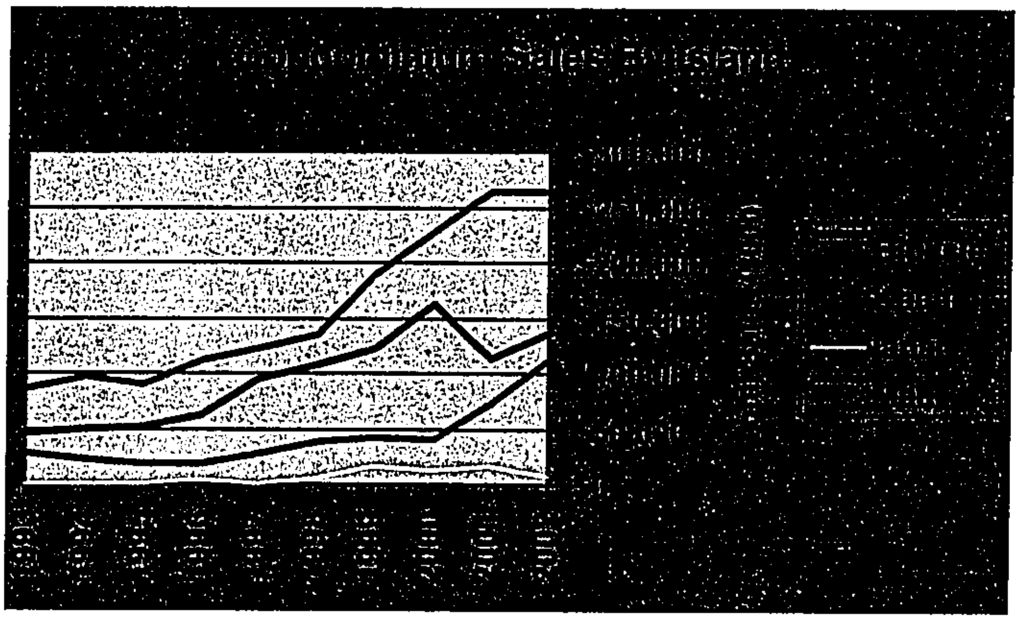
The Big Island is #3 in single family sales volume in master planned communities, averaging about $25 million to $40 million in annual sales volume.



The Big Island is by far the leader in vacant lot sales volume at master planned communities.

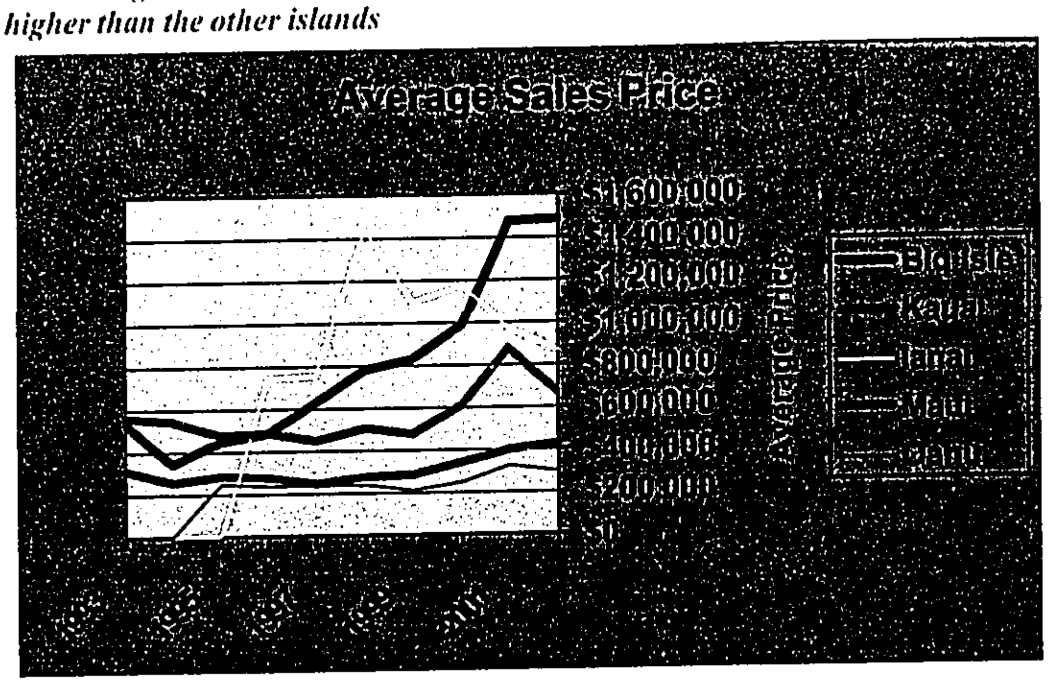


Maui is the leader in condominium sales volume.

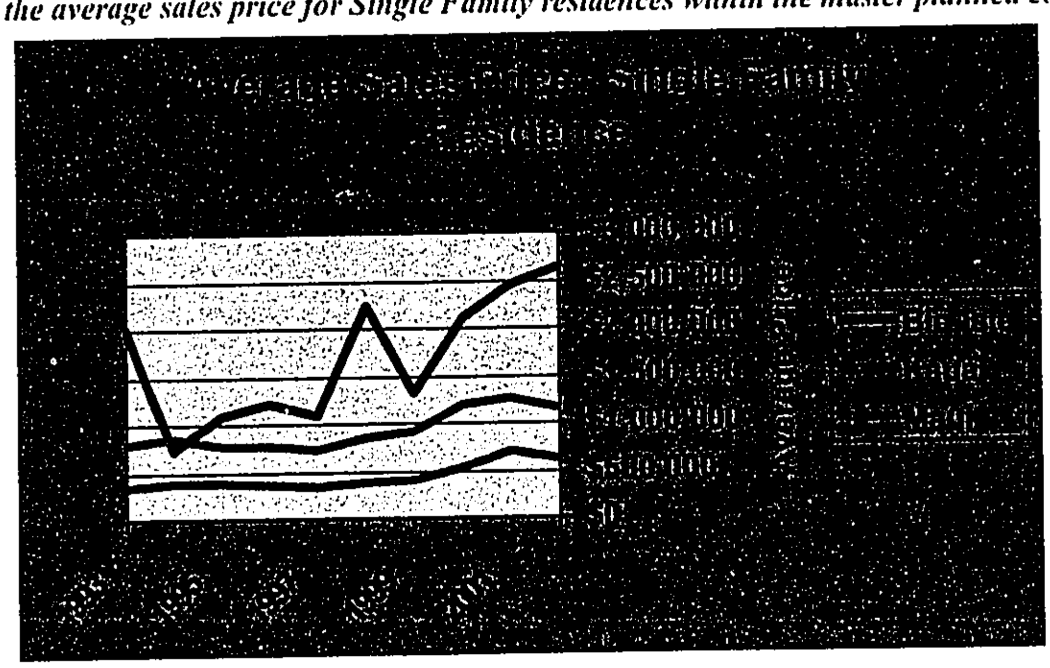


Average Prices

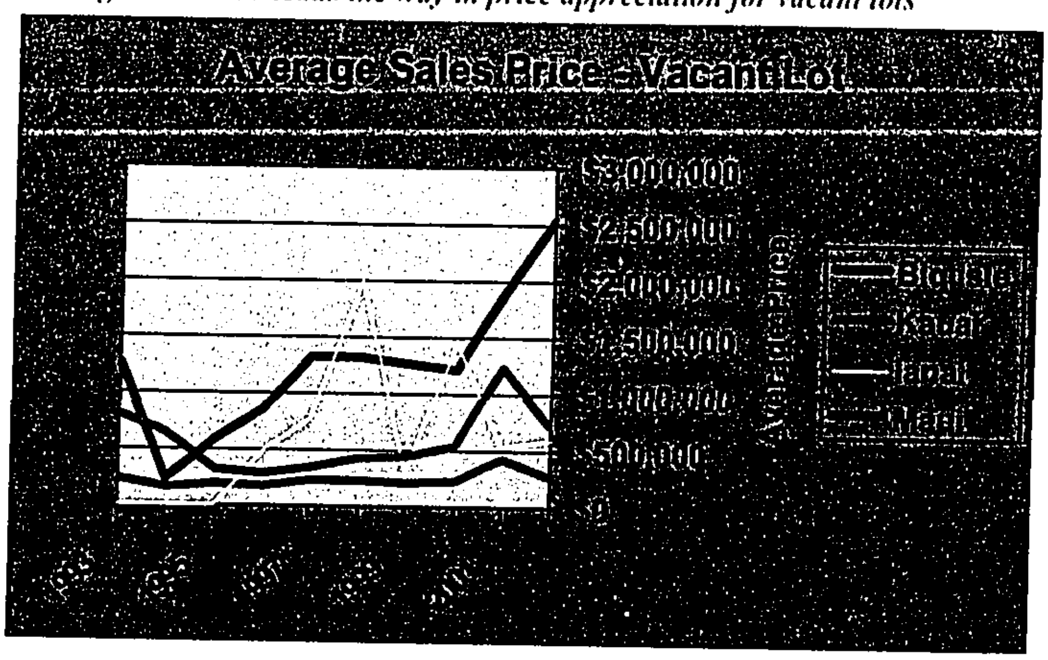
The average real estate values at Big Island master planned communities are substantially higher than the other islands



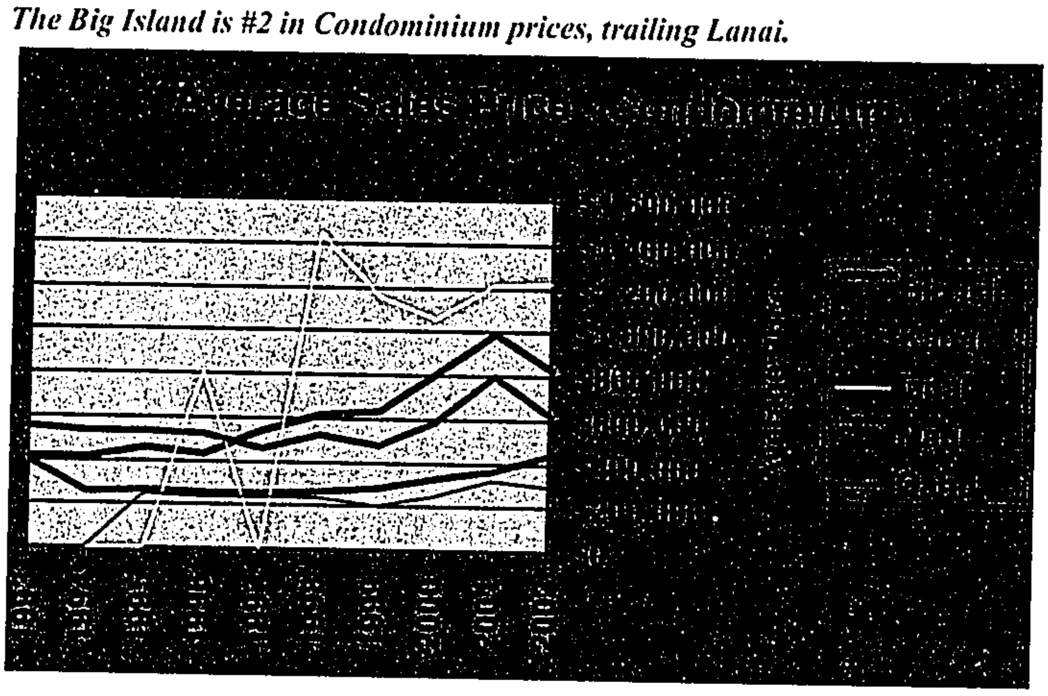
Ever since the opening of Hualalai in 1997, the Big Island has shown a dramatic increase in the average sales price for Single Family residences within the master planned communities.



The Big Island also leads the way in price appreciation for vacant lots

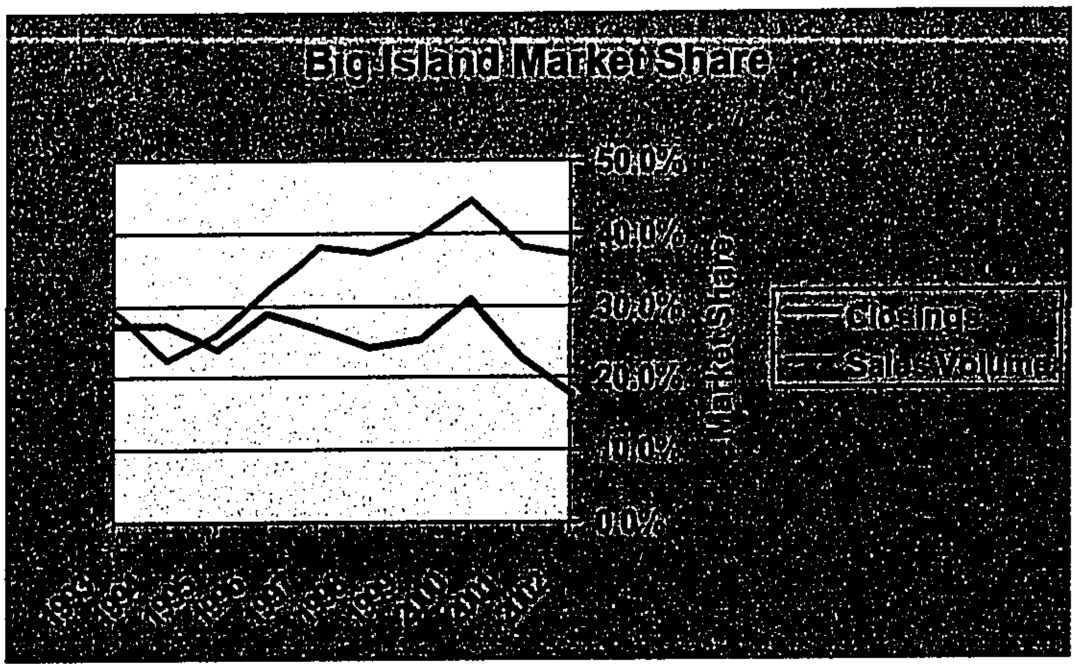


The Big Island is #2 in Condominium prices, trailing Lanai.

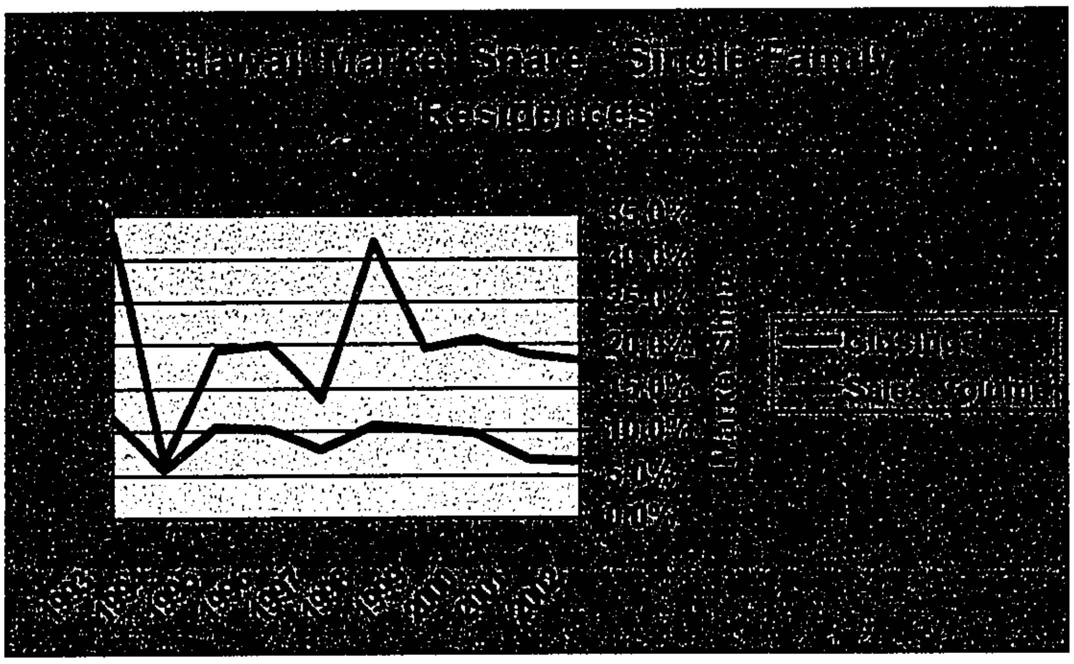


MARKET SHARE

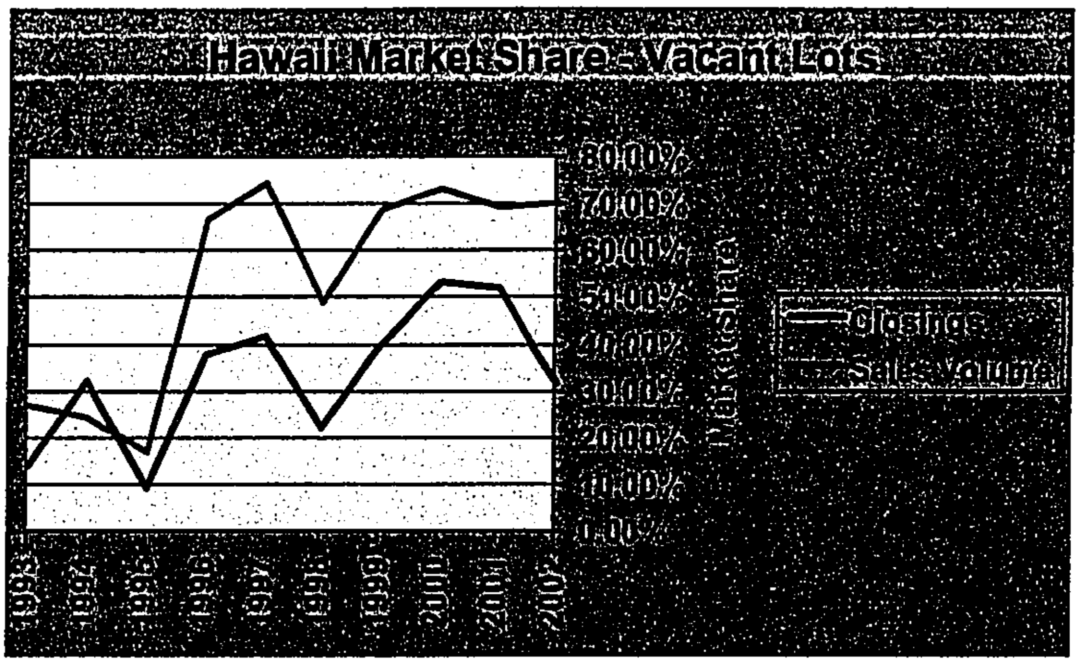
The Big Island has seen a decline in market share for real estate closings and sales volume at master planned communities over the past two years



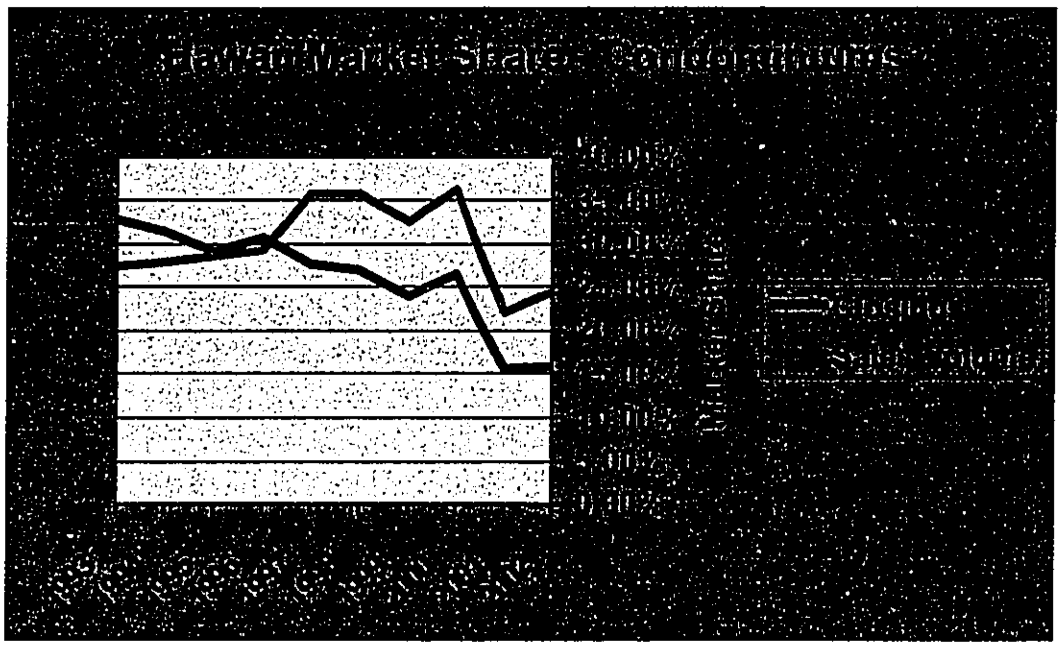
The Big Island represents less than 10% of the closings for single family residences in master planned communities



Since 1996, Hawaii has generally dominated market share in terms of vacant lot closings and sales volume.



Hawaii's share of the condominium market has decreased for both sales volume and closings since the mid 1970's



The supporting data for the above charts and performance for each master planned community is shown in the following table.

Summary of Master Planned Resort Real Estate Activity, 2000 - 2002

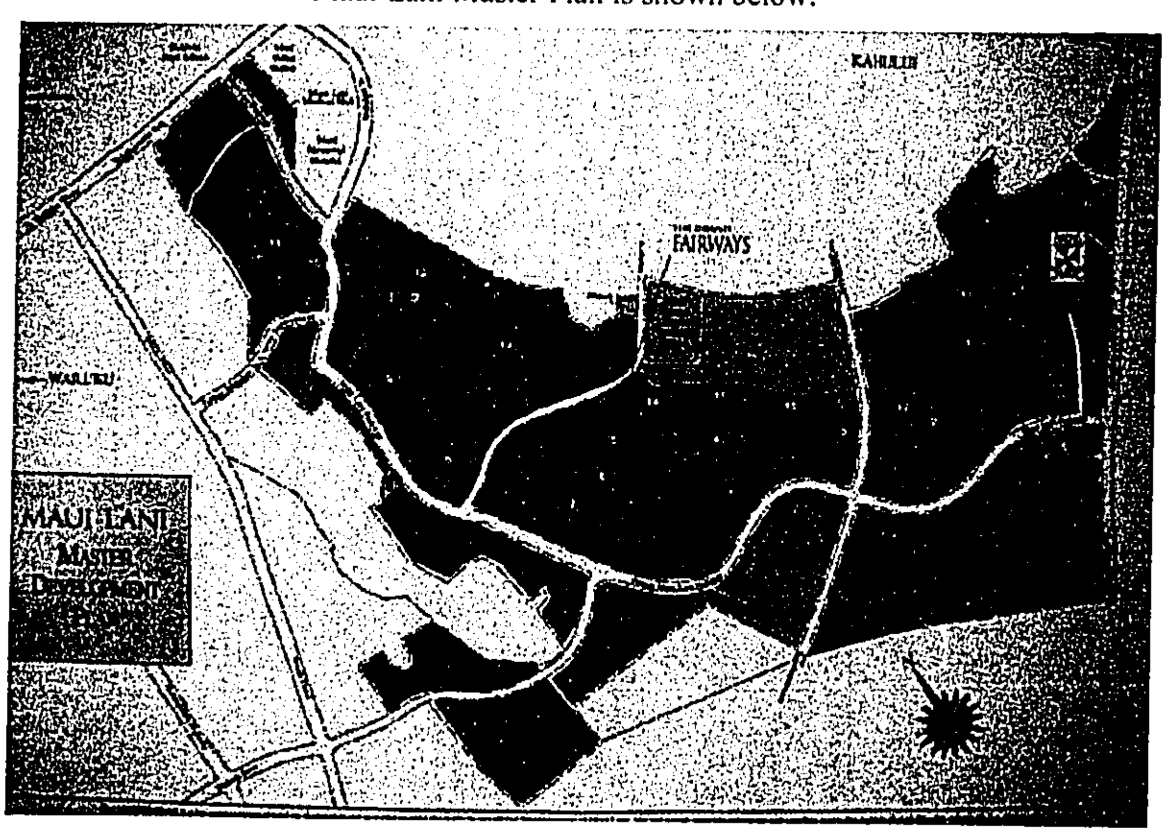
	Closings			Average Price			Total Sales ($000)		
	2000	2001	2002	2000	2001	2002	2000	2001	2002
Residences									
Big Island									
Hualalai	2	1	1	$ 1,570,318	$ 8,425,000	$ 3,575,000	$ 3,141	$ 8,425	$ 3,575
Keauhou	7	4	6	$ 1,032,323	$ 1,475,000	$ 859,833	$ 7,226	$ 5,900	$ 5,159
Mauna Kea	6	2	6	$ 3,231,667	$ 3,740,000	$ 2,609,000	$ 19,390	$ 7,480	$ 15,654
Mauna Lani	1	2	5	$ 4,000,000	$ 3,560,000	$ 4,620,000	$ 4,000	$ 7,120	$ 23,100
	16	9	18	$ 2,109,806	$ 3,213,889	$ 2,638,222	$ 33,757	$ 28,925	$ 47,488
Kauai									
Poipu	29	23	46	$ 623,837	$ 856,483	$ 660,598	$ 18,091	$ 19,699	$ 30,388
Princeville	38	37	105	$ 453,290	$ 600,195	$ 614,620	$ 17,225	$ 22,207	$ 64,535
	67	60	151	$ 527,109	$ 698,439	$ 628,627	$ 35,316	$ 41,906	$ 94,923
Lanai	1	2		$ 735,000	$ 612,500		$ 735	$ 1,225	$ -
Maui									
Kapalua	13	6	2	$ 2,018,462	$ 1,588,467	$ 2,362,500	$ 26,240	$ 9,531	$ 4,725
Wailea	48	44	59	$ 1,004,677	$ 1,235,402	$ 1,160,155	$ 48,224	$ 54,358	$ 68,449
Kaanapali	17	14	34	$ 1,038,941	$ 1,190,214	$ 1,084,559	$ 17,662	$ 16,663	$ 36,875
	78	64	95	$ 1,181,109	$ 1,258,617	$ 1,158,412	$ 92,126	$ 80,551	$ 110,049
Total	*162*	*135*	*264*	*$ 999,597*	*$ 1,130,428*	*$ 956,287*	*$ 161,935*	*$ 152,608*	*$ 252,460*
Vacant Lots									
Big Island									
Hualalai	15	10	18	$ 1,957,333	$ 2,710,000	$ 2,530,833	$ 29,360	$ 27,100	$ 45,555
Keauhou	16	7	12	$ 182,375	$ 263,429	$ 476,617	$ 2,918	$ 1,844	$ 5,719
Mauna Kea	13	10	12	$ 2,600,000	$ 1,473,900	$ 930,854	$ 33,800	$ 14,739	$ 11,170
Mauna Lani	39	3	11	$ 1,690,000	$ 854,167	$ 3,551,409	$ 65,910	$ 2,563	$ 39,065
Hokulia	60	68	19	$ 689,145	$ 841,604	$ 1,338,664	$ 41,349	$ 57,229	$ 25,435
Kukio		14	19		$ 8,562,016	$ 5,434,737	$ -	$ 119,868	$ 103,260
North Kona		7			$ 216,857		$ -	$ 1,518	$ -
	143	119	91	$ 1,212,145	$ 1,889,587	$ 2,529,723	$ 173,337	$ 224,861	$ 230,205
Kauai									
Poipu	9	8	24	$ 371,111	$ 833,139	$ 326,993	$ 3,340	$ 6,665	$ 7,848
Princeville	26	38	80	$ 194,250	$ 345,605	$ 257,724	$ 5,051	$ 13,133	$ 20,618
	35	46	104	$ 239,729	$ 430,394	$ 273,709	$ 8,390	$ 19,798	$ 28,466
Lanai	7	6	8	$ 1,447,857	$ 535,000	$ 599,063	$ 10,135	$ 3,210	$ 4,793
Maui									
Kapalua	17	22	27	$ 1,208,500	$ 1,105,227	$ 864,722	$ 20,545	$ 24,315	$ 23,347
Wailea	57	35	27	$ 354,889	$ 1,315,970	$ 890,325	$ 20,229	$ 46,059	$ 24,039
Kaanapali	14	6	40	$ 507,964	$ 1,211,667	$ 481,345	$ 7,111	$ 7,270	$ 19,254
	88	63	94	$ 544,144	$ 1,232,444	$ 708,937	$ 47,885	$ 77,644	$ 66,640
Total	*273*	*234*	*297*	*$ 878,194*	*$ 1,391,081*	*$ 1,111,458*	*$ 239,747*	*$ 325,513*	*$ 330,103*
Condos									
Big Island									
Hualalai	41	17	11	$ 1,993,293	$ 2,067,839	$ 2,647,273	$ 81,725	$ 35,153	$ 29,120
Keauhou	94	44	47	$ 296,693	$ 393,626	$ 408,144	$ 27,889	$ 17,320	$ 19,183
Mauna Kea	3	16	20	$ 1,540,000	$ 841,893	$ 865,260	$ 4,620	$ 13,470	$ 17,305
Mauna Lani	28	9	39	$ 814,464	$ 999,444	$ 1,019,404	$ 22,805	$ 8,995	$ 39,757
Waikoloa	31	21	44	$ 391,516	$ 396,447	$ 407,891	$ 12,137	$ 8,325	$ 17,947
	197	107	161	$ 757,239	$ 778,163	$ 765,913	$ 149,176	$ 83,263	$ 123,312
Kauai									
Poipu	48	91	102	$ 264,119	$ 322,857	$ 381,300	$ 12,678	$ 29,380	$ 38,893
Princeville	53	105	161	$ 275,702	$ 278,420	$ 375,928	$ 14,612	$ 29,234	$ 60,524
	101	196	263	$ 270,197	$ 299,051	$ 378,011	$ 27,290	$ 58,614	$ 99,417
Lanai	12	14	6	$ 1,056,367	$ 1,215,954	$ 1,208,333	$ 12,676	$ 17,023	$ 7,250
Maui									
Kapalua	69	73	55	$ 592,609	$ 1,174,425	$ 792,579	$ 40,890	$ 85,733	$ 43,592
Wailea	220	104	128	$ 586,654	$ 686,424	$ 668,275	$ 129,064	$ 71,388	$ 85,539
Kaanapali	123	164	273	$ 366,080	$ 573,128	$ 455,832	$ 45,028	$ 93,993	$ 124,442
	412	341	456	$ 521,800	$ 736,405	$ 556,082	$ 214,982	$ 251,114	$ 253,573
Total	*722*	*658*	*886*	*$ 559,729*	*$ 623,123*	*$ 545,770*	*$ 404,124*	*$ 410,015*	*$ 483,552*
Total	1,157	1,027	1,447	$ 696,461	$ 864,786	$ 736,776	$ 805,806	$ 888,136	$ 1,066,115

On balance, the Hawaii real estate market has increased in earnest over the past three years. This upsurge in demand combined with Hawaii's painstaking review and approval process has led to very strong interest in the relatively few development parcels available within master planned communities. For the Big Island, there has been a decrease in market share as average prices increased. The Palama Nui project, with more moderate prices should help recapture market share and improve the affordability of new single-family residences and attached housing within a master planed community setting.

Maui Lani, Maui

In addition to the master planned communities included above, the recent market success of the Maui Lani project near Wailuku on Maui is a good example of new housing being built to meet local demand. *It speaks well for the probable support for an integrated community of* commercial and residential uses such as proposed for the Palama Nui development site and is described below:

Maui Lani is a 1,000-acre master planned community that was started in the 1970s by Alexander & Baldwin Inc. Honolulu developer Bill Mills and other local interests acquired the project in 1994 and in 1996, the first model homes were opened for sale. When completed, it will contain more than 3,000 homes on 1,000 acres that will include 8 different neighborhoods, a large regional park, shopping, schools, churches, a medical complex, The Dunes golf course, clubhouse with restaurant and a driving range. Located in central Maui, Maui Lani is convenient to shopping, the Wailuku business district, the airport, established schools, Maui's attractions, and historic sites. The Maui Lani Master Plan is shown below:



To date, two increments at Maui Lani, the Greens and the Grand Fairways, have been completed and sold out. Resales are already occurring in both developments. The average re-sale price for single-family homes in the Greens subdivision, now three years old, is running around $360,000. Three years ago such a property could have been purchased for around $185,000. Reportedly, 90% to 95% of the buyers are Maui residents and Maui Lani sales have been averaging about 100 units per year. The 6,841-yard Dunes at Maui Lani golf course is ranked as one of the top 2 courses on Maui

Current subdivisions include Grand Fairways North and The Island. Grand Fairways North consists of 80 Lots, ranging from 7,000 to 13,000 square feet. They have mountain and golf course views. Three builders, Betsill Brothers, 3D Builders and Webb Construction, offer semi-custom homes. At The Island, lots were initially offered for sale in late 2001 and early 2002. Perimeter lots sold for $195,000 to $210,000, while interior lots sold for $150,000 to $165,000. Entry level and first time move up developer Schuler Homes purchased a portion of the Island's interior lots. Their typical product is a 2,000 +/- SF homes (4 bedroom, 2 ½ bath) that sells from $365,000 to $425,000.Buyers receive 1-year free membership to the Dunes Player Club and Maui Arts and Cultural Center's Ilima Club.

SECTION III

MARKET DEMAND FOR PALAMA NUI DEVELOPMENT PROJECT

The potential for new residential development is subject to a variety of pressures including interest rates, inflation, social, political and other economic influences. The detailed market and demographic analysis projected the overall growth in population and household formations, which will create the aggregate demand for new housing construction. Historical trends in new housing construction were also examined to show how past construction trends have coincided with population and demographic changes and economic conditions.

Based upon the historical performance of the Hawaii County housing market, and upon the projected growth in new household formations, the demand for new residential construction can be segmented by tenure and type of unit. This will allow the market potentials for specific types of residential construction to be examined. The key components of residential construction demand during the next decade include new housing units to meet demands of new population growth and household formations, construction to meet the demands of the existing households in the area who desire to upgrade or downgrade into new ownership units, and construction to replace units lost through demolition and conversion. The following table summarizes the net change in housing unit demand expected during the next decade in the Hawaii County area.

THK projects new household formations will average 1,370 per year during the projection period 2002-2012 which will produce a demand for the construction of 1,451 dwelling units annually when adjusted for vacancies and demolitions. Single-family detached construction of 1,180 units annually during the next decade will account for approximately 81.4% of total construction in the Hawaii County area. Townhome and condominium construction will average 90 units annually, or 6.1 % of the total market followed by rental apartment construction with 180 units annually, or 12.3% of total construction.

PROJECTED PERMANENT RESIDENTIAL DEMAND IN HAWAII COUNTY

				Ownership Units			
Year	Households	Annual Change	Annual Housing Unit Demand	Total	Detached	Attached	Rental
2003	59,375	1,250	1,304	1,141	1,061	80	163
2004	60,625	1,283	1,338	1,171	1,089	82	167
2005	61,908	1,316	1,373	1,201	1,117	84	172
2006	63,224	1,351	1,409	1,233	1,147	86	176
2007	64,575	1,386	1,446	1,265	1,176	89	181
2008	65,961	1,423	1,484	1,299	1,208	91	186
2009	67,384	1,460	1,523	1,332	1,239	93	190
2010	68,844	1,498	1,562	1,367	1,271	96	195
2011	70,342	1,537	1,603	1,403	1,305	98	200
2012	71,879	1,576	1,644	1,438	1338	101	205
Average Annual Demand (2002-2012)	1,370		1,451	1,269	1,180	89	181

TOTAL PROJECTED RESIDENTIAL DEMAND IN THE HAWAII COUNTY AREA

Based upon the annual housing unit demand forecast above, THK estimated the demand for seasonal/second homes in the Hawaii County area. With the addition of seasonal home demand, the total housing unit demand will grow at an average of 1,533 units per year for the next decade. The second home market comprises 5.4% of the total Hawaii County housing unit demand. This demand is segregated between detached single-family (80%) and attached single-family (20%). Single-family detached construction of 1,242 units annually during 2002-2012 accounts for about 81% of total construction in the Hawaii County area. Condominiums and townhome construction will average 109 units annually, or 7% of the total market followed by rental apartment construction with 181 units annually, or 12% of total construction.

PROJECTED TOTAL RESIDENTIAL DEMAND IN HAWAII COUNTY

				Ownership Units			
Year	Permanent Household Unit Demand	Seasonal/ Second Home Demand	Total Housing Unit Demand	Total	Detached	Attached	Rental
2002	1271	73	1344	1185	1089	96	159
2003	1,304	75	1,378	1,215	1,117	99	163
2004	1,338	76	1,415	1,247	1,146	101	167
2005	1,373	78	1,451	1,279	1,176	104	172
2006	1,409	80	1,489	1,313	1,207	106	176
2007	1,446	82	1,528	1,347	1,238	109	181
2008	1,484	84	1,569	1,383	1,271	112	186
2009	1,523	87	*1609*	1,419	1,304	115	190
2010	1,562	89	1651	1,456	1,338	118	195
2011	1,603	91	1,694	1,494	*1373*	121	200
2012	1,644	93	1,737	1,531	1,407	124	205
Average Annual Demand (2001-2011)	1,451	83	1533	1,352	1,242	109	181

PROJECTED SINGLE-FAMILY LOT DEMAND IN THE HAWAII COUNTY AREA

Based on the demand for single-family detached units forecasted for the next decade in, THK is able to project the number of additional lots that will be in demand during the same timeframe. THK estimates this demand will grow from 54 lots in 2002 to 70 lots in 2012, an annual average of 62 additional lots. Combined with the units demanded, it results in the total demand for units and lots to increase from 1,144 to 1,478 in 2012, an annual average of 1,305 units and lots over the next decade.

Projected Single Family Lot Demand in Hawaii County, 2002-2012

Year	Total Single Family Unit Demand	Additional Lot Demand	Unit and Lot Demand
2002	1,089	54	1,144
2003	1,117	56	1,173
2004	1,146	57	1,204
2005	1,176	59	1,235
2006	1,207	60	1,267
2007	1,238	62	1,300
2008	1,271	64	1,335
2009	1,304	65	1,369
2010	1,338	67	1,405
2011	1,373	69	1,441
2012	1,407	70	1,478
Average Annual Demand (2002 - 2012)	1,242	62	1,305

TOTAL PROJECTED RESIDENTIAL DEMAND IN THE PRIMARY TRADE AREA

Based on the projected household unit demand for the next decade, THK is able to estimate the demand for seasonal/second homes. In the year 2002, THK estimates the demand to be 64 seasonal units and increase to 83 seasonal units by 2012. This increases the construction of detached single-family to an average of 719 units annually over the next decade. Townhome and condominium construction will average 84 units annually while rental apartment demand will average 104 units annually.

PROJECTED PERMANENT RESIDENTIAL DEMAND IN HAWAII COUNTY

				Ownership Units			
Year	Permanent Household Unit Demand	Seasonal/ Second Home Demand	Annual Housing Unit Demand	Total	Detached	Attached	Rental
2002	727	64	792	701	627	73	91
2003	747	66	813	720	644	75	93
2004	767	68	835	739	662	77	96
2005	788	69	857	759	679	79	98
2006	809	71	880	779	698	81	101
2007	831	73	904	800	716	84	104
2008	854	75	928	822	736	86	107
2009	877	77	953	844	756	88	110
2010	900	79	979	866	776	91	113
2011	925	81	1,005	890	797	93	116
2012	948	83	1,031	912	817	95	119
Average Annual Demand (2002-2012)	834	73	907	803	719	84	104

PROJECTED SINGLE-FAMILY DEMAND IN THE PRIMARY TRADE AREA

Based on the demand for single-family detached units forecasted for the next decade, THK projected the number of lots that will be in demand during the same timeframe. THK estimates this demand will grow from 31 additional lots in 2002 to 41 lots in 2012, an annual average of 36 additional lots. In addition to the units demanded, it results in the total demand for units and lots to increase from 659 to 858 in 2012, an average of 755 units and lots over the coming decade.

Projected Single Family Lot Demand in the Primary Trade Area, 2002-2(

Year	Total Single Family Unit Demand	Additional Lot Demand	Unit and Lot Demand
2002	627	31	659
2003	644	32	676
2004	662	33	695
2005	679	34	713
2006	698	35	733
2007	716	36	752
2008	736	37	773
2009	756	38	793
2010	776	39	815
2011	797	40	837
2012	817	41	858
Average Annual Demand (2002-2012)	719	36	755

To better quantify the demand for new residential units in the primary trade area, THK breaks down the trade area's existing households by income range and then converts those income ranges to home purchasing capacity and monthly rental capacity. Home purchasing capacity is calculated using estimated monthly payments (principle, interest, taxes and insurance) based on a 30-year fixed rate mortgage with a 8.0% interest rate and a 20% down payment In determining monthly rental capacity it's assumed – as available statistics indicate – that households that rent spend, on average, 25% of their gross income on housing. Households that own their homes typically allot 28%-32% of their income to mortgage payments. It should be noted that no allowances have been made to account for the greater purchasing capacity that may be derived from adjustable rate mortgages (ARMs) or other alternative financing mechanisms. For that reason, home purchasing capacity estimates are likely conservative.

The median household income in the Palama Nui Development primary trade area is currently approximately $53,158. This suggests that the median permanent household in the trade area can afford a $181,100 home. However, new home sales suggest that buyers are spending a greater percentage of their incomes on housing and that residents with significantly higher incomes are purchasing new products. Many of these buyers are new to the Island and do not comprise the current median income. Therefore, appropriate adjustments have been made to the demand by price range. In terms of second home purchasing capacity, adjustments were made based on pricing of existing and new product aimed at this market and on similar analyses performed by THK in regionally and conceptually competitive markets.

In the following table, the demand for residential units in the Palama Nui Development trade area is projected by price range. It shows the demand distribution for the annual average of 755 single-family detached units projected by THK to be demanded in the primary trade area. Approximately 65.0% of the projected single-family demand in the primary trade area will be for lots priced over $100,000. Almost 50% of the seasonal single-family demand is for lots priced over $225,000.

Annual Average Lot/ Unit Demand by Price Range in the Palama Nui Development Primary Trade Area

Unit Price Range	Lot Price Range	Permanent Households	Percent	2nd Home/ Seasonal Residents	Percent	Additional Lots	Percent	Total	Percent
Detached Single Family									
Under $250,000	Under $100,000	255	38.6%	0	0.0%	0	0.0%	255	33.8%
$250,000 - $349,999	$100,000 $124,999	212	32.1%	3	5.0%	2	5.0%	216	28.7%
$350,000 - $449,999	$125,000 $159,999	78	11.8%	4	7.5%	3	7.5%	85	11.3%
$450,000 - $549,999	$160,000 $189,999	50	7.5%	6	10.0%	4	10.0%	59	7.8%
$550,000 - $649,999	$190,000 $224,999	26	4.0%	18	30.0%	11	30.0%	55	7.3%
$650,000 +	$225,000 +	40	6.0%	28	47.5%	17	47.5%	84	11.2%
Total		660	100.0%	59	100.0%	36	100.0%	755	100.0%

Unit Price Range	Permanent Households	Percent	2nd Home/ Seasonal Residents	Percent	Total	Percent
Condominiums and Townhomes						
Under $250,000	44	63.2%	4	25.0%	47	56.5%
$250,000 $350,000	12	16.8%	4	30.0%	16	19.1%
$350,000 +	14	20.0%	7	45.0%	20	24.4%
Total	69	100.0%	15	100.0%	84	100.0%

Unit Rental Rates		
Rental Multi-Family		
Under $600	26	24.5%
$600 - $750	18	16.8%
$750 +	61	58.7%
Total	104	100.0%

Source: U.S. Bureau of the Census and THK Associates, Inc.

Mobile/Manufactured Homes		
Under $200	2	12.5%
$200 - $239	5	30.0%
$240 - $279	5	35.0%
$280 +	3	22.5%
Total	15	100.0%

Source: U.S. Bureau of the Census and THK Associates, Inc.

Active Residential Projects on the Kona-Kohala Coast

Residential activity on the Big Island has remained fairly robust, even in the aftermath of the September 11th tragedy. A review and analysis of permit activity and sales activity for the period of September 2001 through August 2002 shows greater volume and some appreciation of pricing. The north Kona district, in particular, had by far the greatest activity on the Island. Figures for the 12-month period show 532 single-family sales at an average price of $368,000. Just over 300 condominiums sold for an average price of $222,000. The south Kohala district registered 197 single-family sales at an average price of $413,000. Pricing per square foot generally ranged from $150 to $250 depending upon location and views.

RESIDENTIAL DEVELOPMENT POTENTIALS AT THE PALAMA NUI DEVELOPMENT SITE

The success of residential development at the Palama Nui Development site depends on a number of factors: location, physical suitability of the site for development, and the overall market conditions for residential sales. Physically, the site appears well suited for residential development and should lend itself to an interesting layout, particularly once the planned golf course is completed.

THK's projected capture rates for housing units at the Palama Nui Development site are shown below. The demand by price range and unit type in the primary trade area was projected earlier based upon the projected income and demographic characteristics of the population in the region. The capture rates for the subject site show the share of each market segment that the subject property is expected to capture.

The important elements to evaluate when determining capture rates are the prestige of the community and the quality and character of the immediate area. The capture rates shown reflect the differences in the quality of the location and, the reputation, planning and amenities of competitive developments. These capture rates were determined based upon the geographic attributes of the subject site and those of competitive projects, as well as the' number of competitors in a given price range within the immediate market area.

Based on the competitive review of other projects, the location of the site, its planned amenities, and its access to regional employment, retail, and recreation centers, THK believes that the Palama Nui Development site will be able to capture either a generic capture rate or a higher than generic capture rate of the single-family detached market. In order to determine capture rates, THK reviewed the number of existing competitors and determined those that will still be marketing product during the Palama Nui development period. THK then allowed for new project and resale competition and estimated a "fair" share capture rate, adjusted for the site.

An average annual demand of 500 units priced over $250,000 over the next 11 years is expected in the trade area. Given the site's proposed golf course and overall community plan, THK has programmed product in five ranges over $250,000. It is also assumed that the lots will be relatively large (THK has programmed a 10,000-42,500 square foot range). That said, it is estimated that the site could capture approximately eight units per year in the $350,000 to $450,000 price range, nine per year in the $450,000-$550,000 price range, and nine units per year priced over $650,000. This suggests an average lot size of 20,200 square feet and an average annual absorption of 31 acres.

Projected Single Family Detached Demand and Acreage Absorption at the Palama Nui Development Site

Home Prices	Under $349,999	$350,000 $449,999	$450,000 $549,999	$550,000 $649,999	$650,000 & Above		
Lot Prices:	Under $124,999	$125,000 $159,999	$160,000 $189,999	$190,000 $224,999	$225,000 & Above	Annual Total	Cumulative Total
Annual Average Demand in the Primary Trade Area:	216	85	59	55	84	500	
Number of Competitors:	18	12	8	6	10		
Generic Capture Rate:	5.3%	7.7%	11.1%	14.3%	9.1%		
Site Capture Rate:	5.3%	9.6%	15.0%	19.9%	10.9%	9.7%	
Annual Absorption (Units)							
2002			Planning				
2003	10	7	8	10	8	43	43
2004	10	8	8	10	8	45	88
2005	11	8	8	10	9	46	134
2006	11	8	9	11	9	47	181
2007	11	8	9	11	9	48	229
2008	12	8	9	11	9	50	279
2009	12	9	9	11	10	51	330
2010	12	9	10	12	10	52	382
2011	13	9	10	12	10	54	436
Total	102	73	80	98	83	436	
Annual Average	11	8	9	11	9	48	
Average Lot Size (SF)	10,000	12,500	15,000	21,000	42,500	20,200	
Average Net Density	3.5	2.5	2.0	1.5	0.7	1.5	
Net Acres (Annual Average)	3.3	3.3	4.4	7.2	13.2	31	
Net Acres	29.3	29.4	39.8	65.2	118.4	282.0	

Source: THK Associates, Inc.

Attached and Multi-Family Units

THK has also examined the condominium/townhome component of the development program. Including these units accelerates the project's build-out and opens it up to the sizeable market segments that prefer such product. Moreover, given the market's demographics and the project's location, some sort of townhome/condominium concept will likely draw strong demand.

The following table shows the projected demand for attached ownership units and demonstrates that the site could absorb 20 townhome/condominium units on approximately 2.7 acres annually through 2011. Approximately 35% of those units should be priced over $350,000.

Projected Townhome/ Condominium Demand and Acreage Absorption at the Palama Nui Development Site

Home Prices:	Under $250,000	$250,000 $350,000	$350,000 & Above	Annual Total	Cumulative Total
Annual Average Demand in the Primary Trade Area:	47	16	20	84	
Number of Competitors	5	4	3		
Generic Capture Rate	16.7%	20.0%	25.0%		
Site Capture Rate:	16.7%	30.0%	37.5%	24.3%	
Annual Absorption (Units)					
2002		PLANNING			0
2003	7	4	7	18	18
2004	7	4	7	19	37
2005	7	5	7	19	56
2006	8	5	7	20	76
2007	8	5	8	20	96
2008	8	5	8	21	117
2009	8	5	8	21	139
2010	9	5	8	22	161
2011	9	5	8	23	183
Total	71	43	69	183	
Annual Average	8	5	8	20	
Average Net Density	12	9	5	7.5	
Net Acres (Annual Average)	0.7	0.5	1.5	2.7	
Net Acres	5.9	4.8	13.8	24.5	

Source: THK Associates, Inc.

The Palama Nui development would also include apartment sites, and an average absorption of about 20 units per year is projected.

Projected Rental/ Multi-Family Demand and Acreage Absorption at the Palama Nui Development Site

Rent Ranges:	Under $600	$600 $750	$750 & Above	Annual Total	Cumulative Total
Annual Average Demand in the Primary Trade Area:	26	18	61	104	
Number of Competitors:	5	4	4		
Generic Capture Rate:	16.7%	20.0%	20.0%	18.9%	
Site Capture Rate:	16.7%	20.0%	20.0%	18.9%	
Annual Absorption (Units)					
2002			Planning		
2003	4	3	11	18	18
2004	4	3	11	18	36
2005	4	3	12	19	55
2006	4	3	12	19	75
2007	4	3	12	20	95
2008	4	4	13	20	115
2009	4	4	13	21	136
2010	5	4	13	22	158
2011	5	4	14	22	180
Total	38	32	110	180	
Annual Average	4	4	12	20	
Average Net Density	15.0	12.0	8.0	9.5	
Net Acres (Annual Average)	0.3	0.3	1.5	2.1	
Net Acres	2.6	2.6	13.7	18.9	

Source: THK Associates, Inc.

COMMERCIAL MARKET ANALYSIS

A major component of the Palama Nui Development plan is to incorporate an urban *core* component into the overall plan as a tie-in to and in conjunction with the development plans at the adjacent University of Hawaii. A community college and specialized medical and educational facilities are being considered along the university facilities and student and faculty housing. A rezoning of the Palama Nui Development parcel from agriculture to urban, with the support of the university, would help facilitate the expansion plans and expedite the development of this urban core where the two sites converge. County road development plans call for an arterial road to possibly be extended through the proposed core area. In this urban core area, a need would also arise for the development of some retail, office, and research and development/ flex space to be built to serve both the residential community and the educational/medical components. THK has analyzed the overall demand for each of these uses in the Palama Nui Development trade area as well as at the site. Based on projected annual job growth in the trade area, THK can estimate job growth by sector to project additional space requirements for retail, office, and research and development space over the next ten years. Retail job growth is projected to average 203 annually through 2012. At 350 square feet needed per employee, an additional 700,000 square feet of retail space will be required in the primary trade area. THK estimates a site capture of 15% of this space, meaning 106,000 square feet of retail space will be demanded at the Palama Nui Development site. With coverage of 22% and a speculative factor of 50%, the Palama Nui Development site can support 17 acres of retail development. Following the same methodology, the office and research and development/flex markets yield] 6 acres and 13 acres of space respectively. The following table details the breakdown of the commercial space demand.

Palama Nui Development Office, Retail, and R & D Demand Analysis

Projected Trade Area Annual Employment Growth, 2002 - 2012		810
Annual Retail Job Growth	25%	203
Annual Office Job Growth	35%	284
Annual Medical Campus Employment Growth		30
Annual R & D Flex Space Job Growth	15%	122

Use	Annual Job Growth	Required Square Foootage Over 10 Years	Site Capture	Rounded	Acreage Required	Total Acreage Allowed
Demand for Retail Space at Palamanui	203	708,750	106,313	110,000	10	15
Demand for Office Space at Palamanui	284	850,500	170,100	170,000	11	13
Total Commercial	486	1,559,250	276,413	280,000	21	28
Village Commercial Allocation			80,000	80,000		8
Community Commercial			196,413	200,000		20
Demand for Medical Space at Palamanui	30.0	120,000	120,000	120,000	8	10
Demand for R & D/ Flex Space at Palamanui	121.5	729,000	218,700	220,000	33	50

Planning Parameters	Retail	Office	Medical	R & D
Space Per Employee	350	300	400	600
Site Capture	15%	20%	100%	30%
F. A. R.	25%	35%	35%	15%
Speculative Factor	50%	20%	30%	50%

Source: THK Associates, Knowledge Based Consulting Group

SECTION IV

MARKET SUPPORT FOR UNIVERSITY VILLAGE AT PALAMA NUI DEVELOPMENT

A distinguishing element of the Palama Nui Development project is the opportunity to plan its real estate program in conjunction with the adjacent University of Hawaii site. This site consists of some 500 acres and has been designated as the future West Hawaii campus for both UH and Community College purposes. Hiluhilu Development intends to assist UH in establishing this campus as quickly as possible and to integrate initial University functions and buildings within a University Village in the Palama Nui community. To help plan the Palama Nui project and understand how the University Village would augment its market support, KBCG conducted a market research program with current Big Island residents, non-resident property owners, and visitors. The purpose of the research was to understand the general level of community support for the University Village concept as well as their interest in attending University or community college programs, patronizing associated businesses and services, and/ or having a residence in this type of community.

This research was conducted with a sample of Big Island residents and visitors covering the following market segments:

- Big Island Residents
  - Property Owners
  - Renters
- Mainland Residents
  - Big Island Property Owners
  - Visitors

Responses were made by returning a questionnaire in an enclosed stamped envelope or by fax to KBCG. A charitable donation to one of three Hawaiian charities was provided as an incentive to respondents. A copy of the questionnaire is provided in Appendix A.

FINDINGS

We received 122 responses to the survey, for a response rate of 17%, which is quite good considering the extensiveness of the questions and the nature of the financial and real estate information that was being requested. The following is a top line summary of certain key questions as an indicator of Big Island resident and property owner reaction to the Palama Nui Development project.

RESPONDENT CHARACTERISTICS

Residency

The respondents include a nearly equal mix of permanent residents (50%) and seasonal residents and visitors (50%). The seasonal residents spend an average of 76 days in Hawaii each year. This provides them sufficient time to have substantial involvement in the educational programs and cultural events that could take place at the University Village at Palama Nui Development.

A large majority (86%) of the respondents were homeowners who already own property in Hawaii. A majority currently reside or own property in the Kona area, but there is also good representation from the Kohala Coast master planned communities.

Demographics

The respondents represented a well-educated group (80% with college degrees) with moderate to upper incomes. Most are over 40 years of age, and there was a relatively equal distribution of male and female respondents

REACTION TO UNIVERSITY VILLAGE CONCEPT

As part of the market research, respondents were asked to indicate their level of interest in the University Village at Palama Nui concept and the types of programs that might be included. For reference, the University Village at Palama Nui development project was described as follows:

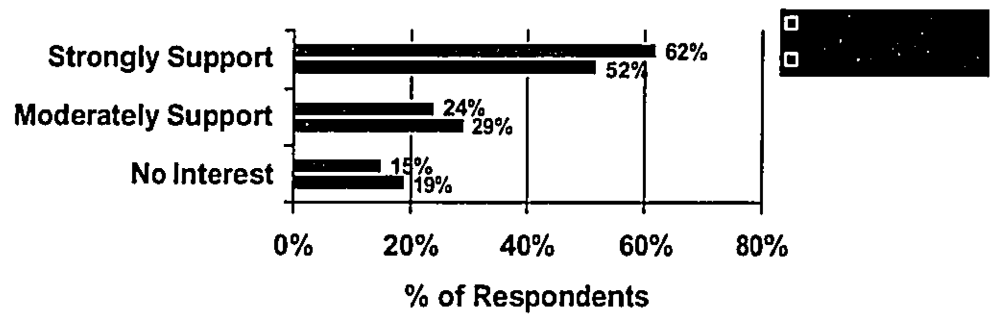
University Village Description

This market research will be used to design a new University Village community north and east of the Kona airport and adjacent to the designated site for the University of Hawaii and Community College West Hawaii campus. The intent of the developer is to assist the UH in establishing this campus as soon as possible. The University Village is intended to be oriented around a community college environment including classrooms and teaching labs. The village attributes will be achieved by integrating residences, shops and restaurants, an inn with conference center, and performing arts and cultural facilities. It will be pedestrian friendly. Other compatible uses that are being considered for areas outside the Village include residences, a Health and Wellness campus, assisted living facility, and research related incubator space. There may also be a golf course that serves as the home course for the University golf team as well as a training ground for a golf management curriculum.

Overall Reaction:

Over 80 % of the total respondents, and 86% of the permanent resident respondents support the University Village at Palama Nui Development in North Kona.

Overall Reaction to University Village and UH Campus for North Kona



Desired UH and Community College Magnet Programs

We also asked a series of questions about whether respondents would be interested in the specific types of community college and UH class subjects that might be offered as well as how they and their family might become personally involved. The opportunities were described as possible magnet programs that are being considered as appropriate to the market and the site. These included:

- **Targeted UH and Community College Subjects and Training Programs** that relate specifically to the strength, character, and resources of the Big Island and the needs of the community.
- **International programs** Kona is an excellent location for safety conscious parents sending their students overseas. Courses useful to these students include English as a second language, business, and technology. There is no English as a second language program currently in Kona. A variety of student housing types would need to be provided.
- **Short Course Magnets.** This program seeks to attract high profile visiting professors, businessmen, public figures, performers and other experts to present focused short courses (2 weeks to two months) at the Kona campus. This program is designed to appeal to full time and seasonal residents as well as mainland and international "self improvement" travelers. Successful models for this approach include Kellogg College in Oxford and the curriculum approach of Colorado College.

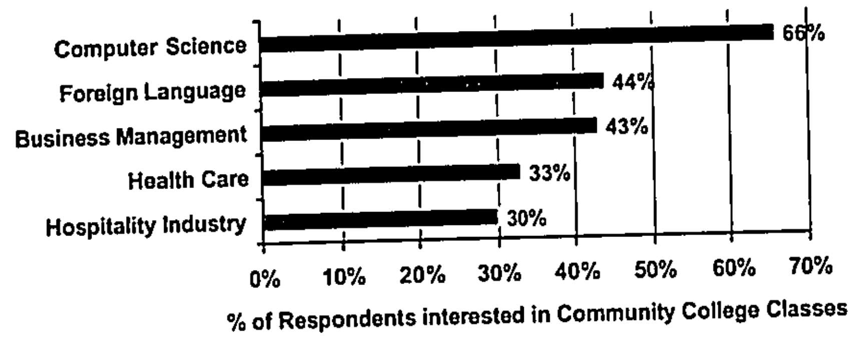
There is a strong level of interest in these magnet programs and the respondents provided thoughtful customer input to help guide the development as shown below:

Targeted Community College Classes

Approximately 78% of the respondents interested in the University Village at Palama Nui Development concept indicated an interest in one or more of a suggested set of community college classes, programs and activities. The types of suggested programs were based upon earlier assessments of community needs conducted by the community college.

The greatest level of interest is in computer sciences with 2/3 of the respondents interested in Community College classes selecting this subject.

Interest in Community College Classes



In addition to the identified class types, respondents offered suggestions of additional subjects they would like to see included in the class offerings. These suggestions covered the following subjects:

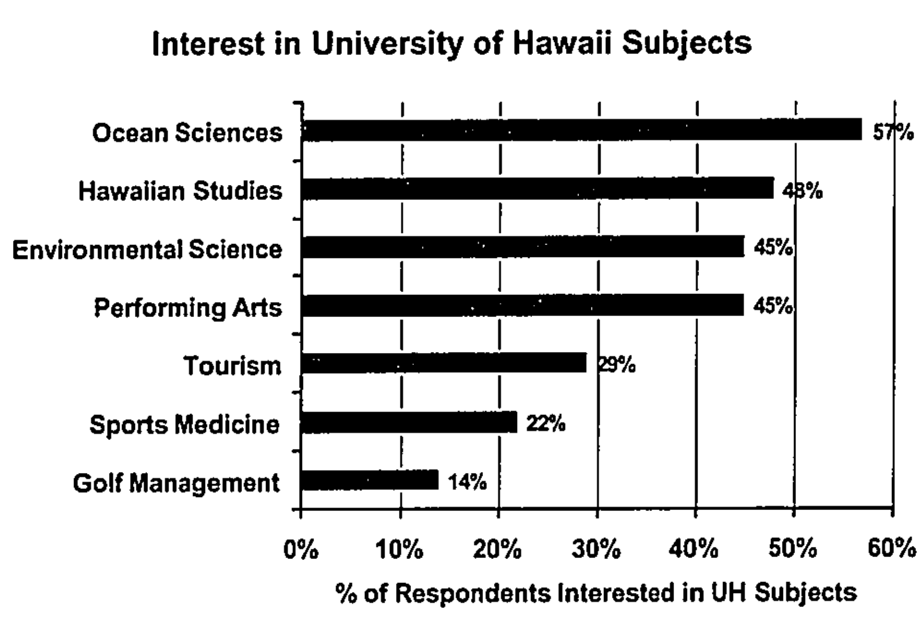
> Accounting, Architecture, Art, Bio Tech, Bridge, Cooking, Construction Management, Criminal Science, Design, Economics, Education, Environment, Hawaiian Culture, History, Landscaping, Land Planning, Liberal Arts, Medical & Alternative Health, Work W/ Disabled, Ocean Sciences, Performing Arts, Political Science, Public Administration, Science, Senior Interest, Writing

Quite obviously there is a wide breadth of educational interests within the community that could be potentially served at the West Hawaii campus.

Targeted University of Hawaii Subjects

Approximately 74% of the respondents interested in the University Village at Palama Nui Development concept indicated an interest in one or more of a suggested set of 7 University of Hawaii subjects that could be provided at the West Hawaii campus. It was noted in the survey questionnaire that it is the intent of the project that the programs that may be offered at the West Hawaii campus will not unduly duplicate or compete with programs already offered at UH-Hilo.

The subject with the most interest is Ocean Sciences, followed closely by Hawaiian Studies, Environmental Science, and the Performing Arts.

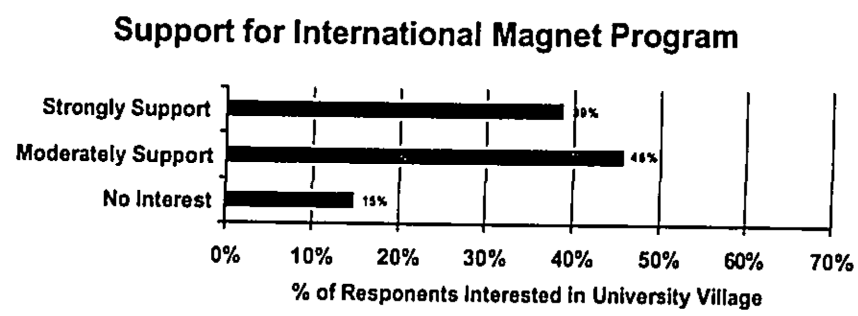


In addition to the identified subjects, respondents offered suggestions of other UH courses they would like to see included. These suggestions covered the following subjects:

> Astronomy, Astrophysics, Child Development, Comparative Religion, Culinary Arts, Education, Engineering, Foreign Language, Flight Training, Medical, Sea Agriculture, Tennis

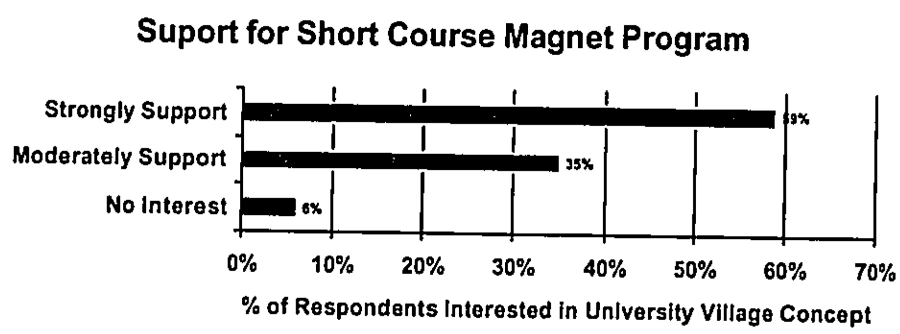
International Magnet Program.

As shown below, 85% of the persons interested in the University Village by Palama Nui Development support including the International Magnet Program.



Short Course Magnet Program

This program was overwhelmingly endorsed. Approximately 95% of the persons interested in the University Village development indicated support, and 60% strongly support this idea.

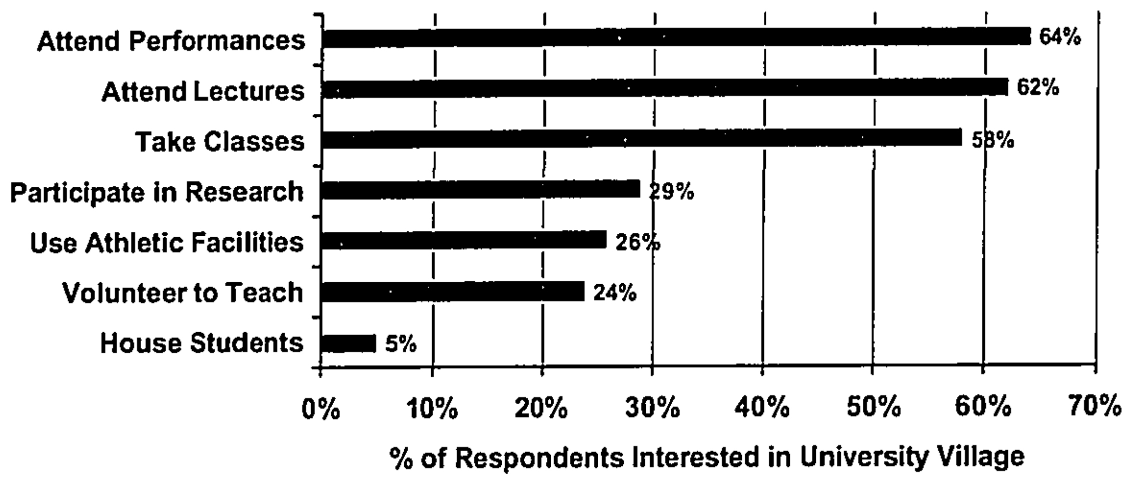


The Short Course Magnet program was equally popular with permanent and seasonal residents,

Usage of University Village Resources and Programs

Given this high level of interest, it follows that the respondents intend to participate in a variety of activities and programs available within the University Village and UH campus.

Expected Participation in University Village and UH Programs



The most highly anticipated usage is to attend performances, followed closely by attending lectures or classes.

INTEREST IN UNIVERSITY VILLAGE REAL ESTATE

Following up on the University Village concept, we asked for respondent reactions to a mix of proposed real estate lots and residences types. The University Village real estate products at Palama Nui Development were described follows:

"In addition to just participating in University or Community College activities, the University Village project will also offer opportunities to live in what promises to be a unique and stimulating environment. We would appreciate your response to the following proposed types of residences that could be included.

> **Ocean View Estate Lots.** These 1-acre lots will front on the golf course and have good ocean views.
>
> **Ocean View Lots.** These 15,000 square foot lots will have ocean views and golf frontage.
>
> **Golf View Lots.** These 12,000 square foot lots will have golf and mountain views.
>
> **Patio Homes.** These two bedroom/ two bath homes would be located in the Village proper and have moderate views
>
> **Townhomes and Condominiums.** These 2 and 3 bedroom units will also be located in the Village and have moderate views.

