Sept. 1996 FEIS
Kaloko Town Center

OEQC LIBRARY

LAND USE COMMISSION
STATE OF HAWAII
SEP 19 9 13 AM '96

Kaloko Town Center

NORTH KONA . HAWAII

FINAL
ENVIRONMENTAL IMPACT STATEMENT

RECEIVED
'96 SEP 19 P2:44
OFC. OF ENVI
QUALITY

September 1996

Office of Environmental Quality Control
235 S. Beretania #702
Honolulu HI 96813
586-4185

DATE DUE

March 14, 1997
2-18-99
MAY 31 2005

Pacific Land

RECEIVED

'96 OCT -8 P12:58

OFC. OF ENVIRONMENTAL QUALITY CONTROL

October 2, 1996

LAND USE COMMISSION STATE OF HAWAII

OCT 4 9 37 AM '96

Ms. Esther Ueda, Executive Officer
State of Hawaii
Department of Business, Economic Development & Tourism
Land Use Commission
P.O. Box 2359
Honolulu, Hawaii 96804-2359

Dear Ms. Ueda:

Kaloko Town Center
Final Environmental *Impact Statement* (FEIS)
North Kona, Hawaii

In accordance with Chapter 200 of Title 11, Hawaii Administrative Rules, Section 20 (d), the undersigned indicates that the attached statement and all ancillary documents were prepared for Tokyo Green Hawaii, Inc. under my supervision and that the information submitted, to the best of my knowledge fully addresses document content requirements as set forth in sections 11-200-17 and 11-200-18, as appropriate.

SUBMITTED BY:

PACIFIC LAND SERVICES, INC.

By Ned Dewey
Ned Dewey, President

10/2/96
Date

PACIFIC LAND SERVICES, INC. 810 RICHARDS ST., SUITE 900 HONOLULU, HI 96813 PHONE: (808) 534-1141 FAX: (808) 534-1004

Kaloko Town Center

NORTH KONA . HAWAII

FINAL ENVIRONMENTAL IMPACT STATEMENT

Prepared for:

TOKYO GREEN HAWAII, INC.
& PACIFIC LAND SERVICES, INC.

Prepared by:

KIMURA INTERNATIONAL INC.

September 1996

Table of Contents

List of Tables

List of Figures

Appendices

Chapter 1
INTRODUCTION AND SUMMARY

Kaloko Town Center

FINAL
ENVIRONMENTAL IMPACT STATEMENT

1. INTRODUCTION AND SUMMARY

1.1. Purpose

This Final Environmental Impact Statement (FEIS) has been prepared in support of a petition by the landowner to the Hawaii State Land Use Commission for a land use boundary amendment from the Conservation District to the Urban District for approximately 223.96 acres of land in the Kaloko-Kohanaiki subdistricts of North Kona on the island of Hawaii. The proposed project seeks to urbanize the property into a mixture of land uses including commercial/retail, office/commercial/retail, multi-family residential, single family residential and a site for a school and park.

This FEIS has been prepared in accordance with Chapter 343, HRS, Chapter 200, Title 11, Department of Health Administrative Rules and Act 241, Session Laws of Hawaii, 1992. The FEIS provides information to reviewing public agencies and members of the community about the proposed action, assesses the existing environmental conditions of the property, evaluates potential impacts of the proposed action, presents mitigating actions for potential impacts and considers alternatives to the proposed action. Issues and comments raised following the distribution and publication of the Draft EIS are appended and necessary revisions have been incorporated in the FEIS.

1.2. Project Summary

Recorded Fee Owner	Tokyo Green Hawaii, Inc. c/o Pacific Land Services, Inc. 810 Richards Street, Suite 900 Honolulu HI 96813 Tel: (808) 534-1141 Fax: (808) 534-1004
Petitioner/Applicant	Tokyo Green Hawaii, Inc. c/o Pacific Land Services, Inc. 810 Richards Street, Suite 900 Honolulu HI 96813 Tel: (808) 534-1141 Fax: (808) 534-1004
Preparers of Environmental Assessment	Kimura International Inc. 1600 Kapiolani Blvd., Suite 622 Honolulu, Hawaii 96814 Tel: (808) 944-8848 Fax: (808) 941-8999 Attn: Glenn T. Kimura

Authorized Representative	Michael W. Moore & R. Ben Tsukazaki Menezes Tsukazaki Yeh & Moore 100 Pauahi Street, Suite 204 Hilo, Hawaii 96720 Tel: (808) 961-0055 Fax: (808) 969-1531
Approving Agency	State Land Use Commission State of Hawaii
Location	North Kona Judicial District, County of Hawaii, portion of Kaloko-Kohanaiki ahupua'a.
Tax Map Key	3rd Division, 7-3-09: por. 17
Approximate Acreage	223.96
Existing State Land Use District	Conservation
County of Hawaii General Plan	Urban Expansion
County Zoning	Open
Existing Uses	Vacant, undeveloped
Request	Urban

1.3 Alternatives Considered

Alternatives to the proposed action include 1) no action, 2) alternative use, and 3) variation in scale and density. These alternatives were not preferred because they did not meet the development objectives of the applicant and would be inconsistent with existing State and County plans and policies for the region. Given the economically depressed state of the local economy, and the determination that the project site is suitable for the proposed use and would not adversely impact the existing environment, the proposed action appears to be the best alternative at this time.

1.4 Summary of Probable Impacts and Mitigation Measures

In recent years the Kailua to Kona region, the region in which the proposed action is located, has been viewed as an area recommended for urbanization to support the expanding economy of the area. There is concurrence among a number of State and County planning documents and studies which recognize the appropriateness of the region for urban development given the rapid economic and population growth of the West Hawaii region.

Among a number of policy documents, the State's Five Year Land Use District Boundary Review recommends conversion of the petition area from Conservation to Urban. The boundary review found that the area meets the standards and criteria for the Urban District contained in Section 205-2, HRS, Section 205-17, HRS, and Sections 15-15-18(2,3,4,5,6 &) in the following manner:

- has a sufficient reserve area for foreseeable urban growth,
- provides employment opportunities and economic development
- provides housing opportunities for all income groups, particularly the low, low-moderate and gap groups.
- has proximity to centers of trading and employment except where the development would generate new centers of trading and employment;
- has proximity to basic services such as sewers, transportation systems, water, sanitation, schools, parks and police and fire protections;
- has sufficient reserve areas for urban growth in appropriate locations,
- has satisfactory topography and drainage,
- is reasonably free from the danger of floods, tsunami, unstable soil conditions, and other adverse environmental effects,
- is contiguous with existing urban areas
- is indicated for future urban use on County general plans,
- is in an appropriate location for new urban concentrations,
- is surrounded by or adjacent to existing urban development, and
- does not contributed toward scattered spot urban development.

The boundary review concludes that the change in designation from Conservation to Urban is consistent with the West Hawaii Regional Plan, the Keahole to Kailua Development Plan, and the County's Development Plan.

The State's West Hawaii Regional Plan identifies the site as a subregional planning area recommended for urban uses. In response to anticipated changes, the plan noted that existing communities such as Kailua-Kona will be the first to expand into a mix of uses in order to support resort development, housing development, industrial development, agricultural development and a host of ancillary services. To protect agricultural activities, culturally-rich heritage areas, and special environmental resource areas, the plan identified sub-regional planning areas that could be planned and developed to accommodate urban growth without encroaching upon natural and cultural resources that are important toe the continued viability of the area. The petition area falls within the Subregional Planning Area that extends form Kailua to Keahole and therefore the proposed urban reclassification is consistent with the intent of the West Hawaii Regional Plan in identifying areas that are appropriate for future urban expansion.

At the County level, the County's General Plan Land Use Pattern Allocation Map designates the property for "urban expansion". It falls within the broad region of lands in the Keahole to Kailua district which are considered appropriate for urban expansion. Urban expansion area allows for a mix of high density, medium density, low density, industrial and/or open designations in areas where new settlements may be desirable, but where the specific settlement pattern and mix of uses have not yet been determined.(The General Plan, Hawaii County, p.80) The General Plan map also indicates an industrial designation which acknowledges the existing Kaloko Light Industrial Subdivision and its proposed expansion area.

In the County's Keahole to Kailua Development Plan, the petition area is designated on the Land Use Plan for "urban expansion". "Urban expansion", as described in the report, denotes the land's general suitability for urban development with no specific recommended uses. In addition, an "open" zone, 100 feet wide is designated along the entire portion of Queen Ka'ahumanu Highway which runs along the petition areas makai boundary. This open area is intended as a "permanent buffer zone" to be dedicated as an "open space strip".

A summary of the probable impacts and mitigation measures recommended for the proposed action is presented below.

Drainage. Concentrated stormwater runoff does not occur in the region surrounding and including the project area because of the high porosity of the a'a and pahoehoe lava fields and the relatively low rainfall levels. The drainage system will be designed in accordance to recommendations in the Keahole to Kailua Development Plan which advocates a zero-runoff drainage concept. Runoff generated on the property would be handled by infiltration into the ground by drywells. The drainage system will be designed in accordance with the requirements of the County Department of Public Works.

Water Quality Relative to Groundwater, Kaloko Fishpond, and Nearshore Waters. The natural rate of groundwater flow beneath the project site to the shoreline is in the order of magnitude of 1.2 MGD beneath the project site and 8.7 MGD from Honokohau to Keahole. This is evidenced by the demonstrated thinness of the basal lens, the relatively high salinity in basal wells, and the near-seawater salinity in Kaloko Fishpond. (Salinity and temperature profiles across Kaloko Pond reveal little evidence of direct input of low temperature groundwater). The project may have an impact on groundwater, the Kaloko fishpond, or adjacent offshore waters as a result of: 1) disposal of wastewater generated on-site; 2) disposal of stormwater runoff; and 3) percolating water from landscape irrigation.

Estimates of changes in groundwater flow volume and composition from the Kaloko Town Center project indicate that there does not appear to be potential to induce long-term changes in physio-chemical composition of pond or marine waters of a magnitude sufficient to cause changes in biological community structure. No wastewater produced by the project would be disposed onsite. Onsite stormwater disposal would not result in a change in discharge volume, but would result in a small addition to the nutrient content of the groundwater. The inorganic nutrients that occur in groundwater (primarily NO_3^- and PO_4^{3-}) were depleted in Kaloko Pond as a result of uptake by plants. Such intake suggests that the pond may be nutrient limited with respect to plant growth. As a result, increased nutrient concentrations in water entering the pond may result in increases in plant abundance, which in turn may have the potential to alter the community composition of the pond environment. Estimates of changes in groundwater dynamics associated with Kaloko Town Center indicate that nutrient concentrations in groundwater should not increase above present concentrations as a result of landscaping. Volume of groundwater discharges into the pond may increase slightly, but the increases appear to be within the natural variability of flow that presently enters the Pond. Because the flow rates are not expected to increase beyond the present range, and the nutrient concentrations of groundwater are not expected to increase, there appears to be little potential for changes in plant uptake compared to the present situation. In addition, because of the strong vertical stratification of the Pond, the small increases of groundwater flow would likely have the effect of altering water composition of only the surface layer, and would be exposed to the organisms that live on the pond floor. Therefore, the potential for impact to marine and pond communities as a result of the development of the Kaloko Town Center project appears to be minimal.

Historic Resources. Of the 55 sites discovered by the archaeological inventory survey of the project area, 40 sites are recommended for data recovery including further documentation and, if feasible, excavation to address scientific and information interests. In addition to the 40 sites, ten sites are recommended for preservation. These include the only recurrent habitation site, a temporary habitation site associated with mining, and eight possible burials. For the site recommended for both data recovery and preservation, a partial preservation of a traditional trail is recommended. The possible burial sites presently recommended for preservation should undergo testing to determine the presence or absence of human burials prior to finalization of any development plan.

Flora/Fauna. Vegetation found on the project site is not complex nor species rich. A few native species are found on the fingers and patches of ‘a’a lava, most notable are endemic plants including the kumu-niu fern, *‘ohe, maiapilo, lama* and *‘ohi’a*. None of the plants found during the survey is a listed, proposed, or category 1 (high priority) candidate endangered species (US Fish and Wildlife Service 1994a, 1994b, 1995). The *maiapilo* is considered a category 2 candidate species for which there is some evidence of vulnerability, but not enough data to support listing proposals at this time. The *maiapilo* can be found scattered along the coast and lowland scrub vegetation throughout all of the main Hawaiian Islands. No sensitive native plant-dominated communities listed in the Hawai'i Natural Heritage Program 1994, exist on the property today. The plant species inventoried on the project site can also be found on the surrounding properties, the West Hawai'i region, and other dry lowland areas throughout the state. Although the proposed project should not have a negative impact on botanical resources, it is recommended that some of the more ornamental, and easily grown native species be propagated and used to landscape the common areas of the proposed project. These plants are adapted to the local growing conditions, and would require less water, soil and nutrients than introduced landscape material. Although the island of Hawaii is known to provide the habitat for 13 out of the 32 currently listed endangered avian species and subspecies in Hawaii, the project site's altitude, vegetation and total lack of standing water, make it unlikely that endangered avian species use the site. The only endangered avian species which may use the site occasionally for foraging is the Hawaiian Hawk (*Buteo solitarius*). However, the site lacks any vegetation that would provide a nesting habitat for this bird. No endangered mammalian species were detected on site, however, Hawaiian hoary bats (*Lasiurus cinereus semotus*) were observed at Aimakapa Pond and within the Kaloko Light Industrial Park in the past and it is likely that this species may transit the petition area occasionally. There is a lack of species diversity and extremely low densities of avian species on the project site indicating that the propose site has little to offer as a site for habitats or foraging. For fauna, there is nothing unique about the site. None of the habitat within the site is considered essential habitat for any of the species detected or for those that are known to use the habitat occasionally.

Visual Resources. The Kaloko Town Center will be visible from various vantage points along the coastline and from mauka residential areas along Mamalahoa Highway. The visual landscape will change as commercial and residential building forms are constructed on open fields of land. Over time, the panoramic visual landscape will change from an area with occasional clusters of building forms, to a more city-like settlement pattern as other projects in the region are developed. With development, the view from the highway will change as commercial buildings are built. To enhance the appearance of the project as seen from Queen Ka'ahumanu Highway, a 100 foot wide landscaped open space buffer will set back proposed buildings.

Air Quality. Short term air pollutant impacts of the proposed project would be caused by construction activities and associated release of fugitive dust. While localized increases of these pollutants are expected to occur, they are considered insignificant and temporary. The most significant long-term pollutant impacts associated with the everyday use of the project would be from motor vehicles emissions in the form of carbon monoxide (CO). Modeling results indicate that the project is not expected to exceed the CO levels established by the National Ambient Air Quality Standards (NAAQS) or State Ambient Air Quality Standards (SAAQS). With future improvements in vehicular emissions, a decrease is predicted in CO concentrations even with the projected increase in traffic. Increased demand for energy from power generating facilities will have an additional, indirect impact on air quality that can be directly attributed to the proposed project. The Hawaii Electric Light Company (HELCO) will need to generate more electricity to meet demand by burning fuel oil which emits SO_2, Nox, PM and HC. This increase in electrical demand is considered minimal but will contribute to the regional air pollution background. However, total air pollutant concentrations will have little impact on the area and are expected to remain below the NAAQS and SAAQS. The worst air pollution episodes experienced in Hawaii County are due to infrequent and unpredictable volcanic activity which causes a source of natural pollution commonly referred to as volcanic smog (VOG). VOG could add to the discomfort of future residents of the proposed project. The health hazards associated with VOG are unknown at this time but the State Health Department intends to conduct a study with a grant from the National Institute of Environmental Health Sciences to determine the contents of VOG and with additional funding determine how it affects health. (Honolulu Star Bulletin, May 1, 1996, p. A1, A6)

Although the proposed project is not expected to cause impacts to air quality which warrant required mitigation measures, various measures can be employed to minimize or reduce the potentially adverse impacts. Fugitive dust emissions created during construction should be mitigated by establishing a regular dust-watering program and covering dirt-hauling trucks in accordance with the State of Hawaii Air Pollution Control Regulations. Although the long term projected increase in vehicular traffic is not expected to significantly raise the CO concentration in surrounding areas, mitigation measures designed to reduce vehicular trip generation should help to improve overall air quality. Traffic flow improvements, ride sharing and other practical means to discourage the reliance of the automobile are possible mitigation measures. Although indirect air pollution sources are not considered significant, energy conservation measures can be employed to minimize the emissions from electrical power generation.

Noise. Traffic Noise will increase on Queen Ka'ahumanu Highway in the areas fronting the project about 3.9 Ldn and about 5.0 to 5.8 Ldn along Hina Lani Drive. The only portion of the project impacted is along Hina Lani Drive where single family and multi-family residences are proposed. In this area, 65 Ldn noise levels will be heard about 173 feet from the centerline of Hina Lani Drive. All other commercial, office and retail uses fronting Queen Ka'ahumanu Highway and Hina Lani Drive are not affected by projected noise levels. Audible construction noise will probably be unavoidable during the entire project construction period. Adverse impacts from construction noise are not expected to be in the "public health and welfare" category because of the temporary nature of the work and the administrative controls available for its regulation. Impacts will probably be limited to the temporary degradation of the quality of the acoustic environment in the immediate vicinity of the project site. The impact of traffic noise on residential uses along Hina Lani Drive can be mitigated by not construction dwellings within the 65 Ldn setback line and/or by using sound attenuating walls and windows, or totally enclosing structures and using air conditioning. In addition, the construction of 6 foot high sound walls is generally effective for attenuating traffic noise at single story structures or at the ground floor of multi--story structures. Reducing construction noise to inaudible levels is not practical simply because of the intensity of construction noise sources and the exterior nature of the work. However, mitigation measures such as the use of properly muffled construction equipment and the incorporation of State Department of Health construction noise limits and curfew times (applies only to Oahu), should be applied to the project.

Social. The Kaloko Town Center will impact the population of the area by adding 850 residential units and an estimated 2,240 to 2,300 new residents at full build out. This additional population would account for about a 10% increase over the 1990 North Kona population of 22,284 and about 6% of the projected Year 2000 population of 35,700. The Kaloko Town Center is consistent with public plans and policies for the future of the region and will be compatible with changes already planned for the area. The project is also likely to complement other projects proposed in this vicinity as it will provide housing for people who may work in these other projects as well as expand the housing market by adding more multi-family and small single-family units to the regional inventory. Future residents of Kaloko Town Center should not be affected by the Kaloko Industrial Park because light industrial uses are regulated to avoid the more noxious and offensive impacts associated with heavy industrial uses. The Kaloko Town Center may affect mauka residents who have a view of the project site. The existing undisturbed landscaped would be transformed as commercial buildings, parking lots and residences are constructed and would appear as an extension of the urban environment already created by the Kaloko Industrial Park. This visual impact is not unique to the project site because the region between Kealakehe and Keahole is planned for substantial growth and in time much of this region will attain a more urbanized character.

To mitigate such impacts, the development should be attractively landscaped and well-maintained. Structures should be designed to be environmentally sensitive and compatible and the use of non-reflective, non-glare roofing material should be considered.

The Kaloko Town Center may have an indirect beneficial impact on the park and its resources. Development of the project will include the installation of a sewer line sized to accommodate other users along the highway to the municipal sewer system at Kealakehe. Other existing uses, including the Kaloko Industrial Park which is currently on cesspools, will be hooked up to the sewer system thereby eliminating potential groundwater pollution impacts to the fishpond and shoreline environment.

Economy. The Kaloko Town Center would contribute to the economy in many ways. For Hawaii residents employed in construction, personal income would average approximately $4.8 million annually during the initial three years, decline slightly to $3.0 million and $2.2 million annually respectively as construction winds down over the subsequent 10 year periods. For those employed in the operation of the Kaloko Town Center, personal income generated is estimated to be about $.44 million in the year 2000, $10.9 million in 2010 and $19.0 million in 2020. In total, annual personal income for both construction and operational employment is projected at almost $9.2 million in the year 2000, increasing to $13.8 million in the year 2010 and $21.2 million in the year 2020. A net increase in property tax revenues and non-real property revenues to the County that is attributable to the Kaloko Town Center is projected at about $390,000 in the year 2000, $950,000 in year 2010 and $1,350,000 in the year 2020. Total revenues to the State attributable to the development of the Kaloko Town Center is projected at about $2.0 million in the year 2000, $2.3 million in 2010 and $3.0 million in the year 2020.

Fiscal Impacts. As the Kaloko Town Center develops over time and additional households and residents move into the area, additional expenditures by the State and County governments will be required to pay for public services. The County of Hawaii spends about $940 per resident. At $940 per resident, new County expenditures directly attributable to the Kaloko Town Center are projected at $170,000 in the year 2000, $540,000 in the year 2010 and $800,000 in the year 2020. The State of Hawaii spends about $4,790 per resident in 1995 dollars. New State expenditures directly attributable to the Kaloko Town Center are projected at $380,000 in the year 2000, and $1.7 million and $2.6 million in the years 2010 and 2020, respectively. For the County, the net additional revenues are projected to be about $217,000 in the year 2000, $406,000 by the year 2010 and $548,000 by the year 2020. Additional County government revenues generated by the Kaloko Town Center and its facilities could be about 2.3, 1.8 and 1.7 times the additional operating expenses incurred for the years 2000, 2010 and 2020. For the State, net additional revenues are projected at about $1.6 million in the year 2000, declining to $630,000 and $380,000 in the years 2010 and 2020, respectively. The initially higher revenues are attributable to higher levels of construction at the initial stages of the project. State revenues are projected at about 5.2 times expenses in the year 2000, and then taper off to 1.2 and 1.0 times in the later years.

Employment. Future employment projections, including direct, indirect and induced employment in construction and operational employment, are projected to account for roughly 6,150 full time equivalent positions over the term of the project. Employment opportunities would be in the form of laborers, operators and craftsmen, as well as professional, managerial, sales and clerical workers in non-resort operations. The elementary school would provide between 60 to 70 new jobs in teaching and administrative positions. Employment created at the Kaloko Town Center is not directly tied to resort operations, although the long term growth and stability of the region is inherently tied to the health of the visitor industry in Hawaii.

Housing. By the Year 2020, a shortfall of almost 7,900 housing units are projected. The Kaloko Town Center will provide 480 multifamily and 370 single family residential units which are projected to meet demand within a 17-year absorption period. The types of units planned are meant for the permanent population and not the luxury resort residential or second home market. Residential products will be targeted to entry level and first time, move up buyers with some multi-family units also available. Buyers and renters are expected to be in the low and moderate income levels.

Traffic. Traffic generated by the proposed project can be accommodated by the roadway systems in the area provided necessary improvements which are currently planned or underway are implemented on a timely basis. To accommodate future growth of the region, the future roadways proposed in the Keahole to Kailua Development Plan should be implemented.

Potable Water. The Department of Water Supply currently has 2 high level wells on line with 2 more coming on line in the near future. The Department is planning to drill and equip another high level well in the area. According to a report prepared by Tom Nance Water Resources Engineering, there are also 3 other high level wells in the area which have been drilled but not outfitted. If need be, the proposed action could enter into a joint venture, at full build-out, to outfit one of the drilled wells. Water is available through the existing system located along Hina Lani Drive, however, 2 reservoirs situated at the 900-foot and 1200-foot elevations and connecting waterlines are required for the proposed project. Use of these water sources and facilities will require approval from the County Department of Water Supply.

Wastewater Disposal. Development of the proposed Kaloko Town Center would require the installation of a 12-inch sewage transmission line from the Kaloko Town Center to the pump station adjacent to the Kealakehe STP. The Kealakehe STP will have enough capacity to accommodate the proposed project. Future expansion is dependent upon the development schedules of other major projects within the region. Development of the Kaloko Town Center will have a beneficial affect of helping to mitigate potential adverse environmental impacts on the groundwater, the ecology of the Kaloko fishpond complex, and near shore marine environment because sewage generated by the Kaloko Town Center will be transported to the Kealakehe STP. Additional cesspools in the project area will not be constructed as a result of this project. Furthermore, the sewer connection from the project site to Kealakehe STP will allow other uses situated along the way to hook up thereby eliminating the current practice of using cesspools for sewage disposal.

Police/Fire/Medical Services. The police department has a current staffing shortfall which has not kept pace with the increased population of the region and the situation will be further exacerbated with the development of the Kaloko Town Center. The ability of the police to deliver assistance will be negatively impacted by the proposed project as the increased resident population will most likely result in an increase in request for assistance. The project is well within the service radius of the Kailua-Kona Fire Station. However, to improve response times, a new station would need to be built somewhere between the Keahole Airport and Kealakehe.

Schools. The Kaloko Town Center Master Plan allocates an approximate 13-acre site for a school/park facility. This site has been designed to allow school facilities, most likely elementary, to be developed in conjunction with a County or State park. The site is free from flooding and drainage problems, on relatively flat topography, and in an interior location off major traffic corridors which allows vehicles, bicycles and pedestrians safe and easy access. Intermediate and high school students generated by the project will need to be bussed to the existing Kealakehe Intermediate and the new Kealakehe High School which should be completed by the time the Kaloko Town Center is completed. The Kealakehe Intermediate School is grossly over capacity. All available rooms are used for instruction including the cafeteria, storage rooms, teachers' rooms and the boys' locker room. Also, several non-PE courses are taught outdoors. The intermediate school's playing field is shared with the neighboring elementary school. Five classrooms are currently under construction but are not expected to solve the overcrowding problem.

Cultural Impact. The potential impacts of the proposed development on specific rights, culture and traditions of native Hawaiians were evaluated as part of this environmental impact statement. Specific areas which have been examined include the issue of burials within the project area, the issue of access to Hawaiian trails, the issue of unique geographic or geological features traditionally used by Hawaiians, Hawaiian hunting rights, and Hawaiian gathering rights. The conclusion of this study is that the impact of the development of this specific parcel *per se* on Hawaiian culture would be minimal. The only significant native rights issue would seem to be the possible burials. Positive identification of human remains within the project area remains to be undertaken. Once one or more burials are identified as present, the remains will be treated within existing laws and the rules of SHPD in conjunction with the Big Island Burial Council.

1.5 Cumulative Impacts

Chapter 200 of Title 11, Environmental Impact Statement rules (11-200-17(I)) requires a discussion of the interrelationships and cumulative impacts of the proposed action and other related projects and of other possible secondary effects.

An evaluation of the cumulative impacts of the proposed action in concert with other proposed projects of the region was conducted by researching potential environmental impacts disclosed in the final environmental impact statements for major projects in the region. These final environmental impact statements were accepted by the State Land Use Commission and used as supporting documentation for obtaining urban reclassification. All of the major projects received Urban classification from the State Land Use Commission.

The projects evaluated include:

1. Liliuokalani Trust (Keahuolu Lands of Kailua-Kona)
2. Kealakehe Planned Development (Villages of La'i'opua)
3. Urban Expansion of State Lands (2,640 acres above Keahole Airport)
4. Kaupulehu Resort Expansion

Two of these projects, the Villages of La'i'opua and Urban Expansion of State Lands are government initiatives. The other two are private developments.

Other projects such as the O'oma II Resort Project and Kohanaiki Resort were not included in this evaluation. According to the Land Use Commission, the O'oma II project's request for urbanization was denied in September 1993. The developer for the Kohanaiki Resort announced a decision in July 1996 not to move forward with their project for undisclosed reasons despite achieving urban classification and county zoning. In addition, the Kamaaina Eight industrial and commercial project adjacent to the Kaloko Town Center was not included in this evaluation because the 70 acre project's contribution to the cumulative impacts for the region would be nominal in comparison with the larger projects proposed.

This assessment does not include other projects with approvals in hand, nor information on plans of other major landholdings in the area because such information was not readily available.

It should be noted that this analysis is based on published information which attempt to predict future environmental impacts. Where possible, quantitative data was used to arrive at cumulative effects. However, information was often inconsistently presented or not provided at all. Further, predicting the cumulative future of the region is highly speculative, particularly because all of the proposed projects indicate that development phasing over time is dependent on market conditions.

Detailed discussions of the cumulative impacts relative to the physical environment, socio-economic environment and infrastructure and public facilities and services are provided in corresponding chapters.

In general, the cumulative impacts of the proposed project in conjunction with other proposed projects of the region would take place over a 20 to 30 year development time frame. The eventual development of these projects would be in keeping with governmental policies and plans which envision the region as a future secondary support center for West Hawaii. In the long term, if all approved projects proceed as planned, the character of the area will change from its broad, open expanses, to a more urban type environment with new residential communities, commerce and resort destinations.

Development of the region would increase its economic productivity in terms of generating employment, tax revenues and more diverse economic activity which should have benefits which extend throughout the regional and state economy. A larger population base would justify improvements in medical care, education, and transportation. The benefits would be offset by costs for public services and changes to the rural lifestyle of the region. Although the cumulative infrastructure demand can be accommodated in the region, the future fiscal state of government, political decision making and factors relative to timing of infrastructure improvements are viewed as potential costs and unresolved issues.

1.6 Unresolved Issues

The final disposition of possible burial sites on the project site remains an unresolved issue pending confirmation of the presence of human remains. In addition, the impacts of VOG (smog from volcanic activity) to potential residents and businesses of the proposed project remains an unresolved issue.

1.7 Necessary Permits and Approvals

State and County of Hawaii permits that will be required prior to development of the petition area are listed in Table 1-1. In addition, other specific permits for construction activity may be required for compliance with noise, air quality, etc.

The status of permit and approval applications hinges on receiving Land Use Commission district boundary amendment approval. This EIS is being prepared as supporting documentation for the Land Use District Boundary Amendment Petition that was filed on September 12, 1995. Chapter 6E, Review by the Department of Land and Natural Resources is currently being conducted.

Pending receipt of Land Use Commission approval, it is envisioned that application for County General Plan Amendment and Rezoning will take place around March to May of 1997, followed thereafter by a request for subdivision approval. Applications for other State and County permits listed will be made at appropriate times as the project proceeds with engineering design.

Table 1-1
Necessary Permits and Approvals

Government Agency	Approval Required
State of Hawaii	
State Land Use Commission	Land Use District Boundary Amendment
Department of Land and Natural Resources	Chapter 6E Review
Commission on Water Resource Management	Well Construction and Pump Installation Permits
Department of Health	Potable Water System Approval
Department of Transportation	Roadway improvements to Queen Ka'ahumanu Highway
County of Hawaii	
County Council	General Plan Amendment Rezoning
Planning Department	Subdivision Approval
Board of Water Supply	Water system approval
Department of Public Works	Building Permits Grading and Stormwater Management Permits
Department of Transportation	Roadway Construction Approval

Chapter 2
DESCRIPTION OF THE PROPOSED ACTION

2. DESCRIPTION OF PROPOSED ACTION

2.1 Location

The petition area is located in the North Kona District of the Island of Hawaii. (See Figure 2-1). It is situated immediately *mauka* of Queen Ka'ahumanu Highway, and bordered by Hina Lani Drive and the existing Kaloko Industrial Park to the south and privately owned industrial and commercial zoned land to the north. The *mauka* border abuts property designated Urban and granted permission for golf course. Within the context of the larger region, the property is about 2.8 miles south of Keahole Airport, and 4 miles north of Kailua-Kona Town. The site is situated on portions of the Kaloko and the Kohanaiki *ahupua'a*. (See Figure 2-2).

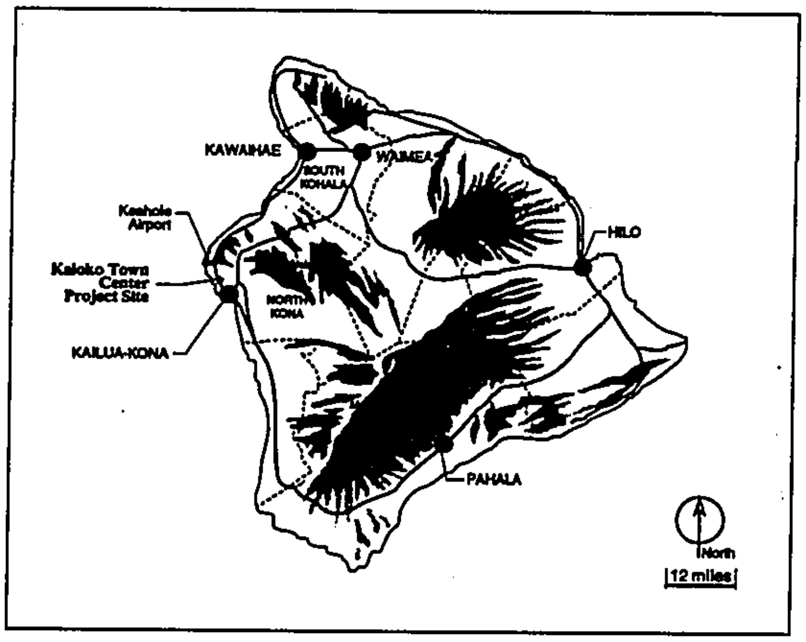


Figure 2-1
PETITION AREA LOCATION

The property, identified as Tax Map Key: 3rd Division, 7-3-09: por. 17, encompasses approximately 223.924 acres. A 54,124 square foot parcel owned by the County of Hawaii for use as a water tank site is located generally in the *makai*- southern corner of the project site. This parcel, identified as Tax Map Key: 7-3-09:27, is excluded from the petition area. (Note: Parcel 27 is not shown on the Tax Map because the map has not been updated). (See Figure 2.-3).

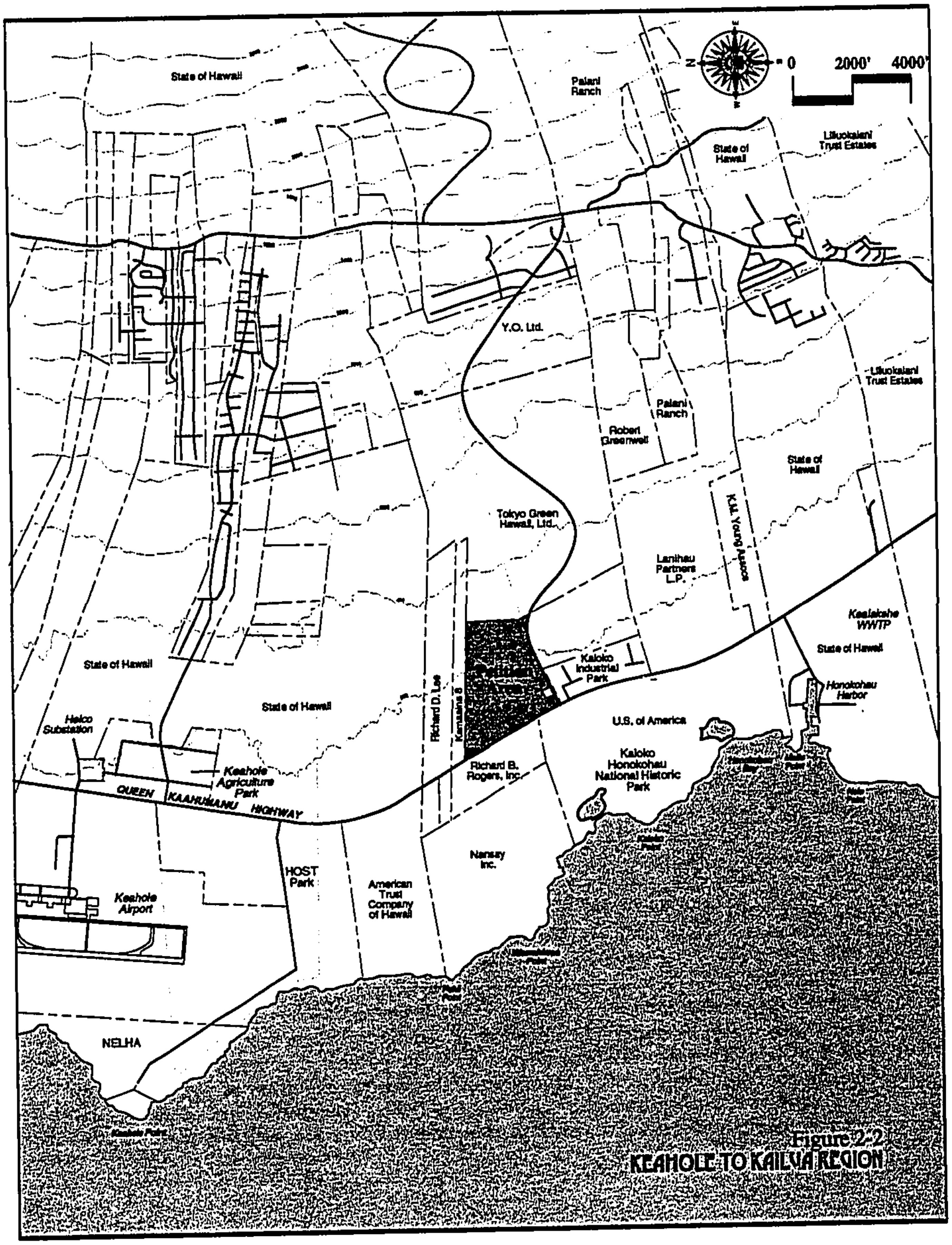


Figure 2-2
KEAHOLE TO KAILUA REGION

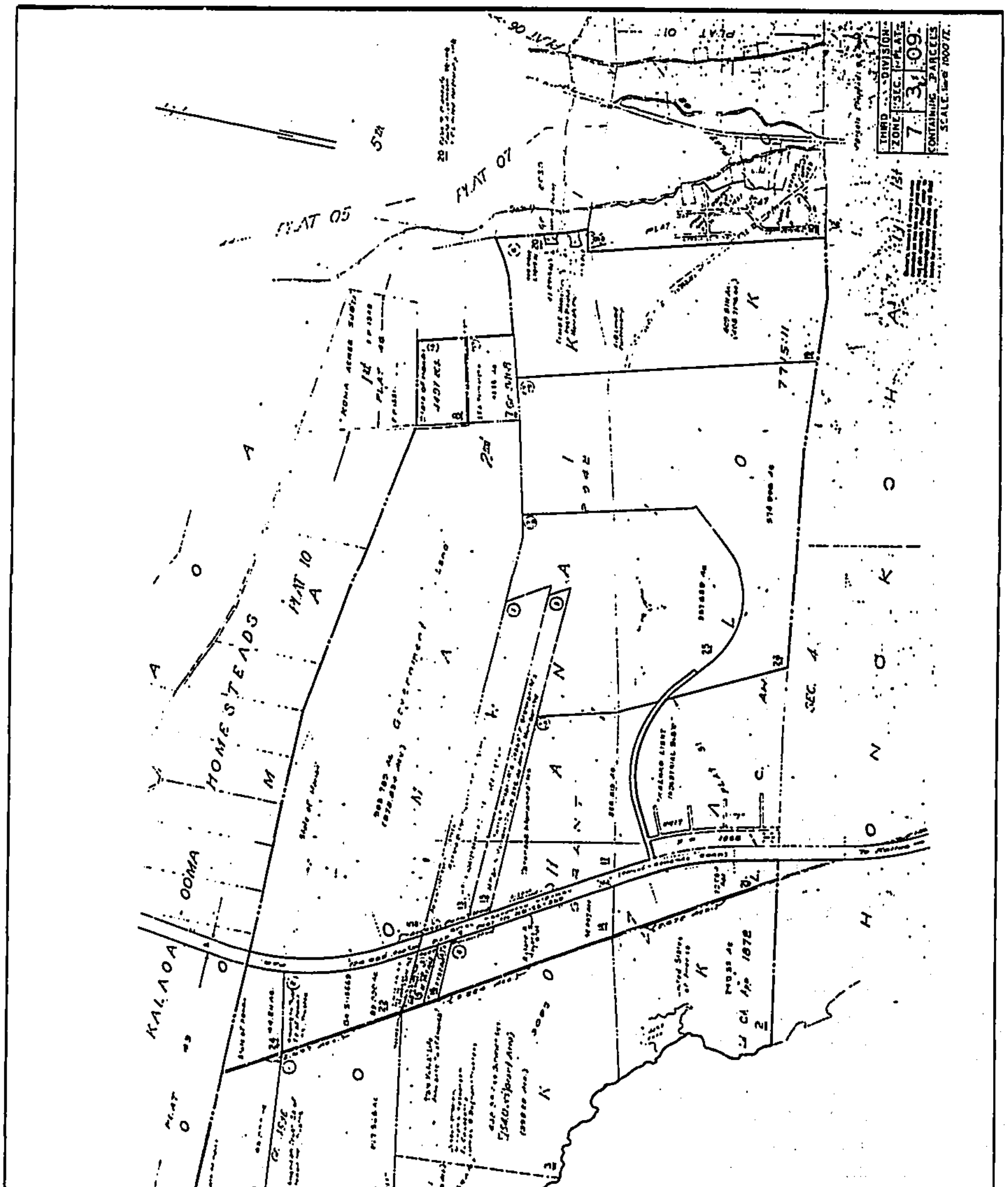


Figure 2-3
TAX MAP KEY

2.2 *Environmental Setting and Existing Use*

The vacant and undeveloped property is generally flat with slopes ranging between 0% to 10%. Ground elevation rises from approximately 90 foot elevation Queen Ka'ahumanu Highway to about 340 feet at its *mauka* boundary. The terrain consists primarily of a'a and pahoehoe lava flows with little or no soil cover and relatively sparse vegetation of grasses, small shrubs and occasional stands of trees. Shrubs and trees include scattered stands of *'ilima, klu,* lantana, *noni,* a few *kiawe* and *'ohi'a* trees and an abundance of *koa haole.* Botanical and biological surveys conducted for the study area found no endangered plants or animals (Char, 1995; Rana Productions, 1995). In the 20th century, the dry and barren site was put to limited use and most likely for ranching purposes as indicated by walls and fencing found nearby. (Cultural Surveys Hawaii, 1996).

2.3 *Regional Description*

The petition area is located in the North Kona Judicial District, a large land area covering some 568 square miles or approximately 14% of the island of Hawaii. As a point of reference, the island of Oahu measures some 607 square miles. From Anaeho'omalu Bay, its northern boundary, to Nenue Point, its southern boundary, the district stretches some 35 statute miles and extends inland to the slopes of Mauna Loa and Hualalai on average about 20 miles.

The District includes Census Tract 215.01 which covers the area from Pu'u Anahulu to Kealakehe, including the project site; Census Tract 215.02 which covers most of North Kona *mauka* of Mamalahoa Highway, Census Tract 215.97 which covers Kainaliu, Census Tract 215.98 which covers Keahuou and Census Tract 216 which centers around Kailua Town. In 1990, the population of the district was over 22,000 people. Kailua-Kona, the second largest city on the island and the economic center of the region had a population of 9,661.

2.3.1 Existing Uses within the Region (See Figure 2-4)

The Kaloko Industrial Park is located on the southern side of the petition area across Hina Lani Drive. Developed about 14 years ago, the industrial subdivision consists of 55 one-acre fee simple lots and includes light manufacturing, warehousing and distribution operations and Costco, a discount shopping outlet.

Makai of the petition area is the Kaloko-Honokohau National Historic Park. Under the administration of the US National Park Service, the 1,161 acre park was authorized in 1978 to preserve the natural and cultural resources of the area. The park lands include the *ahupua'a* of Kaloko and Honokohau *makai* of Queen Ka'ahumanu Highway and extends along the coast from Wawahiawa'a Point to the waters of Honokohau Bay.

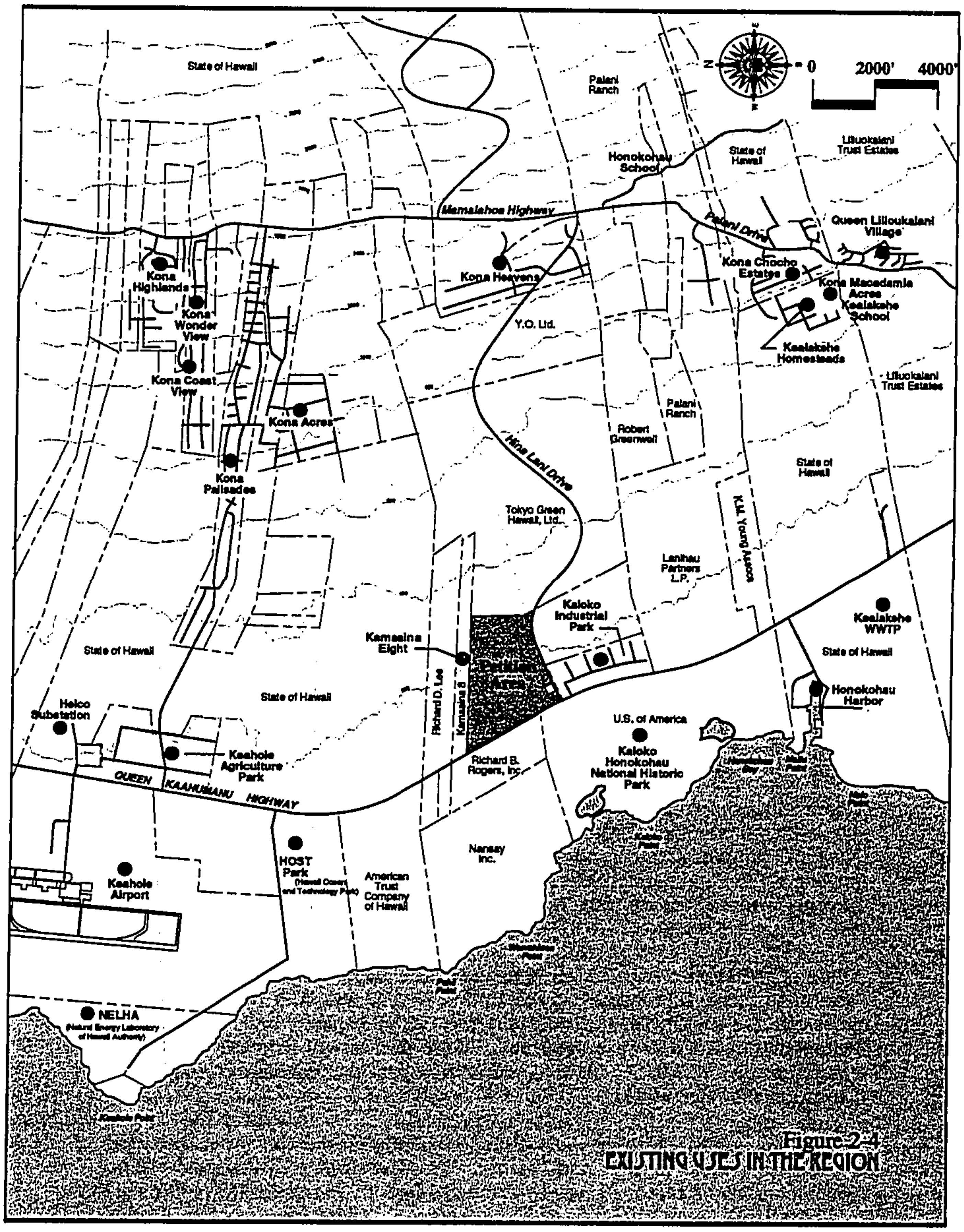


Figure 2-4
EXISTING USES IN THE REGION

Major land use activities located north of the petition area are concentrated around the Keahole Airport. The State-owned Keahole Airport provides air transportation service to West Hawaii. In 1989, some 900,000 passengers passed through the airport (State of Hawaii 1990 Data book). *Makai* of the airport lies the Natural Energy Laboratory of Hawaii Authority (NELHA), a publicly funded research facility conducting research applications in alternative energy systems, aquaculture and related fields, using deep ocean water pumped ashore via offshore pipelines. NELHA consists of the Natural Energy Laboratory of Hawaii and the Hawaii Ocean Science and Technology (HOST) Park located to the south of the airport.

The Keahole Agricultural park is located on the *mauka* side of the airport across Queen Ka'ahumanu Highway. The agricultural park was developed by the State of Hawaii on State-owned property. Individual parcels of farm land are leased to commercial growers who are mostly engaged in the horticultural business.

Existing resort accommodations in the vicinity of the petition area are located in Kailua Town, Keauhou to the south and the Kona Village located to the north beyond the Keahole Airport. Other major resort destinations including the Waikoloa, Mauna Lani and Mauna Kea resorts are located further north along the South Kohala coastline.

The Honokohau Small Boat Harbor is located about 2.5 miles to the south of the petition area. The small boat harbor is operated by the State Department of Transportation and provides 450 small boat slips which are leased to private boat owners. Other facilities include boat repair and dry docks and a restaurant.(County General Plan, 1989:72).

Commercial shopping centers are concentrated in Kailua Town off of Palani Road. These include the Kona Coast Shopping Center, Kona Market Place, Kopiko Plaza, Kuakini Shopping Center, and the Lanihau Shopping center. Major anchor tenants include KTA Supermarket, Marshall's, Safeway, Ben Franklin, Longs, Sack-N-Save as well as various restaurants and specialty shops (KPMG Peat Marwick, 1996).

South of the Honokohau Harbor is the new Kealakehe Regional Wastewater Treatment Plant. The wastewater treatment facility was built by the County on 30 acres of State land in 1993. It has a 20-year design capacity based on 2.8 million gallons per day (MGD) average flow. Future phases will increase its capacity to approximately 7.8 MGD over a 40 year design period (Keahole to Kailua Development Plan, 1991).

Residential subdivisions are located predominantly on the cooler *mauka* slopes along Mamalahoa Highway and Palani Drive. The Kona Heavens subdivision which consists of 118 one acre lots is located directly *mauka* of the petition area and uses Hina Lani Drive as a major access road. There are a number of other residential subdivisions, both large and small. These include the Kona Chocho Estates, Kona Macadamia Acres, Queen Liliuokalani Village, and Kealakehe Houselots to the south of the highway. To the north, other residential subdivisions include Kona Palisades, a 1,358 lot subdivision and Kona Acres, a 312 one acre lot subdivision, Kona Highlands, Kona Wonder View Lots and Kona Coast View.

2.3.2 Proposed Developments within the Region (See Figure 2-5)

A number of major new developments, both publicly- and privately-sponsored, are planned for the region. The development schedule for many of these projects are unknown because of the current economic downturn and other circumstances.

The coastline *makai* of the petition area and Queen Ka'ahumanu Highway has several projects in various stages of development. The Hualalai Project, located in Kaupulehu next to Kona Village, encompasses some 625 acres planned for resort, golf course and residential uses. A 243 room Four Seasons Hotel is under construction and zoning is approved for 1,000 residences. Full build out is projected to occur over 15 to 20 years depending upon market conditions.

Located about two miles to the south of the Keahole Airport is the Kohanaiki project. Nansay, Inc. has plans to develop 470 acres with two resort hotels, an 18-hole golf course, 150 slip marina and 350 residential units. The project received Land Use Commission reclassification from Conservation to Urban in 1987. Despite receiving its major permits, development has been delayed by legal challenges. In late July, Nansay Hawaii, Inc. withdrew a contested special management area use permit from the Hawaii County Planning Department and effectively ended its proposed development (Pacific Business News, July 29, 1996).

The Queen Liliuokalani Trust is proposing to develop some 546 acres in Keahuolu near the intersection of Palani Road and Queen Ka'ahumanu Highway. Land Use Commission reclassification from the Agricultural and Conservation Districts to the Urban Land Use District was granted in 1991. Approximately 550 acres are located *mauka* of Queen Ka'ahumanu Highway and the other 212 are *makai*. The project is planned in three phases. Phase 1 includes 315 acres located at the *mauka* corner of Palani Road and Queen Ka'ahumanu Highway, Phase 2 includes another 231 acres adjacent to Phase 1, and Phase 3 is the *makai* property. Currently, only 50 acres have zoning approval and the remaining property is in various stages of the permit approval process.

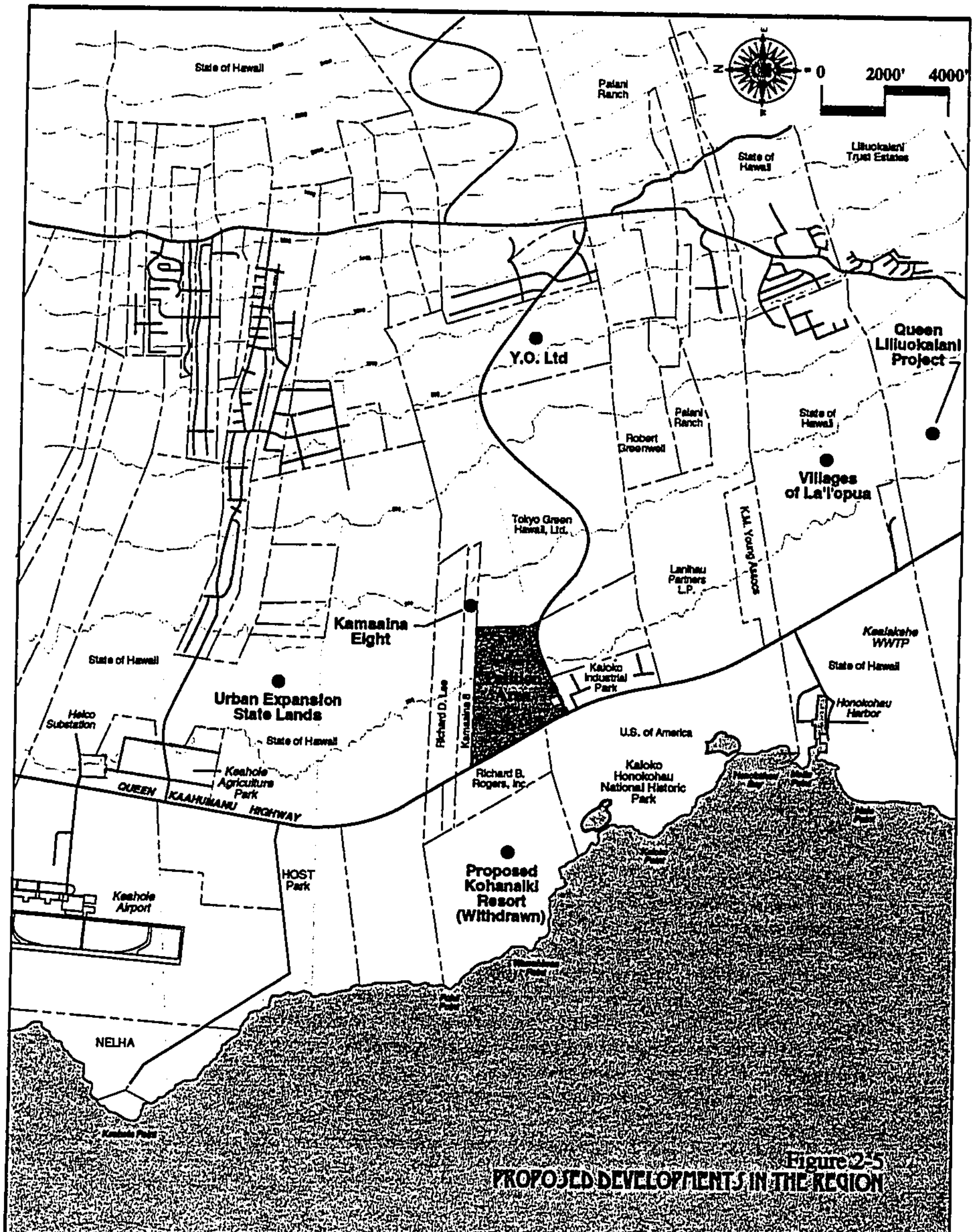


Figure 2-5
PROPOSED DEVELOPMENTS IN THE REGION

The Villages of La'i'opua is a project being developed by the State Housing and Finance Development Corporation in Keahuolu. This project, reclassified from Agricultural and Conservation Districts to Urban District in 1990, is located adjacent to the Queen Liliuokalani Trust project on the *mauka* side of Queen Ka'ahumanu Highway. The project covers some 727 acres and includes 4,082 housing units, an elementary school, a regional high school (now under construction), two commercial areas, parks, churches/day care, a community golf course and archaeological and botanical preserves. Two phases of infrastructure has been completed and the first increment of housing is scheduled for completion in 1998.

Kamaaina Eight is a narrow strip of 70 acres located adjacent to the northern boundary of the petition area which was reclassified from Conservation to Urban in January 1992. Plans for the site include 9 acres of commercial near Queen Ka'ahumanu Highway and 71 acres of light industrial parcels to be sold in fee simple. The project is scheduled to commence in 1998.

The Y-O Limited Partnership has plans for 408 acres of land located on the *mauka* slopes east of the project site. Plans call for 1,093 single family units and 340 multi-family units, along with 5.5 acres for commercial and 5 acres for park. This project does not appear to be moving forward at this time.

In 1993, the State Land Use Commission granted the reclassification of some 2,640 acres of State-owned land located north of the petition area *mauka* of Queen Ka'ahumanu Highway and the Keahole Airport. Although there is no master plan for this area, the Final EIS (Final Environmental Impact Statement, Urban Expansion State Lands, Keahole to Kailua Region, July 1993) described three possible development scenarios based on similar scale master planned communities in the State. In all three scenarios, typical land uses include residential, neighborhood commercial, civic, employment center, light industrial, parks, golf courses, and a university. Residential unit counts ranged from 5,650 to 7,533. No further development plans have been undertaken since the lands have been reclassified to urban.

In summary, the region surrounding the Kaloko Town Center is currently largely undeveloped with the exception of the Kaloko Industrial Park. However, consistent with State and County policies, there are many substantial development projects planned for the region in various stages of the development and permit process.

2.4. Proposed Action

The proposed project seeks to urbanize the property into a mixture of land uses including commercial/retail, office/commercial/retail, multi-family residential, single family residential and a site for a school and park. See Table 2-1:

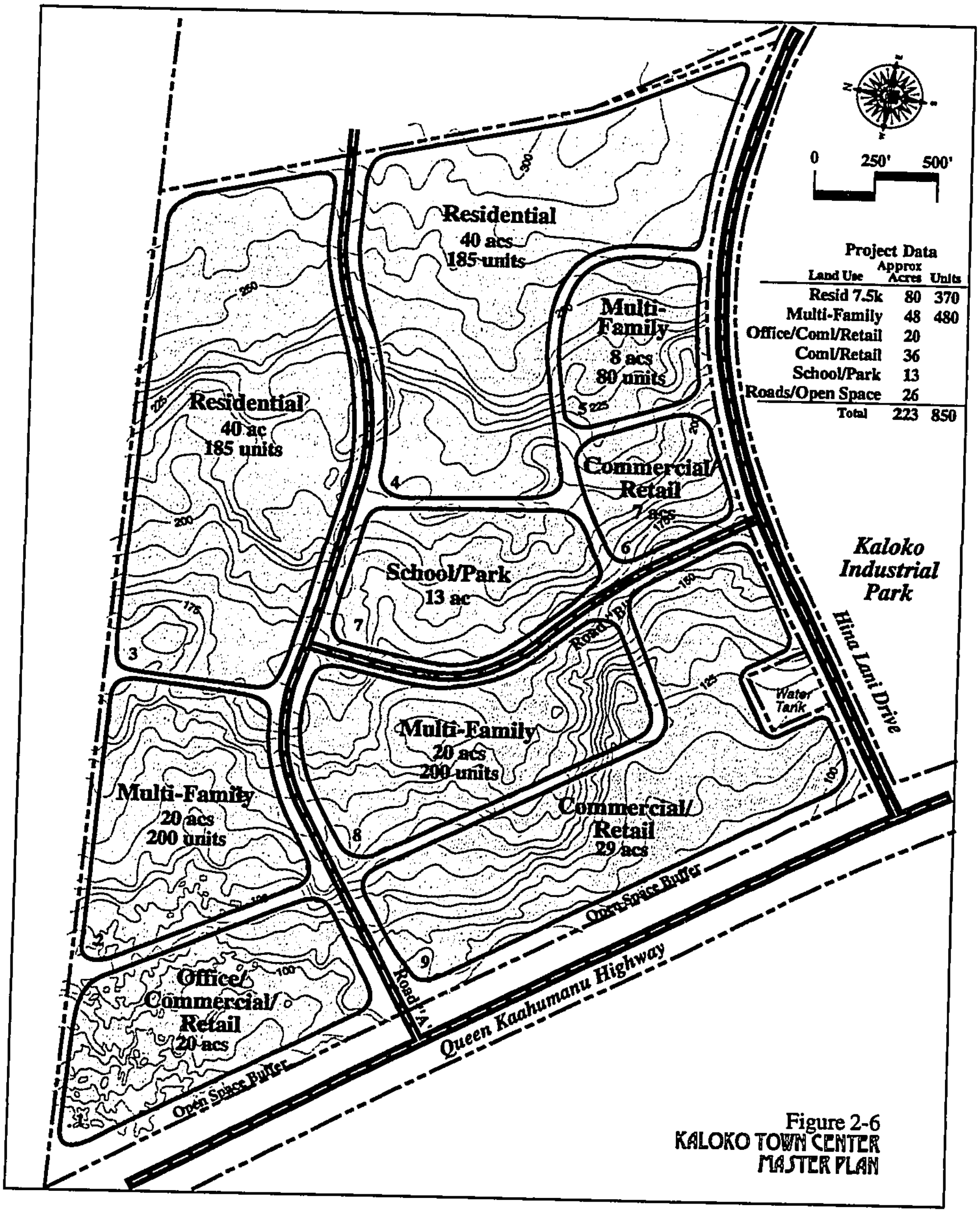
Table 2-1
Project Date Summary

Land Use	Acreage	Units
Commercial/Retail	36	
Office/Commercial/Retail	20	
Multi-Family Residential	48	480
Single Family Residential	80	370
School/Park	13	
Roads and Open Space	26.924	
Total	223.924	850

The Kaloko Town Center is situated in an excellent location at the midpoint between the Keahole Airport and Kailua Town along Queen Ka'ahumanu Highway. It has high visibility from the highway and good proximity to major points in the region including the airport and resort destinations to the north, the residential communities on the *mauka* slopes and the residential population and business activities to the south. Proposed Commercial/Retail uses that are supported by market demand include traditional shopping complexes consisting of food stores, durable goods, sundries, specialty shops and restaurants. In addition, a number of family-oriented commercial activities are planned including: Miniature Golf, Bowling, Batting cages, Go-carts, Family dining/amusement, gas station, car wash and convenience store and various visitor attractions and support services. In addition, to commercial/retail uses, office spaces are also planned as part of the mixed use-commercial areas and would be designed as garden office complexes.

Within the areas planned for commercial use, provisions will be made to work with the Civil Defense Agency to install a warning siren and to determine if any of the proposed facilities are appropriate for use as shelters during major natural disasters.

Residential uses proposed include approximately 480 multi-family units on two parcels totaling 48 acres. The multi-family units are to be designed as low-density townhouse complexes at a density of 10 units per acre with common landscaped areas. Multi-family units will be developed and sold as fee simple condominiums or rented as apartments to provide more affordable housing opportunities. Single family units are proposed for 80 acres with a minimum lot size of 7,500 square feet per lot. All of these units will be sold in fee simple.



Project Data

Land Use	Approx Acres	Units
Resid 7.5k	80	370
Multi-Family	48	480
Office/Coml/Retail	20	
Coml/Retail	36	
School/Park	13	
Roads/Open Space	26	
Total	223	850

Figure 2-6
KALOKO TOWN CENTER
MASTER PLAN

The plan makes provision for a 13 acre school/park complex which provides sufficient space for an elementary school and adjoining playground. In a letter received from the Department of Education (DOE), a fair share contribution was requested. The school site could be counted as a portion of that contribution, either in the form of land dedication, construction of facilities or a cash contribution (Letter to Office of State Planning from Department of Education, dated 2 November 1995). According to a letter from the Department of Parks and Recreation, (July 25, 1996), the recommended standard is 5 acres of park per 1000 population. Based on the projected population of 2,300, a total of 11.5 acres of park would be needed. Depending on the ultimate size of the park to be located at the elementary school/park site, additional park acreage would be provided at appropriate locations in the community. As design development proceeds, the prescribed amount of acreage required for park dedication will be incorporated into the master plan design in accordance with the requirements of the County Department of Recreation.

Access to the project would be via Hina Lani Drive and a new intersection off Queen Kaahumanu Highway located some 2,000 feet to the north of the existing Hina Lani Drive-Queen Kaahumanu Highway intersection. See Figure 2, Kaloko Town Center Master Plan.

2.5 Project Phasing

The proposed project is projected to take 15 to 20 years to complete following the receipt of land use and zoning approvals. In general, development will most likely occur in phases starting with commercial uses at the corner of Queen Ka'ahumanu Highway and Hina Lani Drive and proceeding *mauka* and north according to market demand and absorption rates. See Figure 2-7. Infrastructure improvements, both off-site and on-site will proceed according to the requirements of each phase of development. The installation of the sewer trunk line to the Kealakehe Wastewater Treatment Plant will most likely be one of the first phases of infrastructure development.