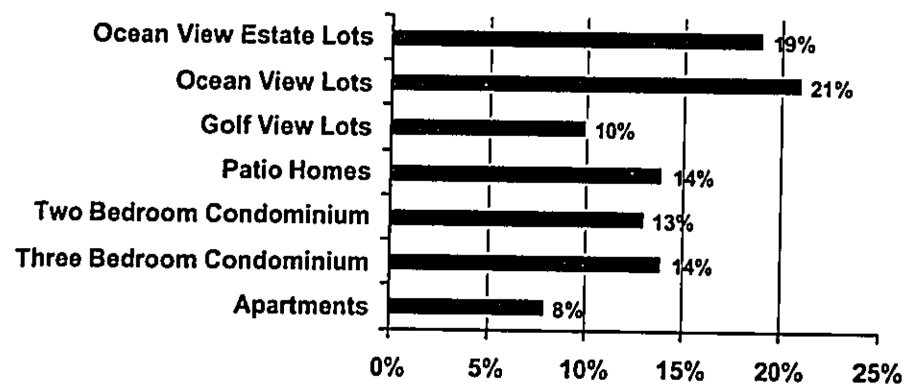
Apartments. The Village Center will also include a mix of apartments for both students and residents."

Approximately 45% of the respondents were interested in at least one form of real estate in the Palama Nui development project. By market source, the most interested were current permanent residents of the Big Island, with the majority (51%) expressing interest in real estate at University Village. For non-residents, the level of interest in University Village real estate was still high at 38%.

By Product Type

The highest level of interest was in the ocean view lots followed by the patio homes and the two and three bedroom condominiums. The market driven product mix as indicated by the survey responses would be as follows:

Indicated Distribution of Real Estate Products

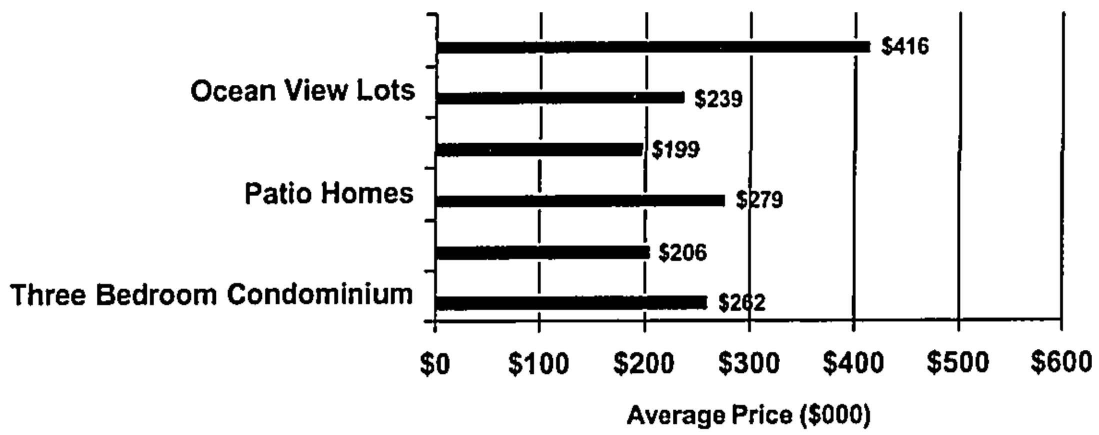


The University Village at Palama Nui development program (excluding student housing) has been designed to be substantially consistent with these responses.

Expected Prices

The average expected lot prices at Palama Nui range from $416,000 for an ocean view estate lot to around $199,000 for a golf view lot. The average expected price for built product ranges from $279,000 for the patio homes to $206,000 for a two-bedroom condominium in the village.

Expected Prices for Real Estate Products ($000)



Since averages can be misleading, we examined the distribution of expected prices for each product type. These results are presented below

Ocean View Estate Lots

The pricing strategy for University Village at Palama Nui is to provide a range of affordability and still accommodate the upper middle part of the market (from 33% level to 90% level of expected prices). Ocean View Estate lots should have an entry-level price at around $325,000 with premium product reaching prices of around $500,000.

Ocean View Lots

The entry point for the Ocean View lots is in the $200,000 to $250,000 range, with reasonable product demand up to $400,000

Golf View Lots

Expected prices for the golf view lots have a relatively wide distribution. The entry-level price would be around $125,000 and reach the high $200s for premium sites.

Patio Homes

Entry prices for the patio homes should be in the $200,000 to $250,000 range. Prices could reach up to $400,000 for premium locations.

Two Bedroom Townhomes and Condominiums

Prices for the two bedroom condominiums should lead with a product at around $200,000 with premium units reaching prices of $325.000.

Three Bedroom Townhomes and Condominiums

The three bedroom condominiums should lead with a product at around $250,000, with premium units reaching $375,000.

Apartments

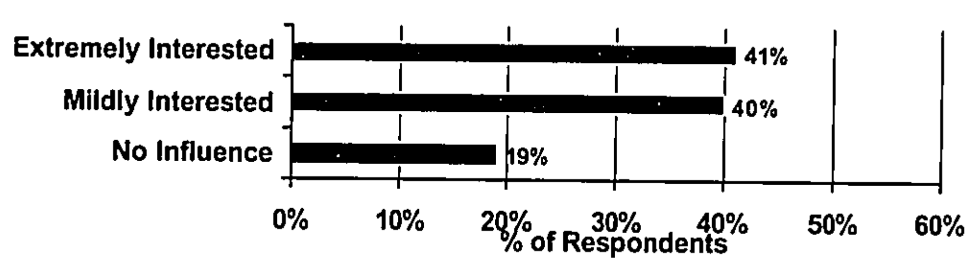
Apartments appeal almost exclusively to permanent residents of the Big Island and are not interesting to Mainland visitors or second home owners. Additionally, they appeal primarily to existing renters rather than homeowners. In our subsample of permanent residents, we had relatively few renters who responded to the survey. Of those that did, 70% were interested in apartment living at University Village.

IMPACT OF UNIVERSITY OF HAWAII CAMPUS ON INTEREST IN PALAMA NUI DEVELOPMENT COMMUNITY

To specifically test the effect of the University of Hawaii relationship to interest in the Palama Nui Development community, we asked: "How does the presence of an adjacent University of Hawaii and Community College campus affect your interest in this community?"

Over 80% of the respondents are interested in the University Village at Palama Nui community – and 41% are extremely interested because of the University of Hawaii connection.

Effect of UH Presence on Interest in Hiluhilu Development Community



The survey research confirms that the University Village at the Palama Nui Development project should achieve strong community acceptance and achieve premium real estate values.

SECTION V

RECOMMENDED DEVELOPMENT PROGRAM, PRICING AND REAL ESTATE ABSORPTION PATTERNS AT PALAMA NUI

The proposed program for the Palama Nui/ University Village project reflects the market findings of THK and KBCG as well as project team planning inputs, discussions with University of Hawaii (UH) administrators, and a review of the UH Master Plan for the West Hawaii Campus. It is subject to revision and confirmation based upon further discussions with UH; County and Community input; land planning, urban design, engineering and traffic considerations; market refinement from ongoing consumer research; financial analysis; construction considerations; and numerous other influences.

Product Mix

There is strong market support for a mix of moderately priced residential products within the University Village community setting at Palama Nui. Based upon the analysis of market support and the strong consumer response to the University Village concept, the development program includes a mix of lots, patio homes, townhomes, apartments, and senior housing targeted to meet the needs of local and seasonal residents. The village commercial program includes classroom and cultural facilities, village shopping, and a University related inn/conference center along with student and faculty housing. Outside the village center, space has been allocated for a medical campus, research and development activities, and future community commercial.

Palama Nui Development Plan

Development Program for Palama Nui

	Total Units	Acres	Average Price @
Single Family Residential (lots)			
Ocean View Estates	70	70.0	$400,000
Ocean View Lots	200	100.0	$300,000
Golf View Lots	120	46.2	$200,000
Single Family Residential (built)			
Patio Homes	80	16.0	$350,000
Two Bedroom Condos	60	7.5	$275,000
Three Bedroom Condos	60	7.5	$350,000
Subtotal Single Family	590	247.2	
Multi Unit Residential			
Apartments	100	8.0	
International Student Housing	75	5.0	
Senior Housing	80	5.0	
Subtotal Multi Family	255	18.0	
Total Residential	845	265.2	
Commercial (acres)	Rooms	Acres	Sq. Ft.
University Leases		6.0	60,000
Village Commercial		8.0	80,000
University Village Inn	120	8.0	60,000
~~Medical, R&D, & Community Commercial~~			
Medical Campus		10.0	120,000
R&D		50.0	220,000
Community Commercial		20.0	200,000
Golf Course		180.0	
Open Space, Parking, & Preservation		177.8	
Subtotal Commercial & Other	120	459.8	
TOTAL UNITS AND ACREAGE	965	725.0	

There are a total of 845 units in the residential program including 590 for sale single family and attached residential units as well as 255 multi family rentals including apartments, student housing, and senior housing. In addition to the residences, the Palama Nui plan includes a 120 unit University Inn. Thus the total housing count (residences plus transient) is 965 units.

Pricing

The proposed unit prices for the Palama Nui development cover a wide range reflecting market ability to pay and the perceived value of the community amenities inherent in the University Village concept.

PRICING RECOMMENDATIONS FOR REAL ESTATE AT PALAMA NUI

PRICING RECOMMENDATIONS FOR REAL ESTATE PRODUCTS AT UNIVERSITY VILLAGE

	Recommended Average Prices	Average Unit Size	Recommended Price
Residential Real Estate - Lots	Sale Price	(Sq. Ft.)	Per Square Foot
Ocean View Estate Lots	$400,000	40,000	$10
Ocean View Lots	$300,000	15,000	$20
Golf View Lots	$200,000	12,000	$17
Residential Real Estate - Built Product			
Patio Homes	$350,000	1,800	$194
Two Bedroom Condominiums	$275,000	1,300	$212
Three Bedroom Condominiums	$350,000	1,600	$219
Village Real Estate - Leased	Annual Lease Rate/SF	Space (SF)	
UH Classroom and Lab Space	$12	60,000	
Village Retail	$24	80,000	
Village Real Estate - Residential Rentals	Land Value ($/ unit)	Units	
Apartments	$35,000	100 units	
International Student Housing	$25,000	75 units	
University Village Inn	$40,000	120 rooms	
Senior Housing	$30,000	80 units	
Other Commercial	Land Value ($/acre)	Acres	
Medical Campus	$400,000	10	
R&D	$250,000	50	
Community Commercial	$700,000	20	
Golf Memberships	Per Member		
Entrance Fee	$30,000		

Source: Knowledge Based Consulting Group

Affordable housing will be accommodated within a mix of rental and for sale units.

REAL ESTATE ABSORPTION

The project is anticipated to commence construction in 2004 with basic infrastructure and golf course development. Initial real estate sales will begin in 2005 and include ocean view estates and ocean view bts along or near the golf course. Housing and commercial space in the University Village will be available for occupancy one to two years later. Total buildout of the residential and commercial areas is expected in 2014.

SUMMARY ABSORPTION SCHEDULE AT PALAMA NUI

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Single Family Detached												
Ocean View Estates												
Annual			30	20	20							
Cumulative			30	50	70	70	70	70	70	70	70	70
Ocean View Lots												
Annual			20	30	35	35	40	40				
Cumulative			20	50	85	120	160	200	200	200	200	200
Golf View Lots												
Annual				20	20	20	30	30				
Cumulative				20	40	60	90	120	120	120	120	120
Patio Homes												
Annual				20	20	20	20					
Cumulative				20	40	60	80	80	80	80	80	80
Multi Family												
Two Bedroom Condos												
Annual					10	20	10	20				
Cumulative					10	30	40	60	60	60	60	60
Three Bedroom Condos												
Annual					10	20	10	20				
Cumulative					10	30	40	60	60	60	60	60
Subtotal For Sale Housing												
Annual			50	90	115	115	110	110	0	0	0	0
Cumulative			50	140	255	370	480	590	590	590	590	590
Rentals												
Apartments												
Annual					100							
Cumulative					100	100	100	100	100	100	100	100
International Student Housing												
Annual					75							
Cumulative					75	75	75	75	75	75	75	75
Senior Housing												
Annual						80						
Cumulative						80	80	80	80	80	80	80
Total Residential Units			50	140	430	625	735	845	845	845	845	845
Seasonal			5	14	43	63	74	85	85	85	85	85
Permanent			45	126	387	563	662	761	761	761	761	761
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Commercial Absorbtion Schedule												
University Village Inn												
Annual					60,000							
Cumulative					60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
University Leases												
Annual				30,000				30,000				
Cumulative				30,000	30,000	30,000	30,000	60,000	60,000	60,000	60,000	60,000
Village Commercial												
Annual				20,000		20,000		40,000				
Cumulative				20,000	20,000	40,000	40,000	80,000	80,000	80,000	80,000	80,000
Medical Campus												
Annual				30,000	30,000	30,000	30,000					
Cumulative				30,000	60,000	90,000	120,000	120,000	120,000	120,000	120,000	120,000
R&D												
Annual					10,000	10,000	15,000	20,000	30,000	40,000	45,000	50,000
Cumulative					10,000	20,000	35,000	55,000	85,000	125,000	170,000	220,000
Community Commercial												
Annual							25,000	25,000	25,000	35,000	40,000	50,000
Cumulative							25,000	50,000	75,000	110,000	150,000	200,000
Golf Course												
Annual			0.5	0.5								
Cumulative			0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

RESIDENTIAL AND UNIVERSITY OF HAWAII TOWN CENTER MARKET ANALYSIS UPDATE

Draft

LANDS OF KAU
KAILUA-KONA, HAWAII

PREPARED FOR:
HILUHILU DEVELOPMENT

PREPARED BY:
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DECEMBER 6, 2002

thk

Economic & Market Research / Land & Development Planning
Landscape Architecture / Community Planning & Design
Golf Feasibility Analysis

RESIDENTIAL AND UNIVERSITY OF HAWAII TOWN CENTER MARKET ANALYSIS UPDATE

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TABLE OF CONTENTS

I. INTRODUCTION

This report determines the development potentials for the 725-acre Lands of Kau property, north of Kailua-Kona, Hawaii, by examining the market demand for office, industrial, retail, and residential uses within the site environs. The primary influences on the site's development potentials are the supply and demand forces affecting the Hawaii County real estate market. In addition to the current market forces outlined in this report, other indirect influences including social, political, environmental and physical factors will impact development potentials.

Trends in business activity, employment and population in the greater regional environs are the principal determinants of real estate demand in Hawaii County. In order to establish opportunities for development at the subject, a comprehensive analysis of the regional economic base including demographic trends in Hawaii County has been completed and is included in Section III of this report. The focus of this section of the analysis is on establishing past trends and projecting future increases in employment, population and households. These estimates provide the principal basis for making demographic projections and for quantifying the overall demand for all types of real estate uses.

In Sections V and VI, THK details historical trends in the market area's residential market and projects residential demand by price range and tenure for the next decade. Once the demand has been isolated, the study examines the existing and proposed competition in order to quantify the market potentials for the subject site. The site's market potentials are broken down by unit type and price for the ten-year projection period.

The office and industrial markets in the Hawaii County area and the site environs are examined in Section VII. Demand is then projected based on the anticipated growth of firms occupying space, and the percentage of that demand that the site can expect to capture is estimated for the 2002-2012 period.

The retail/commercial market in Hawaii County and the site environs is also examined in Section VII. The potential for retail/commercial development at the site depends upon population, income characteristics, and household expenditure patterns within the area and specifically the site's primary trade area. Characteristics of the Kona area retail market are described in this section with projections for retail demand at the subject for the next decade.

Once the specific potentials for the various proposed land uses have been quantified, THK can devise a preliminary plan for the site. THK's preliminary land plan adheres closely to the development potentials established in the market study and takes into account the potential for collaboration with the adjacent University of Hawaii parcel. In conjunction with the university and its plans for expansion, the market study and land plan considers the potentials for developing an "urban core" and town center that blends the two sites together.

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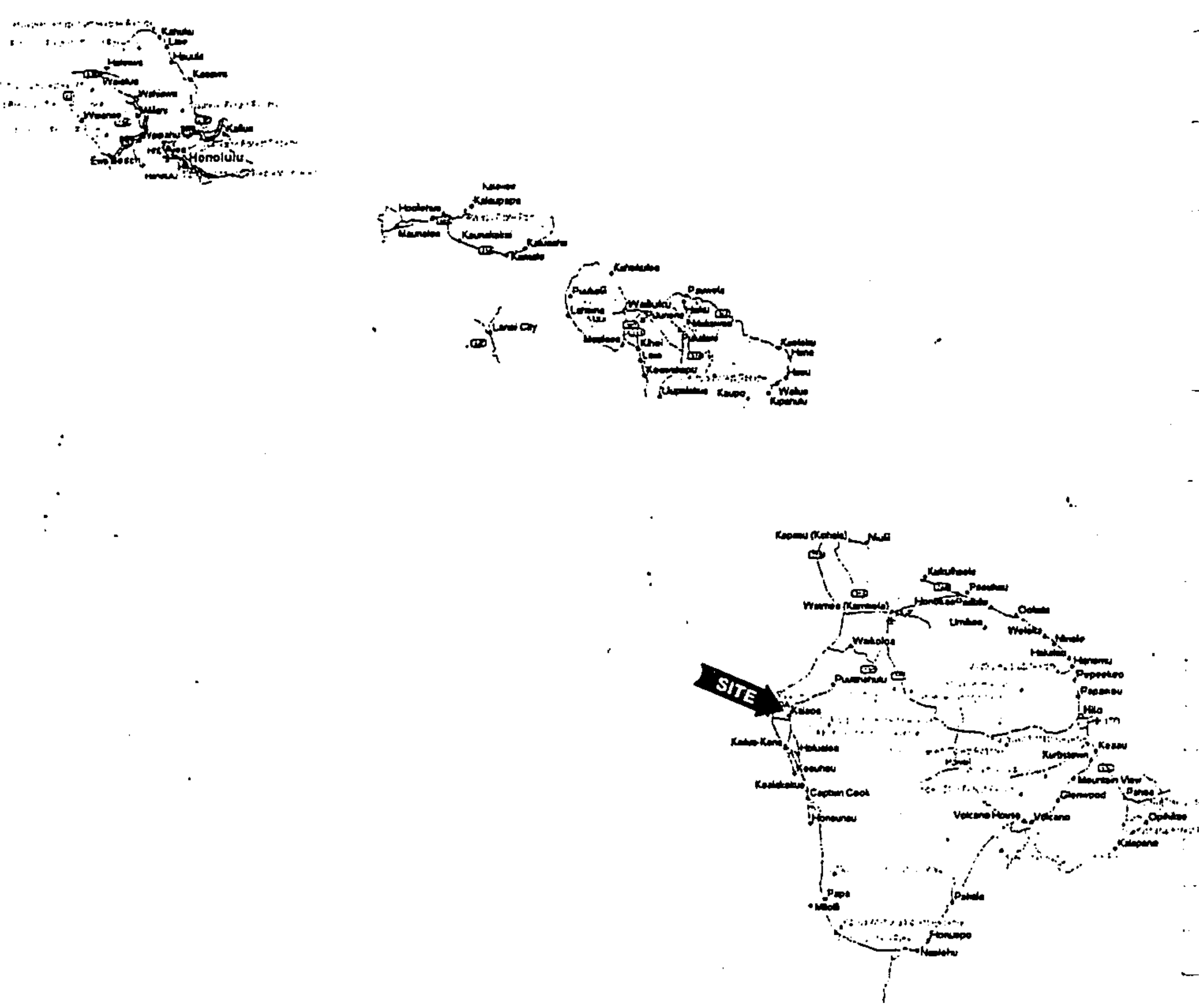
Regional Location



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Mag 9.00
Fri Oct 11 10:40 2002

Scale 1:2,000,000 (at center)

20 Miles

50 KM

Major Road
Interstate/Limited Access
County Seat

II. SITE DESCRIPTION

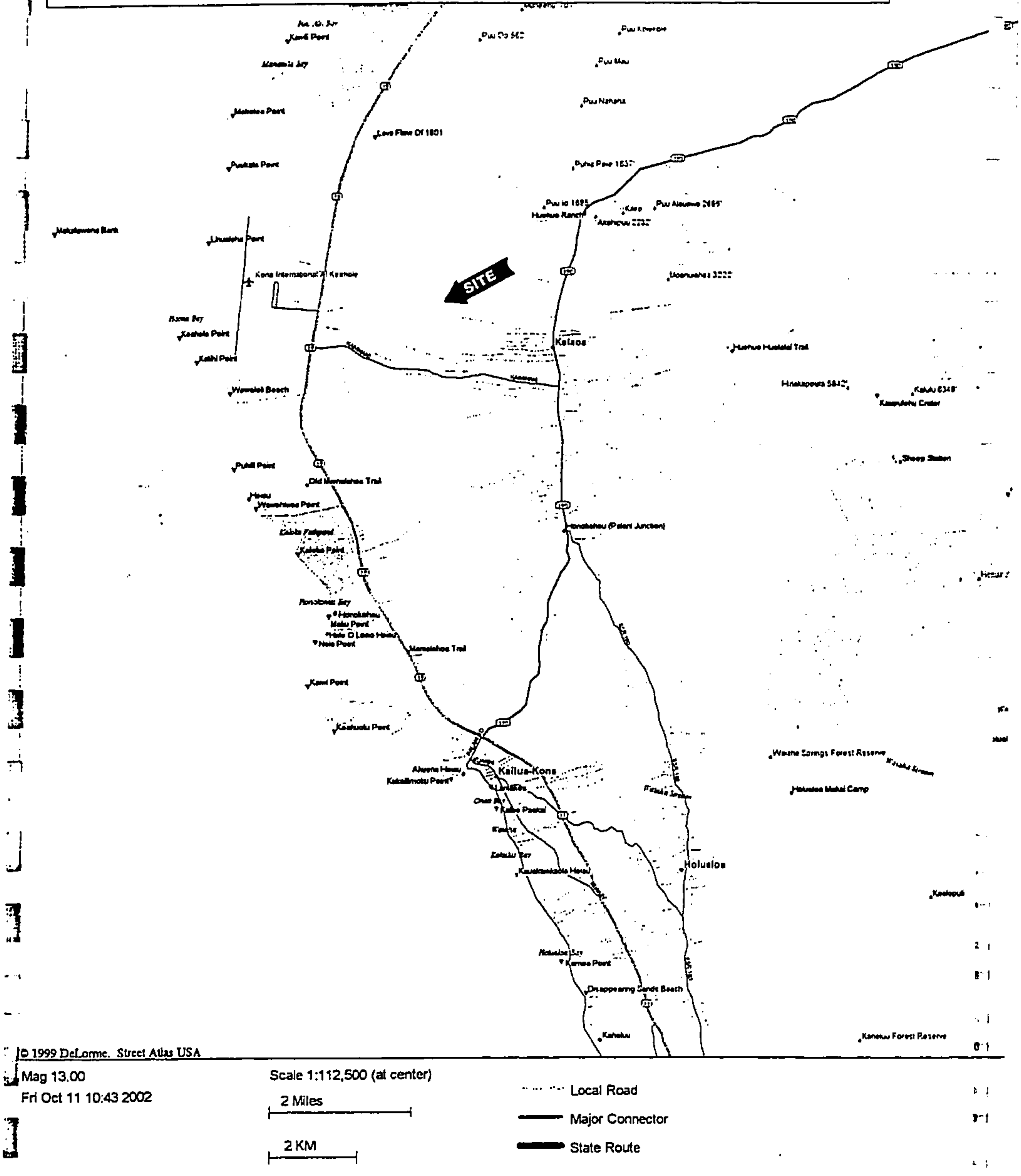
The site for the proposed Lands of Kau golf course and residential development lies in North Kona on the Big Island of Hawaii. The approximately 725-acre parcel is six miles north of Kailua-Kona, just east and inland of Kona International Airport, fronting Queen Kaahumanu Highway and extending upward to Makalei Estates Subdivision. The site slopes from a 150-foot elevation to 1,000 feet. The upper 454-acre section is zoned for an agricultural district, while the lower 272 acres are zoned for conservation. The total parcel is designated for "urban expansion." The 454-acre portion has a special permit for an 18-hole golf course. Water for a golf course is permitted by three brackish wells located at the 800-foot elevation.

Makalei Estates is an agricultural subdivision consisting of 80 three-acre homesites. Phase I of the development has 41 lots, priced from $199,000 to $279,000. Sales began in August 2000. Roads and infrastructure are being graded and implemented and numerous units are complete or under construction. Sales in recent months have been brisk.

The site itself predominantly consists of lava ("A'a Lava" and "Pahoehoe Lava") on rolling, sloping terrain. Vegetation is low-lying, sparse brush and bushes. The views to the west over the ocean are spectacular with views extending to Maui on a clear day of which there are many. The climate is ideal with very little variance in temperature throughout the year. Highs reach the low to mid 80s and the rain, which pummels the eastern side of the Island, remains buffeted form the west side by the massive volcanic masses. The elevation keeps temperatures slightly cooler than on the ocean front and makes for cool, pleasant evenings.

In general, the Lands of Kau parcel is an exceptional property. As Kailua-Kona moves northward, the site is poised to absorb the next wave of golf course and/or residential development. The University of Hawaii has plans for new facilities adjacent to the property on the east, and the airport is just minutes away. Consideration of collaboration between the Lands of Kau site and the university has been undertaken in this analysis.. An urban core of university facilities, health care, student housing, and commercial uses are potential uses that could be shared between the parcels. As large developable parcels become sparse and the Kona-Kohala Coast continues to gain stature, the value and allure of the Lands of Kau site will increase. Zoning changes will be necessary to increase densities on the property and, while noted, THK has assumed for the purposes of this report that favorable changes can be approved in the next two to five years.

Site Vicinity



III. EMPLOYMENT AND GROWTH TRENDS IN THE HAWAII COUNTY MARKET AREA

A. Employment Growth Trends

1. Hawaii County Market Area

Employment trends are prime indicators of the economic growth of an area. Increases in employment generate growth for most sectors of the local economy and dictate the rate at which it will expand. This section looks at the region's various employment figures and projects their course over the next decade. Table III-1 illustrates historic employment growth in Hawaii County. Over a 20-year period, total employment jumped from 46,145 in 1980 to 78,351 in 2001 – an annual average increase of 1,534 jobs. Between 1991 and 2001, the area added an average 629 jobs on an annual basis. The number of jobs added annually has increased in recent years to 1,250 jobs annually between 1996 and 2001. In 1990, the market area added 5,270 jobs, the largest increase in the 21-year study period.

Since 1980, the market area has experienced growth in almost all employment sectors. In terms of growth magnitudes, the most significant contributor to the local economy has been the services industry, which averaged the addition of 810 new jobs per year during the 1980-2001 period. Other strong growth industries include the retail and government sectors, which added 375 and 204 jobs respectively on an average annual basis between 1980 and 2001. Table III-2 shows the market area's employment growth by industry from 1980 to 2001.

Fueling the Hawaii County market area's employment growth is an increasingly diverse economic base. Table III-3 projects employment by industry for the market area from 2002 to 2012. As shown, the market area will continue to experience steady growth with total employment averaging increases of 1,340 jobs annually. The retail and services sectors will lead the way averaging annual gains of 241 and 844 jobs respectively.

TABLE III-1: Employment Trends in Hawaii County 1980-2001

Year	Total Employment	Annual Change Numerical	Annual Change Percent
1980	46,145	-	-
1981	46,391	246	0.5%
1982	46,646	255	0.5%
1983	48,009	1,363	2.9%
1984	48,357	348	0.7%
1985	49,659	1,302	2.7%
1986	50,546	887	1.8%
1987	53,421	2,875	5.7%
1988	57,048	3,627	6.8%
1989	62,267	5,219	9.1%
1990	67,537	5,270	8.5%
1991	72,066	4,529	6.7%
1992	70,325	(1,741)	-2.4%
1993	70,829	504	0.7%
1994	70,638	(191)	-0.3%
1995	70,342	(296)	-0.4%
1996	72,100	1,758	2.5%
1997	73,785	1,685	2.3%
1998	74,483	698	0.9%
1999	76,107	1,624	2.2%
2000	77,776	1,669	2.2%
2001	78,351	575	0.7%
Annual Change			
1980-2001		1,534	2.6%
1991-2001		629	0.8%
1996-2001		1,250	1.7%

Source: U.S. Dept of Commerce, Bureau of Economic Analysis; and THK Associates.

TABLE III-2: Employment By Industry for Hawaii County 1980-2001

Industry	1980	1985	1990	1991	1992	1993	1994	1995	1996
Wage & Salary (By Place of Work)	40,365	43,813	61,647	66,171	65,155	65,419	65,466	65,659	67,437
Ag. Serv, F, & F*	1,149	1,277	1,671	1,739	1,786	1,852	1,987	2,194	2,307
Mining	18	26	75	66	51	59	49	52	46
Construction	2,505	1,866	4,552	5,261	4,463	4,538	4,020	4,093	3,841
Manufacturing	3,160	2,703	2,663	2,719	2,802	2,786	2,674	2,267	2,176
T & U**	2,016	2,186	2,668	2,860	2,794	2,894	2,997	2,908	2,957
Wholesale	1,441	1,615	2,366	2,498	2,475	2,168	2,096	2,085	2,034
Retail Trade	6,937	8,721	12,417	13,085	12,972	13,008	13,218	13,542	13,682
FIRE***	4,563	3,685	4,609	4,756	4,941	4,975	5,028	4,871	5,311
Services	11,086	13,344	20,465	22,524	21,824	22,008	22,025	22,327	23,754
Government	7,490	8,390	10,161	10,663	11,047	11,131	11,372	11,320	11,329
Farm	5,780	5,846	5,890	5,895	5,170	5,410	5,172	4,683	4,663
Total Employment	46,145	49,659	67,537	72,066	70,325	70,829	70,638	70,342	72,100

						Average Annual Change			
Industry	1997	1998	1999	2000	2001	1980-2001 (21 Year)	1991-2001 (10 Year)	1996-2001 (5 Year)	1998-2001 (3 Year)
Wage & Salary (By Place of Work)	69,244	69,982	71,623	73,344	73,944	1,599	777	1,301	1,321
Ag. Serv, F, & F*	2,359	2,390	2,432	2,475	2,461	62	72	31	24
Mining	44	45	43	39	38	1	-3	-2	-2
Construction	3,626	3,622	3,658	3,634	3,657	55	-160	-37	12
Manufacturing	2,151	2,089	2,125	2,134	2,146	-48	-57	-6	19
T & U**	3,005	2,968	2,954	3,047	3,091	51	23	27	41
Wholesale	2,091	2,084	2,096	2,115	2,147	34	-35	23	21
Retail Trade	13,864	14,053	14,354	14,671	14,819	375	173	227	255
FIRE***	5,412	5,499	5,550	5,670	5,714	55	96	81	72
Services	25,232	25,670	26,746	27,822	28,103	810	558	870	811
Government	11,460	11,562	11,665	11,737	11,768	204	111	88	69
Farm	4,541	4,501	4,484	4,432	4,407	-65	-149	-51	-31
Total Employment	73,785	74,483	76,107	77,776	78,351	1,534	629	1,250	1,289

* Agricultural Services, Forestry, & Fisheries
** Transportation & Utilities
*** Finance, Insurance, Real Estate

Source: U.S. Dept of Commerce, Bureau of Economic Analysis; and THK Associates, Inc.

TABLE III-3: Projected Employment in Hawaii County 2002-2012

Industry	Annual Rate of Change	2002	2003	2004	2005	2006	2007
Wage & Salary (By Place of Work)	1.7%	75,179	76,439	77,726	79,039	80,380	81,749
Ag. Serv, F, & F*	1.2%	2,491	2,520	2,551	2,581	2,612	2,644
Mining	0.2%	38	38	38	38	38	38
Construction	0.5%	3,675	3,694	3,712	3,731	3,749	3,768
Manufacturing	-0.7%	2,131	2,116	2,101	2,087	2,072	2,057
T & U**	1.1%	3,125	3,159	3,194	3,229	3,265	3,301
Wholesale	0.8%	2,164	2,181	2,199	2,217	2,234	2,252
Retail Trade	1.5%	15,041	15,267	15,496	15,728	15,964	16,204
FIRE***	1.4%	5,794	5,875	5,957	6,041	6,125	6,211
Services	2.6%	28,834	29,583	30,353	31,142	31,951	32,782
Government	1.0%	11,886	12,005	12,125	12,246	12,368	12,492
Farm	-1.1%	4,359	4,311	4,263	4,216	4,170	4,124
Total Employment	1.6%	79,537	80,750	81,989	83,255	84,550	85,873

Industry	2008	2009	2010	2011	2012	Average Annual Change
Wage & Salary (By Place of Work)	83,147	84,574	86,032	87,520	89,039	1,386
Ag. Serv, F, & F*	2,675	2,707	2,740	2,773	2,806	32
Mining	39	39	39	39	39	0
Construction	3,787	3,806	3,825	3,844	3,863	19
Manufacturing	2,043	2,029	2,015	2,000	1,986	-14
T & U**	3,337	3,374	3,411	3,448	3,486	36
Wholesale	2,270	2,288	2,307	2,325	2,344	18
Retail Trade	16,447	16,693	16,944	17,198	17,456	241
FIRE***	6,298	6,386	6,476	6,566	6,658	86
Services	33,634	34,509	35,406	36,327	37,271	844
Government	12,617	12,743	12,870	12,999	13,129	124
Farm	4,079	4,034	3,989	3,946	3,902	-46
Total Employment	87,226	88,608	90,021	91,465	92,941	1,340

* Agricultural Services, Forestry, & Fisheries
** Transportation & Utilities
*** Finance, Insurance, Real Estate

Source: THK Associates, Inc.

B. Population and Household Growth Trends in the Hawaii County Market Area

Trends in population and household growth are principal indicators of the potential demand for real estate development. Population growth in the market area has been moderate since 1980; recent data shows this trend continuing. Since 1980, the population in the area has increased by 2,821 people annually from 92,053 to 154,113 in 2002. The number of households increased by 1,314 annually during the same period, jumping from 29,237 in 1980 to 58,156 in 2002. The compound annual growth rate for population in the market area over the last 21 years was 2.4% per year; households grew at a compound rate of 3.2%.

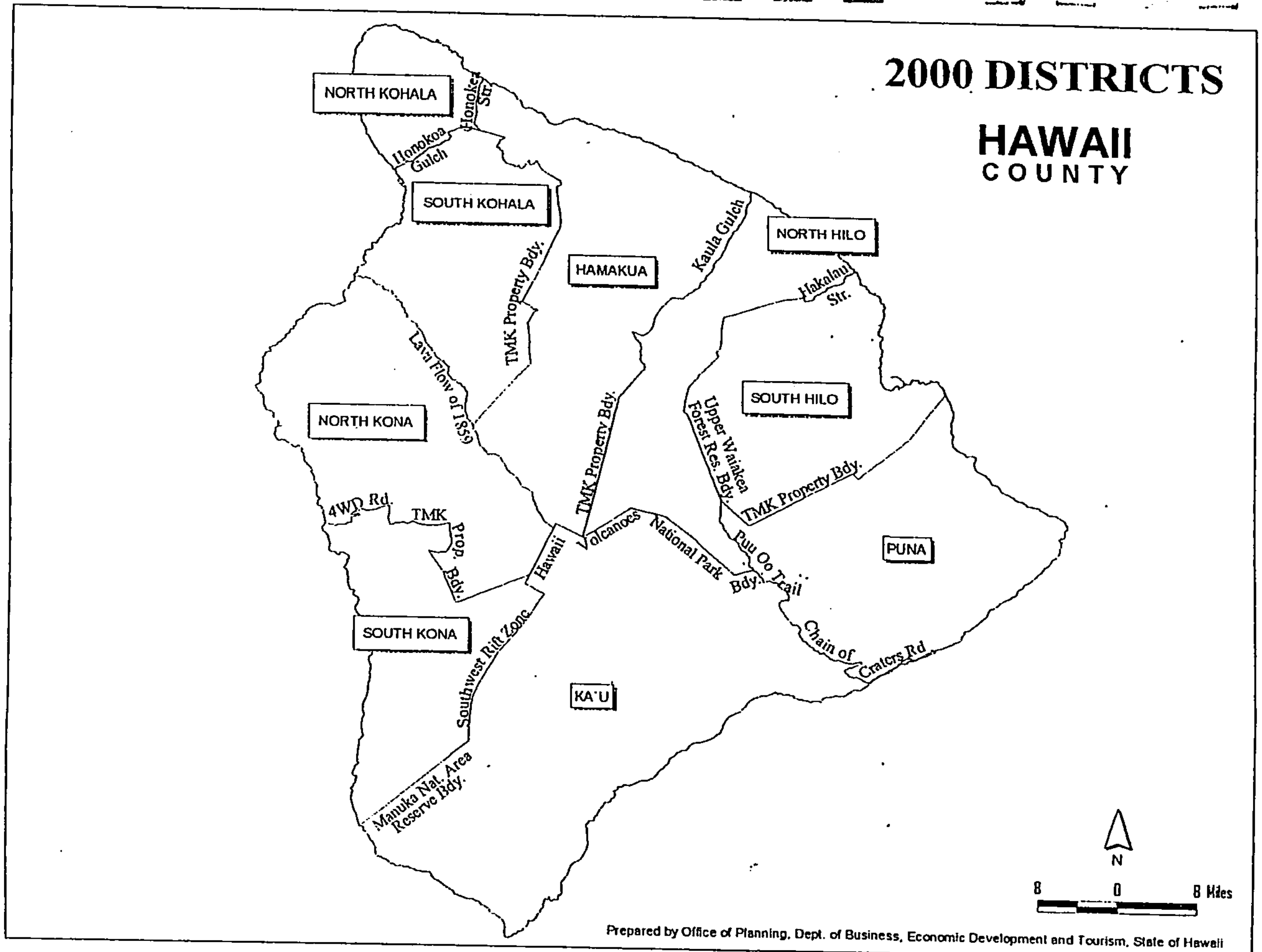
The District of Puna led population growth in the past decade adding approximately 1,050 people per year. The District of North Kona contributed 22.3% of the growth in Hawaii County over the same time period, second only to Puna. South Kona grew at a compound rate of 1.2%, adding 95 people per year to the area.

The primary trade area of the Lands of Kau property, more thoroughly discussed in Section IV, roughly consists of the North Kohala, South Kohala, North Kona, and South Kona districts. This four-district area has accounted for nearly 51% of the county's growth over the past twenty-one years adding nearly 1,440 people per year to the area. In the past decade, the four districts have grown by 1,300 people per year, contributing about 46% of county's growth. The growth rates of these districts are much greater than those on the Hilo side of the island.

TABLE III-4: Estimates of Hawaii County Population and Households, 1980-2002

Year	Hawaii County, HI Pop	HH	Population of Districts in Hawaii County, HI Puna	North Kona	South Kona	Hamakua	North Kohala	South Kohala	South Hilo	North Hilo	Kau
1980	92,053	29,237	11,751	13,748	5,914	5,128	3,249	4,607	42,278	1,679	3,699
1990	120,317	41,461	20,781	22,284	7,658	5,545	4,291	9,140	44,639	1,541	4,438
2000	148,677	55,575	31,335	28,543	8,589	6,108	6,038	13,131	47,386	1,720	5,827
2002	154,113	58,156	33,167	29,846	8,795	6,231	6,389	13,919	47,901	1,741	6,124
1980-2002											
Numerical	2,821	1,314	973	732	131	50	143	423	256	3	110
Percent	2.4%	3.2%	4.8%	3.6%	1.8%	0.9%	3.1%	5.2%	0.6%	0.2%	2.3%
% of Total Annual County Growth			34.5%	25.9%	4.6%	1.8%	5.1%	15.0%	9.1%	0.1%	3.9%
1990-2002											
Numerical	2,816	1,391	1,032	630	95	57	175	398	272	17	141
Percent	2.1%	2.9%	4.0%	2.5%	1.2%	1.0%	3.4%	3.6%	0.6%	1.0%	2.7%
% of Total Annual County Growth			36.6%	22.4%	3.4%	2.0%	6.2%	14.1%	9.7%	0.6%	5.0%

Source: U.S. Bureau of the Census, Hawaii County's Department of Research and Development and THK Associates, Inc.



2000 DISTRICTS
HAWAII
COUNTY
NORTH KOHALA
SOUTH KOHALA
HAMAKUA
NORTH HILO
SOUTH HILO
NORTH KONA
SOUTH KONA
PUNA
KA'U
Honokea Str.
Honokoa Gulch
TMK Property Bdy.
Kaula Gulch
Hakalau Str.
Lava Flow of 1859
Upper Waiakea Forest Res. Bdy.
TMK Property Bdy.
TMK Property Bdy.
4WD Rd.
TMK Prop. Bdy.
Hawaii Volcanoes National Park Bdy.
Puu Oo Trail
Chain of Craters Rd
Southwest Rift Zone
Manuka Nat. Area Reserve Bdy.
N
8 0 8 Miles
Prepared by Office of Planning, Dept. of Business, Economic Development and Tourism, State of Hawaii

C. Residential Construction Trends in the Hawaii County Market Area

Residential housing construction by type and tenure is shown in Table III-5. Single-family and duplex construction has driven historical permit activity in the region, accounting for approximately 86% of permits issued over the 1980-2001 period.

Table III-5: Housing Permits Authorized for Hawaii County 1980-2002

Year	Single Family	Percent of Total	Multi Family	Percent of Total	Total
1980	1,204	62%	727	38%	1,931
1981	892	88%	116	12%	1,008
1982	546	71%	226	29%	772
1983	938	95%	48	5%	986
1984	928	86%	153	14%	1,081
1985	872	88%	124	12%	996
1986	848	81%	201	19%	1,049
1987	977	86%	159	14%	1,136
1988	1,137	84%	224	16%	1,361
1989	2,686	88%	363	12%	3,049
1990	2,077	78%	592	22%	2,669
1991	2,353	81%	565	19%	2,918
1992	1,523	94%	99	6%	1,622
1993	1,413	90%	152	10%	1,565
1994	662	95%	37	5%	699
1995	1,119	94%	72	6%	1,191
1996	734	91%	69	9%	803
1997	653	91%	65	9%	718
1998	763	94%	49	6%	812
1999	1,006	92%	92	8%	1,098
2000	1,316	92%	112	8%	1,428
2001	1,249	90%	138	10%	1,387
2002*	513	95%	27	5%	540
Twenty-One Year Average 1980 - 2001	1,177	86%	199	14%	1,376
Eleven Year Average 1991 - 2001	1,163	90%	132	10%	1,295
Six Year Average 1996 - 2001	954	92%	88	8%	1,041

* through June 2002

Source: U.S. Department of Commerce, C-40 Reports and THK Associates, Inc

D. Projected Population and Household Growth in the Hawaii County Area

The employment participation rate, typically expressed as a decimal, has been increasing steadily during the past two to three decades. A rising employment participation rate is a good indicator of improving conditions in the regional economy. First, a large number of people are employed in the work force, which has a corresponding effect on unemployment levels. Secondly, a larger number of workers in a low wage market provides an ample labor supply for expanding firms or new firms relocating to the area. Finally, more workers earning salaries will boost the area's volume of disposable income available for new retail, housing and related expenditures.

Population, household and employment data for the market area are compared in Table III-6. In 1980, the population of the market area was 92,053 and resident employment was 46,145 for an employment participation rate of .50. By 1990, the market area's resident employment had increased to 67,537 with a population of 120,317 for an employment participation rate of .56. In Table III-6, the population growth of the market area is projected based upon the anticipated employment growth. With a projected January 1, 2012 resident employment of 92,941, the estimated 2012 population for the market area will be 182,809 with a projected employment participation rate of .51. The Hawaii County population is projected to grow by 2,870 persons per year through 2012. In addition, a substantial number of second homes will be demanded along with these new permanent households.

Table III-6 also shows the projected trends in new household formations for the Hawaii County market area. Historically, household size has been declining due to an increased divorce rate and delayed marriages. The population per household in the market area declined from 3.09 in 1980 to 2.86 in 1990; single households were among the most rapidly growing population segments. The 2002 household averages 2.62 members.

During the next decade, household size will continue to decline but at a slower rate. New household formations in the market area are projected to grow by an average of 1,372 annually during the next decade, with the average household size declining to 2.51. Population in group quarters, e.g., institutions, dormitories, etc., is expected to increase slightly during the decade to approximately 1,950.

TABLE III-6: Projected Population and Households in Hawaii County 2002-2012

Year	Total Employment	Employment Participation Ratio	January 1, Population	Annual Population Change	Population in Group Quarters	Population In Households	Population Per Household	Households	Annual Household Change
1980	46,145	0.5013	92,053		1,617	90,436	3.0932	29,237	
1990	67,537	0.5613	120,317	2,826	1,685	118,632	2.8613	41,461	1,222
2000	78,351	0.5270	148,677	2,836	1,780	146,897	2.6432	55,575	1,411
2002	79,537	0.5161	154,113	2,718	1,797	152,316	2.6191	58,156	1,290
2003	80,750	0.5153	156,697	2,584	1,811	154,886	2.6086	59,375	1,219
2004	81,989	0.5145	159,341	2,644	1,826	157,515	2.5982	60,625	1,250
2005	83,255	0.5138	162,046	2,705	1,840	160,205	2.5878	61,908	1,283
2006	84,550	0.5130	164,813	2,767	1,855	162,958	2.5774	63,224	1,316
2007	85,873	0.5122	167,644	2,831	1,870	165,774	2.5671	64,575	1,351
2008	87,226	0.5115	170,540	2,896	1,885	168,655	2.5569	65,961	1,386
2009	88,608	0.5107	173,503	2,963	1,900	171,603	2.5466	67,384	1,422
2010	90,021	0.5099	176,534	3,031	1,915	174,619	2.5365	68,844	1,460
2011	91,465	0.5092	179,636	3,101	1,931	177,705	2.5263	70,342	1,498
2012	92,941	0.5084	182,809	3,173	1,946	180,863	2.5162	71,879	1,537
Average Annual Change (2002-2012) Numerical:	1,340		2,870		15	2,855		1,372	
Percent:	1.6%		1.7%		0.8%	1.7%		2.1%	

Source: Dept of Commerce, Bureau of the Census and THK Associates, Inc.

IV. TOURISM AND VISITATION

A. General Visitation Trends

With its unique setting, exotic environment, and abundance of leisure activities, the Big Island of Hawaii continues to establish itself as a premier vacation destination. In recent years, the area has worked hard to maintain its high level of domestic visitation by promoting its wealth of amenities and business centers to international travelers. As the area continues to gain recognition as a year-round vacation and business retreat, there will be a growing need to preserve, improve, and add to the amenities and attractions sought by the rising tide of tourists.

The magnitude of visitors that travel to an area or merely pass through the environs can have a substantial impact on the local economy. These visitors are an important base for retail sales, lodging occupancies, and for other sectors of the service economy. In turn, these revenues provide spin-off demands for employment, housing and support economic activities. In order to better identify tourism's affects on the area's economy, it is important to identify characteristics of the visitors that are unique to the area. Socioeconomic statistics on tourists allow insights into what types of development will best suit the various visiting segments. Other items of interest are methods of arrival, length of visit, motivation for travel, and type of accommodation desired.

Attracted by the scenic beauty, resort atmosphere, and recreational excitement associated with the area's unique environment, tourists flock to the Big Island. As the numbers indicate, nearly each year between 1990 and 2001 the Big Island has captured a larger percentage of the state's yearly visitor arrivals. Table IV-1 shows historical visitor data for the Big Island, the Kona region and the State of Hawaii from 1990 through 2001. In the first half of the past decade, 1990-1996, the Big Island captured an average of 17% of the state's visitor arrivals and 12.0% of the state's visitor days. (Visitor days equal the number of visitor arrivals multiplied by the average length of stay.) In the second half of the 1990's, these percentages increased to 19% and 14%, respectively. Further inspection of these tables reveals two notable trends. The first is the recent increase of international visitors to the Big Island and the Kona region. The chart below shows that the annual percentage change for international visitation is considerably higher than that of domestic travelers to the Big Island and the Kona region.

Visitor Arrivals

	Annual % Change		
	1990-1996	1996-2001	1990-2001
Domestic Visitors			
Big Island	-1.3%	0.7%	-0.4%
Kona	-1.6%	0.6%	-0.6%
State	-2.1%	2.2%	-0.2%
International Visitors			
Big Island	6.7%	-0.8%	3.2%
Kona	5.5%	1.6%	3.7%
State	3.3%	-6.6%	-1.3%

Visitor Days

	Annual % Change		
	1990-1996	1996-2001	1990-2001
Domestic Visitors			
Big Island	1.4%	2.3%	1.8%
Kona	1.0%	2.4%	1.6%
State	-1.0%	2.1%	0.4%
International Visitors			
Big Island	8.2%	-0.6%	4.1%
Kona	9.2%	-1.2%	4.3%
State	3.9%	-5.1%	-0.3%

Table IV-1: Historical Visitor History to the Big Island and Kona Region, 1990-2001

Total Visitor Days	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Big Island	6,094,858	6,400,372	7,043,408	6,925,611	6,899,363	6,769,531	7,058,147	7,904,388	8,757,279	8,298,758	7,988,180	7,691,897
Kona	4,928,139	5,051,755	5,356,184	5,454,752	5,383,629	5,294,873	5,643,072	5,873,674	6,822,757	6,475,702	6,487,252	6,135,853
State	56,398,499	53,772,839	55,723,013	53,836,611	57,169,825	57,340,911	57,936,622	57,373,493	57,446,913	60,020,237	61,721,150	57,760,242
Big Island/State	10.8%	11.9%	12.6%	12.9%	12.1%	11.8%	12.2%	13.8%	15.2%	13.8%	12.9%	13.3%
Kona/Big Island	80.9%	78.9%	76.0%	78.8%	78.0%	78.2%	80.0%	74.3%	77.9%	78.0%	81.2%	79.8%
Kona/State	8.7%	9.4%	9.6%	10.1%	9.4%	9.2%	9.7%	10.2%	11.9%	10.8%	10.5%	10.6%
Domestic												
Big Island	5,236,063	5,483,653	5,973,547	5,774,415	5,842,456	5,633,326	5,677,151	6,458,370	6,808,785	6,633,839	6,708,831	6,349,576
Kona	4,263,625	4,395,257	4,587,184	4,555,096	4,594,068	4,406,628	4,517,093	4,777,225	5,459,073	5,305,372	5,450,378	5,080,327
State	41,269,155	38,575,333	39,011,618	36,656,820	39,384,934	38,561,739	38,944,059	39,427,198	40,904,938	43,069,177	45,179,587	43,108,798
International												
Big Island	858,795	916,719	1,069,862	1,151,196	1,056,907	1,136,204	1,380,996	1,446,018	1,948,494	1,664,919	1,284,784	1,339,366
Kona	664,514	656,498	769,000	899,656	789,561	888,245	1,125,979	1,096,449	1,363,684	1,170,330	1,043,706	1,059,942
State	15,129,344	15,197,505	16,711,395	17,179,791	17,784,891	18,779,172	18,992,563	17,946,295	16,541,975	16,951,060	16,541,563	14,651,444

Visitor Arrivals	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Big Island	1,127,373	1,111,035	1,139,978	1,117,656	1,079,535	1,081,047	1,163,700	1,205,081	1,340,767	1,307,720	1,267,965	1,181,551
Kona	991,876	953,591	970,696	973,733	933,049	910,393	985,176	1,024,813	1,137,993	1,093,524	1,101,401	1,027,781
State	6,723,531	6,518,460	6,473,669	6,070,995	6,364,674	6,546,759	6,723,141	6,761,135	6,595,790	6,741,037	6,948,595	6,303,791
Big Island/State	16.8%	17.0%	17.6%	18.4%	17.0%	16.5%	17.3%	17.8%	20.3%	19.4%	18.2%	18.7%
Kona/Big Island	88.0%	85.8%	85.2%	87.1%	86.4%	84.2%	84.7%	85.0%	84.9%	83.6%	86.9%	87.0%
Kona/State	14.8%	14.6%	15.0%	16.0%	14.7%	13.9%	14.7%	15.2%	17.3%	16.2%	15.9%	16.3%
Domestic												
Big Island	907,210	868,395	874,716	835,467	826,892	811,197	838,692	872,380	927,037	942,359	925,356	868,615
Kona	809,837	768,672	763,723	735,664	729,025	709,232	734,090	759,523	809,424	815,881	809,863	756,001
State	4,315,161	4,068,508	3,791,945	3,570,059	3,813,279	3,743,474	3,794,113	3,890,798	4,014,140	4,255,621	4,446,936	4,224,321
International												
Big Island	220,163	242,640	265,262	282,189	252,643	269,851	325,008	332,700	413,731	365,361	342,609	312,936
Kona	182,040	184,920	206,973	238,069	204,024	201,162	251,085	265,290	328,569	277,643	291,538	271,780
State	2,408,370	2,449,952	2,681,724	2,500,936	2,551,395	2,803,285	2,929,028	2,870,337	2,581,650	2,485,416	2,501,659	2,079,470

Source: State Department of Business, Economic Development and Tourism Historical Visitor Data and THK Associates, Inc.

Table IV-2 displays aircraft activity at the Kona International Airport from 1991 to 2001. The number of aircraft operations at the airport has increased approximately 6.7% per year since 1991. This trend is in line with the international visitor history data in the previous tables.

TABLE IV-2: Aircraft Operations at Kona International Airport 1991-2001

Year	Total Operations	Annual Change Numerical	Annual Change Percent
1991	56,140		
1992	63,939	7,799	13.9%
1993	59,904	(4,035)	-6.3%
1994	66,438	6,534	10.9%
1995	73,537	7,099	10.7%
1996	77,025	3,488	4.7%
1997	87,358	10,333	13.4%
1998	81,285	(6,073)	-7.0%
1999	82,955	1,670	2.1%
2000	98,052	15,097	18.2%
2001	107,793	9,741	9.9%
Annual Change			
1991-2001		5,165	6.7%
1996-2001		6,154	7.0%

Source: Hawaii State Department of Transportation; and THK Associates, Inc.

Historical hotel occupancy rates in Hawaii County are shown in Table IV-3. Over the past four years, the occupancy rate has averaged about 69.0%. Historically, the winter months of November through April have had higher occupancy rates than the summer months, on average about 2.0% higher. The winter months have also demanded higher room rates, averaging about $17.00 more per room as shown in Table IV-4.

Because the Big Island of Hawaii is such a unique and popular tourist destination, it boasts a wealth of lodging accommodations. Visitors can choose between resorts, hotel/motels, condominiums, and bed and breakfasts. More importantly, the fact that the bulk of the area's visitors are vacationers and business travelers staying extended days greatly increases the likelihood of their participating in some sort of recreational activity. Most of the area's hotel rooms are in the immediate environs, near the heart of the subject site's designated primary trade area.

Currently, the Big Island includes approximately 9,940 lodging units, 8,280 of which are found in the Kona and Kohala/Waimea/Kawaihae regions as shown in Tables IV-5 through IV-7. The Kona region accounts for 43% (4,295 units) of the Island's total units. Interesting to note is the county's historical lodging growth. Unit construction on the Big Island has well outpaced new units for the state as a whole. Hawaii County currently includes 13.8% of all lodging units in the state.

Table IV-3: Historical Hotel Occupancy Rates in Hawaii County, 1997-2001

Year	January	February	March	April	May	June	July	August	September	October	November	December
1997	72.2	84.5	75.0	70.0	60.9	64.8	69.9	72.2	61.0	65.1	66.6	60.7
1998	76.6	85.5	78.2	66.6	68.4	62.5	70.8	74.9	66.4	71.3	65.1	54.5
1999	73.0	81.3	68.7	59.8	54.2	62.4	67.3	73.0	65.1	67.0	64.6	51.2
2000	63.3	82.4	83.9	69.5	66.6	67.5	80.4	74.4	63.5	72.8	70.0	58.9
2001	70.6	84.9	80.9	62.8	58.4	62.8	70.1	71.3	52.6	58.0	52.5	54.0
Monthly Average	71.1	83.7	77.3	65.7	61.7	64.0	71.7	73.2	61.7	66.8	63.8	55.9

	Average Annual Occupancy Rate	November - April	May - October
1997	68.6	71.5	65.7
1998	70.1	71.1	69.1
1999	65.6	66.4	64.8
2000	71.1	71.3	70.9
2001	64.9	67.6	62.2

Sources: Hawaii Visitors and Convention Bureau and THK Associates, Inc.

Table IV-4: Big Island Average Hotel Room Rate by Month, 1997-2001

Year	January	February	March	April	May	June	July	August	September	October	November	December
1997	$123.12	$125.31	$130.22	$121.47	$114.17	$111.85	$120.62	$129.04	$120.01	$118.20	$117.43	$148.82
1998	$147.40	$146.30	$155.53	$150.11	$141.45	$134.46	$143.50	$137.37	$124.67	$128.72	$120.39	$190.40
1999	$158.60	$158.06	$165.86	$158.13	$143.99	$136.92	$145.34	$158.98	$143.61	$143.26	$146.82	$212.93
2000	$181.46	$179.74	$170.87	$172.18	$155.64	$156.22	$157.65	$166.46	$151.27	$149.73	$156.46	$205.37
2001	$184.98	$191.04	$175.39	$180.28	$168.23	$168.97	$175.65	$184.62	$157.08	$155.61	$156.66	$200.50
Monthly Average	$159.11	$160.09	$159.57	$156.43	$144.70	$141.68	$148.55	$155.29	$139.33	$139.10	$139.55	$191.60

	Average Annual Room Rate	November - April	May - October
1997	$123.36	$127.73	$118.98
1998	$143.36	$151.69	$135.03
1999	$156.04	$166.73	$145.35
2000	$166.92	$177.68	$156.16
2001	$174.92	$181.48	$168.36

Sources: Hawaii Visitors and Convention Bureau and THK Associates, Inc.

Table IV-5: Available Lodging Units in the State of Hawaii and Hawaii County, 1980 - 2001

Year	State Total	Percent Change	County Total	Percent Change	County as Percentage of State
1980	54,246		5,889		
1981	56,769	4.7%	6,705	13.9%	11.8%
1982	57,968	2.1%	7,167	6.9%	12.4%
1983	58,765	1.4%	7,469	4.2%	12.7%
1984	62,448	6.3%	7,149	-4.3%	11.4%
1985	65,919	5.6%	7,511	5.1%	11.4%
1986	66,308	0.6%	7,280	-3.1%	11.0%
1987	65,318	-1.5%	7,328	0.7%	11.2%
1988	69,012	5.7%	8,823	20.4%	12.8%
1989	67,734	-1.9%	8,161	-7.5%	12.0%
1990	71,266	5.2%	8,952	9.7%	12.6%
1991	72,275	1.4%	9,383	4.8%	13.0%
1992	73,089	1.1%	9,170	-2.3%	12.5%
1993	69,502	-4.9%	9,140	-0.3%	13.2%
1994	70,463	1.4%	9,595	5.0%	13.6%
1995	n/a	n/a	n/a	n/a	n/a
1996	70,288	-0.1%	9,558	-0.4%	13.6%
1997	71,025	1.0%	9,913	3.7%	14.0%
1998	71,480	0.6%	9,655	-2.6%	13.5%
1999	71,157	-0.5%	9,815	1.7%	13.8%
2000	71,506	0.5%	9,774	-0.4%	13.7%
2001	72,204	1.0%	9,944	1.7%	13.8%
Average Annual Change					
1980 - 2001	855	1.4%	193	2.5%	
1980 - 1990	1,702	2.8%	306	4.3%	
1990 - 2001	85	0.1%	90	1.0%	

note: timeshares are included in unit count

Source: Hawaii State Department of Business, Economic Development and Tourism and THK Associates, Inc.

Table IV-6: Inventory of Lodging Units by Type in Hawaii County and Kona Region, 2001

Type	Big Island		Kona Region			Kohala/Waimea/Kawaihae Region		
	Number of Properties	Available Units	Number of Properties	Available Units	Region's Units as % of Island's Units	Number of Properties	Available Units	Region's Units as % of Island's Units
Bed and Breakfast	72	287	18	67	23%	6	18	6%
Condominium Hotel	29	1,956	20	1,269	65%	7	536	27%
Hostel	2	21	0	0	0%	0	0	0%
Hotel	32	7,073	11	2,566	36%	10	3,426	48%
Individual Vacation Unit	42	438	20	318	73%	2	3	1%
Other	8	169	4	75	44%	0	0	0%
Total	185	9,944	73	4,295	43%	25	3,983	40%

Source: Hawaii State Department of Business, Economic Development and Tourism and THK Associates, Inc.

Table IV-7: Lodging Unit Inventory of Kona and Kohala/Waimea/Kawaihae Regions, 2001

Kona Region

Name	Type	Available Units	Year Opened
Alii Villas	Condo/Hotel	35	1973
Banyan Tree Condominium	Condo/Hotel	15	1978
Country Club Villa	Condo/Hotel	30	1979
Hale Kona Kai	Condo/Hotel	23	1972
Kanaloa at Kona (Outrigger) Resort	Condo/Hotel	79	1980
Keauhou Kona Surf & Racquet Club	Condo/Hotel	17	1976
Keauhou Resort Condominium	Condo/Hotel	19	1972
Kona Bali Kai (Marc)	Condo/Hotel	56	1977
Kona by the Sea (Aston)	Condo/Hotel	78	1982
Kona Coast Resort at Keauhou Gardens	Condo/Hotel	195	1981
Kona Islander Inn (Marc)	Condo/Hotel	55	1969
Kona Isle	Condo/Hotel	52	1972
Kona Magic Sands	Condo/Hotel	18	1964
Kona Makai	Condo/Hotel	80	1978
Kona Plaza	Condo/Hotel	26	1978
Kona Reef	Condo/Hotel	95	1981
Mauna Loa Village	Condo/Hotel	52	1991
Royal Seacliff Resort (Aston)	Condo/Hotel	151	1982
Sea Village Resort	Condo/Hotel	125	1975
White Sands Village	Condo/Hotel	68	1976
Four Seasons Resort - Hualalai	Hotel	243	1996
Keauhou Beach Hotel	Hotel	311	1970
King Kamehameha's Kona Beach Hotel	Hotel	460	1975
Kona Hotel	Hotel	11	1926
Kona Seaside Hotel	Hotel	224	1960
Kona Surf Resort and Country Club	Hotel	530	1971
Kona Tiki Hotel	Hotel	15	1957
Kona Village Resort	Hotel	125	1965
Manago Hotel	Hotel	64	1917
Royal Kona Resort	Hotel	440	1968
Uncle Billy's Kona Bay Hotel	Hotel	143	1975
Other	Bed and Breakfast	67	
	Individual Vacation Unit	318	
	Other	75	
Total		4,295	

Kohala/Waimea/Kawaihae

Name	Type	Available Units	Year Opened
The Bay Club at Waikoloa Beach Resort	Condo/Hotel	145	1991
The Islands at Mauna Lani	Condo/Hotel	17	1992
Mauna Lani Point	Condo/Hotel	62	1986
Mauna Lani Terrace	Condo/Hotel	60	1984
Paniolo Greens Resort	Condo/Hotel	161	1991
The (Aston) Shores at Waikoloa	Condo/Hotel	75	1987
Waikoloa Villas	Condo/Hotel	16	1980
Hilton Waikoloa Village	Hotel	1,240	1988
Kamuela Inn	Hotel	31	1960
Kohala Club Hotel	Hotel	20	n/a
Kohala Village Inn	Hotel	18	1994
Mauna Lani Bay Hotel & Bungalows	Hotel	350	1983
The Orchid at Mauna Lani	Hotel	539	1990
Outrigger Waikoloa Bch on Kohala Coast	Hotel	547	1981
Waimea Country Lodge	Hotel	21	1976
The Westin Hapuna Beach Prince Hotel	Hotel	350	1994
The Westin Mauna Kea Beach Hotel	Hotel	310	1965
Other	Bed and Breakfast	18	
	Individual Vacation Unit	3	
Total		3,983	

Source: Hawaii State Department of Business, Economic Development and Tourism and THK Associates, Inc.

B. Seasonal Units and Socioeconomic Profile of the Primary Trade Area

1. *Growth Trends*

In the analysis to determine demand for additional real estate uses, it is necessary to identify the primary area from which the facility typically will attract its patrons. The trade area is a function of population density, natural barriers, golfer distance/travel time habits, accessibility of the site, the competitive nature of the existing facilities, and the location of competitive facilities. The trade area in this instance comprises the bulk of the west coast of the Big Island, including the districts of North Kona and South Kohala. This is the center of the concentration of resorts, hotels, and condominiums on the Island and the majority of tourist activity on the Island revolves around the site and the trade area.

The historical growth pattern in the trade area has shown some unique characteristics. In 1980, there were 27,566 people living in the trade area. Since then the trade area has experienced 4.0% annual growth in its population, adding 1,702 new residents annually. Household growth has continued throughout this time period at a 4.6% growth rate or 679 new households annually. In 1980, the trade area represented 29.9% of Hawaii County's population. Today, it accounts for 42.2% of the market area's population. The significant growth in seasonal units that has occurred in the trade area is also displayed in Table IV-8. While second homes have grown by 59 units annually in the trade area, the total numbers of these units today, 2,467, seems relativity low for a destination and vacation spot such as the Kona Coast of the Big Island. This is potentially a significant untapped market segment.

Based on the historical development activity in the area and the economic forecast for the market area, it is possible to project future population levels in the trade area. The trade area's 2002 population of 65,017 residing in 23,906 households will experience annual average population growth of 1,821 and household growth of 729 through 2012. Thus, the population in the primary trade area will increase to 73,560 by 2007 and 83,230 by 2012. The growth in seasonal units will be approximately 2.7% in the coming decade and there will be 3,180 seasonal units in the trade area in 2012.

As mentioned, a substantial source of demand for housing can be second home and seasonal residents. A second home is a census-defined category that characterizes a housing unit that is for "seasonal, recreational, or occasional use". The vast majority of these units in Hawaii are occupied by out-of-state visitors. These units are treated separately from households in THK's golf and residential analyses. These segments of visitors are staying for extended periods. In 2002, there will be an average of 1,324 second homes occupied daily in the primary trade area. Table IV-11 shows the visitors from second homes in the primary trade area for the coming decade. THK has projected the annual average number of seasonal visitors on a daily basis to increase from 3,012 in 2002 to 3,961 by the year 2012. The majority of these visitors will stay between November and March; during February 2012, 4,797 seasonal visitors will be in the area daily.

Table IV-8: Population and Household Trends in the Primary Trade Area, 1980-2002

					Annual Average					
					1980-2002		1990-2002		2000-2002	
Hawaii County	1980	1990	2000	2002	Numerical	Percent	Numerical	Percent	Numerical	Percent
Population	92,053	120,317	148,677	154,113	2,821	2.4%	2,816	2.1%	2,718	1.8%
Households	29,237	41,461	55,575	58,156	1,314	3.2%	1,391	2.9%	1,290	2.3%
Housing Units	34,215	48,253	63,480	66,387	1,462	3.1%	1,511	2.7%	1,454	2.3%
Seasonal Units	1,424	2,045	2,775	2,912	68	3.3%	72	3.0%	69	2.4%
Primary Trade Area										
Population	27,566	43,429	61,537	65,017	1,702	4.0%	1,799	3.4%	1,740	2.8%
Households	8,976	14,953	22,487	23,906	679	4.6%	746	4.0%	710	3.1%
Housing Units	12,107	18,713	27,933	29,709	800	4.2%	916	3.9%	888	3.1%
Seasonal Units	1,172	1,695	2,341	2,467	59	3.4%	64	3.2%	63	2.7%
Primary Trade Area as a percent of the Hawaii County Area										
Population	29.9%	36.1%	41.4%	42.2%	60.3%		63.9%		64.0%	
Households	30.7%	36.1%	40.5%	41.1%	51.6%		53.6%		55.0%	
Housing Units	35.4%	38.8%	44.0%	44.8%	54.7%		60.6%		61.1%	
Seasonal Units	82.3%	82.9%	84.4%	84.7%	87.0%		89.0%		92.0%	

Source: U.S. Bureau of the Census and THK Associates, Inc.

Table IV-9: Projected Population and Household Trends in the Primary Trade Area, 2002-2012

				Annual Average			
				2002-2007		2002-2012	
Hawaii County	2002	2007	2012	Numerical	Percent	Numerical	Percent
Population	154,113	167,644	182,809	2,706	1.7%	2,870	1.7%
Households	58,156	64,575	71,879	1,284	2.1%	1,372	2.1%
Housing Units	66,387	73,660	81,730	1,455	2.1%	1,534	2.1%
Seasonal Units	2,912	3,290	3,720	76	2.5%	81	2.5%
Primary Trade Area							
Population	65,017	73,560	83,230	1,709	2.5%	1,821	2.5%
Households	23,906	27,310	31,200	681	2.7%	729	2.7%
Housing Units	29,709	33,940	38,780	846	2.7%	907	2.7%
Seasonal Units	2,467	2,800	3,180	67	2.6%	71	2.6%
Primary Trade Area as a percent of the Hawaii County Area							
Population	42.2%	43.9%	45.5%	63.1%		63.5%	
Households	41.1%	42.3%	43.4%	53.0%		53.2%	
Housing Units	44.8%	46.1%	47.4%	58.2%		59.1%	
Seasonal Units	84.7%	85.1%	85.5%	88.1%		88.2%	

Source. U.S. Bureau of the Census and THK Associates, Inc.