Approximately 100 residential units are projected for development by the year 2000, and another 250 units every 5 years hence up to the year 2015. Retail land is projected for development in conjunction with residential and visitor population growth. Estimates of supportable retail land area suggest that 8.4 acres could be developed by the year 2000 followed by retail expansion ranging between 4 to 7 acres every 5 years. Office spaces would most likely be developed in two phases: the first would consist of an approximate 3 acre complex built by the year 2010 and the second approximate 2.5 acres would be expanded by the year 2020, depending upon market conditions at the time.

The school/park complex will be developed in accordance with State budget appropriations and enrollment demands in the area.

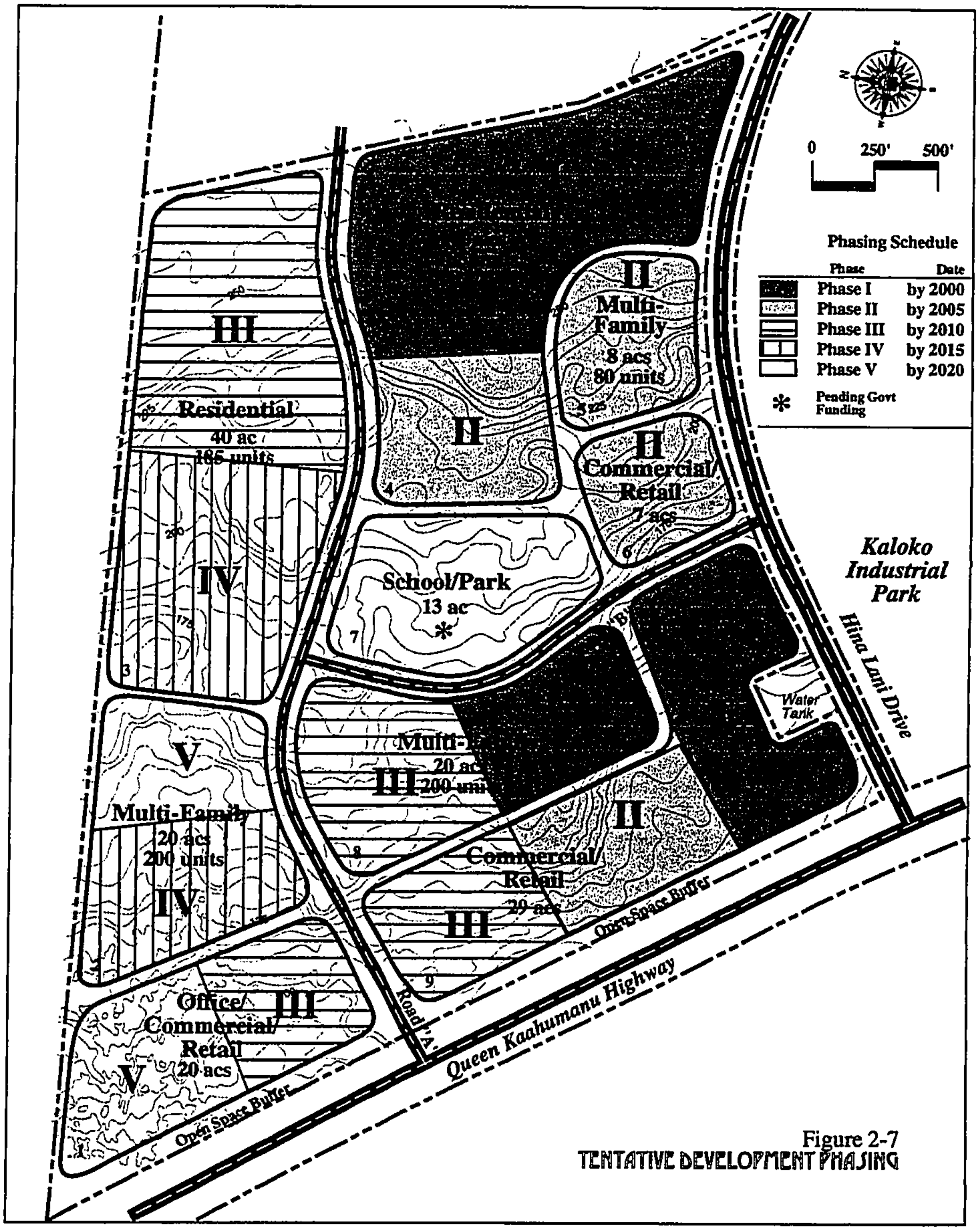


Figure 2-7
TENTATIVE DEVELOPMENT PHASING

2.6 Project Cost

Off-site infrastructure costs are estimated at $12.7 million and on-site construction costs are estimated at $187 million. Total projected costs are estimated at $199.7 million over the life of the project in current dollars. An itemized breakdown of these costs are provided in Exhibit B of the Economic and Fiscal Impact study in the appendix of the EIS. Project financing will be provided as a combination of corporate investment capital provided by the owner, joint venture investment capital, and bank financing.

2.6 Historical Perspective

A brief summary of the historical use of the property is summarized below. A complete discussion is provided in the Cultural Impact and Archaeological Inventory sections and appendices. The petition area is situated on the *ahupua'a* of Kaloko and Kohanaiki. In the periods between pre-contact to 1800, the two *ahupua'a* were in the southern end of an area known as Kekaha. Prior to the ascendancy of Kamehameha, the lands were apportioned by the ali'i and Kekaha was held by the *kahuna* class of Ka-uahi and Nahulu (Kamakau 1961:231). During the 1770s, Kekaha and the lands of the section were held by descendants of the Nahulu line, the Ka-me'e-ia-moku and Ka-manawa, the twin half brothers of Ke'e-au-moku, the Hawai'i island chief (Ibid.:310). In the last decades of the 18th century, following western contact, Kohanaiki and Kaloko, as portions of the larger Kekaha area, remained under the control of Ka-me'e-ia-moku, who resided to the north at Ka'upulehu (Kamakau 1961:147).

In the 1800s to 1850s, western contact became a major influence in changing the traditional Hawaiian social structure and government. The *Mahele* of 1848 indicate that Kaloko was claimed by and awarded (LCA 7715) to Lot Kamehameha (Kamehameha V). Kohanaiki was classified as Government Land. Parcels within Kohanaiki were subject to sale and designated grants by the Hawaiian government. Land sales began in the 1850s with Grant 2030 to Kaiakoili in 1856, awarding 102 acres adjacent to and *makai* of the Government Road. Land sales continued throughout the 19th and 20th century. Grant 2942 and 1864 awarded to Hulikoa 929.75 acres which included the width of the *ahupua'a*, extending *makai* from Kaiakoili's grant. In 1871, Grant 3086 awarded 154 acres to Kapena. This grant extended *makai* from Hulikoa's grant to the shoreline. Kaloko continued to be held by the ali'i throughout the remainder of the 19th century, passing, after the death of Lot Kamehameha, successively to Bernice Pauahi Bishop, Kalakaua and Kapi'olani.

During the 20th century, John Maguire purchased the former chiefly lands of Kaloko in 1906. The uplands of the *ahupua'a* were developed into the Huehue Ranch. The Kaloko fishpond was leased from the ranch and used as a commercial fishing operation until the 1950s. The lands situated between Queen Ka'ahumanu Highway and Mamalahoa Highway were subdivided and purchased by various parties over the years. Residential subdivisions were developed on the *mauka* portions with plans by others for additional residential subdivisions. The Kaloko Industrial Subdivision was developed in the early 1980s and sold as fee simple industrial lots.

In 1982, TSA International purchased approximately 1,154 acres from the Huehue Ranch and proceeded with plans to develop a golf course in the area *mauka* of the petition area. Under Improvement District No. 17, which was created in 1990, the Hina Lani Drive roadway and water system were constructed at a total cost of $14 million. Plans for the golf course were approved with a reclassification from Agricultural to Urban by the State Land Use Commission in 1985 and granting of Use Permit No. 33 from the County of Hawaii in 1985.

In December 1993, the entire 1,100 acre property was sold to Tokyo Green Hawaii, Inc. After due consideration, Tokyo Green Hawaii made a decision to initiate a land use boundary amendment for a portion of the total property (the subject petition). There are no plans at present for the remainder of the property.

Chapter 3
RELATIONSHIP OF THE PROPOSED ACTION TO EXISTING PUBLIC PLANS, POLICIES AND CONTROLS

Kaloko Town Center

FINAL
ENVIRONMENTAL IMPACT STATEMENT

3. RELATIONSHIP OF THE PROPOSED ACTION TO EXISTING PUBLIC PLANS, POLICIES AND CONTROLS

3.1 *Introduction*

This section presents a discussion of State and County land use plans, policies and controls that are relevant to the proposed action. In Hawaii, there are multiple layers of plans, policies and controls, many which overlap or serve to validate other policies and proposals with more detailed studies and plans. In some instances, some of the policy and objective statements, particularly in policy documents, appear to compete with others because of inherently different agency priorities.

It is significant to note that the proposed petition is supported at all levels of government which offers plans, policies and land use controls over development of the subject property. Furthermore, the proposed petition is supported by the State's Office of State Planning as only 1 of 3 areas recommended for urbanization in their 5 year review of land use boundaries (State Land Use Commission 5 year Boundary Review). There were 30 recommendations to downzone from Agricultural or Urban District to Conservation throughout the entire island (17 in the west Hawaii region alone) and only 3 recommendation for upzoning from Agricultural and Conservation to Urban.

Relevant State and County land use plans, policies and controls are discussed in this section.

3.2 *Hawaii State Plan*

The Hawaii State Plan (Chapter 226, HRS, as amended), 1991, was prepared to serve as a guide for the future long-range development of the State by identifying goals, objectives, policies and priorities; providing a basis for determining priorities and allocating limited resources, such as public funds, services, manpower, land, energy, water, and other resources, improving coordination of state and county plans, policies, programs, projects, and regulatory activities, and by establishing a system for plan formulation and program coordination to provide for an integration of all major state and county activities.

Goal, objective and policy statements and guidelines contained in the Hawaii State Plan are written to address major topic headings. Within the context of the proposed project, the following section evaluates the potential impacts associated with relevant State Plan goals, objectives, policies and priority guidelines.

SEC: 226-5 Objectives and Policies for Population

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

Section 226-5(b)(2) Encourage an increase in economic activities and employment opportunities on the neighbor islands consistent with community needs and desires.

Section 226-5(b)(3) Promote increased opportunities for Hawaii's people to pursue their socio-economic aspirations throughout the islands.

Section 226-5(b)(4) Plan the development and availability of land and water resources in a coordinated manner so as to provide for the desired levels of growth in each geographic area.

Discussion:

Assuming full build-out, the Kaloko Town Center would increase the population of the North Kona District by some 2,090 people by the year 2020. This increase represents a small portion of the overall population growth projections for the North Kona and South Kohala districts (estimated at about 77,700 by the year 2020) and is consistent with future policies for development of the region. The use of land resources in the area is appropriate. It is adjacent to an existing employment center, the Kaloko Industrial Park, and approximately 4 miles from Kailua-Kona, the island's second largest city. The property is surrounded on three sides by urban designated lands, it is adjacent to a major highway, water resources are available but requires system improvements, and flora and fauna surveys found no endangered species.

SEC: 226-6 Objectives and Policies for the economy in general

Section 226-6(a)(1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaii's people.

Section 226-6(a)(2) A steadily growing and diversified economic base that is not overtly dependent of few industries.

Section 226-6(b)(6) Strive to achieve a level of construction activity responsiveness to, and consistent with, state growth objectives.

Section 226-6(b)(10) Stimulate the development and expansion of economic activities which will benefit areas with substantial or expected employment problems.

Discussion:

Future employment projections, including direct, indirect and induced employment in construction and operational employment, are projected to account for roughly 6,150 full time equivalent positions over the term of the project. Employment opportunities would be in the form of laborers, operators and craftsmen, as well as professional, managerial, sales and clerical workers in non-resort operations. The elementary school would provide between 60 to 70 new jobs in teaching and administrative positions. Employment created at the Kaloko Town Center is not directly tied to resort operations, although the long term growth and stability of the region is inherently tied to the health of the visitor industry in Hawaii.

SEC: 226-12 Objectives and polices for the physical environment -- scenic, natural beauty, and historic resources.

Section 226-12(b)(1) Promote the preservation and restoration of significant natural and historic resources.

Section 226-12(b)(3) Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features.

Section 226-12(b)(4) Protect those special areas, structures, and elements that are an integral and functional part of Hawaii's ethnic and cultural heritage.

Discussion

The project site is characterized as open lava fields with relatively sparse vegetative cover. It has not been identified in public policy documents as a significant natural resource known for its striking physical features or scenic qualities nor for its historic and cultural resources. The archaeological inventory survey identified possible burials and a recurrent habitat which are recommended for preservation pending further studies. The cultural resources of the site were evaluated through research of land tenure and oral histories and recommendations have been made for protecting these resources.

SEC: 226-13 Objectives and polices for the physical environment land, air, and water quality.

Section 226-13(b)(2) Promote the proper management of Hawaii's land and water resources.

Section 226-13(b)(3) Promote effective measures to achieve desired quality in Hawaii's surface, ground and coastal waters.

Section 226-13(b)(4) Encourage actions to maintain or improve aural and air quality levels to enhance the health and well-being of Hawaii's people.

Section 226-13(b)(5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.

Section 226-13(b)(7) Encourage urban developments in close proximity to existing services and facilities.

Discussion:

The use of this land is appropriate given public development policies and its physical features which are suitable for development. Ensuring that the proposed action does not impact the water quality of the Kaloko fishpond complex was an expressed concern. The groundwater study found that the natural rate of groundwater flow beneath the project site to the shoreline is relatively modest. The project may have an impact on groundwater, the Kaloko fishpond, or adjacent offshore waters as a result of: 1) disposal of wastewater generated on-site; 2) disposal of stormwater runoff; and 3) percolating water from landscape irrigation. Estimates of changes in groundwater flow volume and composition from the Kaloko Town Center project indicate that there does not appear to be potential to induce long-term changes in physio-chemical composition of pond or marine waters of a magnitude sufficient to cause changes in biological community structure. No wastewater produced by the project would be disposed onsite. Onsite stormwater disposal would not result in a change in discharge volume, but would result in a small addition to the nutrient content of the groundwater. The inorganic nutrients that occur in groundwater (primarily NO_3^- and PO_4^{3-}) were depleted in Kaloko Pond as a result of uptake by plants. Such intake suggests that the pond may be nutrient limited with respect to plant growth. As a result, increased nutrient concentrations in water entering the pond may result in increases in plant abundance, which in turn may have the potential to alter the community composition of the pond environment. Estimates of changes in groundwater dynamics associated with Kaloko Town Center indicate that nutrient concentrations in groundwater should not increase above present concentrations as a result of landscaping. Volume of groundwater discharges into the pond may increase slightly, but the increases appear to be within the natural variability of flow that presently enters the Pond. Because the flow rates are not expected to increase beyond the present range, and the nutrient concentrations of groundwater are not expected to increase, there appears to be little potential for changes in plant uptake compared to the present situation. In addition, because of the strong vertical stratification of the Pond, the small increases of groundwater flow would likely have the effect of altering water composition of only the surface layer, and would be exposed to the organisms that live on the pond floor. Therefore, the potential for impact to marine and pond communities as a result of the development of the Kaloko Town Center project appears to be minimal.

Noise and air quality studies indicate that the proposed project would not exceed Federal or State standards and regulations. There will be an increase in traffic noise which creates a 65 Ldn noise contour requiring a 173 foot setback from the Hina Lani Drive centerline. Residential uses will not be built within this noise setback area. The airport noise contours as projected will not impact the project. Short and long term, and direct and indirect pollution impacts on air quality were analyzed. Findings indicate that the proposed action would not exceed the National Ambient Air Quality Standards (NAAQS) or the State Ambient Air Quality Standards (SAAQS). With projected population growth, the Hawaii Electric Light Company (HELCO) will need to generate more electricity to meet demand. Generating electricity by burning fuel oil emits SO_2, Nox, PM and HC. However, total air pollutant concentrations will have little impact on the area and are expected to remain below the NAAQS and SAAQS. In addition to air pollutants caused by vehicular sources or other human generated activity, the infrequent and unpredictable volcanic eruptions which create a source of natural pollution commonly referred to as volcanic smog (VOG) can have a significant effect on air quality in the petition area. VOG could add to the discomfort of future residents of the proposed project. The health hazards associated with VOG are unknown at this time but the State Health Department intends to conduct a study with a grant from the National Institute of Environmental Health Sciences to determine the contents of VOG and with additional funding determine how it affects health. (Honolulu Star Bulletin, May 1, 1996, p. A1, A6)

The petition area may be subject to hurricane force winds, earthquakes or lava flows which may occur as natural, unpredictable disasters. During the last two major hurricane events which caused extensive damage to the island of Kauai, the island of Hawaii and the petition area were unaffected. The island of Hawaii has a seismic zone rating of 3, according to the Uniform Building Code (1991 edition). All structures will need to be built to withstand seismic forces expected to be generated in zone 3. The petition area is in lava hazard Zone 4. The zones are ranked from 1 through 9 based on the probability of coverage by lava flows with zone 1 being the highest hazard and zone 9 being the lowest. The lava flow hazard for Zone 4 is attributed to Hualalai, one of three volcanoes which have been active in historic times on the island of Hawaii. To reduce risks to property damage, buildings will be built to the requirements of the County's Building Code. To assist the general public in dealing with these unpredictable natural hazards, provisions will be made to accommodate a civil defense warning facility on site.

The project site has been identified as an area recommended for urban development. It is surrounded by urban designated lands with proximity to existing services and facilities.

SEC: 226-15 Objectives and policies for facility systems -- solid and liquid wastes.

Section 226-15(a)(1) Provision of adequate sewerage facilities for physical and economic activities that alleviate problems in housing, employment, mobility and other areas.

Section 226-15(a)(2) Encourage the adequate development of sewerage facilities that complement planned growth.

Discussion

Development of the proposed Kaloko Town Center would require the installation of a 12-inch sewage transmission line from the Kaloko Town Center to the pump station adjacent to the Kealakehe STP. The Kealakehe STP will have enough capacity to accommodate the proposed project without any need for expansion. The off-site connection from the project site to the Kealakehe STP as well as the on-site sewerage system will be designed in accordance with the requirements of the County Department of Public Works.

Solid waste generated by the proposed project can be accommodated at the new Puu Anahulu landfill. However, to reduce the amount of solid waste, programs which encourage the reuse, recovery or recycling of waste should be implemented throughout the proposed development. In addition to recycling paper, glass and aluminum, landscape waste material should be sorted and recycled into composting material.

SEC: 226-16 Objectives and policies for facility systems -- water

Section 226-16(b)(1) Coordinate development of land use activities with existing and potential water supply.

Discussion:

The permanent water source for this project will most likely come from high level wells which will need to be developed together with reservoirs and connecting pipelines at elevations 900' and 1200'.

SEC: 226-17 Objectives and policies for facility systems -- transportation

Section 226-17(b)(6) Encourage transportation systems that serve to accommodate present and future development needs of communities.

Discussion:

Traffic generated by the proposed project can be accommodated by the roadway systems in the area provided necessary improvements which are currently planned or underway are implemented on a timely basis. To accommodate future growth of the region, the future roadways proposed in the Keahole to Kailua Development Plan should be implemented.

SEC: 226-19 Objectives and policies for socio-cultural advancement -- housing.

Section 226-19(b)(1) Effectively accommodate the housing needs of Hawaii's people.

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

Section 226-19(b)(6) Facilitate the use of available vacant, developable, and underutilized urban lands for housing.

Discussion:

By the Year 2020, a shortfall of almost 7,900 housing units are projected. The Kaloko Town Center will provide 480 multifamily and 370 single family residential units which are projected to meet demand within a 17-year absorption period. The types of units planned are meant for the permanent population and not the luxury resort residential or second home market. The site is vacant and poses no major physical obstacles for development. It is surrounded by urban zoned properties that have been developed or are currently undergoing the development process. In addition, it is considered an area suitable for urban expansion under the County General Plan.

SEC: 226-21 Objectives and Policies for socio-cultural advancement -- education.

Section 226-21(b)(2) Ensure the provision of adequate and accessible educational services and facilities that are designed to meet individual and community needs.

Discussion:

A 13 acre site for an elementary level school with adjoining park is proposed to serve the public education needs of residents in the surrounding communities.

SEC: 226-25 Objectives and Policies for socio-cultural advancement -- culture.

Section 226-25(b)(3) Encourage increased awareness of the effects of proposed public and private actions on the integrity and quality of cultural and community lifestyles in Hawaii.

Discussion:

The potential impacts of the proposed development on specific rights, culture and traditions of native Hawaiians were evaluated as part of this environmental impact statement. Specific areas which have been examined include the issue of burials within the project area, the issue of access to Hawaiian trails, the issue of unique geographic or geological features traditionally used by Hawaiians, Hawaiian hunting rights, and Hawaiian gathering rights. The conclusion of this study is that the impact of the development of this specific parcel *per se* on Hawaiian culture would be minimal. The only significant native rights issue would seem to be the possible burials. Positive identification of human remains within the project area remains to be undertaken. Once, one or more burials are identified as present, the remains will be treated within existing laws and the rules of SHPD in conjunction with the Big Island Burial Council.

3.3 State Functional Plans

Functional plans were prepared by each state agency head to further define and implement statewide goals, objectives, policies and priority guidelines. Each functional plan identifies priority issues in the functional area and contains objectives, policies, and implementing actions to address these priority issues. Functional plans are meant to guide the allocation of resources for implementing state policies adopted by the legislature. Although designed as a vehicle for implementing the Hawaii State Plan, functional plans are not to be interpreted as law or statutory mandates, nor do they mandate County or private sector actions.

There are twelve State Functional Plans which cover the areas of agriculture, transportation, conservation lands, housing, tourism, historic preservation, energy, recreation, education, health, human services and employment. Discussed below are the relationship of the proposed project to relevant State Functional Plans.

3.3.1 State Agricultural Functional Plan

The agricultural Functional Plan has two fundamental objectives: 1) continued viability in Hawaii's sugar and pineapple industries, and 2) continued growth and development of diversified agriculture throughout the State. The plan has four issue areas of which the issue of land and water is pertinent to the proposed project.

Issue Area: Land and Water

Policy H(2): conserve and protect important agricultural lands in accordance with the Hawaii State Constitution.

Action: H(2)(a): Propose enactment of standards and criteria to identify, conserve, and protect important agricultural lands and lands in agricultural use.

These policies and actions are aimed at conserving and protecting important agricultural lands and lands in agricultural use. The US Soil Conservation Service indicates that Soil capability class ratings are VIIIs for the a'a and pahoehoe lava classes and VIIs for the Punaluu soil both of which indicate that the soils have very severe limitations that make them unsuited to cultivation and commercial plants and restrict their non-urban use largely to pasture, woodland, wildlife, water supply or to aesthetic purposes.

According to the Detailed Land Classification, Island of Hawaii, prepared by the Land Study Bureau, University of Hawaii in 1965, the majority of the project site consists of bare a'a and pahoehoe lava flows with no topsoil material. These soil series have an "E' rating which is the poorest in terms of suitability for agricultural cultivation. Furthermore, the lands within the project site have not been identified as Agricultural Lands of Importance to the State of Hawaii (ALISH).

3.3.2 State Housing Functional Plan

The State Housing Functional Plan focuses on six broad areas of concern: increasing homeownership, expanding rental housing opportunities; expanding rental opportunities for the elder and other special need groups; preserving housing stock; designating and acquiring land that is suitable for residential development; and establishing and maintaining a housing information system. Of these, the issues of home ownership and rental housing are relevant to this project.

Issue: Homeownership

Action A(1)(a): Develop infill projects on Oahu, Hawaii, Maui, Molokai, Lanai and Kauai.

Policy A(2): Encourage increased private sector participation in the development of affordable for-sale housing units.

Implementing Action (A)(2)(a): Create and offer incentives to private developers for providing affordable for-sale housing units.

Discussion:

The Kaloko Town Center includes 850 residential units that will be privately developed with no government participation. The single family residential units will be sold in fee simple and the multi-family units will be sold as fee-simple condominiums. By offering a variety of products based on unit types and varying density, it is envisioned that market demand will be a major determinant of price and will most likely span the entire range of affordability.

Issue Area: Rental Housing

Policy B(2): Encourage increased private sector participation in the development of affordable rental housing.

Implementing Action B(2)(a): Offer developers tax incentives, financing tools and other incentives to make the development of affordable rental housing projects possible.

Implementing Action B(2)(b): Form public/private partnerships and /or enter into public/private development agreements to develop affordable rental housing projects.

Discussion:

The development and provision of rental housing will be based on market demand. An estimate of potential units is difficult to determine at this early stage, however, approximately 10% of the total 850 units may be developed as rental housing.

3.3.3 State Recreation Functional Plan

The State Recreation Functional Plan has six issue areas: ocean and shoreline recreation; mauka, urban and other recreation opportunities; public access to the shoreline and mauka recreation areas; resource conservation and management; management of recreation programs, facilities and areas; wetlands protection and management. The mauka, urban and other recreation opportunities issue is relevant to the project:

Objective II-C: Improve and expand the provision of recreation facilities in urban areas and local communities.

Implementing Action II-C(1)(b): Provide additional playing fields and upgrade existing fields for both youth and adult sports leagues.

Discussion:

The proposed project will reserve a site for school/playground. In addition, with the residential areas, park lands will be dedicated at the county's prescribed ratio of 218 square feet per person. Based on this formula, another 10.5 acres of park land would need to be dedicated within the residential areas. According to a letter from the Department of Parks and Recreation, (July 25, 1996), the recommended standard is 5 acres of park per 1000 population. Based on the projected population of 2,300, a total of 11.5 acres of park would be needed. Depending on the ultimate size of the park to be located at the elementary school/park site, the additional park acreage would be provided at appropriate locations in the community. As design development proceeds, the prescribed amount of acreage required for park dedication will be incorporated into the master plan design in accordance with the requirements of the County Department of Recreation.

3.3.4 State Transportation Functional Plan

Issues identified in the transportation functional plan are congestion, economic development, funding and education.

Policy I.A.2. Improve regional mobility in areas of the State experiencing rapid urban growth and road congestion.

Implementing Action I.A.2.a. Plan, design, and construct the road infrastructure for West Hawaii including improving Queen Ka'ahumanu Highway and developing a supporting local road network.

Policy I.B: Reduction of travel demand through zoning and decentralization initiatives.

Policy I.B. 1. Close the gap between where people live and work through decentralization, mixed zoning, and related initiatives.

Objective I.E. Planing and designing State highways to enhance inter-regional mobility.

Implementing Action I.E.1.a. Plan, design and develop Queen Ka'ahumanu *Highway with controlled accesses and grade-separated crossings to maintain regional mobility. Encourage Hawaii County to develop a local road network to serve local traffic and to provide business and residential accesses.*

Discussion:

The proposed amendment would allow urban development in an area which is consistent with long range policies of both the State and County. The proposed land use includes a mix of commercial and residential uses. In theory, this would provide opportunities for people to live and work within the same general area and not to overload the region's highways. In addition, the adjacent Kaloko Industrial Subdivision and other employment centers are nearby. Plans for the future expansion of Queen Ka'ahumanu Highway no longer include the concept of a frontage road and grade separated interchanges. A signalized intersection is proposed for Hina Lani Drive and Queen Ka'ahumanu Highway.

3.3.5 State Historic Preservation Functional Plan

Issue areas concern 1) the preservation of historic sites and 2) the collection and preservation of historic records, artifacts and oral histories and perpetuation of traditional skills.

Issue Area: Preservation of Historic Sites

Objective B: Protection of Historic Properties

Policy B.I. Provide timely historic property reviews which are integrated effectively into the land use regulatory system.
Implementing Action B.2.c. Respond to the discovery of prehistoric/historic burials in a timely and sensitive manner, which takes into consideration cultural concerns.

Discussion:

An assessment of cultural impact on native Hawaiians presents an oral history of the region and discusses issues relative to native Hawaiian rights. The archaeological inventory survey identifies possible burial sites and a recurrent habitation site which are recommended for preservation. For further information, refer to the section on historic resources and cultural impact.

3.4. State Land Use Commission

The State Land Use Commission, pursuant to Chapter 205 and 205A, HRS and Chapter 15-15, Hawaii Administrative Rules, is empowered to classify all lands in the State into one of four land use districts: urban, rural, Agricultural and conservation. The petition area is designated Conservation. (See Figure 3-1).

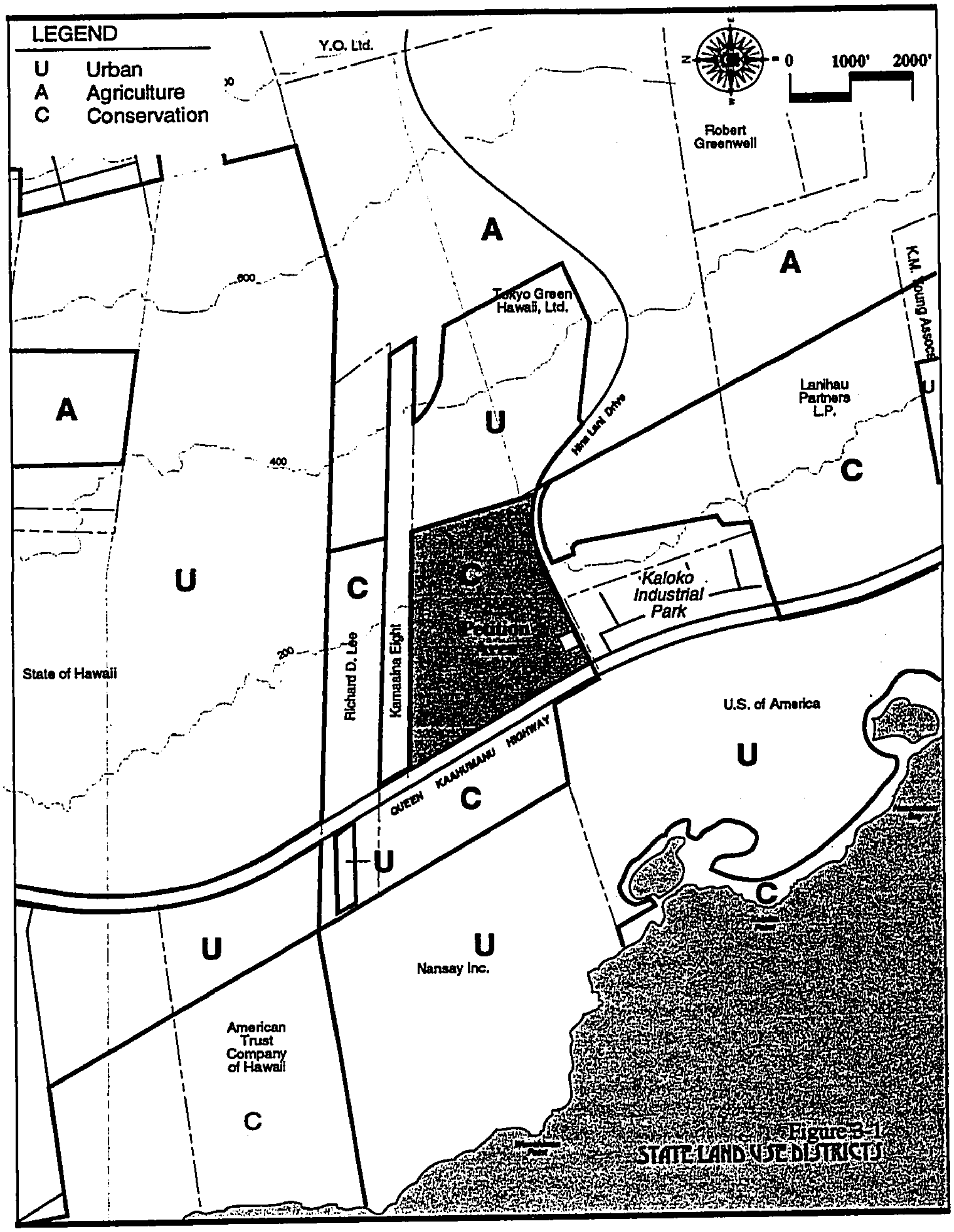


Figure 3-1
STATE LAND USE DISTRICTS

The applicant filed a petition with the Land Use Commission on September 12, 1995 to reclassify the petition area from Conservation to Urban. An EIS Preparation Notice (EISPN) was published in the OEQC Bulletin for the proposed boundary amendment on November 23, 1995, following a determination by the State Land Use Commission on November 21, 1995 that the proposed boundary amendment required the preparation of an EIS. The Draft EIS was distributed on June 23, 1996. The August 7, 1996 deadline for comments was extended to August 14, 1996 at the request of an interested party. The Commission will determine the acceptability of the final EIS upon its completion and schedule a hearing on the petition to reclassify the lands. The Commission, in accordance with Chapter 15-15, Hawaii Administrative Rules, must specifically consider four criteria in reviewing petitions for reclassification of district boundaries as described in Section 15-15-77.

1. The extent to which the proposed reclassification conforms to the applicable goals, objectives, and policies of the Hawaii State Plan and related to the applicable priority guidelines of the Hawaii State Plan and the adopted functional plans.

Discussion:

The proposed Kaloko Town Center, as discussed in the previous section, conforms to pertinent goals, objectives and policies of the State Plan and relevant policies, guidelines and implementing actions of the State Functional Plans.

2. The extent to which the proposed reclassification conforms to the applicable district standards.

Discussion:

The petition seeks an urban reclassification. Urban District standards, Section 15-15-18, include:

(1) It shall include lands characterized by "city-like" concentrations of people, structures, streets, urban level of services and other related land uses;
(2) It shall take into consideration the following specific factors:
- *(A) Proximity to centers of trading and employment except where the development would generate new centers of trading and employment;*
- *(B) Substantiation of economic feasibility by the petitioner;*
- *(C) Proximity to basic services such as sewers, transportation systems, water, sanitation, schools, parks, and police and fire protection; and*

(D) Sufficient reserve areas for urban growth in appropriate locations based on a ten year projection;

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

(4) In determining urban growth for the next ten years, or in amending the boundary, land contiguous with existing urban areas shall be given more consideration than non-contiguous land, and particularly when indicated for future urban use on state or county general plans;

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

(6) It may include lands which do not conform to the standards in paragraphs (1) to (5):

(A) When surrounded by or adjacent to existing urban development; and

(B) Only when those lands represent a minor portion of this district;

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

(8) It may include lands with a general slope of twenty percent or more which do not provide open space amenities or scenic values if the commission finds that those lands are desirable and suitable for urban purposes and that official design and construction controls are adequate to protect the public health, welfare and safety, and the public's interests in the aesthetic quality of the landscape.

Discussion:

The petition area is located approximately 4 miles from the heart of Kailua Town, the second largest city on the island of Hawaii which is characterized as a "city-like" concentration of people, structures, streets and urban level of services. It is adjacent to the Kaloko Industrial Park, an area of employment and center of industrial and commercial trade. The market assessment indicates that the project is economically feasible and that the proposed uses are supported by market demand over the project's 15 to 20 year development schedule. The project has proximity to basic infrastructure and its development will contribute to the implementation of water and sewerage system development. The master development plan allocates land for a school and park, and will be developed in accordance with the County's park dedication requirements. The police department has a current staffing shortfall which has not kept pace with the increased population of the region and the situation will be further exacerbated with the development of the Kaloko Town Center. The ability of the police to deliver assistance will be negatively impacted by the proposed project as the increased resident population will most likely result in an increase in request for assistance. The project is well within the service radius of the Kailua-Kona Fire Station.

The mauka area provides more than sufficient reserve areas for urban growth. The topography of the land is virtually flat and well drained. The petition area is not subject to tsunami inundation nor floods resulting from heavy rainstorms. The area was not mapped under the National Flood Insurance Program of the Federal Emergency Management Agency but was determined to be in Zone X, which are areas determined to be outside the 500 year flood plain.

The proposed project is recommended as an area for new urban expansion according to the State's West Hawaii Regional Plan, the State Land Use Commission 5 Year Boundary Review, the County General Plan and the Kailua to Keahole Development Plan. The proposed project is contiguous to urban designated lands on three sides: to the south (Kaloko Industrial Subdivision), to the east (lands previously amended from Agricultural to Urban for golf course) and to the north (adjacent privately-owned property recently amended from Conservation to Urban for light industrial use). The proposed reclassification would not contribute to scattered spot urban zoning.

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

- *(A) Preservation or maintenance of important natural systems or habitats;*
- *(B) Maintenance of valued cultural, historical, or natural resources;*
- *(C) Maintenance of other natural resources relevant to Hawaii's economy including but not limited to agricultural resources;*
- *(D) Commitment of state funds and resources;*
- *(E) Provision for employment opportunities and economic development; and*
- *(F) Provision for housing opportunities for all income groups, particularly the low, low-moderate and gap groups;*

Discussion:

A study of groundwater in the area found that the proposed development will not impact the water quality of the Kaloko fishpond complex. Archaeological findings recommend preservation of eight possible burial sites and a recurrent habitation site. A cultural impact assessment evaluated the proposed project's impact on native Hawaiian rights and recorded an oral history of the region. The land is vacant and undeveloped and not actively cultivated because the lava substrate is not suitable for agriculture. No state funds will be used to develop this project. In contrast, this project will have a positive fiscal impact in the amount of taxes it will generate and the number of jobs it will create. The project contributes to employment diversity because it is not a resort development. With respect to housing inventory, the proposed project will contribute a variety of new housing stock to meet the projected shortfall in housing.

(4) In establishing the boundaries of the districts in each county, the commission shall give consideration to the general plan of the county in which the land is located.

Discussion:

The property is designated Urban Expansion according to the General Plan, Hawaii County, November 1989. It falls within the broad region of lands in the Keahole to Kailua district which are considered appropriate for urban expansion and is consistent with the goals and objectives of the County General Plan.

3.5. State Land Use Commission Boundary Review

Every five years, the Office of State Planning, as mandated by Section 205-18, is required to review the classification and districting of all land in the State. This review provides the Land Use Commission with an opportunity to review urbanization proposals from a broad, comprehensive and long range view rather than incrementally on a case-by-case basis. It also provides an opportunity to identify conservation or agricultural resources which are not in the appropriate land use district and should be reclassified.

According to the State Land Use District Boundary Review, Hawaii, for the County of Hawaii, 1992, there were 30 recommendations to downzone from Agricultural or Urban to Conservation throughout the entire island (17 in the west Hawaii region alone) and only 3 recommendations for upzoning from Agricultural and Conservation to Urban.

The recommended upzoning from Conservation and Agricultural to Urban includes the region extending from Kailua to Keahole. This region encompasses the petition area. The boundary review found that the area meets the standards and criteria for the Urban District contained in Section 205-2, HRS, Section 205-17, HRS, and Sections 15-15-18(2,3,4,5,6 &) in the following manner:

- has a sufficient reserve area for foreseeable urban growth,
- provides employment opportunities and economic development
- provides housing opportunities for all income groups, particularly the low, low-moderate and gap groups.
- has proximity to centers of trading and employment except where the development would generate new centers of trading and employment;

- has proximity to basic services such as sewers, transportation systems, water, sanitation, schools, parks and police and fire protections;
- has sufficient reserve areas for urban growth in appropriate locations,
- has satisfactory topography and drainage,
- is reasonably free from the danger of floods, tsunami, unstable soil conditions, and other adverse environmental effects,
- is contiguous with existing urban areas
- is indicated for future urban use on County general plans,
- is in an appropriate location for new urban concentrations,
- is surrounded by or adjacent to existing urban development, and
- does not contributed toward scattered spot urban development.

In total, the Boundary Review concludes that the change in designation from Conservation to Urban is consistent with the West Hawaii Regional Plan, the Keahole to Kailua Development Plan, and the County's Development Plan. (See Figure 3-2).

3.6 West Hawaii Regional Plan

The West Hawaii Regional Plan prepared by the Office of State Planning in 1989, was prepared in response to a need :

- to coordinate State activities in the region in order to respond more effectively to emerging needs and critical problems;
- to address areas of State concern;
- to coordinate the Capital Improvements Program within a regional planning framework; and
- to provide guidance in State land use decision-making processes.

The planning area of the West Hawaii Regional Plan encompasses the judicial districts of North Kohala, South Kohala, and North Kona. In 1989, this area was anticipated to undergo major changes in the landscape and lifestyle as a result of increased development of resorts along the coastline and residential communities in the mauka areas.

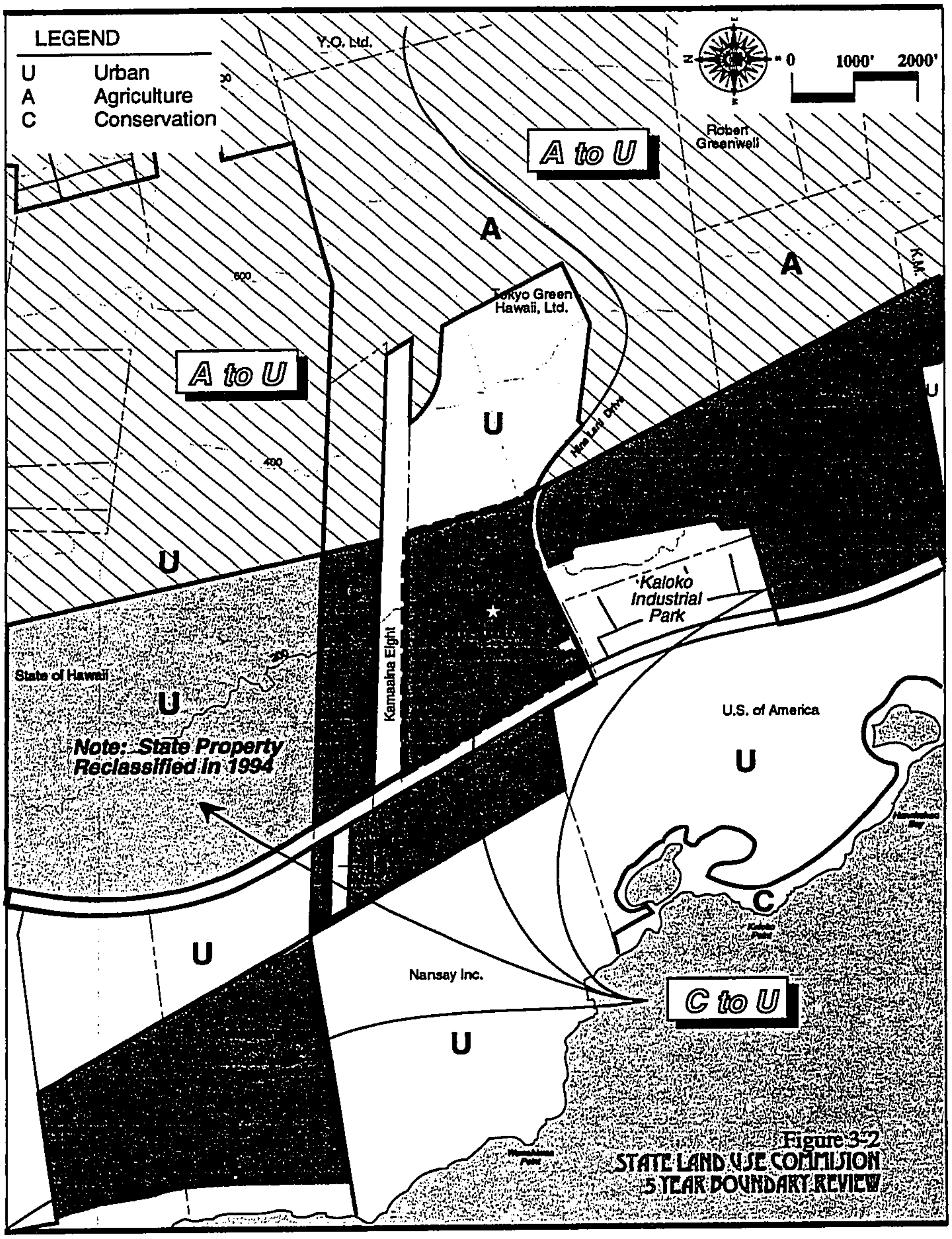


Figure 3-2
STATE LAND USE COMMISION
5 YEAR BOUNDARY REVIEW

In response to anticipated changes, the plan noted that existing communities such as Kailua-Kona would be the first to expand into a mix of uses in order to support resort development, housing development, industrial development, agricultural development and a host of ancillary services. To protect agricultural activities, culturally-rich heritage areas, and special environmental resource areas, the plan identified sub-regional planning areas that could be planned and developed to accommodate urban growth without encroaching upon natural and cultural resources that are important toe the continued viability of the area. The petition area falls within the Subregional Planning Area that extends form Kailua to Keahole and therefore the proposed urban reclassification is consistent with the intent of the West Hawaii Regional Plan in identifying areas that are appropriate for future urban expansion. (See Figure 3-3).

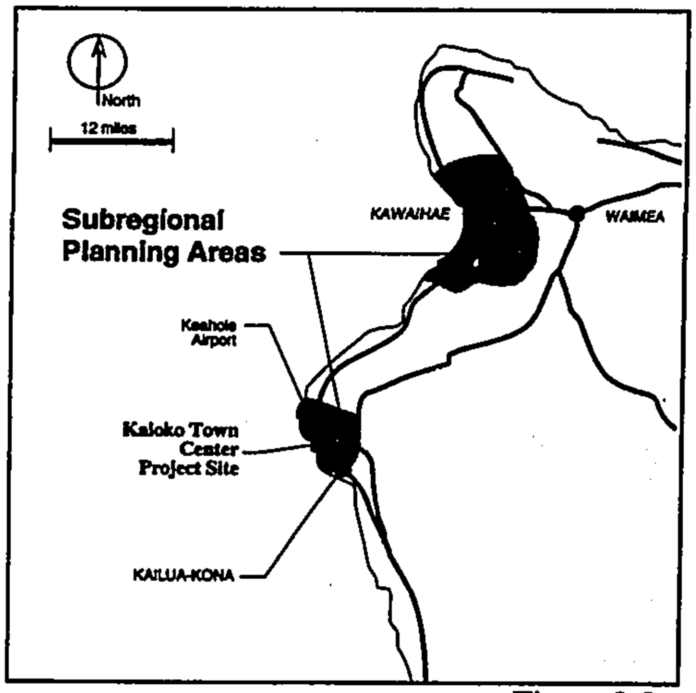


Figure 3-3
WEST HAWAII REGIONAL PLAN

3.7 *Coastal Zone Management and Special Management Area*

Chapter 205A, HRS, established the Coastal Zone Management (CZM) Program for the State of Hawaii in 1975. This program is intended to preserve, protect and where possible restore the natural resources of the coastal zone of Hawaii by applying special controls on developments occurring within an "area" of the shoreline. For the island of Hawaii, the CZM "area" encompasses the entire island frcm the shoreline to the mauka edge of the forest reserve boundary. Only the forest reserve area is excluded. In addition to the CZM area, the County has the authority to establish Special Management Areas which are areas identified on maps that extend inland from the shoreline to a rationally determined mauka boundary. In the case of this petition, the Special Management Area is defined by the County as the area makai of Queen Ka'ahumanu Highway. (See Figure 3-6). The proposed project, therefore, does not require a Special Management Area Use Permit from the County of Hawaii. However, to determine whether the proposed project conforms to the CZM, the following section evaluates the relationship of the proposed action to relevant CZM objectives and policies.

Objective
(1) Recreational resources;
(A) Provide coastal recreational opportunities accessible to the public.
Policies:
(B) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:
(i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;
(iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shoreline with recreational value;
(vi) Adopting water quality standards and regulating point and nonpoint sources of pollution to protect and where feasible, restore the recreational value of coastal waters

Discussion:

The proposed reclassification will not have a direct effect on coastal recreation and access opportunities because the project area is mauka of Queen Ka'ahumanu Highway. Concerns regarding water quality impacts from point and non-point sources were investigated because of the proximity to the Kaloko Fishpond. Results indicate that the proposed project will not have a significant effect on the Kaloko Fishpond complex. See section on Groundwater and Pond and Nearshore Environment Assessment.

Objectives
(2) Historic resources;
(A) Protect, preserve, and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.
Policies:
(A) Identify and analyze significant archaeological resources;
(C) Support state goals for protection, restoration, interpretation and display of historic resources.

Discussion:

The archaeological inventory survey found eight possible burials and one recurrent habitation which were recommended for preservation.

Objectives
(3) Scenic and Open Space resources:
(A) Protect, preserve, and, where desirable, restore the quality of the coastal scenic and open space resources.
Policies:
(A) Identify valued scenic resources in the coastal zone management area;
(D) Encourage those developments which are not coastal dependent to locate in inland areas.

Discussion:

The petition area has not been identified as a significant visual resource in the Kailua to Keahole Development Plan. The project site is located on the mauka side of Queen Ka'ahumanu Highway and hence will not impact the makai coastal views of travelers along this highway. The mauka view will change as future commercial and residential structures are built. A 100 foot wide landscape buffer will be provided as a visual buffer from the highway.

Objectives
Coastal Ecosystems
(A) Protect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems.
Policies:
(B) Preserve valuable coastal ecosystems of significant biological or economic importance;
(C) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and ;
(D) Promote water quantity and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate state water quality standards.

Discussion:

The Kaloko fishpond complex in the National Park is an important ecological system. The groundwater study found that the natural rate of groundwater flow beneath the project site to the shoreline is relatively modest. The project may have an impact on groundwater, the Kaloko fishpond, or adjacent offshore waters as a result of: 1) disposal of wastewater generated on-site; 2) disposal of stormwater runoff; and 3) percolating water from landscape irrigation. Estimates of changes in groundwater flow volume and composition from the Kaloko Town Center project indicate that there does not appear to be potential to induce long-term changes in physio-chemical composition of pond or marine waters of a magnitude sufficient to cause changes in biological community structure. No wastewater produced by the project would be disposed onsite. Onsite stormwater disposal would not result in a change in discharge volume, but would result in a small addition to the nutrient content of the groundwater. The inorganic nutrients that occur in groundwater (primarily NO_3^- and PO_4^{3-}) were depleted in Kaloko Pond as a result of uptake by plants. Such intake suggests that the pond may be nutrient limited with respect to plant growth. As a result, increased nutrient concentrations in water entering the pond may result in increases in plant abundance, which in turn may have the potential to alter the community composition of the pond environment. Estimates of changes in groundwater dynamics associated with Kaloko Town Center indicate that nutrient concentrations in groundwater should not increase above present concentrations as a result of landscaping. Volume of groundwater discharges into the pond may increase slightly, but the increases appear to be within the natural variability of flow that presently enters the Pond. Because the flow rates are not expected to increase beyond the present range, and the nutrient concentrations of groundwater are not expected to increase, there appears to be little potential for changes in plant uptake compared to the present situation. In addition, because of the strong vertical stratification of the Pond, the small increases of groundwater flow would likely have the effect of altering water composition of only the surface layer, and would be exposed to the organisms that live on the pond floor. Therefore, the potential for impact to marine and pond communities as a result of the development of the Kaloko Town Center project appears to be minimal.

Objectives
Economic Uses

(A) Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policies:

- *(A) Concentrate in appropriate areas the location of coastal dependent development necessary to the State's economy;*
- *(C) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:*
- *(I) Utilization of presently designated locations is not feasible;*

(ii) Adverse environmental effects are minimized; and
(iii) Important to the State's economy.,

Discussion:

As mentioned previously, the proposed project is not a coastal dependent land use and is not located in the area of the coastline that would impact access, use or environmental systems of the coastal area.

Objectives
Coastal Hazards
(A) Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, and subsidence.
Policies:
(A) Develop and communicate adequate information on storm wave, tsunami, flood, erosion, and subsidence hazard;
(B) Control development in areas subject to storm wave, tsunami, flood, erosion, and subsidence hazard ;
(C) Ensure that developments comply with requirements of the Federal Flood Insurance Program;

Discussion:

The project's inland location is not subject to tsunami or storm waves. The area was not mapped under the National Flood Insurance Program of the Federal Emergency Management Agency but was determined to be in Zone X, which are areas determined to be outside the 500 year flood plain.

3.8. Environmental Impact Statements (Chapter 343 HRS)

In accordance with Section 343-5(a)(7), an environmental assessment is required for actions which propose any reclassification of land within the conservation district. Section 343-5(b) further requires that following the preparation of the environmental assessment, the accepting agency must determine whether an environmental impact statement is required.

An environmental assessment was prepared and a determination was made by the Land Use Commission on November 23, 1995 that the proposed boundary amendment may have a significant impact on the environment and an EIS was required. An EIS Preparation Notice (EISPN) was published in the OEQC Bulletin for the proposed boundary amendment on November 23, 1995. A copy of the EISPN was mailed to agencies and organizations and any other interested parties. Following the 30-day review period which ended on December 23, 1995 comment letters were received from those responding to the EISPN and written responses to the comments are reproduced in Chapter 10. The Draft EIS was prepared and distributed on June 23, 1996. Deadline for comments originally set for August 7, 1996 was extended to August 14, 1996 at the request of an interested party. Comment letters to the Draft EIS and corresponding responses are reproduced in Chapter 13.

3.9 The General Plan Hawaii County

The General Plan Hawaii County, November 1989, (Ordinance 89 142), is the policy document for the long range comprehensive development of the island. Like the Hawaii State Plan, it provides direction for future growth with a series of goals, policies and standards for the entire County. A discussion of relevant goals, policies and standards are given below:

A. Economic

Goals:

- *Provide residents with opportunities to improve their quality of life.*
- *Economic development and improvement shall be in balance with the physical and social environments of the island of Hawaii.*
- *The County of Hawaii shall strive for diversity and stability in its economic system.*
- *The County shall provide an economic environment which allows new, expanded, or improved economic opportunities that are compatible with the County's natural and social environment.*

Policies

- *The County of Hawaii shall strive for an economic climate which provides its residents an opportunity for choice of occupation.*
- *The County of Hawaii shall strive for diversification of its economy by strengthening existing industries and attracting new endeavors.*
- *The County's capital improvements program should improve the quality of existing commercial and industrial areas.*
- *The County shall strive for full employment.*
- *The County shall identify and encourage primary industries that are consistent with the social, physical, and economic goals of the residents of the County.*
- *An active liaison between the County and the private sector should be encouraged with respect to the County's requirements for establishing business on the island.*
- *The County of Hawaii shall encourage the continuing development of the retirement industry.*

Standards

- *The island of Hawaii should be developed into a unique scientific and cultural model. The island should become a model of living where economic gains are in balance with social and physical amenities.*

- *Development should be reviewed on the basis of total impact on the residents of the County, not only in terms of immediate short run economic benefits.*
- *New industries which provide favorable benefit-cost relationship to the people of the County should be encouraged. Benefit-cost relationships as used here include more than fiscal considerations.*

Discussion:

The proposed project offers basic economic opportunities that are not directly tied to the visitor industry. Future employment projections, including direct, indirect and induced employment in construction and operational employment, is projected to account for roughly 6,150 full time equivalent positions over the term of the project. Employment opportunities would be in the form of laborers, operators and craftsmen, as well as professional, managerial, sales and clerical workers in non-resort operations. The types of commercial uses proposed are designed to support the expansion of the urban areas and provide employment diversity.

B. Energy

Goals

- *Strive towards energy self-sufficiency for Hawaii County.*
- *Establish the Big Island as a demonstration community for the development and use of natural energy resources.*

Policies

- *The County shall strive to assure a sufficient supply of energy to support present and future needs.*
- *The County shall provide incentives which will encourage the use of new energy sources and promote energy conservation.*

Standard

- *New power plants shall incorporate devices which minimize pollution.*

Discussion

Evaluation of energy requirements is based on the assumption that the proposed project will continue to rely on electrical energy generated by burning fossil fuels. Perhaps, within the development time frame of the proposed project, other alternative energy sources such as geothermal, wind or solar would be practical with advances in technology. In the interim, commercial uses shall be encouraged to use state of the art air conditioning systems which are efficient and use minimal power. Private homes will be encouraged to use solar water heaters. Because the proposed project is situated at the midpoint between the airport, the town and other nearby employment centers, savings in gasoline consumption may be achieved by the concentration of these various destination points.

C. *Environmental Quality*
Goal
- *Maintain and, if feasible, improve the existing environmental quality of the island.*

Policies
- *The County of Hawaii shall take positive action to further maintain the quality of the environment for residents both in the present and in the future.*
- *Encourage the concept of recycling agricultural and municipal waste material.*
- *the County shall encourage the State to establish air and water quality monitoring stations in areas of existing and potential urban growth.*

Standards
- *Pollution shall be prevented, abated, and controlled at levels which will protect and preserve the public health and well-being, through the enforcement of appropriate Federal, State and County standards.*
- *Environmental quality controls are to be incorporated either as standards in appropriate ordinances or as conditions of approval.*
- *Federal and State environmental regulations shall be adhered to.*

Discussion:

The proposed project is located in an area that is appropriate for urban development. It is not situated in an officially designated pristine ecological preserve, view channel, or area that is specially known for its physical or natural features. Currently, municipal waste material is disposed in a landfill. Unlike Honolulu, the county has not constructed a waste to energy recovery facility. To date, the State has not established air and water quality monitoring stations in urban areas of the county, although the State Department of Health will embark on a study of monitoring volcanic haze emissions to study the its effects on the health of the residents. Construction practices, building designs, and long term operation and maintenance of the physical structures shall meet all Federal and State environmental regulations.

D. *Flood Control and Drainage*
Goals
- *Conserve scenic and natural resources*
- *Protect human life*
- *Prevent damage to man-made improvements*
- *Control pollution*
- *Prevent damage from inundation*

- *Reduce surface water and sediment runoff*

Policies

- *The County of Hawaii shall update and improve the FIRM and floodway maps in compliance with Chapter 27 as needed.*
- *All development-generated runoff shall be disposed of in a manner acceptable to the Department of Public Works.*
- *The County shall develop a comprehensive program for the coordinated construction of a drainage network along a single drainage system.*
- *It is the responsibility of both the government and the private sector to maintain and improve existing drainage systems and to construct new drainage facilities.*

Standards

- *"Storm Drainage Standards" County of Hawaii, October 1970, and as revised.*
- *Applicable standards and regulations of Chapter 27, "Flood control" of the Hawaii County Code.*
- *Applicable standards and regulations of the Federal Emergency Management Agency (FEMA)*
- *Applicable standards and regulations of Chapter 10, "Erosion and Sedimentation Control," of the Hawaii County Code.*

Discussion

The petition area is located mauka of Queen Ka'ahumanu Highway at ground elevation ranging from 90 to 340 feet. It is approximately 4/5th of a mile from the shoreline. The petition area is not subject to tsunami inundation nor floods resulting from heavy rainstorms. The area was not mapped under the National Flood Insurance Program of the Federal Emergency Management Agency but was determined to be in Zone X, which are areas determined to be outside the 500 year flood plain. The project's drainage system will be designed using a "zero runoff" concept with the use of dry wells on site and in a manner acceptable to the department of Public Works and all applicable standards and regulations of the Hawaii County Code.

E. Historic Sites

Goals

- *Protect and enhance the sites, buildings and objects of significant historical and cultural importance to Hawaii,*
- *Access to significant historic sites, buildings and objects of public interest should be made available.*

Policies

- *The County of Hawaii shall require both public and private developers of land to provide a historical survey prior to the clearing* *or development of land when there are indications that the land under consideration has historical significance.*

- *The County of Hawaii shall encourage the restoration of significant sites on private lands.*

Standards

- *Sites with a preponderance of original materials in context and complexes rather than single isolated sites unless they are of great significance.*
- *Sites of traditional and cultural significance*

Discussion

An assessment of cultural impact on native Hawaiians presents an oral history of the region and discusses issues relative to native Hawaiian rights. The archaeological inventory survey identifies possible burial sites and a recurrent habitation site which are recommended for preservation. For further information, refer to the section on historic resources and cultural impact.

F. Natural Beauty

Goals

- *Protect, preserve and enhance the quality of areas endowed with natural beauty, including the quality of coastal scenic resources.*
- *Protect scenic vistas and view planes from becoming obstructed.*
- *Maximize opportunities for present and future generations to appreciate and enjoy natural and scenic beauty.*

Policies

- *The County shall consider structural setback from major thoroughfares and highways and shall establish development and design guidelines to protect important view planes.*

Standards

- *Distinctive and identifiable landforms distinguished as landmarks, e.g. Mauna Kea, Waipio Valley.*
- *Coastline areas of striking contrast, e.g. Laupahoehoe Point.*
- *Vistas of distinctive features.*
- *Natural or native vegetation which makes a particular area attractive.*
- *Areas which are harmoniously developed and enhance by man so as to appear natural.*

Discussion:

Commercial buildings in the Kaloko Town Center will be setback 100 feet from the Queen Ka'ahumanu Highway right of way. This setback area will be greater than the existing setback of the Kaloko Industrial Subdivision and will be attractively landscaped. The petition area does not have any distinctive and identifiable landforms that are distinguished as landmarks, it is not on the coastline, and offers no panoramic vistas of distinctive features.

G. *Natural Resources and Shoreline*

Goals

- *Protect and conserve the natural resources of the County of Hawaii from undue exploitation, encroachment and damage.*
- *Protect and promote the prudent use of Hawaii's unique, fragile, and significant environmental and natural resources.*
- *Protect rare or endangered species and habitats native to Hawaii.*
- *Ensure that alterations to existing land forms and vegetation, except crops, and construction of structures cause minimum adverse effect to water resources, and scenic and recreational amenities and minimum danger of floods, landslides, erosion, siltation, or failure in the event of earthquake.*

Policies

- *The County shall encourage the continued identification and inclusion of unique wildlife habitat areas of native Hawaiian flora and fauna within the Natural Area Reserve System.*
- *Encourage the use of native plants for screening and landscaping.*

Standards

The following shall be considered for the protection and conservation of natural resources.

- *Lands with topographic, location, soils, climate or other environmental factors that may not be normally adaptable or required for urban, rural, agricultural or public uses.*
- *The Coastal Zone and Special Management Area as defined by stature and in accordance with the adopted objectives and guidelines.*

Discussion

Flora and fauna surveys conducted for the petition did not encounter any rare, threatened or endangered species of plants or animals. The landscape is dry and barren and does not support a unique wildlife habitat. The developer shall be encouraged to use native plants for screening and landscaping whenever possible. The petition area is not within the Special Management Area.

H. *Housing*

Goals

- *Attain safe, sanitary, and livable housing for the residents of the County of Hawaii.*

- *Attain a diversity of socioeconomic housing mix throughout the different parts of the County.*
- *Maintain a housing supply which allows a variety of choice.*
- *Develop better places to live in Hawaii County by creating viable communities with decent housing and suitable living environments for our people.*
- *improve and maintain the quality and affordability of the existing housing stock.*
- *Seek sufficient production of new affordable rental and fee-simple housing in the County in a variety of sizes to satisfactorily accommodate the needs and desires of families and individuals.*
- *Ensure that housing is available to all persons regardless of age, sex, marital status, ethnic background, and income.*
- *The cornerstone of the County's housing programs and activities shall continue to be the encouragement and expansion of appropriate home ownership opportunities for our residents.*

Policies

- *The County shall encourage a volume of construction and rehabilitation of housing sufficient to meet growth needs and correct existing deficiencies.*
- *The County shall utilize its housing powers to accomplish its housing goals and shall utilize existing programs and seek out new programs and resources to address the housing needs of its residents.*
- *The County shall adopt appropriate ordinances and rules as necessary to implement its housing programs and activities.*
- *Seek to ensure that adequate infrastructure is available in appropriate locations to support the timely development of affordable housing.*
- *The County shall work with, encourage and support the private sector efforts in the provision of affordable housing.*

Standards

Housing standards shall consist of and comply with:

- *Housing Code*
- *Building Code*
- *Electrical Code*
- *Plumbing Code*
- *Zoning Code*
- *Subdivision Code*
- *Standards of the single-family and multiple residential land use element.*

Discussion:

An inherent goal of the Kaloko Town Center is to create a viable community with decent housing and suitable living environments. This project is not a high-priced resort residential or second home community. The desire is to create an affordable community which offers housing opportunities for the residents of the county.

I. Public Facilities
Goals
- *Encourage the provision of public facilities that effectively service community needs and seek ways of improving public service through better and more functional facilities which are in keeping with the environmental and aesthetic concerns of the community.*

Policies
- *The County shall continue to seek ways of improving public service through the coordination of service and by maximizing the use of personnel and facilities.*
- *The County shall coordinate with appropriate State agencies for the provision of public facilities to serve the needs of the community.*

Standards
Standards have been established in each of the four major groupings of public facilities.
(1) Education
Policies
- *The County shall encourage the joining of school yards with county parks and the availability of school facilities for after school use by the community for recreational, cultural, and other compatible uses.*
Standards
- *In proposed communities, sufficient acreage shall be reserved for school facilities. Sites shall be free from flooding and drainage problems, excessive slope and shall incorporate appropriate street and driveway design and location to minimize traffic interference, pedestrian hazard, and to enable safe and easy access for vehicles, bicycles and pedestrians.*

Discussion:

The Kaloko Town Center Master Plan allocates an approximate 13-acre site for a school/park facility. This site has been designed to allow school facilities to be developed in conjunction with a County or State park. The site is free from flooding and drainage problems, on relatively flat topography, and in an interior location off major traffic corridors which allows vehicles, bicycles and pedestrians safe and easy access.

(2) Protective Services
Standards
- *Stations in outlying districts shall be based on the population to be served and response time rather than on geographic district.*

Discussion:

The police department has a current staffing shortfall which has not kept pace with the increased population of the region and the situation will be further exacerbated with the development of the Kaloko Town Center. The ability of the police to deliver assistance will be negatively impacted by the proposed project as the increased resident population will most likely result in an increase in request for assistance. The project is well within the service radius of the Kailua-Kona Fire Station.

J. Public Utilities

Goals

- *Ensure that adequate, efficient and dependable public utility services will be available to users.*
- *Maximize efficiency and economy in the provision of public utility services.*
- *To have public utility facilities which are designed to fit into their surroundings or concealed from public view.*

Policies

- *Public utility facilities shall be designed so as to complement adjacent land uses and shall be operated so as to minimize pollution or disturbance.*
- *Provide utilities and service facilities which minimize total cost to the public and effectively service the needs of the community.*
- *Utility facilities shall be designed to minimize conflict with the natural environment and natural resources.*

Discussion:

All utilities will be designed according to County Department of Public Works standards and regulations. Electrical power lines will be placed underground. The existing water reservoir is in a highly visible corner of the petition area. Appropriate landscaping will be used to screen it from public view to the extent possible.

Policies and Standards discussed relative to (1) Water, (2) Telephone, (3) Electricity, (4) Gas, and (5) Sewer refer to engineering design standards and practices of each utility department or company. For all of these sections, the project will comply with the requirements of relevant departments or companies.

K. Recreation

Goals

- *Provide a wide variety of recreational opportunities for the residents and visitors of the County.*

- *Maintain the natural beauty of recreation areas.*
- *Provide a diversity of environments for active and passive pursuits.*

Policies

- *Recreational facilities in the County shall reflect the natural, historic and cultural character of the area.*
- *The County shall review and, if appropriate, revise its ordinance requiring subdivision to provide land area for park and recreational use or pay a fee in lieu thereof.*

Standards

Neighborhood Parks

Provide open space in urbanizing areas for the general aesthetic enjoyment of the outdoors, play areas for young children, and a social gathering place for the neighborhood.

Up to 4 acres, within the center of the neighborhood and preferably adjacent to a school.

Minimum facilities include: restrooms; drinking water; parkkeeper's storage; walking and jogging paths (biking and skating paths); courts for basketball, volleyball and tennis; ballfields for tetherball, baseball/softball and soccer; play are and equipment for young children; and an adequate and defined parking area.

Discussion:

According to a letter from the Department of Parks and Recreation, (July 25, 1996), the recommended standard is 5 acres of park per 1000 population. Based on the projected population of 2,300, a total of 11.5 acres of park would be needed. Depending on the ultimate size of the park to be located at the elementary school/park site, the additional park acreage would be provided at appropriate locations in the community. As design development proceeds, the prescribed amount of acreage required for park dedication will be incorporated into the master plan design in accordance with the requirements of the County Department of Recreation.

L. Transportation

Goals

- *Provide a transportation system whereby people and goods can move efficiently, safely, comfortably and economically.*

Policies

- *A framework of transportation facilities which will promote and influence desired land use shall be established by concerned agencies.*

- *The agencies concerned with transportation systems shall provide for present traffic and future demands, including mass transit programs for high growth areas.*
- *The improvement of transportation services shall be encouraged.*

Standard

- *Transportation systems shall meet the requirements of the State Department of Transportation and the County of Hawaii.*

(1) Thoroughfares and Streets

Goals

- *Provide a system of thoroughfares and streets for the safe, efficient and comfortable movement of people and goods between and within the various sections of the County.*
- *Provide an integrated State and County system so that new major routes will complement and encourage proposed land uses.*

Policies

- *The County shall encourage the programmed improvement of existing thoroughfares and streets by both public and private sectors.*
- *The County shall investigate various methods of funding road improvements, including private sector participation, to meet the growing transportation needs of the island.*
- *Provision for on-street parking shall be incorporated into the design of street systems.*
- *Transportation and drainage system shall be integrated where feasible.*
- *The design of urban streets shall consider their implication for urban design and potential multiple uses of the right-of-way within the limits of feasibility and quality road design.*

Standards

Reference is made to different classes of road from Primary Route to Local Minor Streets.

Discussion

The design and construction of all streets and right-of-ways within the Kaloko Town Center will be in accordance with all applicable State and County regulations. The traffic impact study recommends a number of roadway improvements which would be necessary to accommodate projected traffic demand (Please refer to section 6-1). All roads will be designed by the civil engineer to comply with the County Department of Public Works requirements.

M. Land Use

Goals

- *Designate and allocate land uses in appropriate proportions and mix and in keeping with the social, cultural, and physical environments of the County.*
- *Protect and encourage the intensive utilization of the County's important agricultural lands.*
- *Protect and preserve forest, water, natural and scientific reserves and open spaces.*

Policies

- *Zone urban- and rural-types of uses in areas with ease of access to community services and employment centers and with adequate public utilities and facilities.*
- *Allocate appropriate requested zoning in accordance without the existing or projected needs of neighborhood, community, region and County.*
- *The County shall develop, in cooperation with community residents, community development or regional plans for all of the districts or combination of districts and shall periodically review and amend these documents as necessary or as mandated.*

Standards

- *The designated land uses will be delineated on the General Plan Land Use Pattern Allocation Guide Map. The broad-brush boundaries indicated are graphic expressions of the General Plan policies, particularly those relating to land uses. They are long-range guides to general location and will be subject to: a) existing zoning; b) State Land Use District; and c) zone guide map and interpretation.*
- *Zoning requests shall be reviewed with respect to General Plan designation, district goals, regional plans, State Land Use District, compatibility with adjacent zone uses, availability of public services and utilities, access and public need.*

(2) Commercial Development

Goals

- *Provide for commercial developments that maximize convenience to users.*
- *Provide commercial developments that complement the overall pattern of transportation and land usage within the island's regions, communities, and neighborhoods.*

Policies

- *Commercial facilities shall be developed in areas adequately served by necessary services, such as water, utilities, sewers, and transportation systems. Should such services not be available, the development of more intensive uses should be in concert with a* *localized program of public and private capital improvements to meet the expected increased demand.*

- *Distribution of commercial areas shall be such as to best meet the demands of neighborhood, community and regional needs.*
- *The development of commercial facilities should be designed to fit into the locale with minimal intrusion while providing the desired services. Appropriate infrastructure and design concerns shall be incorporated into the review of such developments.*
- *Applicable ordinances shall be reviewed and amended as necessary to include considerations for urban design, aesthetic quality and the protection of amenities in adjacent areas through landscaping, open space and buffer areas.*

Standards

- *Commercial development shall be located in areas adequately served by transportation, utilities and other amenities. Commercial developments shall provide for adequate internal circulation amongst commercial facilities in the area.*
- *Off-street parking and loading facilities shall be provided.*
- *Commercial development shall maintain or improve the quality of the present environment through the consideration of visual, access, landscaping, and other design elements in their development.*
- *Preference shall be given to commercial lands with a reasonably level topography.*

Discussion

The commercial development is designed to provide convenience to the project residents as well as the broader market area of the West Hawaii region. The topography is relatively flat and suitable for commercial development. It offers high visibility and excellent access. The shopping complex will be designed to fit into the big island design context.

(4) Multiple Residential

Goals

- *To provide for multiple residential developments that maximize convenience for its occupants.*
- *To provide for suitable living environment which accommodate the physical, social and economic needs of the island residents.*

Policies

- *Appropriately zoned lands shall be allocated as the demand for multiple residential dwellings increases. These areas shall be allocated with respect to places of employment, shopping facilities, educational, recreational and cultural facilities, and public facilities and utilities.*

- *The County shall incorporate reasonable flexibility in applicable codes and ordinances to achieve a diversity of socio-economic housing mix.*
- *The County shall encourage flexibility in the design of residential building sites, buildings and related facilities to achieve a diversity of socio-economic housing mix and innovative means of meeting the market requirements.*

Standards

- *Areas shall be located in such a manner that traffic generated by high density development will not be required to travel through areas of lesser density en route to principal community facilities.*
- *Provide adequate access to arterial streets, shopping facilities, schools, employment centers, and other services.*
- *Development shall not be permitted in natural hazard areas unless proper on-site improvements are provided.*
- *Recreational area and/or facilities shall be considered in multiple residential development.*

Discussion

Approximately 480 multi-family units are being proposed at this time. The aim is to achieve a mix of product types to accommodate demand, differences in ability to pay, as well as young and older families

Multi-family developments will be encouraged to provide on-site recreational facilities in addition to providing the required amount of park land in accordance with dedication requirements of the county.

(5) Single-Family Residential

Goals

- *To maximize choices of single-family residential lots and/or housing for residents of the County.*
- *To ensure compatible uses within and adjacent to single-family residential zoned areas.*
- *To provide single-family residential areas conveniently located to public and private services, shopping, other community activities and convenient access to employment centers.*

Policies

- *To assure the orderly use of single-family residential zoned areas and to curb speculation and resale of undeveloped lots, the County may impose incremental and conditional zoning which would be based on performance requirements. This is to assure that a certain percentage of buildings will be constructed.*
- *The County shall designate and allocate single-family residential zone lands at varying densities for future use in accordance with the*

needs of the communities and the stated goals, policies and standards.

Discussion:

Residential development will strive to provide a range of product choices to meet the needs of the residents of the County. The project will be marketed to local residents and not the second-home, luxury residential market. Residential development will be within an area that is planned to have commercial, office, retail uses, and a school/playground. Development will be financed with normal financial methods and will not be marketed as a speculative venture.

General Plan Land Use Pattern Allocation Guide Maps

In addition to these statements, the plan contains a series of land use maps referred to as General Plan Land Use Pattern Allocation Guide (LUPAG) Maps. These maps delineate a number of land use categories for each area.

The property is designated Urban Expansion according to the County General Plan. It falls within the broad region of lands in the Keahole to Kailua district which are considered appropriate for urban expansion. Urban expansion of the area allows for a mix of high density, medium density, low density, industrial and/or open designations in areas where new settlements may be desirable, but where the specific settlement pattern and mix of uses have not yet been determined. The General Plan also indicates an industrial designation which acknowledges the existing Kaloko Light Industrial Subdivision and its proposed expansion area. (See Figure 3-4).

3.10 Keahole to Kailua Development Plan

The Keahole to Kailua Development Plan (commonly referred to as the K to K Plan), was adopted by resolution by the Hawaii County Council on April 3, 1991. The plan was prepared for the County of Hawaii Planning Department by RM. Towill Corporation with extensive input from State agencies, community groups and major landowners. The land use plan contained within the development plan report is intended to provide a:

- a framework for the future growth and development of the Keahole to Kailua area
- a framework for infrastructure plans and cost estimates; a basis for coordinated public-private implementation of major infrastructure projects
- a framework for State and County action on designating lands for urban development.

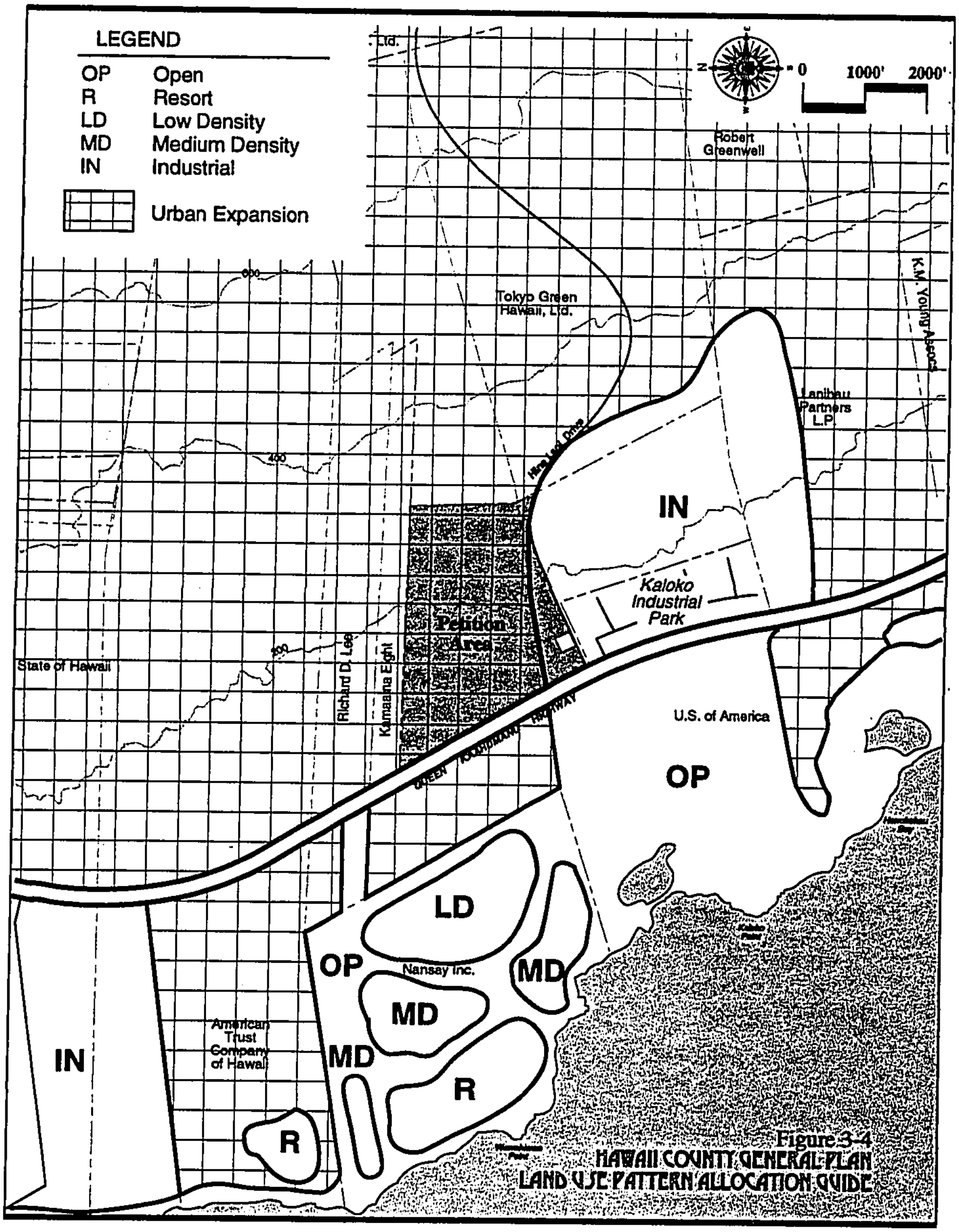


Figure 3-4
HAWAII COUNTY GENERAL PLAN
LAND USE PATTERN ALLOCATION GUIDE

The plan is not intended to be used as a rigid site specific land use and zoning boundary map. Instead it is intended to be a flexible tool for guiding urban development.

The K to K Plan encompasses a project area of some 17,000 acres stretching from the Kau *ahupua'a* to the north, the Mamalahoa Highway to the East, Palani Road and Kailua Village to the south and the shoreline to the west. Within this project area, the petition area is designated on the Land Use Plan for "urban expansion". "Urban expansion", as described in the report, denotes the land's general suitability for urban development with no specific recommended uses. In addition, an "open" zone, 100 feet wide is designated along the entire portion of Queen Ka'ahumanu Highway which runs along the petition area's makai boundary. This open area is intended as a "permanent buffer zone" to be dedicated as an "open space strip". (See Figure 3-5).

The Land Use Plan also recognizes the need for "educational centers" including a high school, a middle school and two new elementary schools. The educational centers were shown in a schematic fashion pending more detailed site location studies in the future. In addition, smaller community and neighborhood parks and playgrounds are not shown in the plan but are recommended as integral parts of larger subdivisions and planned communities.

The Plan makes many suggestions for roadway improvements. Within the vicinity of the petition area, Queen Ka'ahumanu Highway is proposed to be upgraded from 4 to 6 lanes with interchanges at Keahole Airport and Kealakehe. A grade separated interchange is not proposed for Hina Lani Drive. In addition to Queen Ka'ahumanu Highway, the Plan proposes a "Main Street" running parallel to Queen Ka'ahumanu Highway from Kealakehe Drive to Hina Lani Drive and through the limited light industrial area proposed above the existing Kaloko Industrial Park. An arrow suggests that this roadway may or may not extend into the petition area.

The K to K Plan also proposes a mid-level arterial which also runs parallel to Queen Ka'ahumanu Highway. As shown, the road would run along the mauka boundary of the petition area.

3.11 Zoning

The property is classified Open according to the Hawaii County Zoning ordinance. Zoning for adjacent properties include an ML-1a , Light Industrial, classification for the Kaloko Industrial Park and a combination of CV-20, Village Commercial and ML-1a, Light Industrial for the Kamaaina Eight parcel to the north. (See Figure 3-5). The County will determine the appropriate zoning classifications for the proposed land uses within the Kaloko Town Center master plan when an application for rezoning the project area is submitted.

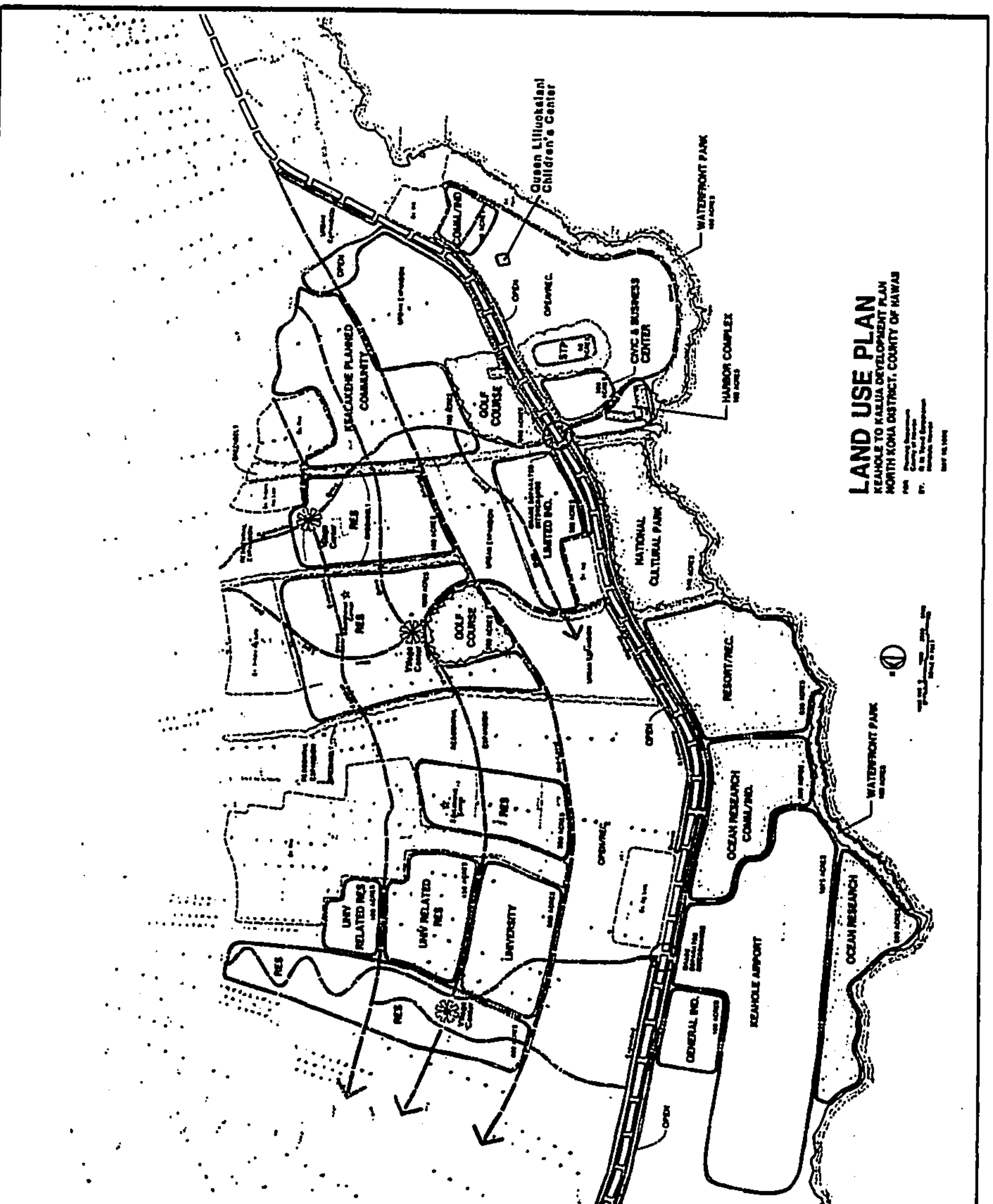


Figure 3-5
KEAHOLE TO KAILUA DEVELOPMENT PLAN

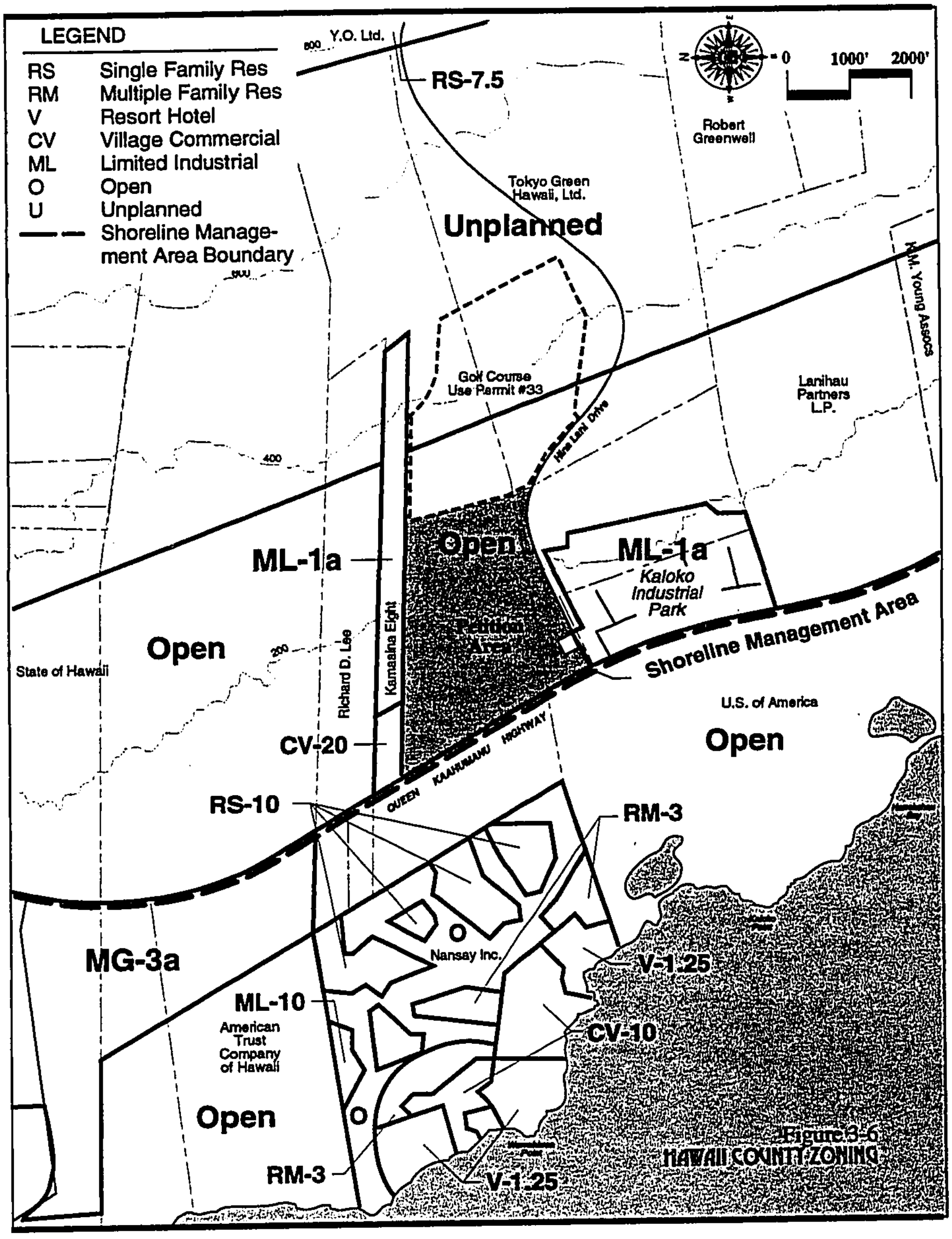


Figure 3-6
HAWAII COUNTY ZONING

Chapter 4
PHYSICAL AND NATURAL ENVIRONMENT

4. PHYSICAL AND NATURAL ENVIRONMENT

4.1. Climate

Weather information is collected at various geographical locations throughout the State. For the project site the weather stations fall within the general location of the Kailua-Kona district where temperature and annual precipitation is recorded. The average temperature is 72.1° F for the coolest month, 77.3° F for the warmest month with extreme temperatures of 54° F for the lowest and 93° F for the highest. The average annual precipitation for the entire district is 25 inches. However, weather stations at Keahole Point and Waikoloa, which are probably more representative of the conditions at the project site, recorded annual rainfalls of 11.48 inches and 11.51 inches in 1992.

Kona weather is typified by afternoon showers brought on by warm air which has been moved inland by light sea breezes. The humid air gradually condenses over higher altitudes throughout the day. At night the land cools resulting in breezes which send warm air back out to sea (Cordy, 1991).

4.2. Topography and Soils

Affected Environment

As is typical of the terrain of West Hawaii, the project site is characterized by a relatively uniform slope which rises gently from Queen Kaahumanu Highway to its mauka boundary. Slopes range from 0% to 10% and the ground elevation rises from approximately 90 feet ground elevation at Queen Kaahumanu Highway to about 340 feet elevation at its mauka border.

The Soil Survey, Island of Hawaii, State of Hawaii, prepared by the United States Department of Agriculture Soil Conservation Service (1973), classifies the lands on the petition area as pahoehoe lava (rLW), a'a lava (rLV) and Punaluu extremely rocky peat (rPYD). See Figure 4-1. Pahoehoe lava, which typically has a billowy and glassy surface that is smooth, covers approximately 40% of petition area. A'a lava, which is typically rough and broken with hard, glassy sharp pieces piled in tumbling heaps, extend as fingers on the northern portion of the site and covers approximately 30% of the site. Both types of lava flows have no soil covering. About 30% of the central makai portion of the site consists of Punaluu extremely rocky peat. Rock outcrops occupy 40 to 50 percent of the surface. The soil consists of about 4 inches of black peat underlain by pahoehoe lava bedrock. The peat is rapidly permeable, pahoehoe lava is very slowly permeable although water moves rapidly through cracks. Runoff is slow and erosion hazard is slight.

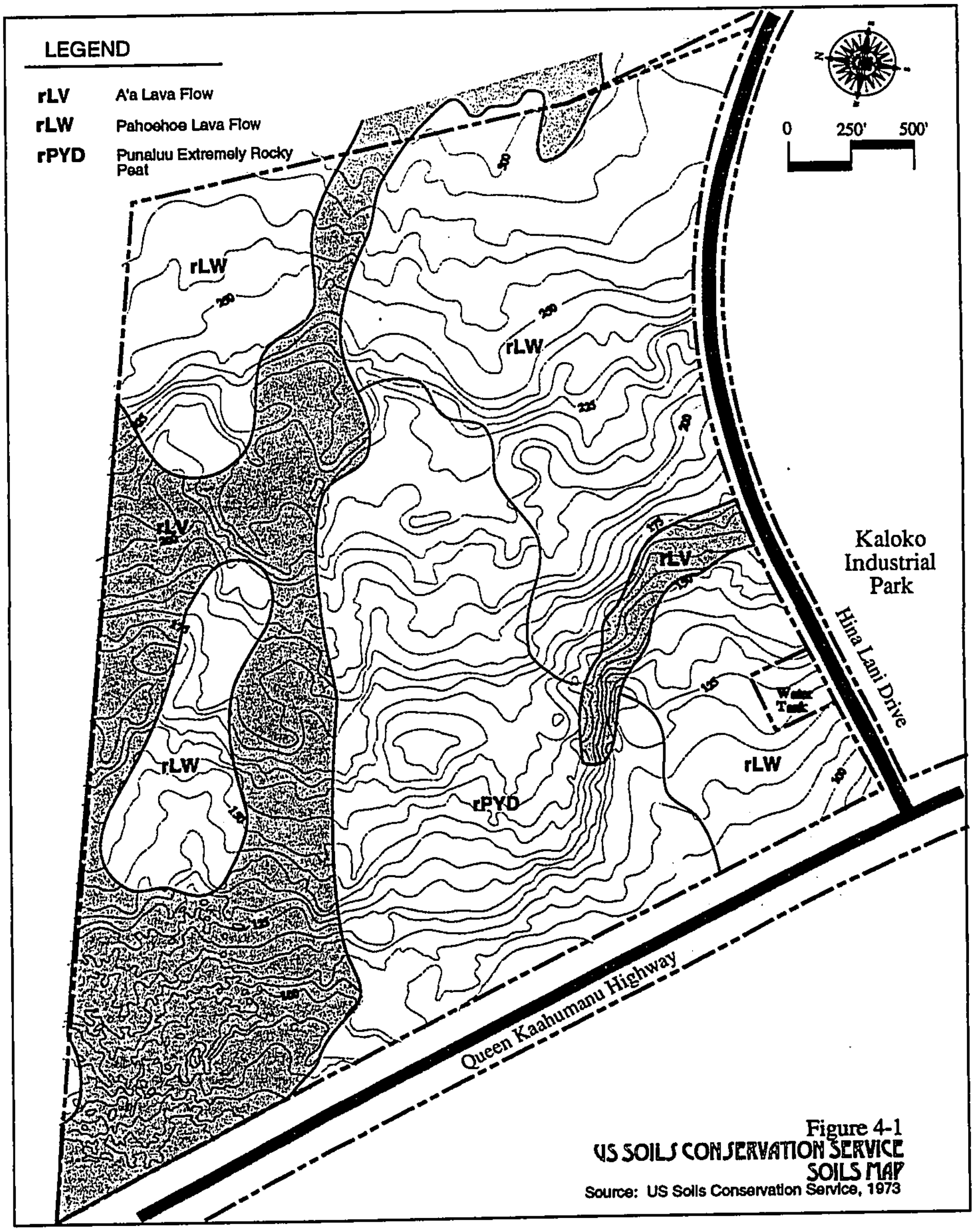


Figure 4-1
US SOILS CONSERVATION SERVICE
SOILS MAP
Source: US Soils Conservation Service, 1973

Soil capability class ratings are VIIIs for the lava classes and VIIs for the Punaluu soil both of which indicate that the soils have very severe limitations that make them unsuited to cultivation and commercial plants and restrict their non-urban use largely to pasture, woodland, wildlife, water supply or to aesthetic purposes.

According to the Detailed Land Classification, Island of Hawaii prepared by the Land Study Bureau, University of Hawaii in 1965, the majority of the project site consists of bare a'a and pahoehoe lava flows with no topsoil material. These soil series have an "E' rating which is the poorest in terms of suitability for agricultural cultivation. (See Figure 4-2)

None of these lands have been identified by the State's Agricultural Lands of Importance to the State of Hawaii (ALISH) program.

<u>Probable Impacts</u>

Short Term Impacts

The soil types, which are basically lava flows, will present varying degrees of difficulty for construction activities. Pahoehoe lava is typically harder and more difficult to crush and shape for site improvements and foundations in comparison to a'a lava. During the grading and construction phases, dust and loose particles will be exposed to wind and water erosion.

Long Term Impacts

The soil types have the poorest ratings for agricultural cultivation and will not reduce the amount of agriculturally suitable lands on the island nor adversely impact agricultural operations. For urban uses the absence of soil material for landscaping residences, the school and commercial areas will require the importation of soil materials from other locations.

<u>Mitigation Measures:</u>

The relatively uniform topography and terrain will require relatively little mass grading and filling operations. Appropriate erosion control techniques required by the State and County agencies will be used during construction. Xeroscape or landscaping designs which require minimal changes to the soil composition and irrigation will be encouraged throughout the development.

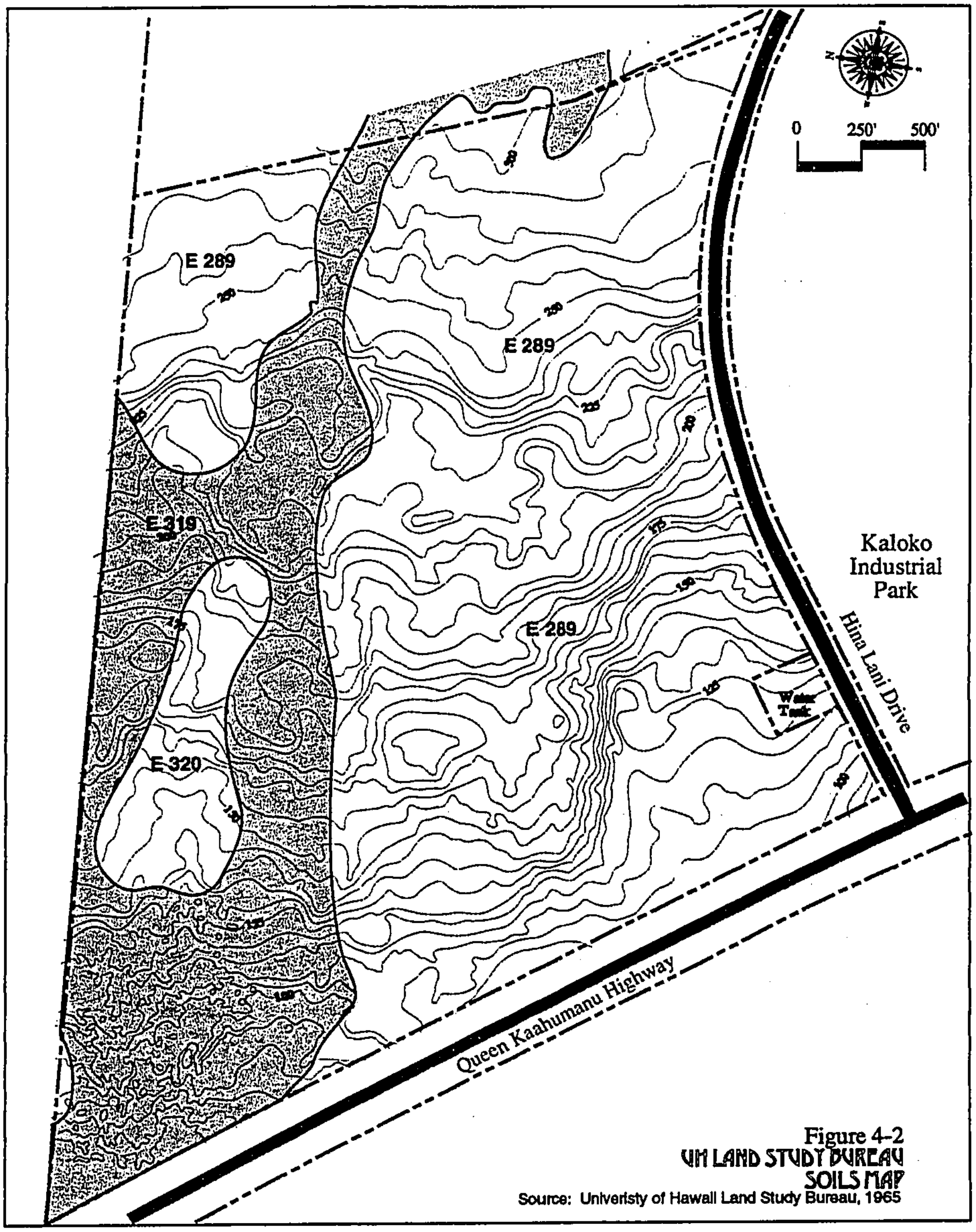


Figure 4-2
UH LAND STUDY BUREAU
SOILS MAP
Source: Univeristy of Hawaii Land Study Bureau, 1965

4.3. Groundwater

Evaluation of groundwater conditions were conducted by Tom Nance Water Resources Engineering. Study findings and recommendations are presented below. Knowledge of groundwater conditions in the vicinity of the project site comes from wells in the region, from conditions in nearshore anchialine ponds, and from evidence of shoreline discharge such as into Honokohau Harbor.

<u>Affected Environment</u>

Regional Perspective.

Groundwater occurs beneath the project site as a thin, brackish to saline basal lens in hydraulic contact with seawater at depth and at the shoreline. Further inland, along an alignment which is almost coincident with that of Mamalahoa Highway, there is an abrupt change from the brackish basal lens to high level groundwater of exceptionally good quality. This remarkable transition in groundwater regimes, which apparently extends from Kalaoa on the north end to as far south as Kealakekua, was discovered in the early 1990s. The geologic structures or features which create this change have yet to be determined. However, its existence explains, at least in part, some of the anomalies which occur in the basal lens in the Kaloko area. The discovery of high level groundwater has also completely changed the approach to developing new drinking water supply for North and South Kona.

Existing Wells From Honokohau to Keahole.

Figure 4-3 and Table 4-1 summarize available data from existing wells in the region, drawing the distinction between the high level wells above Mamalahoa Highway and the brackish to saline wells which tap the basal lens at lower elevations. Wells nearest to the project site are State Nos. 4160-01 and -02 which are located directly upslope and State No. 4262-01M, which is a 2-inch monitoring well on the makai side of Queen Kaahumanu Highway. The wells directly upslope are not used at present, but they are capable of producing water of marginal irrigation quality.

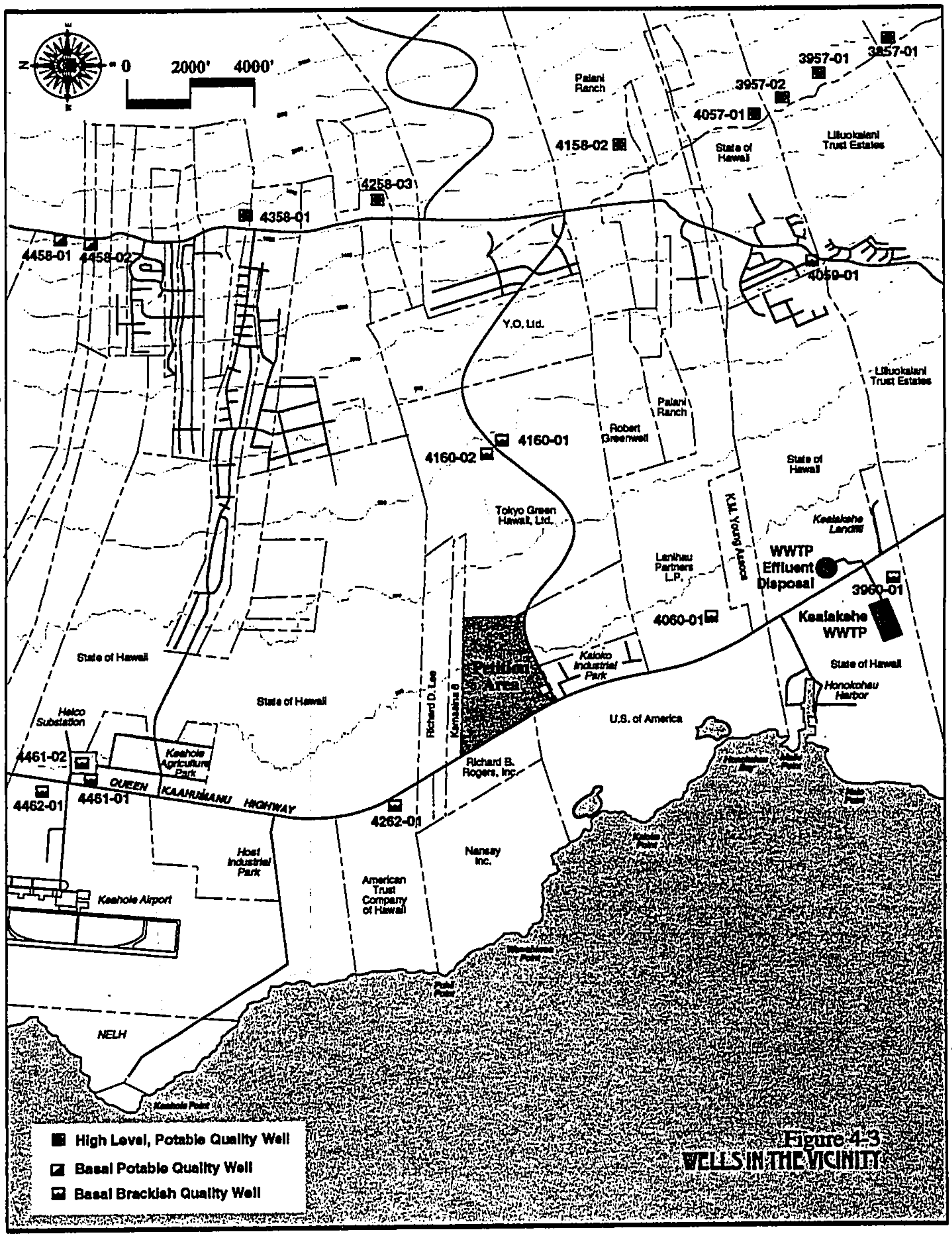


Figure 4-3
WELLS IN THE VICINITY

Table 4-1
Available Data on Wells in the Kaloko Region

State No.	Well Name	Owner or Developer	Year Drilled	Ground Elev (ft MSL)	Groundwater Level: Feet MSL	Groundwater Level: Date Measured	Chloride Concentration: MG/L	Chloride Concentration: Date Sampled	Water Temp °F	Present Use
Basal (Brackish Quality)										
3960-01	–	Queen Liliuokalani Trust	1982	40			3,400	1982		Irrigation
4059-01	Palani	DWS	1958	800	1.72	1958	3,475	1958	67.5	None
4160-01	Kaloko Irr-1	TSA International	1985	566	2.59	3-31-93	940	7-16-85		None
4160-02	Kaloko Irr-2	TSA International	1985	543	2.45	4-26-95	955	11-25-85	64.3	None
4360-01	Kalaoa	DLNR-DOWALD	1968	683	2.54	4-26-95	740	9-27-68	69.2	None
4461-01	–	Alika Cooper	1990	165			2,600		71.6	Irrigation
4461-02	–	HELCO	1993	210			5,900	6-24-93	69.5	Future cooling water supply
4462-01	–	State DOT	1993				3,825	1-28-93		Dust control
4262-01M	Ooma Test	Kahala Capital	1992	90	0.81	3-1-93	2,500	1993	66.0	0Monitoring only
–	NELHA									Monitoring only
High Level (Potable Quality)										
3857-01	Waiaha	DWS	1993	1,542	62	1993				Pump stuck in well; to be re-drilled
3957-01	Keopu Mauka	HASEKO	1993	1,674	47	1993	10	1-22-93	70.0	Future potable use
3957-02	USGS-Keopu	DWS	1991	1,600	42.8	1-20-93				Monitoring only
4057-01	QLT-1	Queen Liliuokalani Trust	1994	1,720	189	1-19-94	10	11-15-93		Future potable use
4158-02	Honokohau	DWS	1992	1,675	98.19	4-26-95	8	8-12-91	70.3	About to be connected to DWS system
4258-03	Hualalai	DLNR-DOWALD	1994	1,681	288.65	4-26-95	5	10-12-93		Future potable use
4358-01	North Kalaoa	DOWALD-DWS	1991	1,799	236	1991	10	1-14-91	73.9	Operating well; part of DWS system
Basal (Potable Quality)										
4458-01	Kohanaiki-1	Nansay	1991	1,799	10.1	4-26-95	17	5-30-90	72.0	Future potable use
4458-02	Kohanaiki-2	Nansay	1992	1,799	10.5	4-26-95	15	7-15-91		Future potable use

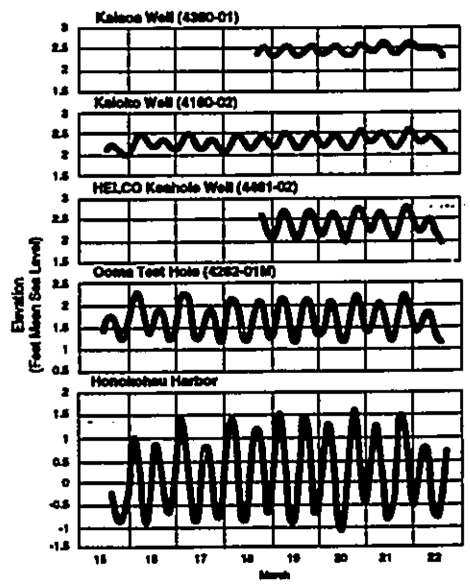


Figure 4-4
RECORDED WATER LEVELS IN WELLS
TAPPING THE BASAL LENS IN THE KALOKO AREA

Water Levels and Tidal Fluctuations in the Basal Lens.

Figure 4-4 illustrates water level recordings made in March 1996 at accessible basal lens wells in the Kaloko area. It also compares these to the water level variations recorded in Honokohau Harbor over the same period. On Table 4-2, average water levels and tidal lags and amplitudes in the basal wells are summarized. Water levels are referenced to mean sea level survey datums for each well. Unfortunately, the surveyed mean sea level is not likely to correspond to the ocean's actual level over the recorded period; groundwater gradients can be established between wells but not from the well to an assumed mean ocean level. Nevertheless, these recordings establish that water levels in the basal lens are very low and that the gradient for the lens is extremely flat. Based on water level differences between the wells, the gradient is on the order of 0.2 to 0.6 feet per mile. It is also clear, from the movement of the tidal pulse through the aquifer, that the permeabilities of the basalt formation are extremely high. These very high permeabilities are also borne out by available test pumping data for the Kalaoa (No. 4360-01) and Kaloko (Nos. 4160-01 and -02) wells. Specific capacities of these basal wells vary from 250 to more than 4000 GPM per foot drawdown.

Table 4-2
Water Levels and Tidal Responses in Nearby Basal Aquifer Wells, March 15 to 22, 1996

Name	State No.	Benchmark Elev. (Ft MSL)	Water Level (Ft MSL)	Distance Inland (Feet)	Tidal Response Lag (Hours)	Tidal Response Amplitude (%)
Ooma Test Hole	4262-01M	90.50	1.68	5,500		42.0
HELCO	4461-02	Not Avail	--	8,900	2.06	27.7
Kaloko	4160-02	544.00	2.34	11,600	3.25	15.8
Kalaoa	4360-01	680.80	2.46	16,000	4.92	9.2

Notes: 1. Tidal lag and amplitude are based on the measured tide at Honokohau Harbor.
2. Benchmark elevations from Glenn Bauer of the Commission on Water Resource Management. None was available for the HELCO well.

Salinity and Temperature Profiles of the Basal Lens.

Figures 4-5, depict recently made salinity and temperature profiles for three wells which tap into the upper portion of the basal lens. Figure 4-6 illustrates similar profiles made several years ago in wells which are drilled through the basal lens into saline water at depth. Several anomalies are illustrated by the profiles:

- Very low temperature water, on the order of 63° to 64° F., is found in the top portion of basal lens at the Kaloko well (No. 4160-02) and at depth in the Ooma well (No. 4262-01M). These temperatures do not occur in other basal wells. They are also substantially lower than the 70° to 74° F. temperatures which occur in the high level wells located directly inland (refer back to Table 4-1). Based on this, it does not appear that the cold water is coming from groundwater further inland. However, to find these temperatures in the ocean offshore, you have to go to depths of 300 to 400 feet.

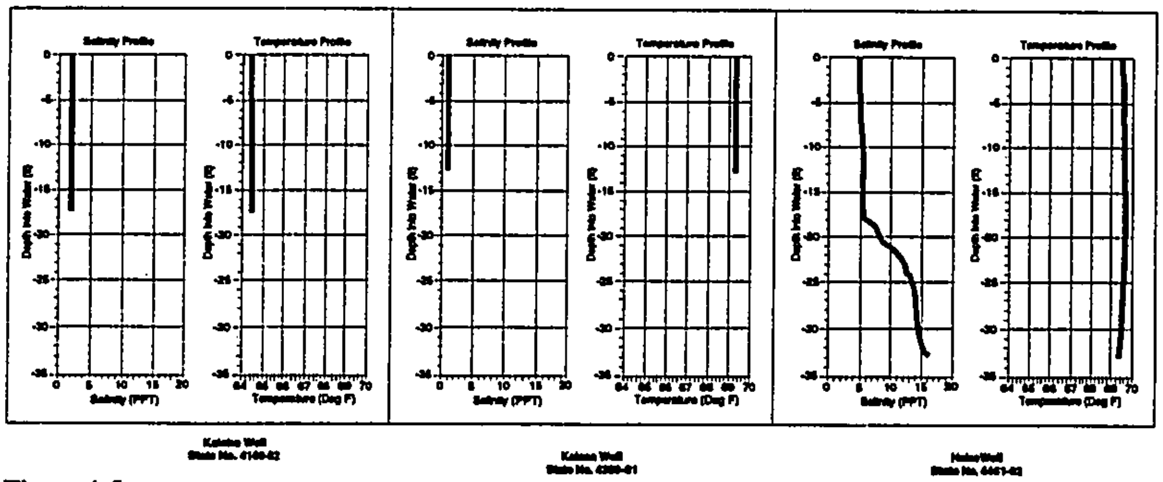


Figure 4-5
KALOKO, KALAOA & HELCO WELLS TEMPERATURE AND SALINITY LEVELS

- At Ooma and Keahole, surface salinities are surprisingly high and the thickness of the basal lens, as portrayed by salinity profiles, is substantially less than expected from the measured water levels and applying the Ghyben Herzberg relationship. There are sharp salinity breaks 10 feet into the lens at Keahole and 20 feet at Ooma. However, directly inland of these locations, the salinity in the Kalaoa well (No. 4360-01) is lower than any of the other basal wells in the region.

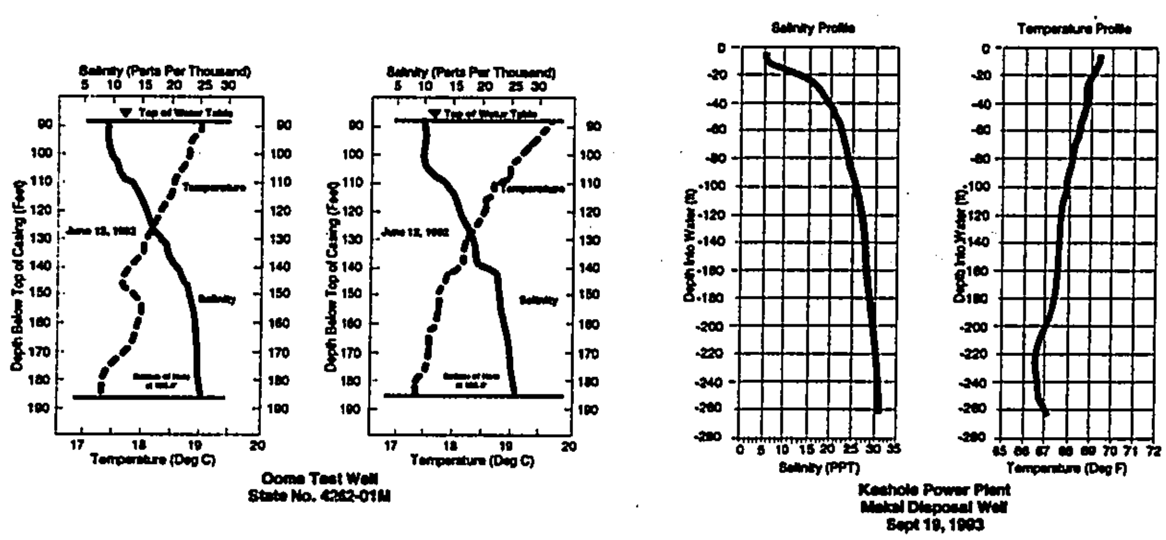


Figure 4-6
OOMA TEST WELL AND KEAHOLE POWER PLANT MAKAI DISPOSAL WELL

Groundwater Quality

Table 4-3 summarizes water quality of wells and several nearshore ponds in the Kaloko area. The high level, potable quality wells have extremely low salinity and relatively typical levels of nitrates and phosphates. Of the basal wells, only the Kaloko (Nos. 4160-01 & -02) and Kalaoa (No. 4360-01) wells produce irrigation quality water. All others, including the Palani well (No. 4059-01) which is 2.5 miles inland, are too saline for irrigation use. The extreme range of salinity among the basal wells is probably the result of variable leakage from the high level groundwater formation.

Another anomaly of the water quality data is the virtual absence of nitrogen, phosphorus, and silica in samples from the Kalaoa well (No. 4360-01). The well was sampled twice to confirm these concentrations which are not within the expectable range for groundwater. One possible explanation is that the annular space was not properly sealed, allowing surface water to cascade down the annulus.

Table 4-3
Representative Groundwater Quality in the Kaloko Area

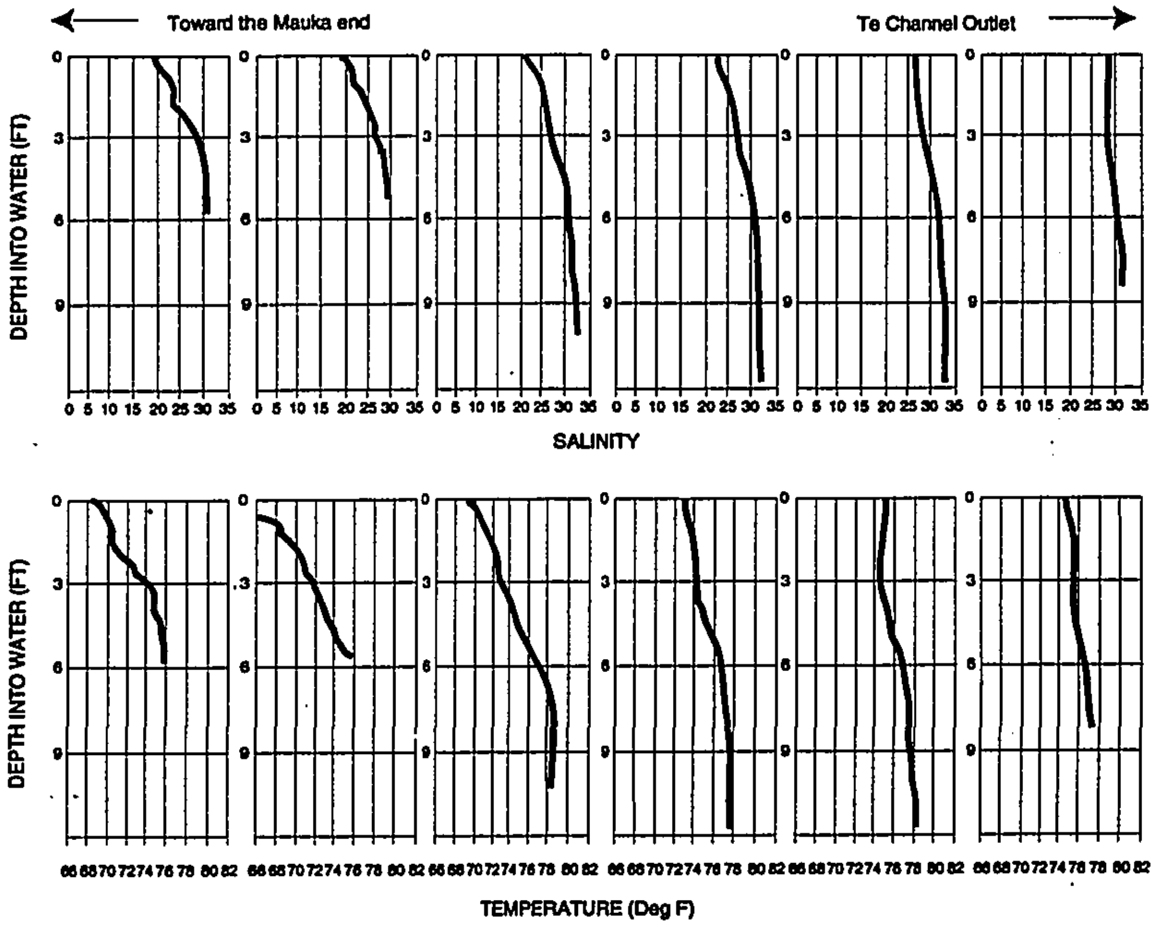
Sampling Site	Date Sampled	Salinity PPT	Silica µM	NO_3 µM	Total N µM	PO_4 µM	Total P µM
High Level Wells							
4158-02	10-23-94	0.212	697	74.2	87.6	3.59	3.59
4358-01	3-22-96	0.256	856	75.2	78.9	3.50	3.58
Brackish Water Wells							
3960-01	10-23-94	25.543	318	28.1	33.3	1.49	1.51
4160-02	5-15-94	1.734	670	68.6	71.8	5.89	5.92
	3-22-96	1.773	671	78.1	86.6	4.42	5.12
4262-01M	3-15-96	7.962	661	81.8	97.8	3.08	3.24
4360-01	3-18-96	1.306	11.2	1.04	14.9	0.40	0.44
	4-6-96	1.432	124	0.34	7.89	0.97	1.26
4461-02	3-15-96	4.946	752	79.4	92.0	3.84	3.88
Anchialine Ponds							
Kaloko	5-15-96	28.238	153	1.20	24.1	0.16	0.19
	4-17-96	27.256	168	2.57	24.2	0.42	1.03
Kohanaiki	Ave. thru 1991	12.27	293	26.9	28.0	2.16	2.18
Ooma	1988	14.16	501	37.9	39.1	1.87	1.87

Notes: 1. Samples from wells and the Kaloko Fishpond taken by TNWRE and analyzed by Marine Analytical Specialists. 2. Data on the Ooma anchialine ponds from Dollar and Smith, 1988, a manuscript report prepared for Helber, Hastert & Kimura. 3. Data on the Kohanaiki anchialine ponds from OI Consultants, Inc. August 1991 Monitoring Program Baseline Report, Sumner 1991.

Coastal Evidences of Groundwater Discharge

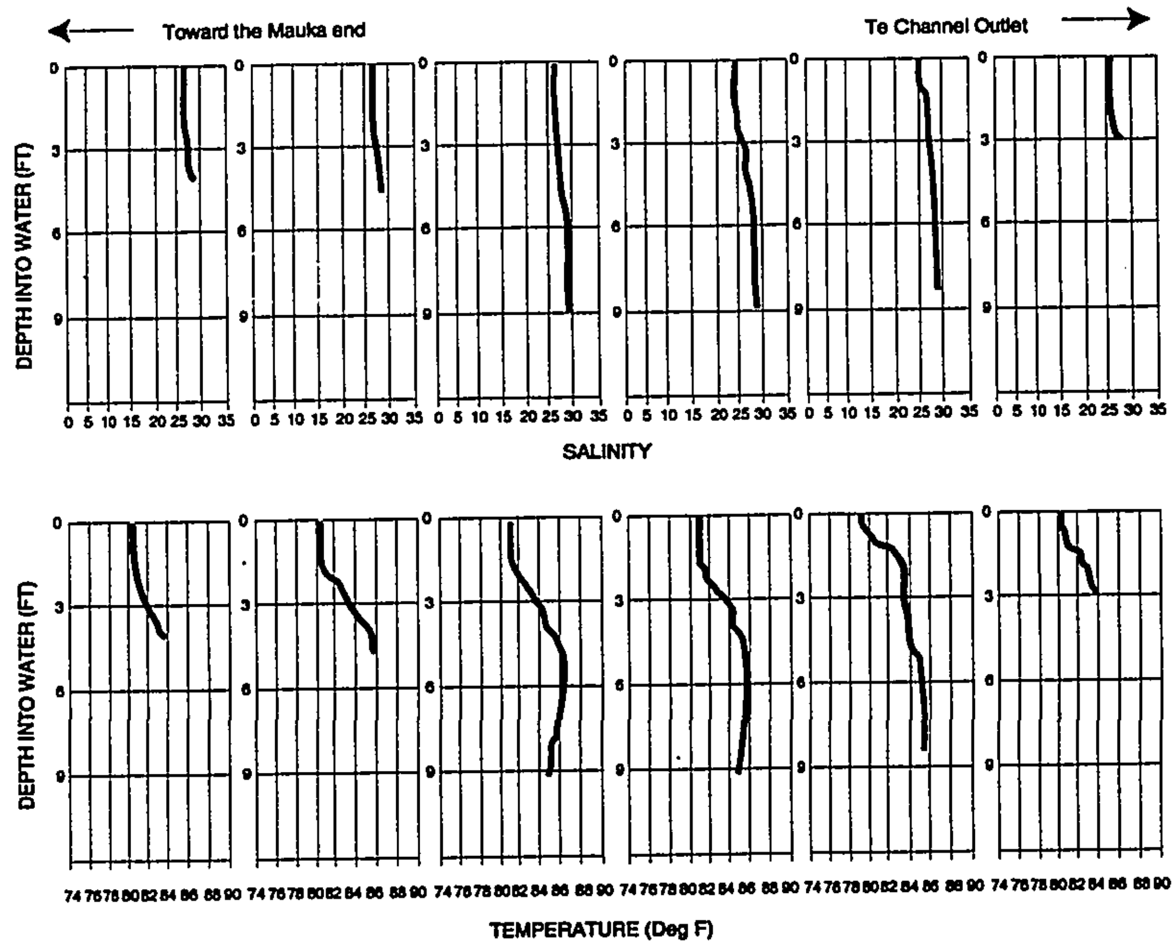
Based on water levels and water quality, it is clear that the rate of groundwater flow to the shoreline in the Kalaoa area is quite limited. It is definitely less than three million gallons per day (MGD) per coastal mile and is more likely in the range of one to two MGD per mile. In fact, significant groundwater discharge along the shoreline is only evident at Honokohau Harbor. Because the harbor is excavated almost one-half mile inland from a small, natural embayment, it is a focus of groundwater discharge on a sub-regional scale. Figure 4-7 illustrates the input of cool, brackish groundwater into the harbor with a series of salinity and temperature profiles, starting at its inland end and proceeding to its channel outlet. At the harbor's inland end, incoming groundwater is 66° to 68° F. and salinity is about 50 percent seawater. At the outlet channel, the groundwater input, while still discernible, is substantially mixed with seawater.

On Figure 4-8, a similar set of salinity and temperature profiles across Kaloko Fishpond is presented. The fishpond appears to be a natural embayment which is closed off to the ocean by a man-made boulder embankment. Temperature stratification across the pond is more pronounced than is salinity, probably due to a combination of restricted circulation and limited groundwater input. Rather significantly, there is no evidence of the direct input of the 64° F. water at the Kaloko (4160-02) well directly upgradient. Compared to Honokohau Harbor, which has an open connection to the ocean, groundwater input to the fishpond is obviously far less significant.



Salinity and Temperature Profiles Across Honokohau Harbor

Figure 4-7
SALINITY AND TEMPERATURE PROFILES ACROSS HONOKOHAU HARBOR



Salinity and Temperature Profiles Across Kaloko Fishpond

Figure 4-8
SALINITY AND TEMPERATURE LEVELS ACROSS KALOKO FISHPOND

Probable Impacts

The natural rate of groundwater flow beneath the project site to the shoreline is relatively modest. Evidence of this includes the demonstrated thinness of the basal lens, the relatively high salinity in basal wells, and the near-seawater salinity in Kaloko Fishpond. Based on these indicators and also on water balance computations for the upland watershed, the groundwater flowrate discharging along the shoreline is probably on the order of one to three MGD per coastal mile, with the lower end of this range being more likely. Since the project site is 0.6 miles wide, the natural flow of groundwater beneath it may be 0.6 to 1.8 MGD. Between Honokohau Harbor at Keahole Point, total flow would be in the range of 4.3 to 13 MGD. In the computations which follow, the middle of these ranges is used: 1.2 MGD as the groundwater flowrate beneath the project site and 8.7 MGD as the total groundwater flow from Honokohau to Keahole.