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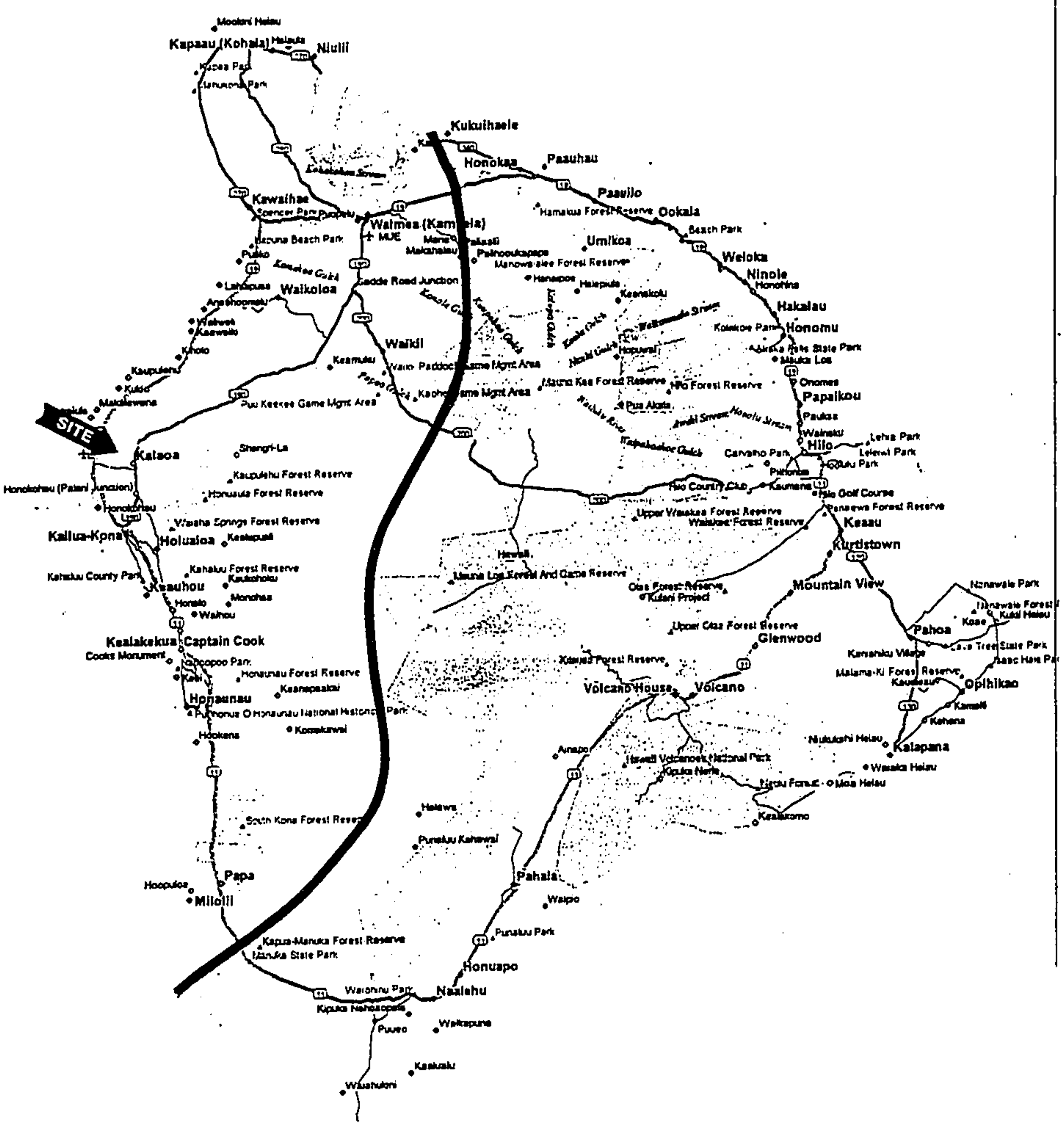
Primary Trade Area



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Scale 1:800,000 (at center)

10 Miles

20 KM

Major Connector

State Route

Primary State Route

TABLE IV-10: SEASONAL RESIDENTS IN THE LANDS OF KAU PRIMARY TRADE AREA, 2002

SEASONAL UNITS OCCUPIED

AVERAGE DAILY SEASONAL	AVERAGE	January	February	March	April	May	June	July	August	September	October	November	December
TOTAL UNITS	2,467												
OCCUPANCY	54%	62%	65%	68%	54%	47%	50%	53%	52%	45%	49%	47%	52%
OCCUPIED UNITS	1,324	1,530	1,604	1,678	1,332	1,159	1,234	1,308	1,283	1,110	1,209	1,159	1,283
VISITORS	3,012	3,480	3,648	3,816	3,031	2,638	2,806	2,975	2,918	2,526	2,750	2,638	2,918
PERCENT	100.0%	9.6%	10.1%	10.6%	8.4%	7.3%	7.8%	8.2%	8.1%	7.0%	7.6%	7.3%	8.1%

1\ Assumes 2.28 visitors per unit

Source: THK Associates, Inc

TABLE IV-11: PROJECTED SEASONAL VISITORS IN THE LANDS OF KAU PRIMARY TRADE AREA, 2002-2012

PROJECTED SEASONAL VISITORS

Year	AVERAGE	January	February	March	April	May	June	July	August	September	October	November	December
2002	3,012	3,480	3,648	3,816	3,031	2,638	2,806	2,975	2,918	2,526	2,750	2,638	2,918
2007	3,453	3,989	4,182	4,375	3,474	3,024	3,217	3,410	3,346	2,895	3,153	3,024	3,346
2012	3,961	4,576	4,797	5,019	3,985	3,469	3,690	3,912	3,838	3,321	3,616	3,469	3,838

1\ Assumes 2.28 visitors per unit

Source: THK Associates, Inc

2. *Lodging Visitors*

Tables IV-12 and IV-13 show monthly breakdowns of the projected lodging visitors to the trade area. The occupancy rates of each month from the previous section are used to calculate the percentage of the 8,278 units occupied each month in the Kona and Kohala/ Waimea/Kawaihae regions. The study assumes 1.8 visitors per room. The area's 2002 daily average of 10,617 lodging visitors is expected to increase to 11,439 by 2007 and 13,109 by 2012. This projects out to approximately 180 new lodging guests per night in the trade area. ~~In 2002, the month of February will average nearly 13,270 lodging visitors daily, and by 2012~~ January, February and March will average over 14,630 lodging visitors daily. It should also be noted that the number of hotel/lodging rooms in the land of Kau primary trade area are projected to grow from it's current inventory of 8,278 rooms to 10,090 rooms by 2012 and this represents an increase of 180 new hotel rooms being added to the market each year. This projected annual increase in hotel rooms is similar to the pace of hotel construction that occurred in the 1980's.

TABLE IV-12: LODGING VISITORS IN THE LANDS OF KAU PRIMARY TRADE AREA, 2002

HOTEL VISITORS

AVERAGE DAILY LODGING ROOMS	AVERAGE	January	February	March	April	May	June	July	August	September	October	November	December
TOTAL UNITS	8,278												
OCCUPANCY	71%	75%	89%	86%	67%	63%	68%	75%	76%	64%	68%	65%	59%
OCCUPIED UNITS	5,898	6,209	7,367	7,119	5,546	5,215	5,629	6,209	6,291	5,298	5,629	5,381	4,884
VISITORS	10,617	11,175	13,261	12,814	9,983	9,387	10,132	11,175	11,324	9,536	10,132	9,685	8,791
PERCENT	100.0%	8.8%	10.4%	10.1%	7.8%	7.4%	8.0%	8.8%	8.9%	7.5%	8.0%	7.6%	6.9%

1\ Assumes 1.8 visitors per room

Source: THK Associates, Inc

TABLE IV-13: PROJECTED LODGING VISITORS IN THE LANDS OF KAU PRIMARY TRADE AREA, 2002-2012

PROJECTED LODGING VISITORS

Year	AVERAGE	January	February	March	April	May	June	July	August	September	October	November	December
2002	10,617	11,175	13,261	12,814	9,983	9,387	10,132	11,175	11,324	9,536	10,132	9,685	8,791
2007	11,439	12,042	14,289	13,808	10,757	10,115	10,918	12,042	12,202	10,275	10,918	10,436	9,473
2012	12,322	12,970	15,391	14,872	11,587	10,895	11,759	12,970	13,143	11,068	11,759	11,241	10,203

1\ Assumes 1 8 visitors per room

Source THK Associates, Inc

3. *Houseguests*

Another source of potential revenue on the Kona Coast are houseguests who stay with permanent residents of the Island. These visitors are a significant force in tourist economics. It is estimated that 3.1% of households are hosting guests on a daily basis. This adds 1,115 people to the trade area on a daily basis. Table IV-14 and IV-15 illustrate these visitors by month through 2012.

Table IV-16 summarizes the projections of the average daily population in the Lands of Kau primary trade area through 2012. It is estimated that the average daily population of 78,093 in 2002 will increase to 100,491 by 2012.

TABLE IV-14: HOUSEGUESTS TO THE LANDS OF KAU PRIMARY TRADE AREA, 2002

	HOUSEGUESTS AVERAGE	January	February	March	April	May	June	July	August	September	October	November	December
TOTAL HOUSEHOLDS	23,906												
OCCUPANCY	3.1%	5%	4%	4%	3%	2%	3%	3%	3%	2%	2%	3%	4%
OCCUPIED UNITS	743	1,076	980	1,052	645	430	622	669	693	550	406	741	1,052
VISITORS	1,115	1,614	1,470	1,578	968	645	932	1,004	1,040	825	610	1,112	1,578
PERCENT	100.0%	12.1%	11.0%	11.8%	7.2%	4.8%	7.0%	7.5%	7.8%	6.2%	4.6%	8.3%	11.8%

1\ Assumes 1.5 visitors per household

Source: THK Associates, Inc

TABLE IV-15: PROJECTED HOUSEGUESTS TO THE LANDS OF KAU PRIMARY TRADE AREA, 2002-2012

Year	HOUSEGUESTS AVERAGE	January	February	March	April	May	June	July	August	September	October	November	December
2002	1,115	1,614	1,470	1,578	968	645	932	1,004	1,040	825	610	1,112	1,578
2007	1,303	1,843	1,680	1,802	1,162	775	1,092	1,153	1,194	952	750	1,335	1,894
2012	1,519	2,106	1,919	2,059	1,396	931	1,279	1,324	1,371	1,098	923	1,603	2,219

1\ Assumes 1.5 visitors per household

Source THK Associates, Inc

TABLE IV-16: SUMMARY OF AVERAGE DAILY POPULATION IN THE LANDS OF KAU PRIMARY TRADE AREA

	TOTAL	Percent	January	February	March	April	May	June	July	August	September	October	November	December
2002														
RESIDENTS	63,350	81.1%	63,350	63,350	63,350	63,350	63,350	63,350	63,350	63,350	63,350	63,350	63,350	63,350
HOTEL	10,617	13.6%	11,175	13,261	12,814	9,983	9,387	10,132	11,175	11,324	9,536	10,132	9,685	8,791
SEASONAL	3,012	3.9%	3,480	3,648	3,816	3,031	2,638	2,806	2,975	2,918	2,526	2,750	2,638	2,918
HOUSEGUESTS	1,115	1.4%	1,614	1,470	1,578	968	645	932	1,004	1,040	825	610	1,112	1,578
TOTAL	78,093	100.0%	79,619	81,730	81,559	77,332	76,021	77,221	78,504	78,633	76,237	76,842	76,785	76,637
2007														
RESIDENTS	72,380	81.7%	72,380	72,380	72,380	72,380	72,380	72,380	72,380	72,380	72,380	72,380	72,380	72,380
HOTEL	11,439	12.9%	12,042	14,289	13,808	10,757	10,115	10,918	12,042	12,202	10,275	10,918	10,436	9,473
SEASONAL	3,453	3.9%	3,989	4,182	4,375	3,474	3,024	3,217	3,410	3,346	2,895	3,153	3,024	3,346
HOUSEGUESTS	1,303	1.5%	1,843	1,680	1,802	1,162	775	1,092	1,153	1,194	952	750	1,335	1,894
TOTAL	88,575	100.0%	90,254	92,531	92,365	87,774	86,294	87,607	88,984	89,122	86,502	87,201	87,175	87,093
2012														
RESIDENTS	82,690	82.3%	82,690	82,690	82,690	82,690	82,690	82,690	82,690	82,690	82,690	82,690	82,690	82,690
HOTEL	12,322	12.3%	12,970	15,391	14,872	11,587	10,895	11,759	12,970	13,143	11,068	11,759	11,241	10,203
SEASONAL	3,961	3.9%	4,576	4,797	5,019	3,985	3,469	3,690	3,912	3,838	3,321	3,616	3,469	3,838
HOUSEGUESTS	1,519	1.5%	2,106	1,919	2,059	1,396	931	1,279	1,324	1,371	1,098	923	1,603	2,219
TOTAL	100,491	100.0%	102,342	104,797	104,640	99,658	97,984	99,419	100,895	101,042	98,177	98,989	99,002	98,950

V. Residential Market Analysis

A. Projected Residential Demand in the Hawaii County Area

The potential for new residential development is subject to a variety of pressures including interest rates, inflation, social, political and other economic influences. The preceding section of this report projected the overall growth in population and household formations, which will create the aggregate demand for new housing construction. Historical trends in new housing construction were also examined to show how past construction trends have coincided with population and demographic changes and economic conditions.

Based upon the historical performance of the Hawaii County housing market, and upon the projected growth in new household formations shown earlier in this report, the demand for new residential construction can be segmented by tenure and type of unit. This will allow the market potentials for specific types of residential construction to be examined. The key components of residential construction demand during the next decade include new housing units to meet demands of new population growth and household formations, construction to meet the demands of the existing households in the area who desire to upgrade or downgrade into new ownership units, and construction to replace units lost through demolition and conversion. Table V-1 summarizes the net change in housing unit demand expected during the next decade in the Hawaii County area.

THK projects new household formations will average 1,370 per year during the projection period 2002-2012 which will produce a demand for the construction of 1,451 dwelling units annually when adjusted for vacancies and demolitions. Single-family detached construction of 1,180 units annually during the next decade will account for approximately 81.4% of total construction in the Hawaii County area. Townhome and condominium construction will average 90 units annually, or 6.1% of the total market followed by rental apartment construction with 180 units annually, or 12.3% of total construction.

Table V-1: Projected Permanent Residential Demand in the Hawaii County, 2002-2012

Year	Households	Annual Change	Annual Housing Unit Demand	Ownership Units: Total Ownership	Ownership Units: Detached Single Family	Ownership Units: Attached Single Family	Rental Multi-family
2002	58,156	1,219	1,271	1,112	1,035	78	159
2003	59,375	1,250	1,304	1,141	1,061	80	163
2004	60,625	1,283	1,338	1,171	1,089	82	167
2005	61,908	1,316	1,373	1,201	1,117	84	172
2006	63,224	1,351	1,409	1,233	1,147	86	176
2007	64,575	1,386	1,446	1,265	1,176	89	181
2008	65,961	1,423	1,484	1,299	1,208	91	186
2009	67,384	1,460	1,523	1,332	1,239	93	190
2010	68,844	1,498	1,562	1,367	1,271	96	195
2011	70,342	1,537	1,603	1,403	1,305	98	200
2012	71,879	1,576	1,644	1,438	1,338	101	205
Average Annual Demand (2002-2012)	1,370		1,451	1,269	1,180	89	181

Source: THK Associates, Inc.

B. Total Projected Residential Demand in the Hawaii County Area

Based upon the annual housing unit demand forecasted in Table V-1, THK has estimated the demand for seasonal/second homes in the Hawaii County area. With the addition of seasonal home demand, the total housing unit demand will grow at an average of 1,533 units per year for the next decade. The second home market comprises 5.4% of the total Hawaii County housing unit demand. This demand is segregated between detached single-family (80%) and attached single-family (20%). Single-family detached construction of 1,242 units annually during 2002-2012 accounts for about 81% of total construction in the Hawaii County area. Condominiums and townhome construction will average 109 units annually, or 7% of the total market followed by rental apartment construction with 181 units annually, or 12% of total construction.

TABLE V-2: Total Projected Residential Demand in Hawaii County, 2002-2012

				Ownership Units			
Year	Permanent Household Unit Demand	Seasonal/ Second Home Demand	Total Housing Unit Demand	Total Owner-ship	Detached Single Family	Attached Single Family	Rental Multi-family
2002	1,271	73	1,344	1,185	1,089	96	159
2003	1,304	75	1,378	1,215	1,117	99	163
2004	1,338	76	1,415	1,247	1,146	101	167
2005	1,373	78	1,451	1,279	1,176	104	172
2006	1,409	80	1,489	1,313	1,207	106	176
2007	1,446	82	1,528	1,347	1,238	109	181
2008	1,484	84	1,569	1,383	1,271	112	186
2009	1,523	87	1,609	1,419	1,304	115	190
2010	1,562	89	1,651	1,456	1,338	118	195
2011	1,603	91	1,694	1,494	1,373	121	200
2012	1,644	93	1,737	1,531	1,407	124	205
Average Annual Demand (2001-2011)	1,451	83	1,533	1,352	1,242	109	181

Source: THK Associates, Inc.

C. Projected Single-Family Lot Demand in the Hawaii County Area

Based on the demand for single-family detached units forecasted for the next decade in Table V-2, THK is able to project the number of additional lots that will be in demand during the same timeframe. THK estimates this demand will grow from 54 lots in 2002 to 70 lots in 2012, an annual average of 62 additional lots. Combined with the units demanded, it results in the total demand for units and lots to increase from 1,144 to 1,478 in 2012, an annual average of 1,305 units and lots over the next decade.

TABLE V-3: Projected Single Family Lot Demand in Hawaii County, 2002-2012

Year	Total Single Family Unit Demand	Additional Lot Demand	Unit & Lot Demand
2002	1,089	54	1,144
2003	1,117	56	1,173
2004	1,146	57	1,204
2005	1,176	59	1,235
2006	1,207	60	1,267
2007	1,238	62	1,300
2008	1,271	64	1,335
2009	1,304	65	1,369
2010	1,338	67	1,405
2011	1,373	69	1,441
2012	1,407	70	1,478
Average Annual Demand (2002-2012)	1,242	62	1,305

Source: THK Associates, Inc.

D. Projected Residential Demand in the Lands of Kau Trade Area

Based upon the construction and growth trends within the region and the Lands of Kau primary trade area, it is possible to estimate the portion of Hawaii County residential demand that will be captured in the site vicinity. It is estimated that the Lands of Kau trade area will capture approximately 64.0% of new residential construction in the Hawaii County area.

Table V-4 shows THK's projected demand for single-family detached units, townhomes and condominiums, and rental apartments in the Lands of Kau trade area over the next decade. THK projects demand for single-family detached units in the primary trade area of the Lands of Kau site to range from 576 units in 2002 to 751 units in 2012 for an average of 660 units annually throughout the decade. Townhome and condominium demand will average 69 units annually. Rental unit demand per year will average 104 units on an annual basis.

TABLE V-4: Projected Permanent Residential Demand in the Lands of Kau Primary Trade Area, 2002-2012

Year	Households	Annual Change	Housing Unit Demand	Detached Single Family	Attached Single Family	Total Ownership	Rental Multi Family
2002	23,906	645	727	576	60	637	91
2003	24,551	663	747	592	62	654	93
2004	25,214	681	767	608	64	671	96
2005	25,895	699	788	624	65	689	98
2006	26,594	718	809	641	67	708	101
2007	27,312	737	831	658	69	727	104
2008	28,050	757	854	676	71	747	107
2009	28,807	778	877	694	73	767	110
2010	29,585	799	900	713	75	788	113
2011	30,384	820	925	732	77	809	116
2012	31,204	841	948	751	79	830	119
Average Annual Demand (2002-2012)		740	834	660	69	730	104

Source: THK Associates, Inc.

E. Total Projected Residential Demand in the Primary Trade Area

Based on the projected household unit demand for the next decade, THK is able to estimate the demand for seasonal/second homes. In the year 2002, THK estimates the demand to be 64 seasonal units and increase to 83 seasonal units by 2012. This increases the construction of detached single-family to an average of 719 units annually over the next decade. Townhome and condominium construction will average 84 units annually while rental apartment demand will average 104 units annually.

TABLE V-5: Total Projected Residential Demand in the Primary Trade Area, 2002-2012

Year	Permanent Household Unit Demand	Seasonal/ Second Home Demand	Total Housing Unit Demand	Ownership Units: Total Owner-ship	Ownership Units: Detached Single Family	Ownership Units: Attached Single Family	Rental Multi-family
2002	727	64	792	701	627	73	91
2003	747	66	813	720	644	75	93
2004	767	68	835	739	662	77	96
2005	788	69	857	759	679	79	98
2006	809	71	880	779	698	81	101
2007	831	73	904	800	716	84	104
2008	854	75	928	822	736	86	107
2009	877	77	953	844	756	88	110
2010	900	79	979	866	776	91	113
2011	925	81	1,005	890	797	93	116
2012	948	83	1,031	912	817	95	119
Average Annual Demand (2002-2012)			907	803	719	84	104

Source: THK Associates, Inc.

F. Projected Single-Family Demand in the Primary Trade Area

Based on the demand for single-family detached units forecasted for the next decade in Table V-5, THK is able to project the number of lots that will be in demand during the same timeframe. THK estimates this demand will grow from 31 additional lots in 2002 to 41 lots in 2012, an annual average of 36 additional lots. In addition to the units demanded, it results in the total demand for units and lots to increase from 659 to 858 in 2012, an average of 755 units and lots over the coming decade.

TABLE V-6: Projected Single Family Lot Demand in the Primary Trade Area, 2002-2012

Year	Total Single Family Unit Demand	Additional Lot Demand	Unit & Lot Demand
2002	627	31	659
2003	644	32	676
2004	662	33	695
2005	679	34	713
2006	698	35	733
2007	716	36	752
2008	736	37	773
2009	756	38	793
2010	776	39	815
2011	797	40	837
2012	817	41	858
Average Annual Demand (2002-2012)	719	36	755

Source: THK Associates, Inc.

To better quantify the demand for new residential units in the primary trade area, THK breaks down the trade area's existing households by income range and then converts those income ranges to home purchasing capacity and monthly rental capacity. Home purchasing capacity is calculated using estimated monthly payments (principle, interest, taxes and insurance) based on a 30-year fixed rate mortgage with a 8.0% interest rate and a 20% down payment. In determining monthly rental capacity it's assumed - as available statistics indicate - that households that rent spend, on average, 25% of their gross income on housing. Households that own their homes typically allot 28%-32% of their income to mortgage payments. It should be noted that no allowances have been made to account for the greater purchasing capacity that may be derived from adjustable rate mortgages (ARMs) or other alternative financing mechanisms. For that reason, Table V-7's home purchasing capacity estimates are likely conservative.

The median household income in the Lands of Kau primary trade area is currently approximately $53,158. This suggests that the median permanent household in the trade area can afford a $181,100 home. *However, new home sales suggest that buyers are* spending a greater percentage of their incomes on housing and that residents with significantly higher incomes are purchasing new products. Many of these buyers are new to the Island and do not comprise the current median income. Therefore, appropriate adjustments have been made to the demand by price range. In terms of second home purchasing capacity, adjustments were made based on pricing of existing and new product aimed at this market and on similar analyses performed by THK in regionally and conceptually competitive markets.

In the following table, the demand for residential units in the Lands of Kau trade area is projected by price range. Table V-7 shows the demand distribution for the annual average of 755 single-family detached units projected by THK to be demanded in the primary trade area. Approximately 65.0% of the projected single-family demand in the primary trade area will be for lots priced over $100,000. Almost 50% of the seasonal single-family demand is for lots priced over $225,000.

Table V-7: Annual Average Lot/Unit Demand By Price Range in the Lands of Kau Primary Trade Area

Unit Price Range	Lot Price Range	Permanent Households	Percent	2nd Home/ Seasonal Residents	Percent	Additional Lots	Percent	Total	Percent
Detached Single Family									
Under $250,000	Under $100,000	255	38.6%	0	0.0%	0	0.0%	255	33.8%
$250,000 - $349,999	$100,000 $124,999	212	32.1%	3	5.0%	2	5.0%	216	28.7%
$350,000 - $449,999	$125,000 $159,999	78	11.8%	4	7.5%	3	7.5%	85	11.3%
$450,000 - $549,999	$160,000 $189,999	50	7.5%	6	10.0%	4	10.0%	59	7.8%
$550,000 - $649,999	$190,000 $224,999	26	4.0%	18	30.0%	11	30.0%	55	7.3%
$650,000 +	$225,000 +	40	6.0%	28	47.5%	17	47.5%	84	11.2%
Total		660	100.0%	59	100.0%	36	100.0%	755	100.0%

Unit Price Range	Permanent Households	Percent	2nd Home/ Seasonal Residents	Percent	Total	Percent
Condominiums and Townhomes						
Under $250,000	44	63.2%	4	25.0%	47	56.5%
$250,000 $350,000	12	16.8%	4	30.0%	16	19.1%
$350,000 +	14	20.0%	7	45.0%	20	24.4%
Total	69	100.0%	15	100.0%	84	100.0%

Unit Rental Rates	Permanent Households	Percent
Rental Multi-Family		
Under $600	26	24.5%
$600 - $750	18	16.8%
$750 +	61	58.7%
Total	104	100.0%

Source: U.S. Bureau of the Census and THK Associates, Inc.

Unit Rental Rates	Permanent Households	Percent
Mobile/Manufactured Homes		
Under $200	2	12.5%
$200 - $239	5	30.0%
$240 - $279	5	35.0%
$280 +	3	22.5%
Total	15	100.0%

Source: U.S. Bureau of the Census and THK Associates, Inc.

G. Active Residential Projects on the Kona-Kohala Coast

Residential activity on the Big Island has remained fairly robust, even in the aftermath of the September 11th tragedy. A review and analysis of permit activity and sales activity for the period of September 2001 through August 2002 shows greater volume and some appreciation of pricing than the 2000-2001 figure indicated in our previous analysis. Given overall market and economic trends, it is noteworthy how the residential market has held up. The north Kona dristrict, in particular, had by far the greatest activity on the Island. Figures for the 12-month period show 532 single-family sales at an average price of $368,000. Just over 300 condominiums sold for an average price of $222,000. The south Kohala district registered 197 single-family sales at an average price of $413,000. Pricing per square foot generally ranged from $150 to $250 dependant upon location and views. A total of 1,210 transactions occurred on the Kohala Coast in the 12-month data period. The detailed MLS printouts and summaries that comprise these statistics are in the appendix of the report.

H. Golf Course Communities

Hokuli'a

Lots and homes within golf course communities demand much higher prices. One of the newest and most exclusive private communities being developed is Lyle Anderson's Hokuli'a project located 17 miles south of the Kona Airport. Situated on 1,500 acres along three miles of coastline, Hokuli'a's first phase is planned for 261 homesites. Over 150 lots have been sold over the past two years. All of the sites in Phase I are over one acre with the average being 1.2 acres. Sites on the Jack Nicklaus course sell for $1.8 million to $2.5 million while interior lots range between $650,000 and $1.5 million. Representatives of the project report that homes planned for the sites will be developed for no less than $300 to $400 per square foot. They also expect the lot prices to range from 30% to 60% of the home prices. Phase II of Hokuli'a is planned for 98 homesites that will sell for a minimum of $3.0 million dollars each. In Phase I and Phase II, a $150,000 equity golf membership is included in the purchase of a site.

Mauna Kea & Hapuna Resort Courses

Surrounding the Mauna Kea and Hapuna courses are eight distinct residential communities that form the 1,840-acre Mauna Kea Resort. Two of the communities, The Bluffs and The High Bluffs still have available sites for sale. At the High Bluffs, six of the nine lots are situated along the 17th fairway. The average size of these six lots is 34,025 square feet and costs $1,558,000. The other three sites face the open space toward the Queen Kaahumanu Highway and average 32,200 square feet and $1,385,000. Over half of the 22 sites at The Bluffs front the Pacific Ocean while the others overlook Mauna Kea golf course. The waterfront lots average 41,200 square feet and $3,208,000. The golf-frontage sites average 40,085 square feet and average $1,950,000. The 17 sites of Phase I of the Uplands, Mauna Kea's final development and "crown jewel," have sold out.

Mauna Lani Resort

The 3,200-acre Mauna Lani Resort offers seven residential communities and a variety of housing options including condominiums, villas, and estates. Condominiums and villas range from 1,300 square feet to 1,650 square feet and are priced between $700,000 and $1,325,000. The community of 49 Black Sands Beach is one of the final developments of Mauna Lani. It rests on 60 acres and is limited to 49 custom estate lots, 18 of which front the Pacific while most of the remaining lots have frontage along the resort's South Golf Course. Lots on the course are listed at $1.2 million for 30,274 square feet to $1.45 million for a 28,749 square foot lot. Lot #2 is priced at $15.0 million for 70,480 square feet. Of twelve lots fronting the course in 49 Black Sands Beach, the average price is $1,355,000 for 35,435 square feet.

At the Makalei Estates at the top end of the subject property, three-acre parcels are available for $200,000 to $280,000. Forty-seven have sold since they came on the market in August 2000. Condominiums in this region average around $210,000 per unit, but there is a wide range available from the high $300,000s at Kanaloa at Kona to the $140,000s at Kona Pacific.

At Kona Country Club lots fronting the golf course are achieving premiums of $70,000 to $100,000 over lots priced from $180,000 to $200,000 away from the course. On average golf course frontage lots achieve premiums of 30% to 40% above other lots. Premiums are also found for certain ocean views or open spaces.

VI. Residential Development Potentials at the Lands of Kau Site

The success of residential development at the Lands of Kau site depends on a number of factors: location, physical suitability of the site for development, and the overall market conditions for residential sales. Physically, the site appears well suited for residential development and should lend itself to an interesting layout, particularly once the planned golf course is completed.

The supply and demand sides of the residential market in the Lands of Kau primary trade area were evaluated in the previous sections of this report. It was established that the primary trade area around the site will have an average demand for approximately 907 residential units annually through the year 2012. Approximately 719 of the units demanded will be detached single-family units with an additional 36 lots demanded per year. Table VI-1 projects the absorption potentials for single-family residential development at the Lands of Kau site.

THK's projected capture rates for housing units at the Lands of Kau site are shown in Table VI-1. The demand by price range and unit type in the primary trade area was projected earlier based upon the projected income and demographic characteristics of the population in the region. The capture rates for the subject site show the share of each market segment that the subject property is expected to capture.

The important elements to evaluate when determining capture rates are the prestige of the community and the quality and character of the immediate area. The capture rates shown reflect the differences in the quality of the location and the reputation, planning and amenities of competitive developments. These capture rates were determined based upon the geographic attributes of the subject site and those of competitive projects, as well as the number of competitors in a given price range within the immediate market area.

Based on the competitive review of other projects, the location of the site, its planned amenities, and its access to regional employment, retail, and recreation centers, THK believes that the Lands of Kau site will be able to capture either a generic capture rate or a higher than generic capture rate of the single-family detached market. In order to determine capture rates, THK reviewed the number of existing competitors and determined those that will still be marketing product in 2003. THK then allowed for new project and resale competition and estimated a "fair" share capture rate, adjusted for the site.

Table VI-1 displays THK's projected single-family unit and acreage absorption for the Lands of Kau site. An average annual demand of 500 units priced over $250,000 over the next 11 years is expected in the trade area. Given the site's proposed golf course and overall high-end plan, THK has programmed product in five ranges over $250,000. It is also assumed that the lots will be relatively large (THK has programmed a 10,000-42,500 square foot range). That said, it is estimated that the site could capture approximately eight units per year in the $350,000 to $450,000 price range, nine per year in the $450,000-$550,000 price range, and nine units per year priced over $650,000. This suggests an average lot size of 20,200 square feet and an average annual absorption of 31 acres.

Of these lots probably 250 can front the golf course. With 100 feet of frontage per lot and a likely premium of $1,000 per foot, this creates a potential added value of $25 million to the property.

A. Attached and Multi-Family Units

As currently proposed, a significant portion of the site's residential development will be attached or multi-family units. THK has also examined the condominium/townhome component of the development program. Including these units accelerates the project's build-out and opens it up to the sizeable market segments that prefer such product. Moreover, given the market's demographics and the project's location, some sort of townhome/condominium concept will likely draw strong demand. In addition, a large portion of the rental demand is projected to come in the form of student housing and units for visiting students, academics, and participants in the proposed expanded curriculum, courses, and conferences. Research has shown the need for one rental unit for approximately every four to six students living off campus.

Table VI-2 shows the projected demand for attached ownership units. Table VI-2 demonstrates that the site could absorb 20 townhome/condominium units on approximately 2.7 acres annually through 2011. Approximately 35% of those units should be priced over $350,000.

Table VI-2: Projected Townhome/Condominium Demand and Acreage Absorption at the Lands of Kau Site

Home Prices:	Under $250,000	$250,000 $350,000	$350,000 & Above	Annual Total	Cumulative Total
Annual Average Demand in the Primary Trade Area:	47	16	20	84	
Number of Competitors	5	4	3		
Generic Capture Rate	16.7%	20.0%	25.0%		
Site Capture Rate:	16.7%	30.0%	37.5%	24.3%	
Annual Absorption (Units)					
2002		PLANNING			0
2003	7	4	7	18	18
2004	7	4	7	19	37
2005	7	5	7	19	56
2006	8	5	7	20	76
2007	8	5	8	20	96
2008	8	5	8	21	117
2009	8	5	8	21	139
2010	9	5	8	22	161
2011	9	5	8	23	183
Total	71	43	69	183	
Annual Average	8	5	8	20	
Average Net Density	12	9	5	7.5	
Net Acres (Annual Average)	0.7	0.5	1.5	2.7	
Net Acres	5.9	4.8	13.8	24.5	

Source: THK Associates, Inc.

Table VI-3: Projected Rental/Multi-Family Demand and Acreage Absorption at the LandsofKau Site, 2002-2012

Rent Ranges:	Under $600	$600 $750	$750 & Above	Annual Total	Cumulative Total
Annual Average Demand in the Primary Trade Area:	26	18	61	104	
Number of Competitors:	5	4	4		
Generic Capture Rate:	16.7%	20.0%	20.0%	18.9%	
Site Capture Rate:	16.7%	20.0%	20.0%	18.9%	
Annual Absorption (Units)					
2002			Planning		
2003	4	3	11	18	18
2004	4	3	11	18	36
2005	4	3	12	19	55
2006	4	3	12	19	75
2007	4	3	12	20	95
2008	4	4	13	20	115
2009	4	4	13	21	136
2010	5	4	13	22	158
2011	5	4	14	22	180
Total	38	32	110	180	
Annual Average	4	4	12	20	
Average Net Density	15.0	12.0	8.0	9.5	
Net Acres (Annual Average)	0.3	0.3	1.5	2.1	
Net Acres	2.6	2.6	13.7	18.9	

Source: THK Associates, Inc.

VII. University of Hawaii Town Center Market Analysis

A major component of the Lands of Kau plan is to incorporate an "urban core" component into the overall plan as a tie-in to and in conjunction with expansion plans at the adjacent University of Hawaii. A community college and specialized medical and educational facilities are being considered along with the expanded university and additional student housing. A rezoning of the Lands of Kau parcel from agriculture to urban, with the support of the university, would help facilitate the expansion plans and expedite the development of this urban core where the two sites converge. County road development plans call for an arterial road to possibly be extended through the proposed core area. In this urban core area, a need would also arise for the development of some retail, hotel, office, and research and development/ flex space to be built to serve both the residential community and the educational/medical components. THK has analyzed the overall demand for each of these uses in the Kau trade area as well as at the site.

A. Demand for Office Absorption

The table below illustrates the percentage of new employment that will be housed in office buildings for each major employment group. Some industries are more likely than others to house employees in-office space rather than in industrial buildings, retail facilities, schools, or public buildings. Those industries projected to generate the bulk of the new jobs and their respective occupational breakdowns make it clear that employment growth in the Kona region during the next decade will be dominated by service oriented, white collar occupations.

TABLE VII-1: Proportion of New Employment Housed in Office Space

Industry	Proportion of New Employment Housed in Office Space
Mining	20%
Construction	10%
Manufacturing	15%
Transportation, Communcation, Public Utilities	30%
Wholesale Trade	15%
Retail Trade	22%
Finance, Insurance, Real Estate	85%
Services	56%
Government	20%

Source: THK Associates, Inc.

In Table VII-2, office employment percentages are applied to the projected change in employment by industry in the Lands of Kau trade area in order to project the total growth in office employment over the next decade. Total office employment will increase by an average of 382 per year over the next decade. Service employment will account for an average of 284 new office employees annually, or 74.2% of the total growth in office employment; the FIRE (Finance, Insurance, and Real Estate) sector will add 44 jobs annually, and the retail sector will add 32 office employees annually.

Two important trends affecting the demand for office space are the increasing use of sophisticated electronic business machines and the adoption of open space floorplans that can be adapted rapidly as space needs change. New technology will enable firms to do more work with fewer employees. Routine filing and recordkeeping will be handled automatically, reducing the demand for unskilled office help. On the other hand, firms will need space for expansions to accommodate the growing use of electronic equipment. Consequently, while the actual space available for each office worker will decline, the average number of square feet per office employee will increase.

Recent research by the Urban Land Institute indicates the national average square footage per metropolitan office employee increased from 195 square feet to 230 square feet, primarily because of increased equipment needs. By multiplying the standard of 230 square feet per office employee with the annual growth in new office employment, the annual demand for new office space can be estimated. Given that growth in office employment will average 382 workers per year, there should be an average annual demand for just under 87,000 square feet of office space from 2002 to 2012. Approximately 17.5% of this demand, 15,650 square feet per year, is projected to be captured at the Lands of Kau site. Through the build-out of the project, this will require 16 acres of land for office use, including speculative demand.

TABLE VII-2: PROJECTED ANNUAL CHANGE IN OFFICE EMPLOYMENT IN THE LANDS OF KAU TRADE AREA, 2002-2012

Industry	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Annual Average Change
Mining	5	5	5	5	5	5	5	5	5	5	5	0
Construction	221	222	223	224	225	226	227	228	229	231	232	1
Manufacturing	192	190	189	188	186	185	184	183	181	180	179	-1
T & U/1	563	569	575	581	588	594	601	607	614	621	628	7
Wholesale Trade	195	196	198	199	201	203	204	206	208	209	211	2
Retail Trade	1,985	2,815	2,045	2,076	2,107	2,139	2,171	2,204	2,237	2,270	2,304	32
FIRE/2	2,955	2,996	3,038	3,081	3,124	3,168	3,212	3,257	3,303	3,349	3,396	44
Services	9,688	9,940	10,198	10,464	10,736	11,015	11,301	11,595	11,896	12,206	12,523	284
Goverment	1,426	1,441	1,455	1,469	1,484	1,499	1,514	1,529	1,544	1,560	1,576	15
Total Office Employment	17,229	17,574	17,926	18,287	18,656	19,033	19,419	19,813	20,217	20,630	21,052	382

1\ Transportation & Utilities
2\ Finance, Insurance, and Real Estate

Source: THK Associates, Inc.

TABLE VII-3: PROJECTED OFFICE SPACE DEMAND IN AT THE LANDS OF KAU SITE, 2002-2012

Year	Total Office Employment	Annual Change Office Employment	Projected New Annual Occupied Office Space Demand/1	Lands of Kau Site Capture/2	Lands of Kau Acreage Required/3	Total Lands of Kau Acreage Required/4
2002	17,229	337	77,510		Planning	
2003	17,574	345	79,309	14,117	1.2	1.4
2004	17,926	353	81,106	14,437	1.2	1.4
2005	18,287	361	82,946	14,764	1.2	1.5
2006	18,656	369	84,830	15,100	1.2	1.5
2007	19,033	377	86,759	15,443	1.3	1.5
2008	19,419	386	88,735	15,795	1.3	1.6
2009	19,813	395	90,759	16,155	1.3	1.6
2010	20,217	404	92,831	16,524	1.4	1.6
2011	20,630	413	94,953	16,902	1.4	1.7
2012	21,052	422	97,126	17,289	1.4	1.7
Annual Average 2002-2012		382	86,990	15,650	1.3	1.6
Total		4,160	956,864	156,525	13	16

1/Square footage/office worker: 230
2/Site Capture Rate is 17.5%
3/F.A.R. = 28%
4/Speculative Factor = 20%

Source: THK Associates, Inc.

B. Projected Demands for Research and Development/Flex Building Space at the Lands of Kau

Some enterprises are more likely than others to house employees in industrial and research and development/flex space rather than in office buildings, retail establishments, schools or public buildings. The percentage of new employment that will be housed in these buildings for each major industrial group is given below in Table VII-4.

TABLE VII-4: PROPORTION OF NEW EMPLOYMENT HOUSED IN R&D/FLEX SPACE

Industry	Proportion of New Employment Housed in Industrial Space
Mining and Construction	13%
Manufacturing	85%
Transportation, Communcation, Public Utilities	25%
Wholesale Trade	85%
Retail Trade	5%
Finance, Insurance, Real Estate	0%
Services	18%
Government	5%
Agriculture	10%

Source: THK Associates, Inc.

In Table VII-5, the industrial employment percentages from Table VII-4 are applied to projected employment change per year by industry in the Lands of Kau trade area to find the growth per year in the number of employees expected to be housed in industrial facilities in the coming decade. Industrial employment is projected to experience an average annual growth rate of 113 jobs from 2002 through 2012. The services sector is expected to account for 82% of the total growth.

TABLE VII-5: PROJECTED AVERAGE INDUSTRIAL EMPLOYMENT IN THE LANDS OF KAU TRADE AREA, 2002-2012

Industry	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Annual Average Change
Mining & Construction	290	291	293	294	295	297	298	300	301	303	304	1
Manufacturing	1,087	1,079	1,072	1,064	1,057	1,049	1,042	1,035	1,027	1,020	1,013	-7
T & U*	469	474	479	484	490	495	501	506	512	517	523	5
Wholesale Trade	1,104	1,113	1,121	1,130	1,139	1,149	1,158	1,167	1,176	1,186	1,195	9
Retail Trade	451	458	465	472	479	486	493	501	508	516	524	7
FIRE**	0	0	0	0	0	0	0	0	0	0	0	0
Services	3,114	3,195	3,278	3,363	3,451	3,540	3,633	3,727	3,824	3,923	4,025	91
Goverment	357	360	364	367	371	375	379	382	386	390	394	4
Agriculture	149	151	153	155	157	159	161	162	164	166	168	2
Total Industrial Employment	7,020	7,121	7,224	7,330	7,439	7,550	7,664	7,780	7,899	8,022	8,147	113

* *Transportation & Utilities*
** *Finance, Insurance, and Real Estate*

Source: THK Associates, Inc.

Overall, industrial employers are estimated to require approximately 450 square feet per employee. By using this standard, projected research and development/flex space employment can be converted into space demand estimates. Table VII-6 shows the projected demand for industrial space and acreage at the Lands of Kau site during the next decade.

TABLE VII-6: PROJECTED INDUSTRIAL SPACE DEMAND AT THE LANDS OF KAU SITE, 2002-2012

Year	Total Industrial Employment	Annual Change Industrial Employment	Projected New Annual R&D/Flex Space Demand/1	Lands of Kau Site Capture/2	Lands of Kau Acreage Required/3	Total Lands of Kau Acreage Required/4
					Planning	
2002	7,020	99	44,550	14,977	1.0	1.2
2003	7,121	101	45,386	15,356	1.0	1.2
2004	7,224	103	46,533	15,716	1.0	1.2
2005	7,330	106	47,626	16,104	1.1	1.3
2006	7,439	108	48,798	16,500	1.1	1.3
2007	7,550	111	49,999	16,887	1.1	1.3
2008	7,664	114	51,173	17,302	1.1	1.4
2009	7,780	117	52,429	17,726	1.2	1.4
2010	7,899	119	53,715	18.151	1.2	1.4
2011	8,022	122	55,004	18,587	1.2	1.5
2012	8,147	125	56,324			
Annual Average 2002-2012		113	50,140	16,730	1.1	1.3
Total		1,226	551,536	167,305	11	13
1\Square Footage/Employee		450				

2\Site Capture is33%
3\F.A.R.is 35%
4\Speculative Factor is 20%

Source: THK Associates, Inc.

C. Retail Demand in the Lands of Kau Primary Trade Area

To position the Lands of Kau site in the retail market, it is first necessary to understand the socioeconomic character of the greater Lands of Kau trade area, and the dynamics and retail purchasing power of the market.

In 1980, approximately 27,566 people lived in 12,107 households in the Lands of Kau trade area, and by 2002, this number had changed to 65,017 people living in 29,709 households. The trade area has averaged annually an increase of 800 households over the last 22 years. Based upon socioeconomic forces projected for the area, the current population base of 65,017 people is projected to grow to 83,227 by 2012, which represents a per annum increase of 1,821 people per year.

Households are projected to increase by 907 per year from 29,709 in 2002 to 38,779 by 2012. Within the trade area, the median household income is currently estimated at $53,158 of which approximately $37,647 is the disposable income. Approximately 42.7% of the disposable income is spent on retail items and in total the median household spends $16,075 on retail items each year.

Table VII-7: Population and Households in the Lands of Kau Retail Primary Trade Area, 1980-2012

					Average Annual Change			
					1980-2002		1990-2002	
Lands of Kau Primary Trade Area	1980	1990	2000	2002	Numerical	Percent	Numerical	Percent
Population	27,566	43,429	61,537	65,017	1,702	4.0%	1,799	3.4%
Households	12,107	18,713	27,933	29,709	800	4.2%	916	3.9%

				2002-2007		2002-2012	
Lands of Kau Primary Trade Area	2002	2007	2012	Numerical	Percent	Numerical	Percent
Population	65,017	73,561	83,227	1,709	2.5%	1,821	2.5%
Households	29,709	33,942	38,779	847	2.7%	907	2.7%

Source: U.S. Bureau of the Census; and THK Associates, Inc.

In Table VII-9, the typical operating characteristics of major retail store types are profiled demonstrating sales per square foot of gross leasable area (GLA), median store sizes, the threshold number of support households needed to have a successful retain outlet, as well as the minimum dollar support for a successful retail outlet. As demonstrated in this presentation, to operate a successful grocery store with 42,228 square feet of GLA it is necessary to have 2,663 supporting households spending $5,385 per household to generate total annual sales of $14.3 million or $339.55 per square feet of gross leasable area.

With 29,709 households currently existing in the Lands of Kau trade area, Table VII-10 demonstrates that $623 million of retail sales should occur in 2002 and these expenditures would support 2.9 million square feet of retail establishments. By 2012, retail sales will increase to $813 million with support for 3.7 million square feet of retail establishments. Annually during the next decade, to keep pace with demand, the Lands of Kau market needs to add approximately 87,000 square feet of retail space.

Additionally, Table VII-10 accounts for secondary support from college students, tourists, and recreational visitors to the Lands of Kau primary trade area that will have retail expenditures. This secondary support averages approximately 24% of sales from 2002-2012.

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Table VII-9: Characteristics of Selected Store Types Found in Community Shopping Centers

Store Type	Median Household Expenditure	Sales Per Square Foot GLA	Median Store Size (Sq. Ft.)	Threshold Household Support	Minimum Expenditure Support
Hardware and Building Materials					
Building Materials and Supplies	$277	$123.88	6,846	3,065	$848,082
Hardware	$136	$119.17	7,857	6,907	$936,319
Food Stores					
Grocery	$5,385	$339.55	42,228	2,663	$14,338,517
Automotive					
Tire, Battery and Accessory	$455	$147.52	6,038	1,957	$890,726
Apparel and Accessory					
Men's Clothing	$422	$182.61	3,082	1,334	$562,804
Women's Clothing	$764	$162.24	2,957	628	$479,744
Children's Clothing	$373	$186.50	5,775	2,884	$1,077,038
Shoes	$351	$207.93	2,278	1,348	$473,665
Other Apparel & Accessories	$73	$201.56	2,361	6,491	$475,883
Furniture and Equipment					
Furniture	$440	$141.84	7,471	2,409	$1,059,687
Home Furnishings & Accessories	$737	$201.40	4,522	1,235	$910,731
Household Appliances	$318	$184.24	3,010	1,743	$554,562
Radio, Television, Stereo	$580	$183.31	3,013	953	$552,313
Records & Music	$97	$163.04	2,900	4,883	$472,816
Eating and Drinking Places					
Restaurant	$1,575	$256.66	1,955	319	$501,770
Drug and Proprietary					
Drug / Cosmetics	$533	$244.54	6,741	3,095	$1,648,444
Other Retail and Personal Services					
Liquor / Wine & Spirits	$385	$249.67	2,648	1,719	$661,126
Sporting Goods & Bicycle	$314	$156.62	3,440	1,716	$538,773
Books & Stationary	$308	$147.70	2,155	1,032	$318,294
Jewelry	$142	$263.92	1,263	2,340	$333,331
Hobby & Specialty	$109	$164.03	2,790	4,188	$457,644
Florist	$68	$149.82	1,600	3,537	$239,712
Miscellaneous Retail	$971	$161.66	2,491	415	$402,695
Video Tape Rental	$61	$96.32	5,000	7,913	$481,600
Personal Care Products & Services	$411	$146.91	1,245	445	$182,903
Dry Cleaner / Coin Laundry	$149	$86.21	1,653	954	$142,505
Misc. Personal Services	$643	$280.58	1,328	579	$372,610
Total Retail	$16,078				

Source: U.S. Department of Labor, Bureau of Labor Statistics; and THK Associates, Inc.

Table VII-10: Estimated Retail Sales and Square Footage Support in the Lands of Kau Primary Trade Area, 2002-2012

Store Type	Estimated Annual Household Expenditures	Percent Support From Secondary Trade Area	Annual Sales per Square Foot GLA	2002 Support Dollars (000,000's)	2002 Support Square Feet	Percent Support From Secondary Trade Area	2007 Support Dollars (000,000's)	2007 Support Square Feet	Percent Support From Secondary Trade Area	2012 Support Dollars (000,000's)	2012 Support Square Feet
Households				29,709			33,942			38,779	
Hardware and Building Materials											
Building Materials and Supplies	$277	15.0%	$123.88	$9.67	78,056	15.0%	$11.05	89,179	15.0%	$12.62	101,886
Hardware	$136	15.0%	$119.17	$4.74	39,759	15.0%	$5.41	45,425	15.0%	$6.18	51,897
Food Stores											
Grocery	$5,385	25.0%	$339.55	$213.32	628,235	25.0%	$243.71	717,752	25.0%	$278.44	820,024
Automotive											
Tire, Battery and Accessory	$455	10.0%	$147.52	$15.02	101,836	10.0%	$17.16	116,347	10.0%	$19.61	132,925
Apparel and Accessory											
Men's Clothing	$422	20.0%	$182.61	$15.67	85,799	20.0%	$17.90	98,025	20.0%	$20.45	111,992
Women's Clothing	$764	20.0%	$162.24	$28.36	174,779	20.0%	$32.40	199,683	20.0%	$37.01	228,136
Children's Clothing	$373	20.0%	$186.50	$13.87	74,369	20.0%	$15.85	84,966	20.0%	$18.10	97,073
Shoes	$351	20.0%	$207.93	$13.05	62,752	20.0%	$14.91	71,693	20.0%	$17.03	81,909
Other Apparel & Accessories	$73	20.0%	$201.56	$2.72	13,508	20.0%	$3.11	15,432	20.0%	$3.55	17,631
Furniture and Equipment											
Furniture	$440	20.0%	$141.84	$16.34	115,169	20.0%	$18.66	131,580	20.0%	$21.32	150,329
Home Furnishings & Accessories	$737	20.0%	$201.40	$27.38	135,949	20.0%	$31.28	155,320	20.0%	$35.74	177,452
Household Appliances	$318	20.0%	$184.24	$11.82	64,129	20.0%	$13.50	73,266	20.0%	$15.42	83,706
Radio, Television, Stereo	$580	20.0%	$183.31	$21.52	117,419	20.0%	$24.59	134,149	20.0%	$28.09	153,264
Records & Music	$97	20.0%	$163.04	$3.60	22,055	20.0%	$4.11	25,198	20.0%	$4.69	28,788
Eating and Drinking Places											
Restaurant	$1,575	30.0%	$256.66	$66.86	260,503	30.0%	$76.39	297,621	30.0%	$87.27	340,029
Drug and Proprietary											
Drug / Cosmetics	$533	20.0%	$244.54	$19.78	80,876	20.0%	$22.60	92,400	20.0%	$25.82	105,566
Other Retail and Personal Services											
Liquor / Wine & Spirits	$385	30.0%	$249.67	$16.32	65,370	30.0%	$18.65	74,685	30.0%	$21.30	85,326
Sporting Goods & Bicycle	$314	25.0%	$156.62	$12.44	79,417	25.0%	$14.21	90,734	25.0%	$16.24	103,662
Books & Stationary	$308	20.0%	$147.70	$11.46	77,559	20.0%	$13.09	88,611	20.0%	$14.95	101,237
Jewelry	$142	20.0%	$263.92	$5.29	20,048	20.0%	$6.05	22,905	20.0%	$6.91	26,168
Hobby & Specialty	$109	25.0%	$164.03	$4.33	26,390	25.0%	$4.95	30,150	25.0%	$5.65	34,447
Florist	$68	20.0%	$149.82	$2.52	16,801	20.0%	$2.88	19,195	20.0%	$3.29	21,930
Miscellaneous Retail	$971	25.0%	$161.66	$38.47	237,942	25.0%	$43.95	271,847	25.0%	$50.21	310,582
Video Tape Rental	$61	20.0%	$96.32	$2.26	23,466	20.0%	$2.58	26,810	20.0%	$2.95	30,630
Personal Care Products & Services	$411	20.0%	$146.91	$15.26	103,852	20.0%	$17.43	118,650	20.0%	$19.91	135,556
Dry Cleaner / Coin Laundry	$149	20.0%	$86.21	$5.55	64,354	20.0%	$6.34	73,524	20.0%	$7.24	84,000
Misc Personal Services	$643	25.0%	$280.58	$25.47	90,779	25.0%	$29.10	103,714	25.0%	$33.25	118,492
Total Retail	$16,078	--	$183.31	$623.05	2,861,172	--	$711.83	3,268,859	--	$813.26	3,734,637

Source: U.S. Department of Labor, Bureau of Labor Statistics; and THK Associates, Inc.

D. Retail Development Potentials at the Lands of Kau Site

The market potential today and in the future is a product of the supply and demand forces affecting the Lands of Kau and its trade area. The retail competition in the trade area represents the supply side of the market. Their size, market acceptance, and proximity to the site influences the capture rate of retail demand that any retail development can expect. The median family income, expenditure patterns and sales per square foot of GLA ultimately determines the retail space that can be supported at the Lands of Kau site.

Table VII-11 reflects retail development potentials at the subject site. Because of the site's location along the Kohala Coast and planned amenities, the site is projected to capture a strong portion of retail demand in the trade area.

Table VII-11: Retail Development Potentials at the Subject Site

Store Type	2002 Subject Site Capture Rate	2002 Supportable Square Footage	2002 Requirements at the Site	2007 Subject Site Capture Rate	2007 Supportable Square Footage	2007 Requirements at the Site	2012 Subject Site Capture Rate	2012 Supportable Square Footage	2012 Requirements at the Site
Hardware and Building Materials									
Building Materials and Supplies	0%	78,056	0	0%	89,179	0	0%	101,886	0
Hardware	5%	39,759	1,988	5%	45,425	2,271	5%	51,897	2,595
Food Stores									
Grocery	4%	628,235	25,129	4%	717,752	28,710	4%	820,024	32,801
Automotive									
Tire, Battery and Accessory	0%	101,836	0	0%	116,347	0	0%	132,925	0
Apparel and Accessory									
Men's Clothing	0%	85,799	0	0%	98,025	0	0%	111,992	0
Women's Clothing	0%	174,779	0	0%	199,683	0	0%	228,136	0
Children's Clothing	0%	74,369	0	0%	84,966	0	0%	97,073	0
Shoes	0%	62,752	0	0%	71,693	0	0%	81,909	0
Other Apparel & Accessories	10%	13,508	1,351	10%	15,432	1,543	10%	17,631	1,763
Furniture and Equipment									
Furniture	3%	115,169	2,879	3%	131,580	3,289	3%	150,329	3,758
Home Furnishings & Accessories	3%	135,949	3,399	3%	155,320	3,883	3%	177,452	4,436
Household Appliances	3%	64,129	1,603	3%	73,266	1,832	3%	83,706	2,093
Radio & Television	3%	117,419	2,935	3%	134,149	3,354	3%	153,264	3,832
Records & Music	3%	22,055	551	3%	25,198	630	3%	28,788	720
Eating and Drinking Places									
Restaurant	5%	260,503	13,025	5%	297,621	14,881	5%	340,029	17,001
Drug and Proprietary									
Drug / Cosmetics	3%	80,876	2,022	3%	92,400	2,310	3%	105,566	2,639
Other Retail and Personal Services									
Liquor / Wine & Spirits	3%	65,370	1,961	3%	74,685	2,241	3%	85,326	2,560
Sporting Goods & Bicycle	3%	79,417	1,985	3%	90,734	2,268	3%	103,662	2,592
Books & Stationary	5%	77,559	3,878	5%	88,611	4,431	5%	101,237	5,062
Jewelry	0%	20,048	0	0%	22,905	0	0%	26,168	0
Hobby & Specialty	5%	26,390	1,320	5%	30,150	1,508	5%	34,447	1,722
Florist	0%	16,801	0	0%	19,195	0	0%	21,930	0
Miscellaneous Retail	5%	237,942	11,897	5%	271,847	13,592	5%	310,582	15,529
Personal Care Products & Services	3%	23,466	587	3%	26,810	670	3%	30,630	766
Video Tape Rental	3%	103,852	2,596	3%	118,650	2,966	3%	135,556	3,389
Dry Cleaner / Coin Laundry	2%	64,354	1,287	2%	73,524	1,470	2%	84,000	1,680
Misc Personal Services	3%	90,779	2,723	3%	103,714	3,111	3%	118,492	3,555
Total Retail		2,861,172	83,118		3,268,859	94,961		3,734,637	108,492

Source: THK Associates, Inc.

Table VII-12 provides a recommended tenant mix for the retail space at the Lands of Kau site. The site should be anchored by a small grocery store, and could be complemented by restaurants, clothing stores, home furnishings, and numerous miscellaneous retail shops. In summary, substantial development opportunities exist at the Lands of Kau site.

Table VII-12: Recommended Store Types/Mix for the Lands of Kau Property

Store Types	Gross Leasable Area (Square Feet)	% of Total
Hardware/Building Materials	2,500	2.4%
Grocery	20,000	19.4%
Convenience Grocery	4,000	3.9%
Specialty Food/Drug	5,000	4.9%
Bakery	2,000	1.9%
Family Apparel/Clothing	7,000	6.8%
Clothing (Women's/Children)	4,000	3.9%
Home Furnishings	6,000	5.8%
Household Appliances	5,000	4.9%
Radio/Television/Music/Books	7,500	7.3%
Restaurant	15,000	14.6%
Liquor	2,000	1.9%
Miscellaneous Retail / Personal Services	20,000	19.4%
Video Rental	3,000	2.9%
Total GLA	103,000	100%
Total Building Area (Assumes 95% Building Efficiency)	108,421	
Supportable Site Area (Assumes 22% Floor Area Ratio)	11.3 acres	
Additional Pad Sites (Bank, Fast Food, etc...)	5.7 acres	
TOTAL SITE	17.0 acres	

Source: THK Associates, Inc.

E. Hotel Market Analysis

The demand for hotel accommodations is derived from three principal sources: business related travel, conventions and tourism. Travelers, whether they be business/commercial travelers, group travelers or noncommercial pleasure travelers, have varying demand characteristics that influence the selection of particular hotels, how long they stay and how much they are willing to pay for a room. The demographic trends most responsible for determining the popularity of travel destinations and room demand are population growth and shifts, rising household incomes, increased leisure time, interstate highway construction, suburbanization of business activities, and air travel and airport construction. The table below lists the principal reasons for travel today in the United States.

Distribution of United States Travel Market by Purpose of Trip

Purpose of Trip	Percent
Visit Friends or Relatives	28%
Other Pleasure	34%
Business and Conventions	33%
Other	5%

Source: U.S. Travel Data Center and THK Associates, Inc.

One-third of the total travel market is accounted for by business related travel; the remainder is accounted for by pleasure travel and friend/relative visitation. The market for pleasure travel in the United States has been increasing during the past decade, due largely to the increasing cost of foreign travel and the growing number of foreign tourists visiting this country.

Overall, some 55% of the market for hotel/motel accommodations is derived from guests on business trips and 25% is derived from conventioneers. Tourists comprise just 20% of the market for hotel/motel rooms. Of course, the Hawaiian market is far different. Over 80% of demand is for vacation and pleasure travel. However, a hotel at the Lands of Kau site, in conjunction with university activities, would lure additional business and academic-related visitors. Business travelers prefer locations near airports, in suburban areas, and near highways close to business contacts and transportation facilities; tourists are more likely to locate along highways and in resorts; and conferences prefer resort or downtown locations within easy reach of tourist-related services and amenities.

The group travel market is currently being pulled by two conflicting trends. Corporations are increasingly turning to incentive travel and meetings as a means of rewarding valued employees, and the overall growth in white-collar jobs is generating solid growth in the convention and meetings markets. On the other hand, technological advances in telecommunications and teleconferencing and the desire to control travel costs may ultimately reduce the demand for large conventions and out-of-town meetings.

On the construction side of the industry, hotels are becoming increasingly expensive to build and operate. This is due largely to the need for more complex systems to serve security, communications, safety and mechanical requirements. The traditional rule-of-thumb is that a hotel should achieve stabilized rate and occupancy levels by its second or third year of operation. Today, many show losses through the first three to five years of operation. As a result, the hotel market itself is becoming increasingly complex and diversified, offering different product lines for a growing number of market segments.

Based on historical trends in visitation, occupancy rates, visitor demographics, and lodging preference, THK has projected the demand for additional hotel rooms in the trade area and at the Lands of Kau site for the coming decade. The Kohala Coast hotel market has been relatively stable in recent years and occupancy rates have remained fairly high, averaging over 65% for the last four years until the expected dip in 2001.

The most significant portion of new demand for hotel rooms in the market area has and will continue to come from tourism travelers. As demonstrated in Section IV, the tourism industry in the market area has posted moderate gains since 1995. This growth is expected to continue, although at an even more moderate rate.

As shown in Table VII-14, the projected demand for new hotel rooms in the market area over the next decade will average 87 annually. The bulk of this new demand will be generated by the tourism segment of the visitor market. To accommodate the average nightly room demand of 6,465 projected for 2012, the market area will need 9,235 hotel rooms, approximately 900 more than it has now. This assumes an average annual occupancy rate of 70%. THK estimates that a new full service hotel at the Lands of Kau site could capture 2.5% of this total, or up to 200 to 220 rooms. This development should be phased with an initial 120 rooms, adding 80 rooms once the facility stabilizes in probably the fourth or fifth year. At a development ratio of approximately 40 units per acre, a five-acre parcel should be reserved for the hotel development.

TABLE VII-13: PROJECTED HOTEL DEMAND IN THE LANDS OF KAU MARKET AREA AND SUBJECT SITE

Year	Total Hotel Visitors/1	Nightly Room Demand: Tourism	General Business	Group/ Convention	Total Nightly Room Demand	Average Occupancy	Total Hotel Room Demand	New Rooms Demanded	Cumulative Rooms Demanded	Lands of Kau Capture/2
2001	3,807,050	4,780	580	430	5,790	70%	8,280			
2002	3,845,121	4,828	585	439	5,853	70%	8,361	81	81	209
2003	3,883,572	4,877	591	443	5,911	70%	8,444	84	164	211
2004	3,922,407	4,925	597	448	5,970	70%	8,529	84	249	213
2005	3,961,631	4,975	603	452	6,030	70%	8,614	85	334	215
2006	4,001,248	5,024	609	457	6,090	70%	8,700	86	420	218
2007	4,041,260	5,075	615	461	6,151	70%	8,787	87	507	220
2008	4,081,673	5,125	621	466	6,213	70%	8,875	88	595	222
2009	4,122,490	5,177	627	471	6,275	70%	8,964	89	684	224
2010	4,163,715	5,228	634	475	6,337	70%	9,054	90	774	226
2011	4,205,352	5,281	640	480	6,401	70%	9,144	91	864	229
2012	4,247,405	5,333	646	485	6,465	70%	9,235	91	955	231
Avg. Annual Increase (2002-2012)	40,228	51	6	5	61		87			
Average Capture										220

1\Assumes 1.8 visitors per room and an occupancy rate of 70%

2\THK estimates a capture rate of 2.5% of market demand for a new hotel at the Lands of Kau/U. of Hawaii location based on existing, proposed and under construction competition, as well as location and access.

Source: THK Associates, Inc.

F. Senior Housing Market Analysis

1. *General Trends*

As the population ages, smaller households are becoming the norm and the active adult and senior population is becoming more geographically dispersed. The particular housing needs of senior households depends on their age, income, household composition and health.

The senior population by and large is dominated by married couples who are homeowners. Many own their homes free and clear. For those householders that have good incomes, are mobile and in good health, the general housing market adequately meets their needs. Nevertheless, the general housing market is targeted primarily at householders under age 55 and many residential features such as walk-ups without elevators and units incorporating multi-level design are unappealing to and inappropriate for the 55+ aged market.

Still, seniors typically have many housing choices available to them including:

- remaining in their current residence, most often a single family detached unit, often owned free and clear;
- moving to a rental unit, either existing or new construction in the local area or closer to relatives;
- moving to a smaller new for sale or resale unit in the local area or closer to relatives;
- moving to a rental or for sale unit in a destination retirement area;
- moving to an assisted living or congregate care facility; and
- living with relatives or friends.

The supported independence market (assisted living) is made up of older retirees – sometimes couples with one household member in ill health or more often single senior women. These people prefer some support services, but do not need continual care. They may desire "Meals on Wheels" to be delivered or transportation to certain events, concerts, or doctor's appointments as needed. The management assumes the responsibility for service coordination, as well as preventative maintenance and provides for a safe, secure environment that incorporates the need for personal control and privacy, as well as social interaction.

Detailed below are the typical options available to 55+ adults seeking some sort of empty-nester/retirement/age-restricted housing.

Age-Restricted Communities are typically targeted at 55+ active adults who still live independently and require no special assistance. These increasingly popular communities are usually well amenitized and are often anchored by a golf course or courses. The housing units are usually one level and may be clustered in duplex, triplex, and/or four-plex projects. For many 55+ adults, this is the preferred "retirement" option, particularly if such a community exists within close proximity of their existing home.

Apartment Houses and apartment hotels afford the 55+ demographic the ability to live independently, but provide the security and convenience of a retiree-oriented building and the opportunity for companionship with peers. This type of facility is usually a single high-rise building with studio (efficiency) and one-bedroom apartments. The total number of units is typically less than 500.

Assisted Living offers private living quarters with access to the services needed by persons not totally independent, yet not in need of nursing care. Each apartment may have a kitchen or kitchenette, but there is a kitchen that provides meals for those who do not wish to cook. Activities are organized and there are a variety of services on the premises that cater to the residents such as beauty/barber shops.

Life Care facilities most often mean a retirement village or high-rise buildings with a health care facility within the development. Some provide legal services to tenants, hot meals and transportation to shopping centers. Life care typically assures the resident life long shelter and care regardless of the number of years involved. Financial stipulations vary widely between different life care communities.

Nursing Homes are for persons who require continuous health care. Normally, intermediate and skilled-care are offered. Fewer than 5% of the seniors live in nursing homes at any one time but 20% of the seniors eventually enter one. According to a US Senate Report, 15% to 20% of the persons in nursing homes are misplaced, having been forced into these institutions because no other public program existed to meet their needs outside of an institution.

G. Growth Trends and Projected Active Adult Housing Demand in the Lands of Kau Primary Trade Area

1. *Growth Trends*

Having projected population and household growth for the Lands of Kau area and Hawaii County, the analysis moves to the micro level. Table VII-14 documents the population and household growth in the Lands of Kau primary trade area.

Tables VII-14 and VII-15 also isolate the senior (55+) population and households in the primary trade area. As shown, this demographic has historically accounted and will continue to account for an increasing percentage of the trade area's population and households. The senior population jumped from 15.1% of the trade area's population in 1980 to 19.9% of its population in 2002. It should account for over 23% of the trade area's population by 2012.

Similarly, the number of senior households grew at a markedly higher rate than overall households in the trade area. This trend is projected to continue, and by 2012, senior households should account for approximately one-third of the total households in the trade area.

Table VII-14: Estimated 55+ Population and Household Trends in the Lands of Kau Primary Trade Area, 1970-2002

Hawaii County	1980	1990	2002	1980-2002 Numerical	1980-2002 Percent	1990-2002 Numerical	1990-2002 Percent
Population	92,053	120,317	154,113	2,821	2.4%	2,816	2.1%
Households	29,237	41,461	58,156	1,315	3.2%	1,391	2.9%
Lands of Kau Primary Trade Area							
Population	27,566	43,429	65,017	1,702	4.0%	1,799	3.4%
Households	8,976	14,953	23,906	679	4.6%	746	4.0%
55+ in the Lands of Kau Primary Trade Area							
Population	4,162	7,166	12,938	399	5.3%	481	5.0%
Households	2,127	3,828	6,909	217	5.5%	257	5.0%
Lands of Kau Primary Trade Area as a percent of the Hawaii County							
Population	29.9%	36.1%	42.2%	60.3%		63.9%	
Households	30.7%	36.1%	41.1%	51.6%		53.6%	
55+ as a percent of the Primary Trade Area							
Population	15.1%	16.5%	19.9%				
Households	23.7%	25.6%	28.9%				

Source: U.S. Bureau of the Census and THK Associates, Inc.

Table VII-15: Projected 55+ Population and Household Trends in the Lands of Kau Primary Trade Area, 2002-2012

Hawaii County	2002	2007	2012	2002-2007 Numerical	2002-2007 Percent	2002-2012 Numerical	2002-2012 Percent
Population	154,113	167,644	182,809	2,706	1.7%	2,870	1.7%
Households	58,156	64,575	71,879	1,284	2.1%	1,372	2.1%
Lands of Kau Primary Trade Area							
Population	65,017	73,560	83,230	1,709	2.5%	1,821	2.5%
Households	23,906	27,310	31,200	681	2.7%	729	2.7%
55+ in the Lands of Kau Primary Trade Area							
Population	12,938	15,970	19,710	606	4.3%	677	4.3%
Households	6,909	8,530	10,530	324	4.3%	362	4.3%
Lands of Kau Primary Trade Area as a percent of the Hawaii County							
Population	42.2%	43.9%	45.5%	63.1%		63.5%	
Households	41.1%	42.3%	43.4%	53.0%		53.2%	
55+ as a percent of the Primary Trade Area							
Population	19.9%	21.7%	23.7%				
Households	28.9%	31.2%	33.8%				

Source: U.S. Bureau of the Census and THK Associates, Inc.

2. *New Senior Housing Demand*

In Table VII-16, THK isolates the portion of residential demand in the trade area that will be generated by households headed by somebody 55 or older. As shown, THK estimates that 17% of the demand in the trade area will be for senior housing units. The bulk of that 55+ demand will be for ownership units, with a relatively significant percentage going to attached demand. The 55+ population will also demand an average of 24 new rental multi-family units annually during the 2002-2012 period.

TABLE VII-16: Projected Senior (55+) Residential Demand in the Lands of Kau Primary Trade Area, 2002-2012

Year	Total Housing Unit Demand	Percent 55+	55+ Housing Unit Demand	55+ Ownership Units: Detached Single Family	55+ Ownership Units: Attached Single Family	55+ Ownership Units: Total Ownership	55+ Rental Multi Family
2002	726	17%	123	71	30	102	21
2003	745	17%	127	73	30	105	22
2004	765	17%	130	75	31	108	22
2005	786	17%	134	77	32	111	23
2006	807	17%	137	79	33	114	23
2007	829	17%	141	81	34	117	24
2008	852	17%	145	83	35	120	25
2009	874	17%	149	85	36	123	25
2010	898	17%	153	87	37	127	26
2011	923	17%	157	90	38	130	27
2012	948	17%	161	92	39	134	27
Average Annual Demand (2002-2012)	832		141	81	34	117	24

Source: THK Associates, Inc.

3. *Demand for Senior Housing Units From Relocation in the Lands of Kau Primary Trade Area*

The previous sections of this study have examined demographic patterns and growth trends in the Lands of Kau area, as well as the senior (55+) housing demands that will be created by new growth. In addition to this demand for new 55+ housing units resulting from population and household growth, there will be a significant amount of demand/market from 55+ households that will relocate on an annual basis.

The supply of housing choices available to 55+ demographic includes single-family homes, conventional rental units, boarding homes, nursing homes, congregate housing, assisted living developments, senior citizen housing developments, hotels, leisure/retirement villages, and various types of group living situations. Virtually any type of housing in the marketplace can potentially house this demographic, although these options are not always available or appropriate to serve its housing needs.

Seniors who own their own homes often experience special problems including the inability to pay for routine home maintenance and major repairs, which may potentially result in a dangerously deteriorated living unit. These households may also be bound by high utility and growing upkeep costs which, given the limited budgets of senior persons, may conflict with their ability to purchase other necessary goods and services. Despite these drawbacks, a homeowner is more than likely occupying a dwelling unit with considerable equity. This yields a potential income source to draw upon, either to allow the senior to remain in the current home, or to relocate to an alternative housing choice.

Rental households, on the other hand, do not have any equity and are subject to periodic rent increases that may make it difficult to remain in the unit. Some senior renters pay large portions of their incomes (45%+) on housing, and oftentimes publicly subsidized alternatives are unavailable. Other inadequately housed seniors include seniors sharing quarters with their children (5% of the senior population), boarders and non-relatives sharing units, and inappropriately institutionalized seniors. Research estimates show that 21% of all nursing home residents would be better served in some type of alternative housing arrangement.

Typically, a unit designed for occupancy by seniors includes wider doors, lower countertops and cabinets, and security and safety equipment. In addition, a set of complementary services and facilities intended to enrich the lives of the residents and provide them with a greater sense of personal well-being also exists in well-designed facilities. This all reflects the growing awareness that housing for seniors should provide more than basic shelter and that provision of certain fixtures and the removal of certain architectural barriers prolongs the ability of older persons to live independently (or semi-independently).

Given the characteristics of senior housing trends, it is possible to estimate the number of senior households that will potentially relocate on an annual basis.

As can be seen in Table VII-17, there is an estimated potential for the relocation of an average of 609 senior households annually in the Lands of Kau primary trade area. This calculation was made based on a 4% relocation rate for senior unit owners, and a 15% relocation rate for senior renters. Of these 609 households relocating, 91 are estimated to need assisted living facilities. (This calculation is based on applying the overall demand by age for assisted living facilities to the age distribution in the trade area. Based on industry surveys, 10% of persons age 55-74 require assisted living facilities, 25% of persons age 75-84 require assisted living, and 50% of persons 85+ require assisted living). Subtracting out the portion of the 55+ demographic requiring assisted living leaves an annual averaged relocation demand for 211 detached single-family units, 166 townhome/condominium units, and 307 rental multi-family units.

TABLE VII-17: Projected Senior Adult (55+) Relocation Residential Demand in the Lands of Kau Primary Trade Area, 2002-2012

Year	55+ Households	Tenure Owner	Tenure Renter	Percent Relocating (Owner)	Total Ownership	# Not Requiring Assisted Living*	Ownership Units Detached Single Family	Ownership Units Attached Single Family	Percent Relocating (Renter)	Rental Multi Family Demand	# Not Requiring Assisted Living*
2002	6,909	4,974	1,934	4%	199	169	133	66	15%	290	247
2003	7,206	5,188	2,018	4%	208	176	139	68	15%	303	257
2004	7,516	5,412	2,105	4%	216	184	145	71	15%	316	268
2005	7,840	5,645	2,195	4%	226	192	151	75	15%	329	280
2006	8,177	5,888	2,290	4%	236	200	158	78	15%	343	292
2007	8,530	6,142	2,388	4%	246	209	165	81	15%	358	305
2008	8,897	6,406	2,491	4%	256	218	172	85	15%	374	318
2009	9,280	6,682	2,598	4%	267	227	179	88	15%	390	331
2010	9,680	6,969	2,710	4%	279	237	187	92	15%	407	346
2011	10,096	7,269	2,827	4%	291	247	195	96	15%	424	361
2012	10,530	7,582	2,948	4%	303	258	203	100	15%	442	376
Average Annual Demand (2002-2012)					248	211	166	82		361	307

* % Requiring Assisted Living Facilities = 15% for ages 55-74, 30% for ages 75-84, and 60% for ages 85+.

Source: THK Associates, Inc.

4. *Total Demand for Senior (55+) Housing in the Lands of Kau Primary Trade Area*

Table VII-18 combines the new demand for 55+ housing units generated by population and household growth in the trade area with the 55+ relocation demand projected in Table VII-17 in order to quantify the total demand for senior housing units. As shown, the annual average demand for the 2002-2012 period equates to 247 single-family units, 116 townhome/ condominium units, and 385 rental multi-family units. Of this total of 751 new or relocated senior housing units, an estimated 3%, or 23 units, annually could be captured at the Lands of Kau. This includes a mix of traditional single-family, congregate care, assisted living, and rental units for senior. Parcels for senior housing and a medical/wellness center have sufficient demand to be included in the overall land plan. Table VII-19 shows this projected breakdown by unit type.

TABLE VII-18: Total Projected Senior Adult (55+) Residential Demand in the Lands of Kau Primary Trade Area, 2002-2012

	Total 55+ Housing Unit Demand			Ownership Units			
Year	Relocating	New	Total	Detached Single Family	Attached Single Family	Rental Multi-Family Units	Potential Lands of Kau Unit Capture
2002	489	123	613	204	95	311	18
2003	510	127	637	212	99	324	19
2004	532	130	662	220	103	338	20
2005	555	134	689	228	107	352	21
2006	579	137	716	236	111	367	21
2007	604	141	745	245	115	382	22
2008	630	145	775	255	119	398	23
2009	657	149	806	264	124	415	24
2010	685	153	838	274	129	432	25
2011	715	157	872	285	134	451	26
2012	746	161	907	295	139	470	27
Average Annual Demand (2002-2012)	609	141	751	247	116	385	23

*Estimates a site capture of 3% of all new and relocated senior housing demand

Source: THK Associates, Inc.

Table VII-19: Senior Housing Unit Potential at the Lands of Kau Site

Lands of Kau Unit Capture	230 Units
Congregate Care/Assisted Living Units (Rental)	150 Units
Traditional Senior Rental Units	50 Units
Traditional Senior Single Family Ownership Units Units	30 Units

Source: THK Associates, Inc.

VIII. Recommended Land Use Plan

Table VIII-1 contains THK's recommended land use plan for 721.4 acres. THK recommends a total of 799 residential units. The single-family lots are broken down into five different square footages: 10,000 square feet with 102 units, 12,500 square feet containing 73 units, 15,000 square feet with 80 units, 21,000 square feet with 98 units, and 83 units with one acre lots. The townhome/condominium portion of the land plan has three ranges with 71 units priced under $250,000, 43 units between $250,000 and $350,000, and 69 units priced over $350,000. There is a student housing/rental component comprising 180 units.

It is recommended to dedicate 130 in total acres to open space/civic uses. THK recommends 51 acres to be set aside for commercial and mixed uses. Another 15 acres can accommodate health care and senior housing facilities. Just over 80 acres of the Lands of Kau parcel would be dedicated to the University of Hawaii Town Center.

Table VIII-1: Preliminary Lands of Kau Recommended Land Use Plan

Land Use			Units	Acres	% Total
GOLF COURSE AND RESIDENTIAL COMMUNITY					
Golf Course				200.0	27.7%
Single Family Lots					
	Under $124,999	10,000 SF Lot	102	29.3	4.1%
	$125,000-$159,999	12,500 SF Lot	73	29.4	4.1%
	$160,000-$189,999	15,000 SF Lot	80	39.8	5.5%
	$190,000-$224,999	21,000 SF Lot	98	65.2	9.0%
	$225,000+	42,500 SF Lot	83	118.4	16.4%
	Single Family Total		436	282	39.1%
Townhome/Condominiums					
	Under $250,000		71	5.9	0.8%
	$250,000-$350,000		43	4.8	0.7%
	$350,000 +		69	13.8	1.9%
	T-Home/Condo Total		183	25	3.4%
Rental/Multi-Family/Student Housing			180	18.9	2.6%
	Total Residential:		799	325	45.1%
Roads/Civic/Open Space				115	15.9%
Total Golf Course and Residential Community				640.4	88.8%
UNIVERSITY OF HAWAII TOWN CENTER					
Commercial Uses					
Retail		108,000 sq. ft.		17.0	2.4%
Office		156,000 sq. ft.		16.0	2.2%
R&D		167,000 sq. ft.		13.0	1.8%
Total Commercial/Mixed Use:				46.0	6.4%
Hotel			200 rooms	5.0	0.7%
Congregate Care/Senior Housing			230 rooms/units	10.0	1.4%
Health and Wellness Center				5.0	0.7%
Roads/Civic/Open Space				15.0	2.1%
Total University of Hawaii Town Center				81.0	11.2%
	Total All Uses:			721.4	100%

1\Project buildout period is 8-10 years

Source: THK Associates, Inc.

Appendix J
Groundwater Resources

waimea water services inc.

Groundwater Resources of Kau, North Kona, Hawaii

A Water Study for Hiluhilu Development, LLC

June 2003

Waimea Water Services, Inc.
PO Box 326
Kamuela, HI 96743

Groundwater Resources of Kau, North Kona, Hawaii

Groundwater Occurrence

The groundwater resources beneath the land of Kau (between Mamalahoa and Queen Kaahumanu Highways) consist of a basal lens. In theory, fresh water floats on salt water in a ratio of 1:40 where, for every 1 foot of fresh water head above sea level, there are 40 feet of fresh water below sea level. This ratio becomes highly modified where the recharge varies seasonally and there is a strong tidal influence.

Fresh water is found in the basal lens near Mamalahoa Highway at elevation 1800' (wells 4458-01,02), where the water level stands at + 7'. As evidenced by a well on State land (well # 4360-01) in map 1 near the Kona Palisades subdivision, the lens becomes brackish (total chlorides at 580 mg/L) at elevation 680' with a head of +3.2'.

At elevation 1800' above Mamalahoa Highway, well # 4358-01 struck a high level aquifer with the water level standing at elevation + 238' above sea level. Pumping tests at the time of construction indicate a draw down of nearly 100 feet with a salinity of 10 mg/L. The well is presently in DWS service with a pumping rate of 300 gpm.

Although speculative, the high level aquifers seem to be most likely to be related to a fault system rather than dikes found within the rift zone of Hualalai. The high level aquifers along Mamalahoa to the south are all closely associated with coastal slumping (Moore, et al , 1989- Prodigious Submarine Landslides on the Hawaiian Ridge).

There is no information to suggest that high-level water will occur within the project area.

In 1999, Hiluhilu Development LLC obtained permits to drill three brackish wells at elevation 900' on the land of Kau. The wells were intended to supply brackish water to a proposed golf course. The permits have since lapsed pending changes in development plans. Appendix A contains the complete report of the original description of the groundwater available to the subject wells.

In addition to the occurrence of the groundwater, the recharge to the aquifer has not been systematically evaluated until recently. The following description and analysis is the most current review of the available estimate.

Recharge estimates

The land of Kau lies within the boundaries of a recently completed study (March 2003 by Waimea Water Services, Inc,) entitled " Groundwater Resources of North Hualalai" prepared for the Kamehameha Schools. The study paid particular attention to computing a detailed hydrologic budget where, recharge to the underlying aquifer systems was estimated. These recharge estimates are summarized in Figure 1 below.

LAND
OF
KAU

Average Recharge With Fog

Zone	Recharge (Mgal/year)	Recharge (MGD)
1	173	.474
2	770	2.109
3	248	.678
4	1316	3.606
5	1416	3.880
6	430	1.178
7	1912	5.238
8	28	.077
9	26	.071
10	615	1.685
11	243	.666
12	255	.699
13	898	2.460
14	2563	7.022
15	1392	3.814
16	2753	7.542
	TOTAL	41.199

Zone boundary
Fog area boundary
0 inches/yr
>0 and ≤ 10 inches/yr
>10 and ≤ 25 inches/yr
> 25 inches/yr

Figure 1 (modified from WWS 2003)

The same methodology (see Appendix B) was applied to the preparation of recharge estimates for the land in the immediate vicinity of the project. Estimates were prepared assuming that there was no fog drip input to the precipitation and one where fog drip is included. These techniques allow for a worst-case recharge where no fog drip predominates. Importantly, either estimate is based on long-term data and incorporates short-term weather changes within the long-term data averages.

The most conservative estimates (no fog) are shown in **Figure 2** where fog drip is included in the estimates in **Figure 3**.

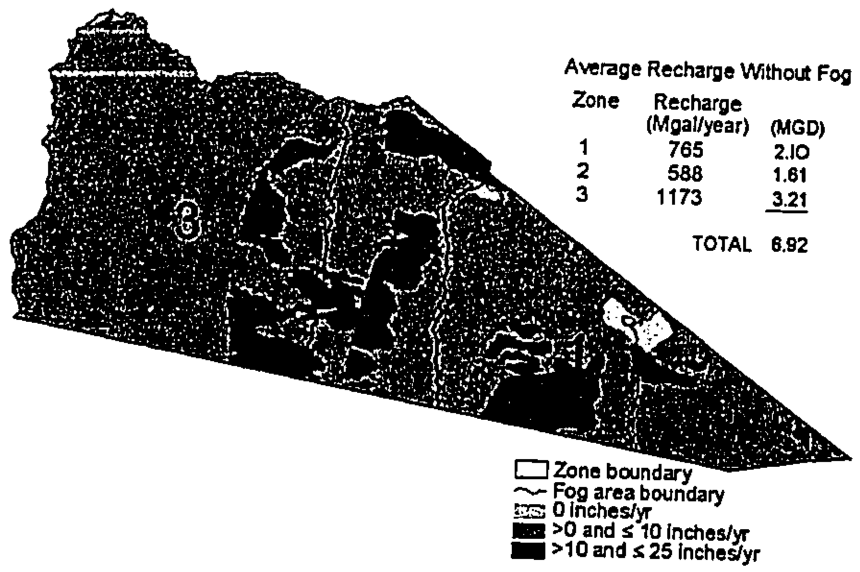

Figure 2

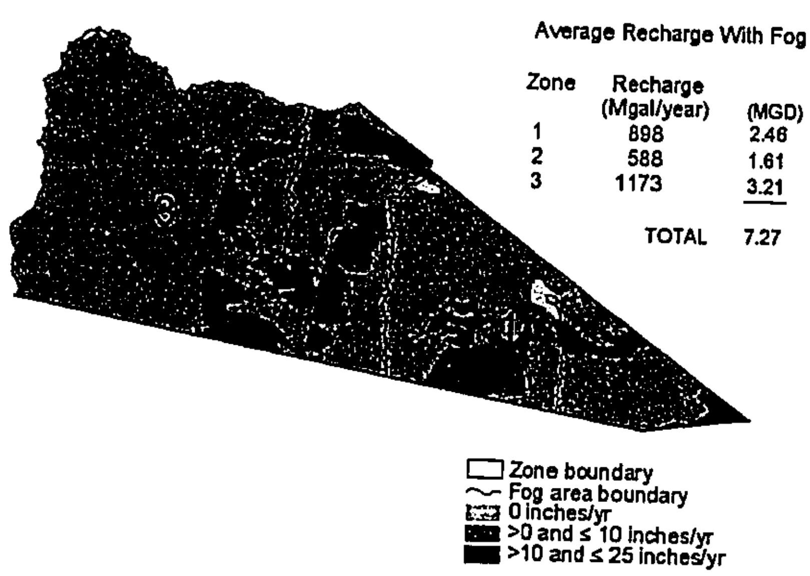

Figure 3

As noted, the most conservative estimate concludes that the groundwater recharge in units 1 and 2 of the study area (above elevation 900 feet) results in about **4 mgd** of groundwater flow within the sub area.

Sustainable Yield

Sustainable yield is defined as that amount of groundwater that can be pumped on a sustained basis. The original estimates by Yuen and Associates, Inc., in 1992 (State Water Resource protection Plan), are more general for the region and are based upon estimates of flow from assumed transmissivity and slope of the water table.

The aquifer sector (Keauhou), which includes the project area, extends from Kua Bay (at Kukio) and Keauhou to the south, and has an estimated sustainable yield of **38 mgd.** The majority of the groundwater flow in the Keauhou sector occurs from Kailua-Kona to Keauhou.

Assuming, however, the flow to the shore is uniformly distributed, the 38 mgd would result is a sustainable yield of about **2 mgd/mile** of shoreline. The width of the project study area is about 4 miles, which would imply that the sustainable yield would be about **8 mgd** for the recharge sub area. Based on the recharge estimates, this would be an excessive estimate of sustainable yield.

A more reasonable estimate might assume that the recharge for the total study sub area includes fog drip and that about **60%** of the **7 mgd** or **4.2 mgd** recharge would be a more defensible estimate of sustainable yield.

Others (ILum 1991) have estimated the groundwater recharge as high as **7.5 mgd / mile** of shoreline versus a sustainable yield of **4.5 mgd/mile** sustainable yield for the Kahaluu area. This appears to be an unrealistic estimate for the land of Kau when compared with the project estimate of slightly more than **1 mgd/mile** estimated from the hydrologic budget results.

The US Geological Survey, under contract with the National Park Service at Kaloko-Honokohau National Historic park, prepared a computor model synthesis of groundwater resources in 1999 (WRIR 99-4070). This study estimated the groundwater flow at **3 mgd/mile.** No estimates of sustainable yield were provided.

From the above information, the most conservative estimate of sustainable yield for the land of Kau and immediate vicinity is about best estimated at about **1mgd/mile of aquifer width.**

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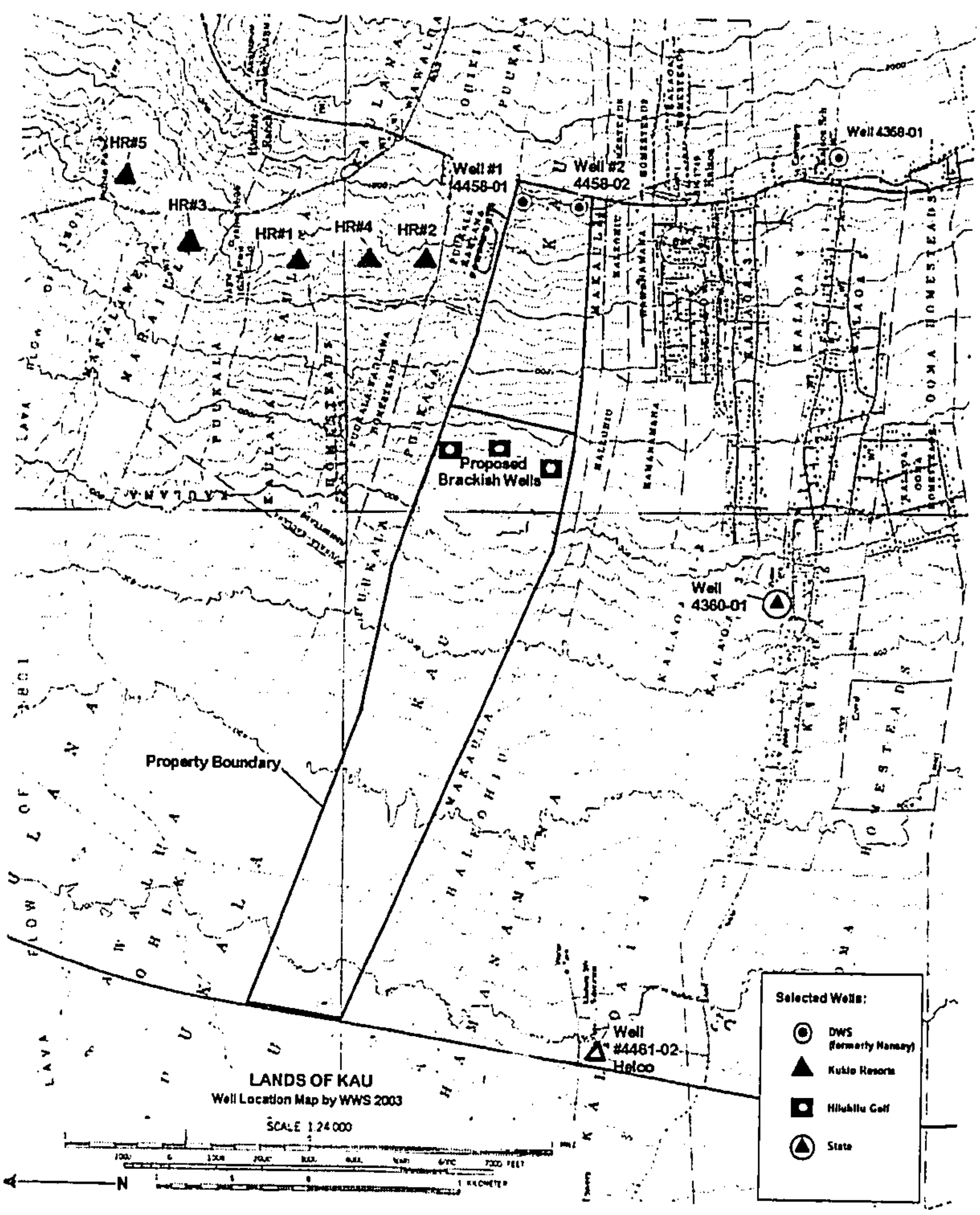
Water Development

Belt Collins and Associates, Inc, (Walter Billingsley- personal communication) estimates that the potable water demand for the project when completed will be approximately 1.21 mgd average day demand. This would include the normal lot uses for irrigation of yards as well as domestic activities as well as those uses for the UH facilities. These uses are expected to generate about .85 mgd of wastewater. The main potable supply will be provided from wells #4458-01& 02.



The proposed golf course will require a supply of about .8 to 1 mgd of irrigation supply when matured. It is intended that the golf course supply will come from brackish wells drilled on site as originally proposed and permitted. New permits will be needed. These wells are shown on the map as " proposed brackish wells".

The combined estimated pump age from the Huehue Ranch wells is to be exported to Kukio (1.3 mgd) and mauka to Makalei Country Club (.6 mgd). About .5 mgd of the 1.3 mgd exported to Kukio will be from the HR # 5 well which pumps from the high-level rift zone aquifer outside the recharge sub area. This leaves a combined pumpage of 1.2 mgd to be pumped from the sub area.

The original planned potable production from wells #4458-01 and # 4458-02 is 2 mgd, of which 1.21 mgd is the potable water to the project.

Assuming the golf demand is 1 mgd, the total to be pumped from the recharge sub area will be as follows:

Wells 4458-01,02	1.21 mgd
HR Wells	1.20 mgd
Brackish	1.00 mgd
Total Pumpage	3.41 mgd

On build out and occupancy, it is anticipated that reclaimed wastewater will be used to irrigate the golf course along the brackish water. This would reduce the pumpage accordingly and possibly reduce it to as low as 2.61 mgd.

Based on the estimates of recharge, sustainable yield and the reclamation of wastewater, it appears that there are adequate water resources in the recharge sub area to support the planned project.

In addition to the obvious supply benefit of recycled wastewater, the application of nutrients to the golf course will consume them. In particular, phosphorus, which is notably absent in Hawaiian soils, will largely be consumed by the turf grass, along with nitrogen. As such, there will be a reduction in the need for the application of supplemental fertilizers

Storm Runoff

The general solution to local drainage in Hawaii County has been to construct dry wells, which redirect any manmade runoff into the ground. The sporadic nature of the rainfall rarely, if ever, results in long-term pollution.

The area is underlain by very fresh, young and permeable lavas from the Hualalai volcano. The lands makai of the project are covered with the youngest of the eruptive series of 1801, which contain numerous lava tubes. The result is a very high horizontal transmissivity in the aquifer as reflected in tidal fluctuation in the water table. Any brief pollution events, which might enter the aquifer, are attenuated as they approach the shore. Even if pollution should be in evidence in moments of time, there will be no persistent pollution if the source is periodic.

Even a long term pollution is likely masked and unidentifiable as the groundwater flow approaches the shoreline.

There are no streams or drainage ways in the area and any manmade runoff should be directed underground as it is presently part of the existing recharge and should not be lost to the system.

There are indications, according to data produced during the 1999 USGS Kaloko- Honokohau study, that there may be some manmade influence as inferred by the detection of phenols in the shallow wells makai of the Kaloko Industrial Park (*Water Resources Investigation Report 99-4070*).

There are a number of potential sources of phenols, however, there is no conclusive evidence as to source.

Regardless, there are no bodies of water in the vicinity of the Kau project which might be negatively influenced by the project including the underlying brackish lens.

APPENDIX I

Brackish Source Report 1999

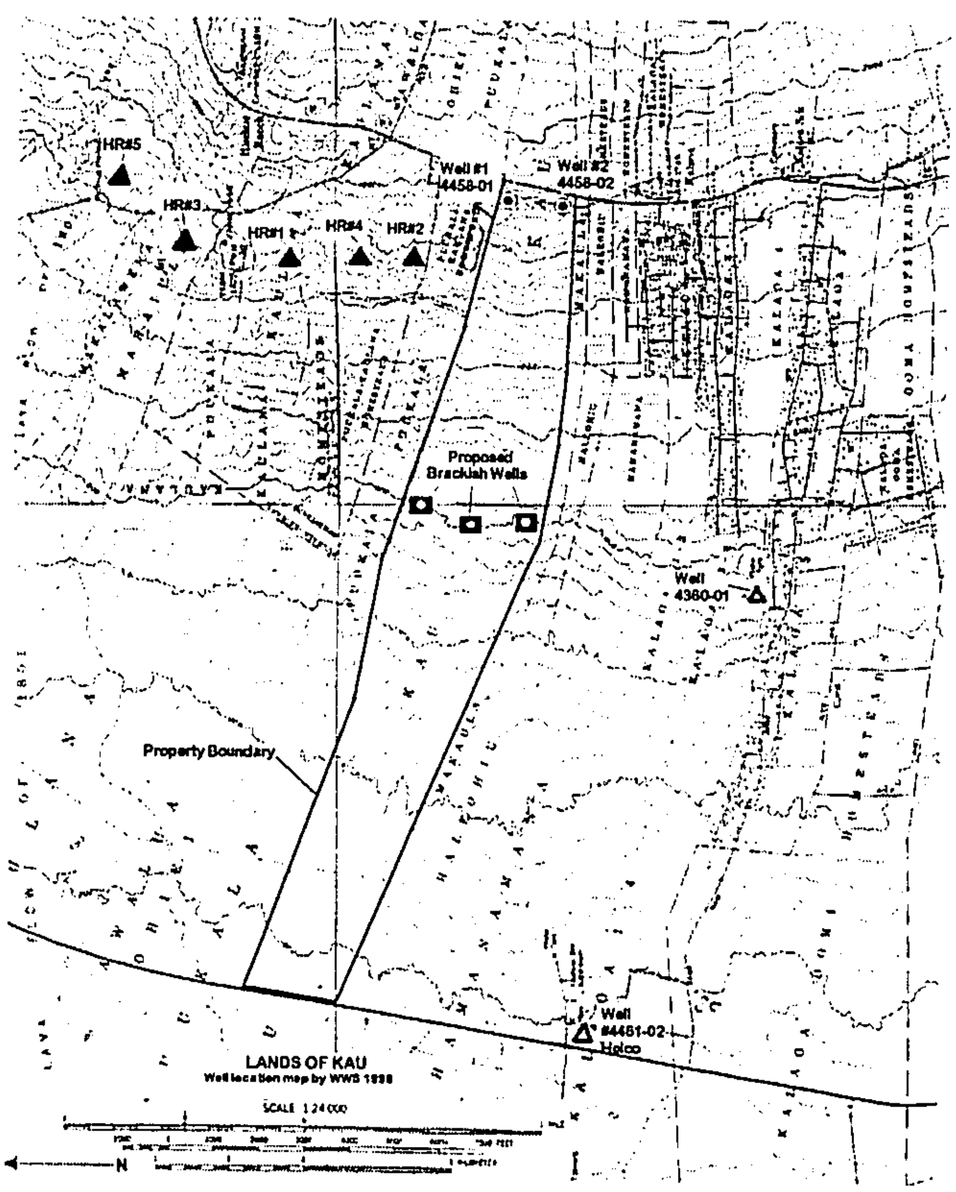
Brackish Water Sources
for
the Lands of Kau, Kona

For Due Diligence, May 15,1999

Introduction

The purpose of this report is to review and evaluate the existing information regarding the water resources on the subject parcel and to more clearly define the opportunity to develop a brackish water supply.

There are presently two wells (4458-01 & 02) situated along the east (*Mamalahoa Highway*) boundary of the parcel. These wells are intended as a drinking water source and are to be turned over to the County Department of Water Supply.



According to Water Resource Associates (WRA) undated report entitled "Water Resources and Supply for Lands of Kau, North Kona, Hawaii", Wells 1& 2 were each intended to produce 0.8 mgd (million gallons per day). The wells were to be pumped at a rate of 1000 gpm (gallons per minute) for 16 hours per day.

For this analysis, the buyer is estimating that water for about 81 homes at the top of the property will be needed. An additional potable water source will be required for a golf course clubhouse and about 20 surrounding upscale homes. The total potable water requirement is expected to be 343 water units or about .205 mgd.

For this review, based on the experience of the Hualalai Golf course, it is estimated that about 1 mgd of irrigation water will be required for the golf course during grow in. If the soil is adequately prepared, the golf course should not require more than 0.8 mgd, assuming that about 100 acres are under irrigation.

Nearby Potable Wells

As indicated on the well location map, there are a series of potable wells to the north of the Kau Wells I & 2. These wells make up the Huehue Ranch well field. Well 1 is designed to pump at a rate of 350 gpm while Wells 2,3,4, & 5 are designed to pump at a rate of 500 gpm each. All are intended to be pumped for a 16-hour day and the expected production will average 2.0 mgd, the sustainable yield as estimated by Waimea Water Services in 1991.

The salinity in the Kau Wells is about 35 mg/L chlorides in comparison to a salinity of 150 mg/L in HR #2. Recent (April 1999) water levels in Kau#1 and HR#1 were 9.38' and 7.73' respectively.

The Huehue wells are spaced out over a distance of about 1.5 miles or a sustainable yield of about **1.33 mgd/mile** of aquifer width. By contrast, the Kau wells are expected to have a sustainable yield of 1.6 mgd in 0.4 miles or **4 mgd/mile** of aquifer width.

Nearby Brackish Wells

Well # 4360-01 was drilled as an exploration well by the state in 1968. The well was pumped at a rate of 150 gpm and the salinity rose from 600 mg/L chlorides to 740 gpm. The **water level** in April of 1999 stood at an elevation of **+1.99'** above mean sea level. Since the well (located at elevation 681') has never been in production the long-term salinity during pumping is unknown and difficult to predict.

A test well, #4461-02, was constructed in 1993 at the HELCO power plant at elevation 210'. The **water level** was reported to stand a **+1.0'** above sea level. When tested at 500 gpm, the salinity was 5,900 mg/L chlorides. According to the records, the well was drilled to a depth of 253' (elevation - 43').

Proposed Brackish Wells

As part of the original well development plan, proposed by WRA in about 1991, two brackish wells, pumping at 500 gpm each, would produce 1.0 mgd for golf course irrigation. The pumping salinity projected by WRA was expected to be from 600 to 700 mg/L.

Based upon the field evidence and, the assumption that all of the potable well are placed into production as planned, maintaining a salinity of 600 to 700 mg/L chlorides seems highly unlikely, especially with only 2 wells. It is recommend that 3 wells, located at elevation 800', be used to produce the needed irrigation supply (see location map)

Water level measurements made through the years at the state well # 4461-01 *indicate that the level ranges from about* + 2' to +3'. The water level gradient between the state well and the HELCO well is about 0.75'**/mile**. Between the state well and Kau well # 1, the slope is **4.8'/mile**. The change in slope may indicate an, as yet undefined, groundwater flow boundary between the potable Kau wells and the proposed brackish wells.

Very dense and frequently very thick (up to 300' or more) trachyte lava flows have been encountered during drilling on the slopes of Hualalai. According to the geologic log of Kau well #2 contained in the WRA report, there is a trachyte flow located between the elevations of + 510' and +240'. Assuming that the present land slope (666'/ mile) can be projected at depth, this trachyte flow would be found at elevation – 1000' at the 800' proposed well sites.

The geologic formations penetrated in the upper 800' of Kau # 2 are generally very permeable except for a several very dense AA flows. In particular, a 40' thick, dense AA is located between a depth of 760' and 800' (see attached geologic log). The proposed wells are to be located at about elevation 800' and should penetrate permeable rock, however, this is not certain. The state exploration well penetrated dense lava at sea level and would have difficulty producing at a rate of 500 gpm.

It is recommended that the proposed golf course be carefully designed to minimize water consumption and be planted with salt tolerant grass. Further that the first well be drilled (or at least a pilot bore) be drilled in the pre-planning phase of project development to establish both yield and water quality.

It is expected that as the mauka wells begin to pump heavily, there will be a rise in salinity in the brackish resources, even at the 800' elevation. More detailed investigations, such as recording of water level fluctuations should be pursued upon purchasing the property and prior to any additional water development.

As planned, the purchase of, and supplement with, potable water may be necessary to maintain water quality of the golf course.

Additionally, it is recommended that at least three wells of 500 gpm be used as the source of irrigation water to supply the estimated 0.8 to 1.0 mgd. These wells should be pumped within the HELCO off peak power period from 9:00 PM to 7:00 AM. This represents a rate of about 50% below the on – demand power schedule. By using the off – peak schedule, a usage of about 800,000 gallons per day will cost about $345 per day or $0.43/1000 gallons.

The estimated cost for a completed 800' well, including the well, pump, controls and necessary pipes and valves, is $500,000 per well or about $1.5 million for a well field containing 3 wells.

In conclusion, from 0.8 to 1.0 mgd of brackish irrigation water can be developed within the Land of Kau. The development process should be conservative and recognize the risks to both yield and quality as discussed above. There remain a number of unanswered questions which can only be answered via actual field monitoring and pumping.

APPENDIX II

Hydrologic (water)Budget

Kau Sub-area Water Budget

There are three basic methods of estimating the reliability of groundwater resource supplies commonly applied in Hawaii as follows:

1. Sustainable Yield- These estimates have been calculated based on water table gradient estimates where data is scarce. Where water is extensively developed (Oahu), the sustainable yields have been refined through the use of actual pumpage and water quality data.
2. Gound water modelling- The models are based upon a series of aquifer assumptions and coefficients. Such models create recharge, storage flow and pumpage projections. The model can be used to define the sustainable yield estimate
3. Hydrologic (water) budget – The estimates are based upon long - term rainfall, stream runoff evaporation, transpiration of plants and soil storage balances. The product represents the estimate of recharge to the underlying ground water resources. A sustainable yield of the aquifer can then be estimated using percentages developed in similar conditions where pumpage is occurring.

Estimates of sustainable yield, using method 1 and method 2, have previously been prepared for the North Kona district. Accordingly, it was determined that a hydrologic budget should be prepared to provide a cross check to previous estimates. The following paragraphs describe the methodologies used in the budget process.

GIS Model

The water budget was calculated using a Geographic Information System (GIS) that links the location or spatial distribution of each component of the water budget with the attributes of each component such as monthly median rainfall value or soil type. The GIS model is a model of the environment with real-world coordinates. As such, it is a powerful analytical tool to discover spatial interrelationships among the model components as well as to analyze the validity of the model results.

Water Budget

Ground water is replenished by the infiltration of rainfall that percolates through the root zone in the soil to bedrock. Groundwater recharge can be estimated by a water accounting model similar to that developed by Thornthwaite (1948) and Thornthwaite and Mather (1955) that balances input of rainfall and fog drip with output of runoff, evapotranspiration, groundwater recharge, and the change in soil-moisture storage expressed by:

Eq 1. $$G = P + F - R - ET - \Delta SS$$

Where: G = groundwater recharge,

F = fog drip,

P = rainfall,

R = direct runoff,

ET = evapotranspiration, and

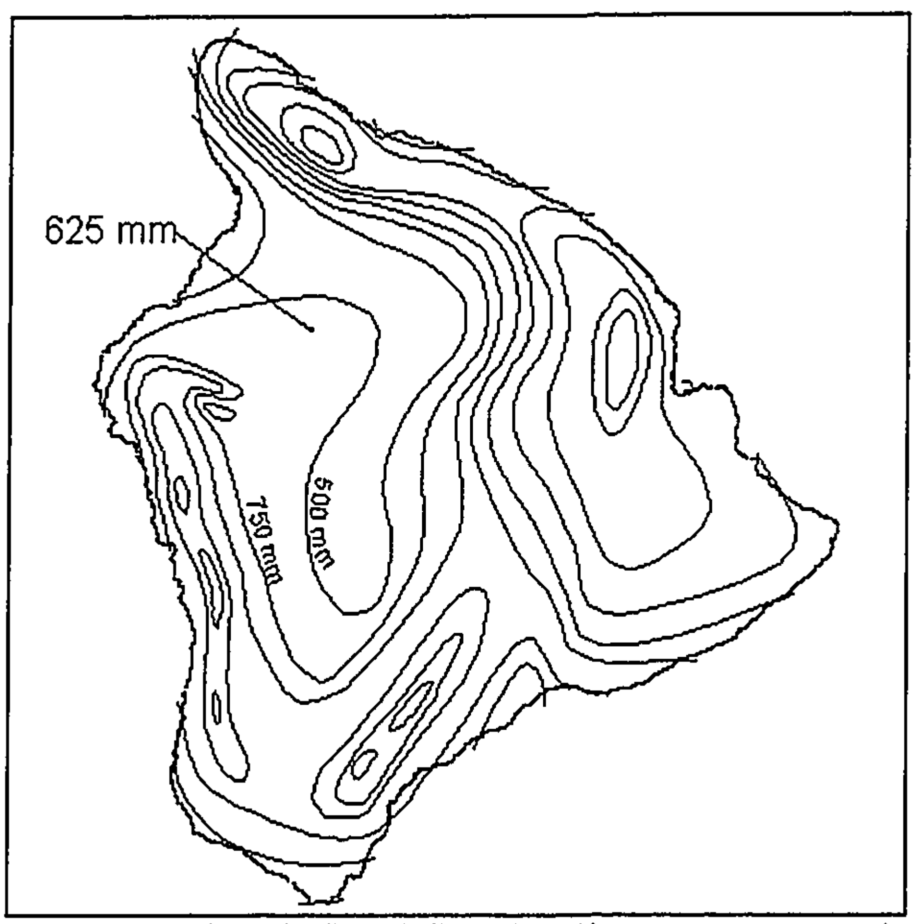
ΔSS = change in soil-moisture storage.

In this water-budget model direct runoff and fog drip are calculated separately as a percentage of rainfall. Thus, the model calculates groundwater recharge, evapotranspiration and the change in soil-moisture storage in the budgeting process.

Rainfall

The project area is within the strong convergence zone where the Kona area rainfall maximum occurs. This area has a pronounced sea-breeze that develops by way of the tradewind shelter provided by Mauna Loa and Hualalai and high afternoon surface temperatures on the west-facing slopes. The convergence zone occurs where the tradewind flow that is diverted around the high volcanoes collides with the strong sea breeze moving upslope.

The twelve monthly median rainfall maps (Giambelluca and others, 1986) were digitized for use in the GIS model. The maps depict the changing rainfall distribution across the island through the months. Digitizing is a process where each rainfall isohyet, line of equal rainfall, on the map is traced electronically. These lines are projected into a real-world coordinate system in the GIS model creating twelve layers, one for each month. The rainfall value applied to the area between the isohyets is the average value of the two bounding isohyets. The average annual rainfall in the Kau sub area is 23 Mgal/d.



Regression equations from Juvik and Ekern (1978) transects were used to estimate the fog component of the water budget in the project area. A fog contribution area was conservatively set between 3600 ft and the upper reaches of the project area at 5000 feet. For the winter months, October through March, fog was calculated relative to rainfall using:

Eq.2 Fog (mm) = 2.563 + 0.165 x Rainfall (mm) $r = 0.903$

For the summer months, April through September the following equation was used:

Eq.3 Fog (mm) = 2.098 + 0.341 x Rainfall (mm) $r = 0.507$

The average fog component calculated by this method is 1 Mgal/d. These equations were developed from a small sample during a collection period that had large synoptic storms. Further investigations to measure fog drip within the project area are necessary to better define this component of the water budget. Because fog drip is poorly known, the water budget was calculated with and without a fog component.

Runoff

Direct runoff from the project area was assumed to be zero as there is no runoff discharge to the ocean. Any surface flow that occasionally occurs, is estimated to infiltrate locally, and thus the volume of water remains in the water budget either as ground-water recharge or as evapotranspiration.

Evapotranspiration and Soil Attributes

Evapotranspiration (ET) is the quantity of water evaporated from water and soil surfaces and transpired by plants. ET can be measured by evaporimeters or lysimeters, or calculated mathematically from various climatic data, none of which are available in the project area. However, ET can be estimated from soil and pan evaporation data.

Pan evaporation measurements are a common way to assess plant water use, and the potential or maximum ET is frequently estimated as a factor of pan evaporation. Ekern and Chang (1985) created a map of the mean annual pan evaporation for the island of Hawaii that was digitized for the GIS water-budget model. The value assigned for the area between the lines of equal pan evaporation is the average value of the two bounding lines. Monthly pan evaporation values were calculated from each month's mean monthly to mean annual ratio, at the Lalamilo station, applied to the mean annual distribution.

The soil attributes of available water capacity (the amount of water held in the soil available to plant roots between field capacity and wilting point) and the root depth determine the maximum soil moisture storage for each soil type. This volume of water in soil storage sets the limit to how much ET can occur from that soil type in any given month. Depending on the monthly input of rainfall and fog drip, the volume of water in soil storage changes. Thus, the actual ET monthly values fluctuate limited by the maximum pan evaporation value and the volume of water held in soil storage.

With a fog component, ET in the Kau sub-area was estimated to be 16.6 Mgal/d and without fog, ET was estimated to be 16 Mgal/d.

Groundwater Recharge

Using equation 1 above, with a fog component, recharge in the Kau sub-area was calculated to be 7.3 Mgal/d, and without fog, recharge was 6.9 Mgal/.

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Appendix K
Development Plan Timetable

PALAMANUI DEVELOPMENT PLAN TIMETABLE

10 YEAR 2005 - 2014

AS OF 11/24/03

		Development Year	1	2	3	4	5	6	7	8	9	10
		Calendar Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
I)	INFRASTRUCTURE											
	Access Road											
	Connect to Makalei Estates & Queen K. Hwy											
	Create access road for University Village											
	Subdivision Roads											
	Extend minor streets & systems as needed											
	Layout Pedestrian Area in University Village and Related Parking											
	Private Wastewater Treatment Plant											
	Phase 1 - Construct treatment plant including treated effluent (wastewater) storage and distribution for irrigation of golf course											
	Expand wastewater treatment plant											
	Potable Water System											
	Connect to County Dept of Water system. Include storage tanks and distribution line to connect to University site											
	Golf Course											
	Drill and Develop Irrigation Wells for Golf Course and Landscaping											
	Grading, Construction & Landscaping											
	Construct Walls or Fences around Dry Forest Area											
	Exclosure of endangered species outside of dry forest area											
	Protection of cultural and archaeological areas											
II)	RESIDENTIAL											
	Ocean View Estate Lots											
	Phase 1 - 30 Lots											
	Phase 2 - 20 Lots											
	Phase 3 - 20 Lots											
	Ocean View Lots											
	Phase 1 - 20 Lots											
	Phase 2 - 30 Lots											
	Phase 3 - 35 Lots											
	Phase 4 - 35 Lots											
	Phase 5 - 40 Lots											
	Phase 6 - 40 Lots											
	Golf View Lots											
	Phase 1 - 20 Lots											
	Phase 2 - 20 Lots											
	Phase 3 - 20 Lots											
	Phase 4 - 30 Lots											
	Phase 5 - 30 Lots											
	Patio Homes											
	Phase 1 - 20 Units											
	Phase 2 - 20 Units											
	Phase 3 - 20 Units											
	Phase 4 - 20 Units											

	PALAMANUI DEVELOPMENT PLAN TIMETABLE 10 YEAR 2005 - 2014										AS OF 11/24/03
	Development Year	1	2	3	4	5	6	7	8	9	10
	Calendar Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
III)	MULTI FAMILY										
	2 Bedroom Condominium Apartments										
	Phase 1 - 10 Units										
	Phase 2 - 20 Units										
	Phase 3 - 10 Units										
	Phase 4 - 20 Units										
	3 Bedroom Condominium Apartments										
	Phase 1 - 10 Units										
	Phase 2 - 20 Units										
	Phase 3 - 10 Units										
	Phase 4 - 20 Units										
	Rental Apartments Phase 1 - 100 Units										
	International Student Housing Phase 1 - 75 Units										
	Senior Housing Units Phase 1 - 80 Units										
IV)	UNIVERSITY VILLAGE INN Phase 1 - 60,000 SF										
V)	UNIVERSITY LEASES										
	Phase 1 - 30,000 SF										
	Phase 2 - 30,000 SF										
VI)	VILLAGE COMMERCIAL										
	Phase 1 - 30,000 SF										
	Phase 2 - 40,000 SF										
VII)	MEDICAL CAMPUS										
	Phase 1 - 30,000 SF w/parking										
	Phase 2 - 30,000 SF w/parking										
	Phase 3 - 30,000 SF w/parking										
	Phase 4 - 30, 000 SF w/parking										
VIII)	R&D										
	Phase 1 - 10,000 SF w/parking										
	Phase 2 - 10,000 SF w/parking										
	Phase 3 - 15,000 SF w/parking										
	Phase 4 - 20,000 SF w/parking										
	Phase 5 - 30,000 SF w/parking										
	Phase 6 - 40,000 SF w/parking										
	Phase 7 - 45,000 SF w/parking										
	Phase 8 - 50,000 SF w/parking										
IX)	COMMUNITY COMMERCIAL										
	Phase 1 - 25,000 SF w/parking										
	Phase 2 - 25,000 SF w/parking										
	Phase 3 - 25,000 SF w/parking										
	Phase 4 - 35,000 SF w/parking										
	Phase 5 - 40,000 SF w/parking										
	Phase 6 - 50,000 SF w/parking										
X)	GOLF COURSE										
	Begin Golf Course grading and development of Clubhouse										
	Begin clubhouse construction										
	Complete Clubhouse and course grow-in, open to public										

Development Plan Timetable

The estimated development schedule for Palamanui covers ten (10) years, beginning in 2005. Absorption of some of the areas is expected to extend to 2014. Construction is expected to begin by 2005, contingent on land use reclassification, zoning and initial subdivision. Unit and acreage figures are estimates; adjustments are expected because of factors such as market demand, infrastructure design changes, costs, changes required to accommodate University of Hawaii needs and other economic factors. The information represents the best estimates that can be made given current information.

Year 1 (2005)	
Infrastructure	Begin Access road to connect to Makalei Estates subdivision road and Queen Kaahumanu Highway and to create access road within petition area for University Village
	Subdivision roads for 30 ocean view estates lots and 20 ocean view lots
	Begin layout of University Village pedestrian area within project area and related parking
	First phase of private wastewater treatment plant, including construction of treated effluent storage and distribution for irrigation of golf course.
	Potable water system within project to be connected to County Dept of Water Supply system, including storage tanks and distribution line to connect to University site
	Drill and develop irrigation wells for golf course/landscaping
	Begin grading and construction of golf course
	Construct enclosures around Dry Forest area
	Enclosure around Endangered species outside of Dry Forest area
	Construct buffers and enclosures around cultural and archeological areas that are to be treated
Residential	30 Ocean View Estates Lots for single family dwellings

	20 Ocean View lots for single family dwellings
Multi Family	None
University Village Inn	None
(Year 1 continued)	
University Leases	None
Village Commercial	None
Medical Campus	None
R&D	None
Community Commercial	**None**
Golf Course	Begin golf course grading and development

Year 2 (2006)	
Infrastructure	Complete access road to connect to Makalei Estates subdivision road and Queen Kaahumanu Highway and to create access road within petition area for University Village
	Subdivision roads for Golf View lots, Patio Home lots
	Complete initial improvements for University Village pedestrian area in project area and related parking for University leases and Village commercial
	Continue golf course construction, landscaping
Residential	20 Ocean View Estates Lots for single family dwellings
	30 Ocean View lots for single family dwellings
	20 Golf View lots for single family dwellings
	20 Patio Homes for single family townhouse units
Multi Family	None
University Village Inn	None
University Leases	30,000 square ft building area
Village Commercial	30,000 square ft building area
Medical Campus	30,000 square ft building area w/ parking
R&D	None
Community Commercial	None
Golf Course	Begin clubhouse construction

Year 3 (2007)	
Infrastructure	Subdivision roads for Ocean View Estates lots, Ocean View lots, Golf View lots, Patio Home lots as needed
Residential	20 Ocean View Estates Lots for single family dwellings
	35 Ocean View lots for single family dwellings
	20 Golf View lots for single family dwellings
	20 Patio Homes for single family townhouse units
Multi Family	None
	10 two bedroom condominium apartments
	10 three bedroom condominium apartments
	100 rental apartments units
	75 units International Student housing
University Village Inn	60,000 square ft building
University Leases	None
Village Commercial	None
Medical Campus	30,000 square ft building area w/ parking
R&D	10,000 square ft building area w/ parking
Community Commercial	None
Golf Course	Complete clubhouse and golf course grow in, open to public

Year 4 (2008)	
Infrastructure	Extend minor streets and systems as needed.
Residential	35 Ocean View Lots for single family dwellings
	20 Golf View lots for single family dwellings
	20 Patio Homes for single family townhouse units
Multi Family	
	20 two bedroom condominium apartments
	20 three bedroom condominium apartments
	80 Senior Housing units
University Village Inn	None
University Leases	None
Village Commercial	None
Medical Campus	30,000 square ft building area w/ parking
R&D	10,000 square ft building area w/ parking
Community Commercial	None
Golf Course	Completed

Year 5 (2009)	
Infrastructure	Extend minor streets and systems as needed.
Residential	40 Ocean View Lots for single family dwellings
	30 Golf View lots for single family dwellings
	20 Patio Homes for single family townhouse units
Multi Family	
	10 two bedroom condominium apartments
	10 three bedroom condominium apartments
University Village Inn	None
University Leases	None
Village Commercial	None
Medical Campus	30,000 square ft building area w/ parking
R&D	15,000 square ft building area w/ parking
Community Commercial	25,000 square ft building area w/ parking
Golf Course	Completed

Year 6 (2010)	
Infrastructure	Extend minor streets and systems as needed.
	Expand wastewater treatment plant.
Residential	40 Ocean View Lots for single family dwellings
	30 Golf View lots for single family dwellings
Multi Family	
	20 two bedroom condominium apartments
	20 three bedroom condominium apartments
University Village Inn	None
University Leases	30,000 square ft building
Village Commercial	40,000 square ft building
Medical Campus	None
R&D	20,000 square ft building area w/ parking
Community Commercial	25,000 square ft building area w/ parking
Golf Course	Completed

Year 7 (2011)	
Infrastructure	Extend minor streets and systems as needed.
Residential	None
Multi Family	None
University Village Inn	None
University Leases	None
Village Commercial	None
Medical Campus	None
R&D	30,000 square ft building area w/ parking
Community Commercial	25,000 square ft building area w/ parking
Golf Course	Completed

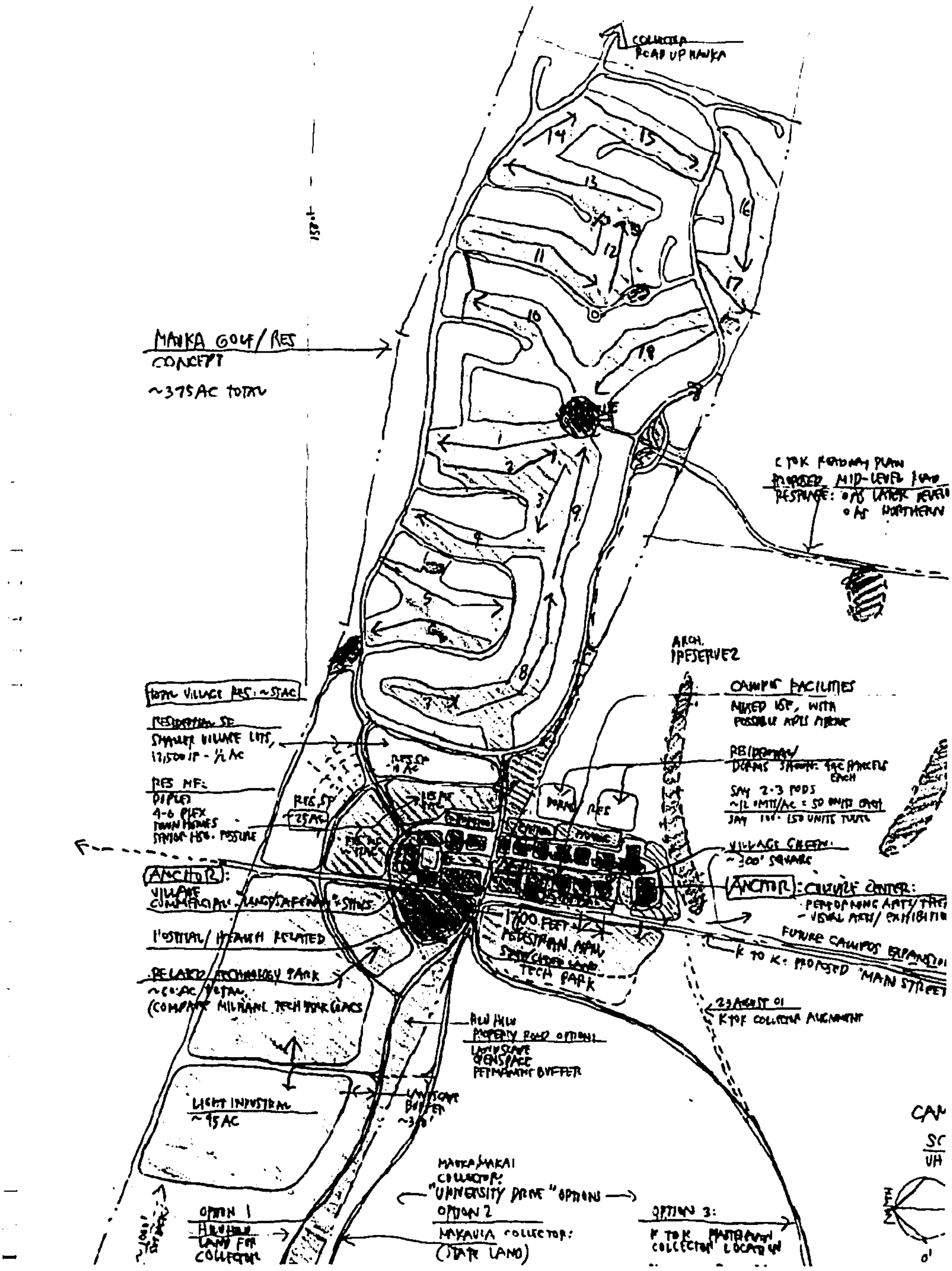
Year 8 (2012)	
Infrastructure	Extend minor streets and systems as needed.
Residential	None
Multi Family	None
University Village Inn	None
University Leases	None
Village Commercial	None
Medical Campus	None
R&D	40,000 square ft building area w/ parking
Community Commercial	35,000 square ft building area w/ parking
Golf Course	Completed

Year 9 (2013)	
Infrastructure	Extend minor streets and systems as needed.
Residential	None
Multi Family	None
University Village Inn	None
University Leases	None
Village Commercial	None
Medical Campus	None
R&D	45,000 square ft building area w/ parking
Community Commercial	40,000 square ft building area w/ parking
Golf Course	Completed

Year 10 (2014)	
Infrastructure	Extend minor streets and systems as needed.
	Expand wastewater treatment plant as needed.
Residential	None
Multi Family	None
University Village Inn	None
University Leases	None
Village Commercial	None
Medical Campus	None
R&D	50,000 square ft building area w/ parking
Community Commercial	50,000 square ft building area w/ parking
Golf Course	Completed

Appendix L
Alternative Designs

RECEIVED AS FOLLOWS



Appendix M

Department of Education (DOE) Fair Share Policy

Appendix M: DOE Fair Share Contribution

~~DOE Fair Share Contribution~~

~~Hiluhilu Development will contribute to the development, funding and / or construction of school facilities, on a fair share basis, as determined by and to the satisfaction of the Department of Education. Terms of the contribution will be agreed upon in writing by Hiluhilu Development and the Department of Education prior to obtaining county subdivision and building permits.~~

~~Fair share contributions are unresolved at this time. Preliminary discussions with State Department of Education regarding current fair share policies and development towards an agreement are ongoing. Hiluhilu Development is currently reviewing the State Department of Education Fair Share program.~~

~~Hiluhilu Development will work with the DOE to determine if the fair share contribution should be paid in land, in fees, or a combination of both. At minimum, Hiluhilu Development can expect to contribute a fair share towards the construction cost of future educational facilities.~~

~~If the DOE determines that land dedication is required, Hiluhilu Development would provide the land within the Palamanui project site. Such a requirement, however, would involve additional planning, site design analysis and negotiations with the DOE to determine facility needs and siting requirements. If the DOE determines that a fee in lieu is required, clarification will be needed to clarify fair share calculations.~~

~~On July 11, 2003, the Department of Education (DOE) implemented a revised method for calculating the fair share contribution it receives from the developers of new dwelling units in Hawaii. Certain aspects of the program remain the same:~~

- ~~The contribution is only required for housing developments of 50 or more units;~~
- ~~It doesn't apply to non-residential developments like shopping centers, hotels, or offices; and~~
- ~~It doesn't apply to senior citizen housing.~~

~~The Palamanui project involves development of more than 50 housing units and therefore is subject to contributing a fair share in costs of providing needed public educational facilities to the state of Hawaii.~~

~~The Palamanui units subject to the DOE fair share calculations involve the planned 590 single family housing units, 100 multi family apartment housing units and 75 multi family student housing units. Non residential development components of Palamanui like the research and development offices, commercial center, parks, preservation areas, and golf amenities are not subject to the DOE fair share calculations. The senior housing component planned for Palamanui is also exempt from the DOE fair share policy.~~

~~For projects that comprise 50 acres or more, the DOE determines whether to require a~~

- ~~dedication of land~~
- ~~payment of standard fee in lieu~~
- ~~or a combination of both.~~

~~Hiluhilu Development will work with theDOE to determine if the fair share contribution should be paid in land, in fees, or a combination of both. At minimum, Hiluhilu~~

Appendix M: DOE Fair Share Contribution

~~Development can expect to contribute some fair share towards the construction cost of future educational facilities.~~

~~Construction Cost Component: Hiluhilu Development can expect to contribute over 2 million dollars to support construction costs for future educational facilities in Kona. The construction cost component for the period of July 2003 to June 2005 is estimated at $2,193,905. After July 1, 2005, construction cost component is estimated at $3,656,370.~~

~~The DOE fee per single family unit in Kona is set at $3,332 and the fee for a multi family unit in Kona is set at $1,303 until June 2005. As of July 2005, the fee charged per single family unit in Kona will increase to $5,553 and the fee charged per multi family unit in Kona will be $2,172. Again, Palamanui proposes to develop 590 single family units and 175 multi family units.~~

~~Fair Share Worksheet~~	~~Location of New Dwelling Units~~	~~Fee per Single-Family Unit~~	~~Fee per Multi-Family Unit~~	~~Benefit District~~
~~July '03 to June '05~~	~~Kona~~	~~$3,332~~	~~$1,303~~	~~Hawaii~~
~~July '05~~	~~Kona~~	~~$5,553~~	~~$2,172~~	~~Hawaii~~

~~Land dedication. If the DOE determines that land dedication is required, Hiluhilu Development can expect to dedicate 5.9 acres of land.~~

~~The acreage to be dedicated by the developer is calculated using the following formula: (0.00899 acres x proposed number of single family dwellings) + (0.00356 acres x proposed number of multi-family dwellings) = total school acres required. Where 0.00899 is the number of school acres required to cover the number of students generated by one new single family, townhouse, or duplex dwelling unit and 0.00356 is the number of school acres required to cover the number of students in one new multi-family dwelling unit. Where 590 single family dwelling units and 175 multi family dwelling units are planned at Palamanui.~~

~~Hiluhilu Development will provide the land within the Palamanui project site. Such a requirement would involve further negotiation with the DOE to determine facility needs and revisions to the site plan to accommodate the school facility.~~

~~Fee-in-lieu: If DOE determines that a fee in lieu is required, the fee amount will involve the actual appraised value of the project's land.~~

~~The fee in lieu calculation involves the (acres per single family unit of 0.00899 x the 590 single family units proposed x the average cost per acre of the subdivision per the developers' appraisal) + the (acres per multi family unit of 0.00356 x the 175 multi family units proposed x the average cost per acre of the subdivision per the developers' appraisal). The last variable is unclear as to how it is to be determined.~~

Appendix M: DOE Fair Share Contribution

~~The policy guidelines suggest that the actual appraised value of the project's land will be used. The 2004 assessed market land value of the property according to the Hawaii County Real Property Tax Office is $1,887,000 for the parcel. This figure reflects the existing land use designations of agriculture and conservation. If we use this figure and divide it over the total 725 acres of the parcel, the average cost per acre of the subdivision is $2,603. Hiluhilu Development can expect to pay a Fee In Lieu in the amount of $15,427.~~

~~We do not know what the market value of the parcel will be after the lands are reclassified to an Urban designation.~~

~~The DOE worksheet involves the average cost per acre of the subdivision per the developers' appraisal. If we define the "developer's cost per acre" to mean the cost of an acre of land ready for building with all services to the boundary etc, under this definition, Hiluhilu Development can expect to pay a Fee In Lieu in the amount of $761,939. This assumes $93,200,000 cost to ready the residential components divided by 725 total acres for a sum of $128,550 per acre.~~

~~To reiterate, Hiluhilu Development is prepared to enter into discussion with the Department of Education to determine a fair share contribution to support future public education facilities in Kona. Some of the variables in the DOE formula need further clarification.~~

~~The following represent estimates of fair share contributions towards educational facilities:~~

~~Construction Cost Component:~~	~~$2,193,905 Prior to July 2005~~
	~~$3,656,370 (After July 2005)~~
~~Land Component:~~	~~5.9 acres~~
~~Fee In Lieu (unclear)~~	~~range from $15,427 to $761,939 (unclear)~~
~~Single Family units:~~	~~590~~
~~Multi Family units:~~	~~175~~

~~Implementation Schedule: The DOE is phasing in the revisions of the fair share policy. Fort he two year period starting form initial implementation (Phase I) the amount of the contribution covering school construction costs will be approximately 30% of the per pupil cost for school construction. Two years after implementation (Phase II), the school construction cost will increase to approximately 50% of the per pupil construction costs. There are no plans for further adjustments beyond the date for 50% implementation. These phases have been taken into account in the calculations for Hiluhilu's estimated fair share contributions.~~

~~Hiluhilu recognizes that a signed, written Educational Contribution Agreement can be finalized at any point prior to the deadline imposed by conditions of the State Land Use Commission or the counties.~~

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REAL PROPERTY
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HEI

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- 2003 Tax History
- 2002 Tax History
- 2001 Tax History
- 2000 Tax History
- 1999 Tax History
- Map

720050010000

NA **HILUHILU DEVELOPMENT LLC**

Values - 2004 Assessment Yr

Property Class	Override Class	Market Land Value	Dedicated / Use Value	Land Exemption	Net Taxable Land Value	Assessed Building Value	Building Exemption	Net Taxable Building Value
Parcel Summary Totals		$1,887,000	$0	$0	$1,887,000	$0	$0	$0 $'
AGRICULTURAL		$1,629,300	$0	$0	$1,629,300	$0	$0	$0 $'
CONSERVATION		$257,700	$0	$0	$257,700	$0	$0	$0

Table A: July '03 to June '05

	Location of New Dwelling Units	Fee per Single-Family Unit	Fee per Multi-Family Unit	Benefit District
Oahu	Honolulu	$2,541	$997	Honolulu
	Ewa	$2,541	$997	Central
	Wahiawa	$2,739	$1,074	Central
	Waialua	$2,936	$1,150	Central
	Koolaupoko	$2,541	$997	Windward
	Koolauloa	$2,936	$1,150	Windward
	Ewa	$2,541	$997	Leeward
	Waianae	$2,936	$1,150	Leeward
Hawaii	Hilo	$3,134	$1,227	Hawaii
	Puna	$3,332	$1,303	Hawaii
	Kona	$3,332	$1,303	Hawaii
	Hamakua	$3,332	$1,303	Hawaii
	South Kohala	$3,332	$1,303	Hawaii
	North Kohala	$3,529	$1,380	Hawaii
	Pohakuloa	$3,529	$1,380	
	Kau	$3,727	$1,457	Hawaii
Maui	Wailuku	$3,134	$1,227	Maui
	Makawao	$3,529	$1,380	Maui
	Lahaina	$3,727	$1,457	Maui
	Hana	$3,924	$1,533	Maui
Molokai	Molokai	$3,727	$1,457	Molokai
Lanai	Lanai	$3,924	$1,533	Lanai
Kauai	Lihue	$3,134	$1,227	Kauai
	Koloa	$3,332	$1,303	Kauai
	Kawaihau	$3,332	$1,303	Kauai
	Waimea	$3,529	$1,380	Kauai
	Hanalei	$3,529	$1,380	Kauai

Fair-Share Worksheet **July '03 to June '05**
(Enter data into yellow cells only)

Enter number of single-family units:	590	
Enter number of multi-family units:	175	
Enter fee per single-family unit:	$3,332	Varies by Location. See Table A Below.
Enter fee per multi-family unit:	$1,303	Varies by Location. See Table A Below.