The project may have an impact on this groundwater in the following three ways: (1) disposal of wastewater generated by the project; (2) onsite disposal of stormwater runoff; and (3) percolating water from landscape irrigation. Amounts of these quantities of water which may impact groundwater are as follows:

	Estimated Amount (Ave. MGD)	Basis of Estimate
Wastewater Generation	0.28 to 0.35	Assumes that half of the drinking water supply will become wastewater
Percolation of Landscape Irrigation	0.04 to 0.05	About 15 percent of landscape irrigation will percolate to groundwater
Onsite Stormwater Runoff Disposal	0.10 to 0.15	One-third to one-half of annual rainfall over 224 acres

Wastewater Disposal.

Sewage generated by the project would be conveyed via lift stations and a force main along Queen Ka'ahumanu Highway to the County's Kealakehe WWTP. The County's WWTP provides secondary treatment and, at present, utilizes seepage disposal in a unlined pit located on the mauka side of Queen Ka'ahumanu Highway (refer back to Figure 1 for the location. This method of disposal was begun in 1994 as an interim measure, anticipating that reuse for golf course irrigation would be the ultimate disposal method. Via deep percolation, disposal into the pit provides a direct addition to the underlying basal lens. Present disposal rates at the WWTP are in the range of 0.9 to 1.0 MGD. The project's estimated wastewater flow at full build-out is 30 to 35 percent of the WWTP's present load. When full build-out is achieved, however, the plant's load will also be significantly greater.

The County has a temporary permit from the State Department of Health for the pit disposal. It has hired a consultant, Waimea Water Services, to evaluate the impact of this disposal method and to identify viable alternative methods. Monitoring of water quality has been done of the (1) effluent, (2) the Quarry well (No. 4060-01), (3) at a "spring" at the inland end of Honokohau Harbor, and (4) at the Harbor's outlet. Based on October-November 1995 sampling data, levels of nitrogen and phosphorus in the effluent average 160 and 140 µM, respectively.

The phosphorus levels are about an order of magnitude higher than typical secondary effluent, apparently due to inputs of detergent from laundry facilities, some of which are located in the old airport area. The October-November 1995 data from the two sampling locations in Honokohau Harbor do not show an apparent impact of this disposal method. The permanent disposal method may be some form of reuse or deep disposal wells. Either method will have less impact on groundwater than the present pit disposal.

Landscape Irrigation Input to Groundwater.

Percolation of water supplied by the DWS drinking water system and used for landscape irrigation within the project is estimated at 40,000 to 50,000 gallons per day. This irrigation return flow would amount to an increase of 3 to 4 percent to the 1.2 MGD groundwater flow directly beneath the project site. Compared to the total groundwater flow from Honokohau to Keahole, the increase would be 0.5 to 0.6 percent, an obviously modest addition. Assuming that fertilizers are applied reasonably in the landscaped areas and irrigation is not done at excessive rates, the quality of the percolate will have about the same nutrient concentrations as the underlying groundwater, so no nutrient concentration changes would be expected. However, the percolate would be of substantially lower salinity than the receiving groundwater. If the percolate has a salinity of 0.3 PPT and the underlying groundwater is 3.0 PPT, the salinity of the underlying brackish basal lens might be lowered by 0.09 to 0.11 PPT. Such a change might be viewed as a benefit to irrigation use of the basal lens. However, the change would be less than normal salinity variations of groundwater throughout the year and from year-to-year.

Onsite Stormwater Disposal.

With the exceptionally permeable character of the project site in its natural state, surface runoff during even extreme storm events is not known to occur. The very high surface permeability enables all rainfall to infiltrate and percolate downward rather than flow across the site as runoff. With the project's construction, impervious surfaces would be created and drainage facilities would be installed to convey runoff to onsite dry wells and/or seepage pits. Specific siting and design of such disposal facilities is not yet available. Use of dry wells would require a UIC permit; seepage pits would not.

Despite the changes due to development, the amount of onsite rainfall which ultimately becomes groundwater recharge is not likely to be significantly changed. In its natural state, about one-third to one-half of the 15 to 20 inches of annual rainfall is likely to reach the underlying groundwater. Over the site's 224 acres, this amounts to 0.10 to 0.15 MGD or 8 to 12 percent of the estimated groundwater flowrate directly beneath the site. With development, a portion of this amount would become surface runoff. However, it would be captured by the drainage conveyance system and disposed of in onsite wells and/or pits. As a result, the quantity of rainfall which would ultimately reach groundwater would not be significantly changed.

Water quality impacts of surface runoff directed to disposal pits and/or wells are more difficult to assess because data to depict the change in the quality of percolating rainfall are not available. However, an order of magnitude estimate of the potential impact can be made with the following assumptions: (i) the total quality of percolate reaching groundwater remains unchanged (i.e. 0.10 to 0.15 MGD of the 1.2 MGD underlying flowrate); (ii) nitrogen and phosphorus levels in the percolate in the site's natural state are essentially identical to the levels in the underlying groundwater (i.e. 87 µM nitrogen and 4.5 µM phosphorus); and (iii) concentrations of both nitrogen and phosphorus will be 50 percent higher when the site is fully developed. For these assumptions, groundwater concentrations would be raised by 3.7 to 5.5 µM for nitrogen and by 0.19 to 0.28 µM for phosphorus. These increases would be small compared to natural variability.

4.4 Marine and Pond Environments

An assessment of the pond and marine environments downslope of the proposed Kaloko Town Center was prepared by Marine Research Consultants. See Appendix A. This assessment was conducted in response to concerns that development of the proposed project would negatively impact the fishpond complex within the Kaloko-Honokohau Historic Park. The objectives of this assessment, therefore, were to determine the contribution of groundwater to the Kaloko fishpond and marine environments, and the effects of such input on the structure of the marine environments before and after construction of the proposed project.

<u>Affected Environment</u>

The Kaloko fishpond complex, includes the Kaloko pond and 'Aimakapa pond. These are large brackish ponds separated from the ocean by basaltic rock walls. Water in the ponds are a mixture of seaward-flowing, low salinity groundwater, and landward-flowing seawater. Because of these conditions, water chemistry in the ponds can potentially be influenced by changes in groundwater composition and runoff of surface water. Leaching of materials such as fertilizer nutrients and pest control agents to the groundwater could alter pond water chemistry. As pond water exchanges with ocean water in the nearshore area, there is also potential for alteration of marine water chemistry. Such alternations in water chemistry can, in turn, affect the structure of marine biotic communities in the nearshore area.

Water Chemistry Analysis

The Kaloko fishpond was chosen as the sampling site for this study. A series of transects were established from which water samples were collected at two depths; approximately 10 centimeters near the sea surface and a bottom sample, approximately one meter of the sea floor. Water quality parameters evaluated included the 10 specific criteria designated for open coastal waters in Chapter 11-54, Section 06 (Open Coastal waters) of the Water Quality Standards, Department of Health, State of Hawaii. Lab analyses were conducted by Marine Analytical Specialists. Water chemistry results are given in Tables 1 and 2 of the Assessment Report under Appendix A.

Biological Community Assessment

Evaluation of the marine biological community was conducted by qualitative reconnaissance surveys along the length of the area frontage Kaloko Pond from the shoreline out to the 10 meter depth contour. Information gathered during the surveys included abundance estimates of the dominant flora and fauna, as well as observations on factors that affect these biotic assemblages. Marine community structure can be defined as the abundance, diversity, and distribution of benthos (bottom dwelling organisms), including stony and soft corals, marine plants (algae), motile benthos such as echinoderms, pelagic species such as reef fish, and federally protected species. When considering environmental changes caused by changes in land use or changes in non-point input of water of altered composition, benthic communities are probably the most useful biological assemblages for direct evaluation of environmental impacts to the offshore marine environment.

Probable Impacts

The purpose of this baseline survey was to provide the data to make valid estimates of the potential for impact to the marine and Kaloko pond environment from shoreline development. There are, however, no plans for any direct alteration of the shoreline or offshore areas. Therefore, potential impacts to the marine environment can only be considered from activities on land that may result in delivery of materials to the ocean through infiltration to groundwater, changes in surface runoff, and wind transport. The project may have an impact on groundwater as a results of: 1) disposal of wastewater generated on-site; 2) disposal of stormwater runoff; and 3) percolating water from landscape irrigation. Presented below are considerations of potential impacts from sedimentation, nutrient enrichment and biocides that may be of concern from the planned project.

Sedimentation and Runoff

A potential mechanism for negative impact to nearshore marine and pond systems is increased sedimentation resulting from wind and surface runoff as a consequence of grading and changes in land use. There appears to be little potential for alteration to the marine community offshore from increased sedimentation as a result of the proposed project for several reasons. The climate of the Kaloko area is one of the direst in the Hawaiian Islands. On an annual basis rainfall is likely to be far exceeded by evaporation at the proposed project site. Surface water runoff from storm events is infrequent. The basaltic composition of the land surface is highly porous and is capable of absorbing rainfall with little or no surface. Even in the event of heavy rainfall, the porous nature of the soil ground cover is such that sheet flow carrying suspended sediment toward the ocean would be expected to be relatively small. Rather, most rainwater that would enter the ocean as runoff would do so following percolation through the surface rock layers to the water table, followed by groundwater extrusion at the shoreline.

The project site is presently comprised of extensive areas of exposed soil, with relatively little vegetative groundcover. During the construction phases, it is likely that permit regulations will limit the area of excavation at any one time, and require dust control measures. In addition, the predominant direction of wind (land breezes) generated by thermal convection from solar heating of the land mass is inland, resulting in transport of dust inland, and not toward the ocean. As a result, it appears that there is little potential for significant input of sediment to the marine and pond environment resulting from the proposed project.

Within the marine environment, the nearshore area contains locally high regions of cover of calcareous sands of marine origin. Corals and other reef organisms are capable of removing sediment suspended by natural phenomena, up to threshold levels of deposition where cleaning mechanisms are overwhelmed and organisms become buried. Because of the existence of natural sands, and the normally turbulent conditions which continually resuspend natural sediment, biotic community structure is presently adapted to extremes in sediment stress from natural conditions. Organisms that occur in the region are therefore capable of withstanding the stress associated with large natural sediment loads. In comparison to the frequent natural sediment resuspension within the study area, any additional input from land resulting from construction activity would probably not have the potential to accumulate to the point where organisms could be buried.

The entire floor of Kaloko Pond is covered with a thick layer of fine mud-sand sediment. Pond biota is adapted to this high sediment composition. Should a small amount of sediment reach the pond as a result of construction activity, it is not likely that there will be any qualitative change to sediment composition.

Alteration of Groundwater Flow

The hydrological study performed by Tom Nance Water Resource Engineering (TNWRE 1996) found that natural groundwater discharge to the ocean is quite limited, with a likely range of 1 to 2 million gallons per day per shoreline mile. Salinity and temperature profiles across Kaloko Pond reveal little evidence of direct input of low temperature groundwater. Results of the present study also indicate that based on salinity, water in the pond is a mix of about 80% seawater to 20% freshwater (not accounting for evaporation). In addition, the lack of distinct horizontal gradients of salinity within the pond suggest that input of groundwater is relatively small.

There appear to be no potential effects to Kaloko Pond or the adjacent offshore areas from wastewater generated by the Kaloko Town Center since sewage generated by the project would be conveyed via lift stations to a force main along Queen Ka'ahumanu Highway to the County Kealakehe Waste Water Treatment Plant.

Percolation to water supplied by the DWS drinking water system and used for landscape irrigation with the project is estimated at 40,000 to 50,000 gallons per day. The irrigation return flow would amount to an increase of 3% to 4% to the 1.2 mgd groundwater flows directly beneath the 224 acre site (TNWRE 1996). If the change in additional groundwater flowed in Kaloko Pond also equaled an increase of 3% (assuming that the groundwater has a salinity of zero) the change in salinity would be less than 1%. This small change is well within the natural variability of the system as salinity measured in the Kaloko Pond varied from 27% to 30%. In addition, the strong vertical stratification of Pond waters indicates that incoming groundwater is restricted to a surface layer that is not in contact with the pond bottom. Thus, any increase in groundwater input would likely have the effect of only decreasing salinity in the surface layer. The distinct break in salinity between pond water and ocean water indicates that there is little direct mixing of water through the boulder seawall. Thus, any increase in freshwater input would have little effect on the ocean side of the wall.

TNWRE (1996) also estimates that if fertilizers are applied reasonably in the landscaped areas of the project, the nutrient concentrations of the percolate will be of the same magnitude as natural underlying groundwater. It was determined through the use of mixing diagrams that the inorganic nutrients that occur in groundwater (primarily NO_3^- and PO_4^{3-}) were depleted in Kaloko Pond as a result of uptake by plants. Such uptakes suggests that the pond may be nutrient limited with respect to plant growth. Should there be a slight increase in groundwater delivery to the Pond without alteration in nutrient concentration it is not likely that there would be any change to the Pond chemistry or biota.

As discussed above, with the exceptionally permeable character of the project site in the natural state, surface runoff during even extreme storm events is not known to occur. The high surface permeability enables all rainfall to infiltrate and percolate downward rather than flow across the site as runoff. With the project in place, impervious surfaces would be created and drainage facilities would be installed to convey runoff to onsite drywells. TNWRE (1966) calculates that the amount of rainwater that reaches underlying groundwater over the 224-acre site is 0.1 to 0.15 mgd. With development, part of this water would be captured by drainage conveyance systems and disposed of in onsite drywells. As a result, the quantity of rainfall which would ultimately reach groundwater to flow to Kaloko Pond and the ocean would not be altered from natural conditions.

While water volume of surface runoff would not change, TNWRE (1996) estimates that the nutrient content of runoff will be 50% higher when the site is fully developed. Thus for the 8-12% of the groundwater increase resulting from surface runoff nutrient concentrations could increase about 5 µM for nitrogen and from 0.2 µM for phosphorous. When this water is mixed with the natural underlying groundwater, the change would be on the order of an increase of 0.5 µM for nitrogen and 0.02 µM for phosphorous. Measured concentrations of total nitrogen and total phosphorous in high level wells above Kaloko range from 79-88 µM and 3.58-3.59 µM, respectively. Thus the potential increases in nutrient concentrations from surface runoff are well within the natural range of variability.

Potential Effects to Protected Species

There are several protected marines species that may inhabit the offshore environment. Because there is no plan for any work in the nearshore region, there is no potential for blasting or excavation that might affect behavior of whales, monk seals and other marine mammals. Similarly, as described above, there is little potential for changes in water quality resulting from construction. As the Kaloko area is a National Park, the Kaloko Town Center project will not alter access to the shoreline. Thus, there is little potential for any negative factors associated with the project that may affect turtles or other protected species.

Summary

The potential for impact to marine and pond communities as a result of development of the Kaloko Town Center project appears to be minimal. Water in Kaloko Pond is presently a mixture of seawater and groundwater that is strongly stratified vertically, and weakly stratified horizontally. These patterns suggest that input of groundwater to the pond is small in magnitude, and there is little mixing within the pond by physical processes. Inorganic nutrients entering the pond from groundwater input are removed from the water column by plant uptake. The distinct discontinuity between concentrations of water chemistry constituents between the seaward end of the pond the nearshore portion of the ocean indicates that the boulder rampart is an effective barrier preventing free exchange between the pond and ocean. In addition, vigorous mixing action in the marine environment (primarily by breaking waves) results in mixing of the entire water column in the nearshore ocean. Such mixing does not occur in the pond owing to the boulder barrier that shields the pond from most wave action. As a result while separated by only several feet of boulder barrier, pond and ocean water display very different characteristics with little apparent communication. In addition, the marine communities adjacent to the boulder rampart do not appear to be affected by freshwater intrusion.

Estimates of changes in groundwater flow volume and composition from the Kaloko Town Center project indicate that there does not appear to be potential to induce long-term changes in physio-chemical composition of pond or marine waters of a magnitude sufficient to cause changes in biological community structure. No wastewater produced by the project would be disposed onsite. Increases in groundwater input from irrigation of landscaping would be small in relation to natural groundwater flow. Onsite stormwater disposal would not result in a change in discharge volume, but would result in a small addition to the nutrient content of the groundwater. However, this addition is well within the natural variability of uncontaminated groundwater. Aquatic and marine environments are routinely subjected to stresses that can be much more destructive than the small changes that might result from any development activity. Tolerance to such changes appears to already be part of the physiological range of the community.

4.5 Natural Hazards

Affected Environment

Hurricanes

In the past 14 years, the Hawaiian Islands have been hit by two major hurricane events carrying with them extremely high winds and causing extensive damage. On November 23, 1982, Hurricane Iwa hit the island of Kauai with maximum sustained winds of 65 mph and peak gusts of 85 mph. The eye of the storm passed about 30 miles from Kauai and Niihau causing major destruction to the island of Kauai and extensive damage to the leeward coast of the island of Oahu. The other islands, Hawaii, Maui, Lanai, Kahoolawe and Molokai, were not heavily damaged. Hurricane Iwa, classified as a Category 1 Hurricane, on a scale of 1 to 5 with 5 being the most intense, caused an estimated $308 million in property damage most of which was caused by violent winds and unusually high coastal waves. Rainfall was light to moderate during the storm and did not produce significant flooding (Post Disaster Report, Hurricane Iwa, March 1983, US Army Corps of Engineers, Flood Plain Management Section, Planning Branch, Engineering Division, POD.)

On September 12, 1992, almost exactly ten years from the date Hurricane Iwa struck, Hurricane Iniki hit the island of Kauai with maximum sustained winds of 145 mph and gusts to 175 mph. The eye of the Hurricane passed directly over the island of Kauai causing total destruction and leaving at least 8,000 people on Kauai homeless. In comparison to Iwa, Hurricane Iniki was classified a Category 4 Hurricane which resulted in $1.6 billion in insurance claims for damage to homes, commercial property, vehicles, boats and yachts. The devastation left by Hurricane Iniki was caused by hurricane force winds, dangerous tide surges and high surf, and heavy showers which flooded Oahu's and Kauai's leeward coasts (Hurricane Iniki, The Honolulu Advertiser, 1992, Mutual Publishing,)

Hurricanes are unpredictable. Although very little or no impacts were felt by the island of Hawaii during the last two major hurricanes, no one can predict the path or intensity of the next major event.

According to the Uniform Building Code (UBC), the minimum basic wind speed for the island of Hawaii is 80 miles per hour. The design and construction of all residential and commercial buildings within the petition area will need to be built according to the requirements of the UBC. Care will be taken in siting, designing and constructing publicly accessible structures such as commercial, office and retail structures as well as the proposed school to mitigate against potentially destructive winds. If appropriate, these structures could be surveyed by the Civil Defense agency as public shelters in disasters. Furthermore, it is recommended that the petitioner coordinate development plans with the Civil Defense at latter stages of the development process to accommodate the need for Civil Defense equipment such as warning sirens.

Seismicity

The island of Hawaii has a seismic zone rating of 3, according to the Uniform Building Code (1991 edition). The rating system is based on a scale of 0 to 4 with 4 having the highest risk associated with seismic activity. All structures will need to be built to withstand seismic forces expected to be generated in zone 3.

Lava Flow Hazards

Volcanic hazard zones for the island of Hawaii have been prepared by the US Geological Survey. The most recent map, dated 1990, indicates that the petition area is in Zone 4. The zones are ranked from 1 through 9 based on the probability of coverage by lava flows with zone 1 being the highest hazard and zone 9 being the lowest. The lava flow hazard for Zone 4 is attributed to Hualalai, one of three volcanoes which have been active in historic times on the island of Hawaii. About 5 percent of the area within Zone 4 was covered by lava since 1800, and less than 15 percent of the area was covered by lava in the last 750 years. In this zone, frequency of eruptions is lower than on Kilauea and Mauna Loa and flows typically cover large areas. Lava flows cannot be stopped or diverted and choose their own path, traversing into one area and then another in a rather unpredictable manner, dependent primarily on terrain features.

Probable Impacts

Hurricane force winds, earthquakes or lava flows occur as natural disasters and are unpredictable. Should such events occur, there would be risks to property and possibly life within the petition area depending upon the intensity of each event.

Mitigation Measures

All structures within the petition area should be built to conform to the Uniform Building Code and Hawaii County Building Code regarding wind speed and seismic zone. The Uniform Building Code and Hawaii County Building Code do not address the danger of lava flows. Although property damage may be left to the forces of nature, protecting human life from these natural disasters may be assisted by providing an opportunity to locate a civil defense warning siren facility on site. In addition, post disaster care may be provided in commercial structures or the proposed school if these structures have been surveyed by the Civil Defense agency to be appropriate as shelters.

4.6 Flood Hazards

Affected Environment

The petition area is not subject to tsunami inundation nor floods resulting from heavy rainstorms. The area was not mapped under the National Flood Insurance Program of the Federal Emergency Management Agency but was determined to be in Zone X, which are areas determined to be outside the 500 year flood plain.

Probable Impact

Because of the high porosity rate of the existing lava substrate and the low rainfall which averages less than 11" per year, flooding is not expected to be a major concern even with full build-out and the addition of impervious surfaces such as roof tops and parking lots. The proposed drainage system will be designed according to a zero-runoff drainage concept which means that runoff generated on the property would be handled by infiltration into the ground by drywells.

On-site drainage requirements using the Drainage Standards of the County of Hawaii indicate that a total of 55 drywells would be required for the proposed project site.

4.7 Noise

An acoustic study was prepared by Y. Ebisu & Associates to describe the existing and future noise levels in the vicinity of the proposed Kaloko Town Center and their potential impacts on present and future noise sensitive areas. See Appendix B. Environmental noise is currently measured as a Day-Night Average Sound Level (Ldn). This measurement incorporates a 24-hour average of instantaneous A-Weighted Sound Levels read on a standard Sound Level Meter. For noise generated primarily from automobile traffic, Federal noise standards have set 65 Ldn or lower as an acceptable exterior noise level for residences. Other land uses such as office buildings, commercial and retail uses allow 75 Ldn as the marginally compatible sound level. For aircraft noise, the State Department of Transportation, Airports Division, has recommended that 60 Ldn be used as the common level for determining land use compatibility next to airports.

Affected Environment

Traffic Noise

Existing traffic noise levels were measured with receptors placed on Queen Kaahumanu Highway, about 800 feet from the intersection of Hina Lani Drive, and on Hina Lani Drive, about 2,500 feet from the intersection of Queen Kaahumanu Highway. Receptors were placed about 50 feet from the centerline at these locations. Existing p.m. peak hour traffic noise levels vary from approximately 72 to 73 Ldn along Queen Kaahumanu Highway to approximately 65 to 68 Ldn along Hina Lani Drive. Calculations indicate that the existing 65 Ldn noise contour line along Queen Kaahumanu Highway would occur at 142 feet or greater setback distances from the highway centerline and 81 feet or greater setback distances from the Hina Lani drive centerline. The interior portions of the project site register low levels of traffic noise (less than 55 Ldn) because of their distance from both major roadways.

Future traffic noise levels were calculated using projected traffic volumes for the Year 2020 that would be generated with the proposed project. By the Year 2020 following complete project build out, p.m. peak hour traffic noise levels on Queen Kaahumanu Highway in the areas fronting the project are predicted to increase by 3.9 Ldn. Along Hina Lani Drive, noise levels would increase by 5.0 to 5.8 Ldn. To achieve the 65 Ldn standard for residential uses, the setback distances would range from 257 to 282 feet from the centerline of Queen Kaahumanu Highway and from 86 to 173 feet from the centerline Hina Lani Drive. The increases in noise levels along Queen Kaahumanu Highway is largely attributable to non-project generated traffic whereas noise level increases along Hina Lani Drive is largely attributed to project related traffic. The increased noise levels are expected given the current low volumes of traffic which now use Hina Lani Drive. See Table 4-4 and 4-5.

Table 4-4
Comparisons of Existing and Future Traffic Noise Levels

Location	Speed (MPH)	VPH	Hourly LEQ in dB Auto	Med Truck	Hvy Truck	All Veh
Existing 1996 PM Peak Hour						
Queen Kaahumanu Hwy (No)	60	1,279	68.2	64.3	68.3	72.1
Queen Kaahumanu Hwy (So)	60	1,609	69.2	69.2	69.3	73.1
Queen Kaahumanu Hwy (Front)	60	1,279	68.2	68.2	68.3	72.1
Hina Lani Dr (@ QK Hwy)	55	573	64.3	64.3	64.9	68.4
Hina Lani Dr (East)	55	302	61.5	61.5	62.1	65.7
Hina Lani Dr (@ Mamalahoa Hwy)	45	316	58.4	58.4	60.1	63.1
Future 2020 PM Peak Hour						
Queen Kaahumanu Hwy (No)	60	3,100	72.1	68.5	72.1	76.0
Queen Kaahumanu Hwy (So)	60	3,565	72.7	69.1	72.7	76.6
Queen Kaahumanu Hwy (Front)	60	3,127	72.1	68.5	72.2	76.0
Hina Lani Dr (@ QK Hwy)	55	1,800	69.3	35.8	69.8	73.4
Hina Lani Dr (East)	55	1,158	67.3	63.9	67.9	71.5
Hina Lani Dr (@ Mamalahoa Hwy)	45	1,172	64.1	61.0	65.8	68.8

Note: Noise levels along access roads to project site, measured 50 feet from roadway centerlines. Assumed traffic mix for Queen Ka'ahumanu Highway and Hina Lani Drive: 93% autos, 3.5% medium trucks, 3.5% heavy trucks and buses.

Table 4-5
Existing and Future Setback Distances

Street	60 Ldn Setback (distance in ft)		65 Ldn Setback (distance in ft)		70 Ldn Setback (distance in ft)	
	Existing	Future	Existing	Future	Existing	Future
Queen Ka'ahumanu Highway (north)	306	553	142	257	66	119
Queen Ka'ahumanu Highway (south)	357	607	166	282	77	131
Queen Ka'ahumanu Highway (front)	306	556	142	258	66	120
Hina Lani Drive (@QK Hwy)	174	374	81	173	38	80
Hina Lani Drive (east)	114	278	53	129	24	60
Hina Lani Drive (@ Mamalahoa Highway)	77	185	36	86	17	40

Notes: 1) All setback distances are from roadway centerline.
2) Ldn assumed to be equal to PM Peak Hour Leq minus 0.3 dB along all roadways.
3) Setback distances are for unobstructed line-of-sight conditions.
4) Soft ground conditions assumed along all roadways.

Aircraft Noise

The approximate center of the project site is about 1,600 feet or about 3 miles (measured as straight-line distance) from the center of the runway at Keahole Airport. Because of its proximity to the airport, aircraft noise contours for Keahole Airport were evaluated to determine whether noise from the airport's operations would have a potential impact on the proposed project. Occasionally,, depending on weather, visibility, or air traffic conditions, helicopter and fixed wing aircraft may cross over the project site. However, the vast majority of aircraft flight tracks typically remain west or northwest of the project site and are aligned with Keahole Airport's single runway.

To verify that the project site is located outside the Keahole Airport's 55 Ldn contour, aircraft noise measurements were obtained at a location on Queen Kaahumanu Highway about 1,000 feet north of the northernmost boundary of the project site. The Keahole Airport's noise contours for the Years 1990 and 2005 which were prepared as part of the most recent FAR Part 150 Program for Keahole Airport were used as the basis for comparison. The results of these measurements conclude that aircraft noise levels in 1995 over the project site are estimated to be less than the 55 Ldn contours for 1990 and 2005. As such, the existing and projected noise levels are considered to be in the "Minimal Exposure, Unconditionally Acceptable" category for the planned noise sensitive land uses on the project site.

Combined Traffic and Aircraft Noise

The FHA/HUD residential standard for total exterior noise levels from all sources must not exceed 65 Ldn. For the project site, determining combined traffic and air noise levels would be applicable only to that portion of the project where residential uses front Hina Lani Drive. At this location, the total noise level would equal traffic noise plus aircraft noise equal to 60 Ldn at a project dwelling. In the case of the proposed project traffic noise levels exceeds 65 Ldn but aircraft noise is less than 55 Ldn resulting in a total noise level which does not exceed the 65 Ldn standard.

Probable Impacts

Traffic Noise

As predicted, traffic noise will increase on Queen Kaahumanu Highway in the areas fronting the project about 3.9 Ldn and about 5.0 to 5.8 Ldn along Hina Lani Drive. The only portion of the project impacted is along Hina Lani Drive where single family and multi-family residences are proposed. In this area, 65 Ldn noise levels will be heard about 173 feet from the centerline of Hina Lani Drive. All other commercial, office and retail uses fronting Queen Kaahumanu Highway and Hina Lani Drive are not affected by projected noise levels.

Construction Noise

Audible construction noise will probably be unavoidable during the entire project construction period. Construction will cover the full range of activities from initial grading, infrastructure installation, site clearing and erecting buildings and structures. Actual work will move from location to location during different phases of development. Noise sensitive properties which are expected to experience the highest noise levels during construction activities are the future residential parcels of the project. Nearby properties are currently in light industrial uses, so construction noise impacts are not expected. Adverse impacts from construction noise are not expected to be in the "public health and welfare" category because of the temporary nature of the work and the administrative controls available for its regulation. 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 Measures

The impact of traffic noise on residential uses along Hina Lani Drive can be mitigated by not construction dwellings within the 65 Ldn setback line and/or by using sound attenuating walls and windows, or totally enclosing structures and using air conditioning. In addition, the construction of 6 foot high sound walls is generally effective for attenuating traffic noise at single story structures or at the ground floor of multi--story structures.

Reducing construction noise to inaudible levels is not practical simply because of the intensity of construction noise sources and the exterior nature of the work. However, mitigation measures such as the use of properly muffled construction equipment and the incorporation of State Department of Health construction noise limits and curfew times (applies only to Oahu), should be applied to the project.

4.8 Air Quality

Affected Environment

A study of the local and regional impact of the proposed project on air quality was prepared by Ogden Environmental using the National Ambient Air Quality Standards (NAAQS) or the State Ambient Air Quality Standards (SAAQS) as the regulatory standard to measure impacts to air quality. See Appendix C. The proposed project is defined as an "indirect source" of air pollution in the Federal Clean Air Act (CAA) because the potential impact to air quality would be caused by an increase in traffic generated by residential and commercial activities. Additional air quality impacts would be caused by short- term, on-site construction activities and indirect and long term impacts off-site caused by an increased demand for electrical energy generation.

To evaluate the air quality impacts of the proposed project, ambient background concentrations of pollutants for which NAAQS and SAAQS have been established are added to the maximum predicted concentrations resulting from implementation of the proposed project and compared with existing NAAQS and SAAQS. Sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), particulate matter less than 10 microns in diameter (PM_{10}), lead (Pb) and hydrogen sulfide (HPS) are the pollutants monitored to protect the public health and welfare. Typically, the maximum background concentrations recorded with the previous three years are used to represent baseline conditions for the air quality analysis. However, there are no ambient concentration data available for the criteria pollutants, although it is safe to assume that the air quality relative to these pollutants is good. The State of Hawaii is presently considered by the US Environmental Protection Agency (EPA) to be in attainment for all criteria pollutants, e.g. does not violate NAAQS or SAAQS.

Probable Impacts

Short Term Pollutant Impacts

Short term air pollutant impacts of the proposed project would be caused by construction activities. Emission sources primarily include tailpipe emissions from heavy-duty construction equipment and worker's vehicles, and fugitive dust generated during site clearing, land grading and construction activities. During construction, various types of equipment, i.e., scrapers, dozers and water trucks will be used causing the emission of SO_2 oxides of nitrogen (Nox), hydrocarbons (HC), CO and PM_{10}. While localized increases of these pollutants are expected to occur, they are not considered significant.

Fugitive dust generation, i.e., PM, from clearing vegetation and other heavy-duty construction operations is estimated at the rate of 1.2 tons per acre per month of activity according to the Environmental Protection Agency (EPA 1985). The 224 acre project site will be disturbed over a 15 to 20 year development lifetime. Assuming an estimated 11.2 acres of land being disturbed per year, the amount of fugitive dust generated per month is expected to be less than one ton per month and below the EPA rate noted above. This amount is considered insignificant and will be localized and temporary.

Long-Term Pollutant Impacts

The most significant long-term pollutant impacts associated with the everyday use of the project would be from motor vehicles emissions in the form of CO. High short-term concentrations of CO will occur at the intersection of Queen Kaahumanu Highway and Hina Lani Drive where traffic is expected to be concentrated. Air quality impacts were predicted using existing 1996 traffic data, the projected Year 2020 traffic data with the project, without the project, and assuming the project is built with mitigation measures recommended by the traffic consultant. The CAL3QHC air quality model developed by the EPA was used to analyze potential air quality impacts at specific receptors surrounding the intersection. The modeling results provide the worst-case scenario of CO concentration levels with or without the project. Table 4-6 lists the maximum predicted CO concentrations for the wind direction that cause the highest overall concentration for a 1 hour modeling scenario and Table 4-7 lists the maximum predicted CO concentrations for an 8-hour modeling scenario.

Table 4-6
Maximum Predicted 1-Hour CO Concentrations

Year	Ambient	Base Year	No Project	With Project	Traffic Mitiga-tion	Total Concen tration	SAAQS	NAAQS
1996 am	2.00	2.00				4.00	9	35
pm	2.00	2.90				4.90	9	35
2020 am	2.00		0.90			2.90	9	35
pm	2.00		1.30			3.30	9	35
2020 am	2.00			1.20		3.20	9	35
pm	2.00			1.90		3.90	9	35
2020 am	2.00				1.10	3.10	9	35
pm	2.00				1.70	3.70	9	35

Note: 1-hour CO SAAQS of 9 ppm is equivalent to 10,000 µg/m3.
1-hour CO NAAQS of 35 ppm is equivalent to 40,000 µg/m3

Table 4-7
Maximum Predicted 8-Hour CO Concentrations

Year	Ambient	Base Year	No Project	With Project	Traffic Mitiga-tion	Total Concen tration	SAAQS	NAAQS
1996 am	1.40	1.40				2.80	4	9
pm	1.40	2.03				3.43	4	9
2020 am	1.40		0.63			2.03	4	9
pm	1.40		0.91			2.31	4	9
2020 am	1.40			0.84		2.24	4	9
pm	1.40			1.33		2.73	4	9
2020 am	1.40				0.77	2.17	4	9
pm	1.40				1.19	2.59	4	9

Note: 8-hour CO SAAQS of 4 ppm is equivalent to 5,000 µg/m3. 8-hour CO NAAQS of 9 ppm is equivalent to 10,000 µg/m3

The modeling results indicate that the project is not expected to exceed the CO NAAQS or SAAQS. Ironically, it is interesting to note that projected improvements in vehicular emissions expected in future years outweighs the increased traffic in the year 2020, resulting in a decrease in the predicted CO concentrations. As a result, the total CO impacts, with or without the Kaloko Town Center project are not significant.

Indirect Pollutant Impacts

Currently, over 90 percent of the energy generated in the State of Hawaii is by combustion of fossil fuel. Increased demand for energy from power generating facilities to provide electricity for residences and businesses, and street lights, etc. will have an additional, indirect impact on air quality that can directly attributed to the proposed project. In addition, as the population of the island of Hawaii continues to grow, the Hawaii Electric Light Company (HELCO) will need to generate more electricity to meet demand. Currently, HELCO generates the island's electricity by burning fuel oil which emits SO_2, Nox, PM and HC. This increase in electrical demand is considered minimal but will contribute to the regional air pollution background. However, total air pollutant concentrations will have little impact on the area and are expected to remain below the NAAQS and SAAQS.

In addition to air pollutants caused by vehicular sources or other human generated activity, natural sources of air pollution can have a significant effect on air quality in the petition area. The worst air pollution episodes experienced in Hawaii County are due to infrequent and unpredictable volcanic eruptions. Volcanic emissions is known to affect visibility by the presence of fine particles resulting directly from volcanic activity, as well as, secondarily from forest fires caused by lava flows, a source of natural pollution commonly referred to as volcanic smog (VOG). In addition, there are substantial increases in the ambient concentrations of SO_2 and other toxic air contaminants.

Mitigation Measures

Although there are no significant impacts to the air quality as a result of the proposed project to warrant required mitigation measures, various measures can be employed to minimize or reduce the potentially adverse impacts.

Short-Term Measures

Fugitive dust emissions created during construction should be mitigated by establishing a regular dust-watering program and covering dirt-hauling trucks in accordance with the State of Hawaii Air Pollution Control Regulations. To control dust, twice-daily watering is estimated to reduce dust emissions by up to 50 percent. Windscreens may be erected to contain dust next to sensitive or dust-prone areas. Minimizing the number of concurrent clearing or construction activities would also effectively mitigate fugitive dust emissions. Although exhaust emissions from construction equipment are not expected to be significant, using electrical equipment whenever practical and fuel burning equipment with air pollution control technologies, such as catalytic converters and fuel injection timing retard, would contribute to reducing potential impacts.

Long-Term Measures

Although the long term projected increase in vehicular traffic is not expected to significantly raise the CO concentration in surrounding areas, mitigation measures designed to reduce vehicular trip generation should help to improve overall air quality. Traffic flow improvements, ride sharing and other practical means to discourage the reliance of the automobile are possible mitigation measures.

Indirect Mitigation Measures

Although indirect air pollution sources are not considered significant, energy conservation measures can be employed to minimize the emissions from electrical power generation. Such energy conserving measures could include passive solar water heating, low pollutant emitting systems for water heating, developing integrated energy systems such as a centralized water heating system for multi-family apartments. To reduce dependency on air conditioning, buildings could be designed to avoid large glass areas, efficiently use shading, and use natural ventilation.

4.9 Flora

A study of the flora on the project site was prepared by Char & Associates in June 1995. The results of the study is attached as Appendix D. Field studies were conducted using four botanists working in teams of two to provide a description of vegetation, inventory of flora, and to search for threatened and endangered species protected by Federal and State laws.

Affected Environment

The substrate throughout most of the petition area consists of pahoehoe lava flows with smaller fingers and patches of 'a'a lava. The pahoehoe lava flows support dense fountain grass grassland with *koa-haole* shrubs. The 'a'a lava flows are sparsely vegetated but support the majority of native species. A total of 48 plant species were inventoried. Of these, 29 (60.5%) are introduced or alien species, 2 (4%) are originally of Polynesian introduction, and 17 (35.5%) are native. Of the native species, 5 are endemic (found only in Hawaii), while 12 are indigenous (found in the Hawaiian Islands and elsewhere).

Fountain grass (*Pennisetum setaceum*) is the most abundant plant found on the project site and adjacent properties. A plant native to northern Africa, fountain grass was introduced into the Hawaiian Islands in the early part of the 20th century. Fountain grass invades lava flows previously dominated by native vegetation, where it interferes with native plant regeneration, upsets natural succession, and increases the likelihood of fire.

Scattered throughout the dense fountain grass cover in low-lying swale areas are thickets of *koa-haole* or *ekoa* shrubs (*Leucaena leucocephala*). Other woody introduced species occasionally found in the this grassland include scattered trees of kiawe (*Prosopis pallida*), and a few shrubs of *klu* (*Acacia farnesiana*), lantana (*Lantana camara*) and Christmas berry (Schinus terebinthifolius). Smaller nonwoody, components include indigo (*Indigofera suffruticosa*), Natal redtop grass (*Rhynchelytrum repens*), partridge pea (*Chamaecrista nictitans*), air plant

(*Kalanchoe pinnata*), hairy spurge (*Chamaesyce hirta*), and Guinea grass (*Panicum maximum*).

Native plants found on site are generally found as scattered individuals or in small numbers. These include shrubs of *'ilima* (*Sida fallax*), the native caper or *maiapilo* (*Capparis sandwichiana*), *alahe'e* (*Canthium odoratum*), and *a'ali'i* (*Dodonaea viscosa*) as well as the diminutive *kumu-niu* fern (*Doryopteris decipiens*) and two vines: koali-'awa (*Ipomoea indica*) and *huehue* (*Cocculus trilobus*). Only *'uhaloa* (*Walteria indica*) which is locally common, was found in larger quantities.

The 'a'a lava flows are largely barren except for small pockets of plants which occur in depressions where some soil and debris accumulates. Fountain grass and shrubs of koa-haole and Christmas berry occur in these depressions with a number of dryland native species. These include a few trees of *'ohi'a* (*Metrosideros polymorpha*) 20 to 25 feet tall, the native persimmon or *lama* (*Diospyros sandwicensis*) and *'ohe* (*Reynoldsia sandwicensis*). Shrubs of *naio* (*Myoporum sandwicense*) *maiapilo*, and *alahe'e* as well as smaller plants such as *alena* (*Boerhavia repens*) *huehue*, and *'uhaloa* were found on site. Native species tend to occur more frequently in the a'a lava because the rough, clinkery and loose lava tends to discourage grazing animals such as cattle and goat.

Probable Impacts

The proposed development of the site should not have a significant negative impact on botanical resources. The vegetation found on the project site is not complex nor species rich. A few native species are found on the fingers and patches of 'a'a lava, most notable are endemic plants including the kumu-niu fern, *'ohe, maiapilo, lama* and *'ohi'a*. None of the plants found during the survey is a listed, proposed, or category 1 (high priority) candidate endangered species (US Fish and Wildlife Service 1994a, 1994b, 1995). The *maiapilo* is considered a category 2 candidate species. These are plant species for which there is some evidence of vulnerability, but there is not enough data to support listing proposals at this time. The *maiapilo* can be found scattered along the coast and lowland scrub vegetation throughout all of the main Hawaiian Islands. No sensitive native plant-dominated communities listed in the Hawai'i Natural Heritage Program 1994, exist on the property today. The plant species inventoried on the project site can also be found on the surrounding properties, the West Hawai'i region, and other dry lowland areas throughout the state.

Mitigation Measures

Although the proposed project should not have a negative impact on botanical resources, it is recommended that some of the more ornamental, and easily grown native species be propagated and used to landscape the common areas of the proposed project. These plants are adapted to the local growing conditions, and would require less water, soil and nutrients than introduced landscape material. Plants suggested include *Alahe'e*, a shrub to small tree with glossy green leaves and fist-sized clusters of very fragrant white flowers, *Lama*, a native persimmon which has dark, hard wood, grayish-green leaves and small ornamental fruits, *'Ohe*, a handsome, fast-growing tree with a reddish, lacquered-looking trunk and rounded canopy of leaves, *Naio*, a small tree easily propagated with cuttings which has fragrant flowers and wood which was once used in place of sandalwood, and *'Ohi'a* a small to medium-sized tree with showy red flowers, fuzzy, silver-green leaves and corky gray bark. Other native plants found in the same area could be used as well. These include ***wiliwili*** ***(Erythrina sandwicensis)***, ***mamane*** ***(Sophora chrysophylla)***, ***kolomona*** ***(Senna guadichaudii)***, and ***'ulei*** ***(Osteomeles anthyllidifolia)***.

4.10 Fauna

An ornithological and mammalian survey was conducted by Rana Productions, Inc. in November 1995 of the petition area. The complete report is attached as Appendix E. The survey was conducted by laying two transects spaced approximately 1,750 feet apart and running mauka-makai through the petition area. A total of 13 count stations were placed 200 meters apart along these transects. At these count stations, eight minute unlimited distance circular plot counts were made. All stations were visited at least twice. Counts were concentrated during 6:00 am to 10:00 am, the peak bird activity time. In addition, three twilight counts were conducted to detect the presence of the Hawaiian hoary bat or Hawaiian owl. Pockets of vegetation were also surveyed to locate any species not recorded during the count periods.

<u>Affected environment</u>

Although the island of Hawaii is known to provide the habitat for 13 out of the 32 currently listed endangered avian species and subspecies in Hawaii, the project site's altitude, vegetation and total lack of standing water, make it unlikely that endangered avian species use the site. The only endangered avian species which may use the site occasionally for foraging is the Hawaiian Hawk (***Buteo solitarius***). The site lacks any vegetation that would provide a nesting habitat for this bird.

Past research indicate that the avifauna of the region is dominated by introduced species; migratory and extra limital shorebirds and waterfowl from September to April; and nesting pelagic seabirds which fly upslope to nesting sites on Hualalai and Mauna Loa during the summer months.

The study results counted a total of 126 birds of 7 species representing 7 families. Of the 7 species recorded, 6 are introduced by man and the seventh is a native migratory shorebird. No Avian species currently listed as endangered by either the United States Fish and Wildlife Service of the State of Hawaii Division of Forestry and Wildlife were detected.

Two Pacific Golden Plover, the most common migratory shorebirds that visit Hawaii each year, were recorded during the survey. Introduced birds observed on the site include the Spotted Dove (*Streptopelia chinensis*), Common Myna (*Acridotheres tristis*), Japanese White-eye (*Zosterops japonica*), Warbling Silverbill or African Silverbill (*Lonchura cantans (malabarica)*), Nutmeg Mannikin or Scaly-breasted Munia (*Lonchura punctulata*), House Finch (*carpodacus mexicanus*) and Yellow-billed Cardinal (*Paroaria capitata*).

During the course of the survey the only mammalian species detected were 2 flocks of feral goats (*Capra hircus*). However, it is very likely that roof rats (*Rattus rattus*), Norway rats (*Rattus norvegicus*), European house mice (*Mus domesticus*), small Indian Mongoose (*Herpestes auropunctatus auropunctatus*) and cats (*Felis catus*) utilize the site.

No endangered mammalian species were detected on site, however, Hawaiian hoary bats (*Lasiurus cinereus semotus*) were observed at Aimakapa Pond and within the Kaloko Light Industrial Park in the past and it is likely that this species may transit the petition area occasionally.

Probable Impacts

The survey which indicated a lack of species diversity and extremely low densities of avian species on the project site indicate that the propose site has little to offer as a site for habitats or foraging. For fauna, there is nothing unique about the site. None of the habitat within the site is considered essential habitat for any of the species detected or for those that are known to use the habitat occasionally. There is an abundant amount of similar habitat within the lowland areas of the Kona coast.

4.11 Historic Resources - Archaeology

Affected Environment

An archaeological inventory survey with limited subsurface testing was conducted by Cultural Surveys Hawaii in February and March 1996 of the entire project site. The survey, designed to meet the requirements of the Department of Land and Natural Resources - State Historic Preservation Division (DLNR-SHPD) guidelines, included a complete (100 percent) ground survey and limited subsurface testing to determine depth and quantity of cultural materials within archaeological sites, and to obtain datable samples for chronological information. The survey covered lands which fell within portions of the Kaloko and Kohanaiki *ahupua'a* located in the North Kona District of the island of Hawaii. The inventory survey is summarized below and attached as Appendix F.

Inventory Survey Results

The inventory survey identified and documented a total of 55 archaeological sites. The 55 sites are made up of 90 structural and non-structural (lava tubes, blisters and rock shelters) features. Of the 90 features, 50 have been combined into 15 site complexes and the remaining 40 features are classified as single-feature sites. (See Figure 4-9)

Feature Types:

Formal feature type designations are described according to their physical characteristics and commonly refer to structural elements of a site. The 90 features identified within the project area include the following types:

- *Ahu*: A cairn of stacked or piled stones.
- Alignment: A single row of stones one course high.
- C-shape: A walled structure which partially encloses an area.
- Enclosure: A walled structure which completely encloses an area.
- Lava blister: A small subterranean lava formation. Unlike lava tubes, however, they tend to be circular and do not extend in any direction for a great length.
- Lava tube: Modifications or apparent usage of a subterranean lava formation characteristic of pahoehoe lava flows.
- Modified depression: an area in which stones have been removed, usually on a lava flow, to create a depression. A modified depression differs from a planting area in that it appears to have functioned as a storage area rather than a planting area.
- Modified tumulus: an area within an existing lava flow in which a portion of the flow has been humanly modified by the placement or removal of stones (a modified tumulus differs from a modified outcrop in that a modified tumulus is in a field of exposed outcrop whereas a modified outcrop may be surrounded by soil.
- Mound: Linear, circular or amorphous stone pile which typically lacks a vertical face and level surface.
- Pavement: a stone-filled floor or surface.
- Planting area: An area in which the only modification consists of the removal of stones to create an area suitable for agriculture either in soil or possibly through mulching.
- Platform: A raised free-standing stone structure with three or more vertical faces.
- Quarry: An area in which there has been clearly definable mining of stone.
- Rock Shelter: Varying degrees of construction which modifies a rock shelter (or outcrop overhang). This structure is distinguished by an apparent primary focus on the enhancement of natural features.

- Terrace: A raised stone construction partially built against, or level to, a ground or outcrop surface. These structures commonly resemble platforms. Unlike platforms, however, they are not totally free-standing.
- Trail: a trodden lava surface, pavement or stone alignment set into the ground or outcrop surface.
- Wall: A bi-faced and free-standing stone structure which is an isolated segment or defines large boundaries.

Table 4-8
Occurrences of Formal Feature Types

Formal Feature Type	Number Observed	Percentage of Total
Ahu	2	0.022
Alignment	1	0.011
C-shape	1	0.011
Enclosure	9	0.100
Lava blister	2	0.022
Lava tube	8	0.089
Modified depression	2	0.022
Modified tumulus	22	0.244
Mound	2	0.022
Pavement	7	0.078
Planting area	1	0.011
Platform	4	0.044
Quarry	1	0.011
Rockshelter	1	0.011
Terrace	4	0.044
Trail	20	0.222
Wall	3	0.033
Total	90	100.000

As shown in Table 4-8 above, the most prevalent feature types include modified tumuli, trails, enclosures and lava tubes and blisters. Modified tumuli are domed-shaped lava mounds of pahoehoe lava that have been humanly modified for a variety of functions, e.g., temporary habitation or possible burial (MacDonald and Abbott 1970:28). The 9 enclosures observed were used for agriculture, storage or temporary habitation.

Lava tubes and blisters are prevalent throughout the entire region. The tubes and blisters were used for various functions depending upon their size, accessibility and interior environmental conditions. Many blisters and small tubes inspected during the survey showed no evidence of utilization. The range of functions for tubes and blisters within the project area include a possible burial/temporary habitation, temporary habitation, storage and indeterminate. Indigenous artifacts,

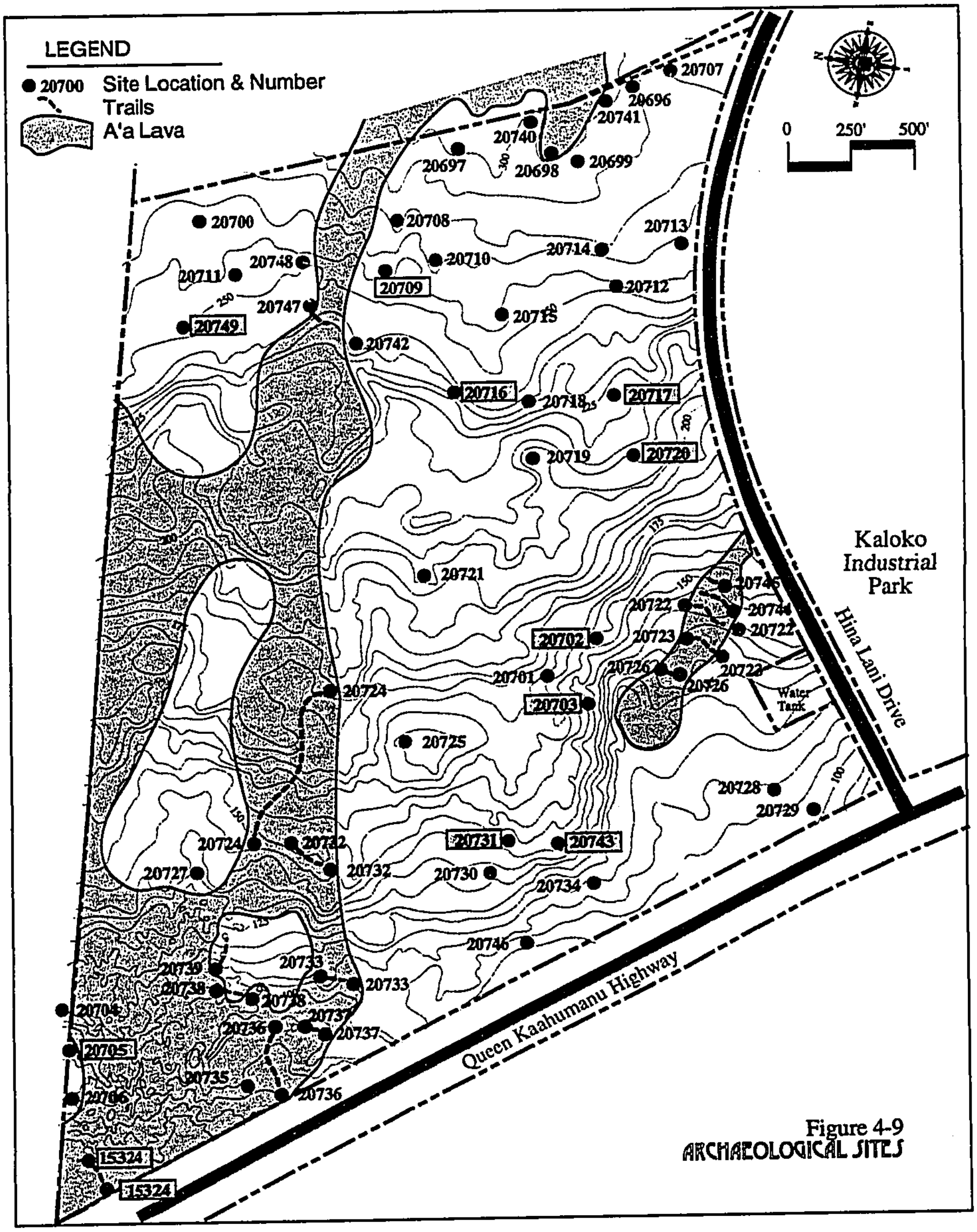


Figure 4-9
ARCHAEOLOGICAL SITES

including volcanic flakes, a scraper, a waterworn basalt manuport, a bird bone pick and a wooden tapa beater were recovered from lava tubes.

Functional Interpretation

The formal features discussed above have been evaluated and categorized by function based on criteria such as site construction and complexity; locational context (in association with other sites and/or geological determinate); analysis of cultural remains (surface and subsurface); and external correlation with other archaeological sites in Hawaii. These functional categories are listed in Table 4-9 below:

Table 4-9
Occurrences of Formal Function Types

Function	No of Sites
Agriculture	4
Possible Burial	7
Recurrent habitation with Agriculture/Storage	1
Temporary habitation	15
Temporary habitation w with Mining	1
Temporary habitation/ Agriculture	1
Temporary habitation/ Agriculture/Transportation	1
Temporary Habitation/ Storage/Transportation	1
Temporary habitation/ Possible burial	1
Temporary habitation/ Transportation	1
Temporary habitation/ Agriculture/Marker	1
Indeterminate	6
Marker	1
Storage	1
Storage/Transpiration	1
Transportation	12
Total	55

Agriculture:

Sites which have been interpreted to have an agriculture function are characteristic of a variation of the "Kona Field System" (State site 50-10-37-6601). The Kona Field System is an intensive, non-irrigated dryland agriculture complex which has been identified along the upland slopes of North and South Kona, from Kealakekua Bay to beyond the northern limits of Kailua Town. The field system is described as a grid-like patterning of rectangular fields formed by earthen and stone boundaries. Typically, the field's long axis walls *(kuaiwi)* extend in a *mauka/makai* direction and are intersected by shorter walled boundaries that cross-cut the slope.

Within the Kona Field System there were four terrestrial subzones classifying areas of different agricultural use within the *ahupua'a*. The four subzones are described as follows:

Kula Subzone -- Coastal Area
Elevation: Sea level to 500 feet
Annual rainfall: c. 30-50 in.
Late Prehistoric Crops: Sweet potatoes, gourd and *wauke* (paper mulberry).

Kaluulu Subzone -- Seaward Slope
Elevation: 500-1000 feet
Annual rainfall: c. 40-55 in.
Late Prehistoric Crops: Breadfruit, with sweet potatoes and *wauke* interspersed; mountain apple and some taro.

'Apa'a Subzone -- Upland Slope
Elevation: 1000-2500 feet
Annual rainfall: c. 55-80 in.
Late prehistoric crop: Taro, sweet potatoes, ti, and sugarcane.

'Ama'u Subzone -- Upland Jungle
Elevation 2500 - 4000 feet
Annual rainfall: c. 80 in.
Prehistoric crops: Bananas and plantains.

Note: Historic period crops were also cultivated in the Kaluulu and Apa'a subzones and to a lesser degree in the Kula subzone. These crops included cabbage, melons, onions, oranges, tobacco, beans, coffee, corn, cotton, pineapple, Irish potatoes and pumpkin.

Agricultural sites within the project area are believed to generally fall within the *Kula* Subzone and appear to be interrelated components of a non-intensive non-irrigated field system within the *ahupua'a*. These sites ranged from minimal constructions, characterized by the removal of stones to clear a small depression within pahoehoe lava to larger more clearly defined enclosures typically abutting a'a lava flows. The sites were probably placed in a fashion to maximize water retention. The scattered nature and rough construction (indicating little energy expended) suggest that intensive agricultural activity was not practiced within the project area. The features found represent agricultural activity associated with temporary habitation and the numerous trails within the project area. Sweet potato was most likely the abundantly grown crop because of its adaptability to stony and dry environments. It was commonly planted in mounds and in pahoehoe excavations. Essentially, the rough terrain, lack of water and soil indicate that agricultural productivity was severely limited.

In general, the agriculture-related sites and features within the project area represent more of an opportunistic approach versus the more expansive/intensive approach practiced at higher, more productive elevations within the Kaloko and Kohanaiki *ahupua'a*. Two of the larger sites enclose natural depressions or undulations in the pahoehoe terrain. Two other sites are constructed on pahoehoe lava which abut edges of a'a flows which in turn act as portions of the enclosure. In all cases, pahoehoe is the preferred substrate with the choice of location based on maximizing soil and water retention.

Burial

A total of eight sites within the project area are considered possible burials (State sites 20702, 20705, 20716, 20717, 20720, 20731, 20743, 20749). Within the eight sites there are nine features consisting of modified tumuli (6 features), a linear mound, a terrace and a lava tube. These features are designated as possible burials because of their rough surfaces which are unsuitable for habitation; their size and location; the apparent filling of existing crevices that would be suitable for human burial; and local informant information (Rev. Norman Keanaaina personal communication). In addition, a lava tube was designated as a possible burial because of the presence of a number of broken bone fragments (possibly human long bone fragments) that appear to have been humanly modified.

Habitation

Twenty three sites are functionally interpreted as habitation sites, eight of which are also associated with non-habitation component features such as agriculture, possible burial, marker, mining, storage, and transportation. All of the sites fit the characteristics of a temporary habitation based on Dr. Ross Cordy's Model (Cordy et al. 1991) of habitation typology. One site (State site 20709) is classified as recurrent habitation because it has characteristics of both a temporary and permanent nature. However, because of its location and isolation from other substantial habitation features, it is believed to have been used on an extended or semi-annual basis rather than on a permanent basis.

Temporary habitation sites generally contain structures that are relatively small, measuring less than 16.0 square meters, and not elaborately constructed. Temporary habitation structures observed in the project area have floor areas which measure between 0.75 to 14 square meters. These sites do not have substantive amounts of construction and appear to have been constructed with relatively little effort and time. The majority of the temporary habitation sites are located on the pahoehoe lava flow which dominates the majority of the project area and appear to be fairly evenly distributed within the project area.

The recurrent habitation site is comprised of four features; a platform, enclosures for agriculture and a lava blister for storage. This site is classified as a recurrent habitation because it is more substantially constructed and larger than temporary habitation sites. In addition, the midden and artifacts recovered was more plentiful than what was recovered from other temporary sites that were tested.

Indeterminate

Sites which lacked features that help to determine function are classified as indeterminate. There were a total of six sites within the project area which have been listed as indeterminate. Two are modified tumuli, one is a wall and three are lava tubes.

Marker

Two sites are considered to function as markers. These consist of two *Ahu* (State sites 20713 and 20719) which is defined as a collection or pile of stones. One site possibly functioned as a boundary marker demarcating the Kaloko/ Kohanaiki *ahupua'a* boundary or border. The second marker possibly functioned as a location marker but its non-conspicuous location adjacent to other features within the site suggest that it functioned as a site specific marker. However, the construction style of this *Ahu* is more oval, or donut shaped, and an alternative interpretation may be that the feature represents a small fire place or hearth related to temporary habitation.

Mining

One site appears to have been used as a quarry for scoria (cinderlike basic cellular lava). The site is located in the southwestern portion of the project area adjacent to a number of trails. This feature consists of an area in which it appears that the outer crust of a high pahoehoe tumulus was removed for use as low grade scoria. Based on the relatively small area of quarrying and lack of associated abrader basins, it is felt that the quarrying activities at this site reflect localized (within the *ahupua'a*) exploitation of the limited resources for local consumption.

Storage

A total of four sites within the project area contain features that function as storage. One type of storage activity was associated with collecting water. These consisted of small modified depressions and a very small enclosure found along existing transportation routes where water catchment receptacles (i.e. gourds) were left to retain rainfall. The other type of storage site consists of lava tubes or blisters which were used to store articles associated with habitation activities.

Transportation

Trails or trail segments were observed within the petition area which formed a network of transportation corridors that traveled both in the *mauka/makai* and cross-slope directions. The trails provide fairly direct coast to uplands routes through the project area as well as access to activity areas such as lithic resource procurement, agricultural pursuits and temporary and recurrent habitation sites within the project area. All of the were identified as type A trails based on a *classification system developed* by Russell A. Apple (1965). These trails are defined as prehistoric and early historical (pre-abolishment of the *kapu* system) single-file foot trails that follow the configuration of the shoreline and extend between the coast and upland localities (Apple 1965: Appendix 2). Designed in accordance with the *kapu* system, the trails did not cross *ahupua'a* boundaries as residents were prohibited from crossing their own *ahupua'a* boundaries. The large number of trails within the project area reveal that the residents of both Kaloko and Kohanaiki had a significant network of travel routes that provided access to resources and exchange of resources between the coast and upland regions of the two *ahupua'a*. Because all of the trails found in the project area are classified as Type A, it appears that travel within the project area was common during the prehistoric period but not as heavy during the historic and modern periods.

Remnants of the Kohanaiki road traverses through the southeastern portion of the project area in a *mauka/makai* direction. The original alignment proved hard to follow as some portions were bulldozed (bulldozer scars on the pahoehoe) while others were visible through stunted vegetation.

<u>Probable Impacts</u>

The distribution of sites correlate closely with expectations for the Intermediate Zone. Sites are near visible portions of trails or near the presumed corridors of trails. However, it is difficult to draw a direct association between certain sites and trails because the majority of sites are on pahoehoe lava where trail identification is difficult. There is a clear preference of pahoehoe terrain over a'a terrain in terms of site location. Approximately 82% of habitation sites, all eight burial sites, and all agriculture related sites or features are on pahoehoe lava terrain or use pahoehoe depressions in a'a lava.

Sites are fairly evenly distributed *makai* to *mauka* within the project area, with habitation and burial site location apparently more dependent on the availability or choice of a natural geological feature than a location associated with a specific ground elevation. The most commonly used geological feature is the pahoehoe tumulus. For habitation, the tumulus provides better air circulation and view plane. For burials, the tumuli have existing cracks and crevices that can be filled relatively easily once human remains have been deposited. . . .

In conclusion, the site/feature types and functions correlate with the anticipated finds for the region and zone within which the project area lies. Habitation sites have been interpreted as temporary in nature, with no permanent habitation sites present. Burials, trails, and lithic resource procurement are documented site types within the Intermediate Zone of the Kekaha region and are present within the project area. Agricultural site/features are also present but represent opportunistic productivity rather than full scale land modification for intensive productivity found at higher elevations.

All the recorded sites in the project area are presumed to be prehistoric, which indicates very little historic period activity. Based on historic information, grazing by goats and cattle was the main form of land use during the historic to modern era. *Mauka/makai* transportation through the *mauka* south corner of the project area is suggested by an old wooden gate within a fenceline near the *mauka* boundary. This gate and rough bulldozing in the vicinity may be remnants of the Kohanaiki Road as it passed into the adjacent Kaloko *ahupua'a*. Presently, the project area is not utilized, though urban encroachment is quite evident with Queen Ka'ahumanu Highway on the western boundary, Hina-Lani Drive and the Kaloko Industrial Subdivision along the southern boundary.

Limited Subsurface Testing

During the course of the inventory survey, limited subsurface testing was conducted at 8 sites (includes a total of 9 different features) which were functionally interpreted to be temporary or recurrent habitations. The testing procedure was conducted to clarify feature or site function, attempt to collect charcoal for radiocarbon dating analysis and to inspect the nature of natural and cultural deposits. The radiocarbon dating analysis is being conducted at this writing.

Midden, recovered from all test units, were predominantly marine, primarily invertebrates or shellfish, and terrestrial consisting of a pig bone, kukui endocarps and an unidentified mammal bone. The predominance of marine midden clearly attests that coastal resources were a primary source of protein-related food for the residents of the Kaloko and Kohanaiki *ahupua'a*.

In addition to midden, a total of 13 indigenous Hawaiian artifacts were recovered from surface or subsurface contexts of the sites in the project area. The majority of the indigenous artifacts is made up of volcanic glass flakes and 1 volcanic glass scraper. All of the volcanic glass artifacts were recovered from a single lava tube. Other items recovered include one waterworn basalt manuport, one bird bone pick and one wooden tapa beater.

Mitigation Measures

Significance and Recommended Treatment

A total of 55 sites of varied archaeological significance are present in the project area. These sites were evaluated for significance in accordance with the criteria established for the National and State Registers as follows:

- A Site reflects major trends or events in the history of the state or nation.
- B Site is associated with the lives of persons significant in our past.
- C Site is an excellent example of a site type.
- D Site may be likely to yield information important to prehistory or history.
- E Site has cultural significance; probable religious structures (shrines, heiau and/or burials present).

Table 4-10 below lists individual sites and associated significance criteria.

Significance criterion C is assigned to two sites (Sites 20703 and 20709). These sites represent the best examples of a temporary habitation site in combination with mining activities and of a recurrent habitation site.

Significance criterion D is assigned to 44 sites in the project area. All provide important information to the settlement patterns and livelihood of the Kaloko and Kohanaiki residents because of their location and structural and functional characteristics.

Significance criterion E is assigned to nine sites within the project area. These include all eight of the possible burials and one of the trails. Further testing or data recovery may alter the significance assessments of the eight possible burial sites.

Recommended Treatment

Of the 55 sites in the project area, 40 sites are recommended for data recovery including further documentation and, if feasible, excavation to address scientific and information interests. Data recovery should proceed in accordance with a data recovery plan which will be submitted to DLNR State Historic Preservation Division and Hawaii County for review and approval. In addition to the 40 sites, one site is recommended for both data recovery and preservation. These sites include a variety of site and function types attributable to traditional Hawaiian use such as habitation (temporary), agriculture, trails and sites deemed indeterminate that have excavation potential.

Ten sites are recommended for preservation. These include the only recurrent habitation site, a temporary habitation site associated with mining, and all eight possible burials. For the site recommended for both data recovery and preservation, a partial preservation of a traditional trail is recommended. The possible burial sites presently recommended for preservation should undergo testing to determine the presence or absence of human burials prior to finalization of any development plan.

No further research is recommended for the remaining 4 sites in the project area as they are deemed to have been subjected to sufficient data recordation.

Table 4-10
Archaeological Site Summary

State Site No. (50-10-27-)	Cult Survey Hi No.	Feature	Formal Site Type	Functional Interpretation	Significance	Probable Age	Recommended Treatment
1534			Trail	Transportation	D, E*	P	DR,Pres
20696	1		Lava Tube	Indeterminate	D	P	NFW
20697	2		Modified Tumulus	Temp Habitation	D	P	DR
20698	3		Pavements	Temp Habitation	D	P	DR
		A	Pavement	Temp Habitation			
		B	Pavement	Temp Habitation			
20699	4		Modified Tumulus	Indeterminate	D	P	DR
20700	5		Complex	Temp Hab/Agric	D	P	DR
		A	Modified tumulus	Temp Habitation			
		B	Enclosure	Agriculture			
20701	6		Modified Tumulus	Temp Habitation	D	P	DR
20702	7		Mod Tum/Mound	Burial (possible)	D, E*	P	Preserve
		A	Modified tumulus	Burial (possible)			
		B	Linear mound	Burial (possible)			
20703	8		Complex	Temp Hab/Mining	C, D	P	Preserve
		A	Platform	Temp Habitation			
		B	Pavement	Temp Habitation			
		C	Quarry	Mining			
20704	9		Complex	Temp Hab/Transp	D	P	DR
		A	Trail	Transportation			
		B	Wall	Temp Habitation			
		C	Trail	Transportation			
		D	Trail	Transportation			
		E	Trail	Transportation			
20705	10		Modified Tumulus	Burial (possible)	D. E*	P	Preserve
20706	11		Modified Tumulus	Temp Habitation	D	P	DR
20707.	12		Lava Tube	Indeterminate	D	P	NFW
20708	13		Modified Tumulus	Temp Habitation	D	P	DR
20709	14		Complex	Recur Hab/Ag/Sto	D	P	Preserve
		A	Platform	Recurrent Hab			
		B	Enclosure	Agriculture			
		C	Enclosure	Agriculture			
		D	Lava blister	Storage			
20710	16		Complex	Temp Habitation	D	P	DR
		A	Lava tube	Temp Habitation			
		B	Alignment	Temp Habitation			
		C	Mound	Temp Habitation			
		D	Modified Tumulus	Temp Habitation			
20711	17		Enclosure	Temp Habitation	D	P	DR
20712	18		C-shape	Temp Habitation	D	P	DR
20713	19		*Ahu*	Marker	D	P	DR
20714	20		Wall	Indeterminate	D	P	DR
20715	21		Terrace	Temp Habitation	D	P	DR
20716	22		Modified tumulus	Burial (possible)	D. E*	P	Preserve
20717	23		Modified tumulus	Burial (possible)	D. E*	P	Preserve
20718	24		Modified Tumulus	Agriculture	D	P	DR

State Site No. (50-10-27-)	Cult Survey Hi No.	Feature	Formal Site Type	Functional Interpretation	Significance	Probable Age	Recommended Treatment
20719	25		Complex	Temp Hab/Ag/Marker	D	P	DR
		A	Rock shelter	Temp Habitation			
		B	*Ahu*	Marker			
20720	26		Terrace	Burial (possible)	D, E*	P	Preserve
20721	27		Modified Tumulus	Temp Habitation	D	P	DR
		A	Pavement	Temp Habitation			
		B	Modified Tumulus	Temp Habitation			
		C	Pavement	Temp Habitation			
		D	Pavement	Temp Habitation			
20722	28		Trail	Transportation	D	P	DR
20723	29		Trail	Transportation	D	P	DR
20724	30		Trail	Transportation	D	P	DR
20725	31		Modified Tumulus	Temp Habitation	D	P	DR
		A	Terrace	Temp Habitation			
		B	Platform	Temp Habitation			
		C	Modified Tumulus	Temp Habitation			
		D	Pavement	Temp Habitation			
20726	32		Trails	Transportation	D	P	DR
		A	Trails	Transportation			
		B	Trails	Transportation			
20727	33		Lava Tube	Temp Habitation	D	P	DR
20728	34		Enclosure	Temp Habitation	D	P	DR
20729	35		Modified Tumulus	Indeterminate	D	P	NFW
20730	36		Modified Tumulus	Temp Habitation	D	P	DR
20731	37		Modified Tumulus	Burial (possible)	D, E*	P	Preserve
20732	38		Trail	Transportation	D	P	DR
20733	39		Trail	Transportation	D	P	DR
20734	40		Planting area	Agriculture	D	P	DR
20735	41		Complex	Temp Hab/Sto/Trans	D	P	DR
		A	Wall	Temp Habitation			
		B	Mod depression	Storage			
		C	Modified Tumulus	Temp Habitation			
		D	Trail	Transportation			
20736	42		Trail	Transportation	D	P	DR
20737	43		Trail	Transportation	D	P	DR
20738	44		Enclosures	Agriculture	D	P	DR
		A	Enclosure	Agriculture			
		B	Enclosure	Agriculture			
20739	45		Enclosure/Trail	Stor/Transport	D	P	DR
		A	Enclosure	Storage			
		B	Trail	Transportation			
20740	46		Modified tumulus	Agriculture	D	P	DR
20741	47		Complex	Temp Hab/Ag/Trans	D	P	DR
		A	Platform	Temp Habitation			

State Site No. (50-10-27-)	Cult Survey Hi No.	Feature	Formal Site Type	Functional Interpretation	Significance	Probable Age	Recommended Treatment
		B	Modified tumulus	Temp Habitation			
		C	Trail	Transportation			
		D	Enclosure	Agriculture			
		E	Modified tumulus	Temp Habitation			
		F	Lava blister	Temp Habitation			
		G	Mod depression	Temp Habitation			
20742	48		Lava tube	Temp Habitation	D	P	DR
20743	49		Modified tumulus	Burial (possible)	D, E*	P	Preserve
20744	50		Trail	Transportation	D	P	DR
20745	51		Trail	Transportation	D	P	DR
20746	52		Lava tube	Storage	D	P	DR
20747	53		Trail	Transportation	D	P	DR
20748	54		Lava tube	Indeterminate	D	P	NFW
20749	55		Terrace/lava tube	Temp Hab/Burial	D	P	Preserve
		A	Terrace	Temp Habitation			
		B	Lava tube	Temp Hab/Burial			

Explanatory Note:
P = *Prehistoric*
DR = Data Recovery
NFW = No Further Work

4.12 Hawaiian Trails

A record research was conducted by R.M. Towill Corporation of portions of lands which make up the project area. The lands are identified as Lot 7-A-1, being portions of Grant 2942 to Hulikoa and Royal Patent 8214, Land Commission Award 7715, Apana 11 to Lota Kamehameha. Research for the existence of documents, descriptions, maps and sketches was conducted at the Bureau of Conveyances, Tax Map Branch, State Survey Office, State Land Management, State Archives, State Department of Transportation and the Planning Department, County of Hawaii.

Original survey notes for Grant 2942 could not be located by the State Survey Office and site specific maps were not available for Grant 2942 and Land Commission Award 7715, Apana 11.

Record research indicate that Grant 2942 and Land Commission Award 7715, Apana 11, have reservations for the rights of native tenants which provides for access to Kuleanas situated within said lands. Findings indicate that a number of roads and trails traversed the area but only a portion of two roads and trails actually passed through the study area. The first is a roadway which runs in a mauka/makai direction from an approximate elevation of 325 feet to 504 feet and is described on a map entitled "Akahipuu Section, North Kona, Hawaii". The second is a set of trails which crossed Queen Ka'ahumanu Highway in a mauka/makai direction, approximately 440 feet South and 850 feet from the boundary of Kaloko and Kohanaiki. There are no reservations for the roadway or trails in the original grants and awards. However, it appears that the roadway was a primary route in early times to get from the sea to the Mauka Government Road. (See Figure 4-10). The complete report is provided as Appendix G.

4.13 Visual Resources

Affected Environment

The project site is about 3,800 feet wide along Queen Ka'ahumanu Highway and extends mauka some 3,600 to 4,400 feet and rises from about 90 feet ground elevation to 340 feet at its mauka border. Because of its size, this parcel will be visible from various vantage points along the coastline and from mauka residential areas along Mamalahoa Highway. With development of the proposed Kaloko Town Center, the visual landscape will change as commercial and residential building forms are constructed on open fields of land. Over time, the panoramic visual landscape will change from an area with only occasional clusters of building forms, to one that gradually fills in as the entire region develops.

The makai side of the project site is seen predominantly from traffic traveling along Queen Ka'ahumanu Highway. From this vantage point, the site appears as barren a'a and pahoehoe lava flows covered with fountain grass grasslands and clusters of shrubs and kiawe trees. The slopes of Hualalai with clusters of residential developments dominates the background view. The existing warehouse buildings of the Kaloko Industrial Park are prominent urban forms which dominate the view of the area.

Probable Impacts and Mitigation Measures

With development, the view from the highway will change as commercial buildings are built. To enhance the appearance of the project as seen from Queen Ka'ahumanu Highway, a 100 foot wide landscaped open space buffer will set back proposed buildings further back than buildings built at the adjacent industrial park.

DOCUMENT CAPTURED AS RECEIVED

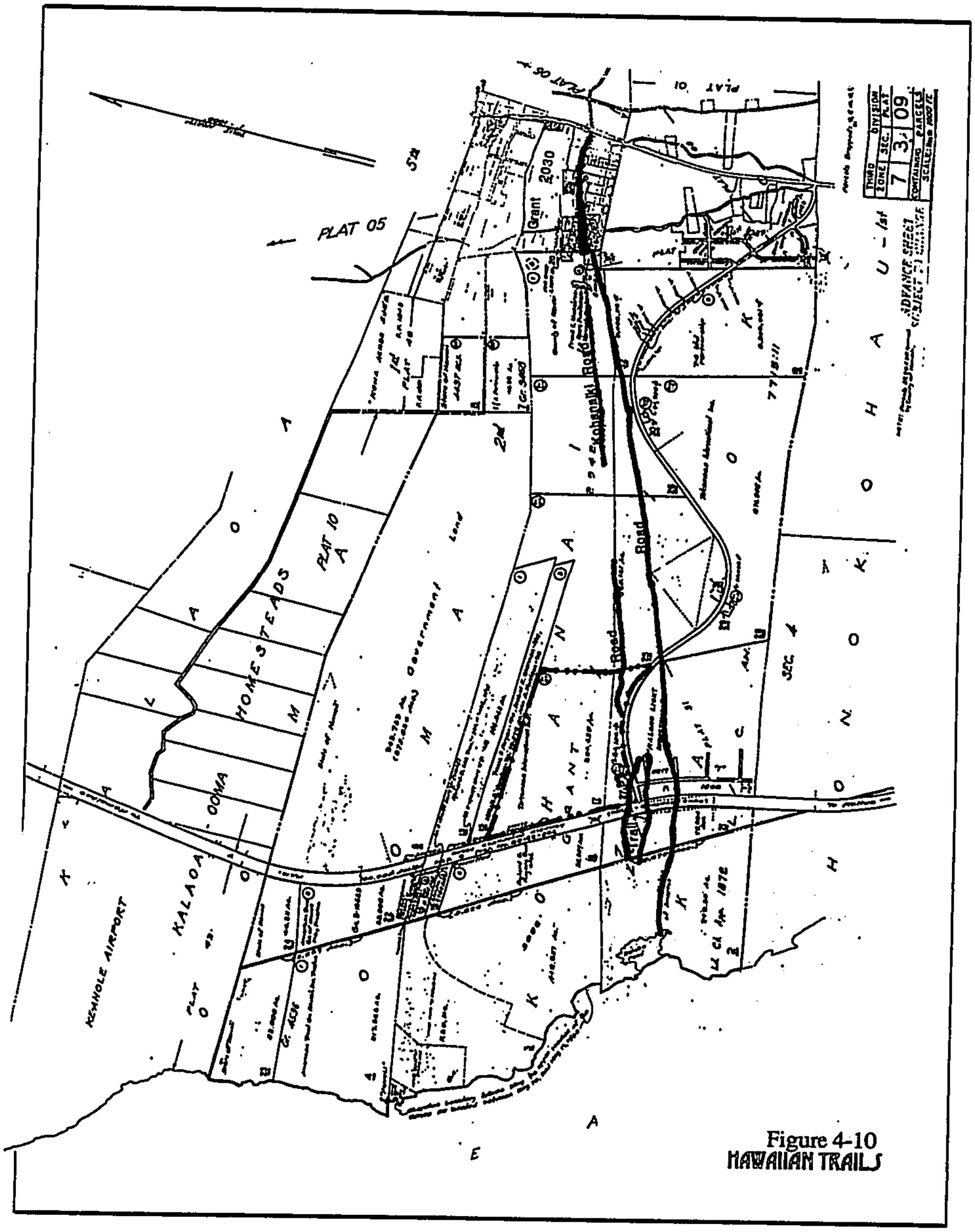


Figure 4-10
HAWAIIAN TRAILS

4.14 *Cumulative Impact: Physical and Natural Environment*

Chapter 200 of Title 11, Environmental Impact Statement rules (11-200-17(I)) requires a discussion of the interrelationships and cumulative impacts of the proposed action and other related projects and of other possible secondary effects.

An evaluation of the cumulative impacts of the proposed action in concert with other proposed projects of the region was conducted by researching potential environmental impacts disclosed in the final environmental impact statements for major projects in the region. The projects include:

1. Liliuokalani Trust (Keahuolu Lands of Kailua-Kona)
2. Kealakehe Planned Development (Villages of La'i'opua)
3. Urban Expansion of State Lands (2,640 acres above Keahole Airport)
4. Kaupulehu Resort Expansion

Looking at the physical environment from an urban design perspective, the existing generalized pattern of development can be characterized as having pockets of development activity clustered in various geographic locations in the district. Residential developments are clustered on the mauka slopes off Mamalahoa Highway, industrial-like activities such as the NELHA and HOST Park, and the Keahole electrical substation are clustered around the Keahole airport, and the Kealakehe WWTP is situated adjacent to the Honokohau Harbor on the coast. Commercial activities including shopping centers and businesses are concentrated in Kailua Town, the historical center of West Hawaii. The existing Kaloko industrial park is located approximately midway from the airport to the town along a major travel corridor. Resort activities are concentrated in the South Kohala District to the north with the exception of the Kona Village and the Hualalai Resort now under construction just north of Keahole Airport.

This current development pattern would change 20 to 30 years hence as more people would be living, working, and playing in the district. The proposed action would be part of the overall change as the physical environment of the region would change from largely open lava fields to a developed landscape which would look more like suburban communities with low rise residences mixed with stores, offices, professional medical facilities, public facilities such as schools and civic centers and a variety of recreational uses including parks, golf courses and natural open space reserves.

Although an additional 6,000 acres would be urbanized if all projects proceed as approved, cumulative changes to climate, soils, or groundwater resources are not expected to be significant. Whether climatic patterns would change as a result of an increase in impermeable surfaces such as additional roads, driveways and rooftops is unknown. Unlike leeward Oahu where an increase in average daily temperatures is attributed by some to urbanization, the likelihood of similar increases occurring in the region is unpredictable. Parts of the existing region surrounding the project site consists predominantly of expansive open lava fields with sparse vegetative cover, while others consist of fountain grass, koa haole shrubland and open mixed shrubland. Whether temperatures would rise as a result of urban development over a 20+ year time frame is difficult to predict. In contrast, with the development of future residential communities and recreational uses, more areas would be devoted to landscaped lawns, gardens and trees which may result in a cooling effect. Currently, there is very little soil cover throughout the region. It is likely that soils would be imported for landscaping purposes which over time would cumulatively change the soil characteristics of the region. With respect to groundwater, surface water runoff and drainage from each project will increase because of the overall increase in impermeable runoff surfaces. Studies conducted for the proposed action conclude that the potential effects on groundwater, the Kaloko fish ponds and the marine environment would not be significant. Similarly, the Liliuokalani Trust project (p. IV-9) and the Kaupulehu Resort Expansion project (pgs. 4-19 to 4-20) report that negative impacts to the groundwater are unlikely since studies have indicated that there are no adverse impacts to groundwater supplies resulting from the proper use of fertilizers and biocides on landscaped areas. Because the Kaupulehu lands extend to the coastline, the concerns are more on coastal water quality. The environmental impact statement reports that mitigation of adverse coastal water quality effects due to applied nutrients and pesticides can be accomplished by insuring an adequate depth of surface soil in any areas planted to turf, use of slow-released nitrogen fertilizers, selection of pesticides and an integrated pest management plan (p. 4-21). The FEIS of Urban Expansion of State Lands recognizes the potential that urbanization will increase the opportunity for pollutants to enter groundwater via storm runoff or as leachate from materials to landscaped areas and that within the region makai of the petition area, there is particular concern about maintaining pristine ocean water because of the proximity of the Natural Energy Laboratory of Hawaii Authority (NELHA) (p. 4-5, 4-6). However, the impacts of such urbanization was not evaluated. Instead, the responsibility to maintain pristine water quality was assigned to potential future developers of this area.

The flora and fauna of the region would be transformed as a result of the cumulative effects of proposed projects. Natural preserves containing rare, endangered or threatened species of plants will be established throughout the region with adequate buffer areas for their protection as mitigative measures proposed by other projects(p. 4-34 - Kaupulehu FEIS, p. 4-17, Urban Expansion of State Lands FEIS, p. IV-24, Kealakehe FEIS). The transformation in flora of the region would more than likely result in an increased amount of introduced plant species that are commonly used for landscaping residences, businesses and public facilities. Impacts on the fauna of the region is not expected as no endangered or threatened species were surveyed. Feral dogs, cats, donkeys and goats will eventually be driven to other habitats outside the region. With the potential increase in landscaping in the region, additional habitats would be made available for birds.

The proposed action and other major projects will result in an increased number of vehicles within the region. More vehicles will have a cumulative impact on the region's air quality, however, air quality projections indicate that air quality levels would not exceed State and Federal Ambient Air Quality Standards for the area. However, with full development of all approved projects and the concomitant increase in population, it is likely that the number of people with respiratory or breathing problems will increase during periods of excessive volcanic haze or vog. Traffic-related noise will increase but noise thresholds can be met through proper planning and design setbacks.

Chapter 5
SOCIO-ECONOMIC FACTORS

5. SOCIO-ECONOMIC FACTORS

5.1 *Profile of the Existing Community* (Earthplan, 1996)

Population Characteristics of the North Kona District

The North Kona District is a broad region that extends from Pu'u Anahulu Homestead to Keauhou and Kainalu. Populated areas fall into five census tracts: Census Tract (CT) 215.01 which covers the area from Pu'u Anahulu to Kealakehe and includes the project site, CT 215.01 (north Kona mauka of Mamalahoa Highway) CT 215.97 (Kainalu), CT 215.98 (Keauhou) and CT 216 (Kailua Town). Populated areas within CT 215.01 occur in the mauka portion of the census tract boundaries. There are no populated areas immediately adjacent to the proposed Kaloko Town Center. (See Figure 5-1).

The population in the project site census tract was approximately 12,623 people in 1990. Like the fast growing north Kona district, the population increased almost six times from 2,600 in 1970 to 12,600 in 1990 and registered average annual growth rates of 11.4% from 1970 to 1980 and 5.4% from 1980 to 1990. With a median age of 32.1 years, the project site census tract has a slightly younger population than Hawaii county and all other census tracts in North Kona. In terms of ethnicity, North Kona differs from the overall Hawaii County in several respects. There are proportionately more Caucasians in North Kona (59%) than in Hawaii County (40%) and correspondingly less Japanese and Filipino. The ethnic pattern for the project area census tract is similar to that of the larger district.

North Kona has a high proportion of people who moved into their house some time in the five years prior to the 1990 census. In Hawaii County slightly over half of the residents (53%) had lived in the same house on years prior to the census, 26% lived in another house on the Big Island, 7% lived on another island and 12% came from out of state. In North Kona, only 39% lived in the same house five years prior to the census, 27% moved to their present house from another house on the island, 7% came from another island. However, almost one quarter of the population came from a different state and 3% came from a foreign county indicating that the North Kona district has a higher proportion of newly arrived residents.

In 1990, there were almost 2,200 households in the project site census tract with an average household size of 2.99 persons. This was slightly higher than the county-wide average of 2.86 and the district average of 2.75 persons per household. The median household income in the project site census tract was $37,500. This was higher than the county's median of $29,712 and the district's median of $35,364 in 1990.

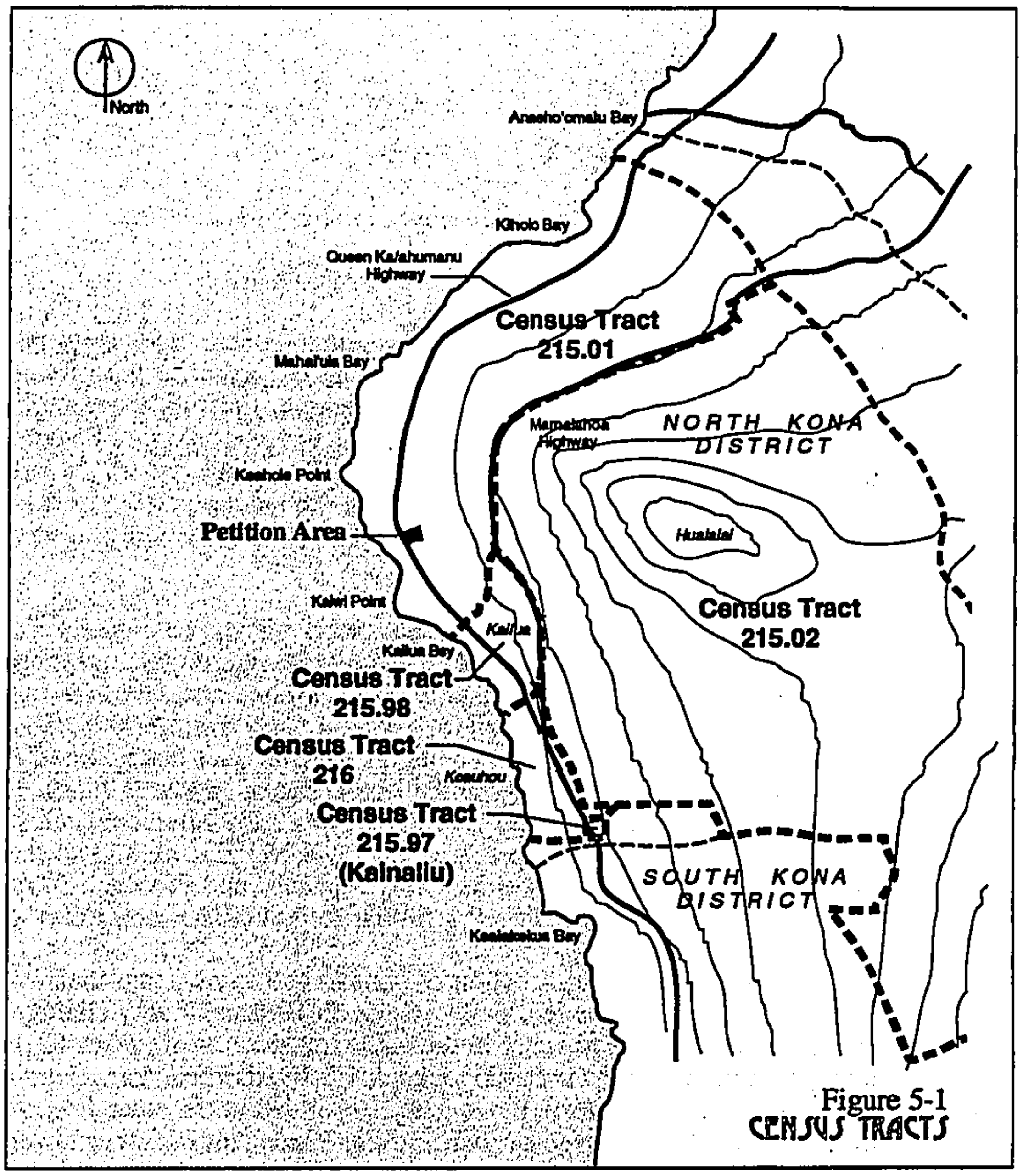


Figure 5-1
CENSUS TRACTS

Housing Units

The North Kona district had a total of 9,990 housing units with a 21% vacancy rate in 1990. This represented 21% of the total housing stock of the island and a higher vacancy rate than that of the island. Approximately 62% of the total units were single family homes compared to 79% of the total county housing stock. In addition, about 45% of the occupied residential units were renter-occupied compared to the 39% of the island. Rent was relatively high in North Kona. It's median rent of $644 was significantly higher than Hawaii County's median rent of $428.

Labor Force Characteristics

North Kona residents and in particular the residents in the project site census tract were very active in the labor force and were able to find jobs. In 1990, 712 % of the residents 16 years and older participated in the civilian labor force as compared to the 64% participation rate for the County. In addition, the non-participation rate in the labor force, i.e., those not part of the labor force due to illness, injury, age, lifestyle choice or other reason but not considered unemployed, was 29 percent as compared to 36 percent for the rest of the County. By type of occupation, those employed in the labor force in the project census tract consisted of 33% in service occupations, 22% in managerial and professional, 17% in technical and sales, and 15% in precision and crafts. These proportions compared similarly to the rest of the county and the north Kona district with the exception that there were slightly more people employed in the service category, e.g., 33% in the project site versus 30% for the entire county. Study area residents generally spent less time commuting to work than island-wide residents. In Hawaii County, the mean commute time to work was 20.8 minutes, in North Kona, 19.0 minutes. However, those living in the project census tract had a longer commute time of 24.3 minutes generally because the census tract covers a very large area and the residential communities are located p[primarily on the mauka areas.

5.2 *Profile of the Regional Community* (Earthplan, 1996)

Population Characteristics and Projections

The North Kona and South Kohala Districts are considered the regional market area for the proposed project because employment and housing opportunities are available in these districts. The population for 1995 for the North Kona and South Kohala Districts is estimated at about 35,900. This represents approximately 26% of the total population of the County of Hawaii. Between 1970 and 1990, the population of the North Kona and South Kohala districts increased an average of 7.7% annually, from approximately 7,100 to about 31,400. This was about 2.4 times the growth rate of the entire County of Hawaii. Projected population for the North Kona and South Kohala districts is estimated at 42,900 by the year 2000.

From the year 2000 to 2020, the population is projected at about 77,700. (See Figure 5-2).

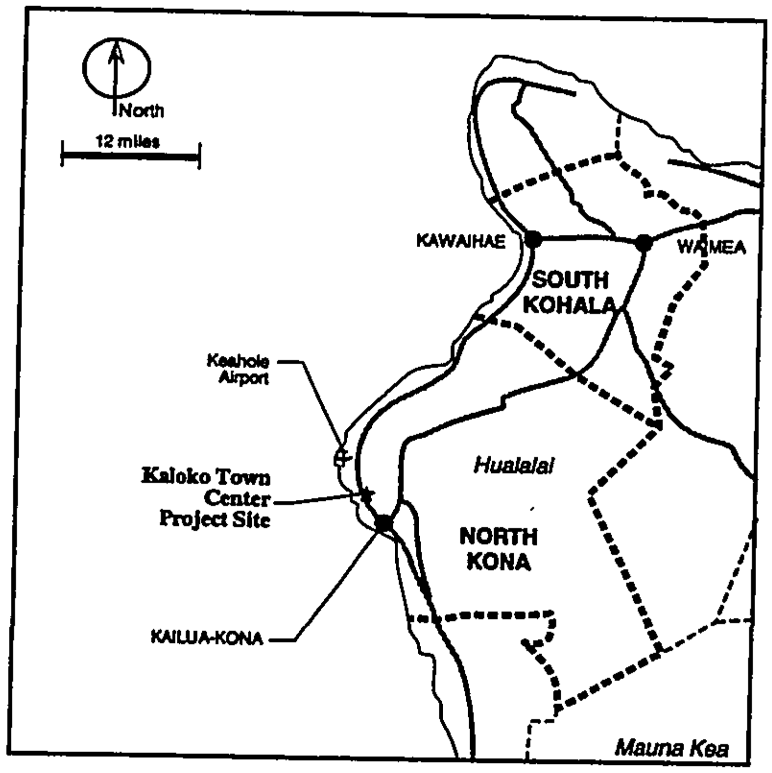


Figure 5-2
NORTH AND SOUTH KOHALA DISTRICTS

Average Household Size

According to the US Bureau of the Census, from 1970 to 1990, average household sizes in the County of Hawaii and the North Kona and South Kohala districts have consistently declined. Hawaii County's average household size decreased from 1970 to 1990 from 3.61 to 2.86 persons per household. North Kona and South Kohala's average household size decreased during the same period from 3.41 to 2.79. Projections of average household sizes from 1995 to the year 2020 assume that the decreasing trend will continue, but at a much slower pace than historically. For Hawaii County, the projected average household size decreases from 2.82 to 2.62 from 1995 to 2020 and 2.76 to 2.59 for North Kona and South Kohala districts.

Number of Households and Projections

From 1970 to 1990, the number of households in the North Kona and South Kohala districts grew an average of 8.7% annually, from 2,100 to nearly 11,000. Using the projected average household size and historical percentage of persons living in households, the projected number of households in the North Kona and South Kohala districts would reach 29,400 or about 16,600 additional households.

Median Household Income

According to the US Department of Housing and Urban Development (HUD), the median household income for a household size of four in 1989 was $36,600 for the North Kona and South Kohala districts or about 10% higher than the median income of $33,200 for Hawaii County. Estimates of 1995 median household income by HUD is $42,800 for the North Kona and South Kohala districts and $38,800 for Hawaii County. Approximately 70% of the households can be categorized as being in either the "affordable" or "gap" income groups, earning up to 140% of the Hawaii County median household income of up to $54,300.

Visitor Arrivals to the State of Hawaii and the County of Hawaii

From 1980 to 1990, visitor arrivals to the State of Hawaii increased from 3.9 million to a peak of almost 7 million visitors, representing an average increase of about 5.9% annually. However, from 1990 to the present, a number of economic events including the Persian Gulf War, collapse of the Japanese investment market, and the economic recessions in the United States and Japan, caused a serious downturn in visitor counts.

Currently, Hawaii's visitor industry appears to be on a rebound. The State of Hawaii Department of Business, Economic Development and Tourism (DBEDT) projects a growth of 5% in 1996, the Hawaii Visitors Bureau projects 2% to 4% in 1996, Bank of Hawaii Economics Division projects 3% to 4% annually through 1997, and First Hawaiian Bank Economics Division projects 3% to 5% annually for 1996 and 1997.

Based on historical ratios of visitors to the island as a percentage of total visitors to the State, in 1985, Hawaii County was able to attract about 19% of all westbound visitors to the State. In 1995, Hawaii County attracts about 22% of the total westbound visitors and about 8% of eastbound visitors. In the future, Hawaii County is expected to attract 22% to 23% of westbound visitors and 8.5% to 11% of eastbound visitors to the State. Through the year 2020, arrivals are projected to increase an average of 3.2% annually, from 1.1 million in 1995 to almost 2.4 million, an increase of almost 1.3 million visitors.

5.3 Market Assessment

A market assessment of the land uses proposed for the petition area was prepared by KPMG Peat Marwick LLP in March 1996. See Appendix H. The assessment reviewed relevant residential, retail and office market conditions in West Hawaii on the island of Hawaii and determined the anticipated market support according to the type and size of each land use proposed for the petition area.

<u>Affected Environment</u>

The market area used to determine demand for housing, retail and office space includes the districts of North Kona and South Kohala in the West Hawaii area of the County of Hawaii. These districts have been the primary growth areas in recent history and continue to transition from a heavily agriculture-oriented economy to a more diverse mixture of agriculture and tourism/service-oriented community. Employment and infrastructure development has been heavily concentrated in this area. The area has also developed as the visitor destination on the island. In 1994, there were 5,700 visitor units in West Hawaii, representing roughly 85% of the total number of visitor units on the island.

5.3.1 Residential Market Assessment

The demand for housing units in North Kona and South Kohala is based upon the projected increase in population and the estimated housing units required to accommodate the population. It also takes into account the desirability of the area and the demand for homes, assuming a sufficient supply of additional housing units are available.

The residential market assessment indicates that:

- Approximately 16,600 households could be added to the North Kona and South Kohala districts by the year 2020.
- About 600 housing units are planned to be constructed on other projects in the area by the year 2000 based upon current development plans with projected sales prices ranging from $150,000 to $500,000.
- Approximately 9,000 additional housing units are proposed but currently have indefinite completion dates or significant hurdles to development.

Thus, by the year 2020, approximately 17,400 housing units could be required in the North Kona and South Kohala districts. This is based upon the estimated 16,600 potential new households and a 5% desired vacancy factor. However, during the same period, only about 9,550 housing units are projected to be constructed at other projects in the area based upon current entitlements and development plans, resulting in a shortfall of almost 7,900 units by the year 2020.

Therefore, based upon the projected demand for additional housing units and the competitive supply, the 480 multifamily and 370 single family residential units planned for Kaloko Town Center could be absorbed at an average rate of 50 units per year (approximately a 17-year absorption period, from 1999 to 2015) accounting for roughly 4% to 10% of the regional market demand in any given period.

5.3.2 Retail Market Assessment

Demand for traditional retail space in the North Kona and South Kohala districts is projected based upon expenditures from regional residents and out-of-state visitors to the island. Projected expenditures from residents are based upon typical retail spending patterns of households while visitor expenditures are based upon the average daily expenditure on retail items surveyed by the Hawaii Visitors Bureau.

Households in the North Kona and South Kohala districts are estimated to spend, on average, about $16,200 annually, or about 38% of the total household income on retail goods. Income is based on households earning 100% of the North Kona and South Kohala median income.

The projected retail expenditure capture rate at the Kaloko Town Center has been based upon an assessment of the project in comparison to he existing retail facilities in the North Kona and South Kohala districts. Assuming an appropriate tenant mix, retail space at the Kaloko Town Center is projected to capture some 10% to 25% of the various household retail expenditures projected for the North Kona and South Kohala districts, resulting in an overall capture rate of about 18%, of $3,000 per household per year in 1995 dollars.

By the Year 2000, annual resident expenditures captured at the Kaloko Town Center (1995 dollars) is projected at about $8.1 million and at about $49.8 million by the year 2020.

In addition the residents, visitors to the area comprise a formidable market for retail development because of the project site's excellent location. Retail demand from visitors is based upon visitor arrival projections to the County and their historical retail spending patterns. Visitors from the US mainland spent on average about $83 per day on retail items. In contrast, visitors from Japan spent about $185 per day.

Thus annual visitor expenditures captured at the Kaloko Town Center (1995) dollars) are projected at about $9.0 million by the year 2000 and $16.7 million by the year 2020.

When resident expenditures are combined with visitor expenditures, by the year 2000, expenditures are projected to reach almost $17. million and will increase to over $66.5 million by the year 2020.

Assuming an overall average sales per square foot of $245 (typical of retail centers in the area), and including a 7% vacancy factor, approximately 75,000 square feet are projected to be supportable by the year 2000, increasing to almost 292,000 by the year 2020. Assuming a 20% site coverage ratio, about 32.4 acres of retail land area could be supported at the Kaloko Town Center.

In addition to traditional retail stores, interviews with residents of adjacent communities were concerned on how the Town Center would fit in with the rest of the area and how beneficial the project will be to the community. Many interviewed indicated that there are insufficient activities for children and families in the Kona area. In light of the concerns expressed, a number of less traditional commercial/retail uses were considered for possible inclusion at the Kaloko Town Center. These include:

- Miniature golf
- Bowling
- Batting cages
- Drive-In theater
- Go-carts
- Family dining/amusement
- Gas station, car wash and convenience store
- Various visitor attraction and support services

With the sites highly visible, central location, and ease of access from the highway, a number of family-oriented activities could be located on the site. The project and the community could also be complemented by a one-stop gas, car wash and convenience store, with a visitor attraction type of factory tours/retail sales also added to take advantage of the site's proximity to the airport. These uses could account for another approximately 21 acres of commercial/retail use at the project site.

In conclusion, based upon the support shown for traditional retail shopping center space, as well as the alternative uses that could be appropriate for the Kaloko Town Center, a total of about 53.4 acres of commercial/retail land area is projected to be supportable by the year 2020.

5.3.3 Office Market Assessment

Demand for office space is projected by accounting for anticipated in crease in population, declining ratios of the amount of office space required relative to the number of residents in the area due to changing technology and business practices, and a 7% vacancy rate. For the North Kona and South Kohala districts, about 748,000 square feet of office space is supportable by the year 2020. Excluding existing office space in the area, by the year 2020, about 354,000 square feet of office space would be required to meet demand. Of this regional market demand, the Kaloko Town Center is assumed to be able to capture about 25%, or about 89,000 square feet of office space by the year 2020. Based on a site coverage ratio of about 37% (approximately 16,000 square feet of office space per acre), about 5.5 acres of office land area could be supported at the Kaloko Town Center.

Based on the foregoing assessments, the projected market support for the proposed developments at the Kaloko Town Center is presented in Table 5-1.

Table 5-1
Projected Market Support at the Kaloko Town Center
Through the Year 2020

Land Use	Market Support
Residential (units)	
Multifamily	480
Single Family	370
Commercial/Retail (acres)	53.4
Office (acres)	5.5

5.4 Economic Impacts

An evaluation of the potential economic and fiscal impact associated with the proposed Kaloko Town Center was prepared by KPMG Peat Marwick LLP. Their findings are summarized in this section and the complete report is attached as Appendix I.

5.4.1 Employment

The Kaloko Town Center will generate short-term employment during the construction and sales/lease up of various aspects of the development, and long-term employment in the sales, operations and support of the various projects upon completion. Employment is classified as being direct, or indirect and induced.

Direct construction employment attributed to the Kaloko Town Center would be in the form of laborers, operators and craftsmen, as well as professional, managerial, sales and clerical workers working elsewhere in the island or State. Based on estimated development costs and anticipated construction schedule, average industry wages adjusted to 1995 dollars, an estimate of the percentage of development costs that are devoted to labor, and estimated wage and benefits costs of an average construction worker, the number of full-time equivalent (FTE) employment was calculated.

Direct construction employment from the development of the Kaloko Town Center is estimated to range from an average of about 60 to 130 FTE positions annually. Jobs created would start at about 130 FTE annually for the first 10 years, decrease to 80 FTE during the second 10 year period and average about 60 FTE positions during the final 10 year period. Overall, total direct construction employment is projected to amount to about 1,770 FTE employees over the life of the project.

Indirect and induced construction employment are expected to be stimulated by direct construction employment at the Kaloko Town Center. Estimates of indirect and induced employment are based upon 1991 ratios provided by the Department of Business, Economic Development's Input-Output Model and Hawaii Econometric Model. It is estimated that an additional 0.79 FTE positions can be attributed to every direct FTE position in the construction industry. Based on this ratio, an average of about 100 FTE positions annually are projected for the initial three year period, decreasing to about 60 FTE positions in the subsequent 10-year period and then declining to about 50 FTE positions over the final 10 year period. Overall, indirect and induced employment is projected to account for roughly 1,400 FTE positions over the term of the project.

Total direct, indirect and induced construction employment is projected to range from about 110 to 230 FTE positions annually. Total employment is projected to account for almost 3,200 FTE positions up to the year 2020.

Direct operational employment attributed to the Kaloko Town Center are estimated based upon the Urban Land Institute's (ULI) "Development Impact Assessment Handbook" and marketing experience of similar projects. Operational employment includes such as positions in sales, operations and management of the various commercial/retail facilities as they are completed. By the Year 2000, about 219 FTE positions are projected, increasing to 559 and 995 FTE positions by the year 20101 and 2020.

Indirect and induced operational employment within other industries on the island and elsewhere in the State is projected to occur during the sales/lease-up and facility operations at the Kaloko Town Center. Employment multipliers developed by DBEDT suggest that for every direct position, an average of 2.16 FTE positions for others services and 0.66 FTE positions for retail services could be generated. This would generate 11 FTE positions during the sales and lease-up period in the years 2000 and 2010, respectively.

Operation of the various commercial/retail facilities would generate an estimated 160 FTE positions in the initial period, increasing to about 380 and 660 FTE positions by the years 2010 and 2020. As a result, total direct, indirect and induced operational employment is projected at 380 FTE positions in the year 2000, 940 FTE positions by the year 2010 and 1,660 FTE positions by the year 2020. See Table 5-2.

Table 5-2
Project Employment (Full-Time Equivalent Positions)

Type	Average Annual FTE Positions 1998-2000	2001-2010	2011-2020	Total FTE Positions
Construction				
Direct	130	80	60	1,770
Indirect & Induced	100	60	50	1,400
Subtotal	230	140	110	3,170
Operational				
Direct	220	560	1,000	1,780
Indirect & Induced	160	380	660	1,200
Subtotal	380	940	1,660	2,980
Total Employment	610	1,080	1,770	6,150

5.4.2 Population

Development of the Kaloko Town Center will result in an increase in households and population in the North Kona district. As the multi-family and single family units come on line, the number of households at the Kaloko Town Center are projected to be at about 90 by the year 2000, 540 by the year 2010 and 770 by the year 2020. Projections were based on the significant demand for residential units in the North Kona area, projected average household size of 2.56 persons for multi-family units and 2.96 persons for single family units, and a 90% occupancy rate.

The population increase resulting from the residential units are projected at about 230 by the year 2000, 1,470 by 2010 and 2,090 by the year 2020. See Table 5-3. The majority of the residents (about 75%) are projected to be current residents living elsewhere on the island of Hawaii. The remaining 25% of the future residents would come from the other islands and out of state. Future residents coming from other islands or out of state are projected at about 180 residents by the year 2000, 570 by the year 2010 and 850 by the year 2020. These include future residents living in the Kaloko Town Center community as well as other residents living off-site who move to Hawaii County because of employment opportunities created by the Kaloko Town Center. Of the future residents who migrate to Hawaii County, it is estimated that about 15% would be new State residents coming from the mainland or foreign countries. See Table 5-4.

Table 5-3
Projected Number of Households and Population

	2000	2010	2020
Incremental Growth			
On-site Households	90	450	230
On-site Population	230	1,240	620
Cumulative Growth			
On-site Households	90	540	770
On-site Population	230	1,470	2,090

Table 5-4
Projected Additional In-Migrant Resident Population

	Assumptions	2000	2010	2020
County of Hawaii	25% of total			
On-site Community Res		58	368	523
Off-site Community Res		127	205	328
Total		180	570	850
State of Hawaii				
On-site Community Res	15% of total	35	221	314
Off-site Community Res		50	126	225
Total		80	350	540

5.4.3 Personal Income

The proposed Kaloko Town Center would generate additional personal income for residents of Hawaii County and the State of Hawaii who are directly employed in the construction or long term operation of the Kaloko Town Center. For Hawaii residents employed in construction, personal income would average approximately $4.8 million annually during the initial three years, decline slightly to $3.0 million and $2.2 million annually respectively as construction winds down over the subsequent 10 year periods. For those employed in the operation of the Kaloko Town Center, personal income generated is estimated to be about $.44 million in the year 2000, $10.9 million in 2010 and $19.0 million in 2020. In total, annual personal income for both construction and operational employment is projected at almost $9.2 million in the year 2000, increasing to $13.8 million in the year 2010 and $21.2 million in the year 2020. See Table 5-5.

Table 5-5
Projected Direct Personal Income

	Full-Time Equiv Wages	2000	2010	2020
Direct Employment				
Construction		130	80	60
Operational				
Prop Mgt & Sales		5	5	0
Coml/Retail		219	559	995
Direct Personal Income				
Construction	$36,900	$4,797	$2,952	$2,214
Operational				
Prop Mgt & Sales	36,400	182	182	
Coml/Retail	19,100	4,183	10,677	19,009
Total Personal Income ($000's)		$9,160	$13,810	$21,220

5.5 Fiscal Impacts

Fiscal impacts consider the effects of additional operating tax revenues generated by the proposed action compared against the additional operating expenditures required by the County and State governments to service the proposed action. The proposed Kaloko Town Center is expected to generate significant positive fiscal benefits to Hawaii County and the State of Hawaii.

5.5.1 County Revenues

County government revenues would be generated in the form of additional real property taxes, and other taxes on fuel, utilities, motor vehicles, etc. State revenues would be composed of general excise taxes, additional personal income taxes and miscellaneous taxes including automobile, gas, etc.

A net increase in property tax revenues to the County that is attributable to the Kaloko Town Center are projected at about $360,000 in the year 2000, increasing to about $860,000 and $1,220,000 in the years 2010 and 2020, respectively. In addition, non-real property revenues are projected at about $30,000 in the year 2000, $90,000 and $130,000 in the years 2010 and 2020. Combined, the total increase in tax revenues is projected at about $390,000 in the year 2000, $950,000 in year 2010 and $1,400,000 in the year 2020.

5.5.2 State Revenues

State tax revenues from direct construction spending would be generated by general excise taxes. Taxes generated are projected to average about $590,000 annually for the first three years, then decrease to $390,000 in the subsequent 10 year period and $270,000 thereafter for the final 10 year period. In total, about $8.4 million in additional general excise taxes are projected.

In addition, indirect and induced expenditures are expected to generate additional tax revenues. About $210,000 to $450,000 annually would be expected over the respective years resulting in a total of about $6.4 million in indirect and induced general excise taxes. Combined tax revenues derived from direct, indirect and induced expenditures related to construction spending could approach about $14.8 million.

Additional state tax revenues will also come from additional personal income taxes from those that are directly employed at the Kaloko Town Center. Personal income taxes are projected to generate an average of about $920,000 to $2.1 million annually over the life of the project. This is based on an average effective State income tax rate of 10%. These miscellaneous taxes include general excise, automobile, gas and specific taxes from new residents to the State of Hawaii. Revenues from these sources are projected at $60,000 in the year 2000, $240,000 in the year 2010 and $370,000 in the year 2020.

Total revenues to the State attributable to the development of the Kaloko Town Center is projected at about $2.0 million in the year 2000, $2.3 million in 2010 and $3.0 million in the year 2020. See Table 5-6.

Table 5-6
Projected Tax Revenues to County and State Government Attributable to the Kaloko Town Center

	2000	2010	2020	Total
County of Hawaii (1995 $000's)				
Net new property tax revenues	$360	$860	$1,220	
New non-real property tax revenues	$27	$86	$128	
Total New County Tax Revenues	$390	$950	$1,350	
State of Hawaii (1995 $000's)				
General Excise Tax Direct	$590	$390	$270	$8,360
General Excise Tax Indirect & Induced	$450	$300	$210	$6,430
Total General Excise Tax	$1,040	$690	$480	$14,790
Total Personal Income Taxes	$920	$1,380	$2,210	
Total Misc Taxes	$60	$240	$370	
Total new State Tax Revenues	$2,020	$2,310	$2,970	

5.5.3 Government Operating Expenditures

As the Kaloko Town Center develops over time and additional households and residents move into the area, additional expenditures by the State and County governments will be required to pay for public services. An analysis of various government operating expenses indicate that the County of Hawaii spends about $940 per resident. This was based on fiscal year 1994 expenditures escalated by 2.2% to estimate expenditures as 1995 dollars. At $940 per resident, new County expenditures directly attributable to the Kaloko Town Center are projected at $170,000 in the year 2000, $540,000 in the year 2010 and $800,000 in the year 2020. See Table 5-7.

The State of Hawaii spends about $4,790 per resident in 1995 dollars. In comparison to the County, State expenditures are perhaps a reflection of the high cost of running the State government. According to the latest Census Bureau figures, Hawaii ranked ninth among the 50 states in the ratio of state workers to population, and first when school, health, air/transport employees are included. (The Honolulu Advertiser, April 29, 1996, p 1, 2). New State expenditures directly attributable to the Kaloko Town Center are projected at $380,000 in the year 2000, and $1.7 million and $2.6 million in the years 2010 and 2020, respectively. See Table 5-8.

Table 5-7
County of Hawaii Additional Government Expenditures
Attributable to the Kaloko Town Center

Function	Total Expenditures FY '94 ($000's)	Service Population	Annual Expenditure per County Resident	
General Government	$15,888	134,100	$118	
Public Safety	50,583	147,800	342	
Highways	4,766	147,800	32	
Health and Sanitation	9,781	147,800	66	
Public Welfare	11,233	134,100	84	
Public Schools	290	134,100	2	
Recreation	9,587	147,800	65	
Interest	6,459	147,800	44	
Bond Redemption	4,923	134,100	37	
Retirement and Pension	14,024	134,100	105	
Mass Transit	1,088	147,800	7	
Cash Capital Improvements	3,193	147,800	22	
Miscellaneous	11,543	134,100	86	
Total 1994 Dollars	$143,358		$924	
Total 1995 Dollars			$940	
		2000	2010	2020
New Residents				
On-Site Residents		58	368	523
Off-Site In-Migrants		127	205	328
Total new residents		180	570	850
New County Expenditures (1995 $000's)		**$170**	**$540**	**$800**

Table 5-8.
State of Hawaii Additional Government Expenditures Attributable to the Kaloko Town Center

Function	Total Expenditures FY '94 ($000's)	Service Population	Annual Expenditure per State Resident
General Government	$480,514	1,172,000	$410
Public Safety	187,381	1,276,400	147
Highways	125,105	1,276,400	98
Natural Resources	42,560	1,276,400	33
Health and Sanitation	186,710	1,276,400	146
Hosptials & Institutions	331,924	1,172,000	283
Public Welfare	831,575	1,172,000	710
Education	1,432,753	1,172,000	1,222
Recreation	37,985	1,276,400	30
Utilities & Other Enterprises	286,438	1,276,400	224
Debt Service	460,258	1,276,400	361
Retirement and Pension	275,168	1,172,000	235
Employees' Health Insurance	622	1,172,000	1
Unemployment Comp	243,985	1,172,000	208
Grants-in-Aid to Counties	2,375	1,276,400	2
Urban Redev & Housing	142,609	1,172,000	122
Cash Capital Improvements	455,369	1,276,400	357
Miscellaneous	112,760	1,172,000	96
Total 1994 Dollars	$5,636,091		$4,684
Total 1995 Dollars			**$4,790**

	2000	2010	2020
New Residents			
On-Site Residents	35	221	314
Off-Site In-Migrants	50	126	225
Total new residents	80	350	540
New State Expenditures (1995 $000's)	**$380**	**$1,680**	**$2,590**

Summary of Government Revenues and Expenditures

By comparing the increases in tax revenues of the County and State against the increased expenditures, an estimate of the net change is helpful in determining fiscal impacts. For the County, the net additional revenues are projected to be about $217,000 in the year 2000, and escalating to approximately $406,000 and $548,000 by the years 2010 and 2020, respectively. The tax revenues are projected to be about 2.3, 1.8, and 1.7 times the additional operating expenses incurred by the Kaloko Town Center development in the later years. See Table 5-9.

For the State, net additional revenues are projected at about $1.6 million in the year 2000, declining to $630,000 and $380,000 in the years 2010 and 2020, respectively. The initially higher revenues are attributable to higher levels of construction at the initial stages of the project. State revenues are projected at about 5.2 times expenses in the year 2000, and then taper off to 1.2 and 1.0 times in the later years. See Table 5-10.

Table 5-9
Summary of County Government Revenues and Expenditures
(1995 $000's)

	2000	2010	2020
New County Revenues	$387	$946	$1.348
New County Expenditures	(170)	(540)	(800)
Net Additional Revenues	$217	$406	$548
Revenu/Expenditure Ratio	2.3	1.8	1.7

Table 5-10
Summary of State Government Revenues and Expenditures
(1995 $000's)

	2000	2010	2020
New State Revenues	$2,020	$2,310	$2,970
New State Expenditures	(380)	(1,680)	(2,590)
Net Additional Revenues	$1,640	$630	$380
Revenu/Expenditure Ratio	5.2	1.2	1.0

5.6 *Social Impact*

A social impact assessment of the proposed Kaloko Town Center was prepared by Earthplan . The assessment which describes the existing community, identifies potential social impacts and discusses current community issues is summarized below and presented in its entirety as Appendix J.

<u>Affected Environment</u>

Polices and Plans Which Guide Change

Changes to communities are often influenced by public policy. Identifying relevant public policies helps to extend the baseline information on existing communities by exploring the type of change directed by public policy.

The following county-wide public policies were identified for their relevance to the proposed project area and are summarized below:

- State DBEDT long-range population and economic projections to the year 2010 (referred to as the M-K Series): *predicts a net population* increase of 29% between 1990 and 2000
- The Hawaii county General Plan which advocates further development of diversified agriculture and aquaculture, protection of the Kona coffee belt, and the continued support of the University of Hawaii's Ocean Thermal Energy Conversion project. It proposes the establishment of a small resident college, expanding existing public school facilities, encourages new industries throughout North Kona, particularly in the area surrounding the airport, discourages strip resort development along Alii drive. The Kaloko Town Center is designated for Urban Expansion.
- State 5 Year Land Use Boundary Review which projects a 49 percent increase in population for North and South Kona districts between 1990 and 2000, and 41 percent between 2000 and 2010 suggesting a need for an additional 3,155 acres of urban land to meet demand. As part of the Keahole to Kailua Urban area, the Kaloko Town Center project site was recommended for redesignation from Conservation to Urban.
- West Hawaii Regional Plan which designates the area surrounding the proposed Kaloko Town Center as the Keahole to Kailua "Subregional Planning Area" to support resort, residential, industrial and agricultural development through a variety of land uses.
- Northwest Hawaii Open Space and Community Development Plan which identified the Keahole to Kailua area as the principal regional support community.
- Keahole to Kailua Development Plan which serves as the implementation tool in this region for the County General Plan

establishes a lowland urban zone for the land surrounding the proposed Kaloko Town Center as an area appropriate for urban expansion.

Evidently, public policy clearly indicates consensus that substation regional development should occur in the project area and surrounding North Kona district.

Preliminary Community Issues

Community issues are people's reactions to the proposed actions. Issues are opinions and they change over time, as people's priorities and values change. Also, in some cases, the proposed action changes in response to issues raised by the community and public officials.

An issues analysis was conducted to identify and analyze community issues regarding the proposed project. The methodology identified and analyzed community concerns about the proposed action, considered feelings and concerns of the existing community, and identified social trends in the context of the overall project. The primary source of information for this analysis were confidential and informal interviews held with various people in the community. Individuals were asked to share information and opinions as individuals and not as a representative for any particular organization. However, knowledge of the person's affiliations provides an indicator of the person's interests and/or perspectives.

Four groups were interviewed to achieve a cross section of interests. These included: 1) Mauka residents of nearby residential communities; 2) Nearby Users including people involved in the Kaloko Industrial Park, landowners and developers and people involved with the Kaloko-Honokohau National Historic park; 3) Community and Cultural Organizations including organizations such as the Kona Conservation Group, the Kona Hawaiian Civic Club, Greater Kona Community Council, Protect Kohanaiki 'Ohana, the Kona-Kohala Chamber of Commerce, and Plan to Protect; and 4) Social service and public officials such as those working in youth and family organizations, the police and fire departments, recreation and medical profession. A list of the people interviewed can be found in Appendix J, pgs 33-37.

Feelings about the Existing Community

One aspect of the issues analysis involved asking interviewees to identify strengths and problems in their community. The responses are listed according to strengths and problems as follows:

Strengths

- The human element or strong sense of community with a willingness to participate for a common good despite divergent interests or purposes and a willingness to take action.

- The continuing sense of a rural lifestyle consisting of the orientation to the ocean and agriculture, the natural physical resources of the ocean, shore and land, the regional climate, and a very strong presence of the host kanaka maoli culture expresses in tangible forms (facilities and sites) and intangible forms (cultural activities).

Problems

- The social and economic diversity of the community creating problems when different groups work against each other. For example, long-time residents feel that newcomers do not appreciate the host culture, tend to take on a "gangplank mentality" to keep others out, and lack long term commitments. Newcomers, on the other hand, feel that long-time residents do not welcome recent residents, and are too quick to accept changes in the name of jobs and economic development.
- The extent and effectiveness of comprehensive planning, which promote extensive development and growth but does not include realistic provisions for implementation.
- The unfair allocation of government funds and priorities, particularly noted by long-time residents, with more going towards Hilo than Kona.
- The inconsistency on the part of government decision-makers with plans once adopted resulting in piecemeal zoning and variances. Government officials do not really listen to public input. It was noted that cultural impact studies would be able to point out impacts on traditional kanaka maoli practices and could have alleviated the need for current land use related lawsuits.
- The inadequacy of public services and facilities including a worsening traffic problem because roadway improvements are implemented too slowly and utilities are not provided in a timely manner, police staffing and hospital facilities have not kept pace with resident population increases.
- The very overcrowded existing school facilities leading to stress and behavioral problems and crime.
- Funding cuts noted by Social service providers when services are needed the most. Any new project will further stretch too little resources.
- The inadequate areas and facilities for recreation both in schools and in the larger community contributing to youth-related crime and family stress.
- The economic problems associated with an oversupply of wholesale and large retail establishments placing existing retailers and small businesses at a competitive disadvantage.
- The weak economy causing family stress as parents work long hours compounded by the high cost of housing, lack of affordable housing and high cost of land.
- Future growth was viewed with mixed reactions. Some wanted to see tourism expand to capitalize the international market while others

wants a moratorium on new projects until the already approved projects are built or "removed from the books".

- Regarding planning, government officials should be more responsive to the communities they serve, place more emphasis on public facilities improvements and infrastructure upgrades and include objective cost-benefit analysis in land use decision-making and cultural impact studies as a standard element of EISs.

Reactions to the Kaloko Town Center

In general, the Kaloko Town Center did not elicit comments that were specific to the site. The project land use components were not considered unique or different and did not generate strong feelings about the project itself. Rather, most reactions the project were in the context of regional development and change. These are summarized as follows:

- The location of the Kaloko Town Center was considered consistent with expected growth, was in an area slated for growth, and was consistent with public plans.
- The project's timing was a key factor because several land use changes granted to other projects have not been built and infrastructure and public facility improvements have not kept pace with the demands of the increasing population. The Kaloko Town Center was seen as a reasonable but premature effort.
- The overall Kaloko Town Center would have mixed effects on neighboring users and developments. Nearby landowners and developers felt that the project would have either a positive effect or no impact at all on their own development. Mauka residents were concerned about allowing multi-family units mauka of Queen Ka'ahumanu Highway particularly in an area which has mostly single family units. Makai users felt that the installation of a sewer system connected to the municipal system would be positive as it would it would eliminate the existing cesspool system and its potential negative effects on the shore and ocean of Kaloko -Honokohau National Park.
- The proposed park and school site was appreciated in light of the problems with existing facilities but untimely implementation and inadequate staffing problems should be addressed. It was suggested that the developer take the initiative to build the school and maintain the park.
- The housing component was viewed as a possible solution to the high cost of living provided that the homes, small lots or multi-family units would be affordable to local residents. However, concern was raised over the appropriateness of multi-family units in the area as the mauka area is predominantly single family. Single family residences were preferred as a means to reduce the density. In addition, development of residential in the warm, dry weather of the project site was seen as a

potential problem because there would most likely be an increased electrical demand for air conditioning.

- The feasibility of the commercial component was questioned by those who felt that there is an oversupply of commercial establishments in the area. The three major outlets plus other existing commercial establishments appear to more than adequately meet the retail demand of the existing population.

Recommendations

The people interviewed were asked to offer their recommendations regarding the proposed project. Their recommendations are listed below without any priority.

- Be culturally sensitive and understand the cultural significance of the site.
- Do a cultural impact study.
- Build truly affordable housing that would benefit the community.
- Build less units to decrease density.
- Build less or no multi-family units.
- Be environmentally sensitive, use non-reflective, non-glare building materials.
- Maintain the park through the homeowners' association and do not dedicate it to the County..
- Help the larger community by opening up the park, building a teen and community center.
- Do as much as you can to facilitate the operation of the school and build the school.
- Make sure the community is well-landscaped with native vegetation. The area is dry and the landscaping will need to be constantly maintained.
- Put in bike/walking/skating/running paths.
- Make sure you meet all of your infrastructure and utility needs.
- Connect the project to the municipal sewer system.
- Make sure nearby uses have to connect to the municipal sewer system.
- The additional ingress/egress to Queen Ka'ahumanu Highway is too close to Hina Lani Drive.
- Put in a cloverleaf intersection at Hina Lani and skip the new road.
- Signalize Hina Lani Drive.
- Build the commercial area cautiously. The market is already inundated.
- Make sure the commercial uses have enough parking.
- Put in more light industrial areas.
- Put all utilities underground.
- Wait.
- Don't build until most of the approved projects are completed.

<u>Probable Impacts and Mitigation Measures</u>

Potential Social Impacts

Potential social impacts which may occur in the study area as a result of the proposed Kaloko Town Center are presented in this section.

The Kaloko Town Center will impact the population of the area by adding 850 residential units and an estimated 2,240 to 2,300 new residents at full build out. This additional population would account for about a 10% increase over the 1990 North Kona population of 22,284 and about 6% of the projected 2000 population of 35,700. In the project site census tract, the 1990 population of 2,944 would increase by 78%.

Relationship with Regional Development

The Kaloko Town Center is consistent with public plans and policies for the future of the region and will be compatible with changes already planned for the area. The project site is designated for Urban Expansion on the Hawaii County General Plan, is recommended for redesignation from Conservation to Urban in the OSP Five-Year Boundary Review, is located in the Keahole-Keauhou Resort Destination Node in the West Hawaii Regional Plan, and is recommended for urban expansion in the Keahole to Kona Development Plan. The project is also likely to complement other projects proposed in this vicinity as it will provide housing for people who may work in these other projects as well as expand the housing market by adding more multi-family and small single-family units to the regional inventory.

Relationship with Neighboring Uses

The Kaloko Town Center is not expected to affect the industrial users of the neighboring Kaloko Industrial Park. Future residents of Kaloko Town Center should not be affected by the Kaloko Industrial Park because light industrial uses are regulated to avoid the more noxious and offensive impacts associated with heavy industrial uses. The residential uses planned do not abut light industrial operations of Kaloko Industrial Park and is buffered by Hina Lani Drive.

The Kaloko Town Center may affect mauka residents who have a view of the project site. The existing undisturbed landscape would be transformed as commercial buildings, parking lots and residences are constructed and would appear as an extension of the urban environment already created by the Kaloko Industrial Park. This visual impact is not unique to the project site because the region between Kealakehe and Keahole is planned for substantial growth and in time much of this region will attain a more urbanized character.