A. Less Than 50 Acres (Fee In-Lieu)

Land Component (Uses Standard Land Value of $100,000 per acre):

Fee per single-family unit:	$899
Fee per multi-family unit:	$356
Total Land Component Amount:	$592,710
Total Construction Cost Component:	$2,193,905
TOTAL FAIR-SHARE REQUIREMENT:	$2,786,615

B. More than 50 Acres and DOE Determines That Land is Required

Land Component:

Acres per single-family unit:	0.00899
Acres per multi-family unit:	0.00356
Total Acres Required:	5.9
Construction Cost Component:	$2,193,905
TOTAL FAIR-SHARE REQUIREMENT:	5.9 Acres plus $2,193,905

C. More than 50 Acres and DOE Determines That Land is Not Required

Enter average cost per acre of the subdivision (per developer's appraisal): $2,603
assumes 2004 Hawaii County property assessment of $1,887,000 divided by 725 total acres

Land Component (fee in-lieu):	$15,427
Construction Cost Component:	$2,193,905
TOTAL FAIR-SHARE REQUIREMENT:	$2,209,332

Fair-Share Worksheet **July '03 to June '05**
(Enter data into yellow cells only)

Enter number of single-family units:	590	
Enter number of multi-family units:	175	
Enter fee per single-family unit:	$3,332	Varies by Location. See Table A Below.
Enter fee per multi-family unit:	$1,303	Varies by Location. See Table A Below.

A. Less Than 50 Acres (Fee In-Lieu)

Land Component (Uses Standard Land Value of $100,000 per acre):

Fee per single-family unit:	$899
Fee per multi-family unit:	$356
Total Land Component Amount:	$592,710
Total Construction Cost Component:	$2,193,905
TOTAL FAIR-SHARE REQUIREMENT:	$2,786,615

B. More than 50 Acres and DOE Determines That Land is Required

Land Component:

Acres per single-family unit:	0.00899
Acres per multi-family unit:	0.00356
Total Acres Required:	5.9
Construction Cost Component:	$2,193,905
TOTAL FAIR-SHARE REQUIREMENT:	5.9 Acres plus $2,193,905

C. More than 50 Acres and DOE Determines That Land is Not Required

Enter average cost per acre of the subdivision (per developer's appraisal): $128,552
$93 million to ready residential component / 725 total acres

Land Component (fee in-lieu):	$761,939
Construction Cost Component:	$2,193,905
TOTAL FAIR-SHARE REQUIREMENT:	$2,955,844

Table A: July '05

	Location of New Dwelling Units	Fee per Single-Family Unit	Fee per Multi-Family Unit	Benefit District
Oahu				
	Honolulu	$4,236	$1,662	Honolulu
	Ewa	$4,236	$1,662	Central
	Wahiawa	$4,565	$1,790	Central
	Waialua	$4,894	$1,917	Central
	Koolaupoko	$4,236	$1,662	Windward
	Koolauloa	$4,894	$1,917	Windward
	Ewa	$4,236	$1,662	Leeward
	Waianae	$4,894	$1,917	Leeward
Hawaii				
	Hilo	$5,223	$2,045	Hawaii
	Puna	$5,553	$2,172	Hawaii
	Kona	$5,553	$2,172	Hawaii
	Hamakua	$5,553	$2,172	Hawaii
	South Kohala	$5,553	$2,172	Hawaii
	North Kohala	$5,882	$2,300	Hawaii
	Kau	$6,211	$2,428	Hawaii
Maui				
	Wailuku	$5,223	$2,045	Maui
	Makawao	$5,882	$2,300	Maui
	Lahaina	$6,211	$2,428	Maui
	Hana	$6,540	$2,555	Maui
Molokai				
	Molokai	$6,211	$2,428	Molokai
Lanai				
	Lanai	$6,540	$2,555	Lanai
Kauai				
	Lihue	$5,223	$2,045	Kauai
	Koloa	$5,553	$2,172	Kauai
	Kawaihau	$5,553	$2,172	Kauai
	Waimea	$5,882	$2,300	Kauai
	Hanalei	$5,882	$2,300	Kauai

Fair-Share Worksheet **July'05**

(Enter data into yellow cells only)

Enter number of single-family units:	590	
Enter number of multi-family units:	175	
Enter fee per single-family unit:	$5,553	Varies by Location. See Table A Below.
Enter fee per multi-family unit:	$2,172	Varies by Location. See Table A Below.

A. Less Than 50 Acres (Fee In-Lieu)

Land Component (Uses Standard Land Value of $100,000 per acre):

Fee per single-family unit:	$899
Fee per multi-family unit:	$356
Total Land Component Amount:	$592,710
Total Construction Cost Component:	$3,656,370
TOTAL FAIR-SHARE REQUIREMENT:	$4,249,080

B. More than 50 Acres and DOE Determines That Land is Required

Land Component:

Acres per single-family unit:	0.00899
Acres per multi-family unit:	0.00356
Total Acres Required:	5.9
Construction Cost Component:	$3,656,370
TOTAL FAIR-SHARE REQUIREMENT:	5.9 Acres plus $3,656,370

C. More than 50 Acres and DOE Determines That Land is Not Required

Enter average cost per acre of the subdivision (per developer's appraisal): $2,603

$1,887,000 2004 market value of parcel / 725 acres of parcel

Land Component (fee in-lieu):	$15,427
Construction Cost Component:	$3,656,370
TOTAL FAIR-SHARE REQUIREMENT:	$3,671,797

Fair-Share Worksheet **July'05**
(Enter data into yellow cells only)

Enter number of single-family units:	590	
Enter number of multi-family units:	175	
Enter fee per single-family unit:	$5,553	Varies by Location. See Table A Below.
Enter fee per multi-family unit:	$2,172	Varies by Location. See Table A Below.

A. Less Than 50 Acres (Fee In-Lieu)

Land Component (Uses Standard Land Value of $100,000 per acre):

Fee per single-family unit:	$899
Fee per multi-family unit:	$356
Total Land Component Amount:	$592,710
Total Construction Cost Component:	$3,656,370
TOTAL FAIR-SHARE REQUIREMENT:	$4,249,080

B. More than 50 Acres and DOE Determines That Land is Required

Land Component:

Acres per single-family unit:	0.00899
Acres per multi-family unit:	0.00356
Total Acres Required:	5.9
Construction Cost Component:	$3,656,370
TOTAL FAIR-SHARE REQUIREMENT:	5.9 Acres plus $3,656,370

C. More than 50 Acres and DOE Determines That Land is Not Required

Enter average cost per acre of the subdivision (per developer's appraisal):	$128,552
$93 million to ready residential component / 725 total acres	
Land Component (fee in-lieu):	$761,939
Construction Cost Component:	$3,656,370
TOTAL FAIR-SHARE REQUIREMENT:	$4,418,309

RECEIVED AS FOLLOWS

An Explanation of Revisions to DOE Fair Share Contribution Formula

On July 11, 2003, the Department of Education (DOE) implemented a revised method for calculating the fair-share contribution it receives from the developers of new dwelling units in Hawaii. Certain aspects of the program will remain the same:

- the contribution is only required for housing developments of 50 or more units;
- it doesn't apply to non-residential developments like shopping centers, hotels, or offices; and
- it doesn't apply to senior citizen housing.

Contributions will continue to be deposited in trust accounts reserved for construction, repair or expansion of school facilities in the school complex area where the new housing is located.

Prior to the revision, the DOE collected either $1,011 per unit or a contribution of land for new school sites. The amount was based on the average per pupil cost of land for a school site during the 1990's.

Major Changes

There are three major changes with the revised program:

1) contributions will depend on whether the new homes are single-family or multi-family;
2) contributions will depend on the geographic location of the new housing; and
3) the calculation of the contribution amount will be based on the cost of constructing school facilities as well as land costs.

Single Family vs. Multi-Family

The revisions of the fair-share program are based on the recommendations of a study commissioned by the Department of Education and completed in 2001. The "*School Fair Share Contribution Study*" (conducted by Group 70 International of Honolulu, Hawaii and Duncan Associates, of Austin, Texas) recommended one contribution amount for single-family housing and a separate, lower amount, for multi-family housing. The recommendation was based on national and statewide data that indicate the average number of children per multi-family dwelling is considerably less than the number of children living in single-family housing. The developer of 100 units of multi-family housing can expect to make a smaller contribution than a neighboring developer of 100 units of single-family housing because the multi-family project is expected to generate fewer students.

Geographic Location

The second major change in the revised program was adjusting contribution amounts to account for regional differences in construction costs. The DOE is using the Department of Accounting and General Services (DAGS) Regional Cost Factors that divides the state into 26 districts and gives each district a construction cost factor that is a multiple of the cost of construction in Honolulu. The Lanai area has a construction cost factor that is 35% more than the cost of the same construction in central Honolulu. Fair-share contributions from Lanai housing developments will reflect the higher construction cost. Schools across the state will have roughly the same amount of construction buying power when we use fair-share contributions to improve their campuses.

Construction Costs
The previous fair-share contribution amount was based solely on the cost of school land. Developers were able to pay with land for school campuses or fees-in-lieu of land. The revised fair-share amount is based on both the cost of land and the cost of school construction. Developers of projects on less than 50 acres will pay fees-in-lieu of land and construction. The DOE will work with developers of larger projects to determine if the fair-share contribution should be paid in land, in fees, or a combination of both.

The Implementation Schedule
The DOE is following the recommendation of the *School Fair Share Contribution Study* to phase-in the revision. For the two-year period starting from initial implementation (Phase I) the amount of the contribution covering school construction costs will be approximately 30% of the per pupil cost for school construction. Two years after implementation (Phase II), the school construction cost will increase to approximately 50% of the per pupil construction costs. There are no plans for further adjustments beyond the date for 50% implementation.

Developers can meet with the DOE to discuss fair-share contribution requirements at any time in their development phase. A signed, written Educational Contribution Agreement can be finalized at any point prior to the deadline imposed by conditions of the State Land Use Commission or the counties.

Financial Summary of Fair Share Contributions
The DOE has received a total of $1.02 million dollars in fair-share cash contributions from 11 different residential projects. It has also received 135 acres of land for schools. There are signed agreements with other landowner/developers that should bring in an additional $3.84 million dollars and 225 acres of land when the residential units in those projects are sold.

A Fact Sheet on Revisions to the Educational Fair Share Contribution

Part 1 - Formula Revisions

On July 11, 2003, the Department of Education (DOE) implemented a revised method for calculating the Fair-Share contribution it receives from the developers of new dwelling units in Hawaii. Certain aspects of the program will remain the same:

- the contribution is only required for housing developments of 50 or more units;
- it doesn't apply to non-residential developments like shopping centers, hotels, or offices; and
- it doesn't apply to senior citizen housing.

Contributions will continue to be deposited in trust accounts reserved for construction, renovation or expansion of school facilities in the school complex area where the new housing is located.

Prior to the revision, the DOE collected either $1,011 per unit or a contribution of land for new school sites. The amount was based on the average per pupil cost of land for a school site during the 1990's.

<u>Major Changes</u>

There are three major changes with the revised program:

1) contributions will depend on whether the new homes are single-family or multi-family;
2) contributions will depend on the geographic location of the new housing; and
3) the calculation of the contribution amount will be based on the cost of constructing school facilities as well as land costs.

Single Family vs. Multi-Family or Accessory Units

The revisions of the Fair-Share program are based on the recommendations of a study commissioned by the Department of Education and completed in 2001. The "*School Fair Share Contribution Study*" (conducted by Group 70 International of Honolulu, Hawaii and Duncan Associates, of Austin, Texas) recommended one contribution amount for single-family housing and a separate, lower amount, for multi-family housing. The recommendation was based on national and statewide data that indicate the average number of children per multi-family dwelling is considerably less than the number of children living in single-family housing. The developer of 100 units of multi-family housing can expect to make a smaller contribution than a neighboring developer of 100 units of single-family housing because the multi-family project is expected to generate fewer students.

For the purposes of determining a Fair-Share contribution, a single family unit is the primary residence on a site, or two similar size units with a shared roof or common walls, otherwise called a duplex. A multi-family unit is three or more units that share common walls or roof. An accessory residential unit, or ohana unit, shares the same site with a primary residence but is smaller in square footage. Ohana or accessory units can be attached to the primary residence or free standing. Accessory units are considered the same as multi-family units in calculating a Fair-Share contribution.

Geographic Location

The second major change in the revised program was adjusting contribution amounts to account for regional differences in construction costs. The DOE is using the Department of Accounting and General Services (DAGS) Regional Cost Factors that divides the state into 26 districts and gives each district a construction cost factor that is a multiple of the cost of construction in Honolulu. The Lanai area has a construction cost factor that is 35% more than the cost of the same construction in central Honolulu. Fair-Share contributions from Lanai housing developments will reflect the higher construction cost. Schools across the state will have roughly the same amount of construction buying power when we use Fair-Share contributions to improve their campuses.

Construction Costs

The previous Fair-Share contribution amount was based solely on the cost of school land. Developers were able to pay with land for school campuses or fees-in-lieu of land. The revised Fair-Share amount is based on both the cost of land and the cost of school construction. Developers of projects on less than 50 acres will pay fees-in-lieu of land and construction. The DOE will work with developers of larger projects to determine if the Fair-Share contribution should be paid in land, in fees, or a combination of both.

Timing

The DOE is following the recommendation of the *School Fair Share Contribution Study* to phase-in the revision. For the two-year period starting from initial implementation (Phase I) the amount of the contribution covering school construction costs will be discounted 40%. Two years after implementation, July 1, 2005, the school construction cost will increase.

Developers can meet with the DOE to discuss Fair-Share contribution requirements at any time in their development phase. A signed, written Educational Contribution Agreement can be finalized at any point prior to the deadline imposed by conditions of the State Land Use Commission or the counties.

Financial Summary of Fair-Share Contributions

The DOE has received a total of $1.02 million dollars in Fair-Share cash contributions from 11 different residential projects. It has also received 135 acres of land for schools. There are signed agreements with other landowner/developers that should bring in an additional $3.84 million dollars and 225 acres of land when the residential units in those projects are sold.

Part 2 - The Process

<u>Policy and Practice</u>

DOE Policy

The basis for requesting a contribution for schools is DOE Policy No. 6700: Facilities Standards Policy. The applicable subsection (f.) is titled: "Assistance for school sites and facilities requirements" and permits the DOE to request assistance from landowners or developers whenever necessary.

State/County

The DOE makes a request to the State Land Use Commission (LUC) or county planning departments if, after reviewing a Draft Environmental Impact Statement (DEIS) or application to change zoning or other land use, DOE determines the development will impact area schools.

HCDA

Developments that are located in areas under the control of the Hawaii Community Development Authority (HCDA) make contributions for public facilities as a condition for receiving development permits. Although schools are considered public facilities, the HCDA does not require developers to sign agreements with the DOE for school contributions. The HCDA has indicated a willingness to use its public facility funds for the design and construction of a new school at the site of the former Pohukaina School site in Kakaako.

DHHL

The Department of Hawaiian Home Lands (DHHL) projects on lands held in the Home Lands Trust are not required to go through the standard state and county land approval processes. So the DOE is unable to ask the LUC or counties to impose conditions for school contributions. However the DOE has asked DHHL to consider making contributions to schools directly impacted by new DHHL residential development. The requests are being considered by the Hawaiian Homes Commission.

<u>Imposition of Conditions</u>

The standard state or county condition requiring a Fair-Share contribution always requires a written agreement signed between the petitioner and the DOE. Generally, in the document, the parties mutually agree that the contribution satisfies a particular condition set by the LUC or county. Some agreements signed in advance of land use decisions spell out that the contribution will meet the DOE Fair-Share requirements for any public education condition set by county or state government.

There have been some development projects that received state land use approvals before school Fair-Share requirements were requested. A few of these projects have then had to meet Fair-Share conditions imposed at the county level when they have requested zoning or other land use changes.

Fair-Share conditions generally require that a written agreement be signed by the developer/petitioner and the DOE prior to a specified development "event." In the past the event has included "final plan approval", "obtaining county zoning", or "obtaining building permits."

Application

Excluded Property

The DOE only requests Fair-Share school contributions for new residential units. No contributions are requested for commercial or industrial land uses. The DOE is only able to request conditions on those projects that require state or county land use approvals. There is no comprehensive way to request conditions on individual homes on property already approved for housing. No contributions are requested for remodeling or repair work of existing housing, unless such work involves the creation of additional units and the total number of units in the application for land use change is greater than 50. If 50 or more new housing units are being created out of a structure that wasn't previously housing, a Fair-Share contribution would be requested.

Because of the difficulty and resources needed to identify, track and administer small projects; and the reduced impact on schools, the request for Fair-Share contributions only applies to projects of 50 or more units. The unit count includes accessory or 'ohana units. For example, if a subdivision project with 25 single family lots applies for land use approval to build 25 primary units and 25 accessory units, the DOE would request a contribution. If that 25-lot project has two lots that are prohibited from having accessory units, and the maximum number of residential units to be built is 48, the DOE would not request a contribution. The determination of the likely number of total residential units often relies on an open and honest discussion between the DOE and the landowner/developer.

No requests for Fair-Share contributions are made for projects with a written prohibition of children under the age of 18. This includes housing for the elderly, student dorms, or other types of group housing. Fair-Share would apply to student housing designed for families.

Fair-Share contributions are not requested for hotels or other projects where the units are expected to generate payment of the transient accommodation room tax. There have always been residential projects in Hawaii that were initially designed and marketed to part-time residents but over time these projects have become year round homes for resident families. The DOE has only one opportunity at the land approval stage to request contributions to offset the school impacts of a project throughout its existence as a residence.

Payment

The DOE sets the terms of the school payment with the project developer in the written educational contribution agreement. In most recent cases, where a cash contribution is required, payment is made upon the closing of the sale of each lot or residential unit. In some cases, payments are grouped according to the number of units sold, for instance, each check covers the payments for 100 units sold.

Contributions of land are synchronized with the schedules for construction of schools on the donated sites.

Enforcement of conditions

When a developer signs an agreement with the DOE, there is generally an acknowledgement that payments must be made and we do not experience difficulty in the payment process. Where the condition set by the state or county does not require compliance prior to a specific development event, such as rezoning or issuance of building permits, the DOE faces great difficulty in enforcing compliance. That is one of the reasons that the wording of the Fair-Share condition is so important to the DOE. In cases where disagreements arise, the DOE's only option is to ask the state or county to enforce the condition they placed on the project.

In some cases, due to the complexity of land changing ownership and different conditions placed on different parcels of the same project, a developer can unintentionally overlook the existence of a school contribution requirement. For LUC approvals, an annual report states how the developer is meeting each stated condition. If the condition requires a written agreement, the annual report can easily state whether that condition has been met or not.

In recent years when there has been a question over a project developer meeting the Fair-Share condition set by the LUC, the LUC has asked both the developer and the DOE to appear before them.

Transition

The formula for calculating the amount of Fair-Share contribution request by the DOE was revised on July 11, 2003. The revision has no effect on any completed educational contribution agreements. The amounts set in those agreements will not change. For projects which have not yet begun discussion with the DOE, the process has not changed. Developers can meet with the DOE at any time in the development process to get an estimate of the amount of Fair-Share contribution that will be requested. A written educational contribution agreement can be signed at anytime, provided that sufficient detail about the project is available.

Developers of projects which have to meet both state and county conditions can settle on an agreement that the DOE will certify meets both sets of conditions. Projects that do not have a state imposed educational Fair-Share condition will still have to come to an agreement with the DOE on educational conditions placed by the counties.

Part 3 - Working the Formula

DOE's Fair-Share Contribution consists of a land component and a construction cost component which, when added together, comprise the total Fair-Share Contribution amount. The specific requirements for each proposed development is determined by the procedures outlined below and will be documented in a written Fair-Share Agreement between each developer and DOE.

Land Component

A. Projects Comprised of Less than 50 Acres

Projects comprised of less than 50 acres shall pay a standard fee in-lieu of land. The fee is $899 per single-family unit and $356 per multi-family unit. These dollar amounts are determined by first calculating the school acres required per housing unit. The number of school acres required per housing unit is calculated by multiplying the number of public school students generated by each unit of housing by the actual number of acres per student in 16 new DOE schools built between 1988 and 1998.

(# of public school students per housing unit) X (actual school acres per student) = school acres required per housing unit

The school acres required per housing unit is then multiplied by $100,000, the average cost of an acre of school land from 1988 to 1998, to determine the fee in-lieu amount.

(school acres required per housing unit) X ($100,000) = fee in-lieu of land

Multi-family projects generate roughly 40% of the number of students generated in a single-family, townhouse or duplex project containing the same number of units. All calculations take that difference into account.

B. Projects Comprised of 50 Acres or More

For projects comprised of 50 acres or more, DOE determines whether to require a dedication of land, payment of a standard fee in-lieu, or a combination of both.

If DOE determines that a <u>fee in-lieu</u> is required, the fee amount shall be calculated as prescribed in Section A. above but the actual appraised value of the project's land will be used, instead of the $100,000 used in calculations for projects under 50 acres in size.

If DOE determines that a <u>land</u> dedication is required, the acreage to be dedicated by the developer is calculated using the following formula:

(0.00899 acres x proposed number of single-family dwellings) + (0.00356 acres x proposed number of multi-family dwellings) = total school acres required

where 0.00899 is the number of school acres required to cover the number of students generated by one new single-family, townhouse, or duplex dwelling unit and 0.00356 is the number of school acres required to cover the number of students in one new multi-family dwelling unit.

For example, 100 new single-family units would require 0.899 acres of school land while 1,000 new single-family units would require 8.99 acres. Likewise, 100 new multi-family units would require 0.356 acres of school land while 1,000 new multi-family units would require 3.56 acres.

Construction Cost Component

Currently during Phase I, the Honolulu construction cost component of the Fair-Share Contribution is $2,541 per single-family unit and $997 per multi-family unit. On July 1, 2005, Phase II begins and the contribution amounts will be $4,236 per single-family unit and $1,662 per multi-family unit. For the purposes of formula, the Phase II figures were used, and then the figures were reduced for the two-year Phase I period.

The Honolulu figures are adjusted according to geographic region to account for higher construction costs in outlying areas. The construction cost component is based on the actual costs of building the permanent (not portable) facilities of 15 schools constructed from 1989 to 1998. It also factors in a credit for state taxes that will be paid by new residential units.

The 1989 to 1998 actual school construction cost per new housing unit used in the Fair-Share formula is $13,169 for single-family, townhouse, and duplex homes and $5,102 for multi-family homes (in Honolulu, which is the baseline district for cost purposes). These figures are obtained by multiplying the average school construction cost per student by the number of students generated by each new housing unit.

The formula then provides a revenue credit based on the actual average amount of funding for construction provided by the State Legislature in recent years. Use of the credit eliminates the possibility that a new housing project pays twice for the same facility; once with Fair Share and again with taxes. The credit amount is the present value of a stream of $608 per year (the Legislature's past average annual funding per student) over 25 years (the life span of a school facility). The credit of $8,156 per student is then multiplied by the number of students generated by each new unit, resulting in a single-family revenue credit of $4,698 per unit and a multi-family credit of $1,778 per unit.

(net school construction costs per new housing unit) – (revenue credit per unit) = (net cost per unit)

The single-family school construction cost of $13,169 is reduced by the revenue credit of $4,698, leaving a net cost of $8,471. The multi-family school construction cost of $5,102 is reduced by the revenue credit of $1,778, leaving a net cost of $3,324.

The net cost is then halved, based on the assumption that net cost of new schools should be shared equally between the new development and taxpayers statewide. The resulting figure is the construction cost component of the Fair-Share Contribution: $4,236 per single-family unit and $1,662 per multi-family.

(net cost per unit) / (2) = (construction cost component)

The construction cost component is adjusted based on the location of the housing project. Single-family fees range from $4,236 in Honolulu to $6,540 in Hana, Maui or Lanai. See the attached Table B for the Phase II amounts. For the two year period from July 2003 to July 2005, the amounts were reduced by 40% to serve as a graduated method of introducing the new contribution amounts. Phase I amounts are listed in Table A.

The land and construction cost components of the Fair-Share Contribution will be collected according to terms specified in the Fair-Share Agreement between the developer and DOE. Fees will be deposited into a trust fund designated for the benefit district where the new housing is being built. The state is divided into nine benefit districts: Honolulu, Central, Leeward, Windward, Hawai'i, Maui Island, Molokai, Lanai and Kauai. The fees collected in the trust fund will only be used to construct, expand or improve schools within the benefit district.

What's the cost of school facilities for a new subdivision?

Welcome to Maui 2030, a planned community, in Lahaina, with a mixture of residential, recreational, open space, golf course, public/quasi-public and commercial uses. The community will contain 857 single family homes and 1,154 multi-family homes on a total of 1,154 acres.

Maui 2030's estimated stabilized student population:

375 students in grades K-8	172 students in grades 6-8	218 students in grades 9-12

DOE's cost to provide Maui 2030 with school facilities:

	Land	Construction
1 elementary school	12.0 acres	$25 million
10% of a middle school	1.8 acres *(10% of 18 acres)*	$4.0 *(10% of 40 million)*
9% of a high school	4.5 acres *(9% of 50)*	$8.1 *(9% of 90 million)*
TOTAL:	**18.3 acres**	**$37.1 million**

The developer/homeowners' Share of school facility costs at Maui 2030

	Land in acres	Construction in million $
DOE's Total Cost to serve the development	18.3	37.1
Fair-share Contribution from the developer/homeowners	11.8	4.79
Developer/homeowners' share	65.0% *(2/3)*	12.9% *(less than 1/8)*
Hawaii taxpayers' share	35.0%	87.1%

The land and construction cost variables used in the formula

The land calculation (11.8 acres):
Multiply the number of single family units by .00899
Multiply the number of multi-family units by .00356

Where .00899 is # of school acres per new single-family unit needed
Generated by the number of public school children per single-family unit
multiplied by
the # of acres per student provided in the 16 DOE schools built from '89 to '98.

and
.00356 is # of school acres per new multi-family unit needed
Generated by the number of public school children per multi-family units
multiplied by
the # of acres per student provided in the 16 DOE schools built from '89 to '98.

The construction cost calculation (4.79 million):
Multiply the number of single-family units by $3,727 (Lahaina area amt.)
Multiply the number of multi-family units by $1,380 (Lahaina area amt.)

The construction cost variable includes:
the construction cost per student of DOE schools from 1989 to 1999
multiplied by
<u>the number of students per unit</u>
$13,169 (Honolulu single family amt.)

add
the 30% cost differential between construction in Honolulu and Lahaina
<u>+ $3,951</u>
$17,120

subtract
a revenue credit based on '92 to '98 legislative appropriations (present value of a stream of $608 per year for 25 years) and the number of students per unit
<u>- $4,698</u>
$12,422

subtract
50% on the assumption that cost of school construction should be shared equally between developer/homeowners and state taxpayers
<u>- $6,211</u>
$6,211

subtract
40% as a discount for the first two years of the revised formula. In July '05, the amount increases to the full construction cost variable.
<u>- $2,484</u>
$3,727

DOE's facilities cost for each new <u>single-family</u> residential unit

Number of students per unit:

	1 unit	100 units
Elementary K-5	.279	27.9
Middle 6-8	.143	14.3
High School 9-12	.154	15.4
Total	.576	57.6

Number of school acres required per unit:

	Students per unit	Acres per student	Acres per unit
Elementary K-5	.279	.0122	.00340
Middle 6-8	.143	.0114	.00163
High School 9-12	.154	.0257	.00396
Total	.576		.00899

Honolulu school construction required per unit:

	Students per unit	Adjusted cost per student	Adjusted cost per unit
Elementary K-5	.279	18,105.	5,051.
Middle 6-8	.143	21,112.	3,019.
High School 9-12	.154	33,110.	5,099.
Total	.576		13,169.

DOE's facilities cost for each new <u>multi-family</u> residential unit

Number of students per unit:

	1 unit	100 units
Elementary K-5	.109	10.9
Middle 6-8	.040	4.0
High School 9-12	.069	6.9
Total	.218	21.8

Number of school acres required per unit:

	Students per unit	Acres per student	Acres per unit
Elementary K-5	.109	.0122	.00133
Middle 6-8	.040	.0114	.00046
High School 9-12	.069	.0257	.00177
Total	.218		.00356

Honolulu school construction required per unit:

	Students per unit	Adjusted cost per student	Adjusted cost per unit
Elementary K-5	.109	18,105.	1,973.
Middle 6-8	.040	21,112.	844.
High School 9-12	.069	33,110.	2,285.
Total	.218		5,102.

Appendix N
Affordable Housing Policy- County of Hawaii

Affordable Housing Requirement for Palamanui project

APPENDIX N: AFFORDABLE HOUSING REQUIREMENT – Palamanui project

Affordable housing requirements will be met with agreements established with the County and State housing agencies. The developer proposes to provide 100 affordable housing units. The County of Hawai'i Affordable Housing Policy (1998, Ord. No. 98-1, Sec. 2) Article 1, Section 11-4 requires 10 percent of total units be affordable. While the actual number of units is 845 and the actual requirement is 85 units, Hiluhilu Development has decided to round the numbers and use 1,000 as the base number of units. Therefore, based on 1,000 units, ten percent represents 100 units. Fifty (50) affordable units will be available for purchase. Fifty (50) affordable units will be available for rent. Affordability will be based on Federal, State and County standards and guidelines. See Appendix N for affordable housing policy guidelines.

The County of Hawaii affordable housing code offers alternatives to the provision of on-site affordable housing units. According to Section 11-4 of the code, the affordable housing requirement may be satisfied through the use of the following alternatives:

1) payment of in-lieu fees
2) provision of affordable housing units on property other than the project site
3) provision of developable land
4) provision of infrastructure / services
5) other means approved by the County housing agency.

Hiluhilu Development, however, will not be exercising these alternative options. Rather, as stated, Hiluhilu Development will provide 100 affordable housing units within the Palamanui project site.

The THK market study confirms the strong need and demand for housing units in North Kona. The Palamanui project will add to the supply of housing unit types, including market and specifically affordable housing units. There may be a number of people working in the proposed Palamanui University Village who will meet the guideline income requirements and find Palamanui a suitable place to work and reside. Thus the provision of affordable housing units are planned to support the general community need for affordable housing as well as the projected need generated by the proposed Palamanui project.

The anticipated distribution of planned 100 affordable housing units for sale and for rent, will be one third in the 80 to 100 percent applicable median income, one third in the 100 to 120 percent applicable median income and one third in the 120 to 140 percent of applicable median income. Hiluhilu Development will provide 100 total affordable housing units.

Percent of Median Income	For Sale Affordable Housing Units to be provided on site	For Rent Affordable Housing Units to be provided on site
80% – 100%	1/3 of 50 units = 17 units	1/3 of 50 units = 17 units
100% - 120%	1/3 of 50 units = 17 units	1/3 of 50 units = 17 units
120% - 140%	1/3 of 50 units = 17 units	1/3 of 50 units = 17 units
TOTAL	50 for sale affordable housing units	50 for rent affordable housing units

Affordable Housing Requirement for Palamanui project

Median income for a family of four in the County of Hawaii in the year 2004 is approximately $51,000. Affordable housing is being calculated based on the assumption of a family of four. The County of Hawaii uses the affordable housing definition as a lot or dwelling unit which is affordable to qualified households earning no more than one hundred forty percent (140%) of the median income for family of four in the County of Hawaii, as published annually by the Office of Housing and Community Development. Appendix N includes income guideline tables used by the County of Hawaii Office of Housing and Community Development.

According to the County of Hawaii Affordable Sales Guidelines, a family of 4 earning 80% of the median income in the County of Hawaii can afford a $186,200 housing unit. This is based on a 30 year mortgage loan at 5.760% hula mae interest rate with a total housing expense of 28% and 5% down payment. The family of 4 earning the median income of $51,000 in the County of Hawaii can afford a housing unit of $214,000. Similarly, the family of 4 earning 120% of the median income can afford a housing unit costing $239,860. And the family of 4 earning 140% of the median income can afford to purchase a housing unit at the cost of $239,860. Hula Mae new construction sales price limit as of 2002 for the County of Hawaii is $239,860.

Affordable Sales Guidelines

Percentage of Median	$ Income	Affordable For Sale Housing Price
80%	$44,300	$186,200
100%	$51,000	$214,400
120%	$61,200	$239,860
140%	$71,400	$239,860

Family of four. 2004 Median Income of $51,000. 30 year mortgage. 5.76% Hula Mae interest rate. 5% down payment. 28% housing expense. Housing Price cap at $239,860.

The County of Hawaii has established affordable rent guidelines which are based on 30% of income including utilities. The County affordable rent guideline tables are based on 2004 Hawaii County median income of $51,000. A family earning 80% of the median income for the County of Hawaii can afford a 2 bedroom housing unit at a cost of $991 a month. A family earning 100% of the median income for the County of Hawaii can afford a 2 bedroom housing unit at a cost of $1134 a month. A family earning 120% of the median income for the County of Hawaii can afford a 2 bedroom housing unit at a cost of $1360 a month. A family earning 140% of the median income for the County of Hawaii can afford a 2 bedroom housing unit at a cost of $1587 a month. Monthly rent levels would include the cost of the following utilities: water, sanitary sewage service, electricity and gas where applicable.

Affordable Rent Guidelines

Median Income $51,000	Monthly rent levels for a 2 bedroom unit
80% of median	$991
100% of median	$1,134
120% of median	$1,360
140% of median	$1,587

Affordable Housing Requirement for Palamanui project

As required by code, an implementation plan to satisfy affordable housing requirements will be submitted for approval prior to the issuance of any building permit for the market project. The affordable housing code states that the County housing agency shall determine the implementation period based upon the specific circumstances of each case. Hiluhilu Development will work with the County housing agency in developing an appropriate implementation schedule for this project. In particular, Hiluhilu Development will need to discuss the timing of the provision of units.

Should the need arise to entertain the option of payment of in-lieu fees instead of the provision of affordable housing units on site, Hiluhilu Development will need to discuss the amount of subsidy required with Hawaii County housing agency.

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County of Hawai'i
Office of Housing and Community Development
50 Wailuku Drive
Hilo, Hawai'i 96720-2484

Phone: V/TT 808 / 961-8379 FAX: 808/961-8685

Fax

To: Roger Harris		**From:** Tina Whitmarsh	
Fax: 881-9501		**Pages:** 7	
Phone:		**Date:** 06/18/03	
Re: Affordable Housing		**CC:**	

☐ **Urgent** ☐ **For Review** ☐ **Please Comment** ☐ **Please Reply** ☐ **Please Recycle**

• **Comments:**

As requested:

Article 1. Affordable Housing	3 pages
Affordable Rent Guidelines	1 page
Income Schedule by Family Size	1 page
Affordable Sales Price Guidelines	1 page
Cover	1 page

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Article 1. Affordable Housing.

Section 11-1. Title.

This article shall be referred to as the County of Hawaii affordable housing policy.

(1998, Ord. No. 98-1, sec. 2.)

Section 11-2. Objectives.

The objectives of this affordable housing policy are to:

(1) Implement goals and policies of the General Plan;

(2) Promote and assist private development of housing for senior citizens and qualified households;

(3) Use available governmental grants and funds in the development of affordable housing and increase the capabilities of qualified households to obtain affordable housing;

(4) Support innovative, lower-cost approaches which may be used in the development of affordable housing; and

(5) Require large resort and industrial enterprises to address related affordable housing needs as a condition of rezoning approvals, based upon current economic and housing conditions.

(1998, Ord. No. 98-1, sec. 2.)

Section 11-3. Definitions.

The following words and phrases, unless the context otherwise requires, are defined as follows:

(1) "Affordable housing" means dwelling units which may be rented or purchased at cost levels which can be afforded by persons or families who are within the definition of "qualified households," as provided herein.

(2) "Affordable housing income guidelines" mean those household income levels which extend up to one hundred forty percent of the median family income in the County of Hawaii, as published annually by the office of housing and community development and as described further herein.

(3) "Qualified households" mean an individual or two or more related by blood, state-sanctioned adoption, foster parentage, guardianship, or marriage, occupying a dwelling unit and whose total household income is within the affordable housing income guidelines or who would otherwise qualify in a State or federal affordable housing program.

(4) "Unit" or "affordable unit" or "affordable housing unit" means a lot or dwelling unit which is affordable to qualified households earning no more than one hundred forty percent of the median income for a family of four in the County of Hawaii.

(1998, Ord. No. 98-1, sec. 2.)

Section 11-4. Requirements for rezonings involving residential uses.

(a) Requests for rezoning which propose the establishment of residential uses, including single-family and multiple-family dwellings will be assessed as follows:

(1) Nine units or less	-	no requirement
(2) Ten or more units	-	Ten percent of total units to be developed (rounded to the nearest whole number)

(b) Satisfaction of these requirements will be accomplished through the provision of affordable housing units within the land which has been the subject of the rezoning.

(c) In lieu of the provision of affordable housing units on-site and subject to the approval of the County housing agency, the affordable housing requirement may be satisfied through the use of the following alternatives, the value of which shall be based upon a calculation of in-lieu fees for the specific residential development involving the rezoned lands and which shall meet with the approval of the County housing agency:

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this has not been increased as of 6/18/03

(1) Payment of in-lieu fees. These fees are calculated by determining the amount of subsidy required to provide housing units affordable to the targeted income groups. The in-lieu fee amount, averaged for the various target groups to be served, amounts to $4,720 per affordable unit required in 1997 dollars. The in-lieu fee amount may be updated by the County housing agency on an annual basis. The in-lieu fee amount shall be calculated based on the lowest, generally available interest rate for a thirty-year fixed mortgage on September 1 of each year.

(2) Provision of affordable housing units on property other than the land which has been the subject of the rezoning.

(3) Provision of developable land. The amount of land required will be determined by an assessment of value (by appraisal) of that contribution measured against the projected in-lieu fee value that would otherwise have been required.

(4) Provision of infrastructure/services. Contributions of infrastructure and services may be accepted to satisfy affordable housing requirements. The infrastructure or services provided must be directly related to the provisions for affordable housing units. The value of the contribution will be measured against the in-lieu fee amount that would otherwise have been required as the basis for allocating credit.

(5) Any other means which are approved by the County housing agency.

(d) An implementation plan to satisfy affordable housing requirements shall be approved prior to the issuance of any building permit for the market project upon which the requirements were imposed. The County housing agency shall determine the implementation period based upon the specific circumstances of each case.

(1998, Ord. No. 98-1, sec. 2.)

Section 11-5. Requirements for rezonings involving resort and industrial uses.

(a) Requests for rezonings involving resort uses generating more than one hundred employees will be assessed based on an analysis of full-time or full-time equivalent jobs generated, the resultant number of households to be supported by those jobs, and the projected number of those qualified households which are described below. The employee-related affordable housing condition shall be satisfied as follows:

(1) The provision of twenty-five affordable housing units for every one hundred resort employees generated as a result of the rezoning activity. The affordable housing units shall be affordable to those qualified households earning between fifty percent and one hundred forty percent of the median income of a family of four;

(2) In the alternative, the rezoning approval-holder or its designee may submit a housing needs assessment to the County housing agency as a basis for a determination of the applicable employee housing requirement for a specific development and a plan for implementation, meeting with the approval of the County housing agency.

(3) The number of affordable housing units shall not exceed the maximum of one employee unit for every two hotel units built as provided in the County of Hawai'i General Plan.

(b) Requests for rezoning which proposes the establishment of industrial uses generating more than one hundred employees will be assessed based on an analysis of jobs generated, the resultant number of households to be supported by those jobs, the projected number of qualified households which may be entitled to housing assistance, and other factors as may be identified. The rezoning approval-holder or its designee shall submit a housing needs assessment to the County housing agency as a basis for a determination of the applicable employee-related affordable housing requirement and plan for implementation meeting with the approval of the County housing agency.

(c) Satisfaction of these requirements will be accomplished through the use of the following alternatives:

(1) Provision of affordable housing units within or without the land which has been the subject of the rezoning.

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(2) In lieu of the provision of affordable housing units, the affordable housing requirement may be satisfied in the following ways, the value of which shall be based upon a calculation of in-lieu fees for a particular rezoning:

(A) Payment of in-lieu fees. These fees are calculated by determining the amount of subsidy required to provide housing units affordable to our target groups. The in-lieu fee amount, averaged for the various target groups to be served, amounts to four thousand seven hundred twenty dollars per affordable unit required in 1997 dollars. The in-lieu fee amount may be updated by the County housing agency on an annual basis. The in-lieu fee amount shall be calculated based on the lowest, generally available interest rate for a thirty-year fixed mortgage on September 1 of each year.

(B) Provision of developable land. The amount of land required will be determined by an assessment of value (by appraisal) of that contribution measured against the projected in-lieu fee value that would otherwise have been required.

(C) Provision of infrastructure/services. Contributions of infrastructure and services may be accepted to satisfy affordable housing requirements. The infrastructure or services provided must be directly related to the provisions for affordable housing units. The value of the contribution will be measured against the in-lieu fee amount that would otherwise have been required as the basis for allocating credit.

(D) Any other means which are approved by the County housing agency.

(d) An implementation plan to satisfy affordable housing requirements shall be approved prior to or in conjunction with the development of new resort or industrial facilities which will generate employment. The County housing agency shall determine the implementation period based upon the specific circumstances of each case and prevalent economic and regional housing conditions.

(1998, Ord. No. 98-1, sec. 2.)

Section 11-6. Waiver of additional requirements.

Additional affordable housing requirements for rezoning of off-site property for the development of affordable units in satisfaction of existing affordable housing requirements shall be waived, provided that the parcel is utilized exclusively for the provision of affordable units. Additional market rate units produced on such parcel will be assessed based on the provisions outlined in Section 11-4(a) above.

(1998, Ord. No. 98-1, sec. 2.)

Section 11-7. Section 201E projects.

The County's exemption authority, as contained in HRS 201E, may be utilized to expedite change of zone requests, subdivision applications, and plan review as well as the consideration of reduced development standards.

(1998, Ord. No. 98-1, sec. 2.)

Section 11-8. Effect on existing requirements.

This policy supersedes all previous affordable housing requirements. Any affordable housing condition or portion thereof in a prior rezoning ordinance which has not been fully satisfied as of the effective date of this policy may be re-assessed, to the extent it has not been fully satisfied, pursuant to this policy upon the initiation of the person or entity which is legally required to satisfy such condition. However, in no event shall the County of Hawai'i reimburse or be obligated to reimburse any person or entity for the partial or full satisfaction of an affordable housing condition in any ordinance which became effective prior to the effective date of this policy.

(1998, Ord. No. 98-1, sec. 2.)

INCOME SCHEDULE BY FAMILY SIZE

HAWAII

THE FOLLOWING TABLE PRESENTS INCOME LIMITS BY FAMILY SIZE AND BY PERCENTAGES OF THE MEDIAN INCOME ESTABLISHED BY HUD. THESE INCOME LIMITS SERVE AS GUIDELINES TO ESTABLISH SALES/RENTAL PREFERENCE. IT IS SUGGESTED THAT THE INCOME FIGURES BE ROUNDED TO THE NEAREST $50.

THE 2004 HUD MEDIAN INCOME IS: **$51,000**

% OF MEDIAN	INCOME LIMITS BY FAMILY SIZE 1 PERSON	2 PERSON	3 PERSON	4 PERSON	5 PERSON	6 PERSON	7 PERSON	8 PERSON
Adjustments for family size	0.7000	0.8000	0.9000	1.0000 Base	1.0800	1.1600	1.2400	1.3200
10%	3,860	4,410	4,960	5,510	5,950	6,390	6,830	7,270
20%	7,720	8,820	9,920	11,020	11,900	12,780	13,660	14,540
30%	11,550	13,200	14,900	16,550	17,850	19,150	20,500	21,800
40%	15,440	17,640	19,840	22,040	23,800	25,560	27,320	29,080
50%	19,300	22,050	24,800	27,550	29,750	31,950	34,150	36,350
60%	23,160	26,460	29,760	33,060	35,700	38,340	40,980	43,620
70%	27,020	30,870	34,720	38,570	41,650	44,730	47,810	50,890
80%	30,850	35,250	39,650	44,100	47,600	51,150	54,650	58,200
90%	34,740	39,690	44,640	49,590	53,550	57,510	61,470	65,430
100%	35,280	40,320	45,360	50,400	54,432	58,464	62,496	66,528
110%	38,808	44,352	49,896	55,440	59,875	64,310	68,746	73,181
120%	42,336	48,384	54,432	60,480	65,318	70,157	74,995	79,834
130%	45,864	52,416	58,968	65,520	70,762	76,003	81,245	86,486
140%	49,392	56,448	63,504	70,560	76,205	81,850	87,494	93,139

HUD determines the median, very low (50%), and low (80%) income limits. Adjustments are made by HUD for areas with unusually high or low family income or housing cost to income relationships. Pursuant to rules for the Low Income Housing Tax Credit Program, the 60% income limit is calculated as 120% (60/50) of the very low income limit for each family size. The income limits for other income groups of less than 80% are calculated in the same way. The remaining income limits are calculated as a percentage of the median income for a family of four (the base) with adjustments for family size (e.g., income for a 3-person family is 90% of the base, income for a 2-person family is 80% of the base, etc.).

AFFORDABLE SALES GUIDELINES*

COUNTY	HAWAII		FAMILY SIZE:		4						
% of Median	50%	60%	70%	80%	90%	100%	110%	120%	130%	140%	
$ Income	$27,700	$33,240	$38,780	$44,300	$49,860	$51,000	$56,100	$61,200	$66,300	$71,400	
5.760%	$116,500	$139,700	$163,000	$186,200	$209,600	$214,400	$235,900	$239,860	$239,860	$239,860	Hula Mae
0.000%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	Hula Mae
5.500%	$119,800	$143,800	$167,800	$191,600	$215,700	$220,600	$242,700	$264,700	$286,800	$308,900	
5.750%	$116,600	$139,900	$163,200	$186,400	$209,900	$214,600	$236,100	$257,600	$279,000	$300,500	
6.000%	$113,500	$136,200	$158,900	$181,500	$204,300	$208,900	$229,800	$250,700	$271,600	$292,500	
6.250%	$110,500	$132,600	$154,700	$176,700	$198,900	$203,400	$223,800	$244,100	$264,500	$284,800	
6.500%	$107,600	$129,200	$150,700	$172,100	$193,700	$198,200	$218,000	$237,800	$257,600	$277,500	
6.750%	$104,900	$125,900	$146,900	$167,800	$188,800	$193,100	$212,400	$231,800	$251,100	$270,400	
7.000%	$102,300	$122,700	$143,200	$163,500	$184,100	$188,300	$207,100	$225,900	$244,800	$263,600	
7.250%	$99,700	$119,700	$139,600	$159,500	$179,500	$183,600	$202,000	$220,300	$238,700	$257,100	
7.500%	$97,300	$116,800	$136,200	$155,600	$175,100	$179,100	$197,100	$215,000	$232,900	$250,800	
7.750%	$95,000	$114,000	$133,000	$151,900	$170,900	$174,800	$192,300	$209,800	$227,300	$244,800	
8.000%	$92,700	$111,300	$129,800	$148,300	$166,900	$170,700	$187,800	$204,900	$221,900	$239,000	
8.250%	$90,600	$108,700	$126,800	$144,800	$163,000	$166,700	$183,400	$200,100	$216,800	$233,400	
8.500%	$88,500	$106,200	$123,900	$141,500	$159,300	$162,900	$179,200	$195,500	$211,800	$228,100	

1. Based on 2004 median income established by HUD for various family sizes. County of Hawaii. Adjustments to the very low- (50%) and low-income (80%) limits are made by HUD for areas with unusually high or low family income or housing costs. Most income limits are proportionately based on very low-income limits. Thus, the four-person "60%" income limit is 120% (60/50ths) of the four-person very low-income limit.
2. Mortgage term: 30 years
3. Housing expense of 28% of annual income.
4. Down payment of: 5% for those earning 140% and below median income;
5. Hula Mae Rate: 5.760%
   Hula Mae Rate: 0.000%
6. Effective 3/20/02, Hula Mae income and new construction sales price limits are as follows:
   Income limits by family size:

	1 or 2	3+	New construction price
Honolulu	$75,120	$87,640	$241,480
Other Counties	$71,160	83,020	239,860

AFFORDABLE RENT GUIDELINES*

Affordable rents are based on 30% of income (including utilities)**

Area		Studio	1 Bedroom	2 Bedrooms	3 Bedrooms	4 Bedrooms
HAWAII	$51,000					
30% of Median		$288	$309	$372	$430	$478
50% of Median		$482	$516	$620	$716	$798
60% of Median		$579	$620	$744	$860	$958
80% of Median		$771	$826	$991	$1,146	$1,278
100% of Median		$882	$945	$1,134	$1,310	$1,461
120% of Median		$1,058	$1,134	$1,360	$1,572	$1,753
140% of Median		$1,234	$1,323	$1,587	$1,834	$2,046

*Please note that area market rents may be lower than these rent guidelines.

**Monthly rent levels would include the cost of the following utilities: water, sanitary sewage service, electricity and gas (where applicable). Please refer to the Utility Allowance Schedules for each island.

Based on 2004 HUD median income established by HUD for the County of Hawaii.

Appendix O
Cave Fauna Report

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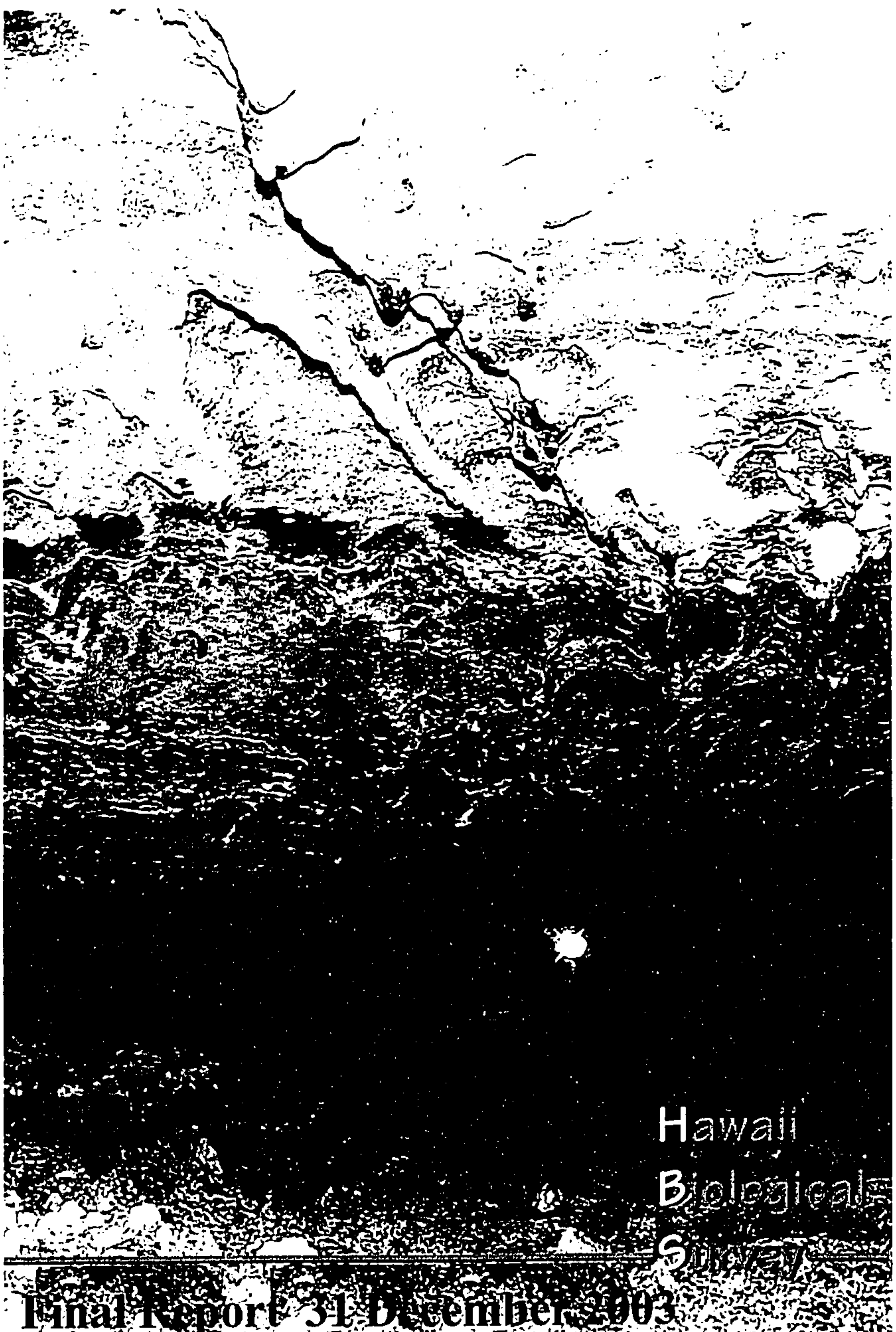

FINAL REPORT

Biological Assessment of the Lava Tubes of the Hiluhilu Development Area, Kaū, North Kona, Hawai'i

Prepared for:
Hiluhilu Development, LLC
c/o Island Advisors, Inc.
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December 2003
Contribution No. 2003-023 to the Hawaii Biological Survey

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EXECUTIVE SUMMARY

This report presents the results of a biological reconnaissance of 23 caves (lava tubes) conducted from 8 to 15 September 2003 within a portion of the Ahupua'a of Kaū, identified as TMK# 3-7-2-05:1. This assessment was undertaken at the request of Hiluhilu Development, LLC, to provide information for an Environmental Impact Statement. The objectives of the survey were to 1) conduct a biological survey of the caves; 2) identify all biologically significant caves found; 3) list the invertebrate species found in the caves; and 4) provide recommendations on management of the more significant caves. The project area covers approximately 725 acres and is located between Queen Ka'ahumanu and Mamalahoa Highways. Lava tubes characteristically form in *pāhoehoe* lava, which cover over one-half of the surface of the project area, but there are also large areas of *'a'ā*. The lava flows are undated but are believed to be between 1,500 and 10,000 years old.

The 23 lava tube segments investigated are grouped into six lava tube systems and 3 isolated caves. Five cave segments in four systems entered the deep cave zone environment (i.e., perpetually dark, moist passage with a stable air mass saturated with water vapor) and supported obligate cave-inhabiting species. The biologically significant caves found are 1) Cave 14338 near the northeast boundary; 2) Cave 14368C along the middle of the of the northern boundary; 3) Cave 14375B south of the main access road near the middle of the southern boundary; and 4) and 5) two segments within Cave 14350 lava tube system. The latter trends about 600 m downslope from near the middle of the eastern boundary. Eighteen species of arthropods were found, of which five (28%) are native to Hawai'i. Three are obligate cave-adapted species: a springtail (*Sinella* cf. *yosiia*); an undescribed moth (*Schrankia* species); and an undescribed sowbug (*Littorophiloscia* species). These obligate cave species probably have a limited distribution within the lowland western slopes of Hualālai. No officially recognized rare species were found. However, the presence of suitable habitat, supporting native plant roots and obligate cave-inhabiting species indicate that a cave ecosystem occurs within the project area. Additional native cave species very likely live in the cave-like voids in the young lava flows.

The five caves found that contain a deep cave zone environment deserve protection. In addition, early Hawaiians intensively used four of these cave segments for water catchment. The exploitation of water resources in caves was paramount in allowing Hawaiian communities to live in dry, harsh environments, such as at Hiluhilu. Two caves (14368C and 14338) are already designated to be preserved. Protection of Cave 14375B and the two segments in the Cave 14350 system, along with at least part of the natural surface environment and flora over the footprints and adjacent buffer areas is strongly recommended. Major threats to cave ecosystems include 1) alteration or elimination of food and water inputs through changes in land use, 2) alteration of airflow and microclimate in caves by disturbance of the surface, 3) waste disposal and pollution, 4) invasions by alien species, and 5) direct and indirect disturbance of the habitat by human visitors. A resource management plan should be developed to address mitigation measures to minimize the impacts upon the cave ecosystems, such as:

- Place significant caves along with a suitable buffer area of the surface surrounding the cave footprints within protected reserves.

- Control harmful invasive species within the cave reserves (especially fountain grass), and prevent the introduction of additional harmful invasive species.
- Monitor the surface vegetation over the cave footprints, and where possible, take remedial steps to encourage recovery of deep-rooted native species.
- Prevent wildfires.
- Exercise due care to minimize the amount of surface disturbance during construction activities in the vicinity of significant caves.
- Minimize the addition of topsoil or other impermeable material to the surface directly above sensitive areas (that is, over deep cave zone passages) within the significant caves.
- Consider including mitigation to minimize impacts on the cave ecosystem when managing open space, where appropriate.
- Consider gating especially sensitive and significant caves.
- Conduct additional biological surveys and ecological studies in caves by competent cave biologists with the goal of determining appropriate protective management strategies for subterranean ecosystems.
- Conduct biological surveys of cave segments discovered during project development.

INTRODUCTION

This report presents the results of a biological reconnaissance of the caves or lava tubes conducted from 8 to 15 September 2003 within a portion of the Ahupua'a of Kaū, identified as TMK# 3-7-2-05:1. The project area covers approximately 725 acres and is located between Queen Ka'ahumanu and Mamalahoa Highways. The elevation extends from about 150 to 900 feet. Moisture increases with elevation, and the grassland and barren lava fields that cover most of the lower portion transition to a low stature dry forest in the upper portion (**Figure 1**). No previous biological studies of caves have been reported from the project area, and in general, the cave fauna of Hualālai remains poorly known. Stone and Howarth (1993) reported on a biological survey of caves at Kīholo Bay a few miles north of the current study area, and Howarth and colleagues have investigated a few caves on the western slope of Hualālai (e.g., Hoch and Howarth, 1993).

The lava flows within the project area are undated but are believed to be between 1,500 and 10,000 years old (Moore et al. 1987, Orr 2003). Over one-half of the surface is covered by *pāhoehoe* lava, but there are also large areas of *'a'ā*. Lava tubes generally form in *pāhoehoe*, although subsequent *'a'ā* flows can cover a lava tube and obscure its mode of formation. Compared to other flows on Hawai'i Island that have been surveyed for caves, the *pāhoehoe* within the project area contains a relatively high number of lava tubes. Clarke et al. (2003) list 22 of the 83 recorded archeological sites (26%) that are associated with one or more entrances into caves. Many of these are reported to enter short shelter cave segments, but their presence suggests that larger lava tubes may occur in the vicinity. The known larger cave systems are concentrated in 3 areas: 1) in a line extending downslope about 600 m from the middle of the eastern boundary; 2) south of the main access road near the middle of southern boundary; 3) and along the middle of the northern boundary. An additional >100 m-long lava tube is located near the northeastern corner of the project area.

This assessment was undertaken at the request of Hiluhilu Development, LLC, to provide information for an Environmental Impact Statement. The objectives of the survey were to 1) conduct a biological survey of the caves; 2) identify all biologically significant caves found; 2) list the invertebrate species found in the caves; and 3) provide recommendations on management of the more significant caves. Special efforts were devoted to searching for obligate cave-inhabiting species, especially those considered rare. No cave species on Hawai'i Island is currently listed as an endangered or threatened species by the U.S. Fish and Wildlife Service (USFWS) USFWS or the State of Hawai'i. However, several species are considered "species of concern" (SOC), a category created for species considered rare but for which more information is needed to determine their conservation status. Populations of species of concern expected to occur within caves in the project area include *Caconemobius* and *Thaumatogryllus* crickets, *Oliarus* planthoppers, and the cave thread-legged bug, *Nesidiolestes ana* Gagne and Howarth. Less likely but possible is the terrestrial water treader *Cavaticovelia aaa* (Gagne and Howarth). In addition, many Hawai'i Island cave animals have diverged into distinct geographic populations (or species) so that each lava tube system may harbor a unique community of animals different from relatives found in neighboring systems. This happenstance makes Hawaiian caves ideal natural laboratories for biological studies and worthy of protection.

Two Kaua'i cave invertebrates: the no-eyed, big-eyed wolf spider (*Adelocosa anops* Gertsch 1973) and the terrestrial amphipod (*Spelaeorchestia koloana* Bousfield and Howarth 1976) are officially listed as endangered by the USFWS and the State of Hawai'i; however, they do not occur on Hawai'i Island.

Hawaiian Cave Ecosystems

Caves support discrete ecosystems composed of communities of highly specialized organisms that have adapted to live in what is considered a rigorous, stressful physical environment. The subterranean environment is inhospitable for most organisms; being perpetually dark and humid, lacking normal environmental cues used by surface species, and with a complex three-dimensional maze-like form, lethal or sublethal gas mixtures, scattered food resources, unforgiving rocky substrates, and wet slippery vertical surfaces (Howarth 1993). The physical environment is rigidly constrained by the geological and environmental setting and can be defined with great precision because it is surrounded and buffered by thick layers of rock. Because the environment is discrete, rigorous, and easily defined, it provides an ideal ecosystem in which to conduct biological studies (Culver 1982, Howarth 1983a).

Howarth (1981a, 1981b) described the Hawaiian cave ecosystem. The main energy sources in Hawaiian lava tube ecosystems are plant roots, which often penetrate into cavernous lava; organic matter, which washes into the caves with percolating rainwater; and accidentals, which are surface and soil animals blundering into the caves. Both living and dead roots are utilized, and this resource is usually the most important. Furthermore, both rainwater and accidentals often use the same channels as pathways to enter caves, so that root patches often provide food for a wide diversity of cave organisms. These resources support discrete subterranean communities comprising root-feeders, scavengers, and predators. The importance of roots in the cave ecosystem makes it desirable to identify the major plant species. Unfortunately, this has proven difficult to do, although a few are known. The native pioneer tree on young lava flows, *'ōhi'a* (*Metrosideros polymorpha*), is the most important source of roots, especially in wetter climates. The native shrubs, *a'ali'i* (*Dodonaea viscosa*) and *maiapilo* (*Capparis sandwichiana*), are locally important in drier habitats.

Some cave-adapted species on Hawai'i Island have diverged into small, distinct, geographically restricted populations or even separate species. For example, the Hawai'i Island cave planthopper, *Oliarus polyphemus*, is widespread in young lava tubes on Kīlauea, Mauna Loa, Hualālai and Mauna Kea, virtually wherever its host tree, the endemic *Metrosideros polymorpha*, grows over suitable caves. However, in a study of its mating behavior, Hoch and Howarth (1993) found that each of the seven cave populations tested used unique substrate-borne calls as premating recognition signals. Even populations in neighboring caves without known barriers had different calls, and one cave supported two populations each with a unique call. Their calling behavior indicates that these populations are reproductively isolated; that is, distinct species. Armed with these results, Hoch (unpublished) re-examined their morphology and found small but consistent differences corroborating the behavioral data.

Preliminary studies suggest similar divergence in *Caconemobius* crickets (Otte 1994), *Schrankia* moths, and other groups. Such diversity must be considered in conducting ecological research and conservation programs.

Environmental Zones

Caves are strongly zonal environments. Five zones are recognized; each with a different community of organisms and each defined on the basis of its physical environment, in particular the amount of light, moisture, airflow, gas concentration, and evaporative power of the air. The 5 zones are the **Entrance, Twilight, Transition, Deep,** and **Stagnant Air Zones**, the boundaries of which are determined by the shape of the passage. Constrictions, including n- or u-shaped configurations (Howarth 1993), often bound each zone. However, these factors are often highly dynamic with the boundaries shifting in response to changing seasons. Animals living in one zone may make brief forays into neighboring zones for food, dispersal, or even by accident, complicating predictions on animal distributions in caves. Nevertheless, the zonal model provides a useful classification scheme for understanding cave ecology.

Entrance Zone. This is the zone of mixing of the surface and underground communities. It is often richer in species than either neighboring habitat since it supports a more mesic community of plants and leaf litter arthropods than is found in nearby surface habitats. Surveying the fauna and flora of entrances was beyond the scope of the present study, but these entrances can be important conservation areas on their own since plant and animal communities are sometimes protected from ungulate grazing and other disturbances.

Twilight Zone. As the name implies, this is the area with reduced light between the limit of vascular green plants and the region of total darkness. The twilight zone is usually dry, with a high potential evaporation rate. Species diversity is low and is mostly composed of waifs from neighboring zones. Web-building predators (e.g., scytodid, loxoscelid, and pholcid spiders) often are the dominant residents. Several native moth species once used this zone as a daytime roost, but the group is now very rare or extinct.

Transition Zone. The area adjacent to the twilight zone is characterized by total darkness and a variable abiotic environment, especially changing humidity level, airflow, and potential evaporation rate. In Hawai'i, as in the tropics generally, desiccating air enters caves at night whenever the outside temperature falls below cave temperature. The more accessible passages in larger caves are often within this zone. Because this zone is alternately wet and dry almost on a daily basis, secondary minerals leaching from the lava often accumulate on exposed surfaces. Species diversity is generally low, but local moist areas can be temporarily colonized by both obligate and facultative cave species. The native cave-roosting moths once probably also used this zone as a daytime retreat.

Deep Cave Zone. Beyond the transition zone is a totally dark zone where the air remains still and saturated with water vapor, the substrate remains moist, and the potential evaporation rate is negligible. There is usually a constriction in the passage that creates a barrier to air exchange and marks the boundary between the transition zone and the deep cave zone. The deep cave zone environment also often occurs in dead-end upwardly sloping passages, since water vapor is lighter than air and remains trapped in such passages.

Stagnant Air Zone. Where air exchange is restricted even further, the atmosphere periodically stagnates, and gas concentrations, particularly carbon dioxide, become stressful. This zone is believed to be the characteristic environment associated with cracks and voids within cavernous rock strata.

Distribution of Obligate cave animals within caves

Obligate cave animals are adapted to live in the persistently moist saturated atmospheres of the deep and stagnant air zones. Besides passages enterable by humans, obligate cave animals also inhabit the numerous intermediate-sized voids in cavernous rock strata, which are often in the stagnant air zone because of the constricted connections to the surface (Howarth 1993). These buffered inner zones have a nearly constant temperature, which approximates the regional mean annual temperature of the surface over the cave.

Succession

Just as the surface communities over caves change with time, Hawaiian lava tube communities undergo ecological succession (Howarth 1996). Unlike soil, which acts as a filter trapping nutrients and water, the voids in cavernous rock strata act as conduits that transport organic resources deep underground beyond the reach of most surface species. Cave-adapted animals are highly specialized to exploit subterranean resources within the anastomosing system of interconnected medium-sized voids. They colonize caves only where their unique environment is found. Thus, caves can be envisioned as windows that allow access into the subterranean habitat to study the organisms and monitor the health of the ecosystem.

Young basalt contains numerous voids of varying sizes interconnected into an extensive anastomosing system. The surface is barren and organic material accumulating on the surface quickly washes into the deeper cracks and voids. Obligate cave animals evolved to exploit these resources. As the lava weathers, these spaces fill with soil and detritus and the interconnectedness of the habitat for cave animals becomes more restricted until it is too small to support the animals. In addition, the soil captures organic material and moisture preventing these from percolating deeper. Concomitantly, the larger, more open cave passages dry out, and food and water become more and more concentrated in upper level shallow passages. The cave fauna moves upward, tracking its food and moisture supply, so that in intermediate aged lava flows, the cave fauna sometimes survives in shallow voids.

METHODS

Fieldwork

Fieldwork was conducted from 8 to 15 September 2003. Caves were located using the map of archaeological resources prepared by Clark et al. (2003). Highest priority was given to investigating caves that appeared promising from the archaeological description, but other entrances found were also investigated. The locations of cave entrances were determined using a Garmin "etrex summit" handheld GPS unit. To find additional entrances as well as to better understand the relationship of the caves to the lay of the land within the project area, Mr. Roger Harris of Hiluhilu, LLC, kindly arranged for a helicopter flight for aerial reconnaissance.

Caves were entered and surveyed for biological resources using standard speleological techniques taking great care not to disturb the environment or any cave resources present (including any geological or cultural material). For safety and efficiency in working underground, two experienced people worked in the caves as a team. Dry passages were quickly traversed in search of the characteristic damp areas indicating the entry into the deep cave zone environment. These suitable deep cave zone passages were searched visually for animals concentrating on roots and other organic material present (**Figure 2**). Notes on the physical environment of the passages were taken.

Figure 2. Searching for arthropods in Site 14358 Cave with aspirator ready to capture any animals of interest. Photo by D.J. Preston.

Even when present, many specialized cave animals are difficult to find in caves during brief surveys because of their cryptic behavior and the difficulty of working underground. Baits help concentrate the animals. Therefore small amounts of bait were set out to coax the animals into the passage (**Figure 3**). Baits used included sweet potato tubers, oatmeal, bleu cheese, and mushrooms. Since the animals respond to baits very slowly, the baits were left in three wet caves (HBS New Cave, Site 14350 Cave and Site 14375B Cave) and revisited after three or four days. Also, in these three caves one or two pitfall traps were set on ledges to capture foraging arthropods. Each trap consisted of a hard plastic drinking cup with a small amount of alcohol as a preservative and cheese or mushrooms smeared around the rim as bait. After three or four days the traps were retrieved, and the passage and baited areas intensively searched again for specialized cave animals. Any remaining bait was removed following the last inspection.

Voucher specimens of each species were collected to confirm their identification and document the survey. These voucher specimens are deposited in the Hawaii Biological Survey collection at Bishop Museum.

Figure 3. Sweet potato bait near roots in HBS New Cave. Photo by D.J. Preston.

Root Identification

Because plant roots provide the major energy resource for the cave community, it is important to identify the roots present in caves in order to more effectively mitigate disturbance on the surface as well as protect the cave ecosystem. Unfortunately, this has proved difficult to do since roots often change form as they grow deeper or encounter different environmental conditions (**Figure 4**). The advent of molecular techniques provides a useful tool to solve this problem. Five root samples, representing three different types, were collected in the wet side passage in Site 14350 Cave and placed immediately into separate clean plastic vials. One additional sample of a very different root was collected in Site 14338 Cave. The samples were returned to the Pacific Center for Molecular Biodiversity, the molecular laboratory at Bishop Museum, where they were processed and identified using standard techniques. Briefly, this involved extracting the pure DNA and making multiple copies of a region that is known to vary among plant groups. The copied region of the unknown DNA was sequenced (i.e., the nucleotides were identified in the order that they occurred along the DNA molecule), and the sequence compared to those of known species. The specific techniques are as follows:

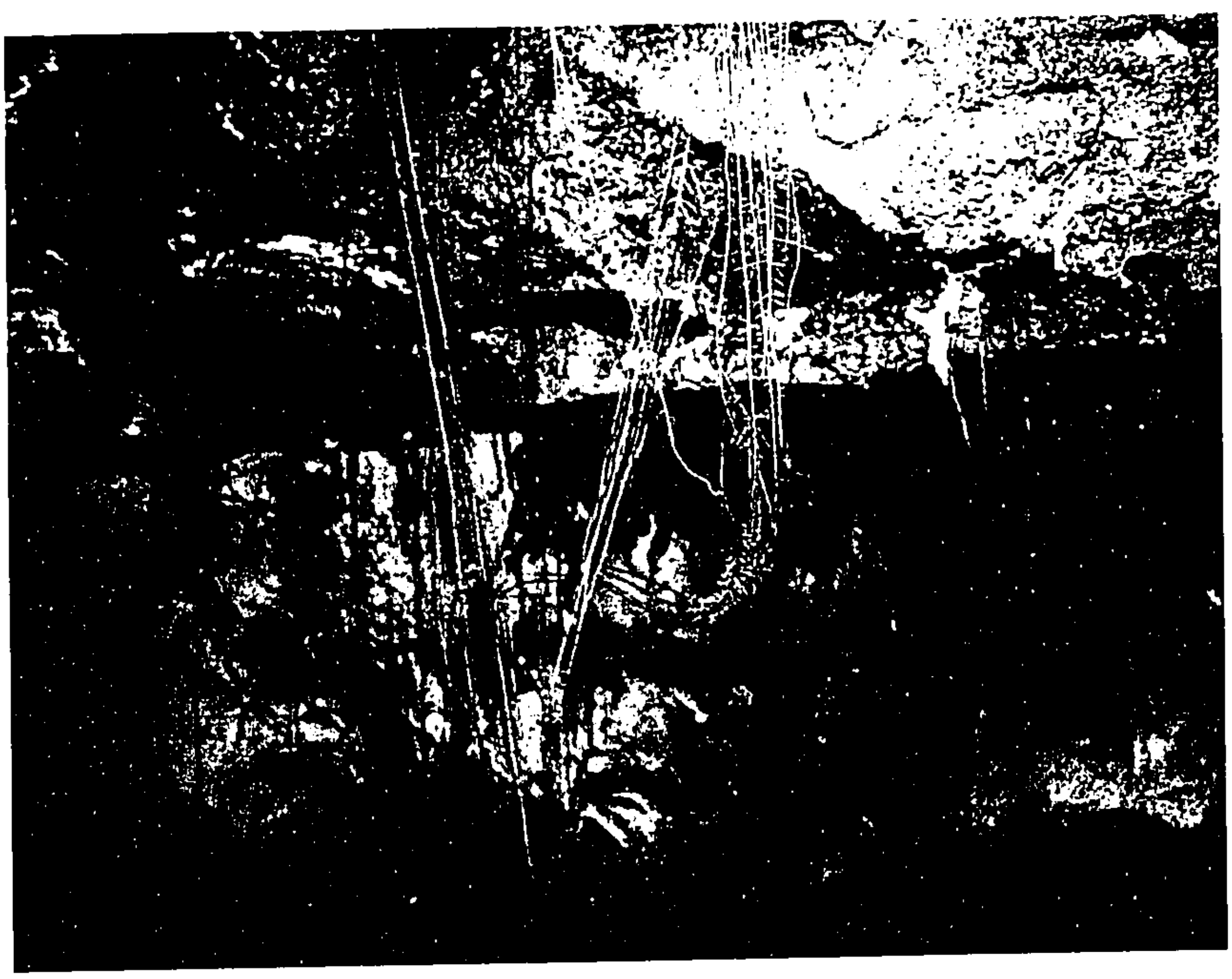

Figure 4. Roots in HBS New Cave. Photo by D.J. Preston.

Genomic DNA was extracted from approximately 6 mg of root material using the DNeasy Plant Mini Kit (Qiagen), following the manufacturers instructions, with the extra step of adding 0.67 μg Pronase E and incubating at 60 °C for 30 min. The primer pairs ITSA (5'-3': GGAAGGAGAAGTCGTAACAAGG) and ITSB (5'-3': CTTTTCCTCCGCTTATTGATATG) were used to amplify the complete ITS (internal transcribed spacer) region (ITS1, 5.8S rRNA gene, ITS2). Gene amplification was performed in a MJ Research, Inc. PTC-100 Programmable Thermal Controller as follows: 45 cycles of denaturation at 94 °C for 1 min, primer annealing at 50 °C for 1 min, extension for 1 min at 72 °C, and a final extension of 5 min at 72 °C. Polymerase chain reaction (PCR) amplifications were performed in 50 μL of a solution containing approximately 10 ng of genomic DNA, 400 μM of each dNTP, 1.5 unit Taq Polymerase (Promega), 2 mM $MgCl_2$, each primer at 1 μM, and buffer. PCR products were cleaned for sequencing using the QIAquick PCR purification kit (Qiagen) according to the manufacturer's specifications. The double stranded PCR products were sequenced using the ABI PRISM BigDye Terminator v3.1 Cycle Sequencing Kit (Applied Biosystems). Sequences were determined by the Brigham Young University Sequencing Center on an automated sequencer. Sequences were aligned by eye. A nucleotide-nucleotide BLAST search was performed for the sequences using GenBank (http://www.ncbi.nlm.nih.gov/BLAST/). Confirmation of species identification was performed by comparing the root sequences to those of identified leaf material.

RESULTS

CAVE DESCRIPTIONS

Twenty-three cave segments were investigated. These can be grouped into 6 systems and 3 isolated segments **(Figures 5a and 5b, Table 1)**.

Site 14350 Lava Tube System

This lava tube system is located near the middle of the project area between about 275 and 250 m elevation. It consists of 3 separate cave segments that are aligned along an altitudinal gradient within a single lava flow. The segments are separated by only a few tens of meters, and the specialized cave animals are able to disperse within the lava voids between them. The lava flow is undated but is relatively young, probably a few thousand years old. The surface is vegetated with small trees and shrubs with a thin veneer of soil and grass groundcover, yet the exposed lava shows little sign of weathering. The presence of numerous areas of exposed *pāhoehoe* lava, cracks and holes on the surface indicates that potential cave habitats are widespread within the lava flow.

Site 14339 Cave. This is the upslope cave segment in the 14350 System. Its single entrance is located at the downslope end of a sinuous trench about 25 m long and leads into a 45-m long cave, which trends downslope. The accessible passage is dry and barely extends beyond the twilight zone into the transition zone. No arthropods were collected in the cave.

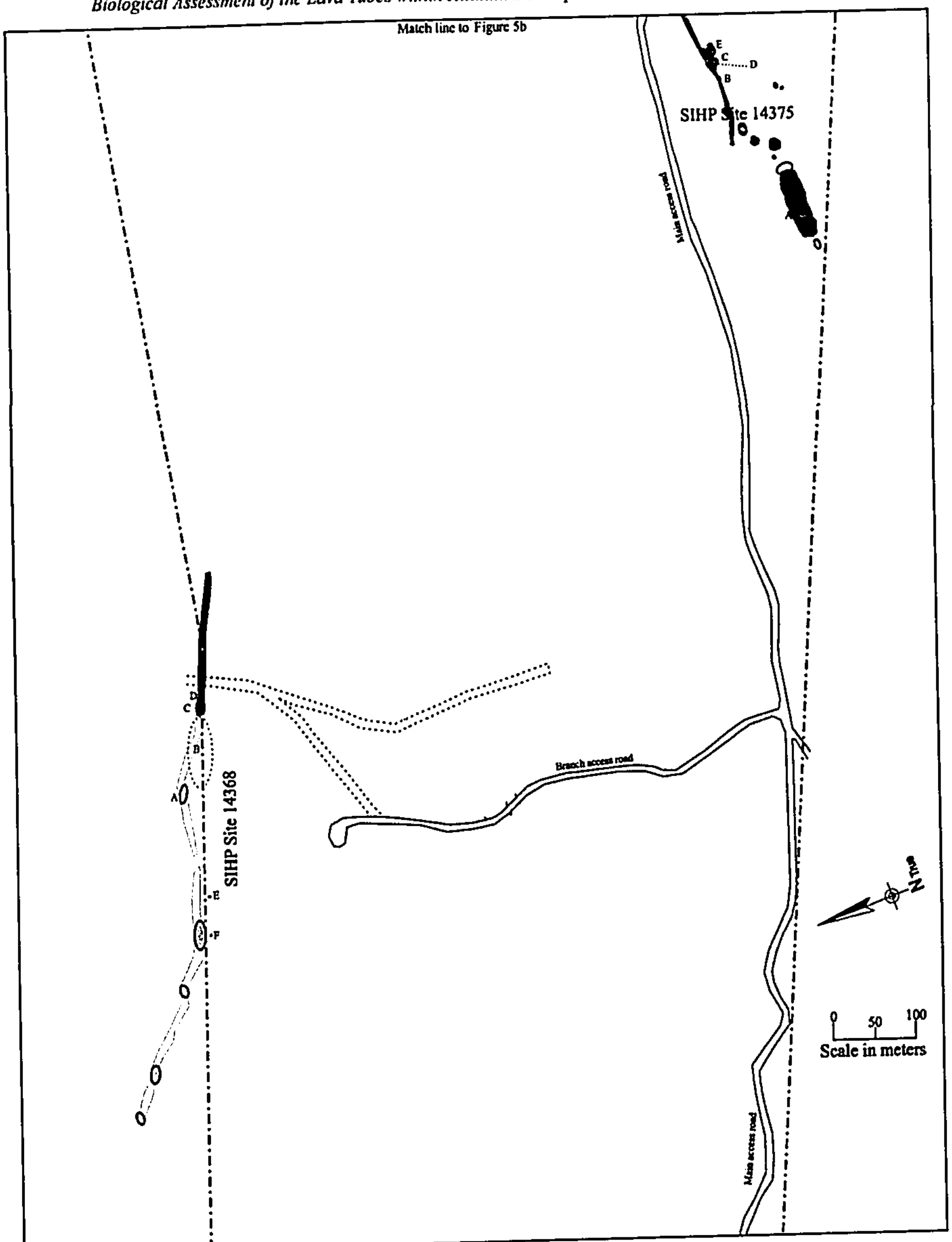

Figure 5a. Site Location Map [Redrawn from Clark et al., 2003]

▌ = Cave sites surveyed by HBS.

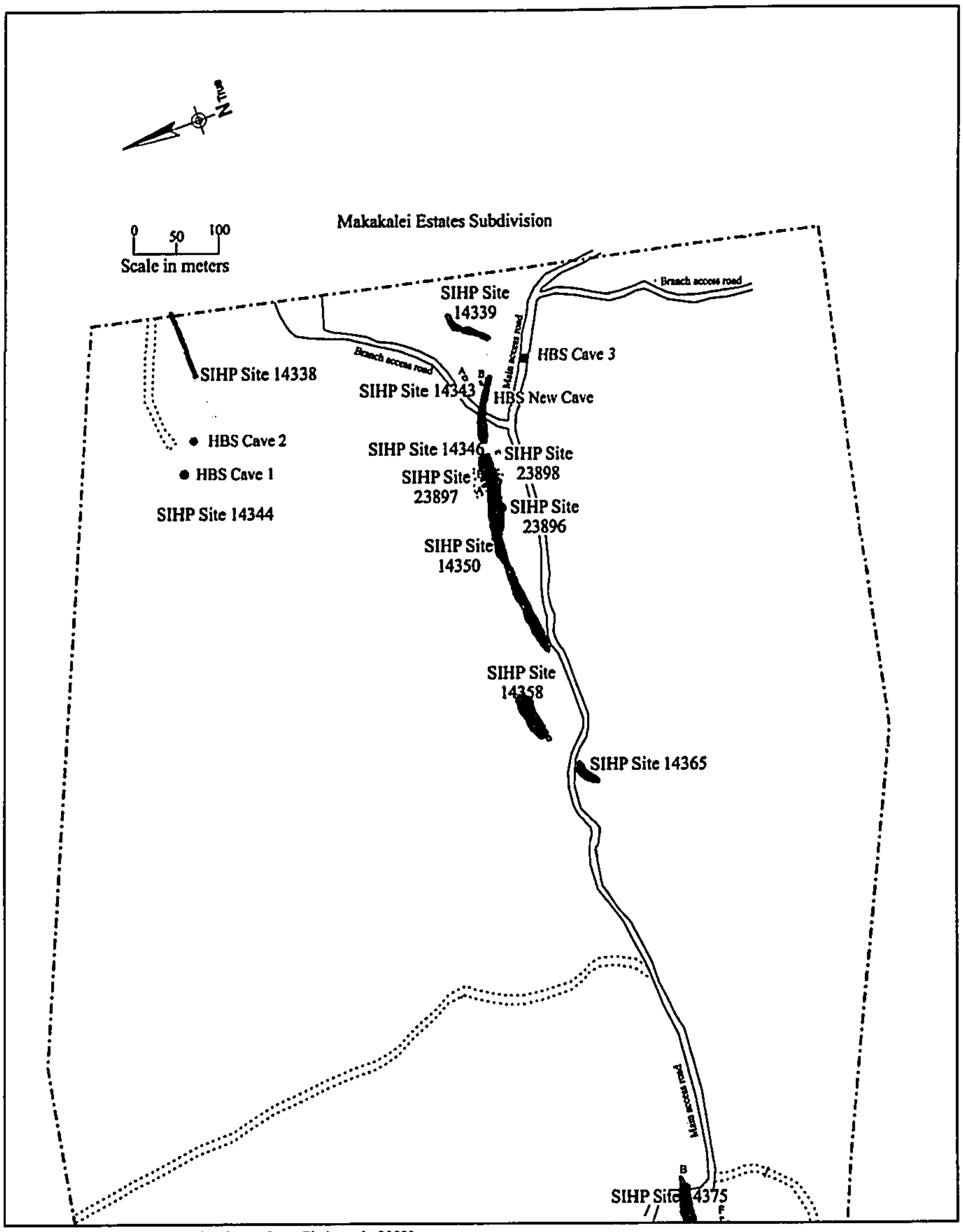

Figure 5b. Site Location Map [Redrawn from Clark et al., 2003]

= Cave sites surveyed by HBS.

Table 1. Caves surveyed for biological resources during the period 8-15 September 2003 at Hiluhilu, Kona, Hawai'i. Site numbers from Clark *et al.*, 2003.

Entrance	Latitude; Longitude (Old HI Datum)	Elevation meters (feet)	Description	Native Cave Species*
Site 14350 Cave System				
Site 14339	19°44.443'N; 155°59.81'W	275 m (900 ft)	Mauka cave segment in 14350 System. Accessible passage trending downslope, 45 m long. Dry. Transition zone	---
HBS New Cave	19°44.43'N; 155°59.85'W To 19°44.44'N; 155°59.89'W	275 m (900 ft) To 265 m (870 ft)	Biologically significant unrecorded cave segment between Sites 14339 and 14346. Passage about 100 m long. Deep cave zone present midway between the two entrances.	**Schrankia* species (cave moth) *Oliarus* cf. *koanoa* (planthopper)
Site 14346	19°44.45'N; 155°59.90'W To 19°44.46'N; 155°59.95'W	265 m (870 ft) To 260 m (850 ft)	The cave is about 100 m long and connects with the cave at Site 14350. Passage dry, but some areas would support obligate cave animals when moist.	---
Site 14350	19°44.46'N; 155°59.95'W To 19°44.45'N; 156°00.01'W	260 m (850 ft) To 250 m (820 ft)	Biologically significant cave is the downslope continuation of 14346. The main passage is over 125 m long. Beyond a constriction in the passage about 30 m below entrance, the cave becomes damp to moist and in Deep cave zone.	**Littorophiloscia* species (cave isopod) **Schrankia* species (cave moth) *Oliarus* cf. *koanoa* (planthopper)
Site 14358 Cave System				
Site 14358	19°44.47'N; 156°00.06'W	245 m (800 ft)	Upslope passage with four branches; largest 15-20 m long and 1.3 m diameter. Downslope passage with four branches; largest >75 m long. Damp with few roots at end. May support cave animals when wet.	---
Site 14365 Cave System				
Site 14365	19°44.45'N; 156°00.12'W	240 m (780 ft)	Cave 50 m long with entrance near middle. Passage dry. A few dry roots present.	---
Site 14375 Cave System				
Site 14375B	19°44.51'N; 156°00.39'W	200 m (650 ft)	Biologically significant cave. Passage about 240 m long, wet areas with roots, cave life and evidence of Hawaiian water catchments.	**Sinella* cf. *yosiia* (cave springtail) *Oliarus* cf. *koanoa* (planthopper) **Schrankia* species (cave moth) **Littorophiloscia* species (cave isopod)

Table 1. (Continued).

Entrance	Latitude; Longitude (Old HI Datum)	Elevation meters (feet)	Description	Native Cave Species*
Site 14375 Cave System (Continued)				
Site 14375E	19°44.50'N; 156°00.44'W	195 m (640 ft)	Large pit entrance; dark cave passage inaccessible.	---
Site 14375C	19°44.48'N; 156°00.46'W	190 m (630 ft)	Large pit entrance; dark cave passage inaccessible.	---
Site 14375	19°44.49'N; 156°00.50'W	185 m (610 ft)	Large pit entrance; dark cave passage inaccessible.	---
Site 14375A	19°44.48'N; 156°00.53'W To 19°44.47'N; 156°00.57'W	180 m (600 ft)	Four large pits in line connected by large dry passage all in twilight.	---
Site 14368 Cave System				
Site 14368C	19°44.943'N; 56°00.71'W	145 m (475 ft)	Biologically significant cave, about 250 m long passage, damp with roots and Hawaiian water catchments.	---
Site 14338 Cave System				
Site 14338	19°44.61'N / 155°59.75'W To 19°44.61'N / 155°59.79'W	290 m (950 ft) To 280 m (920 ft)	Biologically significant cave; upslope passage >30 m long, damp with roots and animals. Downslope passage 125 m long with entrance near midlength with roots and moisture.	*Oliarus* cf. *koanoa* (planthopper) **Schrankia* species (cave moth)
Isolated Cave Entrances				
HBS Cave #1	19°44.63'N; 155°59.83'W	265 m (865 ft)	Small lava tube near surface; cave 1 m high by 3 m wide and 4 m long. All twilight.	---
HBS Cave #2	19°44.64'N; 155°59.85'W	260 m (850 ft)	Small lava tube near surface; cave 1.5 m high by 2.5 m wide and 5 m long. All twilight.	---
HBS Cave #3	19°44.40'N / 155°59.84'W	268 m (880 ft)	Small shallow cave segment broken into by main access road. Cave 1.3 m high by 2 m wide and 6 m long. All twilight.	---

* Indicates obligate cave-adapted species.

HBS New Cave. HBS New Cave is an apparently unrecorded cave segment located between Sites 14339 and 14346. The upper entrance is in a shallow depression about 25 m downslope of the terminus of Site 14339 Cave. A wall of lava boulders, part of which had been breached to gain entrance previous to our visit, partially blocks the entrance. The downwardly sloping passage is 1 m high, 1.5 to 2 m wide and 4 to 5 m long to a tight squeeze into the top of a 2.5-m drop. Below the drop, the sinuous passage (**Figure 6**) is 2 to 3 m high and 1.5 to 4 m wide for about 30 m, after which the passage size decreases to about 3 m wide and 1 to 2 m high for about 60 m to a second entrance. This entrance, which is also fortified, is in a pit 4 m wide and 1.5 m deep. The total passage length is about 100 m.

Figure 6. A portion of the main passage in HBS New Cave. Photo by D.J. Preston.

This is a biologically significant cave, which enters deep cave zone environment and supports obligate cave animals. The constrictions at each entrance buffer the relatively large passage in the middle, trapping humid air. The passage becomes moist about 10 m downslope of the drop, and the damp passage continues until it gradually dries out about 30 m upslope of the lower entrance. One pitfall trap was set near roots on a ledge in the moist room on 10 September 2003 and retrieved on 14 September 2003. In spite of the presence of suitable environment, few animals were seen. The species found are as follows: cocoons of the cave-adapted moth, *Schrankia* species; cast skins of a cixiid planthopper, presumably *Oliarus* cf. *koanoa*; 2 dead individuals of the cane spider, *Heteropoda venatoria;* and spider webs of presumably a *Scytodes* species.

The cave was utilized by Hawaiians for water and a few water catchments lie on the floor in the moist section, and fragments of charcoal from torches are scattered on the floor throughout the cave. There is a possible Hawaiian stepping-stone trail composed of flat *pāhoehoe* slabs about 30 cm across laid about 30 to 60 cm apart in the middle of the cave passage. The trail is in several intermittent sections between the lower entrance and the catchment area. The fortification of the upper entrance would have enhanced the water holding capacity of the cave.

Site 14346 Cave. The main entrance to Site 14346 Cave is in an elongated pit 2 m deep about 15 m downslope of the lower entrance to HBS New Cave. The low walking passage (about 1.5 m high) trends downslope (west) about 50 m to a small skylight in the ceiling. The passage continues beyond the skylight another 60 m to the entrance pit of Site 14350 Cave. Below the skylight, the passage is generally smaller; i.e., averaging about 1 m high. Three small passages branch off the main passage and reconnect in a short distance. The cave is over 100 m long and connects with the cave at Site 14350. The 3 entrances allow outside air to enter and moisture to escape. The presence of roots and absence of secondary minerals indicate that some areas remain moist after rains. The dark inner passage was dry during the survey, but some areas would support obligate cave animals during extended wet periods. No cave arthropods were collected.

Site 14350 Cave. The main entrance to this biologically significant cave is in a small pit, which also is the lowest entrance to Site 14346 Cave. The pit is 2 m wide, 3 m long and 2 m deep. The main passage trends downslope (west) and is over 125 m long. Below the entrance, the passage is initially 1.5 m high and up to 8 m wide. Near the entrance 3 small side passages branch off and reconnect. Twenty meters inside the cave, the passage is constricted to a 0.8 m dia hole. About 10 m beyond the constriction, the cave becomes damp to moist and in a true deep cave zone. The sinuous passage continues another 100 m to the lower entrance and ranges in size between 1 to 3 m high and 2 to 4 m wide (**Figure 7**). The passage shape is irregular with small "rooms" separated by short low sections. The rooms are wetter than the low sections, since the stronger airflow in the smaller passages dries the walls. Some of this moisture condenses on the higher ceilings in the rooms, keeping these moist. Moist areas contained roots and Hawaiian water catchments. Bait was set out in the more promising sections of the passage on 9 September 2003

Figure 7. A portion of the main passage in Site 14350 Cave. Photo by D.J. Preston.

and checked again on 12 September 2003. About 50 m above the lower entrance the passage becomes lower (about 1 m high) and gradually dries out as the entrance is approached. The air temperature 25 m above the lower entrance was 25 °C on 12 September. The cave continues only a short distance, all in twilight, below the lower entrance.

A low side passage heading south was found 50 m below the upper entrance. The side passage is about 15 m long, 2 m wide and 0.5 m high to a room 8 m wide, 10 m long and 1 to 1.4 m high. Within the inner room are luxuriant live roots, drips, Hawaiian water catchments and cave animals. The inner room was baited, and 2 pitfall traps set in ceiling cracks on 9 September 2003 and retrieved on 12 September 2003. The air temperature on 12 September 2003 was 23.5 °C. Five root samples from the room have been identified as the native woody vine (*Cocculus trilobus*) and the introduced silk oak tree (*Grevillea robusta*).

Ten species of arthropods were collected in the cave, mostly in the inner room of the side passage. The native species are the obligate cave-adapted sowbug (*Littorophiloscia* species); obligate cave-adapted moth (*Schrankia* species); the facultative cave-inhabiting cixiid planthopper (*Oliarus* cf. *koanoa*); and the facultative cave-inhabiting springtail (*Entomobrya?* species A). The nonnative species are the sow bug (*Trichorhina tomentosa*); the spitting spider (*Scytodes* species); the American cockroach (*Periplaneta americana*); the ants (*Paratrechina bourbonica* and *Solenopsis* species A); and an unidentified coffin fly (family Phoridae).

Hawaiians extensively used this cave to collect water. Charcoal fragments from torches occurred throughout the cave but the deposits were larger and more conspicuous near the catchments. A few simple water catchments were seen in the side passage. Many more occur along the main passage, including an area with pecked or hammered reservoirs in the floor surrounded by rings of stones (**Figure 8**). These reservoirs were created by pounding and removing the loosened welded *'a'ā* clinker to create a small basin. A large, used hammer stone and fragments of a wooden bowl lie near these catchments.

Figure 8. Pecked or hammered basin for water catchment in the floor in the main passage of Site 14350 Cave. Photo by D.J. Preston.

Site 14358 Lava Tube System

This cave system is probably the downslope continuation of 14350 System, but the 2 caves are about 75 m apart and not in line; therefore, they are treated separately in this report. Additional cave segments may occur between the two systems. In fact, Clark et al. (2003) described and illustrated a large passage trending upslope and containing a 3 m-long tree branch leaning against the wall 40 m upslope of the entrance. Although the 3 entrances in line that we found matched their description, we did not find the large upslope passage.

Site 14358 Cave. Site 14358 Cave has 3 small pit entrances in an east-west line about 25 m long. The middle passages between the 3 entrances consist of 2 low arches about 5 to 10 m long, which are all in twilight. The upslope passage at the eastern entrance divides into 4 branches a short distance from the entrance. The largest passage is about 1.3 m in diameter and 15-20 m long and shrinking to a squeeze at the end. There was little air motion. A few roots grew in crevices, but the passage was mostly in twilight. The downslope passage at the western entrance splits into 4 crawlways about 10 m below the entrance. The largest crawlway was about 1.5 m wide, 0.5 m high and over 75 m long. The partially anchored *'a'ā* clinker on the floor was largely undisturbed, indicating that few humans had previously explored the passage. The passage was damp near the end, and a few roots grew along the wall and into the clinker. No cave arthropods were collected, but the passage may support cave animals especially during extended wet periods. The other crawlways were smaller and became inaccessible in 10 to 20 m. No charcoal or other signs of human use were seen in either the upslope or downslope sections of the cave.

Site 14365 Lava Tube System

Site 14365 Cave. This small cave segment is about 15 m south of the main access road at 240 m elevation. It is probably the downslope continuation of Site 14358 Cave but separated by 75 m. The cave is 50 m long with the small pit entrance near the middle. The cave is almost entirely in twilight and dry. There are many dry roots growing into the cave through the relatively thin lava roof, which is about 1 m thick.

Site 14375 Lava Tube System

This system is located 500 m downslope (west) of Site 14365 Cave and is probably within the same lava flow. The surface environment is drier and supports an open grassland savanna with scattered shrubs. The lava tube system is unusual in that it consists of 2 large parallel caves that appear not to connect, at least for humans. The two caves are described below.

Site 14375B Cave. The entrance to Site 14375B Cave is located in the western end of a large lava trench, which is adjacent to the main access road at 200 m elevation. The entrance is 2 m wide by 1.2 m high, and the passage begins as a 1 to 1.5 m high stoopway for 10 m to a 10 m-long crawl, which opens on to a wide shelf in a large room, 15 m long and 10 m wide. Except for the entrance crawl, the room is sealed at the upslope end. Downslope the shelf continues through a squeeze into a small alcove or room (10 m in diameter and 2 m tall), which remains constantly wet (**Figure 9**). The main cave continues downslope in a canyon-like passage below the shelf and room.

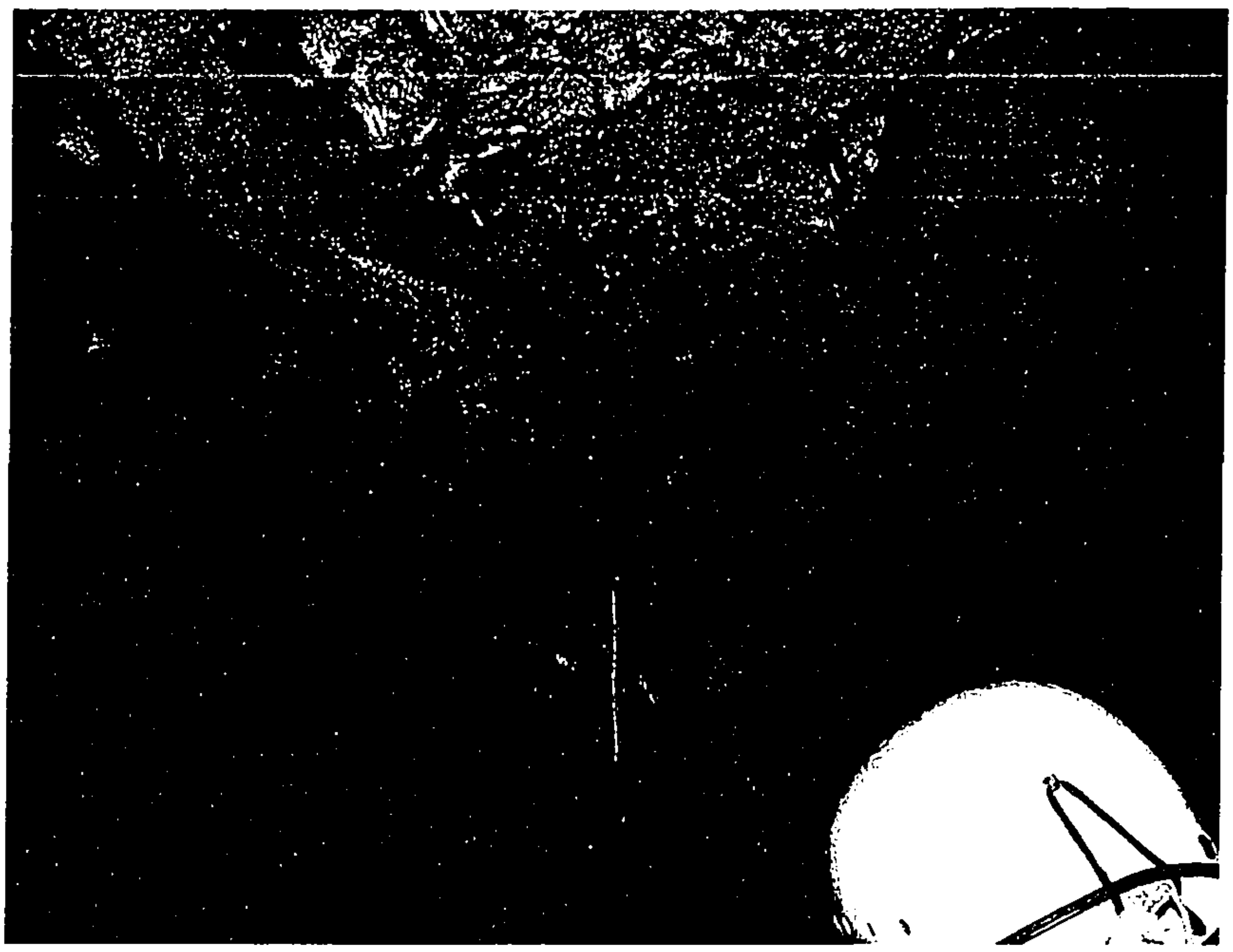

Figure 9. Portion of the wet wall in the alcove room in Site 14375B Cave. Photo by D.J. Preston.

The passage is about 225 m long and large enough for walking except for a few low areas. The environment is moist to wet except near a skylight about 170 m from the entrance. The cave ends at a lava seal about 240 m below the entrance. The cave is deep; the exposed overburden at the lower skylight is over 4 m, and the floor is about 8 m below the surface. The skylight is between and approximately in line with the large sink holes of similar depth that are part of the southern parallel cave (Site 14375A-E).

This is the most biologically significant cave found during the survey. Numerous roots grow in moist areas, in the alcove room on the shelf and in scattered patches along the main passage. Bait was set out in promising moist areas and 1 pitfall was set in a ceiling crack in the alcove on 11 September 2003 and retrieved on 14 September 2003. Nine species of arthropods were collected, including 3 obligate cave-inhabiting species: the cave isopod (*Littorophiloscia* species), the cave springtail (*Sinella* cf. *yosiia*), and the cave moth (*Schrankia* species). Two native facultative cave species were found: a springtail (*Entomobrya?* species A) and the cixiid planthopper (*Oliarus* cf. *koanoa*). Four alien species have invaded the cave: a silverfish (*Nicoletia phytophila*), the American cockroach (*Periplaneta americana*), the flat-backed millipede (*Oxidus gracilis*), and a haplodesmid millipede (*Prosopodesmus jacobsoni*).

Hawaiians extensively used the cave to collect water. Fragments of charcoal are scattered throughout the cave and concentrated in small piles near water catchments and at possible signal fire or resting sites. A few simple water catchments were seen in the alcove room at the end of the shelf. Many more occur along the main lower passage. A ring of 3 or more stones surrounded the basins. At one, the stones were arranged in an elongate boat shape.

Site 14375A, C, E Cave. This lava tube is marked on the surface by a sinuous line of 10 large sinkholes. The line of collapsed pits trends east west with the slope and is nearly 300 m long. The 4 western-most sinks comprise Site 14375A and are connected by a large airy passage. The large passage and 4 entrances admit daylight and cause the passage to be dry and in twilight. The 3 eastern pits each contain large shelter caves that do not extend into darkness. The 3 middle pits are sealed by collapse and do not enter caves. No arthropods were collected.

Site 14368 Lava Tube System

This large lava tube is located on the northern boundary of the property between 125 and 150 m elevation. There are 6 large pit entrances into the cave, which is over 650 m long. The western segments of the cave, including Site 14368A, were not surveyed since they lie outside the property boundary.

Site 14368C Cave. The entrance to Site 14368C is the eastern-most pit in the system. The pit is 15 m long by 12 m wide and 7 m deep and nearly vertical. Access is gained by a Hawaiian trail along the north wall. The entrance arch is 12 m wide by 7 m high and leads into a passage 10 m wide and 1.5 to 7 m high. The first 30 m are in twilight and dry (**Figure 10**). A large breakdown pile 30 m from the entrance nearly blocks the passage, but a narrow gap, 8 m long and 0.5 m wide along the south wall, allows access to another 220 m of passage. Immediately beyond the breakdown, the air is calm and humid, and the walls and floor become progressively wetter further into the cave. In spite of the dry surface environment, water drips from the ceiling, and small pools of water, 10 cm to 30 cm in diameter and 1 to 5 cm deep, occur on the floor. One patch of roots was observed hanging from ceiling cracks about 8 m above the floor. The cave is relatively deep, the floor being 7 to 10 m below the surface. Small pieces of sweet potato, rotting banana, rotting mushrooms and cheese were set out on the floor, walls and ceiling crevices on 13 September and periodically inspected for 3 hours.

The cave is potentially a biologically significant cave. The large dead-end, upwardly sloping passage traps water vapor, keeping the passage constantly moist. A suitable deep cave zone environment was present. However, little food energy appears to be entering the cave, and animal populations were low. The single patch of roots, although large, was inaccessible and could not be sampled. Only 3 species of arthropods were collected: the American cockroach (*Periplaneta americana*), the symphylan (*Hanseniella unguiculata*), and the sowbug (*Porcellionides*

Figure 10. Looking upslope into darkness from the twilight zone in Site 14368C Cave. Photo by D.J. Preston.

pruinosus). Evidence of the presence of 3 additional species was found but specimens could not be collected: dead individuals of the flatbacked millipede (*Oxidus gracilis*), a coffin fly (family Phoridae) visiting the bait, and cobwebs probably of a cellar spider (family Pholcidae) or a spitting spider (family Scytodidae). All 6 are alien species that have invaded the cave. In addition, at least 20 fragmentary bird skeletons were observed in individual deposits on the floor through out the cave. These appeared to be a natural accumulation and possibly represent nesting seabirds that became lost in the cave.

Site 14368C Cave was extensively used for collecting water, and evidence of water catchments occurs throughout the deep cave zone passage. In the first room beyond the breakdown pile, the water catchments are not obviously modified, being natural pools of water in the floor. These catchments are recognizable by the charcoal deposits surrounding them. Deeper in the cave, rocks have been carefully placed to hold containers to collect water. Fragments of charcoal from torches are scattered throughout the dark part of the cave. Some catchment areas are surrounded by relatively large accumulations of charcoal. Bundles of both grass and sticks were used for torches.

Site 14338 Lava Tube System

There is one known cave segment in this system.

Site 14338 Cave. The cave is located near the northeast boundary and has 2 entrances. The eastern entrance is a partly roofed over trench about 10 m long and 3 m deep, with arches between the 1-m wide openings. The upslope passage is a narrow walkway for 5 m then diminishes to a crawlway over *'a'ā* about 10 m from the entrance. The crawlway is 12 m long to a short constriction into an elongate narrow room, 10 m long. A small crawlway continued upslope beyond the room, but only the first 5 m could be surveyed. The room was damp and probably in the deep cave zone. We collected 2 native cave species: the obligate cave-adapted moth (*Schrankia* species) and nymphs of the cixiid planthopper *(Oliarus* cf. *koanoa).* One alien cave species was collected, the tiny cobweb spider *(Nesticella mogera).* Plant roots were abundant in cracks in the ceiling and walls. The roots do not hang freely into the cave, but protrude less than 10 cm from the cracks in thick pompom-like patches. A sample of the roots could not be identified because its DNA could not be isolated and amplified.

The downslope passage begins as a stoopway for 5 m to a short crawlway and constriction (**Figure 11**). Beyond the constriction, the passage gradually becomes larger and is 2 m high at the second entrance about 70 m below the upper entrance. A strong draft was present in the passage between the 2 entrances, which was all in twilight and transition zones. No cave animals were seen. The cave continues west for 55 m, but was not surveyed for lack of time. However, the cave is within a planned dry forest reserve, which should afford it protection from most disturbances.

Isolated Lava Tube Entrances

Numerous small holes and small shallow lava tubes were found while searching for suitable caves. These shallow lava tubes are roofed over by a single layer of lava, usually less than 0.3 m thick. They form in shallow surface flows that distribute overflows from the main lava channel. They rarely enter deeper caves but demonstrate the extent of cave habitats within *pāhoehoe* lava flows, since they form in each overflow and become buried within the flow as the lava covers the surface layer by layer. The following 3 examples were large enough to warrant inspection.

HBS Cave #1. The entrance to this small, shallow distributary lava tube is a pit about 1 by 1.5 m across and 1.3 m deep. The cave is 1 m high by 3 m wide and 4 m long and is entirely in twilight.

HBS Cave #2. The entrance to this lava tube is an elongate pit about 1 m wide, 3 m long and 1.5 m deep. The cave is 1.5 m high by 2.5 m wide and 5 m long and is entirely in twilight.

HBS Cave #3. The entrance to this shallow cave segment is a 1-m dia hole at the north edge of the main access road. It appears to have been broken into during road construction. The cave is about 1.3 m high by 2 m wide and 6 m long and is entirely in twilight. It probably formed in an overflow from a skylight near site 14339 in the Site 14350 System.

Figure 11. Looking downslope at the passage constriction below the upper entrance in Site 14338 Cave. Photo by D.J. Preston.

CAVE ANIMALS

A total of 18 species of arthropods were found, of which 5 (28%) are native (**Table 2**). Three species are obligate cave-inhabiting species and probably endemic to the western lowland slopes of Hualālai in and near the project area. No officially recognized species of concern were found; however, the presence of obligate cave species, native plants that provide food, and suitable deep zone cave environment confirm that a cave ecosystem occurs in the area. Additional cave-adapted species will be found during further surveys. The following is an annotated list of the species so far known from the project area.

Endemic cave species

***Sinella* cf. *yosiia* Bellinger & Christiansen.** *Sinella yosiia* is the dominant cave-adapted springtail on Hawai'i Island. It shows great geographical variation, and more detailed analysis may show that this taxon represents a species complex (Christiansen and Bellinger 1992). The few specimens collected in the alcove in Site 14375B Cave are smaller (about 2 mm body length) and have proportionately longer antennae than animals from

Table 2. List of terrestrial arthropod species found in lava tubes within the Hiluhilu Project Area, Kona, Hawai'i, during the period from 8-15 September 2003. Taxonomic names and arrangement follow Nishida (2002). Site numbers for caves are from Clark *et al.* (2003).

ARTHROPOD FAUNA			
Scientific Name (Common Name)	**Status in Hawai'i***	**Status in Caves****	**Caves in which Found**
Class: Arachnida (Siders and relatives) **Subclass: Araneae (Spiders)**			
Family: Heteropodidae (Giant crab spiders)			
Heteropoda venatoria (Linnaeus, 1767) (Cane spider)	Alien	Accidental	HBS New Cave
Family: Nesticidae (Tiny cobweb spiders)			
Nesticella mogera (Yaginuma, 1972)	Alien	Facultative resident	Site 14338
Family: Scytodidae (Spitting spiders)			
Scytodes species	Alien	Facultative resident	HBS New Cave Site 14350
Class: Insecta (Insects) **Order: Blattodea (Cockroaches)**			
Family: Blattidae:			
Periplaneta americana (Linnaeus, 1758) (American cockroach)	Alien	Facultative resident	Site 14350 Site 14368C Site 14375B
Order: Collembola (Springtails)			
Family Entomobryidae (entomobryid springtails)			
Entomobryia species [unidentified]	Endemic?	Facultative resident	Site 14350 Site 14375B
Sinella species near *yosiia* Bellinger & Christiansen, 1974 (Hawai'i Cave Springtail)	Endemic	Obligate cave species	Site 14375B
Order: Diptera (Flies)			
Family: Phoridae (Coffin flies)			
Genus species [unidentified]	Alien?	Facultative resident	Site 14350 Site 14368C
Order: Homoptera (Hoppers, scales and relatives)			
Family: Cixiidae (Cixiid planthoppers)			
Oliarus species near *koanoa* Kirkaldy, 1902	Endemic	Facultative resident	HBS New Cave Site 14350 Site 14375B Site 14388
Order: Hymenoptera (Bees & Wasps)			
Family: Formicidae (Ants)			
Paratrechina bourbonica (Forel, 1886)	Alien	Cave visitor	Site 14350
Solenopsis species *A* [unidentified] (not *S. geminata* nor *S. papuana*)	Alien	Cave visitor	Site 14350

Table 2. Continued

ARTHROPOD FAUNA			
Scientific Name (Common Name)	**Status in Hawai'i***	**Status in Caves****	**Caves in which Found**
Order: Lepidoptera (Moths & Butterflies)			
Family: Noctuidae (Noctuid Moths)			
Schrankia species [undescribed] (Hawai'i Cave Moth)	Endemic	Obligate cave species	HBS New Cave Site 14350 Site 14375B Site 14338
Order: Thysanura (Silverfish)			
Family: Nicoletidae			
Nicoletia phytophila Gervais, 1844	Alien	Facultative resident	Site 14375B
Class: Crustacea (Crabs and relatives)			
Order: Isopoda (Sowbugs & Slaters)			
Family:Philosciidae (Sowbugs)			
Littorophiloscia species [undescribed] (Hawai'i Cave Isopod)	Endemic	Obligate cave species	Site 14375 Site 14350
Family: Platyarthridae			
Trichorhina tomentosa (Budde-Lund, 1893)	Alien	Facultative resident	Site 14350
Family: Porcellionidae (Sowbugs) *Porcellionides pruinosus* (Brant, 1833)	Alien	Facultative resident	Site 14368C
Class: Diplopoda (Millipedes)			
Order Polydesmida			
Family: Paradoxosomatidae			
Oxidus gracilis (C.L. Koch, 1847) flat-backed millipede	Alien	Facultative resident	Site 14375B Site 14368C
Family: Haplodesmidae			
	Alien		Site 14375B
Prosopodesmus jacobsoni Silvestri, 1910	Alien	Facultative resident	Site #14375B
Class: Symphyla (Symphylans)			
Family: Scutigerellidae			
Hanseniella unguiculata (Hansen, 1903)	Alien	Facultative resident	Site #14368C

*Status in Hawai'i: **"Alien"** = introduced, not naturally occurring in Hawai'i;

"Endemic" = found naturally only in Hawai'i.

Status in caves: **"Obligate cave species" = living only in caves and similar subterranean voids;

"Facultative resident" = able to spend entire life cycle in caves, but also living in surface environments;

"Visitor" = Regularly entering caves for food or shelter but cannot live permanently underground;

"Accidental" = Surface animals wondering into caves but not able to survive.

Kilauea caves. Their small size allows them to move freely through underground voids where they feed on rotting organic matter.

***Entomobrya* species A.** This small (3 mm body length) springtail with functional eyes and dark gray color pattern came to baits in Site 14350 Cave and Site 14375B Cave. This species scavenges on rotting organic material and probably also occurs in damp surface habitats. It belongs to a native group of related cave and surface species.

***Oliarus* cf. *koanoa* (Kirkaldy).** *Oliarus koanoa* is a common planthopper in mesic native forests on western Mauna Loa and Hualālai. Nymphs suck sap from plant roots, and are commonly found in caves. The adults make their way to the surface to mate and disperse. Nymphs and fragments of dead adults were collected in HBS New Cave, Site 14350 Cave, Site 14375B Cave and Site 14338 Cave. One male was reared from a nymph collected in Site 14350 Cave and is tentatively identified as this species. A related cave-adapted species is expected to occur within the project area.

***Schrankia* species.** This small (5-8 mm wingspan) slate gray moth (**Figure 12**) has reduced eyes and is behaviorally blind. Males are weak fliers; the females of this population are unknown, but in other caves they are flightless.

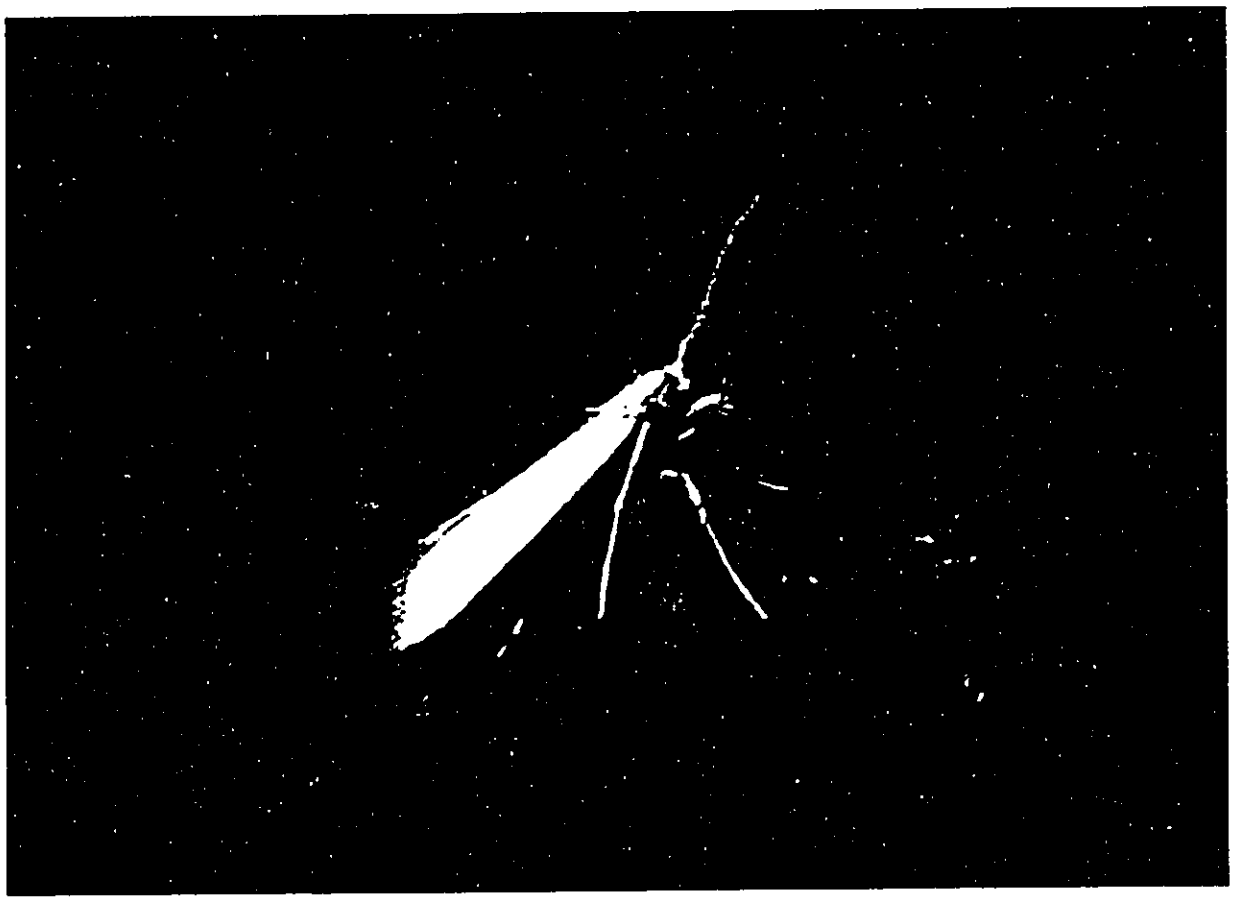

Figure 12. Adult cave moth in Site 14338 Cave. Photo by D.J. Preston.

The larvae feed primarily on plant roots but will also scavenge on organic material. Cocoons are made with root fragments and are often conspicuous in caves, hanging from the tips of roots. Cave-adapted populations are widespread and found in nearly all suitable caves on Hawai'i Island. However, each cave system or region harbors a distinct population, indicating that the geographic range of the Hiluhilu population is probably small. The cave-adapted species on Hawai'i Island are related to a large radiation of native surface and twilight zone species. The taxonomic relationships within the group have not been completed; therefore the Hiluhilu cave specimens cannot be identified further. Specimens were collected or observed in deep cave zone passages in New Cave, Site 14350 Cave, Site 14375B Cave, and Site 14338 Cave.

***Littorophiloscia* species.** The Hawai'i cave isopod is a small (3-5 mm long), white sowbug (**Figure 13**), which is closely related to *Littorophiloscia hawaiiensis* Taiti and Ferrara, an endemic species found only along the seacoast. This pair of related cave and surface species is of considerable interest to evolutionary biologists (Rivera et al. 2002). Except for the Hawai'i cave isopod, all known species in the genus *Littorophiloscia* live in saline habitats near the coast. The genus is widespread on tropical shores. The cave isopod feeds on microorganisms living on rotting organic matter. Previous to the current survey, it was known from 3 widely separated caves on Hawai'i: one on Kīlauea, one at Pōhakuloa, and one near Kīholo Bay on the western slope of Hualālai. It is not common in these caves. It was collected from 2 caves with the project area: Site 14350 Cave and Site 14375B Cave.

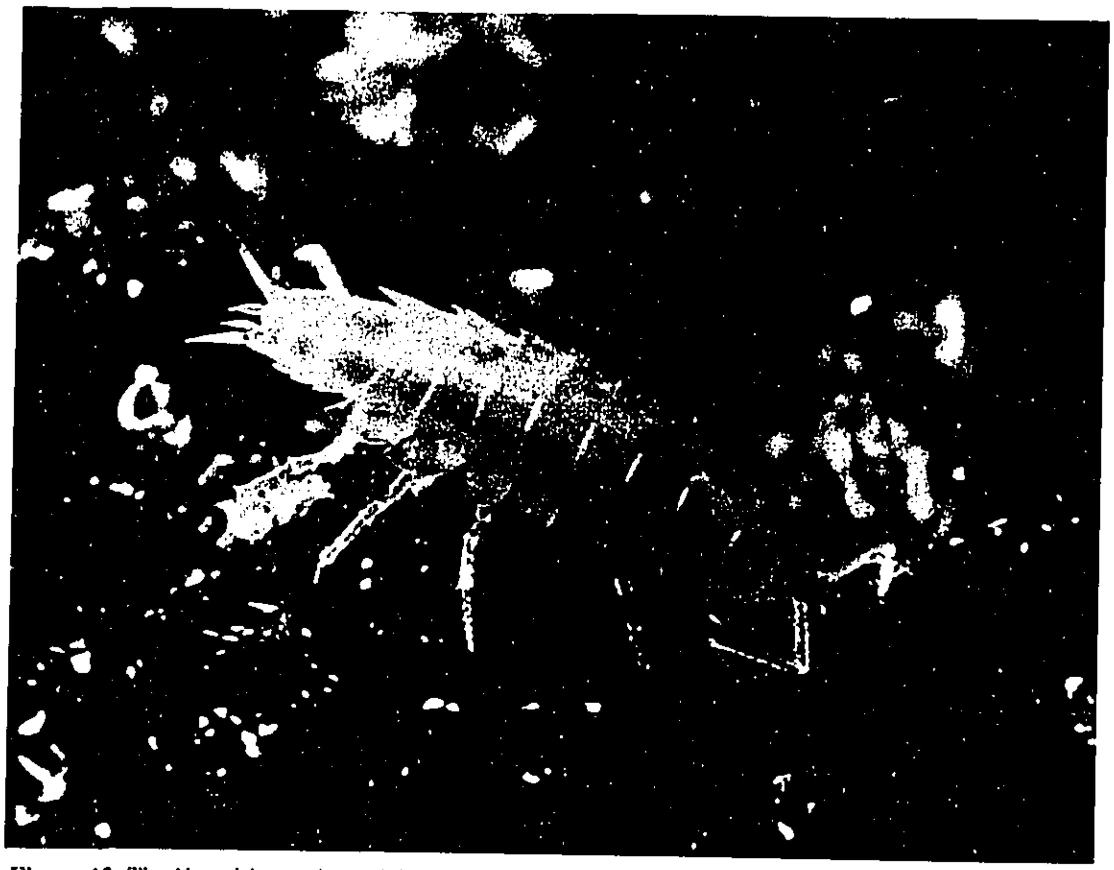

Figure 13. The Hawai'i cave isopod from Border Cave, Hawaii Volcanoes National Park. Photo by D.J. Preston.

Alien species

***Heteropoda venatoria* (Linnaeus).** The cane spider is common in lowland surface habitats in Hawai'i, and frequently occurs in the entrance and twilight zones of caves. It is only rarely found in the deep cave zone and may not be able to survive in the deep cave environment. The 2 dead specimens seen in New Cave may have accidentally fallen in the cave.

***Nesticella mogera* (Yaginuma).** This small (4 mm body length) alien spider builds sloppy cobwebs in crevices and is able to colonize the deep cave zone environment where it may prey on and compete with the native cave species. One male was found in the deep cave zone of Site 14388 Cave, but this tiny spider species is easily overlooked.

Pholcidae. These cellar spiders and the next one are common inhabitants in the twilight and transition zones, as well as in similar protected surface habitats. The occasional specimen in the deep cave zone may be accidental there. Live specimens were not found, but some of the cobwebs seen may have been built by species in this family.

***Scytodes* cf. *longipes* (Vinson).** This common spitting spider builds a loose cobweb. It is often found in twilight and transition zones and occasionally in the deeper cave. A few immature individuals of presumably this species were found in the deep cave zone in New Cave and Site 14350 Cave, and some of the cobwebs seen in other caves may have been built by this species.

***Periplaneta americana* (Linnaeus).** The American cockroach is an aggressive pest in Hawai'i. It is often common near roots and organic matter in lowland caves on Hawai'i Island. It potentially competes with and may displace native species.

Phoridae. Several species of alien coffin flies have invaded Hawaiian caves. The larvae are scavengers on rotting organic material, and the adults actively seek breeding sites and often respond quickly to baits. Two specimens were collected in a pitfall trap in Site 14350 Cave, and several individuals were observed on baits in Site 14368C Cave but escaped.

***Paratrechina bourbonica* (Forel).** Workers of this pestiferous crazy ant follow tree roots deep into cracks and caves in search of water and food. They were common in moist areas in Site 14350 Cave. They can potentially disrupt populations of native species, and the relatively sessile nymphs of *Oliarus* planthoppers could be vulnerable to their predation.

***Selenopsis* species A.** This unidentified, tiny (1-2 m body length) fire ant was discovered in Hilo only a few years ago. This is the first record from the west side of the island. Fire ants are voracious predators, and many species are economic pests. In caves, they may disrupt native species. Workers came to baits and pitfall traps in Site 14350 Cave.

***Nicoletia phytophila* (Gervais).** This introduced siverfish is a common inhabitant of tropical caves. It feeds on plant roots and other organic matter. In caves, it is almost always associated with root patches. We collected specimens on and near roots in the wet alcove room in Site 14375B Cave.

***Trichorhina tomentosa* (Budd-Lund) and *Porcellionides pruinosus* (Brandt).** These two alien slaters or sowbugs are locally common in leaf litter and frequently colonize caves. They are primarily scavengers but will feed on a wide range of foods. *Trichorhina tomentosa* was found in Site 14350 Cave, and *P. pruinosus* was found in Site 14368C Cave.

***Oxidus gracilis* (C.L. Koch).** The flat-backed millipede is a common denizen of leaf litter and compost where it feeds on fungi and rotting organic matter. It readily colonizes caves. They were present in the deep cave zones in Site 14368C Cave and Site 14375B Cave.

***Prosopodesmus jacobsoni* Silvestri.** This alien millipede was previously known in Hawai'i from lowland caves on Kaua'i and Maui. This is the first record from Hawai'i Island. Like other millipedes, it probably scavengers on rotting organic matter. Immature animals were found in Site 14375B Cave.

***Hanseniella unguiculata* (Hansen).** Symphylans are small, slender, 12-legged arthropods related to the millipedes. They are common soil animals and feed on roots. In caves they are usually associated with root patches. Specimens were collected in Site 14368C Cave.

ROOTS

Three root samples from Site 14350 Cave are *huehue* (*Cocculus triloba*, Menispermaceae), and two are silk oak (*Grevillea robusta*, Proteaceae). The three types of roots recognized in the cave do not correspond with these identifications, which is not surprising given the high variability displayed by roots in caves. The sixth sample from Site 14338 could not be identified, because its DNA could not be isolated and amplified. In Site 14350 Cave, *Grevillea robusta* roots hang free into the cave from the ceiling. The hanging roots are up to 2 m long and sometimes reach the floor. Root flushes (the succulent new growth at the tip) often have a bottle brush-like branching near the base of the flush. When present, this characteristic bottle brush may distinguish silk oak roots from other species, but our sample size is small. Silk oak trees were introduced for commercial forestry purposes and subsequently have escaped and become weedy. The trees are locally common within the project area.

Cocculus triloba, or *huehue*, is an indigenous woody vine common within the project area. In Site 14350 Cave, its roots were found attached to the substrate (i.e., ceiling and walls and perhaps other roots in the cave), as well as hanging free. One sample was taken from a hanging root 0.5 meters long. Both silk oak and *huehue* were actively flushing, indicating a consistent source of moisture in the cave passage.

Other native plants occurring within the project area and known to send roots deep into caves are *'ōhi'a* (*Metrosideros polymorpha*), *a'ali'i* (*Dodonaea viscosa*), and *maiapilo* (*Capparis sandwichiana*). Although roots of these species were not found in caves during this survey, it is expected that these species as well as some of the other plants, both native and alien, also provide food for the ecosystem.

DISCUSSION

The five biologically significant cave segments found during this survey are worthy of protection. These caves are also potentially significant archaeological sites. Two biologically significant caves are in areas recommended for reserve status in the draft EIS; that is, Site 14368C Cave, which is part of a proposed archaeological reserve, and

Site 14338 Cave, which is within the proposed dry forest reserve. The biological evidence from this survey further justifies their protection.

Two cave segments (Site 14375B Cave and Site 14350 Cave) are slated for archaeological data-recovery before being affected by the proposed development. However, both of these caves contain highly significant biological and archaeological resources that should be considered in planning for the development. The extent of the accessible subterranean habitat is larger in Site 14375B Cave than in Site 14350 Cave, and we found more species there. But the quality of the habitat in the two caves is comparable. Fortunately, the cave passage in Site 14375B appears to be deep and therefore is expected to be resilient to moderate disturbances on the surface overlying the cave. Site 14350 cave is closer to the surface, which allows more roots and other food resources to enter the cave; however, its shallowness may make the cave more vulnerable to disturbance. Protection of at least part of the natural surface environment and flora over the footprint of these caves is strongly recommended. These two caves also contained unique designs of complex and well-preserved water catchment systems. The exploitation of water resources in caves was paramount in allowing Hawaiian communities to live in harsh environments, including using cave water to irrigate agricultural sites on barren lava (Stone et al., 1994). The evidence of Hawaiian use of the deep cave zones in the caves at Hiluhilu for water catchment should be re-assessed, especially as it relates to their ability to survive and exploit these barren lowland environments.

The other cave segment (HBS New Cave) is an unrecorded archaeological site, which contains both water catchments and a suitable deep cave zone habitat. It is part of the Site 14350 Cave System and is expected to harbor the same species and deserves the same level of protection.

The discovery of three species of obligate cave-adapted species confirms that a cave ecosystem occurs within the project area. Additionally, the number of lava tubes, widespread occurrence of areas of exposed lava surfaces, and presence of native plant species indicate that suitable cave habitats are widespread on the site. The five biologically significant lava tube segments identified during this survey provide access into the unique cave habitat for biologists and managers who need to study and assess of the health of the subterranean ecosystem. These caves along with the planned open space (for example, the dry forest and archaeological reserves and parts of the golf course), with appropriate mitigation, should be sufficient to protect the local cave ecosystem.

The 18 species of arthropods found during this biological reconnaissance survey does not represent a comprehensive list of the cave species living on the site. Most individuals of the native cave species are believed to live in the inaccessible cave-like voids within the lava, and therefore, some species may be missed during initial surveys. Furthermore, finding animals in dark, complex cave passages is often difficult and time-consuming -- a happenstance that reinforces the belief that some species are rare. A useful strategy to solve this problem, when a rapid assessment is required, is to use indicator species to determine the biological significance of caves. That is, finding certain species in a cave passage can be used to predict what other species might be found with more searching, as well as be used to assess the biological significance and health of the cave ecosystem. Additional species will certainly be found during future surveys. For example, Loretta Lynn's cave planthopper, *Oliarus lorettae* Hoch and Howarth, or an equally rare close relative is predicted to occur on the site. *Oliarus lorettae* is so far known only from a few caves at Kīholo Bay and is a species of concern. Other possible species include relatives of a remarkable blind, flightless fly (*Megaselia* species); blind, white millipede (*Nannolene* species); small-eyed, big-eyed wolf spider (*Lycosa howarthi* Gertsch); blind rock cricket (*Caconemobius varius* Gurney and Rentz); underground tree cricket (*Thaumatogryllus cavicola*); cave thread-legged bug (*Nesidiolestes ana*); and cave water-treader (*Cavaticovelia aaa*).

This biological survey focused on those caves that appeared promising from information in the archaeological survey. Of the 22 cave sites recorded during the detailed archaeological survey of the project area (Clark et al., 2003), 12 were inspected in the current survey. Nine of the caves not visited were recorded as short dry segments by Clarke et al. (2003) and therefore are unlikely to harbor specialized cave animals. Only one known long cave (Site 23862), which is reported to be over 90 m long, was not surveyed. However, the description implied that the cave is dry. It is located near the northwest corner of the project well isolated from the other known long caves and is slated to be preserved as part of an archaeological site. The current survey added four caves to the list of known caves, but three were short dry segments without evidence of human use or specialized cave life. The other additional cave (HBS New Cave) is a significant cave segment both biologically and archaeologically. It is part of the 14350 Lava Tube System.

The number and arrangement of the known caves and other surface features suggest that additional cave segments occur within the project area, especially in the areas in line with and between the two main lava tube systems; that is, between Sites 14338 and 14368 and between Sites 14350 and 14375. Some of these, including some that do not currently have an accessible entrance, will be discovered during the development phase of the project. It is recommended that a cave biologist survey the larger cave passages found before they are destroyed. These surveys can be conducted in conjunction with the archaeological surveys.

Threats to the Cave Ecosystem

In general, threats to cave ecosystems include 1) alteration or elimination of food and water inputs through changes in land use, 2) alteration of airflow and microclimate in caves by disturbance of the surface, 3) waste disposal and pollution, 4) invasions by alien species, and 5) direct and indirect disturbance of the habitat by human visitors. These perturbations may differ in scale, some affect only the environment within larger cave passages and therefore affect the ability to study and monitor the health of the system, whereas other perturbations may impact the entire ecosystem (Howarth 1983b). The following are the major threats affecting cave resources and cave fauna within the project area.

1. Alien Weeds. Invasive alien plants represent a major threat to the subterranean ecosystem, not only to the host specific species that require their native hosts growing over the caves, but also to the ecosystem as a whole by changing the quantity and quality of food and water resources entering the caves. Many invasive weeds increase the rate of soil formation. Soil fills voids and acts as a filter trapping moisture and nutrients, thereby supporting shallow rooted plants while starving and desiccating the cave ecosystem. For example, the introduced fountain grass, *Pennisetum setaceum*, may be reducing water infiltration into Site 14350 Cave and other area caves, which would limit their suitability for cave animals, as well as obscure the efficiency of the Hawaiian water catchments. Lowland dry areas have been most utilized by humans, and many of the plant species introduced are adapted to this climate. Thus alien plants are especially problematic to cave management within this vegetation zone.

2. Alien Animals. Many invasive alien animals, most notably the ungulates, reduce native plant cover and exacerbate the problems caused by invasive alien plants. A few invasive alien animals regularly enter caves. The impacts of these animals on the cave community are not easily studied but in some cases can be severe. The species that invade only larger aerated passages, such as the pholcid and scytodid spiders, the roof rat (*Rattus rattus*), and American cockroach (*Periplaneta americana*) possibly have little impact on the subterranean ecosystem. However, their impacts on native cave species can make the caves unsuitable for biological studies. More insidious are the introduced facultative cave species that can invade the whole ecosystem. These include the nemertine worm [*Argonemertes dendyi* (Dakin)], the tiny sloppy-web spider (*Nesticella mogera*), the large hunting spider (*Dysdera crocata* Koch), the flat-backed millipede (*Oxidus gracilis*), the sowbugs [*Porcellionides pruinosus* (Brandt) and *Papuaphiloscia laevis* (Schultz)], and others (Howarth 1981b, 1983b). The bigheaded ant [*Pheidole megacephala* (Fabricius)], fire ants (*Solenopsis* species), and crazy ants (*Paratrechina* species) enter caves along tree roots and may prey on the cave animals. The introduction of species not yet in Hawai'i can potentially be more severe than those already present. The most notorious is the red imported fire ant (*Solenopsis invicta* Buren), which is considered one of the major threats to the endangered cave fauna in Texas, and which could severely impact economic development in Hawai'i should it become established (Loope et al. 2001).