To mitigate such impacts, the development should be attractively landscaped and well-maintained. Structures should be designed to be environmentally sensitive and compatible and the use of non-reflective, non-glare roofing material should be considered.

The Kaloko-Honokohau National Historic Park is located makai of the Queen Ka'ahumanu Highway, slightly southeast of the project site. The park encompasses some 1,161 acres and was established as a national historic landmark to preserve the natural and cultural resources of the area. Although the park is not fully operational, the number of visitors to the park has increased from 12,500 in 1988 to 46,790 in 1991. A large proportion of this increase is attributed to beach users of the Honokohau parcel which was acquired in late 1990.

The Kaloko Town Center may have an indirect beneficial impact on the park and its resources. Development of the project will include the installation of a sewer line sized to accommodate other users along the highway to the municipal sewer system at Kealakehe. Other existing uses, including the Kaloko Industrial Park which is currently on cesspools, will be hooked up to the sewer system thereby eliminating potential groundwater pollution impacts to the fishpond and shoreline environment.

5.7 Cultural Impacts

This section examines potential impacts of the proposed development on native Hawaiian culture and suggests appropriate measures for its protection. It is meant to be an informational discussion disclosing potential impacts on specific rights, culture and traditions of native Hawaiians as they apply to this petition area. The cultural impact assessment was prepared by Hallett H. Hammatt, Ph.D., David W. Shideler MA and Cultural Surveys Hawaii. The report is summarized in this section and reproduced in its entirety as Appendix K.

<u>Affected Environment</u>

Legal background

Issues relative to Native rights are covered in a number of legal documents:

1. Hawaii Revised Statutes (HRS) Chapter 7 :Miscellaneous Rights of the People, Section 7-1, "Building Materials, water etc.; landlords' titles subject to tenant's use."
2. State Constitution of Hawaii, Article XII section 7 "Traditional and Customary Rights",
3. Kalipi v. Hawaiian Trust Company, et. al. (Civil Case No. 2808 in the Second Circuit Court of Maui) filed on August 29, 1975,
4. Pele Defense Fund v Paty (1992) (hereafter PDF)

5. Public Access Shoreline Hawaii (hereafter PASH) v Hawaii County Planing Commission and Nansay Hawaii, Inc. (Supreme Court of Hawaii, Cite as 79 Hawaii 425 (1995)).

The basis of the laws of our State are explained by Hawaii Revised Statutes (HRS) Section 1-1:

> The common law of England, as ascertained by English and American decisions, is declared to be the common law of the State of Hawaii in all cases except as otherwise expressly fixed by Hawaiian judicial precedent, or established by Hawaiian usage. The present law (HRS 7-1) regarding "the rights of the people" to land access and gathering rights, is an example of law established by Hawaiian usage and reads as follows: "Where the landowners have obtained, or may hereafter obtain allodial titles to their lands, the people on each of their lands shall not be deprived of the right to take firewood, house-timber, *aho* cord, thatch or *ki* leaf, from the land on which they live, for their own private use, but they shall not have a right to take such articles to sell for profit. The people shall also have right to drinking water, and running water, and the right of way. The springs[rings of water, running water, and roads *shall be free to all*, on *all lands granted* in fee simple; provided that this shall not be applicable to wells and water-courses, which individuals have made for their own use."

This law reads today exactly the same as section 1477 of the Civil Code of the Hawaiian Islands of 1859.

Furthermore, the State Constitution, Article XIII Section 7. (Added in the Constitutional Convention of 1978 and the election of November 7, 1978) reads as follows:

> The State reaffirms and shall protect all rights customarily and traditionally exercised for subsistence, cultural, and religious purposes and possessed by *ahupua'a* tenants who are descendants of native Hawaiians who inhabited the Hawaiian islands prior to 1778, subject to the right of the State to regulate such rights.

A recent case that would seem to have set some precedent in this matter of native gathering rights was filed by the plaintiff Kalipi seeking injunctive and declaratory relief in that the defendants (Hawaiian Trust Co.) prevented him from "exercising his rights to gather products for his private use from the upper reaches of the *ahupua'a* in violation of HRS Sec. 7-1 and in violation of ancient Hawaiian custom and usage" (quoted in Baxa, 1976:17). The defendants advanced among other defenses, 1) "the claims asserted in the complaint are barred by the stature of limitations:, 2) that the "Defendants are not obligated under the provisions of HRS Sec. 7-1, to open their lands to others not owners therein: and 3) that the "Plaintiff and/or his predecessors in title have waived any rights they might have with respect to the defendant's land." (Ibid:18). While the details of this case are not readily available, the plaintiff won, as the "Case Notes" for HRS 7-1 relate the following:

> Gathering Rights-Lawful Occupants of an *Ahupua'a* may, for the purpose of practicing native Hawaiian customs and traditions, enter undeveloped lands within the *ahupua'a* to gather those items enumerated in this section" (Citation of Kalipi case).

Whether this applies only to native Hawaiians residing immediately with the *ahupua'a* in question is not clear. This question was a major consideration in the Pele Defense Fund case. In the PDF decision, the scope of Hawaiian rights was expanded to acknowledge that, at least in some cases, Hawaiians living outside an *ahupua'a* may have traditional rights to gather or harvest on the property in question.

The PASH case challenged the Hawaii county Planning Commission's approval of a Special Management Area Use Permit for Nansay Hawaii Inc. to develop a $350 million, 450-acre resort complex at Kohanaiki, Hawaii. The State Supreme Court's 1995 ruling gave PASH the right to a contested state hearing on the basis of the right of certain Hawaiians to continue the cultural subsistence practice of gathering shrimps at certain ponds located on the Nansay property. As a result of this decision landowners may be obliged to allow native Hawaiians to practice their customs and, furthermore, landowners may have to provide access and preserve resources used in Hawaiian religious or cultural activity.

The most recent legal exploration of native Hawaiian rights has been the Kaupulehu Development's hearing. In this hearing, the Kona Hawaiian Civic Club, Ka Lahui Hawaii and the Protect Kohanaiki 'Ohana have intervened as parties advocating a number of points including:

1. The governmental permitting processes are flawed because they fail to adequately address and protect native Hawaiian cultural resources and legal rights.
2. A petition or EIS is flawed if there is no inventory of cultural resources. Beyond physical resources, intangible resources (stories, teachings, legends, etc.) must be evaluated.
3. A property's cultural resources cannot be understood without understanding those for the *ahupua'a* and surrounding region.
4. Cultural impact statements should be required before a hearing can be held. Current legislation in HB 3081 would require this in proceedings by all state agencies and would also amend the EIS law to incorporate such a concept in the content of an EIS.
5. Without the necessary inventory and evaluation of cultural resources, the Land Use Commission cannot issue a valid approval because it can

not consider the project's impact to such resources as required in Section 205-17, HRS, and Section 15-15-77 (b)(3).

Description of the Traditional Cultural Practicies Region

The settlement pattern of prehistoric and historic populations in the region encompassing the project area has been described as taking place within the Kekaha region of North Kona. The Kekaha region, or "Kekaha-Waiole, the desolate land without water" refers to the barren lava fields extending north from Kailua-Kona to Anaeho'omalu (Kelly 1973:74). This band of barren lava fields does not encompass entire *ahupua'a* nor does it inhibit the land usage from occurring along the coast and inland where rainfall is sufficient for intensive agriculture. Within the Kekaha region, ethnographic, ethno-historical and archaeological sources suggest that the lands fell into three general terrestrial zones: 1) Coastal; 2) Intermediate or Transitional, and 3) Upland.

The Coastal Zone begins at sea level and extends to approximately 15 feet above mean sea level (amsl). This zone contains evidence of prehistoric and historic settlement in both the Kaloko and Kohanaiki *ahupua'a*. Kaloko contained a permanent settlement concentrated along the coast which was probably comprised of "several local residential groups with constituent households. One household headed each residential group" (Cordy et al. 1991:522). Radiocarbon dating for the coastal region within the Kaloko *ahupua'a* has produced dates ranging between AD 920 and AD 1430. One site on the coast has dates ranging between AD 920-980 and AD 1005-1290 making it one of the oldest permanent habitation known in leeward Hawaii. The Kaloko and Honokohau fish ponds were believed to have been constructed by at least AD 1400-1500.

The Intermediate Zone extends from the *mauka* margin of the Coastal Zone (15 ft amsl) to approximately 400 ft amsl. The project area falls within this Intermediate Zone. Settlement patterns within this Intermediate Zone were characterized by habitations, both temporary and recurrent, located within the vicinity of a *mauka/makai* trail or associated with agricultural or lithic resource activity. The general lack of consistent rainfall and virtual absence of soil limited agricultural use, however, small concentrations of mounds, modified outcrops (which enclosed minimal soil areas), enclosures, and some pahoehoe excavations indicate a limited degree of agricultural activity. Lava tubes and blisters are abundant in this zone and contain temporary components, as well as post-habitation burial interments. An extensive network of *mauka/makai* trails facilitated inter-*ahupua'a* travel of residents between their coastal habitation and the Upland agricultural fields. Within the Intermediate Zone, permanent habitation sites occur directly adjacent to the Coastal Zone and are associated with small scale agricultural activities.

The Upland Zone of Kaloko and Kohanaiki begins at approximately 400 ft amsl and continues *mauka*. With higher elevations, the natural landscape contains a greater soil base and more plentiful and consistent rainfall. Consequently, the Upland

Zone is characterized by an increase in permanent habitation sites in association with intensive non-irrigated (dryland) agricultural features.

Intensive non-irrigated agriculture is characteristic of the Kona slopes and other regions of Hawaii where irrigation was not possible because of the absence of perennial streams. Called the "Kona Field system", this type of agricultural activity consisted of agricultural fields laid out in an interrelated grid defined by stone boundaries which extended over an estimated area of 139 km^2 between Kealakekua Bay and Kailua Bay. (Kirch 1985:225). Additional archaeological studies have found that this type of agricultural field system extended beyond Kailua Bay to the lands further north. Intensive non-irrigated agriculture is characterized by concentrated occurrences of similar feature types, i.e., field walls, modified a'a lava, pahoehoe excavations, and mound complexes. Radiocarbon dates taken from upland field shelters within the Kona Field System indicates that intensive agriculture began developing between *ca.* AD 1400-1600 and intensified with permanent upland settlements between *ca.* AD 1600-1779 (Schilt 1984).

The settlement pattern described above reveals a variety of land uses across all zones during the prehistoric and early historic period. The original settlements of both Kaloko and Kohanaiki were focused on the coast around 920 AD. These earlier settlers were likely drawn to the coast by the presence of potable water found in brackish ponds and the excellent fishing at Kaloko which offered one of the most protected inlets on the Kona Coast (Cordy et al. 1991:575).

Radiocarbon dates from the Kekaha region may indicate that all three zones of the Kaloko and Kohanaiki *ahupua'a* were utilized to some degree or another as early as AD 1280 (Walker and Haun 1988). This period of time correlates with an apparent population increase and geographical expansion in the Hawaiian islands identified as the "Expansion Period" (Kirch 1985:303) or the middle of the "Pioneer Settlement" (Schilt 1984:276).

Development of the intensive upland agricultural system probably occurred between *ca.* AD 1400 and 1650 (Schilt 1984:227) and focused along the more prime agricultural lands at elevations where soil was abundant and rainfall sufficient for productive cultivation. Endemic forest lands were gradually reduced by slash-and-burn methods to make way for agricultural fieldsl During this period permanent settlement continued to be centered at the coast but also began to be developed in the upland localities of Kaloko and Kohanaiki as the distance between the upland farms and original coastal settlement expanded. By the end of this period most of the upland permanent habitations were occupied. It was during this period that the fishponds in Kaloko were likely constructed and a class hierarchy consisting of ruler, high chiefs, local chiefs and commoners was formed in Hawaii (Cordy et al. 1991:575).

The pattern then changed dramatically during the middle to late historic period (post-*mahele ca.* 1850'S). Following western contact, Kaloko and Kohanaiki populations declined rapidly due to disease and a major shift in the traditional settlement pattern of Hawaiians. The residents who survived disease likely shifted their residences to economic centers - such as Kailua Town- or in closer proximity to major roadways or churches and schools established by the missionaries. As a result, the once populated shorelines of Kaloko and Kohanaiki were virtually abandoned and some of these vacant lands were subsequently acquired for cattle ranching.

During the decades following western contact, the traditional subsistence economy was replaced by the western commercial economy. Consequently, localities like the project area would have been further abandoned as a settlement area. Land Commission Award documents indicate that by the middle of the 19th century, habitation and activity within Kaloko and Kohanaiki had shifted far *mauka* to lands between the 1200 to 1700 ft elevation near the Government road. During the second half of the 19th century this *mauka* shift was fully established with the formation of the Kohanaiki Homesteads near the Government road. Throughout the 19th century, only the *mauka/makai* trails in the project area would have been used for ocean access by *ahupua'a* residents of the uplands.

In the early 20th century, the project area was acquired by the Huehue Ranch. Ranching activities included constructing walls and fencing as evidenced by the wall along the Kaloko Kohanaiki boundary (site 40) recorded by Kennedy in 1984 in the location immediately *mauka* of the present project area.

Original Source of Title and History of Land Use

The petition area is situated on a portion of the *ahupua'a* of Kohanaiki and Kaloko, which are located on the southern end of Kekaha. Describing the apportioning of land by the ali'i before the ascendancy of Kamehameha, the nineteenth-century Hawaiian historian Samuel M. Kamakau records:

> Waimea was given to the Pa'ao kahuna class in perpetuity and was held by them up to the time of Kamehameha III when titles had to be obtained. But there was one land title held by the kahuna class for many years and that was Puuepa in Kohala. In the same way the land of Kekaha was held by the kahuna class of Ka-uahi and Nahulu. (Kamakau 1961:231)

During the 1770s, Kekaha and the lands of that section were held by descendants of the Nahulu line, the Ka-me'e-ia-moku and Ka-manawa, the twin half brothers of Ke'e-au-moku, the Hawai'i island chief (Ibid.:310). In the last decades of the 18th century, following western contact, Kohanaiki and Kaloko, as portions of the larger Kekaha area, remained under the control of Ka-me'e-ia-moku, who resided to the north at Ka'upulehu (Kamakau 1961:147).

In the 1800s to 1850s, western contact became a major influence. The Mahele of 1848 indicate that Kaloko was claimed by and awarded (LCA 7715) to Lot

Kamehameha (Kamehameha V). Kohanaiki was classified as Government Land. Eighteen *kuleana* claims were made by commoners claiming to occupy and/or cultivating land parcels in Kaloko *ahupua'a*. Twelve of these claims were awarded. All claims were for mauka lands (between the 1200 to 1700 foot elevation) adjacent to or just makai of the Government Road. All kuleana claims were well outside of the petition area. Only five of the total eighteen claims mention residence on or use of the Kaloko lands dating to the time of Kamehameha I, in the first decades of the nineteenth century; the remaining claims testify to residence/use beginning in the 1830s and 1840s.

Parcels within Kohanaiki were subject to sale and designated grants by the Hawaiian government. Most of the present project area (lying in Kohanaiki) fell within the 930 acre Grant bought by Hulikoa. The Land Index File at the State Archives includes a report from the surveyor J. Fuller to the Minister of the Interior (John Young II) dated May 28, 1855 asserting the land had been sold to Hulikoa and was "now waiting to be approved." The Grants and Patents Book (1916) however lists the grant as awarded to Hulikoa nine years later in 1864.

Much of the subsequent history of land tenure is unclear. As Cordy notes about Kaloko: "The historical documents suggest that by the 1840s-1850s, the Coastal Zone had been abandoned as a residential area, except probably for a house used by the fishpond's caretaker. This pattern would have been a stunning change from prehistoric and early historic times, when many coastal residences were present" (Cordy 1991:288). This pattern likely also held for Kohanaiki. Kaloko continued to be held by the *ali'i* throughout the remainder of the 19th century, passing, after the death of Lot Kamehameha, successively to Bernice Pauahi Bishop, Kalakaua and Kapi'olani.

During the 20th century, John Maguire purchased the former chiefly lands of Kaloko in 1906. The uplands of the *ahupua'a* were developed into the Huehue Ranch. The Kaloko fishpond was leased from the ranch and used as a commercial fishing operation until the 1950s. During the 1970s, the pond was incorporated in the newly-established Kaloko-Honokohau National Historic Park.

Probable Impacts

Native Hawaiian Rights Pertaining to the Petition Area

Rights to Burials

The Archaeological Inventory Survey identified eight sites (including a total of nine features) within the project area as possible burial sites (Figure 5-3). The sites (State Site Numbers 20702, 20705, 20716, 20717, 20720, 20731, 20743, and 20749) include six modified tumuli, one linear mound, one terrace, and one lava tube feature. While no human remains have been confirmed at these sites, it is probable that many, and perhaps all, of these sites include human burials. On

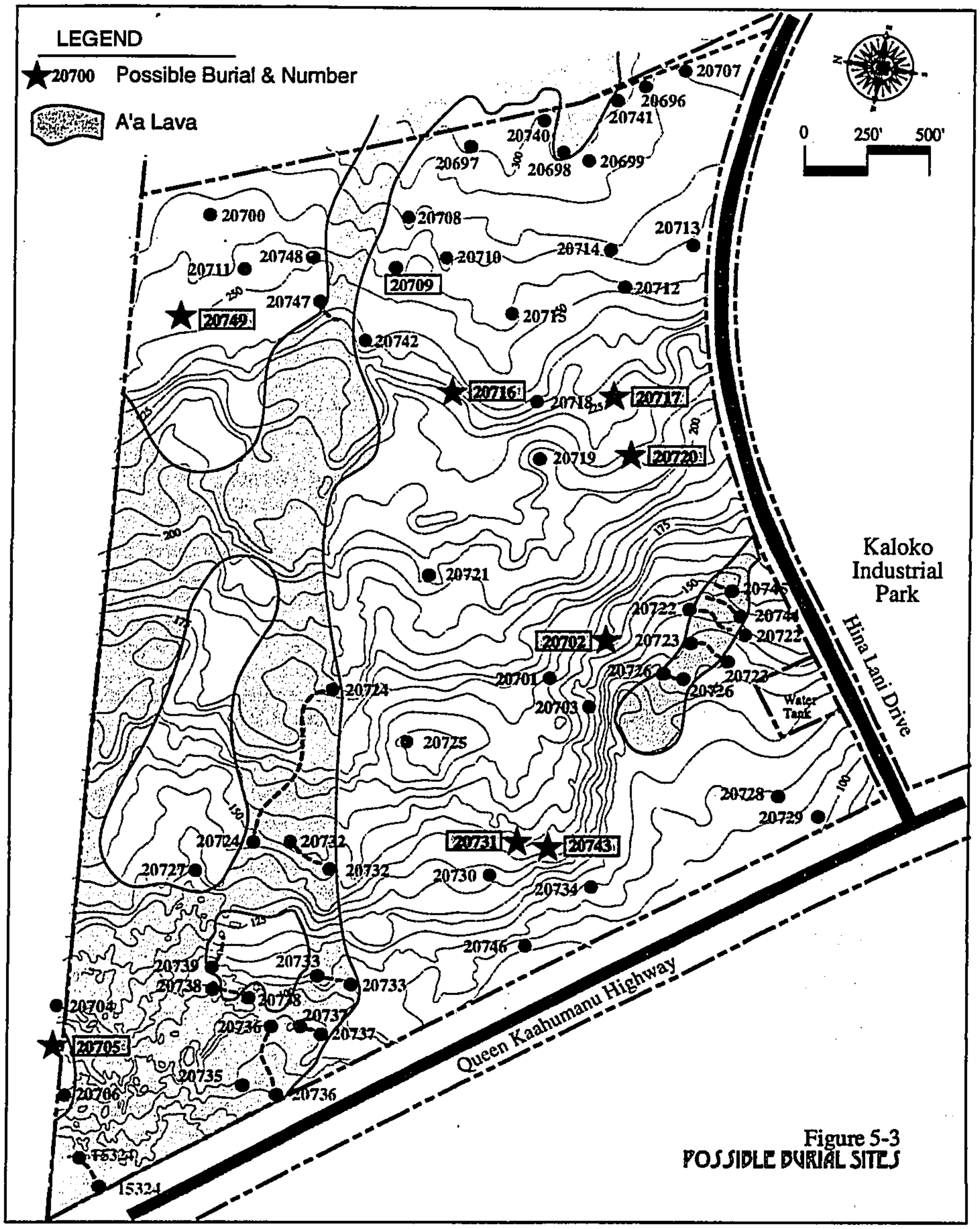


Figure 5-3
POSSIBLE BURIAL SITES

March 16, 1996, Cultural Survey Hawaii (CSH) staff interviewed the Reverend Norman Keanaaina, a kama'aina of Kohanaiki since the 1940s (See Appendix K: Oral Histories). Reverend Keanaaina stated his belief that there were indeed burials within the project area. He stated that interment within the project area continued into the 1930s or 1940s, when his "grandmother's husband", of the Kapaa family, was buried. Reverend Keanaaina, accompanied by CSH personnel, visited three sites (20702, 20717, and 20720) located in the south central portion of the project area which had previously been identified by CSH as probable burials. The Reverend agreed that the filled-in cracks at these sites were probable burials, stating that the common practice was to wrap the body in a mat on a horse blanket, and inter it in a sufficiently large crack which would subsequently be filled with stones.

The archaeological inventory survey recommends that all eight of the designated possible burial sites within the project area be tested to determine the presence or absence of human burials. These eight possible burial sites are presently recommended for preservation but if they are later found not to include burials, then they would probably not merit preservation status.

Human skeletal interments that are identified and thought to be over fifty years old cannot be removed without permission from the Department of Land and Natural Resources (under Section 6E-43a). The law states: "The appropriate island burial council shall determine whether preservation in place or relocation is warranted." The wishes of known lineal descendants are to be taken into consideration in this decision. Council determinations may be appealed.

Furthermore, "Within ninety days following the final determination [of the island burial council] a preservation or mitigation plan shall be approved by the department in consultation with any lineal descendants, the representative council, other appropriate Hawaiian organizations, and any affected property owners" (6E-43d). A request for council determination of burial treatment requires the production of "evidence of a good faith search for lineal and cultural descendants ["cultural descendants" typically have some strong history of association with the *ahupua'a* involved] (S 13-300-33,1) This requirement includes the "publication of a notice in a newspaper of general circulation in the county in which the burial site is located [*West Hawai'i Today* in this case] and a newspaper of statewide circulation for a minimum of three days including Sunday and Wednesday" giving the particulars of the burial location and known associations, proposed treatment and a number and address of a contact person. Lineal or cultural descendants are to be verified by the department.

Preservation in place or relocation also requires the production of an acceptable preservation or mitigation plan which must specify provisions for reasonable access and upkeep of burial sites. This typically involves discussion of buffers and landscaping and may involve issues of viewplanes. If relocation is determined to be the preferred option, reinterment on the project area is generally preferred, or if not feasible, at least within the *ahupua'a* in the general vicinity. Preparation of the preservation or mitigation plan and subsequent follow-through is typically the responsibility of the landowner or developer. The adoption of such a plan usually requires at least two appearances before the island burial council.

The Reverend Keanaaina has clearly stated his intention to come forward to make his claim as a lineal descendant of those interred within the project area. The Reverend is believed to have a strong claim. In addition, other parties who respond to efforts of public notification may also be recognized as descendants.

Another burial issue concerns the remains of Kamehameha the Great which have long been asserted to lie in the lands of Kaloko or the vicinity of Kaloko (Kamakau 1961:215). There is no evidence or reason to believe that the remains of Kamehameha the Great lie within the present project area. The disposition of the bones of Hawaiian chiefs, like those of any other ancient Hawaiian, would be up to the island burial council and the SHPD.

Rights to Trails

The earliest historic documentation of Hawaiian trails in the vicinity of the project area appears to be Emerson's map of 1888 (Figure 4). This map shows a coastal trail running parallel to and just back from the ocean and two major *mauka/makai* trails - one traversing Kaloko *ahupua'a* and one traversing Honokohau *ahupua'a*. Both of these *mauka/makai* trails meet the coastal trail in the vicinity of a fishpond (Kaloko Pond and Aimakapa'a Pond respectively). Heading *mauka*, these two trails veer north and converge within Kohanaiki *ahupua'a* in the immediate vicinity of the old Kohanaiki Church; the trail continues *mauka* to the government road. These were most likely the major trails in use in the 1880s and all lie well outside of the project area. Clearly however there were many earlier trails which are not depicted on the Emerson map.

Emerson does not depict prehistoric trails which were no longer in use in the 1880s. Most notably, he does not depict the "Old Mamalahoa" trail which is shown on modern USGS maps (See Figure 1). The Old Mamalahoa Trail would have been the major cross-*ahupua'a* trail in the vicinity of the project area in pre-Contact times, but lies well *makai* of the project area. The Emerson map also omits an alignment known as the "Kohanaiki Road" which passed through the southeast corner of the project area (in Kaloko *Ahupua`a*).

The nature of pre-Contact trails within the project area remains unclear but it is clear that there were many of them. Trails or trail segments were observed within the petition area which formed a network of transportation corridors that traveled both in the *mauka/makai* and cross-slope directions. The trails provide fairly direct coast to uplands routes through the project area as well as access to activity areas such as lithic resource procurement, agricultural pursuits and temporary and recurrent habitation sites within the project area.

Twenty trails (22.2 percent of the total features) were encountered during the inventory survey which were encompassed within sixteen sites (29 percent of the total 55 sites) (State sites 13493, 15324, 20704, 20722, 20724, 20726, 20732, 20733, 20735, 20736, 20737, 20739, 20741, 20744, 20745, 20747). All of the trails within the project area appear to be prehistoric in nature.

Russell A. Apple (1965) provides classifications ("Types A through D") of Hawaiian trails based on architectural design, location and orientation. As a result of these classifications, it can be suggested what method of transportation (i.e. foot, horse or wheeled vehicle) was used by the trail and during what time period. "Type A" trails appear to be the only type applicable to the present study area.

Apple defines "Type A" trails as being prehistoric and early historic (prior to abolishment of the *kapu* system) "single-file foot trails" that follow the configuration of the shoreline and extend between the coast and upland localities (Apple 1965: Appendix 2). "Type A" trails were designed in accordance with the *kapu* system, for example: trails would not cross *ahupua`a* boundaries because the *kapu* system prohibited residents to go beyond their *ahupua`a* boundaries. Apparently only one trail (encircling the perimeter of each island crossed *ahupua`a* boundaries. This trail was used during the *makahiki* festival for tax collection purposes (*op.cit*: 25). All of the stepping-stone trails are considered to be "Type A" trails. The identified sections of the stepping-stone trails in the project area cross over a`a lava terrain and are believed to be associated with localized travel between the coast and uplands, as well as accessing project area-specific sites and/or features (i.e. agriculture, lithic resource and temporary habitations).

The large number of trails within the project area reveal that the residents of both Kaloko and Kohanaiki had a significant network of travel routes that provided access to resources and exchange of resources between the coast and upland regions of the two *ahupua`a*. The fact that all of the trails within the project area are of Apple's "Type A" attests to the fact that while the area within the project was commonly traversed during the prehistoric period it was not as heavily traversed in the historic and modern period.

Remnants of the Kohanaiki road traverses through the southeastern portion of the project area in a *mauka/makai* direction. The original alignment proved hard to follow as some portions were bulldozed (bulldozer scars on the pahoehoe) while others were visible through stunted vegetation. An old wooden gate in a fenceline which parallels the *mauka* project boundary, is believed to have been related to the former road.

Attempts were made with all trails in the project area to follow them to their full extent and where possible make relevant correlations. It proved impossible to follow trails on the grass-covered pahoehoe adjacent to the a`a lava where the trails were still visible. The uniformity of the terrain (usually consisting of undulating pahoehoe) surrounding the a`a flows negates the necessity of extensive trail construction and leads the authors to believe that while the trails followed a single route over the a`a flows once the trail exited the a`a more than one path may have been traversed by travelers. (Colin et al. April 1996:121-122).

While some of these pre-Contact Hawaiian trail segments were quite minimal in construction, twelve of them include at least a few stepping stones or set slabs and three others involved the clearing of a'a boulders indicating considerable expenditure of effort in their construction. These trails were probably constructed for a variety of purposes including access to temporary habitations or the one designated recurrent habitation (site 20709), access to burial sites, access to the eight sites in which some agriculture was indicated, access to the scoria mining site (20703), access to sites of opportunistic water catchment, access to various local wild plant resources, and access to areas just *mauka* and *makai* of the project area.

While the abundance of trail segments might be perceived as indicative of intensive Hawaiian utilization of the project area, the lack of a clear purpose to these trail segments could be interpreted as an absence of intensive use. For example, in the southwest portion of the project area, five trail segments (13493, 20722, 20726, 20744, and 20745) traverse an a'a exposure. All of these trail segments include at least some stepping stones, but these trail segments appear roughly parallel (in series) and all five lie within a span of 500 feet. This number of trails running so closely together may suggest the absence of a well-defined trail network within the project area and a more random pattern of land use over time.

It is clear from the number of apparently prehistoric trail segments that many Hawaiians traversed the project area in pre-Contact times. These trails were probably used for a variety of purposes but there is no clear explanation for the construction of many of these trails. Curiously none of these trail segments appear to be part of a well-defined *mauka-makai* trail running up the length of Kohanaiki *ahupua'a*. Possibly the a'a in the *makai* portion of Kohanaiki *ahupua'a* encouraged Hawaiian residents of the *ahupua'a* to use a *mauka-makai* alignment running through the seaward portion of Kaloko *ahupua'a*, cutting north into Kohanaiki above the a'a exposure near the government road. The *mauka-makai* trail system shown in Emerson's 1880s map may well have been the pre-Contact system. The major cross-*ahupua'a* trails lay well *makai* of the project area (the coastal trail and the Old Mamalahoa trail)

Presently, *mauka* access is adequately provided by Hinalani Road on the south edge of the project area. Cross-*ahupua'a* travel in the vicinity of the project area is adequately provided by the Queen Ka'ahumanu Highway which forms the west boundary of the project area.

Native Use of Unique Geological or Geographical Resources

The only unique geological or geographical resources in the project area is a pre-Contact scoria quarry (designated site 20703 Feature C). Hawaiians utilized scoria for various abrading tools used in wood working and fashioning of fishhooks. The archaeological inventory survey notes: Feature C consists of an area in which it appears that the outer crust of a high pahoehoe tumulus was removed as a layer of low grade scoria. Mining activities do not appear to have been extensive and there is no evidence of further processing of the mined material (i.e. abrader basins or partially worked pieces of scoria). Due to the quality of the scoria and the lack of evidence of extensive mining it is believed by the authors that the activities represent a localized (*ahupua'a*) exploitation of a resource for local consumption. This entire site is presently recommended for preservation (Colin et al. April 1996:121,141).

The traditional Hawaiian use of scoria for tools largely ceased with the widespread availability of iron ca. 1800. Any present day Hawaiian use of scoria at site 20703C would inherently cause an impact to this site. Other sources of scoria of as good, or better, quality are thought to exist elsewhere. Whether native Hawaiian rights apply to a scoria quarry site overrides the laws regarding historic preservation would be a matter for consideration by the State Historic Preservation Division (SHPD). In this particular case, access to scoria is not anticipated to be a native rights issue as scoria is not used today.

Other Archaeological Concerns

The entire project area has been subject to an archaeological inventory survey and fifty-five sites, including ninety structural and non-structural (lava tubes blisters and rock shelters) features, have been identified (Colin et al. April 1996:108). The formal feature type and function of these sites are related in the following tables and implications regarding cultural impact are discussed below.

Table 5-11
Occurrences of Formal Feature Types (total number of features: 90)

Formal Feature Type	Number	Percentage
Ahu	2	2.2
Alignment	1	1.1
C-shape	1	1.1
Enclosure	9	10.0
Lava blister	2	2.2
Lava tube	8	8.9
Modified depression	2	2.2
Modified tumulus	22	24.4
Mound	2	2.2
Pavement	7	7.8
Planting area	1	1.1
Platform	4	4.4
Quarry	1	1.1
Rockshelter	1	1.1
Terrace	4	4.4
Trail		20
Wall		3

Table 5-12
Occurrences of Formal Function Types (Total number of sites in project = 55.)

Function	No. of Sites
Agriculture	4
Possible burial	7
Recurrent habitation/Agriculture/Storage	1
Temporary habitation/Mining	1
Temporary habitation	15
Temporary habitation/Agriculture	1
Temporary habitation/Agriculture/Transportation	1
Temporary habitation/Storage/Transportation	1
Temporary habitation/Possible burial	1
Temporary habitation/transportation	1
Temporary habitation/Agriculture/Marker	1
Indeterminate	6
Marker	1
Storage	1
Storage/Transportation	1
Transportation	12

No permanent habitations, religious sites (other than the possible burials previously discussed), or unique sites (other than the quarry) are believed to lie within the project area. It is presently recommended (Colin et al. April 1996:140) that forty sites be subject to a program of data recovery to address scientific and informational concerns, and that ten sites (including the eight possible burials, the only recurrent habitation site, and the quarry site) be preserved. A single trail site is recommended for both data recovery and preservation. Four sites are recommended for no further work because it has been determined that these sites lack cultural or scientific significance beyond the documentation and plotting of location completed during the inventory survey. Determination of the treatment of archaeological sites is up to the SHPD of DLNR. As these archaeological sites would generally be regarded as modest and the archaeological recommendations would generally be regarded as conservative, the SHPD will probably be in accord with the recommended treatment. None of the other Hawaiian archaeological sites appear to involve cultural impact issues.

Native Hunting Rights

Native subsistence hunting rights remains something of a gray area but should not prove problematic for the subject property. The Reverend Keanaaina relates hunting for goats and donkeys within the immediate vicinity of the project area. However, there is no evidence of subsistence hunting for pigs or any other animals (other than donkeys and goats) within the project area. There is no reason to believe that the project area was a particularly good hunting ground for goats and donkeys, but rather that these animals would range widely over hundreds of miles of the Kekaha lands. There is no evidence of recent goat or donkey hunting within the project area nor any evidence that any Hawaiians would want to hunt these species there at the present time.

Native Gathering Rights

The Keanaaina family exercises their native gathering rights in the project area and vicinity by collecting various medicinal plants. Some of the plant species specifically mentioned such as *Koko'olau* (*Bidens* species) and *'Uhaloa* (*Waltheria indica*) are abundant over many square miles of North Kona. Adella Keanaaina Bates made reference to the Hawaiian poppy, which is probably *Pua-kala* (*Argemone glauca*) ,in a discussion of medicines in the lava fields of the area. The botanical survey did not indicate the existing of Argemone glauca within the petition area, but it is known to be abundant elsewhere. Mrs. Bates discussed the medicinal use of *`uhi* growing in the vicinity of the project area, but this is thought to be the cultivated yam (*Dioscora alata*). Duane Keanaaina made reference to *`ulei* (*Osteomeles anthyllidifolia*) growing in the vicinity of the project area and having been used for *akule* nets (bent into net hoops) and for musical instruments (dancing sticks). *`Ulei* is believed to be not uncommon in the general vicinity of the project area. Other plants gathered by Hawaiians including *pili* grass, *noni*, and *'ohia* do indeed exist within the project area and may have been gathered by Hawaiians in former times. However, there is no reason to believe that the abundance or quality of these resources was or is in any way exceptional. A similar abundance of these resources may be encountered in many square miles of North Kona. The distance of the project area from permanent Hawaiian habitations and major Hawaiian trails would have been a significant deterrent to the utilization of these resources in the project area.

The project area does not appear to contain any unique botanical resources and is not considered particularly rich in any botanical resources. There is no reason to believe that the development of the project area will significantly inconvenience any native Hawaiian in the matter of gathering plants.

Mitigation Measures

This cultural impact statement has attempted to give due consideration to the effects which the proposed development activity may have on the specific rights, culture and traditions of native Hawaiians. Specific areas which have been examined include the issue of burials within the project area, the issue of access to Hawaiian trails, the issue of unique geographic or geological features (in this case a scoria mine) traditionally used by Hawaiians, Hawaiian hunting rights, and Hawaiian gathering rights. The conclusion of this study is that the impact of the development of this specific parcel *per se* on Hawaiian culture would be minimal.

The lack of impact is a reflection largely of the geographic location of the parcel, set well back from the coast, in an area with very low rainfall, and virtually no unique features (the scoria mine being the only exception). There were no commoner land claims within the project area or anywhere in the immediate vicinity of the project area. While the absence of *kuleana* land claims does not necessarily mean an absence of Hawaiian activity, the patterns of land use in this area are relatively clear and seem to indicate that Hawaiians did not utilize this *kula* land of the intermediate zone nearly as intensively as they utilized the coastal zone and upland zone.

The only significant native rights issue would seem to be the possible burials. Positive identification of human remains within the project area remains to be undertaken. Once one or more burials are identified as present, the remains will be treated within existing laws and the rules of SHPD in conjunction with the Big Island Burial Council.

5.8 *Cumulative Impacts: Socio-Economic Factors*

Chapter 200 of Title 11, Environmental Impact Statement rules (11-200-17(I)) requires a discussion of the interrelationships and cumulative impacts of the proposed action and other related projects and of other possible secondary effects.

As discussed in Chapter 1 and Chapter 3, the North Kona district has been identified as an area recommended for urbanization by government policy makers to support the expanding economy of the area. Studies and documents specific to future plans and policies for the area, such as the State's Five Year Land Use District Boundary Review and West Hawaii Regional Plan; and the County's General Plan Land Use Pattern Allocation Map and Keahole to Kailua Development Plan, consistently identify the North Kona District for urban expansion.

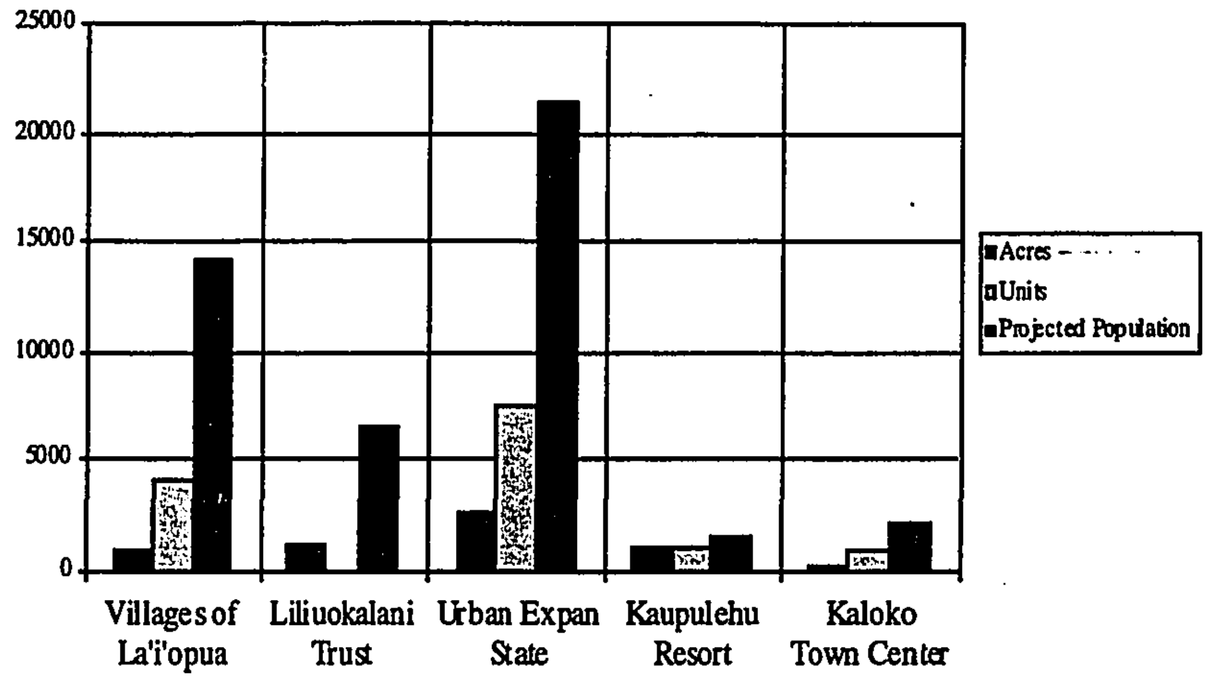
As indicated previously, four major projects are being evaluated to assess the cumulative impact on the region. Relevant information about the four major projects and the proposed action are quantified in Table 5-13 and illustrated in Figure 5-4.

Table 5-13
Major Projects Receiving Urban Classification Since 1990

Project	Owner-ship	Develop-ment Time Frame	Acres	Total Resid Units	Projected Population[1]	Proposed Uses
Kealakehe Planned Community[2] (Villages of La'i'opua)	State	20 years to Year 2010	960	4,100	9,285 to 14,184	Residential Commercial Public Fac Schools Golf Course Recreational Natural Pres
Liliuokalani Trust[3]	Private	20+ years	1,135	none[4]	6,420	Regional Shopping Center Financial Center Hospital, Mixed Use
Urban Expansion of State Lands[5]	State	15 to 30 to Year 2008 to 2023	2,640	5,650 to 7,533	16,254 to 21,339	Residential Neighborhood Commercial Employment Center Lt Industrial Parks Golf Course
Kaupulehu Resort Expansion[6]	Private	20 years to Year 2014	1,010	1,030	1,555	Residential Commercial Golf Course Recreation
Kaloko Town Center (Proposed Action)	Private	20 years to Year 2015	224	850	2,240	Commercial Residential School
Total without the Proposed Action			5,745	10,780 to 12,663	33,514 to 43,498	
Total with the Proposed Action			5,969	11,630 to 13,513	35,754 to 45,738	

1. Population projections are those that were reported in each of the respective Final EISs. With the exception of the Kaupulehu Resort Expansion Final EIS, projections are generally reported as "on-site" or average de facto population.
2. Kealakehe Planned Community Final Environmental Impact Statement, prepared for HFDC by Belt Collins & Associates, Sept 1990
3. Liliuokalani Trust, Final Environmental Impact Statement prepared for Liliuokalani Trust by Belt Collins & Associates, Oct 1990.
4. No residential units planned by Liliuokalani Trust, however, 450 acres of the Trust lands were sold to the State for future residential use and population estimates calculated for this area.
5. Urban Expansion of State Lands, Final Environmental Impact Statement prepared for Office of State Planning by Helber, Hastert & Fee, July 1993.
6. Kaupulehu Resort Expansion, Final Environmental Impact Statement prepared for Kaupulehu Developments by Belt Collins & Associates, Sept 1994.

Figure 5-4
Quantitative Characteristics of Proposed Projects in the North Kona District



Note: Where unit counts and projected population were indicated in ranges, the high end was graphed.

Existing conditions:

The North Kona District covers some 568 square miles, which is almost equivalent to the entire City and County of Honolulu (596 square miles). In 1990, the population of the North Kona District was 22,300 as compared to approximately 863,117 people in the City and County of Honolulu. Translated to population density, the North Kona district had a density of roughly 39 persons per square mile as compared to the City & County of Honolulu with 1,448 persons per square mile. In terms of population density, the North Kona district is undoubtedly a rural area.

Cumulative Impacts under Future Conditions

Population projections prepared by the Office of State Planning in 1992 suggest considerable growth for the North Kona District in the long range future. From the 1990 population of 22,200, the district is projected to grow to approximately 52,600 by the Year 2010. Assuming a 3% compound growth rate beyond 2010, the population is projected to increase to 60,977 by 2015, 70,690 by 2020 and 77,245 by the year 2023.

Table 5-14
Population Projections for the North Kona District

				Projected at 3% per annum compounded		
	1990	2000	2010	2015	2020	2023
Hawaii County	120,300	160,400	206,100			
North Kona	22,300	35,700	52,600	60,977	70,690	77,245

Source: Office of State Planning, 1992, Five-Year Boundary Review Projections beyond 2010 by Kimura International

All four major projects have development time schedules of 20 years or more. The Urban Expansion of State Lands indicates a development schedule of 20 to 30 years. Assuming the four major projects proceed according to their anticipated schedules, the population in the Year 2023 would increase by 33,514 to 43,498 people without the proposed action and 35,754 to 45,738 with the proposed action. Adding the new population to the existing 22,300 people in 1990, the population of the North Kona district would be between 55,814 to 65,789 without the proposed Kaloko Town Center. With the proposed Kaloko Town Center, the population would be approximately 58,054 to 68,038. The cumulative effect of the four major projects plus the proposed action falls within the projected population for the district.

If all projects proceed according to their anticipated development schedules, the cumulative effects on the region would result in the urbanization of the district basically in line with State and County plans and projections. The population density would change from the current 39 persons per square mile to about 120 persons per square mile, which is less than 1/10th the density of Honolulu.

It should be noted that this assessment of cumulative impacts assumes that the projects above will proceed according to schedule. However, it is important to note that most of the projects evaluated suggest that development will occur according to market conditions (Kealakehe Planned Community, FEIS, 1990, p. V-22; Liliuokalani Trust, FEIS, 1990, p. II-17; Urban Expansion of State Lands, FEIS, 1993, p. 2-13; Kaupulehu Resort Expansion, FEIS, p. 2-7). Exactly what point in time full build out will occur is impossible to predict. However, many factors suggest that completion for these projects may not occur according to phasing schedules. The recent decision by Nansay to withdraw their plans for Kohanaiki, complications over jurisdiction and ownership of the State Urban Expansion Lands project, and the current economic downturn, suggest that completion of these projects would most likely exceed the 20+ development time frame.

Table 5-15
Cumulative Employment Characteristics

Project	Construction Employment	Ave number per year	Indirect and Induced jobs	Ave number per year	Operational Employment	Total FTE[1] over life of project
Kealakehe Planned Community[2] (Villages of La'i'opua)	3,830 to 5,570	190 to 280	3,000 to 5,000	170 to 250	420 to 550	7,200 to 11,040
Liliuokalani Trust[3]	31,309	577 1st period 332 2nd period NA 3rd period	NA		14,943 at build-out	46,252
Urban Expansion of State Lands	NA	NA	9303 to 13092	NA	9,303 to 13,092	18,606 to 33,566
Kaupulehu Resort Expansion[6]	2,164	60 to 146	11,300	NA-Ave over 20 yrs=565	1,103	16547
Kaloko Town Center (Proposed Action)	1,770	130 to 60	2,600	260 to 710	1,780	6,150
Total without the Proposed Action	37,303 to 39,043		23,603 to 29,392		25,769 to 29,688	88,605 to 107,405
Total with the Proposed Action	39,703 to 40,813		26,203 to 31,992		27,549 to 31,468	90,385 to 113,555

1. FTE= Full time equivalent position
2. Kealakehe Planned Community Final Environmental Impact Statement, prepared for HFDC by Belt Collins & Associates, Sept 1990
3. Liliuokalani Trust, Final Environmental Impact Statement prepared for Liliuokalani Trust by Belt Collins & Associates, Oct 1990.
4. No residential units planned by Liliuokalani Trust, however, 450 acres of the Trust lands were sold to the State for future residential use and population estimates calculated for this area.
5. Urban Expansion of State Lands, Final Environmental Impact Statement prepared for Office of State Planning by Helber, Hastert & Fee, July 1993.
6. Kaupulehu Resort Expansion, Final Environmental Impact Statement prepared for Kaupulehu Developments by Belt Collins & Associates, Sept 1994.

Evaluating the cumulative impacts on employment in the region is complicated by inconsistent reporting methods provided in each environmental impact report. For example, the Final Environmental Impact Statement for the Urban Expansion of State Lands does not provide an estimate of the number of construction job created (Urban Expansion of State Lands, FEIS, pgs. 5-4 to 5-7). In addition, a variety of reporting methods for indirect and induced employment were provided by the other impact statements. Notwithstanding, if the cumulative impacts on employment for the region is viewed as an order of magnitude impact, the proposed projects would result in roughly 88605 to 107405 full time equivalent positions over the 20+ year development time frames of all projects without the proposed project. With the proposed project, the number of full time equivalent positions would be roughly 90385 to 113555 distributed over the 20+ development time schedules of all projects. These employment estimates represent the total number of direct and indirect/induced construction positions, and direct and indirect/induced operational positions as reported in the various impact statements.

Although construction and indirect/induced construction jobs account for a significant amount of employment opportunities, again, the different reporting methods make it difficult to indicate this impact in a meaningful way. In the absence of this information, perhaps a more useful measure of employment impact would be the total number of long-term operational employment created by these projects. Long term operational employment without the proposed project range from 25769 to 29688 positions and increase to 27549 to 31468 with the proposed project.

Although the visitor industry would most likely continue as the primary economic base in the West Hawaii region, the type of jobs created in the North Kona District as a result of the proposed projects would most likely help to diversify employment opportunities 20+ years from now largely as a result of employment opportunities created indirectly or induced by direct employment. The permanent population base will create a need for not only retail, service and labor categories but also professional, educational, medical, legal, insurance and other semi-professional job categories.

In addition, as former sugar lands are converted to other agricultural uses, the permanent population base as well as the resort destinations in the region will generate a market for diversified agricultural products such as cut flowers, fresh vegetables and fruits and other locally grown produce.

Table 5-16
Cumulative Data on Project Costs, Public Revenues and Public Costs Adjusted for Inflation to 1996 Dollars ($ million)

Project	Project Costs/ 1996 $[1]	State Revenues/ 1996 $[1]	Cnty Revenues/ 1996 $[1]	State Costs/ 1996 $[1]	Cnty Costs/ 1996 $[1]
Kealakehe Planned Community[2] (Villages of La'i'opua)	147 **183**	72 **90**	112 **139**	34 **42**	92 **114**
Liliuokalani Trust[3]	130 **162**	368 **458**	14 **17**	27 **34**	12 **60**
Urban Expansion of State Lands[5]	na	na	na	na	na
Kaupulehu Resort Expansion[6]	364 **390**	112 **120**	120 **129**	11 * **12**	56 * **60**
Kaloko Town Center (Proposed Action)	199 **203**	2.9 **2.96**	1.35 **1.33**	2.59 **2.65**	.8 **.82**
Total without the Proposed Action	641 **735**	552 **668**	246 **285**	72 ** **88**	160 **189**
Total with the Proposed Action	840 **938**	554.9 **670**	247 **286**	74.5 ** **90.6**	160.8 **189.8**

1. Numbers in bold represent amounts adjusted to 1996 dollars according to Bank of Hawaii's consumer price index conversion factors for urban areas.
2. Kealakehe Planned Community Final Environmental Impact Statement, prepared for HFDC by Belt Collins & Associates, Sept 1990
3. Liliuokalani Trust, Final Environmental Impact Statement prepared for Liliuokalani Trust by Belt Collins & Associates, Oct 1990.
4. No residential units planned by Liliuokalani Trust, however, 450 acres of the Trust lands were sold to the State for future residential use and population estimates calculated for this area.
5. Urban Expansion of State Lands, Final Environmental Impact Statement prepared for Office of State Planning by Helber, Hastert & Fee, July 1993.
6. Kaupulehu Resort Expansion, Final Environmental Impact Statement prepared for Kaupulehu Developments by Belt Collins & Associates, Sept 1994.

The cumulative impacts on benefits and costs to government are based on available information provided in the environmental impact reports. Unfortunately, the environmental impact statement for the Urban Expansion of State Lands did not report on project construction costs, public revenues and public costs. As such it is impossible to arrive at a comprehensive and consistent evaluation of this topic. This is especially problematic since the urban expansion project accounts for a potentially large impact covering some 2,640 acres. Nonetheless, available information provided for each of these major projects are summarized in Table 5-

16. Because dollar amounts were provided at different time periods, each of the figures provided were adjusted to 1996 dollars according to Bank of Hawaii's consumer price index conversion factors for urban areas.

Cumulative impacts to the region as a result of the four major projects would potentially result in an investment of over $735 million in construction costs without the proposed action and some $938 million with the proposed action. In terms of revenues to the State in the form of taxes, roughly $668 would be added to the state coffers over the 20+ year development time frame for all projects. This amount would increase to $670 million with the proposed project. County revenues would amount to roughly $285 million without the proposed project and roughly $286 million with the proposed project. To support this cumulative increase in population, the State would need to provide $88 million in public services without the proposed project and roughly $90.6 with the proposed project. The county, similarly would need to provide $189 million in county services without the proposed project and roughly $189.8 million with the proposed project. Again, because of inconsistencies in reporting methodologies, these figures should be viewed as a general order of magnitude assessment of cumulative impacts.

Given the potential amounts of revenues estimated for all projects, the cumulative impacts to public facilities and services should, in theory, be positive. As reported in this EIS and others, public services such as police, fire and education in the region are currently experiencing a number of problems relative to overcrowded and inadequate facilities, as well as staff shortages. If public revenues are generated as a result of the proposed projects for the region and public expenditures are allocated accordingly in a timely manner, future cumulative impacts relative to public facilities and services should be positive. However, predicting government's fiscal situation in the future is speculative at best because budget allocations are highly political. Therefore the cumulative impacts on public services and facilities remain an unresolved issue.

Social Impacts

As indicated in other chapters, the cumulative impact on the region would involve the urbanization of some 6,000 acres. With that, potentially 35,000 to 45,000 people will be living, working, and playing in the North Kona district. The State's Villages of La'i'opua and the Urban Expansion of State Lands would increase the amount of affordable housing stock in the region which would perhaps have a stabilizing effect on the price of housing and rentals. Although the visitor industry is predicted to continue as the primary economic activity for the area, the increased population would generate a demand for more diverse goods and services. With more employment in the district, out migration to Honolulu and other areas of the State by job seeking individuals would potentially decrease. Health services would potentially improve as the larger population base would be able to justify state of the art medical equipment and services. With the possible development of a West Hawaii University, higher education facilities would be provided in the district.

The existing rural lifestyle of residents in the district would change to a faster pace with unpredictable changes to the social structure of the area. Recreational facilities such as neighborhood and regional parks and golf courses developed in conjunction with each project would provide facilities for organized recreation. However, the increased population will most likely increase demand for natural recreational resources such as beaches, ocean and mountains.

Cultural Impacts

The cultural impacts for the proposed action has been discussed in Chapter 5. The interrelationships and cumulative impacts on culture of the region is an unresolved issue because this particular issue was not addressed in the impact statements prepared for the other major projects.

Chapter 6
INFRASTRUCTURE, PUBLIC FACILITIES AND SERVICES

6. INFRASTRUCTURE AND PUBLIC FACILITIES AND SERVICES

6.1 Traffic Impact Analysis Report

A Traffic Impact Analysis Report (TIAR) for the proposed project was prepared by the Traffic Management Consultant. The TIAR is attached as Appendix L and is summarized below. Traffic impacts of the proposed project were assessed in the context of increased traffic which could be expected to occur in the region as other properties are developed and improvements to existing traffic corridors are implemented.

Affected Environment

The project site fronts on Queen Ka'ahumanu Highway, the region's major traffic corridor which provides access to the resorts of South Kohala, the Keahole Airport and Kailua-Kona Town. Access is proposed on Hina Lani Drive via an entry road located opposite the mauka road of the industrial subdivision. Direct access is also proposed on Queen Ka'ahumanu Highway at an at-grade intersection located approximately 2,000 feet north of Hina Lani Drive. Internal collector roads will provide access to various proposed land uses.

Existing Roadway System

Queen Ka'ahumanu Highway is a two way, two lane, high quality arterial highway connecting Kailua-Kona to Kawaihae. It is the primary highway along the South Kohala and North Kona coasts. Exclusive left turn and right turn lanes are provided on Queen Ka'ahumanu Highway at key intersections such as Keahole Airport Access Road and Hina Lani Drive. Left turn median storage lanes and right turn acceleration lanes are also provided at these intersections. Both of these intersections are unsignalized.

Mamalahoa Highway, located about 3.3 miles mauka of Queen Ka'ahumanu Highway, is a two lane, two way arterial highway that is a continuation of a "belt" road that circles the island of Hawaii. Mamalahoa Highway provides the primary route between Waimea and Kailua-Kona.

Kanalani Street is a two-lane, two-way local roadway providing access to the Kaloko Light Industrial Subdivision. Kanalani Street intersects Hina Lani Drive at a stop-controlled, Tee-intersection. Road F is a two-lane, two-way local roadway providing access to the Costco Store. Road F also intersects Hina Lani Drive as a stop-controlled, Tee-intersection.

Hina Lani Drive is a two-way, two-lane collector road on the south border of the project site. It is about 3.2 miles south of the Keahole Airport Access Road. The construction of this 2.2 mile roadway, including water and power transmission systems, was funded by the applicant as an Improvement District. Hina Lani

Drive extends some 2.27 miles mauka and provides a mauka-makai connection between Mamalahoa Highway and Queen Ka'ahumanu Highway. Hina Lani Drive intersects Queen Ka'ahumanu Highway at a stop-controlled, Tee-intersection.

Existing Traffic Volumes and Operating Conditions

Traffic measurements were conducted on November 20, 1995 between 6:00 am and 9:00 am during the morning peak period of traffic and between 2:30 and 5:30 PM during the afternoon peak. The survey included the intersections of Queen K and Hina Lani Drive, Hina Lani Drive and Kanalani Street; Hina Lani Drive and Road F; and Mamalahoa Drive and Hina Lani Drive.

During the AM peak hour of traffic between 7:00 and 8:00 am, the intersections within the study area operate at satisfactory Levels of Service (LOS). In contrast, Mamalahoa Highway carries about 900 vehicles per hour total for both directions and operates at LOS "E". Queen Ka'ahumanu Highway carries about 1,100 vph in the vicinity of the project area and operates at LOS "D".

The PM peak hour of traffic on Queen Ka'ahumanu Highway generally occurs between 3:45 and 4:45 PM. With the exception of the left turn movement onto Mamalahoa Highway from Hina Lani Drive and the movement from Kanalani Drive in both directions onto Hina Lani Drive, both of which operate at LOS "D", all other intersections operate at satisfactory levels of service during the PM peak hour of traffic. Mamalahoa Highway carries 880 vph total for both directions and operates at LOS "E". Queen Ka'ahumanu Highway carries about 1,600 vph and operates at LOS "E".

Probable Impacts

Projected Traffic

An assessment of projected traffic was determined by considering external traffic projections, anticipated future development and their corresponding traffic projections and anticipated future roadway improvements.

External Traffic Projections

A regional transportation master plan, entitled the Land Transportation Master Plan for Hawaii County (LTMPHC) is currently being prepared by the State Department of Transportation (DOT). Preliminary estimates indicate that by the Year 2020, average daily traffic on Queen Ka'ahumanu Highway would increase to 29,300 vpd between Keahole and Kealakehe. Mamalahoa Highway could expect an increase to 18,400 vpd. These estimates represent a 3.44% annual increase in regional traffic for both highways.

Anticipated future development projects include:

- Kaloko Industrial Park consisting of an expansion of an additional 50 acres of a total 127 acre project by the Year 2020.
- Kaloko Subdivision by Y.O. Ltd. on the mauka section of Hina Lani Drive to include development of 320 single family dwelling units and 80 multi-family dwelling units by the Year 2020.
- Kamaaina 8 Industrial subdivision consisting of commercial and industrial lots on 70 acres of property located immediately adjacent to the project site with access provided at an at-grade channelized intersection on Queen Ka'ahumanu Highway;
- Honokohau Light Industrial Project located on the mauka side of Queen Ka'ahumanu Highway, immediately north of the Villages of La'i'opua with access provided on Queen Ka'ahumanu Highway;
- Lanihau Partners/Palani Trust property located immediately south of the Kaloko Industrial Subdivision consisting of 630 acres currently being master planned;
- Kohanaiki Resort located makai of Queen Ka'ahumanu Highway, opposite the project site, to include 2,200 hotel rooms and resort condominium units, 210 single family residences, commercial village and an 18-hole golf course with access planned as a fully channelized, at-grade intersection located about 1 mile north of Hina Lani Drive;
- Kealakehe Planned Community (Villages of La'i'opua), an HFDC project to include 4,379 residences, golf course, two school sites, civic center and three commercial areas on 960 acres with traffic generation estimates of 5,021 vph during the AM peak hour and 6,636 vph during the PM peak;
- Keahole Airport Expansion which is expected to generate 3,300 vph during the airport peak hour of traffic and recommends provision of a full service interchange for both the airport and the mauka area;
- West Hawaii State Lands recently granted urban reclassification and consisting of 2,640 acres located on the mauka side of Queen Ka'ahumanu Highway opposite Keahole Airport and is yet unplanned; and
- Hawaii Ocean Science & Technology Park and Natural Energy Laboratory of Hawaii (NELH) which proposes to improve access by constructing a fully channelized, at-grade signalized intersection provided Queen Ka'ahumanu Highway is widened to four lanes to accommodate future through traffic.

Anticipated Future Roadway Improvements

A number of roadway improvements have been committed by the State Department of Transportation. Queen Ka'ahumanu Highway will be widened between Kailua-Kona and the Keahole Airport by the Year 2000. In addition, the Kealakehe Parkway will be completed as part of the State's Villages of La'i'opua.

Widening of Mamalahoa Highway to a four-lane, undivided highway between Waimea and Palani Road is being evaluated as part of the State's LTMPHC. Roadways proposed in the Keahole to Kona Development Plan would be constructed in increments as development within the region occurs.

The widening of Queen Ka'ahumanu Highway to a four-lane, divided highway from Henry street in Kailua-Kona to Keahole Airport Access Road would provide a highway capacity of 47,000 vehicles per day total for both directions. The widening project considered a four-lane, controlled access freeway with grade-separated interchanges and a system of frontage roads. However, this concept was rejected since is was not warranted by traffic projections within the projected time frame.

As a part of this project, the Queen Ka'ahumanu Highway and Hina Lani Drive intersection will be signalized. At this intersection, Queen Ka'ahumanu Highway would consist of two through lanes in each direction with an exclusive left turn lane in the southbound direction, an exclusive right turn lane in the northbound direction, a bicycle lane in the northbound direction and bicycle route/paved shoulder in the southbound direction. The existing two-lane highway would become the northbound through lanes of the highway and the median and southbound lanes would be constructed on the makai side of the highway. All improvements would be constructed within the existing 300 foot right of way.

Kealakehe Parkway will provide access to the initial phases of the Villages of La'i'opua and the proposed Kealakehe High School. Kealakehe Parkway is ultimately proposed as a four-lane arterial connecting Mamalahoa Highway with Queen Ka'ahumanu Highway.

The Keahole to Kailua Development Plan includes four new roadway proposals designed to provided north-south access paralleling the Queen Ka'ahumanu Highway. The plan's mid-level arterial parallels Queen Ka'ahumanu Highway from Palani Road and extends north to the State's West Hawaii project. The mid-level arterial is proposed to run along the mauka boundary of the proposed project and is classified as a four-lane minor arterial with a 120 foot right of way. Another street, called Main Street, is proposed as a minor collector roadway starting from Kealakehe Parkway and terminating at Hina Lani Drive on the mauka side of the existing Kaloko Industrial Subdivision. The other two roadway proposals, the Waena Drive extension and the Kealakehe Drive extension, are proposed to run parallel to Queen Ka'ahumanu Highway further mauka of the petition area.

Year 2020 Peak Hour Traffic Analysis without the Proposed Project

To determine traffic impacts resulting from the proposed project, the likely future traffic conditions assuming completion of planned traffic improvements without the proposed project have been prepared. Evaluating future traffic conditions without the proposed project establishes baseline conditions from which a comparison can be made. This analysis assumes that Queen Ka'ahumanu Highway widening would be completed by the Year 2020. It does not take into account the construction of any north-south roadways proposed by the Keahole to Kailua Development Plan.

Future AM peak hour traffic conditions in the Year 2020 without the proposed project indicate that the four-lane Queen Ka'ahumanu Highway would operate at LOS "A" and that the intersection of Queen Ka'ahumanu and Hina Lani Drive would operate at "under capacity" with traffic signalization. Mamalahoa Highway without widening would operate at LOS "F". Turning left from Hina Lani Drive onto Mamalahoa Highway would operate at LOS "F". Turning left from Kanalani Street onto Hina Lani Drive would operate at LOS "D".

Future PM peak hour traffic conditions indicate that Queen Ka'ahumanu Highway would operate at LOS "B" and the Queen Ka'ahumanu Highway and Hina Lani Drive intersection would continue to operate at "under capacity" conditions. Mamalahoa Highway without widening would operate at LOS "E". Turning left from Hina Lani Drive onto Mamalahoa Highway would operate at LOS "F". Turning left from Kanalani Street onto Hina Lani Drive also would operate at LOS "F". See Figure 6-1.

Trip Generation

The amount of traffic attributed to the proposed project is based on a trip generation methodology developed by the Institute of Transportation Engineers (ITE) and published in "Trip Generation", 5th Edition, 1991. The number of trips generated by the proposed project assumes a commercial mix of 52 acres in retail-commercial activities and 5 acres of general office buildings. Retail density assumes 11,000 SF gross floor area per acre and office density assumes 15,000 SF gross floor area per acre.