3. Alien Microorganisms. The introduction of arthropod diseases could be disastrous to the cave community. Several entomopathogens (i.e., microorganisms causing disease in insects, such as, nematodes, fungi, and bacteria) are available or are under development for use as biological pesticides. These disease-causing organisms are being modified to improve their ability to survive and cause severe population declines. They were isolated from moist soil and would likely survive and do well in subterranean environments. The naïve native cave fauna could be highly susceptible to this threat (Howarth 1991, 2000). That a disease introduced anywhere on Hawai'i may eventually invade protected caves presents a special quandary for long-term management.

4. Human Use. Many obligate cave animals are sensitive to human disturbance. Cave visitors may break plant roots, kill animals, enlarge passages (thereby increasing air flow in the cave), carry in pollutants (such as tobacco smoke and other toxins), discard bottles and other paraphernalia that can act as traps, and introduce foreign foods that allow alien cockroaches, rats, and other vermin to colonize the cave. Cave visitors occasionally build fires and use torches for light within caves. Incense candles are also used in Hawaiian caves. Smoke from tobacco is highly toxic to arthropods, which, in the confined subterranean space, may linger and be harmful to the ecosystem. Smoke particles act as condensation nuclei, causing water vapor to condense out of the atmosphere, thereby drying the cave. There is a dilemma; educational programs and publicity on caves will increase visitation, leading to damage and loss of cave resources; but if caves and their values are not made known to the public, their resources may be destroyed through ignorance during changes in land use (Howarth 1983b).

5. Construction. Roads and other changes in land use over the caves potentially can alter food and water input into the ecosystem as well as increase the chance that that toxic substances will enter the cave habitat. Enlarging or creating new entrances by breaking into a cave during grading or construction on the surface may desiccate or disrupt the deep cave zone cave environment in the breached passages. Covering the surface with topsoil, pavement, or buildings may reduce the amount of food and water sinking underground, thereby affecting the subterranean community that underlies the disturbance. Due care should be taken to minimize the impacts upon cave ecosystems.

6. Fire. Wildfires not only remove the surface vegetation and kill plants that might be critical to the cave life beneath, but such fires also increase the amount of fine soil over the cave. This soil can fill cracks and capture food and water, preventing these resources from entering the caves and voids.

7. Pollution. Toxic chemicals, such as from spills, pesticide use, and waste disposal, leach into the subterranean voids with percolating groundwater, where they can impact the cave community, especially since much of the runoff on cavernous substrates is vertical into voids rather than horizontal into streams. Even in low dosages, chemical pollutants can reduce fitness (for example, reducing reproductive effort, deterring feeding, reducing longevity) of non-target organisms. Furthermore, some toxic substances may persist for a longer time underground, since some break down more slowly in the absence of sunlight. Organic waste from some genetically modified crops may be toxic to the cave animals. The issue of potential risks to groundwater associated with unfiltered pollutants being transported by runoff was beyond the scope of the current study. However, most of the lava flows that cover lower western slopes of Hualālai are similar in age (Moore 1987); and therefore, except where groundwater can become perched, subterranean runoff rates within the project site should be comparable to other areas in North Kona.

RECOMMENDATIONS

Five lava tube segments within the project area contain significant biological and cultural resources and deserve protective management. A resource management plan should be developed to address mitigation measures designed to minimize the impacts of the above threats upon the cave ecosystems. The following measures should be considered in developing the resource management plan.

- Place significant caves along with a suitable area of the surface surrounding the cave footprints within protected reserves.
- Control the harmful invasive species within the cave reserves (especially fountain grass).
- Prevent the introduction of additional harmful invasive species.
- Monitor the surface vegetation over the cave footprints, and take remedial steps to encourage recovery of deep-rooted native species where possible.
- Prevent wildfires.
- Minimize the amount of surface disturbance over the cave footprints.
- Exercise due care during construction activities in the vicinity of the cave reserves as well as over areas likely to contain caves.
- Minimize the addition of topsoil or other impermeable material to the surface directly above sensitive areas (that is, over deep cave zone passages) within the significant caves.
- Consider gating especially sensitive and significant caves.
- Consider including mitigation to minimize impacts on the cave ecosystem when managing open space, where appropriate.
- Conduct additional biological surveys and ecological studies in caves by competent cave biologists with the goal of determining appropriate protective management strategies for subterranean ecosystems.
- Conduct biological surveys of cave segments discovered during project development.

ACKNOWLEDGMENTS

We thank Mr. Roger Harris of Hiluhilu Development, LLC, for site information and for arranging for the helicopter reconnaissance flight, Dr. Robert B. Rechtman of Rechtman Consulting for site information and for permission to use the archaeology survey maps, and Neal Evenhuis, Ronald Englund, Fabio Moretzsohn, and Myra McShane of HBS for assistance on the report.

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Appendix P

Keāhole to Kailua State Lands Annual Report to LUC (Docket BR 92-685)

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January 5, 2004

To: Anthony Ching, Executive Officer
Land Use Commission

From: Mary Lou Kobayashi, Planning Program Administrator Mary Lou Kobayashi

Subject: Tenth Annual Report for LUC Docket No. BR92-685
Office of State Planning/Keahole to Kailua State Lands

Pursuant to Condition No. 30 of the Findings of Fact, Conclusions of Law, and Decision and Order issued on December 9, 1992 for the subject docket, we are providing you with an original and two copies of the Tenth Annual Report describing the status of the above-referenced boundary amendment. For your information, we have included ten (10) attachments including three (3) GIS generated maps prepared by our office, illustrating relationships of several proposed projects within the vicinity of the lands subject to the conditions imposed under LUC Docket No. BR92-685.

If you have any questions, please call Judith Henry at 587-2803.

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c: w/Report and 10 Attachments

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I

STATUS OF THE PROJECT

The consolidation/re-subdivision of the Government Lands of Kalaoa 1-4 and Ooma 1st created 13 lots for approximately 1,557.54 acres within a portion of the land area covered by Land Use Commission (LUC) Docket BR92-685 (Project Area). See Attachment A for the location and identification of the re-subdivided parcels within the Project Area. (TMK's 7-3-10: 2, 6, 7, 32, 33, 39, 40, 41, 42, 43, 44, 45, 46.) Please note that parcels identified by TMK's 7-3-10: 32 and 41 are outside of the Project Area reclassified to the State Land Use Urban District in 1993. Lot 11 identifies the unimproved access/utility road; parcel 45 is the County's proposed Main Street, and parcel 46 is the County's proposed Mid-level Road. Although the parcels identified by TMK's 7-3-10: 02 and 7-3-09: 05, and 08 are included in the Project Area, and therefore also included under LUC Docket BR92-685, they were not part of the May 1999 consolidation/re-subdivision of Government Lands of Kalaoa 1-4 and Ooma 1st that created the 13 parcels.

The Engineering Division, Department of Land and Natural Resources (DLNR), continues to coordinate the water needs of all State agencies with property interests in North Kona. The University of Hawaii Center at West Hawaii (UHCWH), together with other agencies, signed a Memorandum of Understanding (MOU), to fund water improvement facilities jointly.

The status of the six Phase I projects approved by the 1995 Legislature is as follows:

- Construction of the 1.0 mg Keahole Reservoir was completed on February 1, 2000, and dedicated to the County of Hawaii.
- Construction for the Hina Lani Drive Water Transmission Line and Reservoir was completed on July 14, 2001 and dedicated to the County of Hawaii.
- General obligation bond funds were released for the design and construction of the Keopu Exploratory Well Project. Bid opening was held on November 12, 1998. Construction started on June 15, 2000 with a completion date scheduled for December 2003.

- Additional general obligation bond funds were released to cover the special funds portion that was to be provided by the Housing & Community Development Corporation of Hawaii (HCDCH) (formerly Housing Finance Development Corporation HFDC), for the North Kona Well Sites Planning and Land Acquisition Study. The planning study to identify land parcels to accommodate water wells, reservoirs, access roads, and a HELCO Substation, is currently scheduled for completion by January 2004.

- The planning, design and construction phases for the Palani Road Water Transmission Line and Reservoir have been put on hold indefinitely until the ceded land issue has been resolved, and land title and conveyance have been finalized.

- The planning, design and construction phases for the installation of the 16-inch waterline along Queen Kaahumanu Highway from Hina Lani Drive to the existing 0.5 mg Keahole Reservoir have been put on hold indefinitely due to unavailability of funding for the project.

Executive Order No. 3811, dated March 17, 2000, set aside 1.74 acres (TMK 7-3-10: 43), together with access and utility easements, to the Water Board, County of Hawaii, for two (2) reservoirs (the existing 0.5 mg reservoir and the new 1.0 mg Keahole Reservoir).

Mitsunaga and Associates have completed the preliminary design for the first phase of development for approximately 33 acres of the 500-acre parcel for the UHCWH.

The development of this site has been hampered by a lack of capital improvement funds to provide adequate potable water, roadways, and other basic supporting infrastructure to allow construction of classrooms and office buildings.

Hiluhilu Development, LLC (Hiluhilu) owns approximately 1,000 acres within the Kau Ahupua'a. Approximately 300 acres have been developed into an agricultural subdivision named Makalei Estates. The remaining acreage identified by TMK 7-2-05: 1 is within the State Agricultural and Conservation Land Use Districts (approximately 454.9 acres and 270.3 acres respectively). The 725.202-acre site extends from the mauka boundary of Queen Kaahumanu Highway to the western boundary of the Makalei Plantations agricultural subdivision. The Hiluhilu parcel is also adjacent to the northern boundary for the University of Hawaii's 500-acre site.

Hiluhilu has expressed its willingness to coordinate development of its Kau Lands with the planned development of the UHCWH campus, and further cooperate by providing some major components of the supporting infrastructure required for the development of UHCWH. Hiluhilu proposes to develop this property into a mixed-use property of residential, recreation and University related commercial uses.

A MOU between the University of Hawaii and Hiluhilu was approved by the board of Regents in November 2003. The initial phase of UHCWH will be developed on Hiluhilu land and in the future will be extended across the University parcel (TMK 7-3-10: 42). The University staff and regents have been working closely with the Hiluhilu planning and development team. Numerous community meetings have been held by Hiluhilu and University representatives. The University of Hawaii and Hiluhilu are in the process of identifying essential infrastructure that is needed to accommodate the initial relocation of the University's operations to the University Village from the present location in a commercial complex in Kealakekua. The infrastructure will include wastewater collection and treatment, potable water supply and distribution, and roadway access from Queen Kaahumanu Highway. This joint planning effort could speed up development of the UHCWH campus.

Preferred access to the Hiluhilu Development/University Center has been determined to be via the unimproved road across from the Airport Access Road "T" currently used to access the Hawaii Electric Light Company generating station and County water tanks. The unimproved road, identified as lot 11 on TMK 7-3-10, was set aside for the proposed mauka-makai road from Queen Kaahumanu Highway to the proposed West Hawaii Campus. The tax maps show the unimproved road extending from Queen Kaahumanu Highway, mauka of the Airport Access Road in a northeasterly direction to intersect with the County's proposed "Main Street" at the western boundary of the University parcel. From there, the County's *Proposed Roadway Projects Kona Area* map delineates a proposed road, identified as "University Ave." continuing in a northeasterly direction through the University parcel, crossing the southern boundary of Hiluhilu parcel at the intersection of the County's proposed "Mid-level Road" to connect with the Makalei Estates Access Road.

The current alignment of the unimproved road, passes between two Department of Hawaiian Homes Lands (DHHL) parcels identified by TMKs 7-3-10: 39, 40, and traverses a 232.03-acre State parcel identified by TMK 7-3-10: 44. Hiluhilu was granted Right-of-Entry permits by the Hawaiian Homes Commission (HHC) and the Board of Land and Natural Resources on November 18, 2003, and November 11, 2003 respectively, to access DHHL and State parcels to conduct engineering and topographic reconnaissance studies. DHHL has not committed to the road alignment, but remains open to discussion regarding the road alignment's potential to benefit future development of adjacent DHHL parcels.

The Department of Transportation (DOT) is particularly concerned with the alignment of the unimproved utility road. The utility road (a 16-foot paved roadway) ends at the County water tanks and currently provides access to HELCO's Keahole generating station, and DHHL parcel 7-3-10: 39. From there the utility road continues unpaved to the 500-acre University parcel 7-3-10: 42. (See Attachment A for the location of the aforementioned parcels.) According to DOT, the road should be realigned so that its intersection aligns with the access road to Keahole International Airport. When the engineering and planning studies are completed, Hiluhilu will contact DOT to discuss the proposed alignment and the proposed four-way signalization of the road. The County's most recent (September 2003) roadway update for the Keahole to Keauhou region (Proposed Roadway Projects Kona Area) shows the unimproved road (proposed University Drive) aligned with the entrance to the Keahole International Airport. (*See Attachments B1 and B2*)

DOT Highways Division is currently reviewing the Traffic Impact Analysis Report for Hiluhilu Development, LLC. The DOT Statewide Transportation Planning Office has provided comments on Hiluhilu Development's proposed traffic and roadway plans. Copies of these letters identified by DOT as STP 8.0757 and STP 8.0934 (dated May 9, 2003 and November 12, 2003 respectively) have been sent to the County of Hawaii and the State LUC. Copies of these letters have been included with this report as *Attachments E1 and E2*

Westpro Development, Inc is proposing to develop the Lokahi Subdivision, a 190-lot residential subdivision on approximately 68.534 acres of land identified by

TMK's 7-3-10: 47, 48, and 50. The proposed project will be served by three access roads from Kaiminani Drive. Two of these accesses, Kakahiaka and Kapuahi Streets, are existing streets serving the Kona Palisades subdivision. The third access is proposed through the northernmost portion of a 271.01-acre State parcel included under LUC Docket BR92-685 and identified by TMK 7-3-10: 6. According to Westpro's environmental assessment (*Draft Environmental Assessment and Anticipated Finding of No Significant Impact July 2003*) the proposed roadway will intersect with Kaiminani Drive approximately 200 feet west (makai) of the westernmost parcel within the Kona Palisades Subdivision (7-3-42: 12). This north-south segment of the proposed roadway will eventually become part of the County's "Main Street". (*See Attachments B1, B2 and C1*)

Agencies with jurisdiction to develop the project covered under LUC Docket BR92-685 project area have not yet formally requested DOT to review and comment on proposed road improvements envisioned for their parcels. DOT has prepared a Queen Kaahumanu Highway Master Plan (QKHMP). The QKHMP describes a limited access six-lane freeway with grade-separated interchanges. One of the interchanges is located between the northern end of Kona International Airport and parcels 7-3-10-39 and 44 (*See Attachment A and C3*). Upon completion of the interchange, the existing accesses to Queen Kaahumanu Highway will be closed and serviced by frontage roads. DOT provided Attachment C3, which shows the location of the proposed interchange. All land developments within the land-use-application area should be coordinated with the State's Queen Kaahumanu Highway widening project.

The Hawaii Long Range Land Transportation Plan (HLRLTP) and the General Plan Facilities Map provide the general alignments of the proposed roadway corridors for Hawaii County. The HLRLTP was developed in 1998 to identify the major land transportation improvement needs to support the projected growth of the County to 2020. Various State and County roadway systems located throughout the island were identified for improvement, including the Queen Kaahumanu Highway widening project to four lanes.

The Hawaii Long Range Land Transportation Plan, May 1998, Final Report, proposes four highway improvement projects within or adjacent to the project area. They are as follows:

- DOT widening of Queen Kaahumanu Highway to four lanes
- County extension of Kealakaa Street as a new two-lane "upper-level" highway (Kaiminani Drive to Palani Road) (This alignment is also being re-evaluated and may be realigned to consolidate itself with another proposed north-south arterial proposed within the planning area);
- County widening of Hina Lani Drive to four lanes (Queen Kaahumanu Highway to the proposed Mid-level Road); and
- County extension of Henry Street as a new two-lane "mid-level" highway (Kaiminani Drive to Palani Road).

The Queen Kaahumanu Highway widening from Henry Street to the Kona International Airport Access Road (Increment I) is in the design phase. Design for Phase I (Henry Street to Kealakehe Parkway) will be completed by January 2004. The design consultant closed for business prior to completion of the project, but "Design-Build" contracting for Phase I is proceeding. Design for Phase II (Kealakehe Parkway to Kona International Airport Access Road) is not currently scheduled.

The *Statewide Transportation Improvement Program* (STIP) for 2002 through 2004 was approved by the Federal Highway Administration (FHWA) with $9,500,000 to complete the right-of-way acquisition for Increment I in FY 2002, and $20,000,000 for construction for Phase I in FY 2004. Estimates for right-of-way acquisition are now $15,876,000. Part of the right-of-way for Increment I has been acquired.

Amendment Number 2 to the STIP for federal FY 2002 through 2004 moved construction of Phase I from FY 2004 to FY 2003. Amendment Number 5 to the STIP for FY 2002 through 2004 changed the construction funding to $23,000,000. The amendments were approved by FHWA effective September 15, 2002 and June 20, 2003, respectively.

Construction of the Queen Kaahumanu Highway widening project will be incremental due to funding limitations. Construction estimates for Increment I Phase I (Henry Street to Kealakehe Parkway - 2.6 miles), and for Increment I Phase II (Kealakehe Parkway to Kona International Access Road - 5.0 miles), have been adjusted to $25,000,000 for Phase I and $30,000,000 for Phase II. Construction of Phase I is projected to start in August 2004. Heightened competition for funding may result in delays for the construction of Increment I, Phase II, which is currently not scheduled for construction.

The County of Hawaii Planning Department (Planning Department) is still re-evaluating the alignments of the north-south arterials and collectors as shown on the *Keahole to Kailua Development Plan.* The Planning Department is developing a scope of work for further defining roadway corridors within the North Kona Region. The Planning Department is developing an official roadway map that would be approved by the County Council in order to incorporate the north-south arterials and collectors in rezoning and subdivision applications.

The Planning Department has contracted with Townscape, Inc. of Honolulu to assist the County in evaluating the general circulation of existing and planned roadways within the project area and extending to Honaunau in South Kona. This plan will be referred to as the *Keahole to Honaunau Regional Circulation Plan.* Townscape completed a final report of their findings and recommendations in January 2003.

The Planning Department is now developing an action plan focused on a strategy to implement the recommendations. In particular, the county needs to determine at what level of detail to adopt an official roadway map that would apply to rezoning and subdivision applications. The official roadway map is critical to preserve arterial and collector corridors in the face of ongoing development to assure continuous and feasible corridors when CIP funds are available and allotted to design and construct such roadway projects. Corridor preservation mapping can facilitate implementation and cooperation between developers, county agencies, state, and federal governments. Other issues include an identification of feasible short-term transportation-demand management techniques to accomplish the following:

- Relieve immediate congestion;
- Promote infill mixed-use and affordable housing to reduce commuting;
- Preserve throughway functions of arterials and collectors; and
- Establish priority criteria to prioritize major capital transportation projects.

On October 22, 2002, the HHC approved a Memorandum of Agreement (MOA) between the County of Hawaii and the DHHL. The MOA establishes County procedures for reviewing DHHL land use permit requests, and responsibilities for services and infrastructure. The MOA outlines procedures related to land use planning, infrastructure maintenance, enforcement of laws and the collection of real property taxes and other fees on Hawaiian Home Lands.

The *Hawaii Island Plan Draft Report* was completed in May 2002, but has not been officially accepted by the HHC. The Hawaii Island Plan is part of a comprehensive planning system that will guide the development and use of Hawaiian Home Lands Statewide. The Plan provides DHHL with a comprehensive assessment of its 116,963 acres on the Island of Hawaii. The goal of the Hawaii Island Plan is to assess and recommend future uses for Hawaiian Home Lands.

The Hawaii Island Plan is further intended to help coordinate DHHL projects along with other State, county and private development proposals on the Island of Hawaii. Designations identified in the Hawaii Island Plan may be further modified to conform to County zoning requirements at the development plan level when parcels are identified for development.

The DHHL has a property interest in three parcels consisting of approximately 352.51 acres that are located within the Project Area. .The DHHL lands within the State lands Project Area are identified by Tax Map Keys 7-3-10: 7, 39, & 40. Parcel 7-3-10: 39 is adjacent and north of the Keahole Generating Station, and parcel 7-3-10: 7 is adjacent and south of the State Agricultural Lots. Both parcels are bounded on the west by Queen Kaahumanu Highway. Parcel 40, the smallest of the three, is situated adjacent to the eastern boundary of the Keahole Generating Station. These parcels were conveyed to the DHHL by Land Patent Grant No. S-15931 dated April 24, 2000. A fourth parcel (7-3-10: 41), consisting of 130 acres, was conveyed to DHHL under the same grant. However, this parcel is not included within the Project Area covered by LUC Docket BR92-685.

The proposed land use designations for the parcels were approved by the HHC on October 22, 2002. According to the Hawaii Island Plan Draft Report, DHHL parcels within the Kalaoa Tract are proposed as high-density projects situated near existing residential development, and existing infrastructure. The parcels are also near the proposed UHCWH facilities, and amenities and services available in Kailua-Kona. Traffic along Queen Kaahumanu Highway and the proximity of the Kona International Airport at Keahole make the DHHL parcels that are adjacent to the highway suitable for commercial and industrial uses, while lands further mauka are suitable for rural residential homesteading. DHHL estimates (2002 estimates) that it will take approximately $36,360,000 to develop these parcels, including the one outside of the Project Area. DHHL does not have plans to develop these parcels in the near future. The Department has other lands outside of the Keahole area that are more cost effective areas for residential development and therefore have higher development priorities. Consequently, there has been no development on any of the DHHL parcels within the Project Area during this reporting period.

The DHHL concurs with the DOT's recommendation to amend an access permitted designation along Queen Kaahumanu Highway. The access is identified as a perpetual non-exclusive access easement granted to HELCO on June 6, 1997. The existing designation will be realigned opposite the Hawaii Ocean Science and Technology Park access road within TMK 7-3-43: 42 to promote the future consideration of a fully signalized intersection at this location with the planned Queen Kaahumanu Highway widening project. (See Attachments D1 and D2 for the location of the HELCO Substation within the DHHL parcel 7-3-10: 07 and the associated access easement).

II

PROGRESS IN COMPLYING WITH LUC CONDITIONS OF THE DECISION AND ORDER

1. "The developer and/or landowner of the subject Property shall provide affordable housing opportunities for low, low-moderate, and gap group income residents of the State of Hawaii to the satisfaction of the State Housing Finance and Development Corporation in accordance with the Affordable Housing Guidelines, adopted by the Housing Finance and Development Corporation (HFDC), effective July 1, 1992, as periodically amended. The location and distribution of the affordable housing or other provisions for affordable housing shall be under such terms as may be mutually agreeable between the developer and/or landowner of the subject Property and the State HFDC and the County of Hawaii. Agreement by the HFDC on the provision of affordable housing shall be obtained prior to the developer and/or landowner applying for county zoning or prior to the developer and/or landowner applying for county building permits if county rezoning is not required."

   The developer and/or landowner of the Property will abide by this condition and provide affordable housing opportunities for low, low-moderate and gap group income residents of the State of Hawaii and obtain an agreement by the HFDC on the provision of affordable housing.

   There has been no change from 2003 in the willingness of the developer and/or landowner to comply with this condition. There have been no changes in the Petitioner's/Developer's compliance with this condition.

2. "The developer and/or landowner of the subject Property shall contribute to the development, funding and/or construction of school facilities, on a pro-rata basis, as determined by and to the satisfaction of the Department of Education (DOE). Agreement by DOE on the level of funding and participation shall be obtained prior to the developer and/or landowner applying for county zoning or prior to the developer and/or landowner applying for county building permits if county rezoning is not required."

   The developer and/or landowner of the Property will abide by this condition and will contribute to the development, funding and/or construction of school facilities, on a pro-rata basis, as determined by and to the satisfaction of the DOE.

   There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

3. "The developer and/or landowner of the subject Property shall prepare a Traffic Impact Analysis Report prior to applying for county zoning or prior to the developer and/or landowner applying for county building permits if county zoning is not required. The landowner and/or developer shall also participate in the funding and construction of local and regional transportation improvements and programs including dedication of rights-of-way as determined by the State Department of Transportation and the County Department of Public Works. Agreement by the State Department of Transportation on the level of funding and participation shall be obtained prior to the developer and/or landowner applying for county zoning or prior to the developer and/or landowner applying for county building permits if county rezoning is not required."

The developer and/or landowner of the Property will abide by this condition and when appropriate, prior to applying for county zoning or county building permits, will prepare a Traffic Impact Analysis Report and participate in the funding and construction of local and regional transportation improvements and programs including dedication of rights-of-way as determined by the State Department of Transportation and the County Department of Public Works.

Hiluhilu's engineers have begun preparing intersection improvement and roadway plans. A draft report, Traffic Impact Report Hiluhilu Project Kau, North Kona, Hawaii, was prepared July 10, 2003. Under item No. 3 the Statement of Understanding executed between the University of Hawaii and Hiluhilu, Hiluhilu will include in its development planning, provisions to allow the West Hawaii Center to share roadway access from the Queen Kaahumanu Highway to the site of the University Village.

A traffic impact assessment for the University Parcel (TMK 7-3-10: 42) was completed October 2000, by Phillip Rowell and Associates.

4. "The developer and/or landowner of the subject Property shall monitor the traffic attributable to the project at on-site and off-site locations and shall undertake subsequent mitigative measures that may be reasonably required. These activities shall be coordinated with and approved by DOT."

The developer and/or landowner of the Property will abide by this condition and will monitor the traffic attributable to the project at on-site and off-site locations and shall undertake subsequent mitigative measures that may be reasonably required.

There has been no change in 2003 in the developer's and/or landowner's intent to comply with this condition.

5. "The developer and/or landowner of the subject Property, at no cost to the State, shall appoint a permanent transportation manager whose function is the

formulation, use, and continuation of alternative transportation opportunities that would optimize the use of existing and proposed transportation systems. In the alternative, the developer and/or landowner of the subject Property may participate in a regional program for transportation management with other developers and/or landowners. This program shall address the transportation opportunities that would optimize the use of existing and proposed transportation systems. Either option will continue to be in effect unless otherwise directed by the State Department of Transportation prior to implementation. The transportation manager or developer and/or landowner of the subject Property shall conduct periodic evaluations of the program's effectiveness and shall make reports of these evaluations available to the State Department of Transportation for review."

The developer and/or landowner of the Property will abide by this condition and will appoint a permanent transportation manager or participate in a regional program for transportation management with other developers and/or landowners.

There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

6. "The developer and/or landowner of the subject Property shall participate in the funding and construction of adequate wastewater transmission and disposal facilities, on a pro-rata basis, as determined by the State Department of Health and the County Department of Public Works."

   The developer and/or landowner of the Property will abide by this condition and will participate in the funding and construction of adequate wastewater transmission and disposal facilities, on a pro-rata basis, as determined by the State Department of Health, the County Department of Public Works, and the County Department of Environmental Management.

7. "The developer and/or landowner of the subject Property shall fund the design and construction of drainage improvements required as a result of the development of the Property to the satisfaction of the appropriate State and County agencies."

   The developer and/or landowner of the Property will abide by this condition and will fund the design and construction of drainage improvements required resulting from development of the Property to the satisfaction of the appropriate State and County agencies.

8. "The developer and/or landowner of the subject Property shall have an archaeological inventory survey conducted for those areas of the Property not already the subject of an inventory survey by a professional archaeologist prior to submitting an application to the County of Hawaii for rezoning or prior to applying for a building permit if county rezoning is not required. The findings of such survey(s) shall be submitted to the State's Historic Preservation Division in report

format for adequacy review. The Division must verify that the survey report is acceptable, must approve significance evaluations, and must approve mitigation commitments for significant historic sites prior to the landowner and/or developer submitting an application to the county for rezoning or prior to applying for a building permit if county rezoning is not required."

The developer and/or landowner of the Property will abide by this condition and will have an archaeological inventory survey conducted for those areas of the Property not already the subject of an inventory survey by a professional archaeologist prior to submitting an application to the County of Hawaii for rezoning or prior to applying for a building permit .

The developer and/or landowner of the Property will abide by this condition. Archaeological investigations were conducted by Pacific Legacy within approximately 275 acres designated for the development of UHCWH within the 500-acre parcel.

For Item No. 3 under the Statement of Understanding between the University of Hawaii and Hiluhilu Development LLC, the parties will discuss the feasibility of relocating to the University Village site and Hiluhilu having buildings constructed for lease by the University for the initial phase of the University of Hawaii Center at West Hawaii (UHCWH). The University Village area will extend across the University parcel and across the Hiluhilu parcel and will be master planned to provide classrooms, office, living accommodations, food service and supporting commercial facilities for UHCWH.

9. "If significant historic sites are present, then the developer and/or landowner of the subject Property shall agree to develop and execute a detailed historic preservation mitigation plan prior to any ground altering construction in the area. The State's Historic Preservation Division must approve this plan, and that Division must verify in writing to the Land Use Commission that the plan has been successfully executed."

The developer and/or landowner of the Property will abide by this condition. Fifteen (15) archaeological sites are present in the study area. In October 1999, the developer prepared and submitted a detailed Conceptual Historic Preservation Plan to the State's Historic Preservation Division for approval. There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

10. "Should any human burials or any historic sites such as artifacts, charcoal deposits, or stone platforms, paving or walls be found, the developer and/or landowner of the subject Property shall stop work in the immediate vicinity and contact the State Historic Preservation Division. The significance of these finds shall then be determined and approved by the Division, and an acceptable mitigation plan shall

be approved by the Division (if needed). The Division must verify that the fieldwork portion of the mitigation plan has been successfully executed prior to work proceeding in the immediate vicinity of the find. Burials must be treated under specific provisions of Chapter 6E, Hawaii Revised Statutes."

The developer and/or landowner of the Property will abide by this condition. The developer and/or landowner will stop work in the immediate vicinity and contact the State Historic Preservation Division should any human burials or any historic sites such as artifacts, charcoal deposits, or stone platforms, pavings or walls be found on the subject property.

According to the Final EIS, the current UHCWH Long Range Development Plan (LRDP) avoids all known burial areas on the overall 500-acre Kalaoa site, including those in Preserve 2 See page 35 (Final EIS). A burial treatment plan for burial council determination would be similarly accomplished in conjunction with the completion of the Historic Preservation Plan prior to any construction or improvement permits and approvals. Council determination would also be requested if any burials not presently known are discovered during the course of work described in the current LRDP.

There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

11. "The developer and/or landowner of the subject Property shall conduct a flora survey and prepare and agree to execute a mitigation plan which meets the requirements of the Department of Land and Natural Resources prior to the developer and/or landowner applying for county zoning or prior to the developer and/or landowner applying for county building permits if county rezoning is not required. The Department of Land and Natural Resources must approve the plan, and a copy of the approved plan must be submitted to the Land Use Commission prior to the developer and/or landowner applying for county zoning or prior to the developer and/or landowner applying for county building permits if county rezoning is not required."

The developer and/or landowner of the Property will abide by this condition and will conduct a flora survey and prepare and agree to execute a mitigation plan which meets the requirements of the Department of Land and Natural Resources prior to the developer and/or landowner applying for county zoning or prior to the developer and/or landowner applying for county building permits if county rezoning is not required.

On March 3, 1998, a reconnaissance was made of the proposed site identified for the UHCWH. A detailed survey of the flora and vegetation was conducted from March 10 through March 13, 1998. The purpose of the survey was to assess the botanical resources of the area to determine if any were significant or were protected by local or Federal regulations.

According to the survey report prepared by Derral R. Herbst, PhD, although listed species are known from nearby parcels, no plants which are candidate, proposed, or listed threatened or endangered species were seen during the survey, and none are known historically from the proposed project site. None of the trees on the site are, nor could be considered candidates for the county exceptional tree program. The vegetation is neither pristine nor unique and is not considered worthy of preservation.

There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

12. "The developer and/or landowner of the subject Property shall fund and construct adequate civil defense measures as determined by the County and State Civil Defense agencies."

    The developer and/or landowner of the Property will abide by this condition and will fund and construct adequate civil defense measures as determined by the County and State Civil Defense agencies.

    There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

13. "The developer and/or landowner of the subject Property shall not construct residential or condominium units within areas exposed to noise levels of 60 Ldn or greater."

    The developer and/or landowner of the Property will abide by this condition and not construct residential or condominium units within areas exposed to noise levels of 60 Ldn or greater.

    There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

14. "The developer and/or landowner of the subject Property shall grant to the State of Hawaii an avigation (right of flight) and noise easement in the form prescribed by the State Department of Transportation on any portion of the Property subject to noise levels exceeding 55 Ldn."

    The developer and/or landowner of the Property will abide by this condition and will grant to the State of Hawaii an avigation (right of flight) and noise easement in the form prescribed by the State Department of Transportation on any portion of the Property subject to noise levels exceeding 55 Ldn.

    There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

15. "The developer and/or landowner of the subject Property shall attenuate the noise in guest (living) suites and other noise sensitive areas within commercial and hotel development areas exposed to exterior noise levels of 60 Ldn (day-night average sound level) by a minimum of 25 decibels (A-weighted)."

The developer and/or landowner of the Property will abide by this condition and attenuate the noise in guest (living) suites and other noise sensitive areas within commercial and hotel development areas exposed to exterior noise levels of 60 Ldn (day-night average sound level) by a minimum of 25 decibels (A-weighted).

The provision of air conditioning for proposed educational facilities at the University Center should create a learning environment that is relatively unaffected by the distant sounds from Kona International Airport and the Keahole Generating Station.

There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

16. "The developer and/or landowner of the subject Property shall participate in an air quality monitoring program as specified by the State Department of Health."

The developer and/or landowner of the Property will abide by this condition and participate in an air quality-monitoring program as specified by the State Department of Health.

Proposed educational facilities would be air-conditioned to create a nurturing learning environment that is relatively unaffected by vog and other pollutant emissions.

When completed, the UHCWH would not be a major stationary source of air pollutant emissions. Traffic generated by the project would produce non-stationary sources of pollutants from vehicular emissions along existing roadways traversed by students, faculty, and staff of the UHCWH. In an effort to address potential increased vehicular emissions caused by a student enrollment up to 1,500, the University Center would provide parking and loading provisions for shuttles and vans. Ultimately, it would be the responsibility of conscientious students, faculty, and staff to utilize carpools, public transportation, and other more environmentally friendly modes of travel as opposed to the personal automobile. Given these considerations, no mitigation for future non-stationary impacts to air quality is proposed or deemed warranted.

An increased demand for electrical power and the demand for solid waste disposal would generate off-site stationary source of pollutants from the fuel burned and the use of heavy equipment to transport solid waste to the municipal landfill. The use of an energy efficient design would lower the electrical power requirements for the University Center. The use of recyclable products and the implementation of a recycling program would reduce the amount of solid waste disposal requirements generated from UHCWH operations. Because of the above features, no mitigation for offsite impacts to air quality is proposed or deemed warranted.

There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

17. "The developer and/or landowner of the subject Property shall cooperate with the State Department of Health and the County of Hawaii Department of Public Works to conform to the program goals and objectives of the Integrated Solid Waste Management Act, Chapter 342G, Hawaii Revised Statutes, and the County's approved integrated solid waste management plans in accordance with a schedule and time frame satisfactory to the Department of Health."

The developer and/or landowner of the Property will abide by this condition and cooperate with the State Department of Health and the County of Hawaii Department of Public Works to conform to the program goals and objectives of the Integrated Solid Waste Management Act, Chapter 342G, Hawaii Revised Statutes, and the County's approved integrated solid waste management plans in accordance with a schedule and time frame satisfactory to the Department of Health.

The use of recyclable products and the implementation of a recycling program would reduce the amount of solid waste disposal requirements generated from UHCWH operations. Because of the above features, no mitigation for offsite impacts to air quality is proposed or deemed warranted. There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

18. "The developer of the subject Property shall maintain, to the extent required by the State Department of Health, on-site facilities to ensure that the nearshore, offshore and deep ocean waters remain in pristine condition. The developer of the subject Property shall also participate in a water quality monitoring program with the Natural Energy Laboratory of Hawaii and the Hawaii Ocean and Science Technology Park. This program shall be submitted for review to the State Department of Health."

The developer and/or landowner of the Property will abide by this condition and maintain on-site facilities to ensure that the nearshore, offshore and deep ocean waters remain in pristine condition and participate in a water quality monitoring program with the Natural Energy Laboratory of Hawaii and the Hawaii Ocean and Science Technology Park.

There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

19. "The developer and/or landowner of the subject Property shall, to the satisfaction of the State Department of Health, keep wastewater ponds holding effluent for irrigation of golf courses at a sufficient distance from residential areas to prevent odor and insect nuisances."

The developer and/or landowner of the Property will abide by this condition if a golf course included in the development of the property.

There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

20. "If the development of the Property includes a golf course(s), the developer and/or landowner of the Property shall engage the services of a qualified golf course manager to oversee the irrigation of the golf course and application of fertilizers and pesticides to the golf course within the Property and who shall be qualified in the application of fertilizers and pesticides on those areas."

The developer and/or landowner of the Property will abide by this condition if a golf course included in the development of the property.

There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

21. "If a golf course(s) is included in the development of the Property, the developer and/or landowner of the Property shall comply with the State Department of Health's conditions for new golf course developments."

The developer and/or landowner of the Property will abide by this condition if a golf course is included in the development of the property.

There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

22. "The developer and/or landowner of the Property shall be responsible for implementing sound attenuation measures to bring noise levels from vehicular traffic in the Property down to levels acceptable to the State Department of Health and the State Department of Transportation."

The developer and/or landowner shall abide by this condition and assume responsibility for implementing sound attenuation measures to bring noise levels from vehicular traffic in the Property down to levels acceptable to the State Department of Health and the State Department of Transportation.

The provision of air conditioning for proposed educational facilities at the University Center should create a learning environment that is relatively unaffected by the distant sounds from Kona International Airport and the Keahole Generating Station.

Traffic generated by the project would generate non-stationary noise sources from the movement of vehicle along roadways traversed by students, faculty, and UHCWH staff. In an effort to address potential increased vehicular noise caused by a student enrollment up to 1,500, the University Center would provide parking and loading provisions for shuttles and vans. Ultimately, it would be the responsibility of conscientious students, faculty, and staff to utilize carpools, public transportation, and other more environmentally friendly modes of travel as opposed to the personal automobile. Given these considerations, no mitigation for future non-stationary impacts to noise quality is proposed or deemed warranted.

Since the initial phases of the UHCWH will be developed within the University Village site on the Hiluhilu parcel, the above considerations may be addressed in the Hiluhilu Development's Final Environmental Impact Statement.

23. "The developer and/or landowner of the Property shall notify all prospective buyers of property of the potential odor, noise, and dust pollution resulting from surrounding Agricultural District land."

The developer and/or landowner shall abide by this condition and notify all prospective buyers of property of the potential odor, noise, and dust pollution resulting from surrounding Agricultural District land.

There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

24. "The developer and/or landowner of the Property shall notify all prospective buyers of property that the Hawaii Right-to-Farm Act, Chapter 165, Hawaii Revised Statutes, limits the circumstances under which pre-existing farming activities may be deemed a nuisance."

The developer and/or landowner shall abide by this condition to notify all prospective buyers of the Hawaii Right to Farm Act, Chapter 165, HRS.

There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

25. "If the future development of the Property includes a golf course, the developer and/or the landowner shall conduct an environmental risk assessment to analyze

possible impacts that might occur as the result of the application of pesticides and fertilizers to the course prior to the developer and/or landowner applying for county zoning or prior to the developer and/or landowner applying for county building permits if county rezoning is not required."

The developer and/or landowner shall abide by this condition if the future development of the property includes a golf course.

There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

26. "Once specific land uses for the Property have been identified, the developer and/or landowner shall work closely with HELCO to identify any potential health hazards that might be present as the result of proximity to the transmission lines now found within the Property. The identification of potential health hazards shall be done prior to any application for County zoning or prior to any application for a County building permit."

The developer and/or landowner shall work closely with HELCO, prior to any application for County zoning or prior to any application for a County building permit, to identify any potential health hazards which may result from the proposed development's proximity to the transmission lines.

There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

27. "The developer and/or landowner of the subject Property shall establish a buffer zone on the subject Property between the adjacent Keahole Agricultural Park and uses on the subject Property to the satisfaction of the State Department of Agriculture."

Plans for the development of the property will include a buffer zone on the property between the adjacent Keahole Agricultural Park and uses on the subject Property to the satisfaction of the State Department of Agriculture.

There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

28. "The Petitioner and/or developer shall comply with all applicable County land use and permitting approvals, including the County's zoning process."

As appropriate, the Petitioner and/or developer will comply with all applicable County land use and permitting approvals, including the County's zoning process.

There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

29. "The developer and/or landowner of the subject Property shall develop the Property in substantial compliance with the representations made to the Commission. Failure to so develop the Property may result in reversion of the Property to its former classification, or change to a more appropriate classification."

As planning progresses, the landowner will include plans that comply with the representations made to the Commission.

There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

30. "The developer and/or landowner of the subject Property shall promptly provide without any prior notice, annual reports to the Land Use Commission, the Office of State Planning, and the County of Hawaii Planning Department in connection with the status of the subject project and the developer's and/or landowner's progress in complying with the conditions imposed."

The Office of Planning has complied with the above condition and with this report submits its Tenth Annual Report to the Land Use Commission.

There has been no change from 2003 in the developer and/or landowner's willingness to continue to comply with this condition.

31. "The Land Use Commission may fully or partially release these conditions as to all or any portion of the Property upon timely motion and upon the provision of adequate assurance of satisfaction of these conditions by the developer and/or landowner of the subject Property."

The developer and/or landowner shall abide by this condition, which would allow the Land Use Commission to fully or partially release these conditions to all or any portion of the Property upon a timely motion and provision of adequate assurance of satisfaction of these conditions by the developer and/or landowner.

There has been no change in 2003 in the developer and/or landowner's intent to comply with this condition.

32. "The developer and/or landowner of the subject Property shall give notice to the Commission of any intent to sell, lease, assign, place in trust, or otherwise voluntarily alter the ownership interests in the Property, prior to the completion of the development of the Property."

The developer and/or landowner shall abide by this condition and give notice to the Commission of any intent to sell, lease, assign, place in trust, or otherwise voluntarily alter the ownership interests in the Property, prior to the completion of the development of the Property.

The consolidation/re-subdivision application submitted by DLNR creating 13 parcels within the Government Lands of Kalaoa 1-4 and Ooma 1st for the purpose of establishing, and subsequently, transferring certain lands to the Department of Hawaiian Home Lands was finalized May 1999. There has been no further subdivision of the lands covered by Land Use Docket BR92-685 since May 1999.

33. "Within 7 days of the issuance of the Commission's Decision and Order for the subject reclassification, Petitioner shall 1) record with the Bureau of Conveyances a statement to the effect that the Property is subject to conditions imposed by the Land Use Commission in the reclassification of the Property; and 2) shall file a copy of such recorded statement with the Commission."

The statement of Imposition of Conditions by the Land Use Commission for the real property at Keahole, North Kona, was filed with the Bureau of Conveyances-Regular System, December 15, 1993.

34. "Petitioner shall record the conditions imposed by the Commission with the Bureau of Conveyances pursuant to Section 15-15-92, Hawaii Administrative Rules."

The Declaration of Conditions imposed by the Land Use Commission for the real property at Keahole, North Kona, was filed with the Bureau of Conveyances-Regular System, on February 9, 1994.

westhawaiitoday.com

Kaiminani Drive traffic concerns over Lokahi Subdivision

By BOBBY COMMAND/ West Hawaii Today

A Kona Palisades resident has raised concerns about a proposed 184 - unit subdivision that will use Kaiminani Drive as its primary access.

Westpro Development is planning to develop 68 acres into Lokahi Subdivision, with lots no smaller than 10,000 square feet. The subdivision, which will include a four - acre park, will be connected to Kaiminani Drive by Kakahiaka and Kapuahi streets.

Barry Christian, who lives on Kakahiaka Street, said Westpro Development should not be solely responsible for the infrastructure that should have accompanied tremendous growth in Kona Palisades during the last decade.

However, Christian said the development of Lokahi to the south of lower Kona Palisades will have a tremendous impact on his neighborhood.

"I'm not a statistician, but I would venture to guess that it represents at least two cars per home," said Christian, who estimates 238 more vehicles on the neighborhood's roads each day.

Christian said he and some of his neighbors are frustrated by the lack of opportunity to participate in the planning process for their community.

"I am not against development, but once again in the name of progress have we really thought out all the potential problems before we blankly sign the required permits?"

Sidney Fuke, the developer's representative, said the community had the opportunity to comment, but that was more than a decade ago when the property was originally rezoned by the Hawaii County Council. Indeed, the ordinance that allows the subdivision is so old it was signed by then - Council Chairman Takashi Domingo.

But the original plan was also much more elaborate, calling for a 600 - lot subdivision on more than 125 acres in the same area. The project, then called Puuhonua, would have been made up of single - family homes, townhouses and a commercial area.

Only a dozen homes in the original subdivision were built; those are at the makai end of Kona Acres, which also was piggybacked onto Kona Palisades and Kaiminani Drive. Since then, the 125 acres has been re - subdivided into five parcels.

Westpro is seeking a "nonsignificant zoning change" and a planned unit development (PUD) permit, and the decisions on both will be made administratively by Planning

Attachment C2

Director Chris Yuen. Westpro is asking for minor changes on lot lines and the ability to make small deviations from the subdivision code.

Yuen said the situation has come up before where zoning sits for years before an owner decides to develop the property.

"There's quite a bit of zoning out there," Yuen said. "People have to be aware of the zoning on that undeveloped piece of property next to them."

While Yuen said the zoning guarantees the owner certain rights on the property, since another application has been submitted, the county can add on certain conditions. But Yuen said even that is no guarantee, since if too many more conditions are added, the developer can drop its request and proceed with original plans.

Yuen said Christian should make his concerns known to the county by mail. "We are usually looking at maps and may not be aware of what is happening on the ground," Yuen said. "But we may be able to work things out with the developer."

Fuke said he has received Christian's letter and will respond.

bcommand@westhawaiitoday.com

LINDA LINGLE
GOVERNOR

RODNEY K. HARAGA
DIRECTOR

Acting Deputy Director
GLENN M. OKIMOTO

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

IN REPLY REFER TO:
DIR 0439
STP 8.0757

May 9, 2003

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

Dear Mr. Atta:

Subject: Hiluhilu Development
Environmental Impact Statement Preparation Notice (EISPN)

In reply to your transmittal of the preparation notice, the following are our comments on the subject project:

1. A Traffic Impact Analysis Report (TIAR) should be prepared and submitted for our review and approval. The report should include analysis and discussion of each of the three (3) proposed access routes, including the intersection on Queen Kaahumanu Highway with the entrance access road to Kona International Airport at Keahole (KOA). Necessary roadway and intersection improvements for the mitigation of adverse traffic impacts caused by the development should be identified.

   The TIAR should reflect the cumulative impacts of the entire planned development. .The planned roadway operations, including collector roads running north or south (shown on Figure 2, Development Plan, in the EISPN) which may provide access to and from the development should be included in the analysis and discussion.

2. The subject development should be coordinated with adjacent developments.

3. The developer should construct all required roadway and intersection improvements at no cost to the State Department of Transportation.

4. The developer should be required to contribute to regional roadway improvements on a fair share basis.

5. Plans for construction within the State highway right-of-ways must be submitted for our review and approval.

Attachment E1

6. Although the subject development is outside of the KOA airport noise exposure contours, the developer should be aware that overflights can occur from aircraft utilizing the airport.

7. The developer should submit Federal Aviation Administration (FAA) Form 7460-1, Notice of Proposed Construction or Alteration, so that the FAA can evaluate if there are any impacts to the airspace in the vicinity of KOA airport from the subject development.

We appreciate the opportunity to provide comments.

Very truly yours,

RODNEY K. HARAGA
Director of Transportation

DS:km

c: Genevieve Salmonson, OEQC

bc: HWY-P, STP(ET)

LINDA LINGLE
GOVERNOR

RODNEY K. HARAGA
DIRECTOR

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

IN REPLY REFER TO:
DIR 1244
STP 8.0934

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

November 12, 2003

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

Dear Mr. Atta:

Subject: Hiluhilu Development
Draft Environmental Impact Statement (DEIS)

Thank you for allowing us the time to review the subject impact statement. The following are our comments at this time.

1. Our earlier comments Nos. 6 and 7, regarding airport/aviation concerns, in our letter of May 9, 2003 on the Environmental Preparation Notice are still applicable.

2. Another comment, which we made as part of Comment No. 1 in the same May 9 letter, regarding a proposed road from the Hiluhilu project intersecting with Queen Kaahumanu Highway at the entrance access road to Kona International Airport is still applicable because of its impact to the airport and the highway.

3. Our Highways Division is finalizing its review of the Draft EIS and we will provide the comments to you as soon as they are completed.

We appreciate your cooperation in understanding that we have concerns about the impacts that the Hiluhilu Development will have on our transportation facilities.

Very truly yours,

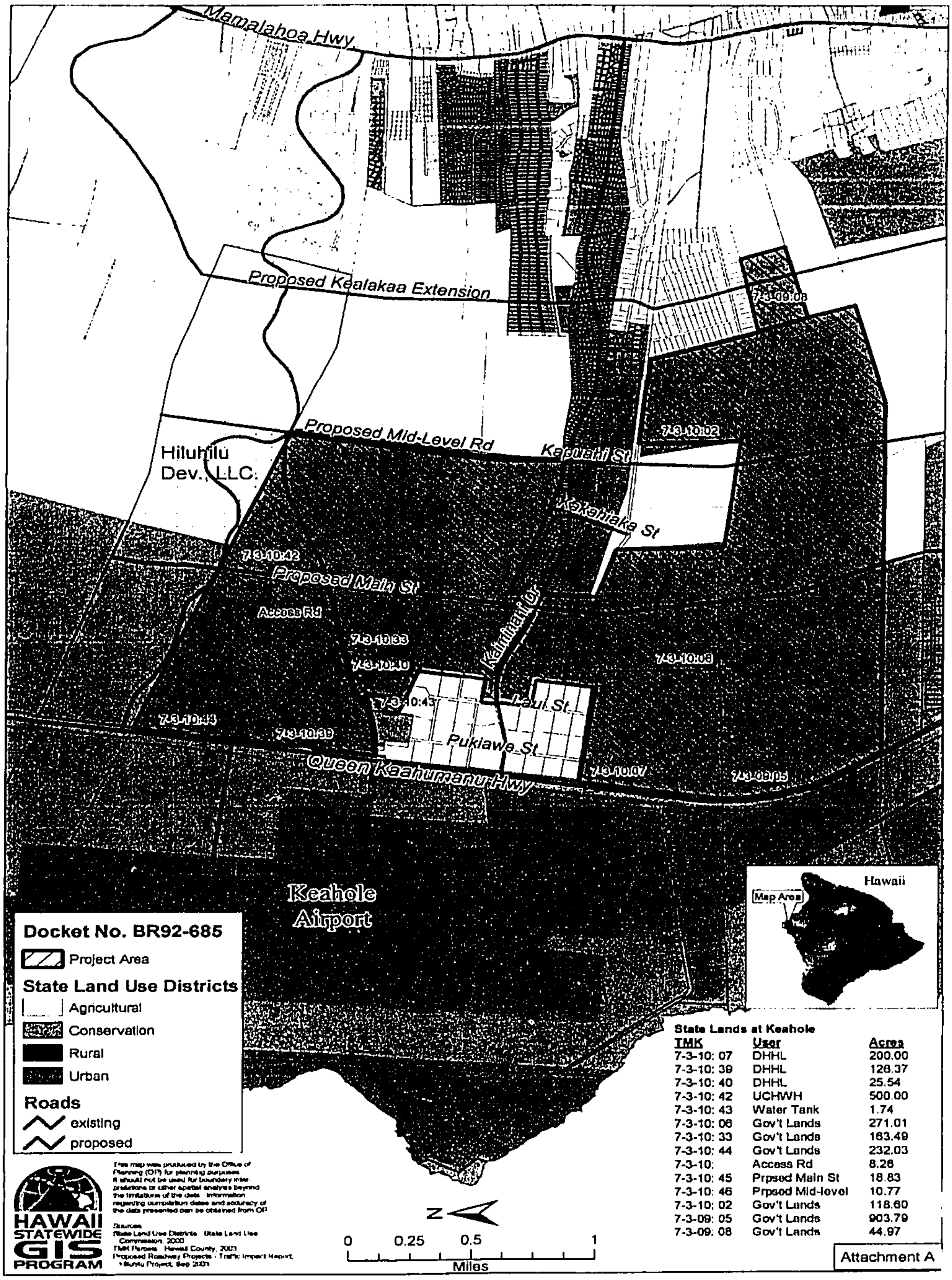
RODNEY K. HARAGA
Director of Transportation

Attachment E2

DS:km

c: Anthony Ching, Hawaii State Land Use Commission
Nancy Heinrich, Office of Environmental Quality Control
Christopher Yuen, Hawaii County Planning Department

bc: AIR-P, HWY-P, STP(DS)

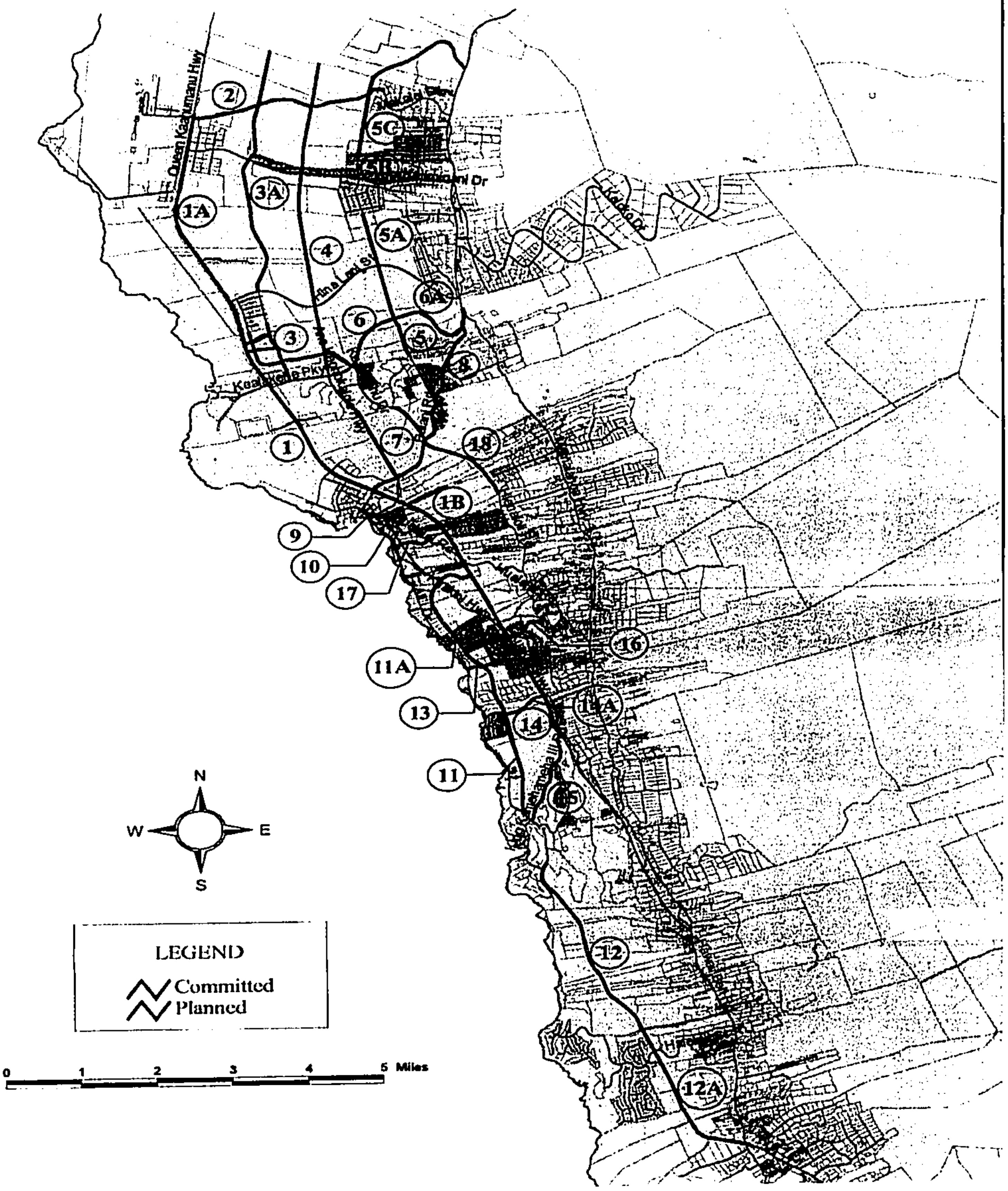


State Lands at Keahole

TMK	User	Acres
7-3-10: 07	DHHL	200.00
7-3-10: 39	DHHL	126.37
7-3-10: 40	DHHL	25.54
7-3-10: 42	UCHWH	500.00
7-3-10: 43	Water Tank	1.74
7-3-10: 06	Gov't Lands	271.01
7-3-10: 33	Gov't Lands	163.49
7-3-10: 44	Gov't Lands	232.03
7-3-10:	Access Rd	8.26
7-3-10: 45	Prpsed Main St	18.83
7-3-10: 46	Prpsod Mid-lovol	10.77
7-3-10: 02	Gov't Lands	118.60
7-3-09: 05	Gov't Lands	903.79
7-3-09: 08	Gov't Lands	44.97

RECEIVED AS FOLLOWS

PROPOSED ROADWAY PROJECTS
KONA AREA



Attachment B1

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PROPOSED ROADWAY PROJECTS KONA AREA

ID NO.	NAME	PROJECT_NO	JURISDICTION	ROW	CLASS	DESCRIPTION	IMPROVEMENT	FUNDING	PLNG	DESIGN	ACQUIRE	CONSTRUCTION	HLRLTP	GP	SOURCE
1	Queen Kaahumanu Hwy	HS10	State of Hawaii	300	Arterial	Kealakehe Pkwy to Henry	Widen	STIP	done	done	2002	2003	1		STIP 2002-04 Am
1A	Queen Kaahumanu Hwy		State of Hawaii	?	Arterial primary	Kealakehe to Airpt	Widen	Future	?	?			1		
1B	Kuakini Hwy.	HS8	State of Hawaii	150	Collector	Henry St. - Kam III	Widen	STIP	2004				1		STIP 2002-04 Am
2	University Ave		County of Hawaii	0	Collector	Mamalahoa to Queen K	New	Future Private?					no	proposed	
3	Kamanu Ext		County of Hawaii	80	collector	McClean, Lanihau	New	Future Private					no	no	SUB ?
3A	Main Street (Kamanu)		County of Hawaii	80	collector	extend to Kaiminani +	New	Future					no	proposed	
4	Mid-level		County of Hawaii	120	Arterial	Kealakehe to Kaiminani	New	Future					1,4	yes	
5	Kealakaa		County of Hawaii	80	Collector	terminus to Hina Lani	New	Future					4	proposed	
5A	Kealakaa		County of Hawaii	80	Collector	Hina Lani to Kaiminani	New	Future					4	proposed	
5B	Kealakaa		County of Hawaii	80	Collector	to Hao Kuni and Kealaka	New	Future Private?					4	proposed	
5C	Holoholo St connection		County of Hawaii	80	Collector	Holoholo connect to Nana	New	Future					no	yes	
6	Kealakehe Pkway Ext		State	?	Arterial	extend to Kealakaa	New	Future					2	yes	
6A	Kealakehe Pkway Ext		State	?	Arterial	Kealakaa to Mamalahoa	New	Future					2	yes	
7	Henry St ext		County of Hawaii	?	Collector?	Palani to Kealakehe Pkwy	New	Future					4	proposed	
8	Palani Safety Imprvmts	5396.10,24	County of Hawaii	?	Collector major	Kealakaa xsctn, other	Improvement	CIP	2003-05 lapse				No	n/a	00-64 01-26,-56,
9	Kuakini Hwy	HC5	County of Hawaii	?	Collector major	Palani to Hualalai	Widen	STIP	done	done	?	2004	1		STIP 2002-04 Am
10	Alii Drive - Oneo Bay	HC9	County of Hawaii	50	Collector	Hualalai Rd. to Walua Rd	Improvement	STIP	done	2003	2003	2004			STIP 2002-04 Am
11	Ke Ala O Keauhou	HC7	County of Hawaii	80	Collector	fka Alii Parkway	New	STIP	done	done	done	2002-03	1		STIP 2002-04 Am
11A	Ke Ala O Keauhou		County of Hawaii	80	Collector	fka Alii Parkway	New	Future	done	done			1		
11A	Ke Ala O Keauhou		County of Hawaii	80	Collector	fka Alii Parkway	New	Future	done	done			1		
12	Mamalahoa Bypass Rd		County of Hawaii	120	Arterial	Halekii to Keauhou	New	Private							Dev Agmt
12A	Mamalahoa Bypass Rd		County of Hawaii	80	Arterial	Halekii to Napoopoo	New	Private							Dev Agmt
13	Lako St. Extension Makai	5396.29	County of Hawaii	60	Collector	Extension Project	New	CIP	2004 lapse						Ord 01-56
14	Laaloa Ext		County of Hawaii	60	Collector major	Alii Hts	New	Private					no	yes	SUB 2002-0118
14A	Laaloa Ext		County of Hawaii	60	Collector major	Alii Hts	New	Future					no	yes	
15	King Kamehameha III		County of Hawaii	?	Collector major	Alii Drive to Kuakini	Widening	Future					Tier 4		
16	Lako St. Extension Mauka		County of Hawaii	60	Collector	Extension Project	New	Private							SUB ?
17	Nani Kailua Extension		County of Hawaii	?	Collector			Future							Kailua Master Pln
18	Hienaloli Ext		County of Hawaii	?	Collector major	Keanalehe to Hienaloli	New	Future							

Attachment B2

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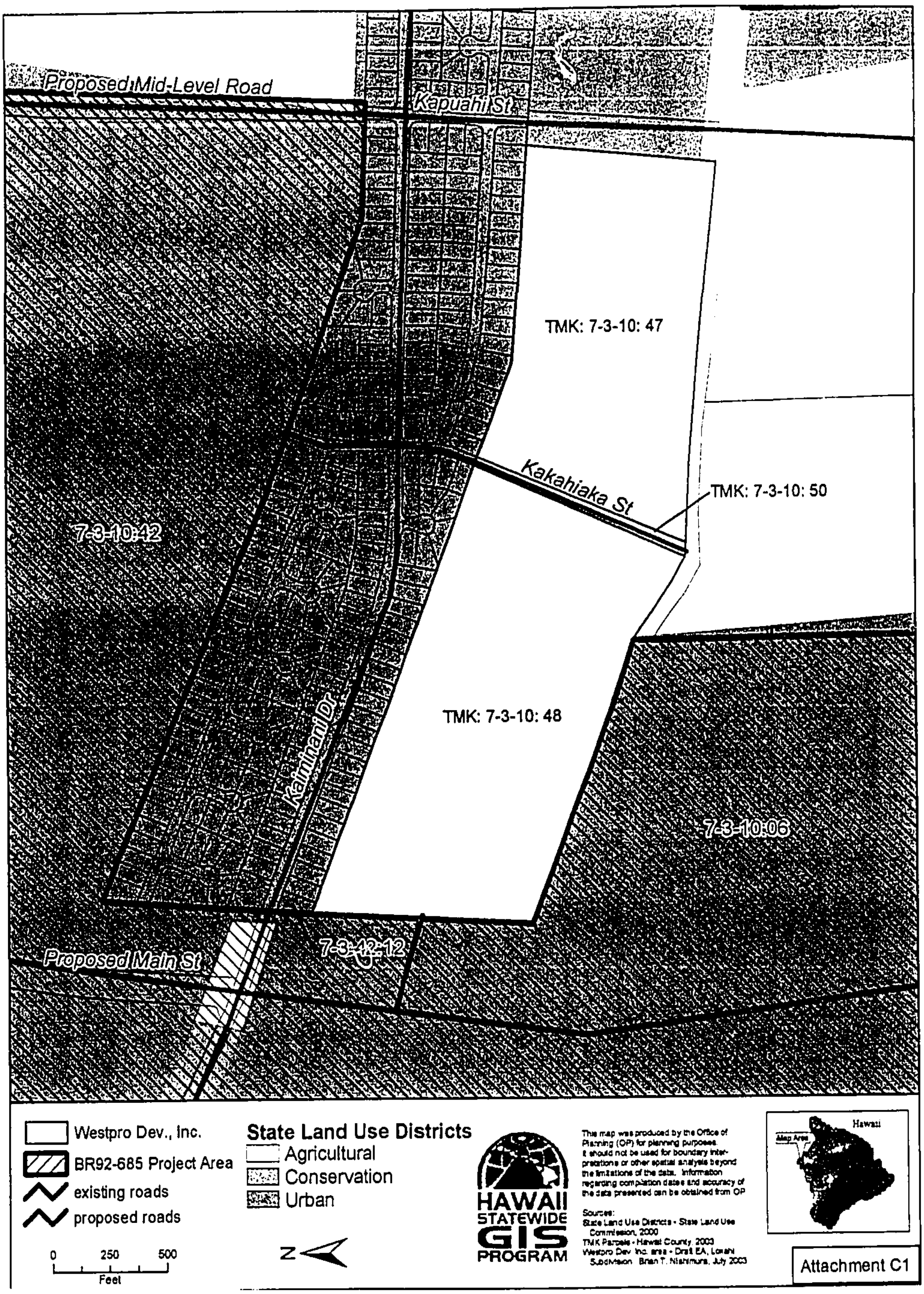

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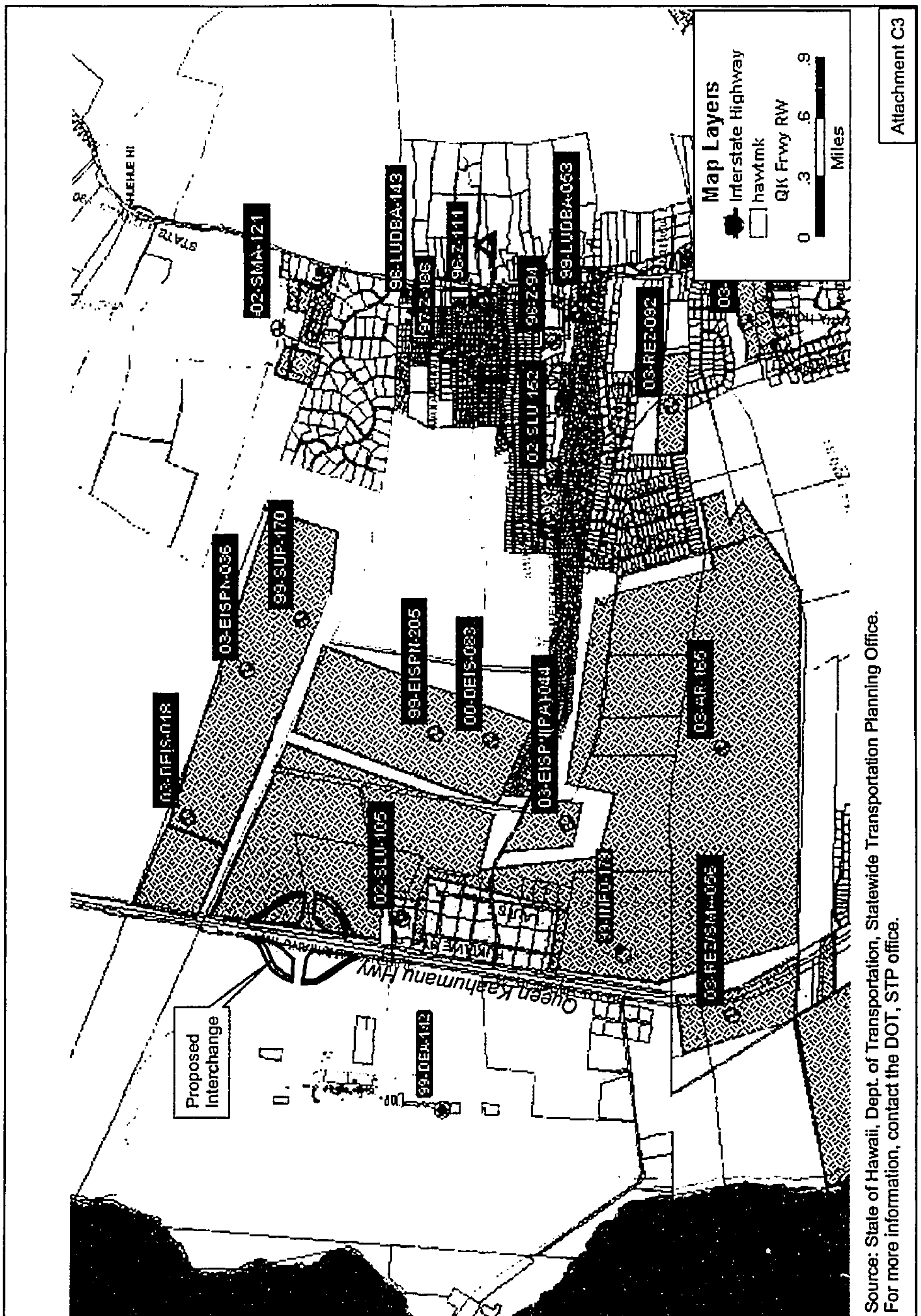

Source: State of Hawaii, Dept. of Transportation, Statewide Transportation Planning Office.
For more information, contact the DOT, STP office.

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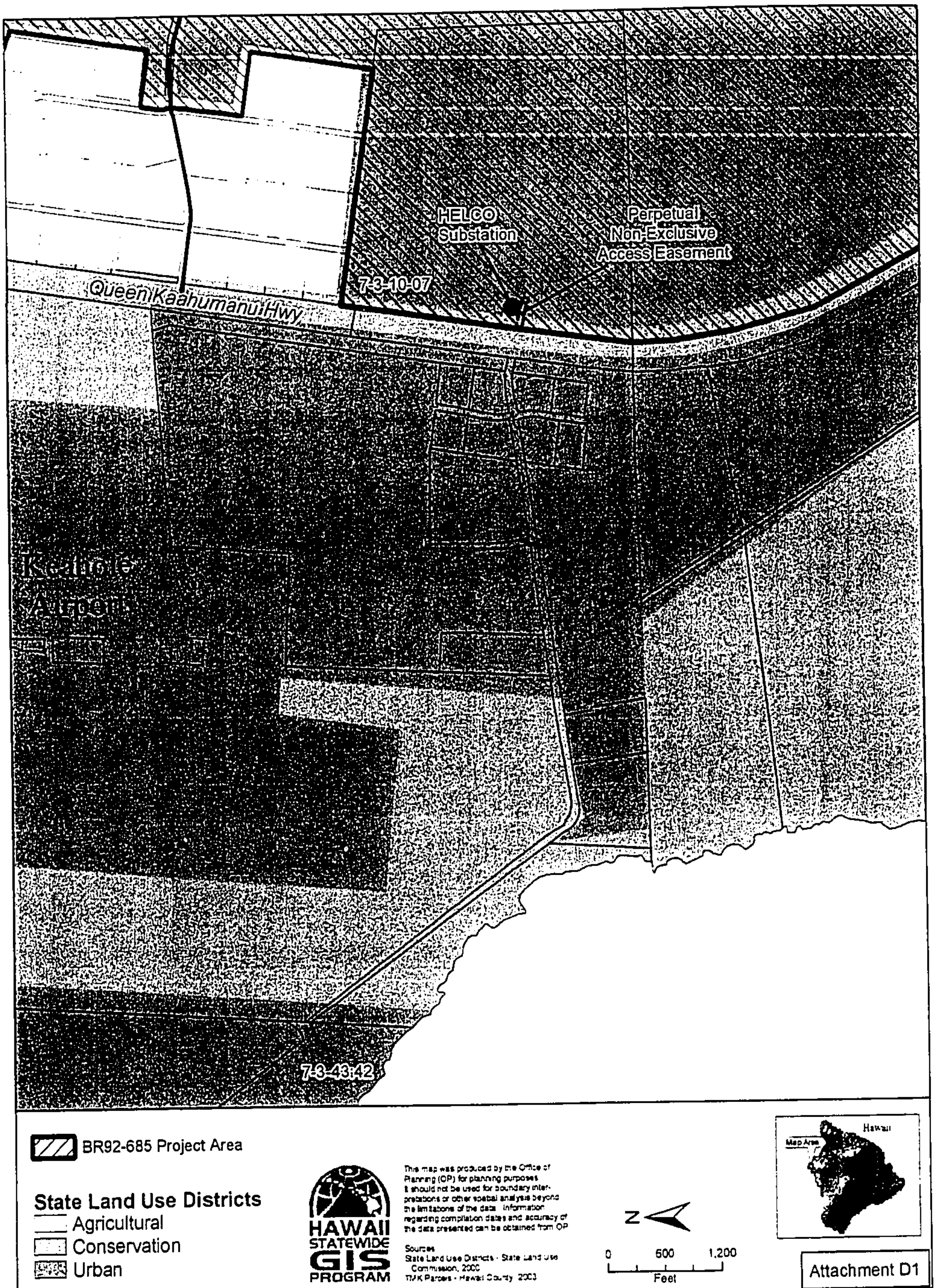

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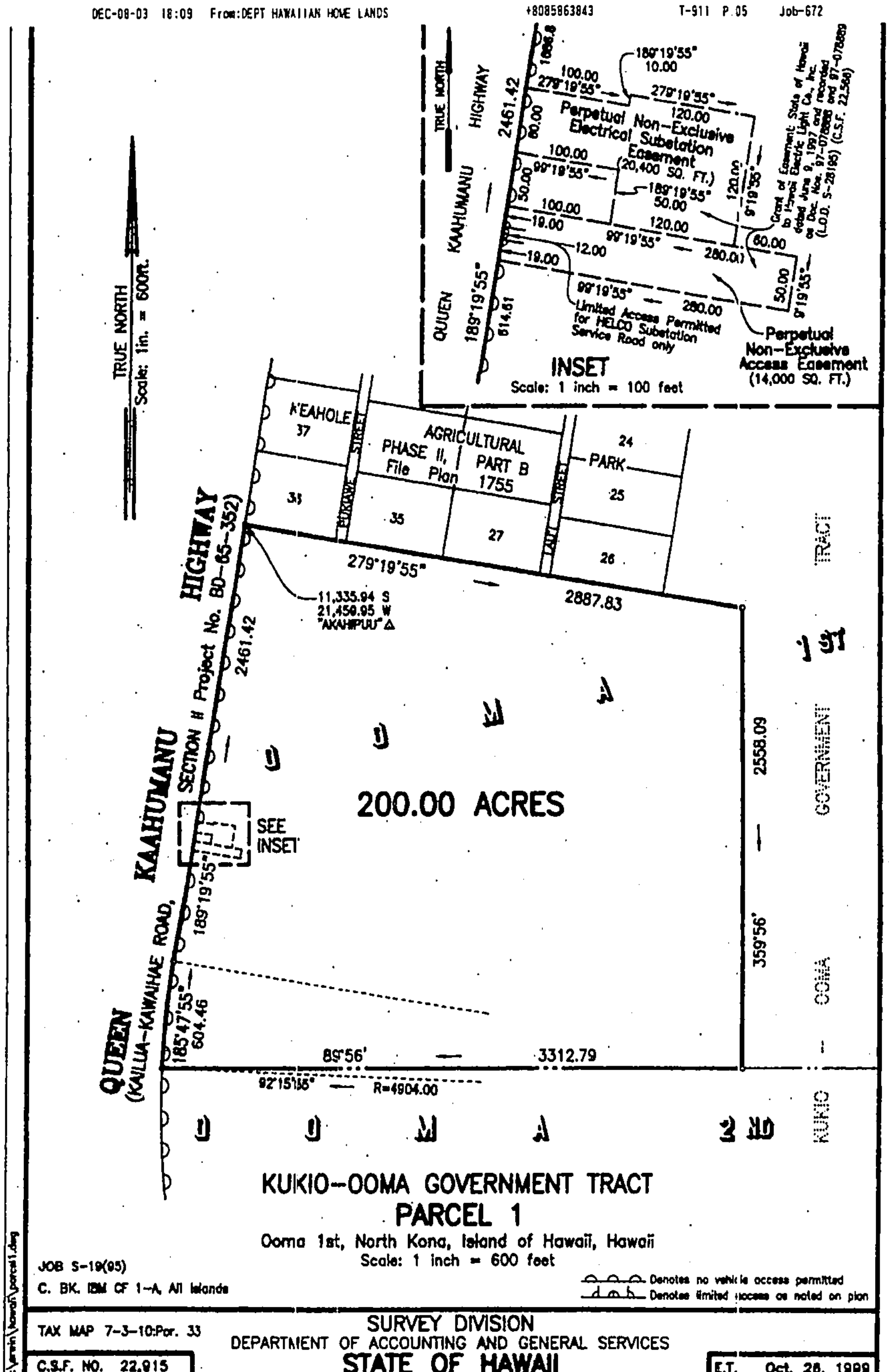

Attachment D2

Appendix Q
Memorandum of Understanding with UH

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UNIVERSITY OF HAWAII CENTER: WEST HAWAII
MEMORANDUM OF UNDERSTANDING

November 21, 2002

Preamble

The University of Hawaii West Hawaii Center was among the centers established by the Board of Regents action in June 1996. The West Hawaii Center is a vehicle for delivering programs and services from all parts of the University of Hawaii system to West Hawaii. Goal E of the University of Hawaii Center: West Hawaii Development Plan 1998-2007 provides that the goal was to:

"Develop the infrastructure of the Center, including provision of basic facilities, equipment and support personnel to facilitate the delivery of quality programs and services."

One of the factors limiting the West Hawaii program was the location of the Center in Kealakekua, and the lack of adequate facilities and infrastructure.

The University of Hawaii identified a 500 acre parcel of vacant land east of the Keahole Airport (within Tax Map Key parcel [3] 7-3-10-42) as a suitable site for a permanent campus for the West Hawaii Center. The development of this site has been hampered by a lack of capital improvement funds to provide adequate potable water, roadway and other basic supporting infrastructure and to allow construction of classroom and office buildings.

Hiluhilu Development, LLC ("Hiluhilu") owns the parcel of land (TMK [3] 7-2-5-1) adjacent to the north boundary of the University of Hawaii's 500 acre site. Hiluhilu has expressed its willingness to coordinate its development with that of the West Hawaii campus and to cooperate by providing supporting infrastructure for the West Hawaii Center.

RECEIVED AS FOLLOWS

Statement of Understanding

Courses of Action.

In order to further the goals of the West Hawaii Development Plan, the undersigned agree to the following courses of action:

1. The parties to this Memorandum shall consult on the location and general site plan for the initial phase of an area to be developed for a University Village for the West Hawaii Center. The University Village area will extend across the University land and across the Hiluhilu land and will be master planned to provide classrooms, office, living accommodations, food service and supporting commercial facilities for the West Hawaii Center.

2. The parties to this Memorandum shall consult and cooperate in identifying critical infrastructure required for the initial relocation of the University's operations to the University Village. The infrastructure will include providing potable water, wastewater treatment and internal roadway access.

3. Hiluhilu will include in its development planning provisions to allow the West Hawaii Center to share roadway access from the Queen Kaahumanu Highway to the site of the University Village. The parties will discuss the routing of such access, including the possibility that a portion of said roadway system may be located within the State land.

4. Hiluhilu in planning for potable water units for its development shall use its best efforts to obtain potable water for the first phase of University Village and will coordinate its efforts with the University to obtain additional potable water for later phases of the West Hawaii Center.

5. Hiluhilu will include in its development plans provisions to allow the University Village to connect to the private wastewater treatment system which Hiluhilu will build. The plans will include provisions to allow expansion of the facilities as additional capacity is needed.

6. The parties to this Memorandum will discuss the feasibility of relocating to the University Village site with Hiluhilu having buildings constructed for lease by the University for the initial phase of the West Hawaii Center.

7. Although the parties to this Memorandum hope to implement the results of the development planning to be undertaken under this Memorandum, such implementation is conditioned upon them being able to obtain funding, water units, permits and other governmental authorizations. In the case of Hiluhilu, implementation ill also depend on the financial feasibility of various parts of its development.

RECEIVED AS FOLLOWS

8. With respect to efforts of the parties to obtain funding, water units, permits and other governmental authorizations, the parties to this Memorandum will cooperate with each other in providing information and reasonable support for the furtherance of the University Village pursuant to mutually acceptable development plans.

9. If the parties to this memorandum are able to agree upon the development plans for the University Village, they will enter into negotiations to establish mutually acceptable terms for such items as operating costs of common infrastructure and lease terms. Hiluhilu expects that it can solely bear the cost of certain capital infrastructure such as shared roadways and infrastructure required for the initial phase of the University Village as part of its contribution to the community for development impacts. It is expected that other capital infrastructure costs which are solely of benefit to the University would be the responsibility of the University. The parties will discuss the terms for other infrastructure costs which are of mutual benefit to both of them.

10. This agreement expires automatically twenty four (24) months after the date of this agreement unless extended by mutual written agreement. Either party may terminate this agreement at any time prior to the expiration date for any reason, upon thirty (30) days notice to the other party.

11. This agreement to consult with each other and discuss joint development opportunities for the adjoining parcels identified in the Preamble is not an exclusive agreement. Either party may explore other development options.

Signed on this day:

UNIVERSITY OF HAWAII	HILUHILU DEVELOPMENT, LLC
By: EVAN S. DOBELLE Its President	By: Its Manager

rodev\hiluhilu\Uhmemo1 10102

Appendix R
Solid Waste

SOLID WASTE

PLAN:
Solid wastes generated on site will be collected and disposed at approved County solid waste disposal facilities. Recycling of solid wastes will be accommodated and implemented to the extent practicable. Green wastes generated by golf course and landscape maintenance will be composted with biosolids at the wastewater treatment plant. Solid waste systems will be designed to comply with the applicable DOH and County requirements. Solid waste from multifamily, commercial and institutional uses will be handled by private waste hauling contractors.

POTENTIAL IMPACTS
No significant short term impacts on the existing solid waste collection and disposal system or the environment are anticipated as a result of the proposed development. There will be no demolition waste, as the property is currently undeveloped. The majority of pre-construction waste will be green waste from site clearing. Approximately 1,392 tons of solid waste is expected to be generated from the construction of the proposed 845 residential units. Approximately 1,087 tons of solid waste is expected to be generated from the construction of the proposed 660,000 square feet of commercial activities. Solid waste typically generated by construction activities includes wood, drywall, cardboard, metals and other materials. Palamanui is expected to reach full build out in 2014. After build out, solid waste generated during the operational life of the residential and commercial activities includes paper, plastic, yard waste, glass, metals, other organics and other solid wastes. Solid waste generated by operation activities from the residential units is estimated at 1,056 tons a year. Solid waste generated by operation activities from the commercial units is estimated at 753 tons a year.

Puuanahulu Landfill is the closest solid waste disposal facility to the proposed project. According to the Draft EIS for the East Hawaii Regional Sort Station, September 2003, "At the end of 2002 the Puuanahulu Landfill had slightly more that 12 million cubic yards of permitted air space. Assuming the in-place density averages 1,100 pounds per cubic yard, and cover materials make up 20% of the volume, the remaining capacity of the Puuanahulu Landfill is 5.28 million tons." Approximately 1,809 tons of solid waste is estimated to be generated a year from the operation of the residential and commercial components of the proposed project. Using recycling and LEED sustainable design efforts, we estimate a 40% reduction in the amount of solid waste generated a year for a sum of 1,086 tons of solid waste. The proposed project will contribute less than .001% of total capacity of solid waste to the landfill a year. In effect, this project will have a very small impact on the life of the landfill.

MITIGATION STRATEGIES
Using recycling and LEED sustainable design efforts, we estimate a 40% reduction in the amount of solid waste generated. LEED (Leadership in Energy and Environmental Design) is a building rating system developed and managed by the U.S. Green Building Control which evaluates environmental performance from a whole building perspective over a building's recycle, providing a definitive standard for what constitutes a "green" building. LEED technologies and strategies to minimize the waste generated by construction and building occupants that is hauled to and disposed of in landfills includes providing easily accessible areas that serves the entire building that is dedicated to the separation, collection and storage of materials for recycling including at a minimum, paper, glass, plastics, and metals. The provision and use of the collection bins should be able to accommodate a 75% diversion rate when easily accessible to custodial staff and recycling collection workers. In addition, LEED recommends recycling and or salvaging at least 50% (by weight) of construction and land clearing waste.

A solid waste management plan will be developed which will identify efforts to minimize waste generated at Palamanui during construction and operation. At minimum the plan will include the following:

- During site excavation and grading, green waste will be generated. Green waste will be recycled. Once construction begins, recycling will be encouraged and practiced as practicable and to the level available within the County of Hawaii. Non-hazardous waste will be transported directly to the landfill.

- Prevention of waste is called source reduction. During construction, Hiluhilu Development will plan efficiently for material use. During operation, minimization of waste generation, such as limiting the number of non-reusable products will be implemented.

- Efforts to re-use materials will be a component of the solid waste plan. In the construction phase efforts will be taken to reuse materials as much as possible, such as scrap generated on the site. The primary re-use taking place in the operational phase will be composting / re-use of green waste.

- Recycling will be an important part of both the construction and operational phase of the development. Recyclable materials will be separated out from non-recyclable materials, hauled from the site to the appropriate company, and eventually processed to make new produces. Hiluhilu Development will also look into buying recycled products as both building materials and for use for Palamanui.

Hiluhilu Development intends to reduce the impact Palamanui may have on the County landfill by promoting a recycling program among commercial retailers. Tenants of the commercial center will be encouraged to utilize separate containers for cardboard disposal and other recyclable waste. This will reduce the commercial element's potential contribution to the landfill by between 15 to 40%. Additionally, the senior housing and multi-family development will be encouraged to develop its own recycling program providing dedicated waste separation receptacles for residents. Space for recycling operation will be provided in the development.

A successfully implemented recycling program will significantly reduce potential impacts on the County landfill. Hiluhilu Development will encourage recycling amongst commercial tenants, work to educate tenants on the benefit of recycling, and will provide separate waste receptacles for recyclable products. Separate waste receptacles will be provided for the residential development. Grounds maintenance crew will separate out green waste for appropriate disposal to one of the composting companies on Hawaii. Chipping and composting will be utilized to the extent practicable; especially during the operational phase. Yard and landscaping maintenance may use compost and chipped material for mulching and soil conditioning. These activities will reduce the amount of green waste that needs to be transported off site.

PALAMANUI SOLID WASTE ESTIMATES

Table 1: PROGRAM

note. total buildout in 2014

RESIDENTIAL

375 # of multi-family residential units
470 # of single family residential units
845 Total Residential Units

Single Family Residential Units
70 Ocean View Estates
200 Ocean View Lots
120 Golf Course Lots
80 Patio Lots
470 Total Single Family Residential Units

Multifamily Residential Units
100 Apartments
75 Student Housing
80 Senior Housing
120 University Inn (hotel)
375 Total MultiFamily Units

RESIDENTIAL
845 Total Number of Residential Units
1,000 Average Square Foot per Unit (assumption)
845,000 TOTAL SF

COMMERCIAL

80,000 University Village commercial
200,000 Community Commercial
120,000 Medical
200,000 R&D / Flexible space
60,000 University Inn (120 unit hotel)
660,000 Total SF

ASSUMPTIONS

1000 Average SF per Residential Unit

2240 lbs equals 1 Ton
7 lbs per 1000 square feet per day. Generation rate for commercial activities
6 lbs per dwelling unit per day. Generation rate for Multifamily units
9 lbs per dwelling unit per day. Generation rate for Single Family units
5.28 million tons of space left in Puuanahulu Landfill

Sources:
www.stopwaste.org/table_et-4.html
www.circleroll-offline.com
Estimated Solid Waste Generation Rates www.ciwmb.ca.gov/WasteChar/WasteGenRates
www.opala.org
U of N Bencorp Solid Wste Management Plan

CONSTRUCTION Waste Stream per type of material for Residential

Materials	Lbs per SF	Total Residential SF	total pounds of waste	Amount of residential waste measured in TONS
Wood	1.3	845,000	1,098,500	490
Drywall	1.1	845,000	929,500	415
Cardboard	0.3	845,000	253,500	113
Metals	0.09	845,000	76,050	34
Others	0.9	845,000	760,500	340
TOTAL	3.69	845,000	3,118,050	1,392

Assumes 1 TON = 2240 LBS

CONSTRUCTION Waste Stream per type of material for Commercial

Materials	Lbs per SF	Total SF - Commercial	total pounds of waste	Amount of Commercial waste measured in TONS
Wood	1.3	660,000	858,000	383
Drywall	1.1	660,000	726,000	324
Cardboard	0.3	660,000	198,000	88
Metals	0.09	660,000	59,400	27
Others	0.9	660,000	594,000	265
TOTAL	3.69	660,000	2,435,400	1,087

Assumes 1 TON = 2240 LBS

POUNDS OF WASTE PER DAY FOR RESIDENTIAL UNITS

2,250 lbs of waste generated a day for the 375 multifamily units (6lbs/day*375units)
4,230 lbs of waste generated a day for the 470 Single family units (9lbs/day*470units)
6,480 lbs of waste generated a day for the 845 residential units (2250+4230)

POUNDS OF WASTE PER DAY FOR COMMERCIAL ACTIVITIES

4,620 lbs of waste generated a day for the 660,000 SF of Commercial (7lbs*660/day)

TYPES OF WASTE GENERATED BY RESIDENTIAL UNITS

Multi Family - Average Waste Composition

Materials	% of Waste Stream	lbs per day (2,250LBS*%)	Pounds each year (LBS*365DAYS)	Tons one year
Paper	33%	742.5	271,013	121
Plastic	11%	247.5	90,338	40
Yard Waste	7%	157.5	57,488	26
Glass	4%	90	32,850	15
Metals	4%	90	32,850	15
Other Organics	36%	810	295,650	132
Other Waste	5%	112.5	41,063	18
TOTAL		2250	821,250	367

Assumes 1 TON = 2240 LBS

Single Family - Average Waste Composition

Materials	% of Waste Stream	lbs per day 4,230*%)	Pounds each year	Tons one year
Paper	33%	1,396	509,504	227
Plastic	10%	423	154,395	69
Yard Waste	13%	550	200,714	90
Glass	4%	169	61,758	28
Metals	4%	169	61,758	28
Other Organics	32%	1,354	494,064	221
Other Waste	4%	169	61,758	28
TOTAL		4,230	1,543,950	689

Total Multi Family & Single Family Waste 1,056

Commercial Waste Stream

Materials	% of Waste Stream	Pounds each day (4,620*%)	Pounds each year (LBS*365DAYS)	Tons one year
Paper	40%	1,848	674,520	301
Plastic	5%	231	84,315	38
Yard Waste	7%	323	118,041	53
Glass	7%	323	118,041	53
Metals	3%	139	50,589	23
Other Organics	33%	1,525	556,479	248
Other Waste	5%	231	84,315	38
TOTAL		4,620	1,686,300	753

Table 6.
IMPACT ON PUUANAHULU LANDFILL over 10 years (2014 buildout)

Project Component	Waste Generated (tons a year)	Portion of the Landfill (waste/space remaining)	40% Reduction using Recycling and LEED design efforts (tons a year)	Reduced impact on landfill
Construction of Residential	1,392	0.0003%	835	0.0002%
Construction of Commercial	1,087	0.0002%	652	0.0001%
Operation of Residential	1,056	0.0002%	634	0.0001%
Operation of Commercial	753	0.0001%	452	0.0001%

Conclusion: Proposed development has very small impact on the life of landfill

Appendix S
North Kona Wells Site Planning and Acquisition

DRAFT

February 9, 2004

Mr. Peter T. Young
Director
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Attention: Mr. Dennis Imada

Dear Mr. Young:

Subject: **Job. No. 8-HW-M North Kona Wells Site Planning and Acquisition, Contract Number 43971**

We are pleased to submit our Preliminary Findings for the subject project. If you have any questions please call the undersigned at 842-1133.

Very truly yours,

James H. Yamamoto P.E.
Project Manager

JY/jhy

NORTH KONA WELLS SITE PLANNING AND ACQUISITION

PRELIMINARY FINDINGS

INTRODUCTION

A. Background. To support State projects, located primarily in North Kona, the State Department of Land and Natural Resources (DLNR) proposed to develop new water sources for the County of Hawaii Department of Water Supply (DWS) in the North and South Kona areas. The DWS requested that the DLNR study the North Kona Water system to determine the water improvements required by the proposed State Projects and other developers.

Five potential well sites in the North Kona area were identified in the approved Final Map and Report dated February 10, 2003, prepared for this project as suitable for development.

B. Purpose. The purpose of this report is to describe the preliminary findings that will be used in the update to the North Kona Water Master Plan. The Sections to updated include:

CHAPTER VII. PROJECTED WATER REQUIREMENTS: SECTION C. TOTAL PROJECTED WATER REQUIREMENTS FOR STUDY AREA (KEAHOLE TO KAILUA TO KAINALIU)

CHAPTER VIII. WATER DEVELOPMENT PLAN: SECTION A. PLANNING AND DESIGN CRITERIA

CHAPTER VIII. WATER DEVELOPMENT PLAN: SECTION B. IMPLEMENTATION PLAN and SECTION D. COST ESTIMATE

C. Scope of Work. The project consists of providing engineering services which includes the preparation of engineering analyses to support updates to the North Kona Water Master Plan. This portion of the project involves these tasks.

1. Update CHAPTER VII. PROJECTED WATER REQUIREMENTS:

    Update SECTION C. TOTAL PROJECTED WATER REQUIREMENTS FOR STUDY AREA (KEAHOLE TO KAILUA TO KAINALIU) to reflect the latest State Water requirements and development schedules filed with the DLNR and the Commission on Water Resource Management (CWRM). The planning period will be extended to the year 2020. The study will include the latest projected water demand planning information of the Department of Water Supply (DWS).

2. Update CHAPTER VIII. WATER DEVELOPMENT PLAN:

Update SECTION A. PLANNING AND DESIGN CRITERIA to reflect the latest State Water requirements and development schedules and the present condition of the North Kona water source and distribution systems. The update will consider the new development plans in the area and the latest water system planning information of the DWS. A hydraulic model of the existing North Kona water distribution system will be developed using the Cybernet hydraulic modeling software. The model will be utilized to determine whether system upgrades meet the projected 2020 water requirements and identify necessary upgrades to the system.

Update SECTION B. IMPLEMENTATION PLAN to reflect the results of the updated planning and design criteria. The water system upgrades, required to meet the 2020 water requirements, will be presented as phased improvements to be implemented over five (5) year increments; 2005, 2010, 2015 and 2020.

Update SECTION D. COST ESTIMATE to reflect the results of the updated implementation plan. Budgetary cost estimates will be determined for the required water system improvements and itemized according to the increments of the Implementation Plan.

D. General. Five (5) potential well sites reviewed in the in the Final Map and Report. The anticipated hydrogeologic conditions of North Kona and the five (5) potential well sites are summarized below. The identification numbers of the well sites discussed below correspond to the numbers shown in Figure VIII-2 of the North Kona Water Master Plan, Report R-104. The status of some well sites identified in the 1994 Plan has changed, and, consequently have become available for acquisition. Also, some well sites planned by the DWS have not been developed and, therefore, the possibility of co-developing with the DWS on developing some of their sites were explored in a meeting on February 2, 1999. The DWS is agreeable to allowing the State to develop wells on their existing well and reservoir sites. At that time the possibility of constructing water transmission mains instead of wells and reservoirs was also discussed and summarized in a Memorandum Dated February 3, 1999.

The lack of water transmission infrastructure from the existing water sources mauka of Mamalahoa Highway to the Queen Kaahumanu Highway is affecting the DWS water sources in Kailua-Kona. In order to relieve over pumping existing Kailua-Kona water sources, the DWS is willing to exchange water development and storage credits at its underdeveloped North Kona sources for water transmission development. The update of the North Kona Water Master Plan will identify the water improvements that will facilitate the relief of the over pumping and provide cost information for discussions with the DWS.

A preliminary study is currently underway to determine the hydrologic feasibility of constructing a water development tunnel located at Keopu to develop 10 mgd or more at a service elevation of 600 feet. Should exploratory drilling indicate the presence of a sustainable potable water source, the construction of the water development tunnel in this sector would be considered in lieu of deep well sources. Therefore, after initial exploratory well drilling at Keopu, subsequent well sources should be considered in outlying hydrologic recharge sectors north of the Keopu Sector. Specifically the Kaloko, Kealakehe and Honokohau Sectors, due to the lack of infrastructure outside of the Mamalahoa Highway and Palani Road Intersection area.

E. Hydrologeologic Conditions

1. General

The Kona high-level aquifer represents the prime source of potable water supply in the North Kona area. The aquifer is not subject to any saltwater intrusion. Also, the high-level aquifer is less likely (than the basal aquifer) to be subject to contamination from existing and future urban development. The high-level aquifer has an estimated sustainable capacity of seventy-three million gallons per day (73 mgd) and, therefore can be developed without adversely impacting existing potable water sources.

Optimum development of Kona's groundwater resources consists of developing the high-level aquifer for potable water and the basal aquifer (with the exception of existing potable water sources) primarily for non-potable uses. Developing high-level well sources to meet the projected average daily demand of 37.76 mgd and maximum daily demand of 56.64 mgd is presented in the North Kona Water Master Plan, Report R-104.

2. Regional Hydrologic Setting

a. Rainfall

Rainfall on Hualalai's western slopes above an elevation of approximately 2,000 feet is the principal source of Kona's groundwater resources. This rainfall occurs in a four to five mile wide coastal belt of 30-75 inches of median annual rainfall. More than a third of this rainfall is able to percolate deep enough into the ground to become ground water at depth. This is due to the highly permeable nature of geologically young basaltic lava flows which are mostly unweathered and have little soil cover. There is little, if any, runoff to the sea even during times of heavy rainfall; and there are no perennial streams anywhere in Kona. In the heaviest part of the rainbelt, a few small springs, such as Waiaha Springs, may occur as groundwater issuing from shallow aquifers perched on top of local soil and ash beds. However, such springs are small and intermittent and suitable only for small needs, rather than municipal supplies.

b. Basal Groundwater Occurrence

Since the beginning of groundwater exploration by drilled wells in 1959, basal ground water has been known to occur as a thin, unconfined basal lens (except near the northwest rift zone) in highly permeable, westward dipping, flank flow lavas that erupted from Hualalai Volcano. The basal aquifer is unconfined and brackish along the entire coastal stretch of the study area. Data from over two dozen basal and high-level wells indicate that the basal aquifer extends approximately 1.5 to 4.5 miles inland from the coastline, more or less near Mamalahoa Highway. A maximum basal head of about 5 to 6 ft. occurs in wells near Kahaluu and at Holualoa, indicating unconfined aquifer conditions. Semi-confined basal aquifer conditions exist only near Hualalai's northwest rift zone, as indicated in five deep wells located 4.5 miles inland from the coast with anomalously high heads of 7.0 to 10.3 feet. The basal aquifer is brackish at least 1-1/2 miles inland, with the exception of the Kahaluu Shaft (3557-05), which develops about 5 mgd of fresh water only one mile from the coast, and the Holualoa Well (3657-01), which develops 0.7 mgd of fresh water 1-1/2 miles inland. Surprisingly, wells drilled 1 /2 to 1 mile laterally on both sides (north and south) of the Kahaluu Shaft encountered brackish water.

North of Kahaluu, brackish water extends 1-1/2 miles inland at Holualoa, 2 miles inland at Kailua-Kona, and 3 runs inland at Keahole. Correspondingly, the seaward hydraulic gradient is 3.3 feet per mile at Holualoa, 2.4 feet per mile at Waiaha, 0.7 feet per mile at Kealakehe, and 0.8 feet per mile at Keahole, probably due to less recharge and more permeable lavas.

As mentioned previously, a large quantity of fresh basal water occurs only a mile inland from the coastline at Kahaluu, the closest distance to shore that fresh water is known to occur along the entire Kona coast. It was fortuitously discovered 43 years ago, in 1959.

South of Kahaluu, several scattered basal wells indicate that the basal aquifer is thin and brackish at least one mile inland. The Kona basal aquifer inland boundary is recharged primarily (approximately 90 %) by the seaward flow of high-level ground water across an undefined low permeability geologic structure or formation which is evidenced only by a hydrologic discontinuity in head. This discontinuity is referred to herein as the Mamalahoa discontinuity. Approximately 10 % of the basal aquifer's total recharge originates from direct infiltration of overlying rainfall.

c. High-level Groundwater Occurrence

The occurrence of high-level ground water in Kona was discovered in 1990 almost simultaneously in the north and south parts of the study area. Approximately seven miles south of Kailua-Kona, Keauhou Well 2 (3355-02), a private well by Kamehameha Investment Corp., encountered high-level ground water at 275 ± ft. above sea level (later confirmed at 277 ft.) on August 1st. Three weeks later on August 24th, the State Division of Water and Land Development encountered high-level ground water at an elevation of 242 ft. above sea level (later confirmed at 236 ft.) in its well (4358-01) at Kalaoa. These two exploratory wells were drilled at then unprecedented elevations of 1,620 and 1,800 feet, respectively.

Less than a year later, in 1991, high-level ground water was again discovered in the County Department of Water Supply's Honokohau Well (4158-02) located 2-1/2 miles south of Kalaoa. The well, located at an elevation of 1675 feet, encountered ground water at an elevation of 109 feet above sea level. Currently (2001), high-level ground water has been found in a total of 13 wells, indicating that high-level ground water occurs mauka of Mamalahoa Highway from Kalaoa to Keei (south of the study area), a distance of 19 miles. Because groundwater exploration has been constrained to elevations of less than 1800 feet, only the extreme seaward part of the high-level aquifer has been explored.

The hydrogeologic nature and extent of this high-level aquifer and the confining dam-like structure (Mamalahoa discontinuity) are conjectural at this time. Based on existing well data, the dam-like structure roughly follows Mamalahoa Highway. Water levels in the 13 high-level wells, drilled at elevations between 1350 and 1800 feet, range from 42 to 490 feet above sea level. Some of the indicated water-level gradients are so steep that they suggest that some parts of the aquifer may be comprised of compartments or bodies of high-level water similar to that of a dike-confined aquifer system. Pump tests on several wells also show the presence of hydrologic boundaries.

d. Regional Groundwater Movement

Prior to the discovery of high-level ground water, the regional movement of ground water in Kona was assumed to be unconfined and perpendicular to the coastline from an inland rainbelt (recharge area) situated parallel to the coastline. However, based upon indications of hydrologic boundary conditions in some high-level well tests and evidence of wide-ranging water levels, the general assumption that high-level groundwater moves uniformly seaward perpendicular to the coastline must be viewed on a regional basis only. Thus, ground water in the high-level aquifer moves seaward across the Mamalahoa discontinuity into the basal aquifer, but such movement may be distorted laterally by local changes in permeability and vertical dimensions in the discontinuity that lies near Mamalahoa Highway. However, in the basal aquifer groundwater movement may reasonably be assumed to occur essentially perpendicular to the coastline due to low heads, unless altered by groundwater withdrawals.

3. Local Hydrology

The identification numbers of the well sites discussed below correspond to the numbers shown in Figure VIII-2 of the North Kona Water Master Plan, Report R-104. The status of some well sites identified in the 1994 Plan has changed, and, consequently have become available for acquisition. Also, some well sites planned by the County of Hawaii Department of Water Supply (DWS) have not been developed and, therefore, the possibility of co-opting with them on developing some of their sites will be explored in a meeting set for February 2, 1999. At that time the possibility of constructing water transmission mains instead of wells and reservoirs will be discussed. This option is possible because the DWS needs to transmit the water developed along Mamalahoa Highway down to the Queen Kaahamanu Highway because both the Keahole Airport and the NELH are makai of the highway. The proposed water lines are along Palani Road and Hinalani Drive. Probable well sites for State acquisition are discussed below by hydrologic sectors identified in the Water Master Plan.

Keopu Sector (9.1 mgd recharge, 6.8 mgd sustainable capacity)

There is one existing, unused well and one soon-to-be drilled well in this sector.

Site #21 - This site consists of an existing well developed by Haseko on privately owned land and located several hundred feet from the soon-to-be drilled Keopu State Well (Site #22). Site 21 is accessible from Mamalahoa Highway, by a paved road. Haseko has been interested in selling their interest in the well and the State may wish to consider acquiring this site, as it is close by and could be easily developed together with Site #22. The pump capacity of the well is probably limited to 1.0 mgd due to casing size.

Site #22 - This site will soon be drilled by the State and pump tested at a capacity of 3.0 mgd. The test data will be very important in the preliminary hydrologic feasibility study for a proposed water development tunnel on State land at Keopu. The anticipated design pump capacity for this well is 1.5 mgd.
Site #23 - This site was once planned as a well site by Nansay Hawaii. Since Nansay Hawaii is believed to have no interest in this privately owned well site at this time, it may be available for acquisition. However, this site should not be considered in the initial phases of water development, pending the outcome of the proposed Keopu development tunnel study.

North Keopu Sector (7.1 mgd recharge, 5.3 mgd sustainable capacity)

There is one existing monitor well (Site #20) in this sector. However, one well site is planned by the Hawaii DWS.

Site #19 - This site has been planned for a well by the Hawaii DWS. The status of their plans is not known at this time but will be discussed as a possible co-op site on February 2nd.

Kealakehe Sector (5.4 mgd recharge, 4.0 mgd sustainable capacity)

Queen Liliuokalani Trust has drilled one well (Site #18) and has plans for two more in this sector. The Hawaii DWS has also acquired and planned a well site in this sector, as described below.

Site #15 - The Hawaii DWS has already obtained a well construction permit for a well on this site. The current status of their plans is not known, but will be discussed on February 2nd. As with all of the wells discussed thus far, the anticipated pump capacity for a well drilled at this site is 1.5 mgd.

Honokohau Sector (3.8 mgd recharge, 2.8 mgd sustainable capacity)

Hawaii DWS has drilled one well (Site #14) and has plans to drill a well at a second site (Site #13).

Site #13 - The Hawaii DWS has obtained a Well Construction Permit for this site. However, the status of the well is not known at this time and will be discussed on February 2, 1999, as a possible co-op site.

Site #12 - This site located on privately owned land has been considered by the State for an exploratory well. Its anticipated pump capacity is 1.0 mgd, based upon lower estimated sustainable capacity of the Honokohau Sector. Residential development has been occurring in this area and the site needs to be re-visited before further consideration.

Kaloko Sector (2.3 mgd recharge, 1.7 mgd sustainable capacity)

This sector has one existing well named "Hualalai" and developed by the State (Site #9). Although the estimated recharge in this sector is much lower than those to the south, nevertheless the two sites described below were investigated.

Sites #10 and #11 - These two sites need to be re-visited before given further consideration.

Waiaha Sector (8.9 mgd recharge, 6.7 sustainable capacity)
This is a water-rich sector. The Hawaii DES plans to drill a well at their existing tank site (Site #25). The well is expected to be successful in developing a 1.5 mgd source. Additional well sites in this sector should be investigated and discussed with the Hawaii DWS.

F Previous Study. The identification numbers of the well sites discussed below correspond to the numbers shown in Figure VIII-2 of the North Kona Water Master Plan, Report R-104. The status of some well sites identified in the 1994 Plan has changed, and, consequently have become available for acquisition. Also, some well sites planned by the DWS have not been developed and, therefore, the possibility of co-opting with them on developing some of their sites were explored in a meeting on February 2, 1999. The DWS is agreeable to allowing the State to develop wells on their existing well and reservoir sites. At that time the possibility of constructing water transmission mains instead of wells and reservoirs was also discussed and summarized in a Memorandum Dated February 3, 1999 (see Appendix A).

F. Present Water Situation. The lack of water transmission infrastructure from the existing water sources mauka of Mamalahoa Highway to the Queen Kaahumanu Highway is affecting the DWS water sources in Kailua-Kona. In order to relieve over pumping in existing Kailua-Kona water sources, the DWS will consider the exchange of water development and storage credits at its underdeveloped North Kona sources for water transmission development.

This option is possible because the DWS needs to transmit the water from recently developed water sources mauka of Mamalahoa Highway down slope to the Queen Kaahumanu Highway, which is served by older water sources in Kailua-Kona. Proposed developments in Kona, which were included in the North Kona Water Master Plan, included plans to transmit the high-level water developed from wells bcated above Mamalahoa Highway down to the Queen Kaahumanu Highway. These land development projects have been delayed by the poor investment climate and are on hold. The proposed water transmission waterlines were not constructed. At the same time, the existing basal water sources serving Kailua-Kona and the Queen Kaahumanu water system are being over utilized and subjected to increased salinity. The DWS water system along Queen Kaahumanu Highway serves the following State projects: Kona International Airport, Natural Energy Laboratory of Hawaii Authority, Keahole Agricultural Park and its proposed expansion, and proposed University of Hawaii Center at West Hawaii.

G. Other Water Projects in the Study Area.

1. Transmission Lines

There are proposals to construct new water waterlines to transmit water from high-level water wells mauka of Mamalahoa Highway to Palani Road and Hina Lani Drive down to the coastal Queen Kaahumanu Highway. The State is pursuing a project to reverse the normal up slope flow of water along Hina Lani Drive. The DWS water system along Hina Lani Drive presently pumps water uphill, from the coastal Queen Kaahumanu Highway water system to the up slope Mamalahoa Highway water system. Once the flow of water is reversed, high-level water developed above Mamalahoa Highway can then be transmitted down to the Queen Kaahumanu Highway water system, relieving the older water sources in Kailua-Kona.

Since the Hina Lani Drive water system is the likely route for the transmission of water developed above the Mamalahoa Highway to the Queen Kaahumanu Highway system, which serves Keahole Airport and the NELHA, the focus of the study has shifted to the area north of the Keopu Hydrologic Sector.

2. Keopu Tunnel

A preliminary study is currently underway to determine the hydrologic feasibility of constructing a water development tunnel located at Keopu (mauka of Kailua Town) to develop 10 mgd or more at a service elevation of 600 feet. Should exploratory drilling indicate the presence of a sustainable potable water source, the construction of the water development tunnel in this sector would be considered in lieu of deep well sources. Therefore, after initial exploratory well drilling at Keopu, subsequent well sources should be considered in outlying hydrologic recharge sectors north of the Keopu Sector. Specifically in the Kaloko, Kealakehe and Honokohau Sectors.

3. Keopu Well

Keopu Well has been drilled and tested.

PRELIMINARY FINDINGS

A. Water Demands. The DLNR has provided preliminary information on the existing and proposed water demands for the North Kona Area. The existing demand is 1.0784 mgd. The 2020 potable water demand for State projects is expected to be 6.8336 mgd. The 2020 non-potable water demand is expected to be 0.636 mgd.

The Department of Agriculture's (DOA) Keahole Agricultural Park is listed with only future demands but is presently using approximately 0.30 mgd according to the DWS. This will be checked with the DOA.

The proposed Hiluhilu, Kohanaiki and Ooma projects will require 2.83 mgd of potable water and 1.28 mgd of non-potable water.

The additional water demands for North Kona are provided in the following table,

NORTH KONA PROJECTS
Projected Water Demand

RECEIVED AS FOLLOWS

Projects	Existing	2003		2010		2020	
STATE	Use Potable (mgd)	Use Potable (mgd)	Non-Pot. (mgd)	Use Potable (mgd)	Non-Pot. (mgd)	Use Potable (mgd)	Non-Pot. (mgd)
NELHA	0.4	0.8		1.5		1.8	
Keahole International Airport 7-3-43:03	0.112	0.142		0.172		0.242	
UHWHC 7-3-10:33		0.01697	0.03643	0.01697	0.0643	0.01697	0.0364
Queen Kaahumanu Highway			0.24		0.06		0.0
Keahole Agricultural Park 7-3-49	0.3						0.5
DOA						0.25	
DLNR		0.09942		0.10285		0.5	
HCDCH/DOE	0.2664	0.2664		0.2664		2.7636	
DLNR Future (Honokohau Harbor)		0.5		0.5		0.5	
DHHL (Harbor Lands)				0.0908		0.761	
SUBTOTAL STATE	1.0784	1.82479	0.27643	2.64902	0.1243	6.83357	0.6364
PRIVATE							
Hiluhilu (former Nansay Kau) 7-2-05:01						0.406	0
Kohanaiki 7-3-09:03						0.311	0.4
QLT Commercial 7-4-08:12						2.1	
TSA 7-3-09:17						0.32	0
QLT Industrial 7-4-08:02						0.2	
Westpro (former Haseko)						0.12	
Palani Land Trust 7-4-08:05 & 47						0.74	
Y-O7-3-09:19						0.6	
Ooma 7-3-09:03						0.352	0.13
Misc. 7-3-10:27						0.24	
DWS						2	
SUBTOTAL PRIVATE & DWS						7.389	1.51
TOTAL	1.0784	1.82479	0.27643	2.64902	0.1243	14.22257	2.1544

B. <u>Potential Well Sites</u>. The State can propose to drill and develop new wells from Waiaha to Honokohau. Besides Well No. 22 (Keopu) and 23 (Komo Tank), the remainder of the North Keopu Wells and Keopu Wells, several well sites were reviewed in the previous report to provide the water source required to serve State projects. The wells include:

1. Honokohau Well No. 2 - Site No. 13

Honokohau Sector - TMK: 7-4-02:08 - Privately owned by the Palani Ranch Company. This site is intended to be in the well field of the existing DWS Honokohau Well. This is a viable well site with an anticipated yield of 1.0 to 1.5 mgd.

2. DWS Kealakehe Well - Site No. 15

   Kealakehe Sector - TMK: 7-4-03:34 - Owned by the DWS. This site is intended to be in the well field of the Queen Lilioukalani Trust Well Site No. 16. This is a viable well site with an anticipated yield of 1.0 to 1.5 mgd.

3. QLT 3 Well - Site No. 16

   Kealakehe Sector - TMK: 7-4-02:06 - Queen Lilioukalani Trust Well Site. This site is intended to be part of the QLT well field to be dedicated to the DWS to support the future developments of their projects.

4. QLT 2 Well - Site No. 17

   Kealakehe Sector - TMK: 7-4-02:16 - Queen Lilioukalani Trust Well Site. This site is part of the QLT well field dedicated to the DWS to support the future developments of their projects.

5. Additional Well Site:

   Well located at the DWS Honokohau 0.05 MG Reservoir Site.

   Honokohau Sector - TMK: 7-4-02:09 - Owned by the DWS. This site is intended to be in the same lot as the DWS Honokohau 0.05 MG Reservoir. This is a viable well site with an anticipated yield of 1.0 to 1.5 mgd.

C. Water System Projects. To service the area several waterline, well and tank projects will be required. As described in the following table and attached Figure.

North Kona Water Projects

Makalei to Hinalani along Mamalahoa

ITEM	
16-inch pipe in Mamalahoa Highway	Makalei to Hinalani
By-pass Kaloa Booster	PRV and control valve
Modify Kaloa Tank	New inlet line and control valves
Modify Kaloa Piping	New 12" line from tank to Kaiminani
Modify Hualalai Tank & Well	By-pass pump and add new controls
Modify Kaloko Tank & Booster	By-pass pump and add new controls
24-inch Hinalani Pipe Segment	Missing segment along Hinalani
Kau #1 Well	Well drilled and ready to outfitted

2.0 and .3 MG Tank at 1200'	Pressure breaker tank
2.0 and 3 MG Tank at 934.67	Pressure breaker tank
Modify Hinalani 650.67 Tank	Control vales
3 MG Tank at 353.67'	New storage tank
16-inch pipe in Queen Kaahumanu Highway	Honokohau Boat Harbor to Hinalani

Makalei to Queen Kaahumanu

ITEM	
16-inch pipe - built with new roadways	Makalei to Kaiminani through UH West Hawaii
.5 MG Tank at 1156' in Makalei	Pressure breaker tank
.5 MG Tank at 867' in Makalei	*Pressure breaker tank*
2 - .5 MG Tank at 650' in UH West Hawaii	Pressure breaker tank
2 - 2 MG Tank at 325' on Kaiminani	New storage tank

Keopu to Palani Road

20-inch pipe in Mamalahoa Highway	Keopu to Honokohau Well
Modify Moeauaa Tank	PRV, piping and control valves
Modify Honokohau Tank & Well	By-pass pump and add new controls
Modify Honokohau 0.5MG Tank	By-pass piping and add new controls
2 MG Tank at 1500'	Distribution Tank at Palani Road and Mamalahoa
20-inch pipe in Palani Road	Mamalahoa to Palani No. 2 Tank
Keopu Well Site	Well No. 22 drilled and ready to be outfitted
Komo Tank Well Site	Well No. 23
Tokunaga Well Site	Well No. 15
QLT 3 Well Site	Well No. 16
QLT 2 Well Site	Well No. 17
N. Keopu Well Site 1	Well No. 19
N. Keopu Well Site 2	Well No. 19
N. Keopu Well Site 3	Well No. 19
Keopu Well Site 2	Well No. 21
Keopu Well Site 3	Well No. 21
Honokohau Well Site	Well No. 13
Honokohau Tank Well Site	0.05 MG Tank Site
16-inch pipe in Queen Kaahumanu Highway	Honokohau Boat Harbor to Hinalani

The costs associated with these projects are shown in the following table.

North Kona Water Projects

Makalei to Hinalani along Mamalahoa

ITEM	UNIT	UNIT COST		COST
16-inch pipe in Mamalahoa Highway	16000	$225.00	per Lineal Foot	$3,600,000.00

			(LS)		
By-pass Kaloa Booster	1	$50,000.00	Lump Sum (LS)	$50,000.00	
Modify Kaloa Tank	1	$125,000.00	LS	$125,000.00	
Modify Kaloa Piping	1000	$175.00	LF	$175,000.00	
Modify Hualalai Tank & Well	1	$100,000.00	LS	$100,000.00	
Modify Kaloko Tank & Booster	1	$150,000.00	LS	$150,000.00	
24-inch Hinalani Pipe Segment	2000	$285.00	per LF	$570,000.00	
Kau #1 Well	1	$2,025,000.00	LS	$2,025,000.00	
2.0 & .3 MG Tank at 1200'	2300000	$1.75	per gallon	$4,025,000.00	
2.0 & .3 MG Tank at 934.67	2300000	$1.75	per gallon	$4,025,000.00	
Modify Hinalani 650.67 Tank	1	$75,000.00	LS	$75,000.00	
3 MG Tank at 353.67'	3000000	$1.60	per gallon	$4,800,000.00	
16-inch pipe in Queen Kaahumanu Highway	8500	$225.00	per LF	$1,912,500.00	
					$21,632,500.00

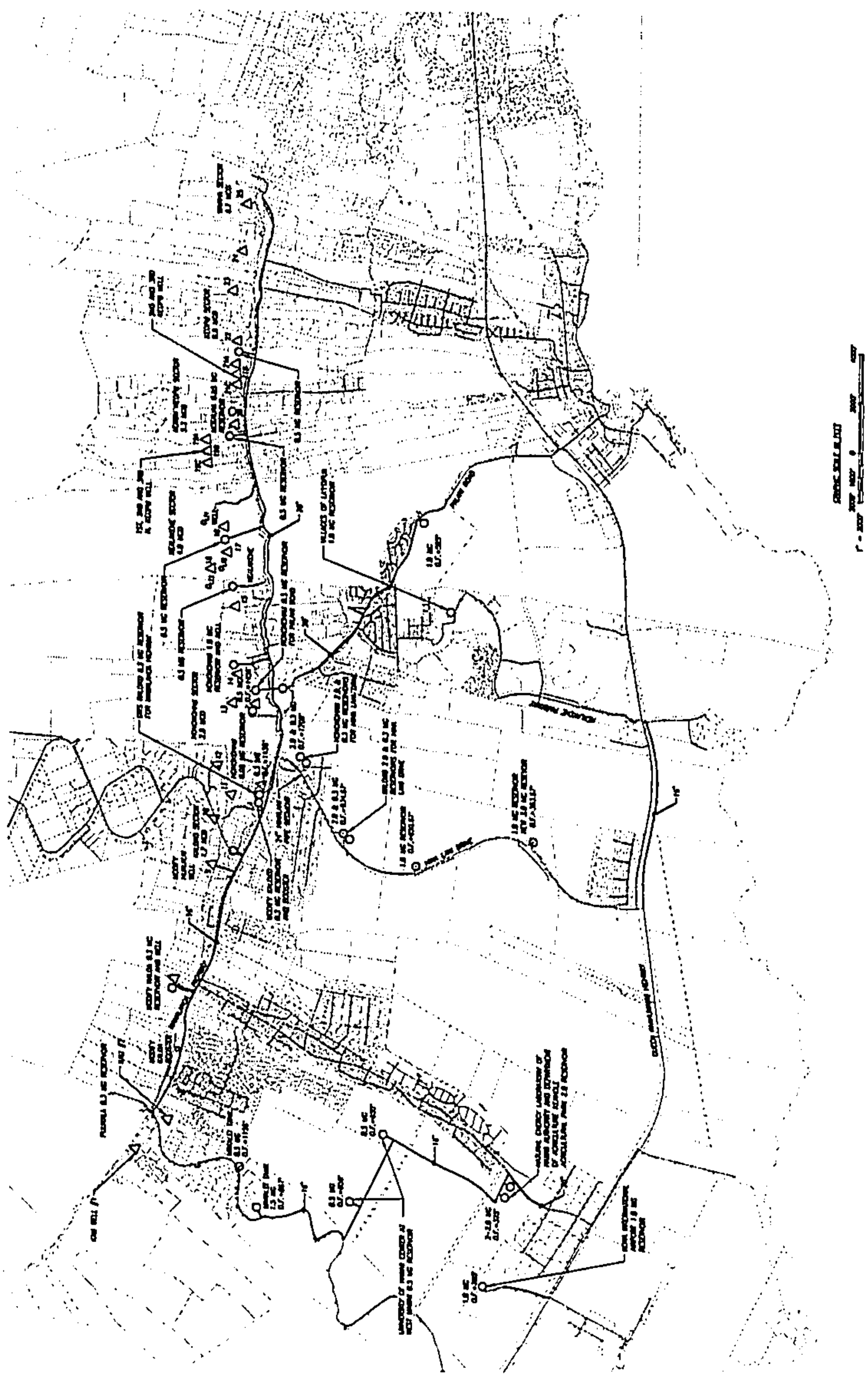
Makalei to Queen Kaahumanu

ITEM	UNIT	UNIT COST		COST	
16-inch pipe - built with new roadways	15000	$165.00	per LF	$2,475,000.00	
.5 MG Tank at 1156' in Makalei	500000	$1.75	per gallon	$875,000.00	
.5 MG Tank at 867' in Makalei	500000	$1.75	per gallon	$875,000.00	
2 - .5 MG Tank at 650' in UH West Hawaii	1000000	$1.75	per gallon	$1,750,000.00	
2 - 2 MG Tank at 325' on Kaiminani	2000000	$1.60	per gallon	$3,200,000.00	
					$9,175,000.00

Keopu to Palani Road

20-inch pipe in Mamalahoa Highway	12000	$255.00	per Lineal Foot (LS)	$3,060,000.00	
Modify Moeauaa Tank	1	$50,000.00	Lump Sum (LS)	$50,000.00	
Modify Honokohau Tank & Well	1	$100,000.00	LS	$100,000.00	
Modify Honokohau 0.5MG Tank	1	$100,000.00	LS	$100,000.00	
2 MG Tank at 1500'	2000000	$1.50	per gallon	$3,000,000.00	
20-inch pipe in Palani Road	12000	$255.00	per Lineal Foot (LS)	$3,060,000.00	
Keopu Well Site	1	$2,025,000.00	LS	$2,025,000.00	
Komo Tank Well Site	1	$3,105,000.00	LS	$3,105,000.00	
Tokunaga Well Site	1	$3,105,000.00	LS	$3,105,000.00	
QLT 3 Well Site	1	$3,105,000.00	LS	$3,105,000.00	
QLT 2 Well Site	1	$3,105,000.00	LS	$3,105,000.00	
N. Keopu Well Site 1	1	$3,105,000.00	LS	$3,105,000.00	
N. Keopu Well Site 2	1	$3,105,000.00	LS	$3,105,000.00	
N. Keopu Well Site 3	1	$3,105,000.00	LS	$3,105,000.00	
Keopu Well 2	1	$3,105,000.00	LS	$3,105,000.00	
Keopu Well 3	1	$3,105,000.00	LS	$3,105,000.00	
Honokohau Well Site	1	$3,105,000.00	LS	$3,105,000.00	
Honokohau Tank Well Site	1	$3,105,000.00	LS	$3,105,000.00	
16-inch pipe in Queen Kaahumanu Highway	8500	$225.00	per LF	$1,912,500.00	
					$47,462,500.00
				TOTAL	$78,270,000.00

RECEIVED AS FOLLOWS



Appendix T

Integrated Natural Cultural Resource Management Plan (INCRMP)

DRAFT

APPENDIX T:

Integrated Natural Cultural Resource Management Plan (INCRMP)
For Palamanui
September 2004

SUMMARY
The plan will be a framework which protects and provides access to important cultural places and natural resources at Palamanui. Appropriate activities within these places are expected to evolve over time.

PLAN
This Integrated Natural Cultural Resource Management Plan addresses preservation, mitigation, *management and stewardship measures for the resources at Palamanui.* Implementation of the Plan is intended to protect and manage the important cultural places and practices in Palamanui.

NATURAL AND CULTURAL RESOURCES
Significant archaeological sites including historic trails, lava tubes and cave ecosystems will be preserved throughout the project site. Significant natural resources including the dryland forest area and a large area of barren lava will be preserved.

MAINTENANCE
The Integrated Natural Cultural Resource Management Plan will be maintained by Hiluhilu Development initially and subsequently by the Palamanui Master Association. At minimum, the INCRMP will be updated every 2 years.

INVENTORY MAP
A detailed inventory map will be utilized to avoid impacting significant sites as detailed planning and construction begins. All sites to be preserved will be staked and clearly marked or fenced in the field. Each increment of building will be planned and constructed around the preservation sites and features.

MANAGEMENT STRUCTURE
Initially, Hiliuhilu Development will provide all resources to finalize and implement the management plan effort. The Palamanui Master Association will assume long term responsibility for administering the plan only after Hiluhilu has obtained required approvals for the plan and has completed field work of the backbone of the plan. Required funding will be provided by Hiluhilu. Long term maintenance funding will come from the Master Association and other resources as may become available.

It is anticipated that the management of the plan will be done in close cooperation with the neighboring community college and the future University of Hawaii West Hawaii Center programs relating to culture, botany and biology.

CC&Rs – COVENANTS, CONDITIONS AND RESTRICTIONS
Hiluhilu Development will draft and record permanent Covenants, Conditions and Restrictions (CC&Rs) covering the land within the projects and preservation / conservation easements covering environmental, archaeological, and cultural areas on this property. Hiluhilu Development will conduct its development activities consistently with the CC&Rs and the preservation / conservation easements. Following developments, the CC&Rs will be administered by the Palamanui Master Association. The CC&Rs will contain covenants and remedies to address potential damage to protected sites caused by activities such as removal of surface rock from site features for landscaping efforts by homeowners; unintentional disturbance to site features by visitors, especially children; and intentional destruction of site features and

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deposits, by artifact collectors or vandals. Control of destructive vegetative growth within and on the architectural features of dry laid stone will also be addressed.

CONSULTANTS

Consultation with experts in the area of natural and cultural preservation will be a vital part of the management of the resources at Palamanui.

CULTURAL ADVISORY COMMITTEE

A cultural committee which consists of Native Hawaiians, kupuna and other cultural practitioners will be meeting with Hiluhilu Development twice a year or more frequently if warranted. Input from committee members about cultural practices that have been undertaken in the proposed project area will continue to be heard. Members include, but are not limited to, area kupuna: Mr. George ("Uncle Kinoulu") Kahananui, Sr.; Mr. Robert Punihaole; Mr. Karin Haleamau; Mr. Peter Park; Ms. Annie Coelho; Mrs. Ruby McDonald; Mr. Eli Nahulu; Mr. Wendell Davis; Mr. Angel Pilago; Ms. Leinaala Lightner; Ms. Hannah Springer; Mr. Gene Leslie; Mr. Curtis Tyler

In addition to cultural resource persons, members of the Hewahewa and Mahi families who have relationships with the project site will also be consulted.

NATURAL RESOURCE EXPERTS

A dryland forest preserve has been set aside to protect culturally significant and endangered botanical resources. The North Kona Dryland Forest Working Group which consists of natural resource experts will be consulted in regards to the preservation efforts of the Dryland Forest Preserve.

Mrs. Sandra Sakaguchi, Mrs. Kathy Damon and Mr. Kalani Flores and others affiliated with the U.H. West Hawaii Center have provided continuous and valuable input on the INCRMP. They will continue to be essential participants.

RESPONSIVE TO PUBLIC AND AGENCY CONCERNS

Hiluhilu Development will work with the State Historic Preservation Division (SHPD), other local kupuna, interested government officials, area residents, and the administration and students of the UHCWH to ensure that the management plans are responsive to both public and agency concerns.

INTERPRETIVE PROGRAMS

The development of interpretive programs is deferred until a later date to allow the students and staff of the UHWCH to become directly involved with those actions. How early Hawaiians used caves for water catchment is one example of an interpretive program.

ARCHAEOLOGICAL DATA RECOVERY AND PRESERVATION PLAN

A Data recovery plan will be developed and submitted to DLNR – SHPD for review and approval for all sites recommended for data recovery. The data recovery plan will describe actions to be taken regarding the treatment of the site. A Preservation plan will further clarify and detail the methodology regarding preservation of the proposed archaeological features and sites.

PUBLIC ACCESS

Native Hawaiians will be allowed to remove a limited amount of timber from Palamanui for personal, non-commercial use. Interested persons should contact Hiluhilu Development until management has been transferred to the master association. Any such activity would be subject to conformity with the projects INCRM Plan.

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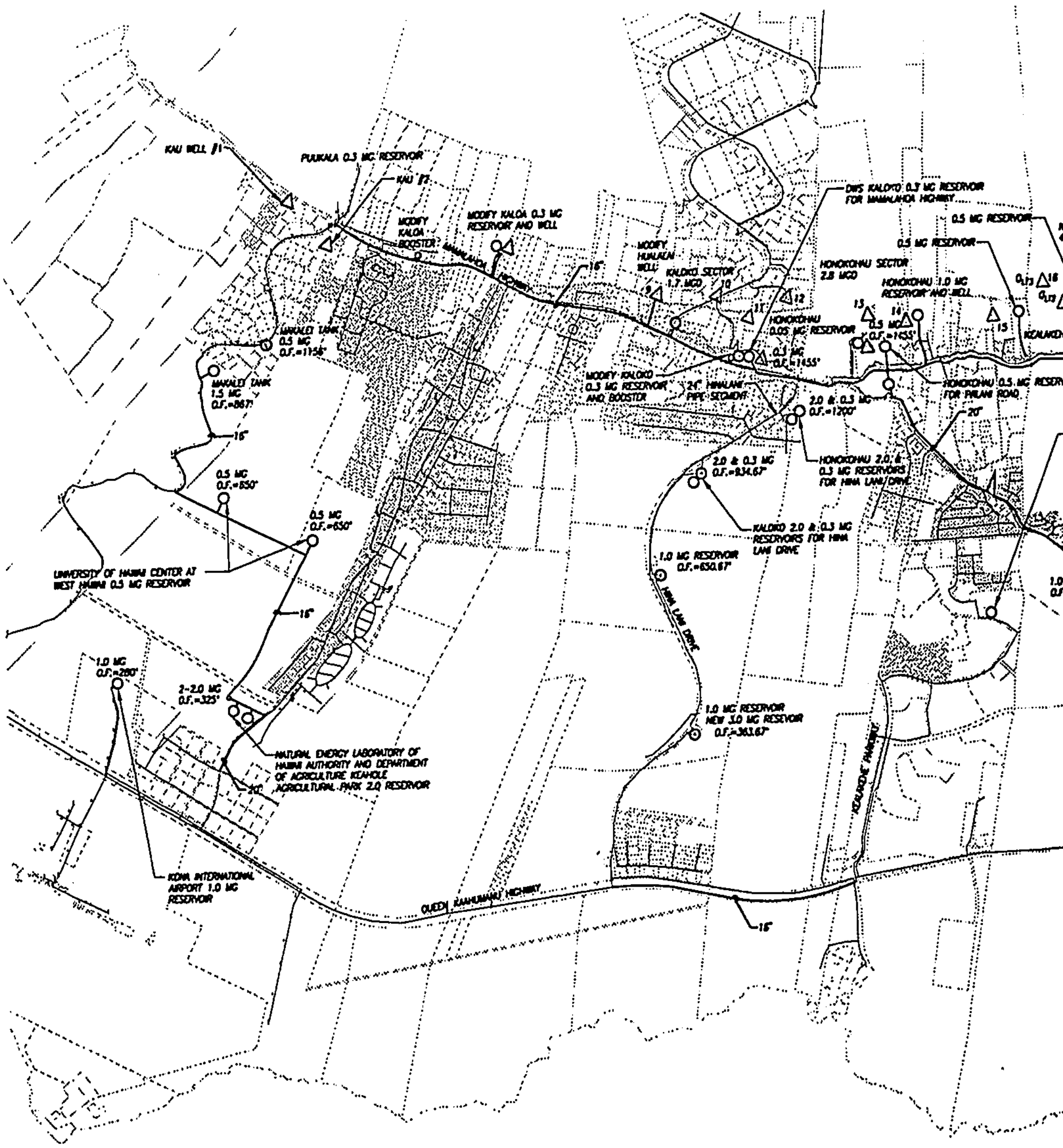

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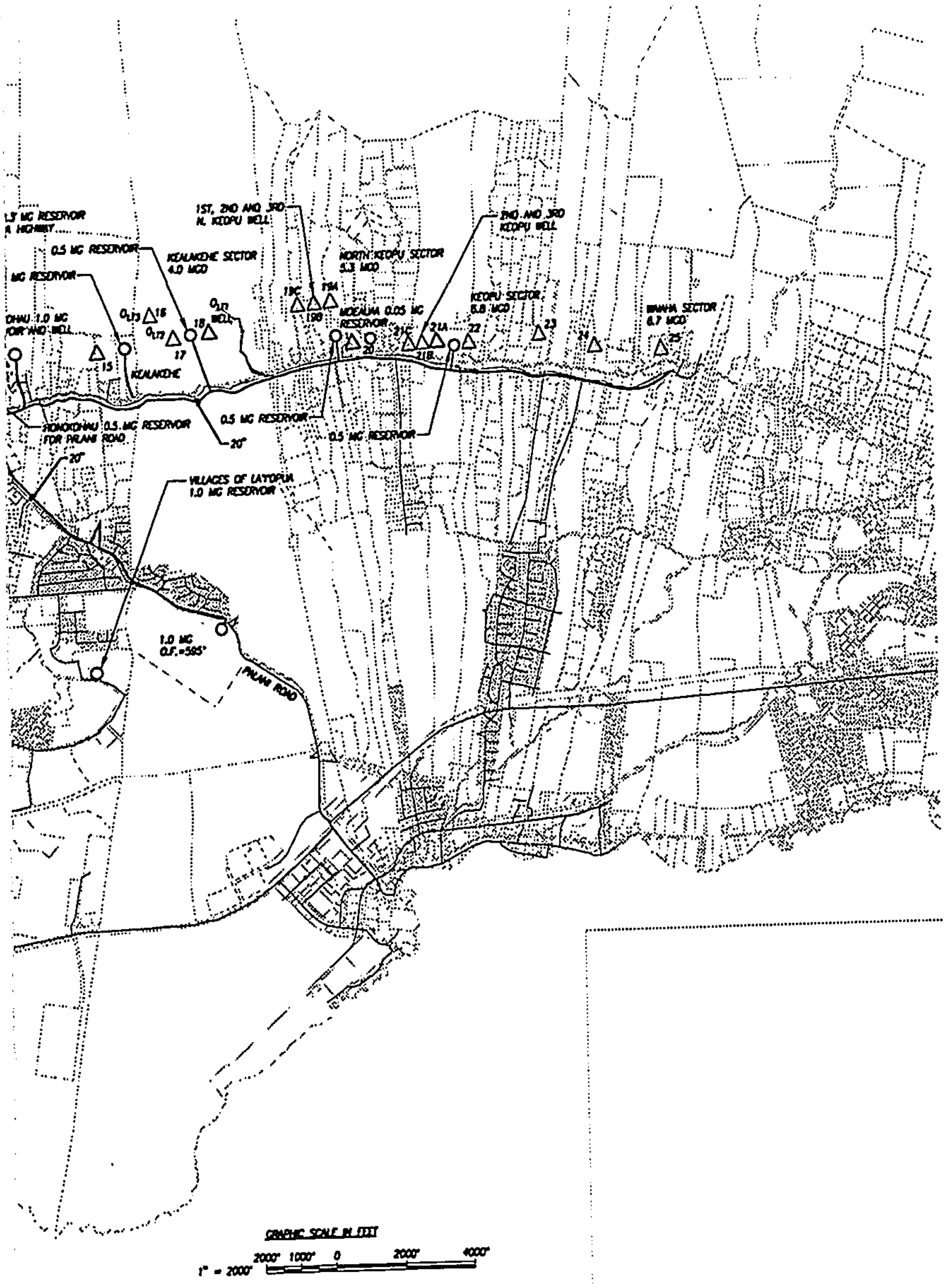

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