The proposed project is expected to generate 1,094 vehicles per hour (VPH) during the AM peak hour and 2,740 vph during the PM peak. Trips generated by the various proposed land uses are presented in Table 6-1.

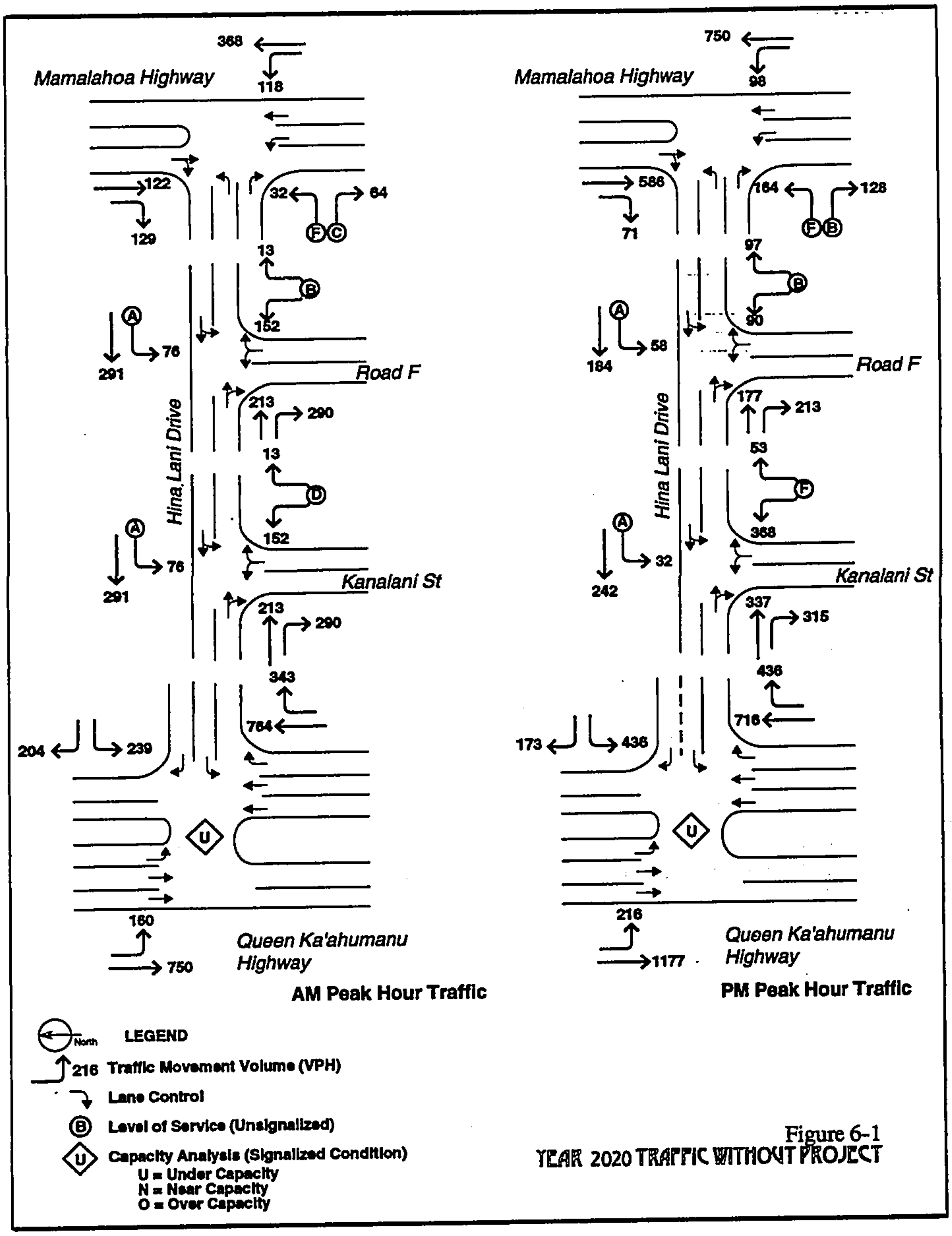


Figure 6-1
YEAR 2020 TRAFFIC WITHOUT PROJECT

Table 6-1
Trip Generation Summary

Land Use	Land Use Intensity	AM Peak Hour Traffic Enter	AM Peak Hour Traffic Exit	AM Peak Hour Traffic Total	PM Peak Hour Traffic Enter	PM Peak Hour Traffic Exit	PM Peak Hour Traffic Total
		Vph					
Single Family Dwelling	370 DU	65	186	251	228	123	351
Multi-Family Dwelling	480 DU	30	146	176	149	77	226
Retail	52 acres	286	168	454	937	997	1994
Office	20 acres	136	17	153	26	125	151
School	13 acres	26	24	60	8	10	18
	Totals	553	541	1,094	1,408	1,332	2,740

Traffic Impact Analysis

In conducting this analysis of future traffic, it is assumed that roadway improvements discussed above are implemented by the State DOT or in conjunction with other developments planned along Hina Lani Drive. The "project-related" traffic improvements are associated with access improvements required by the proposed project.

Traffic improvements by others include the following:

a. Widen Queen Ka'ahumanu Highway from two lanes to four lanes between Kailua and Keahole Airport,
b. Signalize the intersection of Queen Ka'ahumanu Highway and Hina Lani Drive,
c. Upgrade Queen Ka'ahumanu Highway at Hina Lani drive to provide an exclusive left turn lane in the southbound direction and an exclusive right turn lane in the northbound direction,
d. Signalize the intersection of Hina Lani Drive and Kanalani Street,
e. Widen Hina Lani Drive at Kanalani Street to provide an exclusive right turn lane in the mauka bound direction and an exclusive left turn lane in the makai bound direction,
f. Widen Kanalani Street at Hina Lani Drive to provide separate left turn and right turn lanes at Hina Lani Drive.
g. Signalize Mamalahoa Highway at its intersection with Hina Lani Drive
h. Widen Southbound Mamalahoa Highway to provide an exclusive right turn lane at Hina Lani Drive.

Roadway improvements that are required by the proposed project include:

a. Signalize the intersection of Queen Ka'ahumanu Highway and Road,
b. Widen Queen Ka'ahumanu Highway to provide an exclusive left turn lane in the southbound direction and an exclusive right turn lane in the northbound direction at Road A.
c. Widen Hina Lani Drive at Road B to provide an exclusive left turn lane in the mauka bound direction and an exclusive right turn lane in the makai bound direction,
d. Signalize the intersection of Hina Lani Drive and road B,
e. Widen Southbound Hina Lani Drive to provide dual left turn lanes at Queen Ka'ahumanu Highway.

Traffic Impacts with the Proposed Project in the Year 2020

In the Year 2020, AM peak hour traffic volumes with the proposed project would have the following results: The intersection of Mamalahoa Highway and Hina Lani Drive is expected to continue to operate at "near capacity" under signalized conditions. Mamalahoa Highway is expected to continue to operate at LOS "F". Queen Ka'ahumanu Highway will continue to operate at satisfactory LOS. (See Figure 6-2).

The afternoon peak hour traffic would operate under the same conditions as the morning peak hour traffic in the Year 2020 with the proposed project. (See Figure 6-3).

<u>Mitigation Measures</u>

To achieve the peak hour traffic conditions at full build out in the Year 2020, a number of mitigation measures are recommended. These include recommendations for traffic improvements by others such as the State DOT, County DOT and other developers as appropriate. In addition, a number of project related traffic improvements are recommended.

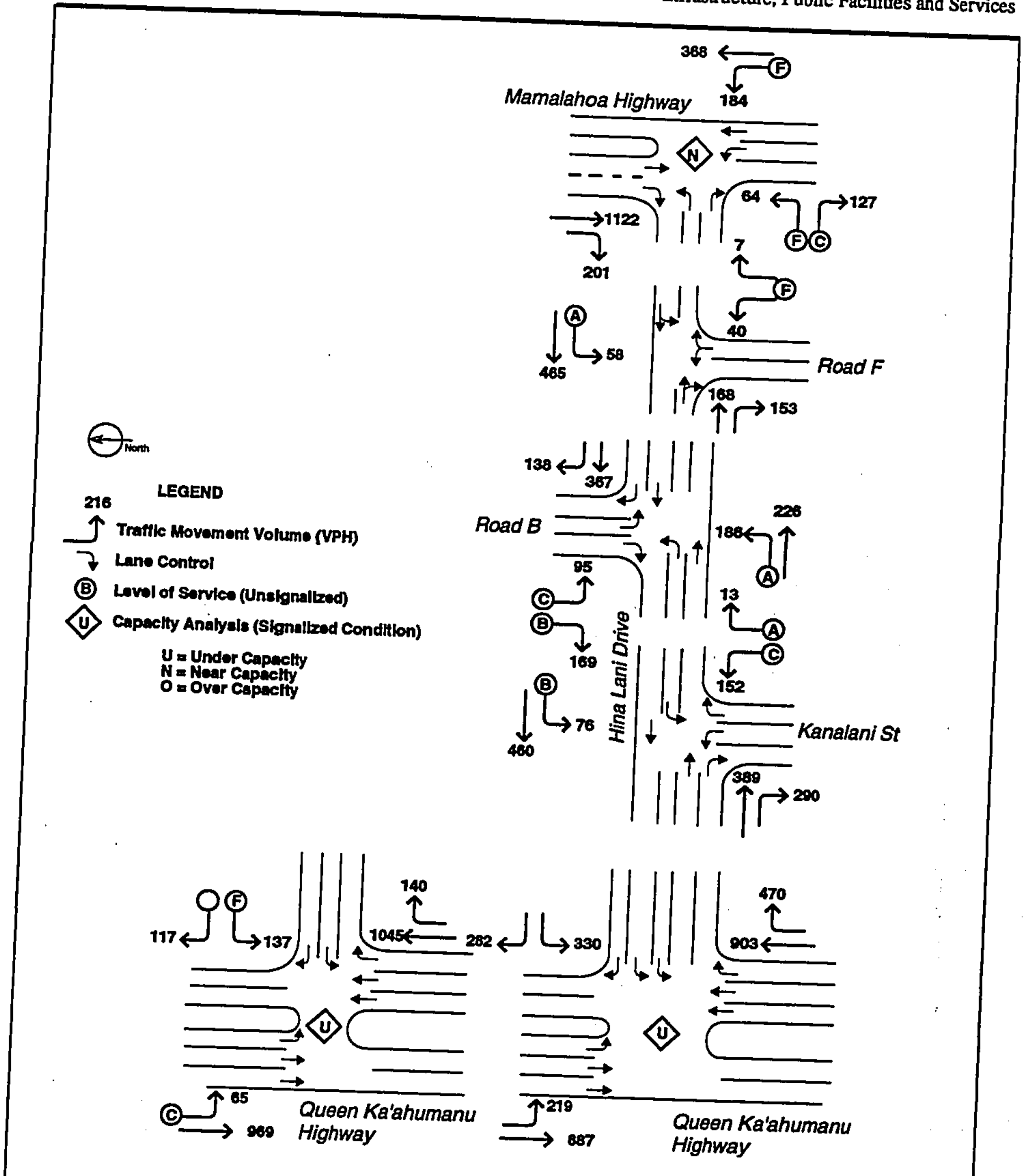


Figure 6-2
YEAR 2020 TRAFFIC WITH PROJECT
AM PEAK HOUR

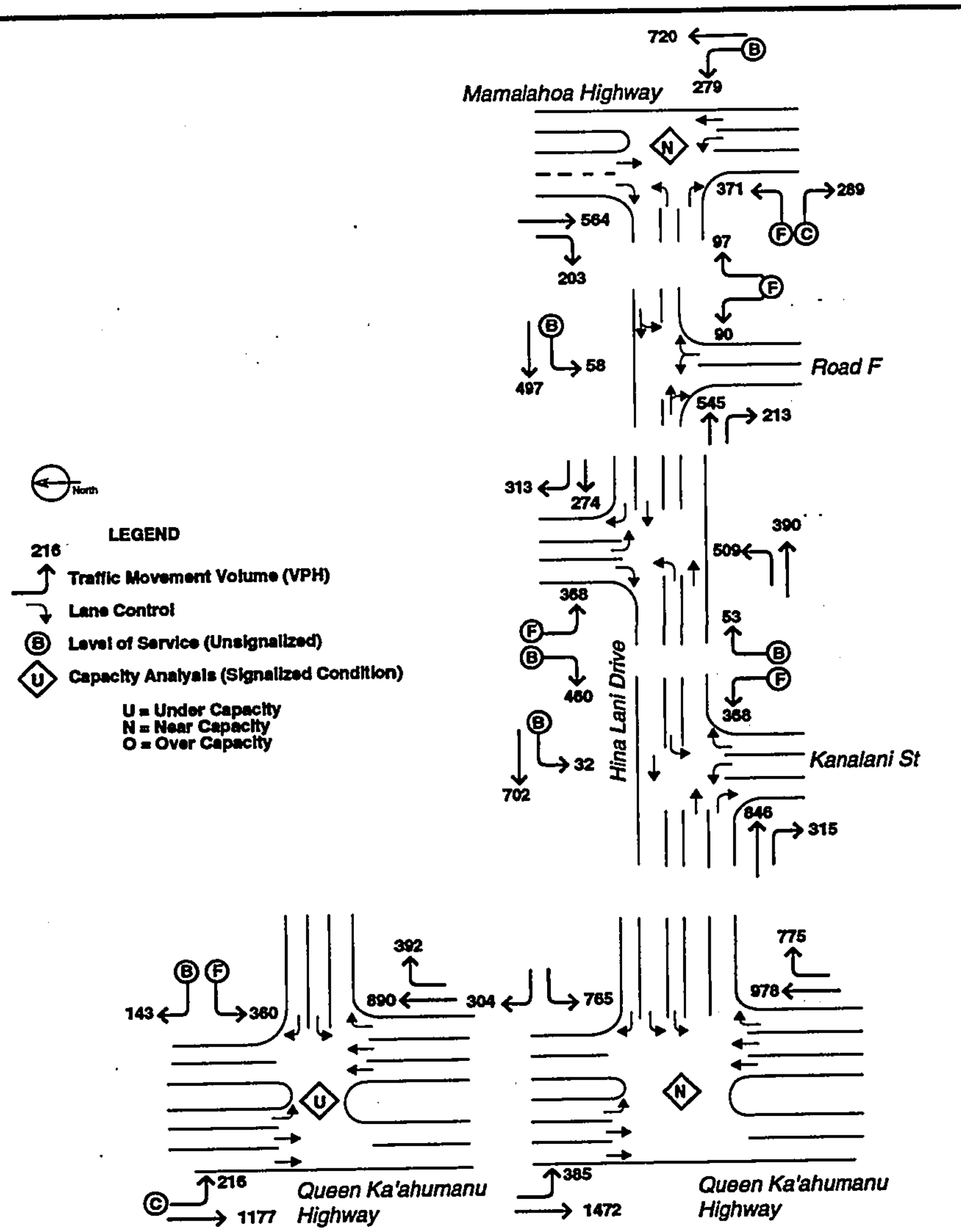


Figure 6-3
YEAR 2020 TRAFFIC WITH PROJECT
PM PEAK HOUR

Traffic improvements by others include:

a. Widen Queen Ka'ahumanu Highway from two lanes to four lanes between Kailua and the Keahole Airport as proposed by the State DOT,
b. Signalize the intersection of Queen Ka'ahumanu Highway and Hina Lani drive as proposed by the State DOT,
c. Upgrade Queen Ka'ahumanu Highway at Hina Lani to provide an exclusive left turn lane in the southbound direction and an exclusive right turn lane in the northbound direction as proposed by the State DOT,
d. Signalize he intersection of Hina Lani Drive and Kanalani to mitigate LOS "F" conditions expected during the PM peak hour of traffic without the proposed project,
e. Widen Hina Lani Drive at Kanalani Street to provide an exclusive right turn lane in the mauka bound direction and an exclusive left turn lane in the makai bound direction to minimize queuing from Kanalani Street to Queen Ka'ahumanu Highway,
f. Widen Kananali Street at Hina Lani Drive to provide separate left turn and right turn lanes at Hina Lani Drive to facilitate the side street movements at the proposed signalized intersection,
g. Signalize Mamalahoa Highway at its intersection with Hina Lani Drive to mitigate the LOS "F" conditions during AM and PM peak hours of traffic without the proposed project,
h. Widen Southbound Mamalahoa Highway to provide an exclusive right turn lane at Hina Lani Drive, to facilitate the right turn movement at the proposed signalized intersection.

Project access improvements required include the following:

a. Signalize the intersection of Queen Ka'ahumanu Highway and Road A,
b. Widen Queen Ka'ahumanu Highway to provide an exclusive left turn lane in the southbound direction and an exclusive right turn lane in the northbound direction at Road A,
c. Widen Hina Lani Drive at Road B to provide an exclusive left turn lane in the mauka bound direction and an exclusive right turn lane in the makai bound direction,
d. Signalize the intersection of Hina Lani Drive and Road B.
e. Widen Hina Lani Drive to dual left turn lanes at Queen Ka'ahumanu Highway,
f. Widen Hina Drive at Road F to provide an exclusive left turn lane in the makai bound direction and an exclusive right turn lane in the mauka bound direction.

Beyond the Year 2020, the TIAR recommends that Mamalahoa Highway be widened from two to four lanes as discussed in the LTMPHC, and the future roadways proposed in the Keahole to Kailua Development Plan should be implemented.

6.2 Water

Affected Environment

The County Department of Water Supply's (DWS) drinking water system provides water supply to the North Kona area from Keauhou to Keahole Airport and Kona Palisades. The system includes a 12-inch line in Queen Ka'ahumanu Highway along the makai end of the project site and a 20-inch pipeline in Hina Lani Drive along the project's south side. There are also three 1.0 million gallon (MG) storage tanks along Hina Lani Drive with spillway elevations of 650.67, 363.67 and 138.67 feet. The elevation of the Kaloko Town Center project site varies from 80 feet along Queen Ka'ahumanu Highway to 290 feet at its mauka end. Project areas below elevation 250 feet would fall within the service pressure zone of the 363-foot tank. Areas above 250 feet would need to be served from the 650-foot tank utilizing a high pressure bypass line above the 363-foot tank.

Water use for the proposed project at full build-out is expected to range between 0.562 MGD to 0.870 MGD. See Table 6-2 below. The low end of the range approximates DWS' island-wide water consumption guidelines. However, in North Kona, actual water consumption generally exceeds these guidelines. To account for this, the high end of the range has been estimated at approximately 25 percent above the guidelines. Based on DWS design standards, this would require reservoir storage of 0.8 to 1.3 MGD and well pumping capacity of 585 to 900 gallons per minute (GPM).

Table 6-2
Projected Water Use

Land Use	No of Units or Acres	Range of Year-Round Average Use: Based on DWS Standards (MGD)	Range of Year-Round Average Use: Anticipated Maximum Use (MGD)
Single Family Resident	37 a	0.015	0.185
Multi-Family Resident	500 u	0.200	0.250
School/Park	13 a	0.052	0.065
Commercial	45 a	0.135	0.170
Office/Commercial	40 a	0.160	0.200
Total		0.562	0.870

Probable Impacts

To meet DWS' design standards, the project's anticipated 0.56 to 0.70 MGD of water use will require a well pumping capacity of 585 to 735 GPM. Present well sources of the County DWS system include four drilled wells at Kahaluu (A, B, C, and D, Well Nos. 3557-01 to -04), the Kahaluu Shaft (Well No. 3557-05), the Holualoa Well (No. 3657-01), and the North Kalaoa well (Well No. 4358-01). Outfitting of the Honokohau, Liliuokalani Trust, and Halekii wells (Nos. 4158-02, 4057-01, and 315502, respectively), all of which tap high level groundwater, are in various stages of design and construction. Virtually all wells which will be subsequently added to DWS' North and South Kona systems will tap high level groundwater.

However, supply allocations from all of these wells including those scheduled for outfitting in the near future have either been committed to existing uses, to projects at a further stage of planning and engineering than the Kaloko Town Center project, or to alleviate the demand on the Kahaluu shaft.

Mitigation Measures

According to Mr. Milton Pavao, Manager, Department of Water Supply, (tel con with Rodney Kawamura, Hilo Engineering, 21 Aug 96), the Department currently has 2 high level wells on line with 2 more coming on line in the near future. The Department is planning to drill and equip another high level well in the area. According to a report prepared by Tom Nance Water Resources Engineering, there are also 3 other high level wells in the area which have been drilled but not outfitted. If need be, the proposed action could enter into a joint venture, at full build-out, to outfit one of the drilled wells. Water is available through the existing system located along Hina Lani Drive, however, 2 reservoirs situated at the 900-foot and 1200-foot elevations and connecting waterlines are required for the proposed project (letter, Department of Water Supply, County of Hawaii, 19 August 1996). Use of these water sources and facilities will require approval from the County Department of Water Supply.

The 20-inch line and three 1.0 MG tanks in Hina Lani Drive were constructed by improvement district funding. This included an appropriate assessment for the Kaloko Town Center project area. These will require a few modifications and additions including: construction of appropriately sized, onsite distribution pipelines which will be connected to the 363-foot tank and the existing 8-inch high pressure bypass line from the 650-foot tank; and modifying the system to enable water to be dropped via gravity from new source wells above Mamalahoa Highway down to the existing 12-inch main in Queen Ka'ahumanu Highway. All improvements will be designed and constructed in accordance with DWS standards and dedicated to the County.

6.3 *Drainage*

Affected Environment

The region surrounding and including the project area consists predominantly of barren a'a and pahoehoe lava fields. Because of the high porosity of this ground material and the relatively low rainfall levels, approximately 11 inches annually, concentrated stormwater runoff is not known to occur. In addition, defined drainage channels and streams are absent.

Probable Impacts

The Keahole to Kailua Development Plan advocates a zero-runoff drainage concept which means that runoff generated on the property would need to be handled by infiltration into the ground either by drywells, seepage areas or a combination of both.

On-site drainage requirements were estimated using the Drainage Standards of the County of Hawaii and the conceptual master plan for the Kaloko Town Center. The number of drywells for each proposed land use area was calculated using a 10-year rainfall recurrence interval and 1.5 inches per 1 hour rainfall (based on County of Hawaii Standards), and a drywell capacity of 6 cubic feet per second per drywell (based on factors used in the Keahole to Kailua Development Plan). Existing ground contours were used to determine the slope of each of the land use areas because detailed subdivision and internal road layouts were not prepared for this preliminary analysis. Based on this conceptual analysis, achieving zero-runoff would require a total of 55 drywells for the proposed project site. See Table 6-3.

Table 6-3
On-Site Drainage Requirements

Area No.	Land Use	Area (Acs)	Number of Drywells
1	Residential	40	7
2	Residential	40	6
3	Multi-Family Resid	8	2
4	Commercial/Retail	7	4
5	School/Park	13	2
6	Commercial/Retail	30	14
7	Multi-Family Resid	20	5
8	Multi-Family Resid	20	5
9	Office/Com'l/Retail	20	10
	Total		55

The drainage system will be designed in accordance according to the requirements of the County Department of Public Works.

6.4 Wastewater Disposal

Affected Environment

There are no sewer lines in either Hina Lani Drive or that portion of Queen Ka'ahumanu Highway that borders the project site. The majority of existing uses and activities situated in the Kaloko Industrial Park are on cesspool sewage systems. The State Department of Health will no longer approve the use of cesspools for domestic sewage treatment. Instead, septic tanks and leaching fields are the minimum domestic standard allowed. Commercial uses are allowed the use of septic systems, subject to approval of the State Department of Health.

The County's Kealakehe Wastewater Treatment Plant (WWTP) is located approximately 2 miles to the south of the project site on the makai side of Queen Ka'ahumanu Highway. The facility, built in 1993 , has a 20-year design capacity of 2.8 MGD average flow. The Kealakehe WWTP has a current capacity of 5.3 mgd and is currently operating at approximately 20% of capacity. Future phases will allow it to expand to an approximate 8 MGD average flow for a 40 year design period (Keahole to Kailua Development Plan, p. 4-12). Additional expansion will be limited by the effluent disposal capacity of the area. Effluent from the facility will be used as irrigation of the planned municipal golf course at Kealakehe or disposed in seepage ponds as backup. Sludge generated at the facility is disposed approximately twice monthly at the Puu Anahulu Landfill. The Kealakehe WWTP is connected to the existing collection system of the Kailua-Kona Sewerage System located in the Kailua Village Industrial Area.

Probable Impacts

Sewage generated from the Kaloko Town Center is estimated to be in the order of 449,920 gallons per day at full build out. Taking into account dry weather infiltration above normal ground water table, the maximum flow based on an estimated population of approximately 5,624 people is estimated at 1,673,140 GPD. See Table 6-4. As new developments come on line in the area to the north of the Kealakehe WWTP, the County's municipal sewerage system includes plans to develop a pump station at the proposed civic and business center located mauka of the Honokohau Harbor. From this pump station, a force main will transport sewage to the Kealakehe WWTP.

Table 6-4
Projected Sewage Generation

Land Use	Ave Daily per Capita Flow	Density	Units or Acres	Average Daily Flow (GPD)
Residential	80 gpd	4 p/u	370	118,400
Multi-Family	80 gpd	2.8 p/u	480	107,520
Commercial	80 gpd	40 p/a	57	182,400
School/Park	80 gpd	40 p/a	13	41,600
Total				449,920

Development of the proposed Kaloko Town Center would require the installation of a 12-inch sewage transmission line from the Kaloko Town Center to the pump station adjacent to the Kealakehe WWTP. The Kealakehe WWTP will have enough capacity to accommodate the proposed project without any need for expansion. The off-site connection from the project site to the Kealakehe WWTP as well as the on-site sewerage system will be designed in accordance with the requirements of the County Department of Public Works.

Mitigation Measures

Development of the Kaloko Town Center will have a beneficial affect of helping to mitigate potential adverse environmental impacts on the groundwater, the ecology of the Kaloko fishpond complex, and near shore marine environment because sewage generated by the Kaloko Town Center will be transported to the Kealakehe WWTP. Additional cesspools in the project area will not be constructed as a result of this project. Furthermore, the sewer connection from the project site to Kealakehe WWTP will allow other uses situated along the way to hook up thereby eliminating the current practice of using cesspools for sewage disposal.

6.5 Solid Waste Disposal

Affected Environment

Currently, solid waste is disposed at the County's Puu Anahulu landfill located south of Waikoloa, about 18 miles from the project site. The new landfill is 300 acres in size. According to Mr. Larry Capellas, DPW Solid Waste Division (tel con with Rodney Kawamura, Hilo Engineering, 21 Aug 96) the landfill has the capacity to handle solid waste generated by existing uses, the proposed project and other projects in the region. The initial 30-acre increment of the landfill, which was opened in 1993, is projected to last about 6 to 11 years. Additional 30-acre increments are projected to be required every 5 years hence. The former Kealakehe landfill area is now used as a transfer station where refuse from the smaller trucks used for collection is compacted and transported by large trucks to the Puu Anahulu landfill

Probable Impacts

Refuse generated by the Kaloko Town Center will rely on private refuse collection services who will use the County's landfill for waste disposal.

Mitigation Measures

The solid waste generated by the proposed project can be accommodated at the new Puu Anahulu landfill. However, to reduce the amount of solid waste, programs which encourage the reuse, recovery or recycling of waste should be implemented throughout the proposed development. In addition to recycling paper, glass and aluminum, locally produced landscape waste material should be sorted and recycled into composting material. Whenever feasible, the use of recycled content building materials including recycled plastic lumber and glasphalt for paving is to be encouraged throughout the development and construction process..

6.6 Electrical and Telecommunications

Affected Environment

Electrical Power. The Hawaii Electric Light Company's (HELCo) Keahole generating plant, located on the mauka side of Queen Ka'ahumanu Highway opposite of the Keahole Airport, provides power to the west Hawaii region. According to Ronald N.S. Ho & Associates, electrical engineers, Hawaii Electric Light Company (HELCo.), has a current generation capacity of approximately 199 MW, with a present peak demand of 166.3 MW.

Telephone. GTE Hawaiian Tel (GTE HT) currently provides telephone service for the region from their Kailua-Kona electronic switching facilities with trunk cables supported on the HELCO 69 kV poles located mauka of Queen Ka'ahumanu Highway. Hawaiian Telephone Company is also a privately owned utility.

Cable Television. Sun Cablevision is franchised to provide cable television service for the West Hawaii region. Cable television service is provided from their main plant located in Kailua Kona at Luhia Street. Currently, cable television lines extend from the main plant to the Kmart shopping area just north of the Liliuokalani industrial area along Queen Ka'ahumanu Highway.

Probable Impacts

Electrical, telephone and television services are provided by privately-owned utilities or companies which plan for and provide service as demand arises. As development projects move along the permitting process, these companies implement improvements according to their projections and system requirements.

The proposed Kaloko Town Center would generate a demand of 7.8 MW at full build-out. See Table 6- 5. Based on forecasted loading, the existing Kaloko Substation would need to be expanded. Over time, HELCo anticipates that its generation system will be adequate to carry the region's electrical demand because the annual load growth is anticipated to be gradual. HELCo has plans to add about 56 megawatts of generation at its Keahole Power Plant in 1998. The Hawaii Electric Light Company, like any other public utility, is mandated by charter to provide utility services. As demand increases with development in the region, the public utility would develop facilities to meet demand.

Figure 6-5
Forecasted Electric Loads (Peak)

Description	Quantity	Unit	Kilowatt (KW) Per Unit	Forecasted Load (KW)
Commercial/Retail	36.0	Acres	69.0	2,484
Office/Coml/Retail	20.0	Acres	69.0	1,380
Mutifamily	480.0	Each	3.5	1,680
Single Family	370.0	Each	4.0	1,480
School/Park	1.0	Each	750.0	750
Roads & Open Space	26.9	Acres	1.0	27
Forecasted Electric Loads (Peak				7,801

Note:
1. Load forecasts are based on the Kaloko Town Center Draft EIS prepared by Kimura International.
2. Loads for water pump station(s) and sewer systems, if any, were not available and therefore, are not included.
3. Loads for landscape lighting, irrigation systems, etc. were not available and therefore, are not included.

Currently, GTE HT provides telephone service to the area. However, other companies such as AT&T, may petition the Public Utilities Commission for certification to provide local telephone service to the area.

Given the potential increase in demand for cable television services with the development of the proposed project, additional service would most likely be provided by extending fiber optic cables supported by HELCO's power poles located mauka of Queen Ka'ahumanu Highway.

6.7 *Public Safety*

6.7.1 Police Protection

Affected Environment

The Kona Police State, located near the project site on Queen Ka'ahumanu Highway, currently has a force of 53 police officers responsible for covering the North and South Kona Districts. There are three watches in a 24-hour period with 14 officers assigned to each watch. In addition, two officers staff a small substation in Captain Cook. Support staff of the Kona Station includes three full-time clerks.

The present level of staffing at the Kona Station is faced with the problem of servicing an area extending over thousands of acres including mountainous topography, many dead-end roads and rough terrain. The situation is compounded by the growing population. Since 1990, staff levels have not increased despite increasing amounts of calls for police assistance. Between 1994 and 1995, miscellaneous calls increased 50% from 7,086 to 10,633. Serious crime reports are estimated at 27,000 in 1995.

Probable Impacts

The current staffing shortfall which has not kept pace with the increased population of the region will be further exacerbated with the development of the Kaloko Town Center. The ability of the police to deliver assistance will be negatively impacted by the proposed project as the increased resident population will most likely result in an increase in request for assistance. Furthermore, the increased de facto population in the commercial areas will most likely add to the service requirements related to crime and traffic problems.

Mitigation Measures

These impacts can be mitigated in several ways. First, all aspects of the project should be designed with security in mind. Public thoroughfares and pathways should be well-lit, structural entrances should be highly visible, and residential carports should be secured. Second, the roadway circulation system should be designed to minimize traffic congestion and unsafe driving conditions. Careful design attention should be paid to parking lot points ingress and egress and internal circulation. Third, the developer could initiate the formation of a homeowners' association which could create a community-based neighborhood watch program. Such programs which actively involve residents have been effective in decreasing property crimes in neighborhoods. Lastly, the commercial areas could be monitored by on-site security to handle minor offenses.

6.7.2 Fire Protection

Affected Environment

The project site falls within the service area of the Kailua-Kona Fire Station. The station covers a 30-mile radius extending from Kona Village Resort to Keauhou. The station is staffed with three shifts a day with 13 firefighters per shift. Equipment consists of an engine company, a ladder truck, a tanker, a rescue boat and EMS (emergency medical service) ambulance.

Other fire stations are located in South Kohala, Kainaliu and Waikoloa. The Maunalani Station, located in South Kohala, is equipped with a pumper, a tanker, an EMS helicopter and an EMS ambulance and staffed with seven firefighters per shift. In addition to these, a volunteer-operated fire station is located on the Belt Highway. The volunteers from this station are only used as a back-up to the Kailua-Kona Station and not for front-line emergencies. A small temporary station to house the fire truck is being constructed on Hualalai Ranch.

A new fire station is scheduled to be built near Keauhou in 1997. The county would also like to build another station between the airport and Kealakehe. However, because of current funding shortages, funds are not available for land acquisition, construction and equipment.

Probable Impacts

With development of the Kaloko Town Center requests for fire assistance will most likely increase with the increase in residential structures and commercial spaces. The project is well within the service radius of the Kailua-Kona Fire Station. However, to improve response times, a new station would need to be built somewhere between the Keahole Airport and Kealakehe.

Mitigation Measures

To mitigate potential impacts of the proposed project, the development's roadway and water distribution systems should be designed in accordance with the County of Hawaii's Uniform Fire Code (1988), as amended. This applies to requirements relative to fire apparatus access roads, roadway geometrics and gradients, placement of fire hydrants, water supply with required fire flow, and so on. In addition, all commercial and public buildings should be constructed in accordance with the Hawaii County Building Code and Uniform Building Code relative to fire protection and the installation of fire appliances.

6.7.3 Medical Facilities

Affected Environment

The Kaloko Town Center project site falls within the service area of the Kona Community Hospital located in Kealakekua. The Kona Community Hospital is administered by the State Department of Health and staffed with 60 doctors and 325 employees. The hospital provides 75 beds: 53 for acute care and 22 for long-term care. Most surgical needs are provided by the hospital although some of the more specialized cases are transferred to Honolulu hospitals. The hospital handles about 37,000 emergency visits and 650 births per year and has occupancy rates ranging between 90 to 95 per cent.

Improvements to the hospital include a new wing and administration building planned for construction within the next two years. However, no new patient beds are proposed.
Hilo Hospital is the other major hospital in the county. In addition, there are a number of small, primarily long-term care hospitals in Ka'u, North Kohala and Honoka'a, All are administered by the State. The North Community Hospital in Waimea, a private hospital, is currently under construction. This hospital will add 25 beds to the island wide inventory.

Probable Impacts & Mitigation Measures

The increased population attributed to the proposed Kaloko Town Center will impact the hospital system by increasing demand for services. The potential increase in demand for beds could be accommodated by transferring the Kona Community Hospitals long-term care beds to the Hill Haven Nursing Home which has 30 long-term care beds and plans to add 30 more. This will allow the Kona Community Hospital to change its long-term care beds to acute care. In addition to providing more physical accommodations, managed care practices may also help to reduce hospital occupancy by increasing outpatient services and same day surgery.

6.7.4 Civil Defense

Affected Environment

The petition area is not subject to tsunami inundation nor floods resulting from heavy rainstorms. The area was determined to be outside the 500 year flood plain by the National Flood Insurance Program of the Federal Emergency Management Agency. However, the petition area is within volcanic hazard zone 4, a zone of medium threat and the Island of Hawaii has a seismic zone rating of 3. In addition, the Hawaiian Islands have been struck by two major hurricanes in the past 14 years which have caused millions of dollars of property damage. Although the island of Hawaii was spared in the last two events, hurricanes are very unpredictable making all the islands at risk.

Probable Impacts

Should a natural disaster occur after the proposed Kaloko Town Center is completed, the added de facto population, major businesses, schools and other improvements would be at risk. The State and County Civil Defense agencies would be responsible for the safety and welfare of the population.

Mitigation Measures

If appropriate, the structures which are built as part of the Kaloko Town Center could be surveyed by the Civil Defense agency as possible public shelters in disasters. Furthermore, it is recommended that the petitioner coordinate development plans with the Civil Defense at latter stages of the development process to accommodate the need for Civil Defense equipment such as warning sirens.

6.8 Schools

Affected Environment

Existing schools which service the project site include the Kealakehe Elementary School, Kealakehe Intermediate School and Konawaena High School. Kealakehe Elementary School built in 1969 covers a service area which extends from Kona Heights to the edge of the service area of Holualoa Elementary School. With a current enrollment of 900 students, the school is operating at full capacity. In addition to its permanent structures, the school must use 13 portable classrooms and has a need for more buildings and playground space and a kitchen which meets health standards.
The service area of Kealakehe Intermediate School encompasses the urban area of the North Kona district. The school is grossly over capacity. All available rooms are used for instruction including the cafeteria, storage rooms, teachers' rooms and the boys' locker room. Also, several non-PE courses are taught outdoors. The intermediate school's playing field is shared with the neighboring elementary school. Five classrooms are currently under construction but are not expected to solve the overcrowding problem.

The Konawaena High School, located about 15 miles from the project site, is the only high school in the North and South Kona districts. As a part of the Villages of La'i'opua, the State has plans to construct a new Kealakehe High School. The school is scheduled for construction in 1997. When complete, it will serve students from Kona to Waikoloa. Konawaena High School will serve the southern portion of West Hawaii.

Probable Impacts

The proposed Kaloko Town Center is projected to generate 213 elementary, 51 intermediate and 85 high school students. The plan allocates 13 acres for a new school and park which will most likely be developed to accommodate elementary school students from kindergarten to grade five. Intermediate and high school students generated by the project will need to be bussed to the existing Kealakehe Intermediate and the new Kealakehe High School which should be completed by the time the Kaloko Town Center is completed.

State officials interviewed indicate that the actual construction and dedication of school facilities at the project site is preferred over land allocation.

6.9 Recreation

Affected Environment

Kona Park, located at the old airport site, is the region's only full-service active recreation park. The park was developed over 26 years ago although the gym was recently completed two years ago. The gym includes a full-sized basketball court, a small office and a multi-purpose room. Other park facilities include five baseball fields, two soccer fields, two football fields and four tennis courts. In addition to the Kona Park, there are four small parks located in Kona, Kailua, Kainaliu and Captain Cook.

Probable Impacts & Mitigation Measures

With the increased residential population attributed to the proposed Kaloko Town Center, demand for recreation facilities will also increase. The proposed project allocates 13 acres for a school/park site which can be developed in conjunction with the school. Who owns and maintains the park will need to be decided between the State and County. The demand for park facilities could be further mitigated in terms of time and resources if the developer initiates the improvements. According to a letter from the Department of Parks and Recreation, (July 25, 1996), the recommended standard is 5 acres of park per 1000 population. Based on the projected population of 2,300, a total of 11.5 acres of park would be needed. Depending on the ultimate size of the park to be located at the elementary school/park site, the additional park acreage would be provided at appropriate locations in the community. As design development proceeds, the prescribed amount of acreage required for park dedication will be incorporated into the master plan design in accordance with the requirements of the County Department of Recreation.

6.10 Cumulative Impacts: Infrastructure, Public Facilities and Services

With full build out of the major projects proposed for the region, an additional 6,000 acres would be developed to accommodate between 35,000 to 45,000 people in the next 20+ years. This increase in population will have a cumulative impact on regional traffic. The traffic impact assessment report identified proposed projects in the region and recommended improvements necessary to accommodate the increase in traffic with and without the proposed project. In addition to the four major projects included in this discussion of cumulative impacts, the traffic assessment included other projects with permits in hand, projects which were denied or withdrawn from the development arena and potential land development projects without government approval. To accommodate regional traffic, traffic improvements required include:

- Widen Queen Ka'ahumanu Highway from two lanes to four lanes between Kailua and the Keahole Airport as proposed by the State DOT,
- Signalize the intersection of Queen Ka'ahumanu Highway and Hina Lani drive as proposed by the State DOT,
- Upgrade Queen Ka'ahumanu Highway at Hina Lani to provide an exclusive left turn lane in the southbound direction and an exclusive right turn lane in the northbound direction as proposed by the State DOT,
- Signalize the intersection of Hina Lani Drive and Kanalani to mitigate LOS "F" conditions expected during the PM peak hour of traffic without the proposed project,
- Widen Hina Lani Drive at Kanalani Street to provide an exclusive right turn lane in the mauka bound direction and an exclusive left turn lane in the makai bound direction to minimize queuing from Kanalani Street to Queen Ka'ahumanu Highway,
- Widen Kanalani Street at Hina Lani Drive to provide separate left turn and right turn lanes at Hina Lani Drive to facilitate the side street movements at the proposed signalized intersection,
- Signalize Mamalahoa Highway at its intersection with Hina Lani Drive to mitigate the LOS "F" conditions during AM and PM peak hours of traffic without the proposed project,
- Widen Southbound Mamalahoa Highway to provide an exclusive right turn lane at Hina Lani Drive, to facilitate the right turn movement at the proposed signalized intersection.

Project access improvements required include the following:

- Signalize the intersection of Queen Ka'ahumanu Highway and Road A,
- Widen Queen Ka'ahumanu Highway to provide an exclusive left turn lane in the southbound direction and an exclusive right turn lane in the northbound direction at Road A,

- Widen Hina Lani Drive at Road B to provide an exclusive left turn lane in the mauka bound direction and an exclusive right turn lane in the makai bound direction,
- Signalize the intersection of Hina Lani Drive and Road B.
- Widen Hina Lani Drive to dual left turn lanes at Queen Ka'ahumanu Highway,
- Widen Hina Drive at Road F to provide an exclusive left turn lane in the makai bound direction and an exclusive right turn lane in the mauka bound direction.

In addition to improvements of roads and highways, the population base would make mass transit, such as busses, more cost effective.

Cumulative demand for public utilities in the region are summarized in Table 6-5.

Table 6-6
Cumulative Infrastructure Demand

	Water	Waste-water	Solid Waste	Electricity
Project	mgd	mgd	tons/day	MW[1]
Kealakehe Planned Community[2] (Villages of La'i'opua)	4.75	1.86	27 to 42	10.7
Liliuokalani Trust[3]	2.88	2.98	96	50
Urban Expansion of State Lands[5]	4.6 to 6.6	2.5 to 3	48 to 64	40
Kaupulehu Resort Expansion[6]	.82	.54	5.7	8.57
Kaloko Town Center (Proposed Action)	.87	.45	11	8
Total without the Proposed Action	13.05 to 15.05	7.88 to 8.4	149.7 to 192.7	109.27
Total with the Proposed Action	13.92 to 15.92	8.3 to 8.8	160.7 to 203.7	117.27

1. MW= megawatts
2. Kealakehe Planned Community Final Environmental Impact Statement, prepared for HFDC by Belt Collins & Associates, Sept 1990
3. Liliuokalani Trust, Final Environmental Impact Statement prepared for Liliuokalani Trust by Belt Collins & Associates, Oct 1990.
4. No residential units planned by Liliuokalani Trust, however, 450 acres of the Trust lands were sold to the State for future residential use and population estimates calculated for this area.
5. Urban Expansion of State Lands, Final Environmental Impact Statement prepared for Office of State Planning by Helber, Hastert & Fee, July 1993.
6. Kaupulehu Resort Expansion, Final Environmental Impact Statement prepared for Kaupulehu Developments by Belt Collins & Associates, Sept 1994.

Cumulative demand for potable water, at the end of build-out 20+ years hence, would range from 13.05 to 15.05 million gallons per day (mgd) without the project and 13.92 to 15.92 mgd with the proposed project. The projects in the region cover two aquifer systems, the Kiholo and Keauhou aquifer systems. The State Water Resources Protection Plan (Geo. A.L. Yuen & Associates, March 1992) indicate a sustainable yield of 38 mgd for the Keauhou system and 18 mgd for the Kiholo system. Present use is about 10 mgd in Keauhou and 2 mgd in Kiholo. Supplying water for urbanization is more of a function of source and transmission system development rather than availability. In order to be cost-effective, the development of water source and transmission systems will need to coincide with the development phases of major projects in the region. According to Mr. Milton Pavao, Manager, Department of Water Supply, (tel con with Rodney Kawamura, Hilo Engineering, 21 Aug 96), the department currently has 2 high level wells on line with 2 more coming on line in the near future. The department has plans to drill and equip another high level well in the area. There are also 4 other high level well sin the area which have been drilled but not outfitted. If need be, the proposed action could enter into a joint venture, at full build-out, to outfit one of the drilled wells. Water is available through the existing system located along Hina Lani Drive however, 2 reservoirs situated at the 900-foot and 1200-foot elevations and connecting waterlines are required for the proposed project (letter, Department of Water Supply, County of Hawaii, 19 August 1996).

The cumulative amount of wastewater generated in the region 20+ years hence would range from 7.88 to 8.4 mgd without the proposed project and 8.3 to 8.8 mgd with the proposed project. According to Mr. David Yamamoto, Department of Public Works, Wastewater Division personnel , (tel con with Rodney Kawamura, Hilo Engineering, 21 Aug 96), the Kealakehe WWTP has a current capacity of 5.3 mgd and is operating at 20% of capacity. The treatment plant can be expanded to accommodate up to 7.5 mgd, resulting in a potential shortfall of .8 to 1.3 mgd in the 20+ year development time frame. According to the Keahole to Kailua Development Plan (County Planning Department and RM Towill Corporation, 1991, p. 4-12), the plant could be expanded to 8 mgd average flow for a 40 year design period. If further increases beyond 8 mgd are required, the WWTP capacity can be further expanded by conversion of the treatment process from aerated lagoons. However, expansion is expected to be limited by the effluent disposal capacity of the area. Proposed methods of effluent disposal included irrigating municipal and private golf courses and green belts in the region. Like water systems, wastewater systems are built to accommodate demand when needed. As development proceeds in the region and the plant approaches capacity, it is most likely that long range studies will be conducted by the County Department of Public Works to assess future needs at that point in time and secure funding for facility expansion.

Solid waste generated in the region 20+ years hence would range from 149.7 to 192.7 tons per day without the project and 160.7 to 203.7 with the proposed project. The new Puu Anahulu landfill is 300 acres in size. According to Mr. Larry Capellas, DPW Solid Waste Division (tel con with Rodney Kawamura, Hilo Engineering, 21 Aug 96) the landfill has the capacity to handle solid waste generated by existing uses, the proposed project and other projects in the region. Calculating the projected capacity of the landfill at full build-out 20+ years hence is difficult because development phasing for each of the major projects are dependent on market conditions. With prudent government planning, a new site would need to be selected and prepared and/or alternative means of solid waste disposal such as Honolulu's waste to energy plant would need to be developed. With the larger volume of waste predicted for the future, a waste to energy plant should be cost-effective. Furthermore, with mandated recycling programs enacted by government, the amount of waste generated per day should decrease and more environmentally friendly means of waste disposal practices will be in place.

Electrical demand 20+ years hence in the region would range from 109 to 117 MW. According to Ronald N.S. Ho & Associates, electrical engineers, Hawaii Electric Light Company (HELCo.), has a current generation capacity of approximately 199 MW, with a present peak demand of 166.3 MW. Based on forecasted loading, the existing Kaloko Substation would need to be expanded. Over time, HELCo anticipates that its generation system will be adequate to carry the regions electrical demand because the annual load growth is anticipated to be gradual. HELCo has plans to add about 56 megawatts of generation at its Keahole Power Plant in 1998. The Hawaii Electric Company, like any other public utility, is mandated by charter to provide utility services. As demand increases with development in the region, the public utility would develop facilities to meet demand. Notwithstanding the need for basic electrical power, as new developments occur over the years, the use of solar water heaters and energy efficient appliances would help to cumulatively reduce the island's dependency on electrical power generated by burning fossil fuels. With advances in technology and research, alternative energy sources such as ocean thermal energy or some yet unknown method may provide alternative energy sources 20+ years from now.

Chapter 7
ALTERNATIVES TO THE PROPOSED ACTION

7. IDENTIFICATION AND SUMMARY OF MAJOR IMPACTS AND ALTERNATIVES CONSIDERED

7.1 Introduction

Three alternatives to the proposed action have been considered and evaluated in terms of their ability to meet the objectives of the landowner and developer, as well as their site specific and regional consequences. The analysis and conclusion includes an explanation for the rejection of each alternative.

7.2 No Action Alternative

This alternative would leave the project site in its current condition. The potential physical and natural environmental impacts of this alternative would be nil. However, the property would not be put to higher economic uses which could contribute to a larger tax base for the county. In addition, it would become increasingly difficult to generate revenue for funding the Hina Lani Drive Improvement District. The property falls within the larger geographical region promoted for urban development as the Big Island's second city. The County's General Plan and the Keahole to Kailua Development Plan designate the property for urban expansion and the no development alternative would not be consistent with these broader county goals. In addition, the property is surrounded on three sides by urban classified land according to the State Land Use Commission. Redesignation to urban would not create an isolated pocket of urban land but would fill in a gap between contiguous urban lands.

7.3 Alternative Intensities for Development

Rather than the proposed plan for development which contains 56 acres of office commercial and retail use, 80 acres with 370 single family units, 48 acres with 480 multi-family units, and 13 acres of school and park lands, alternatives for development may vary densities to which they are proposed. Given possible future market conditions created by the implementation of surrounding projects, it appears that the land use mix and densities proposed provide a balance of land uses which are supported by market demand. The land uses and densities are proposed in response to State and County planning policies which envision the area as a support community for major employment centers in the West Hawaii region.

7.4 Other Land Use Alternatives

Instead of the proposed mix of land uses, other alternatives may include plans which are predominantly industrial, resort, institutional or some other land use activity. From the current inventory of industrial lands, estimated at 174 acres in the North Kona District, there are approximately 2,070 additional acres zoned for industrial use (Hawaii County Planning Department, March 21, 1989). Although site conditions and access to the highway make the project site suitable for industrial use, the amount of lands already zoned for this use and the neighboring light industrial subdivision with its adequate expansion area, make it extremely unlikely that an industrial project would be viable. Resort use as another land use option is unrealistic given site conditions, its location away from ocean resources and proximity to neighboring industrial uses. Other land uses such as a medical hospital or university campus are suitable for the site. However, these uses are already included in plans by the State and other large private landowners in the district.

7.5 Analysis and Conclusion

In accordance with Section 11-200-17(f), Hawaii Administrative Rules, "The draft EIS shall contain any known alternatives for the action. These alternatives which could feasibly attain the objectives of the action -- even though more costly -- shall be described and explained as to why they were rejected. A rigorous exploration and objective evaluation of the environmental impacts of all reasonable alternative actions, particularly those that might enhance environmental quality or avoid or reduce some or all of the adverse environmental benefits, costs, and risks shall be included in the agency review process in order not to prematurely foreclose options which might enhance environmental quality or have less detrimental effects".

The primary objective of the applicant is to urbanize approximately 224 acres of land area in order to develop a community consisting of new residences, businesses, offices and a school and park.

The "no action" alternative would not meet the primary objective of the applicant. The environmental benefits of this action are no change to the existing natural, physical, and cultural environment. The petition area will continue to be an open landscape and enable existing natural processes to continue. The eight possible burials will not be disturbed resulting in a status quo relative to potential cultural impacts. From a socio-economic and infrastructure perspective, the no action alternative will not create additional employment, income, tax revenue and other economic benefits to an area that is facing the effects of a Statewide economic downturn. It would also make it increasingly difficult to generate revenue to fund the Hina Lani Drive Improvement District. In terms of infrastructure, one of the major reasons for establishing the "Subregional Planning Area" designation which encompasses the project area in the West Hawaii Regional Plan was to enable the County to "include existing landowners, and affected governmental agencies so that infrastructure requirements of all landowners can be determined and "sized" in order to attend to existing and anticipated problems. Opportunities for joint infrastructure financing, economies of scale, and creative urban design will be explored and developed in order to provide an environment that can support the "preferred" quality of life." (West Hawaii Regional Plan, 1989:22). From a regional perspective, the no action alternative could result in a situation where other lands in the region which have already obtained Urban reclassification would proceed toward development according to State and County policies and plans for the region, assuming improvement in market conditions and economic circumstances locally and abroad. The immediately adjacent Kamaaina Eight parcel would be developed into commercial and industrial uses and the adjacent 2,640 acre State-owned property would be developed into a new community consisting of land uses ranging from residential, to commercial, civic, employment center, light industrial, parks, golf course and University. Other properties, such as the State's Villages of La'i'opua and Queen Liliuokalani Trust lands to the south of the petition area would also develop in time because they have likewise obtained urban reclassification. The consequence of this no action alternative could be a pocket of undeveloped land surrounded by urban uses. The no action alternative is rejected because its benefits are diminutive when compared to the missing opportunities and consequences of no development.

The second alternative which considers varying intensities of land uses is also rejected. Granted, the benefits of reducing the amount of commercial uses, lowering residential densities or increasing the amount of land area allocated for the school and park are not unreasonable considerations. The effects of these changes in intensities could mean corresponding decreases in traffic demand, infrastructure demand and so forth. In terms of impacts to natural systems, for example, the groundwater, pond and nearshore environments, studies conclude that the currently proposed uses would have nominal impacts. By varying the intensities of these uses, significant improvements relative to natural systems are not anticipated. On the other hand, the effects could mean corresponding decreases in socio-economic benefits in terms of improved facilities and housing, and increased employment, income, tax revenue and other economic benefits. The land uses and densities proposed are supported by market studies and are consistent with State and County policies and plans for the region. It is difficult to predict the environmental consequences of varying land use intensities in terms of regional impacts. Each of the other properties recently urbanized have evaluated their potential environmental impacts and have made recommendations to either mitigate probable impacts or provide necessary physical infrastructure improvements. In the final analysis, the proposed uses and densities meet the primary objective of the applicant. Varying the intensities would not result in major gains in terms of environmental benefit.

Developing other land uses is a reasonable alternative for the proposed property. The question is what other land uses? As discussed above, other land uses have been dismissed because they are not supported by market demand, are unsuitable for the site and location, and do not meet the primary objective of the applicant. Since development is based on market forces, it is better in the long run to propose uses which make economic sense and are consistent with overall public policies and plans. For these reasons, the alternative which considers other land uses is rejected.

Chapter 8
RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

8. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG TERM PRODUCTIVITY

This discussion considers the consequences of urbanizing some 224 acres of land in the near term instead of some other course of action. It examines possible cumulative effects on the environment as a result of this action; considers whether this action forecloses some other beneficial use or narrows the range of other beneficial uses of the environment; and considers whether this action poses any long term risks to health and safety.

The near term act of urbanizing the petition area, when viewed in the long term context of human progress and development, will result in changing natural open space, existing biota, and archaeological and cultural resources, into a new community where people will have an opportunity to live, work and play. In so doing, other future non-urban uses would be foreclosed for all practicable intents and purposes largely because of the investment required to construct infrastructure, roads, homes and buildings. Once built, it is unlikely, with the exception of some unforeseen catastrophic natural disaster, that the land would be put to some other non-urban use.

From a site-specific perspective, the petition area has many attributes which make it suitable for urban use. It is relatively flat and gently sloping making it easy to develop, it has excellent access provided by major roadways and the airport, and it has excellent proximity at the midpoint of existing and future markets since it is in a region of active economic growth. Studies and surveys conducted for this environmental analysis indicate that there are no rare, threatened or endangered plants or animals on site, that future development of this site will not contribute to air or noise pollution which exceed governmental standards, and that traffic generated from this project can be handled by relatively minor improvements provided improvements by government are implemented. Significant archaeological and cultural resources discovered on-site are recommended for preservation. The proposed project will have a beneficial local impact by providing a sewer line connection from the site to the Kealakehe WWTP, thereby allowing other users along the way to dispose of sewage in a treatment plant instead of the current method of cesspool disposal. This may avoid potential long term, cumulative adverse effects on the water quality at the adjacent Kaloko fishpond complex.

From a community and regional perspective, urbanization of the petition area has elicited community responses which acknowledge the eventual development of the site given expressed caveats over timing of development and the need to evaluate the cultural impact of such action. In addition, governmental guidance as expressed in the form of policies and long range plans, both at the State and County level, recommend urbanization of the petition area. Indeed, government actions in the form of recent land use actions have demonstrated their intent to implement these policies. The petition area is surrounded by parcels of land which have been given urban approval and the State has recently approved the urban reclassification of some 2,640 acres of State-owned land near the Keahole Airport.

Whether the cumulative impacts of this proposed change outweigh the benefits should also be viewed from a perspective of scale. The North Kona District covers some 568 square miles, which is slightly smaller than the entire County of Honolulu; the West Hawaii region greatly exceeds the size of Oahu. The cumulative impacts resulting from the eventual development of all projects currently permitted and those desiring permits would be in keeping with governmental policies. What happens in reality, depends highly on market forces and the ability of the region to re-ignite their economy.

Looking at potential environmental impacts from a cumulative perspective, the short term action of urbanizing the petition area would be a contributing move toward the broader urbanization of the region. In the very long term, the character of the area will change from its broad, open expanses of lava fields, to a more urban type environment with new residential communities, commerce and resort destinations.

The no action alternative is a future option for the project area. If pursued, this action would be inconsistent with expressed government policy recommending urbanization, and would not contribute toward the improvement of infrastructure in the area. An agricultural or other use of the property is not feasible given the site's location as a future secondary support center and its unsuitable soils.

With the type of land uses planned, little environmental degradation is expected to occur as a consequence. Further, unlike the development of some industrial or manufacturing activity, the proposed development is not expected to pose any long term risks to health and safety.

Development of the petition area would increase its economic productivity in terms of generating employment, tax revenues and more economic activity which should have benefits which extend throughout the regional economy. This optimistic projection, however, should be qualified because it is difficult to foresee external circumstances such as interest rates, economic downturns, and so on and their effects on the region.

Chapter 9
IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

9. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The proposed action of reclassifying the petition area from a conservation designation to an urban designation will have the unavoidable impact of causing change to occur in many different ways. The existing parcel of land is characterized as a landscape of open space made up of open lava fields and relatively sparse and commonly found plant material. As a natural habitat, surveys have indicated that the land is not a habitat for endangered fauna or flora. As part of the natural processes for the region, the land allows the little amounts of precipitation, approximately 11 inches per year, to recharge the groundwater. However, this is not considered significant because at this elevation groundwater would most likely yield unusable brackish water. As a parcel of real estate, the land is not being actively put to use by humans for cultivating agricultural products nor mining minerals, although in modern history, the land may have been a part of larger ranching activities that extended to higher mauka elevations. In its current state, humans are not consuming natural resources nor generating waste and other byproducts in conjunction with the use of the property. As a part of Hawaiian culture, the cultural impact study has indicated that portions of the property are used for cultural practices, primarily as burial sites for ancestors. Consequently, an unavoidable impact may require that the cultural practice of worshipping possible burial sites may occur elsewhere following agreed upon disinterment. Other significant archaeological artifacts with the exception of one which is recommended for preservation, will be recorded thereby contributing to the body of knowledge of ancient Hawaiian civilization.

Urban reclassification will for most practical purposes cause the unavoidable impact of changing the undeveloped parcel of open space to a landscape consisting of buildings, roads, and newly introduced trees, shrubs and plants. The urban use of the land will irreversibly curtail the range of potential uses of the environment because it involves the investment of large sums of money to build roads, infrastructure, buildings, homes and schools. The parcel of land, which is now a largely undefined part of the broader fields of lava will take on a new identity as it develops into a new community with stores, homes and parks. The visible change will be obvious. With the formation of a community of people, resources such as electricity, water, and gasoline will be consumed and byproducts such as automobile exhaust fumes and noise from generated by people and traffic on site. From the community's perspective, an unavoidable change will be the gradual loss of the rural, country-like community and lifestyle as the region transitions to new communities with more people, opportunities and choices. Change will be visible to people driving along Queen Ka'ahumanu Highway or people living on the mauka slopes as the once undeveloped fields will be replaced by structures and roads.

Reclassification will lead to the commitment of resources such as fossil fuels to generate energy, water for domestic consumption, and raw materials which are manufactured into goods and supplies for the initial construction and long term sustenance of the community. These commitments enable urbanization to occur in an area that is suitable for development, which does not contribute to the degradation of significant natural habitats, and is consistent with the policies of the State and County governments.

Commitment of these resources are a part of the process of civilization as we know it today. Unless there are new advances in science, social practices and politics, these changes are inevitable.

Chapter 10
CONSULTED PARTIES IN THE PREPARATION PROCESS

10 CONSULTED PARTIES AND PARTICIPANTS IN THE DEIS PREPARATION PROCESS

10.1 Participants in the Draft EIS Preparation Process

This draft EIS was prepared for Tokyo Green Hawaii Inc., the landowner and petitioner, by Kimura International Inc. Firms that contributed to the preparation of this document are listed below:

Kimura International	EIS preparation and processing
Technical subconsultants	
Hilo Engineering	Civil Engineering
Traffic Management Consultant	Traffic Impact Assessment Report
Char & Associates	Botany
Rana Productions	Avifauna and Mammals
Cultural Surveys Hawaii	Archaeology and Cultural Impact
Y. Ebisu & Associates	Noise
Ogden Environmental	Air Quality
Tom Nance Water Resources Engineering	Hydrology
Marine Research Consultants	Near Shore Marine Water Quality
R.M. Towill	Hawaiian Trails
Earthplan	Social Impact
KPMG Peat Marwick LLP	Market Assessment and Economic and Fiscal Impact

10.2 Parties Consulted During the Preparation of the Draft EIS

An EIS Preparation Notice (EISPN) was published in the OEQC Bulletin for the proposed boundary amendment on November 23, 1995, following a determination by the State Land Use Commission on November 21, 1995 that the proposed boundary amendment may have a significant impact on the environment and an EIS was required. A copy of the EISPN was mailed to the following agencies and organizations. Following the 30-day review period which ended on December 23, 1995 comment letters were received from agencies identified by a check mark. A number of other agencies who were not on the initial list also provided comments. These agencies are listed in bold type. Agency comments and applicant's responses are attached.

STATE AGENCIES

✓ Office of Environmental Quality Control
Department of Agriculture
✓ Department of Education
✓ Department of Health (DOH)
Department of Land and Natural Resources (DLNR)

- ✓ DLNR State Historic Preservation Office
- Department of Business, Economic Development and Tourism (DBEDT)
- ✓ **Land Use Commission**
- ✓ Department of Transportation
- ✓ DBEDT State Energy Office
- ✓ Office of State Planning
- DOH Environmental Management Division

UNIVERSITY OF HAWAII
- Environmental Center
- Water Resources Research Center

FEDERAL AGENCIES
- US Department of Agriculture, Soil Conservation Service
- ✓ US Fish and Wildlife Service, National Park Service

COUNTY OF HAWAII
- ✓ Planning Department
- Department of Parks and Recreation
- ✓ Department of Public Works
- Department of Research and Development
- ✓ Department of Water Supply
- ✓ **Police Department**
- ✓ **Fire Department**

NON-GOVERNMENTAL AGENCIES
- American Lung Association
- Hawaii Electric Company
- Office of Hawaiian Affairs
- Kona Hawaiian Civic Club
- Kaloko Community Association

Chapter II
COMMENTS AND RESPONSES RECEIVED DURING PREPARATION OF THE DEIS

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT, AND TOURISM

ENERGY DIVISION, 335 MERCHANT ST., RM. 110, HONOLULU, HAWAII 96813 PHONE: (808) 587-3800 FAX: (808) 587-3820

November 29, 1995

RECEIVED DEC 04 1995

Ms. Esther Ueda
State of Hawaii
Land Use Commission
Old Federal Building, Room 104
335 Merchant Street
Honolulu, Hawaii 96813

Dear Ms. Ueda:

SUBJECT: Kaloko Town Center
Draft EIS Preparation Notice and Environmental Assessment
Tax Map Key: 3rd Div. 7-3-09; por 17
North Kona, Hawaii

We wish to inform you that we have no comments regarding the Kaloko Town Center Draft EIS Preparation Notice and Environmental Assessment.

Thank you for the opportunity to submit any comments or recommendations.

Sincerely,

Maurice H. Kaya
Energy Program Administrator

MHK:aw

c Mr. Gary Gill, OEQC
Mr. Glenn Kimura, Kimura International, Inc.

KIMURA INTERNATIONAL

19 December 1995

Maurice H. Kaya, Energy Program Administrator
Department of Business, Economic Development & Tourism
Energy Division
335 Merchant St., Rm 110
Honolulu, Hawaii 96813

Dear Mr. Kaya:

Subject: Kaloko Town Center
Draft EIS Preparation Notice and Environmental Assessment
Tax Map Key: 3rd Div. 7-3-09: por 17
North Kona, Hawaii

Thank you for responding to our EISPN for the above project by letter dated 29 November 1995.

We note that you have no comments to make at this time.

Sincerely,

KIMURA INTERNATIONAL, INC.

Glenn T. Kimura
President

cc: Land Use Commission
Office of Environmental Quality Control

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

Stephen K. Yamashiro
Mayor

County of Hawaii

DEPARTMENT OF PUBLIC WORKS

25 Aupuni Street, Room 202 • Hilo, Hawaii 96720-4252
(808) 961-8321 • Fax (808) 969-7138

Donna Fay K. Kiyosaki
Chief Engineer

Jiro A. Sumada
Deputy Chief Engineer

RECEIVED
JAN 0 1996

Dec. 5, 1995

Ms. Esther Uyeda
State of Hawaii
Land Use Commission Inc.
Old Federal Building, Room 104
335 Merchant Street
Honolulu, HI 96813

LAND USE COMMISSION
STATE OF HAWAII
DEC 6 1 34 PM '95

SUBJECT: Draft EIS Preparation Notice and Environmental Assessment
Applicant: Tokyo Green of Hawaii, Inc.
Location: Kaloko, & Kohanaiki, North Kona, HI
TMK: 7-3-09:17

We have reviewed the subject application and offer the following comment:

All roadways should be designed and constructed in conformance with the Keahole to Kailua Development Plan (K to K plan) as adopted by Council Resolution 296-91. Additionally, the roadway layout should align with both the constructed and the approved roadways on the parcels to the north and the south.

Galen Kuba, Division Chief
Engineering Division

TWP:swa

cc: Engineering-Hilo
Engineering-Kona

KIMURA INTERNATIONAL

4 January 1996

Mr. Galen Kuba, Division Chief
Engineering Division
County of Hawaii
Department of Public Works
25 Aupuni Street, Room 202
Hilo, Hawaii 96720-4252

Dear Mr. Kuba:

Subject: Kaloko Town Center
Draft EIS Preparation Notice and Environmental Assessment
Tax Map Key: 3rd Div. 7-3-09: por 17
North Kona, Hawaii

Thank you for responding to our EISPN for the above project by letter dated 5 December 1995. Your letter was transmitted to us by the Land Use Commission on 3 January, 1996 and we apologize for the tardiness in responding.

We note your comments requesting conformance to roadway design and construction in accordance with the Keahole to Kailua Development Plan and will discuss this in the draft EIS.

We look forward to your review and comment on the draft EIS.

Sincerely,

Glenn T. Kimura

cc: Land Use Commission
Office of Environmental Quality Control

BENJAMIN J. CAYETANO
GOVERNOR

DEC 11 1995

ESTHER UEDA
EXECUTIVE OFFICER

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM
LAND USE COMMISSION
Room 104, Old Federal Building
335 Merchant Street
Honolulu, Hawaii 96813
Telephone: 587-3822

December 6, 1995

Mr. Glenn T. Kimura, President
Kimura International Inc.
1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814

Dear Mr. Kimura:

Subject: LUC Docket No. A95-716/Tokyo Green Hawaii, Inc.: Environmental Impact Statement Preparation Notice (EISPN)

As pointed out in our letter to Petitioner Tokyo Green Hawaii, Inc., dated October 18, 1995, regarding the Petition and Environmental Assessment filed in the subject docket, there are several items which need to be addressed in the draft EIS. We have enclosed a copy of that letter which outlines these specific areas for your information.

Additionally, pursuant to §11-200-17(f), Hawaii Administrative Rules (HAR), the draft EIS should include a thorough discussion on the known alternatives for the proposed action, including an assessment of the environmental impacts of all reasonable alternative actions. Also, pursuant to §11-200-17(i), HAR, the draft EIS should include a thorough discussion on the cumulative environmental impacts of the proposed action and other related projects, particularly with respect to public services and facilities.

We have no further comments to offer at this time. Thank you for the opportunity to comment on this matter.

Should you have any questions, please feel free to call me or Bert Saruwatari of our office at 587-3822.

Sincerely,

Esther Ueda

ESTHER UEDA
Executive Officer

EU:th

encl.

cc: DBEDT (#95-199-0)(w/o encl.)
OEQC (w/o encl.)

KIMURA INTERNATIONAL

19 December 1995

Ms. Esther Ueda, Executive Director
State of Hawaii, Land Use Commission
335 Merchant St., Rm 104
Honolulu, Hawaii 96813

Dear Ms. Ueda:

Subject: Kaloko Town Center
Draft EIS Preparation Notice and Environmental Assessment
Tax Map Key: 3rd Div. 7-3-09: por 17
North Kona, Hawaii

Thank you for responding to our EISPN for the above project by letter dated 6 December 1995.

We note your reference to several items which need to be addressed in the draft EIS in your letter to the petitioner dated October 18, 1995. We will make certain that these items are addressed in the draft EIS.

In addition, the draft EIS will include a discussion of known alternatives for the proposed action including an assessment of environmental impacts of all reasonable alternative actions and a discussion of cumulative environmental impacts of the proposed action and other related projects, particularly with respect to public services and facilities.

Sincerely,

Glenn T. Kimura

Glenn T. Kimura

cc: Land Use Commission
Office of Environmental Quality Control

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

RECEIVED DEC 13 1995

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

MICHAEL D. WILSON, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTY
GILBERT COLOMA-AGARAN

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION DIVISION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

December 8, 1995

MEMORANDUM

LOG NO: 16038 ✓
DOC NO: 9512PM01

TO: Ms. Esther Ueda
State Land Use Commission

FROM: Don Hibbard, Administrator
State Historic Preservation Division

SUBJECT: **Kaloko Town Center Draft EIS Preparation Notice and Environmental Assessment**
Kaloko-Kohanaiki, North Kona, Hawaii Island
TMK: 7-3-09: por. 17

Pages 13-15 of the EA discuss historic preservation concerns. A recently completed archaeological reconnaissance survey of portions of the subject area confirmed the results of an earlier survey in demonstrating the existence in this area of a low density of historic sites which are likely to be significant. The results of this reconnaissance survey suggest that there may also be human burials in this area. Because the reconnaissance covered only part of the project area and did not thoroughly document sites, the EA is correct in stating that an inventory level survey of the project area is needed to identify and inventory all historic sites, evaluate which are significant, and make recommendations for their proper mitigation.

As standard practice, this inventory survey would need to be completed and its report be accepted by our office, prior to your agency making a final decision on the petition. We need the acceptable survey report to advise your office on the significant sites present (and their nature) and to advise your office as to what mitigation conditions might be needed.

c: Gary Gill, OEQC
OCEA
Glenn Kimura, Kimura International Inc.

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

RECEIVED JAN 05 1996

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

MICHAEL D. WILSON, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTY
GILBERT COLOMA-AGARAN

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION DIVISION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

January 2, 1995

LOG NO: 16191
DOC NO: 9512PM26

Mr. Glenn T. Kimura, President
Kimura International
1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814

Dear Mr. Kimura:

SUBJECT: **Kaloko Town Center Draft EIS Preparation Notice and Environmental Assessment**
Kaloko, North Kona, Hawaii Island
TMK: 7-3-9: por. 17

This is to acknowledge receipt of your letter of December 19, 1995 informing us that an archaeological inventory survey of the proposed Kaloko Town Center parcel is currently being undertaken by Cultural Surveys Hawai'i.

We look forward to receiving a report on the inventory survey for review and comment.

Aloha,

DON HIBBARD, Administrator
State Historic Preservation Division

PM:amk

c: Land Use Commission
Office of Environmental Quality Control

KIMURA INTERNATIONAL

19 December 1995

Mr. Don Hibbard, Administrator
Department of Land & Natural Resources
State Historic Preservation Division
33 South King Street, 6th Floor
Honolulu, Hawaii 96813

Dear Mr. Hibbard:

Subject: Kaloko Town Center
Draft EIS Preparation Notice and Environmental Assessment
Tax Map Key: 3rd Div. 7-3-09: por 17
North Kona, Hawaii

Thank you for responding to our EISPN for the above project by letter dated 8 December 1995.

Cultural Surveys Hawai'i is currently conducting an inventory level survey of the project site. Once completed, we will make certain that they send you a copy for your review and be available to answer any questions.

The inventory survey will be summarized in the draft EIS and attached as a technical appendix. We look forward to your comments on the draft EIS.

Sincerely,

KIMURA INTERNATIONAL, INC.

Glenn T. Kimura
President

cc: Land Use Commission
Office of Environmental Quality Control

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

KIMURA INTERNATIONAL

19 December 1995

Captain John Vares, Commander
Police Department
County of Hawaii
Kona Patrol District
74-5221 Queen Kaahumanu Highway
Kailua-Kona, Hawaii 96740

Dear Captain Vares:

Subject: Kaloko Town Center
Draft EIS Preparation Notice and Environmental Assessment
Tax Map Key: 3rd Div. 7-3-09: por 17
North Kona, Hawaii

Police Chief Carvalho responded to our EISPN for the above project by letter on 11 December 1995 and requested that we direct our response to you.

We note that issues raised in the response letter from Chief Carvalho focused primarily on street design and traffic concerns. We have transmitted his letter to the Traffic Management Consultant (our traffic engineer) for responses on these issues. In addition, we will be working with the County Department of Public Works and Planning Department as well as the State Department of Transportation to specifically address these issues.

In the meantime, we look forward to your review and comment on the draft EIS.

Sincerely,

KIMURA INTERNATIONAL, INC.

Glenn T. Kimura
President

cc: Land Use Commission
Office of Environmental Quality Control

1600 Kapiolani Blvd., Suite 632
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

Stephen K. Yamashiro
Mayor

County of Hawaii
POLICE DEPARTMENT
349 Kapiolani Street • Hilo, Hawaii 96720-3998
(808) 935-3311 • Fax (808) 961-2702

Wayne G. Carvalho
Police Chief

James S. Correa
Deputy Police Chief

RECEIVED
DEC 13 1995

December 11, 1995

Ms. Esther Ueda
State of Hawaii
Land Use Commission
Old Federal Building, Room 104
335 Merchant Street
Honolulu, Hawaii 96813

Dear Ms. Ueda:

SUBJECT: KALOKO TOWN CENTER
DRAFT EIS PREPARATION NOTICE AND ENVIRONMENTAL ASSESSMENT
TAX MAP KEY 7-3-09:PORTION 17
NORTH KONA, HAWAII

We reserve comment on the above-mentioned subject until detailed ingress/egress street designs are submitted including information on the following.

To assess the impacts of the Kaloko Town Center project on traffic, several issues need to be addressed in the environmental impact statement:

a. The number and locations of interchanges proposed on Queen Kaahumanu Highway, within the vicinity of the Kaloko Town Center;

b. The configuration and operation of the frontage road system along Queen Kaahumanu Highway in the vicinity of the project site;

c. Implementation schedule of the proposed Mid-Level Arterial;

d. Specific traffic impacts and access requirements for the project site;

e. Specific traffic impacts and access requirements for the remainder of the Kaloko Master Plan;

Please direct your response or any inquiries to Captain John Vares, Commander of our Kona Patrol District, 74-5221 Queen Kaahumanu Highway, Kailua-Kona, Hawaii 96740, telephone 326-4211.

Warmest holiday wishes,

Wayne G. Carvalho
WAYNE G. CARVALHO
POLICE CHIEF

JV:lf

cc:State of Hawaii, Office of Environmental Quality Control
✓Kimura International, Inc.

Stephen K. Yamashiro
Mayor

County of Hawaii
FIRE DEPARTMENT
466 Kinoole Street • Hilo, Hawaii 96720-2983
(808) 961-8297 • Fax (808) 961-6920

Nelson M. Tsuji
Fire Chief

Edward Bumatay
Deputy Fire Chief

RECEIVED DEC 14 1995

LAND USE COMMISSION
STATE OF HAWAII
DEC 12 1 45 PM '95

December 11, 1995

State of Hawaii
Land Use Commission
Old Federal Building, Room 104
335 Merchant Street
Honolulu, HI 96813

Attention: Ms. Esther Ueda

Gentlemen:

Subject: Kaloko Town Center
Draft EIS Preparation Notice & Environmental Assessment
Tax Map Key: 3rd Div. 7-3-09:por 17
North Kona, Hawaii

We have reviewed the Draft EIS Preparation Notice and Environmental Assessment for the above-referenced proposed project and require that Sections 10.207, a to l, and 10.301, c, d and e, of our Fire Code (Uniform Fire Code 1988) be complied with.

Sincerely,

NELSON M. TSUJI
Fire Chief

NMT/mo

KIMURA INTERNATIONAL

19 December 1995

Nelson M. Tsuji, Fire Chief
Fire Department
County of Hawaii
466 Kinoole Street
Hilo, Hawaii 96720-2983

Dear Chief Tsuji:

Subject: Kaloko Town Center
Draft EIS Preparation Notice and Environmental Assessment
Tax Map Key: 3rd Div. 7-3-09: por 17
North Kona, Hawaii

Thank you for responding to our EISPN for the above project by letter dated 11 December 1995.

We note your request for compliance with Sections 10.207, a to l, and 10.301, c, d and e of the Uniform Fire Code 1988 and will convey this to our civil engineer and other pertinent members of the development team.

In the meantime, we look forward to your review and comment on the draft EIS.

Sincerely,

KIMURA INTERNATIONAL, INC.

Glenn T. Kimura
President

cc: Land Use Commission
Office of Environmental Quality Control

1600 Kapiolani Blvd., Suite 612
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

Stephen K. Yamashiro
Mayor

County of Hawaii
PLANNING DEPARTMENT
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720-4252
(808) 961-8288 • Fax (808) 961-9615

Virginia Goldstein
Director

Norman Olesen
Deputy Director

RECEIVED
JAN 0 · 1996

LAND USE COMMISSION
STATE OF HAWAII
JAN 2 2 58 PM '96

December 13, 1995

Ms. Esther Ueda, Executive Director
State Land Use Commission
335 Merchant Street, Room 104
Honolulu, HI 95813

Dear Ms. Ueda:

Koloko Town Center
Draft EIS Preparation Notice and Environmental Assessment
Tax Map Key: 3rd Div. 7-3-09: por 17

Thank you for the opportunity to review the above-referenced Environmental Assessment for the proposed Kaloko Town Center. We have the following comments:

1. Should the Land Use Commission approve the petition for Land Use District Boundary Amendment, this office will require a Change of Zone application.

2. The Draft Environmental Impact Statement should contain a through review of the General Plan's policies, goals and standards relating to the following areas: Economic, Energy, Environmental Quality, Flood Control and Drainage, Historic Sites, Natural Beauty, Natural Resources and Shoreline, Housing, Public Facilities, Education, Protective Services, Government Operations, Health and Sanitation Public Utilities, Recreation, Transportation and Land Uses.

Should you have any questions plese feel free to contact Royden Yamasato of this office at 329-4878.

Sincerely,

Virginia Goldstein

VIRGINIA GOLDSTEIN
Planning Director

RHY
LtrUeda.emm

KIMURA INTERNATIONAL

4 January 1996

Ms. Virginia Goldstein
Planning Director
County of Hawaii
Planning Department
25 Aupuni Street, Room 109
Hilo, Hawaii 96720-4252

Dear Ms Goldstein:

Subject: Kaloko Town Center
Draft EIS Preparation Notice and Environmental Assessment
Tax Map Key: 3rd Div. 7-3-09: por 17
North Kona, Hawaii

Thank you for responding to our EISPN for the above project by letter dated 13 December 1995.

We note your comments requesting a discussion of the County's General Plan's policies, goals and standards and will include this in the draft EIS..

We look forward to your review and comment on the draft EIS.

Sincerely,

Glenn Kimura

Glenn T. Kimura

cc: Land Use Commission
Office of Environmental Quality Control

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Ecoregion
300 Ala Moana Blvd, Room 3108
P.O. Box 50088
Honolulu, HI 96850

phone: 808-541-3441; fax: 808-541-3470

RECEIVED
DEC 19 1995

In Reply Refer To: Kaloko Petition (AOMB/AA)

DEC 18 1995

State of Hawaii
Land Use Commission
Old Federal Building, Room 104
335 Merchant Street
Honolulu, Hawaii 96813

To Whom It May Concern:

Thank you for the opportunity to comment on the Environmental Assessment for the proposed Kaloko Town Center. The U.S. Fish and Wildlife Service (Service) values being included in the initial phases of land use planning for the Kona area to incorporate both development and protection of natural resources.

The Service has conducted botanical, cave invertebrate, and *Plutella* moth surveys at the petition area. No endangered, threatened, proposed, or candidate species were found. One plant species at risk (formerly candidate 2), mia pilo (*Capparis sandwichiana*), is found within the petition area boundaries. This species is found throughout the North Kona area. The scattered individuals of mia pilo within the petition area occur in highly degraded habitat and, therefore, are not likely to represent a viable population that will survive for long. The Service found no biological resources that would prohibit the zoning change of this parcel from Conservation to Urban.

The Service is currently negotiating with the landowner, Tokyo Green, to protect the 200+ acre parcel to the southeast of the petition area. This parcel contains a unique dry forest with six listed, proposed, and candidate plant species and is relatively free of introduced species. The Service hopes to protect and manage this site with the support of the landowner.

The Service does have concerns regarding the project's potential effects on water-related resources. First, the water source for the project has not been identified. Thus, the effects of water usage by the project cannot be assessed. Second, we are concerned fertilizer and other nonpoint source pollutants will adversely affect the Kaloko fishpond and nearby anchialine pools along the coast. Therefore, we recommend that the water source for the project be identified and that nonpoint source pollutant containment be addressed before this project is approved.

If you have any questions about the above comments, please call me or Marie Bruegmann at 808-541-3441.

Sincerely,

ACTING

Brooks Harper
Field Supervisor
Ecological Services

cc: Office of Environmental Quality Control
Kimura International, Inc.

KIMURA INTERNATIONAL

4 January 1996

Mr. Brooks Harper, Field Supervisor
Ecological Services, US Department of the Interior
Fish and Wildlife Service, Pacific Islands Ecoregion
300 Ala Moana Blvd., Room 3108
Honolulu, Hawaii 96850

Dear Mr. Harper:

Reference to: Kaloko Petition (MMB/AA)
Subject: Kaloko Town Center
Draft EIS Preparation Notice and Environmental Assessment
Tax Map Key: 3rd Div. 7-3-09: por 17, North Kona, Hawaii

Thank you for responding to our EISPN for the above project by letter dated 28 December 1995.

We appreciate hearing that the Service has conducted botanical, cave invertebrate, and Plutella moth surveys at the petition area and has found no endangered, threatened, proposed, or candidate species. Maiapilo (*Capparis sandwichiana*), the plant species at risk, was also observed by our botanist, Char & Associates. We note your observation that the individuals found within the petition area occur in a highly degraded habitat and would not likely represent a viable population that will survive for long.

We are also aware that the Service is working with the landowner to protect the unique dry forest located outside the petition area.

Regarding potential water-related resources, the draft EIS will examine potential impacts on the Kaloko fishpond and anchialine ponds.

In the meantime, we look forward to your review and comment on the draft EIS.

Sincerely,

KIMURA INTERNATIONAL, INC.

Glenn T. Kimura
President

cc: Land Use Commission
Office of Environmental Quality Control

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

220 SOUTH KING STREET
FOURTH FLOOR
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-2452

RECEIVED
DEC 22 1995

GARY GILL
DIRECTOR

December 20, 1995

Esther Ueda
State Land Use Commission
335 Merchant Street #104
Honolulu HI 96813

Dear Ms. Ueda:

RE: Environmental Impact Statement (EIS) Preparation Notice for Kaloko Town Center, North Kona; TMK 7-3-9: por. 17

In the draft EIS please include the following:

1. Air quality in Kona has visibly degraded in recent years. This degradation is likely caused by a combination of volcanic, industrial and automobile emissions. Please include an air quality study that describes existing conditions in the Kona area and evaluates potential direct, indirect and cumulative air quality impacts. Include an analysis of regional climatology, including air exchange and an accounting of regulated air pollutants and their impact on the public and the environment.
   Describe how the air quality in the Kona region compares to national and state ambient air quality standards and whether or not Kona can be considered a non-attainment area under Federal law.

2. Include a discussion of cumulative impacts of all development projects for the subject area.

3. Include a faunal survey in the draft EIS that discusses the impact on threatened or endangered bird species.

4. Discuss the project's impact on the Kaloko fishpond complex and the four anchialine ponds.

5. A map of the island indicating the project site is required.

6. Please add a title to the Appendix A entry in the table of contents.

7. In Table 5 indicate the full name of the acronym NELHA.

8. Indicate the project location in Figure 6, Keahole to Kailua Development Plan.

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

Sincerely,

Gary Gill
Director

c: Ned Dewey, Tokyo Green Hawaii
Glenn Kimura, Kimura International

KIMURA INTERNATIONAL

4 January 1996

Mr. Kazu Hayashida
Director of Transportation
State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

Dear Mr. Hayashida:

Reference to: STP 8.7148

Subject: Kaloko Town Center
Draft EIS Preparation Notice and Environmental Assessment
Tax Map Key: 3rd Div. 7-3-09: por 17
North Kona, Hawaii

Thank you for responding to our EISPN for the above project by letter dated 28 December 1995.

A Traffic Impact Analysis Report (TIAR) is being prepared by the Traffic Management Consultant, our traffic engineer. Your letter has been forwarded to them so that your comments are addressed in the TIAR and draft EIS.

In the meantime, we look forward to your review and comment on the draft EIS.

Sincerely,

KIMURA INTERNATIONAL, INC.

Glenn T. Kimura
President

cc: Land Use Commission
Office of Environmental Quality Control

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAII

25 AUPUNI STREET • HILO, HAWAII 96720
TELEPHONE (808) 969-1421 • FAX (808) 969-6996

RECEIVED
JAN 04 1996

January 2, 1996

Ms. Esther Ueda
Land Use Commission
Old Federal Building, Room 104
335 Merchant Street
Honolulu, HI 96813

DRAFT EIS PREPARATION NOTICE AND ENVIRONMENTAL ASSESSMENT FOR KALOKO TOWN CENTER
TAX MAP KEY 7-3-9:PORTION OF 17

We have reviewed the subject document for the proposed development. However, due to the size of the development, the Department will withhold any further comments until the applicant submits a water master plan. This plan shall include on-site and off-site water system improvements.

Should you have any questions, please contact our Water Resources and Planning Section at 969-1421.

Milton D. Pavao, P.E.
Manager

WA

copy - State of Hawaii, Office of Environmental Quality Control
Planning Department
Mr. Glenn T. Kimura, Kimura International Inc.

... *Water brings progress...*

KIMURA INTERNATIONAL

17 January 1996

Mr. Milton D. Pavao, P.E.
Manager
County of Hawaii
Department of Water Supply
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Pavao:

Subject: Kaloko Town Center
Draft EIS Preparation Notice and Environmental Assessment
Tax Map Key: 3rd Div. 7-3-09: por 17
North Kona, Hawaii

Thank you for responding to our EISPN for the above project by letter dated 2 January 1996.

At this stage of the development process, we feel an evaluation of water demand and system improvements necessary for this project should be handled on a conceptual level. Later, when we seek rezoning at the County level, we intend to work with the Department of Water Supply to plan an adequate on-site and off-site water system for the project.

We look forward to your review and comment on the draft EIS.

Sincerely,

Glenn T. Kimura

cc: Land Use Commission
Office of Environmental Quality Control

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

KIMURA INTERNATIONAL

4 January 1996

Mr. Gary Gill, Director
Office of Environmental Quality Control
220 South King Street, Fourth Floor
Honolulu, Hawaii 96813

Dear Mr. Gill:

Subject: Kaloko Town Center
Draft EIS Preparation Notice and Environmental Assessment
Tax Map Key: 3rd Div. 7-3-09: por 17
North Kona, Hawaii

Thank you for responding to our EISPN for the above project by letter dated 20 December 1995.

The draft EIS will include an air quality study, faunal survey, discussion of cumulative impacts and potential impacts on the Kaloko fishpond complex and anchialine ponds. In addition, we will provide the additional map and make changes suggested in your letter.

We look forward to your review and comment on the draft EIS.

Sincerely,

Glenn T. Kimura

cc: Land Use Commission

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

OFFICE OF STATE PLANNING
Office of the Governor

BENJAMIN J. CAYETANO, Governor

MAILING ADDRESS: P.O. BOX 3540, HONOLULU, HAWAII 96811-3540
STREET ADDRESS: 250 SOUTH HOTEL STREET, 4TH FLOOR
TELEPHONE: (808) 587-2846, 587-2800
FAX: Director's Office 587-2848
Planning Division 587-2824

Ref. No. P-6047

December 26, 1995

RECEIVED
JAN 02 1996

MEMORANDUM

TO: Ms. Esther Ueda, Executive Officer
Land Use Commission

FROM: Gregory G.Y. Pai, Ph.D
Director

SUBJECT: Kaloko Town Center DEIS, Preparation Notice and Environmental Assessment, North Kona, Hawaii, TMK 7-03-09:por. 17

We have reviewed the proposal for commercial/retail use, office, multi-family apartment, residential and a 13-acre school and park site. This above-referenced Environmental Assessment and Preparation Notice has been submitted to fulfill application requirements for a Land Use Boundary Petition submitted to the Land Use Commission to reclassify approximately 224 acres of land from the Conservation to the Urban District. We have compiled several comments and concerns from other State and Federal agencies, and have additional concerns as follows:

Traffic

In a letter dated November 21, 1995, the Department of Transportation had the following concerns:

a) "We plan to widen Queen Kaahumanu Highway to a four-lane divided limited access facility before the end of this century. All turning movements will be allowed at the at-grade intersection of Hina Lani Drive and Queen Kaahumanu Highway. We have no plans to provide a grade-separated intersection at this location. Access from the developer's proposed Road "A" may be restricted to right turn in and out.

b) The developer must provide us with a Traffic Impact Analysis Report (TIAR) to identify improvements needed to mitigate project traffic impacts. The TIAR should indicate all assumptions used and incorporate regional traffic projections developed for the update of the Hawaii County Land Transportation Master Plan.

c) The developer must provide all localized improvements necessary to accommodate project traffic and contribute their pro rata share of the cost of regional highway improvements. The Queen Kaahumanu Highway intersection improvements shall be coordinated with adjacent developments."

Civil Defense

The State Office of the Director of Civil Defense has indicated by letter dated December 4, 1995, that "the subject property is located in an area without coverage by an existing civil defense siren device ...

> Section III, Description of Environmental Characteristics, subparagraph B, subparagraph 2, Topography and Soils, discusses slope and elevation ... The threat of extremely high winds and torrential rains resulting in flooding from tropical cyclones and hurricanes need to be addressed. Additionally, the approximately 224 acres are located in an area vulnerable to a variety of natural hazards: volcanic eruptions and earthquakes. Therefore, SCD recommends that the structures/facilities be sited favorably, designed and constructed to mitigate against the potentially destructive winds resulting from orographic amplification and the hazards previously addressed. These structures can then be surveyed and evaluated for use as public shelters in disasters."

School Facilities

By letter dated November 2, 1995, the Department of Education had the following comments:

"...the proposed development of 850 residential units will have the following impact on the area schools:

Schools	Grades	Projected Students
Kealakehe Elementary	K-5	213
Kealakehe Intermediate	6-8	51
Kealakehe High	9-12	85

Both Kealakehe Elementary and Kealakehe Intermediate are operating close to their capacities. A new Kealakehe High School is projected to open in September, 1997 and should be able to accommodate the high school students from this proposed development.

A 13-acre site for a school or park will be reviewed by the Department of Education (DOE). The DOE requires an elementary school site of 12-usable acres or a minimum of 8-usable acres if located next to a four-acre County park. The DOE would also like to have the right to determine the location of the school/park site within the development to meet our own design guidelines ..."

The DOE also requests that a fair share contribution be submitted to the DOE. The above-referenced school site can be counted as a portion of this contribution, which may also be in the form of land dedication, construction of facilities or a cash contribution.

Kaloko-Honokohau National Historic Park

The national park is located makai of the Petition area. In a letter dated October 13, 1995, the park service indicated that the primary resources of the park are Hawaiian fishponds that provide habitat for two species of endangered water birds. The park also contains several anchialine ponds, some with rare ecosystems. The waters offshore are also within the national park and contain significant aggregations of green sea turtles, a threatened species. The adjacent sand beaches provide nesting habitat for the sea turtles.

The National Park Service states: "Our concern is that this petition is just one of many ... We believe that landowner/developers should be required to come up with specific mitigation measures, including wastewater treatment facilities, as part of a regional water quality program. For example, the EA states that sewage generated by the project could be disposed by placing it in deep wells developed on-site. However, it is not at all clear how these wells would be designed so that the wastewater would end up in deep water offshore rather than mingling with the national park's groundwater. The exceptionally permeable character of the bare a'a and pahoehoe lava found throughout this area make this a real likelihood."

The Department of Land and Natural Resources has indicated by letter dated November 16, 1995, the following:

> "An archaeological reconnaissance survey of portions of the petition area was carried out by Cultural Survey Hawaii, but we do not have a copy of the report. And in any case a reconnaissance survey is no longer sufficient for a land use change, because it does not adequately cover the project area, find all significant historic sites, and propose mitigation treatments. It is our recommendation that the petitioner must undertake an archaeological inventory survey of the project area. The results of this survey, including significance evaluations and recommended mitigation treatments, need to be submitted in report format to our office for review and comments and approval. The survey should be undertaken prior to the writing of the Environmental Impact Statement. Until an acceptable survey is available, we will recommend that the LUC not make a decision on the petition, because we cannot advise the LUC as to all the significant historic sites present and what suitable mitigation might be."

Kaloko Dry Forest and Surrounding Land Area

We are aware that the Kaloko Dry Forest is mauka of the Petition area and not a part of the petition. However, this forest area is of prime botanical importance, and OSP is concerned about encroaching developments. The proposal for the development of the 224 acres in the Petition area could eventually lead to the development of the entire property owned by the Petitioner (about 1,000 acres). A conceptual plan for the total landholding should be included in the Environmental Impact Statement, even if all of the support and baseline studies do not go beyond the Petition area. The EIS should describe the proposals for the preservation or use of the forest area and the remainder of the land owned by Tokyo Green.

Coastal Zone Management (CZM)

The CZM Program is concerned about the golf course on the Urban District parcel, mauka and contiguous to the proposed Kaloko Town Center. The pesticide and fertilizer use on the golf course should be discussed in the EIS in relation to the subject project. Also, the integration of the project infrastructure such as water, sewage, traffic systems, with those of surrounding projects should be addressed in some detail. The EIS should describe the phasing and the development schedule of the project. Figure 2 in the EA (Kaloko Town Center Master Plan) is difficult to evaluate without such information.

We request that these concerns and issues be addressed in the draft Environmental Impact Statement. Thank you for the opportunity to comment on this Environmental Assessment. If there are any questions, please contact Lorene Maki at 587-2888.

cc: Mr. Gary Gill
Mr. Glenn T. Kimura

KIMURA INTERNATIONAL

4 June 1996

Mr. Gregory G.Y. Pai, PhD
Director
Office of State Planning
Office of the Governor
PO Box 3540
Honolulu, Hawaii 96811-3540

Dear Mr. Pai:

Subject: Kaloko Town Center
Draft EIS Preparation Notice and Environmental Assessment
Tax Map Key: 3rd Div. 7-3-09: por 17
North Kona, Hawaii

Thank you for responding to our EISPN for the above project by letter dated 26 December 1995. In reviewing our files, we discovered that we inadvertently neglected to send a response letter and apologize for not sending one sooner. However, the issues and concerns raised by other departments, State and Federal agencies, have been noted and addressed in the Draft EIS.

We look forward to your review and comment on the draft EIS.

Sincerely,

Glenn T. Kimura

cc: Land Use Commission
Office of Environmental Quality Control

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

BENJAMIN J. CAYETANO
GOVERNOR

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

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
JERRY M. MATSUDA
GLENN M. OKIMOTO

IN REPLY REFER TO:
STP 8.7148

RECEIVED
JAN 02 1996

December 28, 1995

State of Hawaii
Land Use Commission
Old Federal Building, Room 104
335 Merchant Street
Honolulu, Hawaii 96813

Attention: Ms. Esther Ueda

Dear Ms. Ueda:

Subject: Kaloko Town Center
Draft EIS Preparation Notice and Environmental Assessment
TMK: 3rd Div. 7-3-09: por 17
North Kona, Hawaii

Our comments are as follows:

1. A Traffic Impact Analysis Report (TIAR) should be submitted for our review and approval.

   The TIAR should include:

   a. The anticipated traffic impacts and required mitigation measures attributable to the subject development.

   b. An assessment of the full build-out of planned projects in the area, including the landowner's total master plan development and an implementation schedule.

   c. The conditions and assumptions contained in the latest transportation plan for Hawaii.

   d. The identification of setbacks and right-of-way requirements for roadway improvements. The developer should coordinate this with our Highways Division.

2. The developer should be responsible for necessary improvements at the intersections of Queen Kaahumanu Highway with Hina Lani Drive and the proposed Road "A".

   Additional improvements may be required, pending our evaluation of the TIAR.

3. All plans for construction work within the State highway right-of-way must be submitted for our review and approval.

4. The developer should be responsible to pay his prorata share of regional improvements in this area.

Very truly yours,

Jerry M. Matsuda

KAZU HAYASHIDA
Director of Transportation

bc: Mr. Glenn Kimura, Kimura International Inc.

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

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

LAWRENCE MIIKE
DIRECTOR OF HEALTH

RECEIVED JAN 26 1996

In reply, please refer to:

January 18, 1996

95-201A/epo

Ms. Ester Ueda
Land Use Commission
Old Federal Building, Room 104
335 Merchant Street
Honolulu, Hawaii 96813

Dear Ms. Ueda:

Subject: Kaloko Town Center
Draft EIS Preparation Notice and
Environmental Assessment
TMK: 3rd Div. 7-3-09: por 17
North Kona, Hawaii

Thank you for allowing us to review and comment on the subject document. We do not have any comments to offer at this time besides our comments dated December 6, 1995 (enclosed) pertaining to the petition to amend the State Land Use District Boundaries.

Sincerely,

Lawrence Miike
Director of Health

Enclosure

c: (w/ enclosure)
OEQC
Kimura International

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

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

LAWRENCE MIIKE
DIRECTOR OF HEALTH

In reply, please refer to:

December 6, 1995

95-201/epo

To: The Honorable Gregory Pai, Director
Office of State Planning

From: Lawrence Miike
Director of Health

Subject: Petition for Amendment to the State Land Use District Boundaries

Petition No.:	A95-716
Petitioner:	Tokyo Green of Hawaii, Inc.
Requested Change:	Conservation to Urban
Proposed Use:	Commercial, office/commercial, multi-family and single-family residential, site for a school and park
Location:	Kaloko-Kohanaiki, North Kona, Hawaii
Tax Map Key:	7-3-09: 17

Thank you for allowing us to review and comment on the subject request. We have the following comments to offer:

<u>Noise Concerns</u>

1. Although adequate buffer distances from the Kaloko Industrial Park are proposed, commercial land uses next to residential areas may also result in negative noise impacts. Mitigative measures toward minimizing these noise impacts should be implemented within any planned, mixed-use community.

2. Noise associated with the adjacent golf course to the North may adversely impact project residents. Adequate buffers should be considered, especially for the starting holes where early morning lawn maintenance may occur.

3. Buffering distances between the industrial/commercial and multi-family/residential areas to the East should also be considered.

Should there by any questions on this matter, please call Jerry Haruno, Environmental Health Program Manager of the Noise, Radiation & Indoor Air Quality Branch at 586-4700.

Wastewater

It has been determined that the subject project is located within close proximity of the County sewer service system. As the area can be sewered, we have no objections to the proposed development plan, provided that the project is connected to the public sewers. Use of a private wastewater system with injection wells is not an alternative favored by the Department.

The developer should work closely with the County to assure the availability of additional treatment capacity and adequacy for the project. Non availability of treatment capacity will not be an acceptable justification for use of any private treatment works.

Should you have any questions on this matter, please contact Ms. Lori Kajiwara of the Wastewater Branch at 586-4294.

Underground Storage Tanks

If the proposed project is going to involve the installation and/or removal of underground storage tanks (USTs), these USTs may be regulated in accordance with the technical standards and financial responsibility regulations of 40 CFR Part 280. These regulations include requirements for:

a) Design, construction, installation, and notification;
b) General operating requirements;
c) Release detection;
d) Release reporting, investigation, and confirmation;
e) Release response and corrective action;
f) Changes-in-service and closure; and
g) Financial responsibility.

Owners of newly installed USTs must notify our UST Section of the existence of such USTs within 30 days of installation. The installation of UST systems containing flammable and combustible liquids is also subject to regulation by the County Fire Departments. In this case, the Honolulu County Fire Department should be contacted regarding county requirements that govern UST systems.

If you have any questions on this matter, please call Roxanne Kwan of our Underground Storage Tank Section, Hazardous Waste Branch at 586-4226.

Safe Drinking Water Branch

1. Federal and state regulations define a public water system as a system that serves 25 or more individuals at least 60 days per year or has at least 15 service connections. All public water system owners and operators are required to comply with Hawaii Administrative Rules, Title 11, Chapter 20, "Rules Relating to Potable Water Systems."

2. The draft Environmental Assessment indicates that the project will include the development of new sources of potable water. Section 11-20-29 of Chapter 20 requires that all new sources of potable water serving a public water system be approved by the Director of Health prior to its use. Such an approval is based primarily upon the submission of a satisfactory engineering report which addresses the requirements set in Section 11-20-29.

3. The engineering report must identify all potential sources of contamination and evaluate alternative control measures which could be implemented to reduce or eliminate the potential for contamination, including treatment of the water source. In addition, water quality analyses, performed by a laboratory certified in the State of Hawaii, must be submitted as part of the report to demonstrate compliance with all drinking water standards. Additional tests may be required by the Director upon his review of the information submitted.

4. Section 11-20-30 requires that new or substantially modified distribution systems for public water systems be approved by the Director. However, if the water system is under the jurisdiction of the County of Hawaii, the Department of Water Supply will be responsible for the review and approval of the plans.

If you should have any questions on this matter, please contact Ms. Queenie Tan of the Safe Drinking Water Branch at 586-4258.

Solid Waste

The document does not address the impacts of increased solid waste which will be generated as a result of the development, nor does it address any mitigative efforts such as recycling, composting or waste minimization within the development.

Chapter 342G, HRS formally establishes the State's commitment to reducing the volumes of solid waste through source reduction, recycling and diversion of materials in the waste stream. Also, Chapter 342G establishes recycling goals for each of the counties to achieve 50% recycling by the year 2000. In order to achieve these goals, residential and commercial developments must incorporate recycling and diversion strategies for implementation during construction and occupation.

The Department of Health strongly suggests that a land use boundary amendment require incorporation of source reduction and diversion strategies, as well as procurement of recycled content building materials which are readily available in Hawaii.

For further information, please contact Ms. Carrie McCabe of the Office of Solid Waste Management at 586-4240.

<u>Air Pollution</u>

Control of Nuisance Odors and Fugitive Emissions

The proposal would allow for the siting of residential areas adjacent to commercial/retail and industrial zoned areas. Without adequate buffer zones and consideration to the type of businesses to be allowed in these areas, the potential for future residents to be impacted by paint emissions, smoke and odors from food preparation, exhaust from boiler stacks and other similar emissions common in commercial areas is great and should be addressed in the Draft Environmental Impact Statement.

Control of Fugitive Dust

The proposal would entail the development of large parcels of land that were previously vacant. As with any similar development in this area, there is a significant potential for fugitive dust to be generated during clearing and removal, grading, excavation and construction activities for this plan. The arid climatic conditions and the potential proximity of newly developed and occupied residential subdivisions only adds to the potential dust problems. Scheduling the different phases of development to minimize impacts on potential residents should be considered. Implementation of adequate dust control measures during all phases of construction is warranted. Construction activities must comply with the provisions of Chapter 11-60.1, Hawaii Administrative Rules, "Air Pollution Control," Section §11-60.1-33 on Fugitive Dust.

The contractor should provide adequate means to control dust from road areas and during the various phases of construction activities. These measures include but are not limited to:

a. planning the different phases of construction, focusing on minimizing the amount of dust generating materials and activities, centralizing material transfer points and onsite vehicular traffic routes, and locating potentially dusty equipment in areas of the least impact;

b. providing an adequate water source at site prior to startup of construction activities;

c. landscaping and rapid covering of bare areas, including slopes, starting from the initial grading phase;

d. control of dust from shoulders, project entrances, and access roads;

e. providing adequate dust control measures during weekends, after hours, and prior to daily startup of construction activities; and

f. providing dust control for bare areas on individual lots, prior to lots being sold and eventually grassed by future owners.

If you have any questions on this matter, please contact Mr. Robert Tam at 586-4200.

c: Clean Air Branch
Noise, Radiation & Indoor Air Quality Branch
Office of Solid Waste Management
Safe Drinking Water Branch
Hazardous Waste Branch
Wastewater Branch

KIMURA INTERNATIONAL

4 June 1996

Mr. Lawrence Miike
Director of Health
State of Hawaii
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

Dear Mr. Miike:

Subject: Kaloko Town Center
Draft EIS Preparation Notice and Environmental Assessment
Tax Map Key: 3rd Div. 7-3-09: por 17
North Kona, Hawaii

Thank you for responding to our EISPN for the above project by letter dated 18 January 1996. Your letter and the enclosed letter dated December 6, 1995 were not received by our office until 26 January, 1996, approximately a month past the deadline for comments. In the shuffle, we inadvertently neglected to respond to your letters. However, the issues and concerns raised by the various branches of the Department of Health have been addressed in the Draft EIS. Nonetheless, we apologize for the delay in sending you a response letter.

We look forward to your review and comment on the draft EIS.

Sincerely,

Glenn T. Kimura

cc: Land Use Commission
Office of Environmental Quality Control

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

Chapter 12
COMMENTS AND RESPONSES RECEIVED DURING PREPARATION OF THE FEIS

12 CONSULTED PARTIES AND PARTICIPANTS IN THE FEIS PREPARATION PROCESS

12.1 Participants in the Final EIS Preparation Process

This final EIS was prepared for Tokyo Green Hawaii Inc., the landowner and petitioner, by Kimura International Inc. Firms that contributed to the preparation of this document are listed below:

Kimura International	EIS preparation and processing
Technical subconsultants	
Hilo Engineering	Civil Engineering
Traffic Management Consultant	Traffic Impact Assessment Report
Char & Associates	Botany
Rana Productions	Avifauna and Mammals
Cultural Surveys Hawaii	Archaeology and Cultural Impact
Y. Ebisu & Associates	Noise
Ogden Environmental	Air Quality
Tom Nance Water Resources Engineering	Hydrology
Marine Research Consultants	Near Shore Marine Water Quality
R.M. Towill	Hawaiian Trails
Earthplan	Social Impact
Ron N.S. Ho & Associates	Electrical Engineering
KPMG Peat Marwick LLP	Market Assessment and Economic and Fiscal Impact

12.2 Parties Consulted During the Preparation of the Final EIS

Notice of the availability of the Draft EIS was published in the June 23, 1996 Bulletin of the Office of Environmental Quality Control. Deadline for comments was August 7, 1996, following the 45-day review period. The deadline was extended to 14 August 1996 at the request of an interested party. Comment letters were received from agencies and individuals identified by a check mark. Agency comments and applicant's responses are attached.

STATE AGENCIES

- ✓ Office of Environmental Quality Control
- ✓ Department of Agriculture
- ✓ Department of Accounting and General Services (re Schools)
- Department of Defense
- Department of Education
- ✓ Department of Hawaiian Home Lands
- ✓ Department of Health (DOH)
- ✓ Department of Land and Natural Resources (DLNR)

✓ DLNR State Historic Preservation Office
Department of Business, Economic Development and Tourism (DBEDT)
DBEDT Library
✓ Housing Finance and Development Corporation
✓ Land Use Commission
Department of Transportation
State Archives
DBEDT State Energy Office
✓ Office of Planning

UNIVERSITY OF HAWAII
✓ Environmental Center
Water Resources Research Center

FEDERAL AGENCIES
Regional Division US Environmental Protection Agency
✓ US Department of Agriculture, Soil Conservation Service
✓ US Fish and Wildlife Service, National Park Service

NEWS MEDIA
Honolulu Star Bulletin
Honolulu Advertiser
West Hawaii Today (Kona)

COUNTY OF HAWAII
Planning Department
Department of Parks and Recreation
Department of Public Works
Department of Research and Development
✓ Department of Water Supply
University of Hawaii - Hilo Campus
✓ Police Department
✓ Fire Department

NON-GOVERNMENTAL AGENCIES
American Lung Association
Hawaii Electric and Light Company
Office of Hawaiian Affairs
Kona Hawaiian Civic Club
Kaloko Community Association
James Greenwell, Lanihau Partners
George Iwasaki, AIA Architect & Associates
✓ Life of the Land
✓ Hawaii Leeward Planning Conference

LIBRARIES

University of Hawaii, Hamilton Library
Legislative Reference Bureau
State Main Library

REGIONAL LIBRARIES

Kaimuki Regional Library
Kaneohe Regional Library
Pearl City Regional Library
Hilo Regional Library
Kahului Regional Library
Kauai Regional Library

HAWAII LIBRARIES

Kailua-Kona Public Library

BENJAMIN J. CAYETANO
GOVERNOR
STATE OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P.O. BOX 1879
HONOLULU, HAWAII 96805

KALI WATSON
CHAIRMAN
HAWAIIAN HOMES COMMISSION

JOBIE M. K. M. YAMAGUCHI
DEPUTY TO THE CHAIRMAN

RECEIVED
JUL 09 1996

July 8, 1996

MEMORANDUM

TO: Ms. Esther Ueda, Executive Officer
State Land Use Commission

FROM: Kali Watson, Chairman
Hawaiian Homes Commission

SUBJECT: DRAFT EIS for Amendment to the State Land Use District Boundaries: Kaloko Town Center, Kaloko-Kohanaiki, North Kona, Hawaii, THK: 7-3-09:por 17

Thank you for allowing our review of the draft environmental impact statement for the subject Kaloko Town Center Master Plan project to develop commercial, office/commercial, multi-family and single-family residential, school and park uses on approximately 224 acres.

The Department of Hawaiian Home Lands (DHHL) has acquired or is in the process of acquiring certain lands in North Kona (see attached Map-1) in the vicinity of the proposed project:

(1) North within two miles at Kalaoa, 483 acres mauka of Queen Kaahumanu Highway;

(2) South within two miles at Honokohau, 200 acres makai of Queen Kaahumanu Highway; and

(3) South within three miles at Kealuohu, 150 acres mauka of Queen Kaahumanu Highway and north of Palani Road.

We are therefore interested in what occurs on the subject property and other lands in the region.

DHHL has no objections to the proposed redistricting from Conservation to Urban. It is in a prime location at the intersection of Hina Lani Drive and the Queen Kaahumanu Highway in the general direction of urbanization from Kailua-Kona. The petition represents a relatively small change among the more than 9,000 acres indicated for reclassification to Urban in the 1992 State Land Use District Boundary Review and in the Keahole to Kailua Development Plan.

With the amount of existing vacant Urban land, the Land Use Commission may consider imposing performance conditions which, if not met within periods specified, would result in reversion of the site to its current classification or another classification deemed most appropriate.

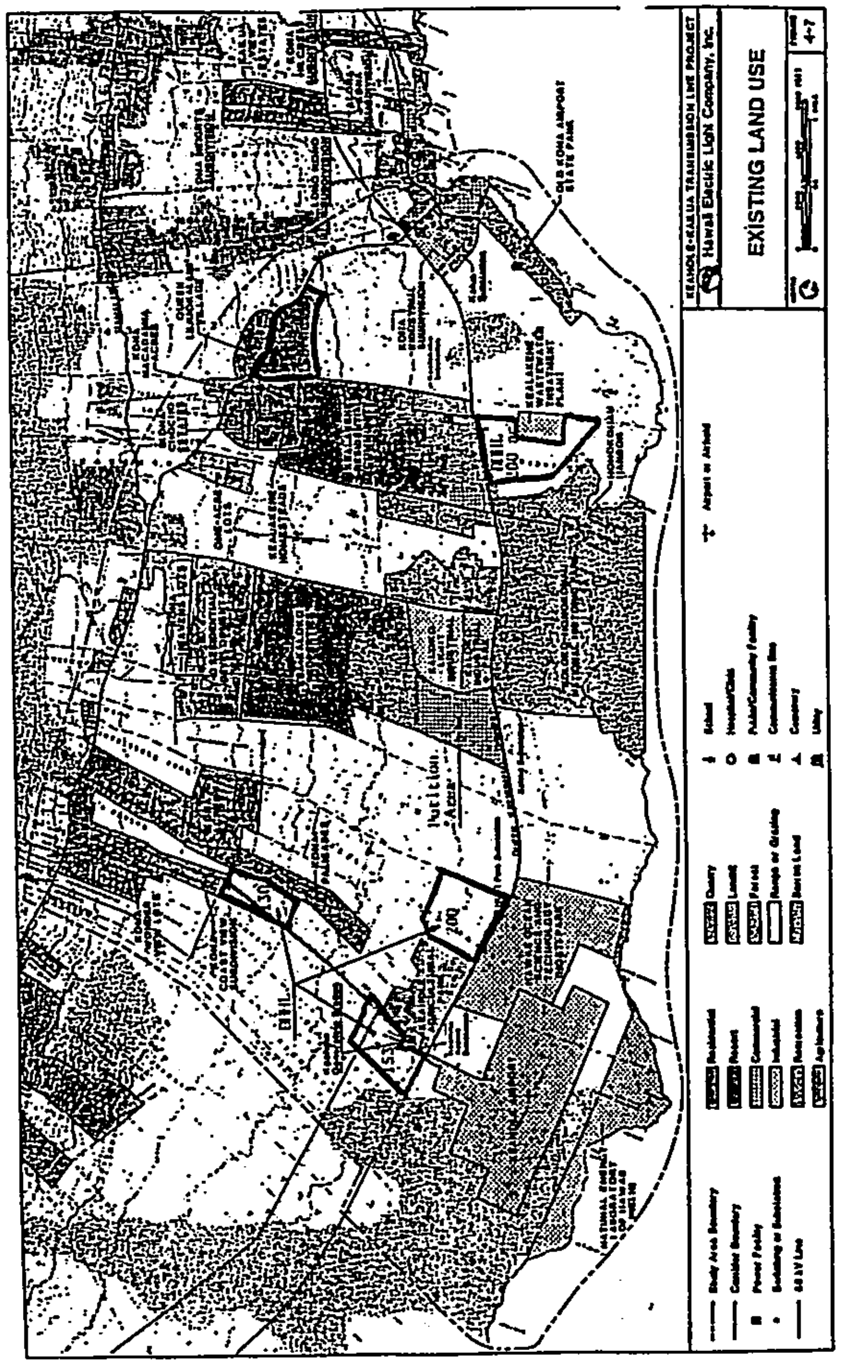
Thank you for the opportunity to comment. If you have any questions, please call Darrell Yagodich of our Planning Office at 586-3837.

Attachment

c: OEQC
Tokyo Green Hawaii, Inc.
Kimura International, Inc.

DOCUMENT CAPTURED AS RECEIVED

Attachment: Map-1



KIMURA INTERNATIONAL

16 September 1996

Mr. Kali Watson
Chairman
Hawaiian Homes Commission
State of Hawaii
Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, HI 96805

Dear Mr. Watson:

Kaloko Town Center
Draft Environmental Impact Statement (DEIS)
North Kona, Hawaii

Thank you for your comments on the draft environmental impact statement (DEIS) for the above project received by memorandum dated 8 July 1996. We note that DHHL has no objections to the proposed redistricting from Conservation to Urban for the petition area.

Again, thank you for taking the time to review the DEIS. A copy of your memorandum and this response letter will be appended to the Final EIS.

Sincerely,

KIMURA INTERNATIONAL INC.

Glenn T. Kimura
President

cc: Esther Ueda, LUC
Gary Gill, OEQC

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM
LAND USE COMMISSION
P.O. Box 2359
Honolulu, HI 96804-2359
Telephone: 808-587-3822
Fax: 808-587-3827

ESTHER UEDA
EXECUTIVE OFFICER

RECEIVED JUL 10 1996

July 9, 1996

Michael W. Moore, Esq.
Menezes, Tsukazaki, Yeh & Moore
100 Pauahi Street, Suite 204
Hilo, Hawaii 96720

Dear Mr. Moore:

Subject: LUC Docket No. A95-716/Tokyo Green Hawaii, Inc.: Draft Environmental Impact Statement (DEIS)

We have reviewed the DEIS prepared for the subject docket and have the following comments:

1) On page 2-11, Figure 2-5, we note that the O'oma II Resort Project, identified as proposed on the map, was denied by the Commission by Decision and Order dated September 22, 1993.

2) On page 3-15, section 3.3.2., the DEIS states that the project will include some rental housing. Clarification should be provided as to how many rental units will be provided, and whether the market assessment included an analysis of the rental market in the region.

3) On page 3-18, section 3.4., reference to the State Land Use Agricultural District as "agriculture" is incorrect. This reference occurs throughout the DEIS and should be amended to reflect the district's correct designation.

4) On page 6-21, section 6.4., the DEIS states that the Kealakehe Sewage Treatment Plant will have enough capacity to accommodate the Kaloko Town Center project without any need for expansion. A discussion on the cumulative impacts upon the 2.8 MGD average flow capacity of the treatment plant from existing and other proposed projects in the region should be provided.

5) On page 6-17, section 6.2., the DEIS states that the permanent water source for the project will probably come from high level wells. However, there is no detailed discussion of whether there is sufficient capacity from the high-level groundwater to meet the anticipated potable water demands of the project at full build-out, nor is there a discussion on the cumulative effects upon the high-level groundwater from existing and other proposed projects in the region.

Clarification should also be provided as to the ownership of the lands on which the high level wells are proposed to be drilled.

6) On page 6-22, section 6.5., the DEIS states that the project's solid waste can be accommodated at the Puuanahulu Landfill. Clarification should be provided as to whether this determination took into account the cumulative impacts of solid waste generation from existing and other proposed projects in the region.

7) On page 6-23, section 6.6., the DEIS states that HELCO's Keahole generating plant provides power to the West Hawaii region. There should be a discussion of the ability of the generating plant to handle the anticipated power demands of the project and an assessment of the cumulative impacts from existing and other proposed projects (including the Kaupulehu Resort Expansion Project) upon the plant.

8) Upon review of the Cultural Impact Statement (CIS), there appears to be a discrepancy between the number of possible burial sites. Page 17, paragraph 3, states that there are eight such sites in the project area. Figure 3 also confirms eight sites, as does the archaeological inventory survey itself. However, Table 2 on page 26, as well as Table 4-9 in Chapter 4 of the DEIS, identifies seven possible sites.

Clarification should also be provided as to whether the CIS examined customary and traditional rights exercised by Hawaiians on the subject property for religious (other than burial) purposes.

9) By letter dated October 31, 1995, you stated that comment nos. 4 through 15 in our October 18, 1995, letter would be addressed in the EIS. It appears that comment nos. 4 (relating to projected costs, including on-site and off-site infrastructure costs <u>and</u>

construction costs of residential units, commercial buildings, etc.), 5, and 14 were not addressed at all in the DEIS. A thorough discussion of each issue should be provided. Relatedly, the economic feasibility of the project should be thoroughly substantiated.

We have no further comments to offer at this time.

Should you have any questions, please feel free to call me or Bert Saruwatari of our office at 587-3822.

Sincerely,

ESTHER UEDA
Executive Officer

cc: Ned Dewey
Glenn T. Kimura
OEQC

KIMURA INTERNATIONAL

16 September 1996

Ms Esther Ueda
Executive Officer
State of Hawaii
Department of Business, Economic Development & Tourism
Land Use Commission
PO Box 2359
Honolulu, HI 96804-2359

Dear Ms Ueda:

Kaloko Town Center
Draft Environmental Impact Statement (DEIS)
North Kona, Hawaii

Thank you for your comments on the draft environmental impact statement (DEIS) for the above project received by letter dated 9 July 1996. Responses to your comments are provided below:

1. O'oma II Resort Project: Figure 2-5 will be revised to delete this project.

2. Rental Housing: The development and provision of rental housing will be based on market demand. An estimate of potential units is difficult to determine at this early stage, however, approximately 10% of the total 850 units may be developed as rental housing. The market assessment projected potential demand for all housing units regardless of whether they are for sale or rent. A separate study of the rental market was not conducted.

3. "Agriculture": The use of the word "agriculture" in reference to the State Land Use Agricultural District will be revised throughout the document.

4. Kealakehe Sewage Treatment Plant: The cumulative amount of wastewater generated in the North Kona district was determined by researching the final environmental impact statements for four major projects proposed since 1990. These projects, all of which have received Urban reclassification from the State Land Use Commission, include:

1. Villages of La'i'opua, a State sponsored development project by the Housing and Finance Development Corporation;
2. Liliuokalani Trust Kealakehe Lands, proposed by the Liliuokalani Trust Estate;
3. Kaupulehu Resort Expansion, proposed by the Kaupulehu Developers; and

1600 Kapiolani Blvd., Suite 612
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

4. Urban Expansion of State Lands, Keahole to Kailua Region proposed by the Office of State Planning.

The cumulative amount of wastewater generated in the region 20+ years hence would range from 7.88 to 8.4 mgd without the proposed project and 8.3 to 8.8 mgd with the proposed project. According to Mr. David Yamamoto, Department of Public Works, Wastewater Division personnel , (tel con with Rodney Kawamura, Hilo Engineering, 21 Aug 96), the Kealakehe WWTP has a current capacity of 5.3 mgd and is presently operating at approximately 20% of capacity. The treatment plant can be expanded to accommodate up to 7.5 mgd, resulting in a potential shortfall of .8 to 1.3 mgd in the 20+ year development time frame. According to the Keahole to Kailua Development Plan (County Planning Department and RM Towill Corporation, 1991, p. 4-12), the plant could be expanded to 8 mgd average flow for a 40 year design period. If further increases beyond 8 mgd are required, the WWTP capacity can be further expanded by conversion of the treatment process from aerated lagoons. However, expansion is expected to be limited by the effluent disposal capacity of the area. Proposed methods of effluent disposal included irrigating municipal and private golf courses and green belts in the region. Like water systems, wastewater systems are built to accommodate demand when needed. As development proceeds in the region and the plant approaches capacity, it is most likely that long range studies will be conducted by the County Department of Public Works to assess future needs at that point in time and secure funding for facility expansion.

5. **Potable Water Demands:** Using the same method to determine cumulative impact of wastewater generation for the region, cumulative demand for potable water, at the end of build-out 20+ years hence, is estimated to range from 13.05 to 15.05 million gallons per day (mgd) without the project and 13.92 to 15.92 mgd with the proposed project. The projects in the region cover two aquifer systems, the Kiholo and Keauhou aquifer systems. The State Water Resources Protection Plan (Geo. A.L. Yuen & Associates, March 1992) indicates a sustainable yield of 38 mgd for the Keauhou system and 18 mgd for the Kiholo system. Present use is about 10 mgd in Keauhou and 2 mgd in Kiholo. Supplying water for urbanization is more a function of source and transmission system development rather than availability. In order to be cost-effective, the development of water source and transmission systems will need to coincide with the development phases of major projects in the region. According to Mr. Milton Pavao, Manager, Department of Water Supply, (tel con with Rodney Kawamura, Hilo Engineering, 21 Aug 96), the department currently has two high level wells on line with two more coming on line in the near future. The department is planning to drill and equip another high level well in the area. According to Tom Nance Water Resource Engineering, there are also three other high level wells in the area which have been drilled but not outfitted. If need be, the applicant could enter into a joint venture, at full build-out, to outfit one of the drilled wells. Further, the department indicated that water is available through the existing system located along Hina Lani Drive, however 2 reservoirs situated at the 900-foot and 1200-foot

elevations and connecting waterlines are required for the proposed project (letter, Department of Water Supply, County of Hawaii, 19 August 1996).

The ownership of property where proposed wells are to be dug is not known at this time. As a public utility, the Department of Water Supply is empowered to condemn land for public purposes. Traditionally, after permission is granted by a landowner to allow exploratory drilling and water is found, the Department would initiate procedures to purchase the property on which the well is situated and establish access easements.

7. **Solid Waste Generation:** Using the same method to determine cumulative impact of wastewater generation for the region, solid waste generated in the region 20+ years hence is estimated to range from 149.7 to 192.7 tons per day without the project and 160.7 to 203.7 with the proposed project. The new Puu Anahulu landfill is 300 acres in size. According to Mr. Larry Capellas, DPW Solid Waste Division (tel con with Rodney Kawamura, Hilo Engineering, 21 Aug 96) the landfill has the capacity to handle solid waste generated by existing uses, the proposed project and other projects in the region. Calculating the projected capacity of the landfill at full build-out 20+ years hence is difficult because development phasing for each of the major projects is dependent on market conditions. With prudent government planning, a new site would need to be selected and prepared and/or alternative means of solid waste disposal such as Honolulu's waste to energy plant would need to be developed. With the larger volume of waste predicted for the future, a waste to energy plant should be cost-effective. Furthermore, with mandated recycling programs enacted by government, the amount of waste generated per day should decrease and more environmentally friendly means of waste disposal practices will be in place.

7. **HELCO's Electrical Generating Capacity:** Using the same method to determine cumulative impact of wastewater generation for the region (which includes the Kaupulehu Resort Expansion Project), electrical demand 20+ years hence in the region is estimated to range from 109 to 117 MW. According to Ronald N.S. Ho & Associates, electrical engineers, Hawaii Electric Light Company (HELCo.), has a current generation capacity of approximately 199 MW, with a present peak demand of 166.3 MW. Based on forecasted loading, the existing Kaloko Substation would need to be expanded. Over time, HELCo anticipates that its generation system will be adequate to carry the region's electrical demand because the annual load growth is anticipated to be gradual. HELCo has plans to add about 56 megawatts of generation at its Keahole Power Plant in 1998. The Hawaii Electric Light Company, like any other public utility, is mandated by charter to provide utility services. As demand increases with development in the region, the public utility would develop facilities to meet demand. Notwithstanding the need for basic electrical power, as new developments occur over the years, the use of solar water heaters and energy efficient appliances would help to cumulatively reduce the island's dependency on electrical power generated by burning fossil fuels. With advances in technology and research,

alternative energy sources such as ocean thermal energy or some yet unknown method may provide alternative energy sources 20+ years from now.

8. Cultural Impact Statement regarding Possible Burial Sites: Table 2 on page 26 of the Cultural Impact Statement, Table 4-9 in Chapter 4 of the DEIS and Table 3, page 110 of the Archaeological Inventory Survey lists 7 possible burials and 1 temporary habitation/possible burial (Site 20749).

With respect to the question of whether the cultural impact statement examined customary and traditional rights exercised by Hawaiians on the subject property for religious (other than burial) purposes, the Cultural Impact Statement at page 26 notes that no religious sites, other than the possible burials, are believed to lie within the project area, and based on Cultural Survey Hawaii's research, there is no evidence that the property was used for customary and traditional religious practices.

9. Supplemental Information:

As requested, supplemental information for the following topics are provided. These will be inserted into the relevant sections of the Final EIS.

Projected costs: Off-site infrastructure costs are estimated at $12.7 million. On-site construction costs are estimated at $187 million. Total projected cost is estimated at $199.7 million over the life of the project in current dollars. An itemized breakdown of these costs is provided in Exhibit B of the Economic and Fiscal Impact study in the appendix of the EIS. Proposed sales prices for residential units will be dependent on market conditions. Anticipated sales prices are tentatively estimated between $100,000 to $150,000 for multi-family units and $175,000 to $275,000 for single family residences (current dollars).

Development Financing Methods: Project financing will be provided by a combination of corporate investment capital provided by the owner, joint venture investment capital, and bank financing.

Development Phasing Map: As requested, a development phasing map is provided as Figure 2-7 of the Final EIS, to supplement the discussion in section 2.5, Project Phasing.

Economic Feasibility: The economic feasibility of the project has been discussed in Chapter 5, Socio-Economic Factors, Section 5.3, Market Assessment. The market assessment, prepared by KPMG Peat Marwick, reviewed relevant residential, retail and office market conditions in West Hawaii and assessed the anticipated market support for the proposed residential, retail and office land uses of the proposed action.

We appreciate the time and effort you took in reviewing the draft EIS. A copy of your letter and this response letter will be appended to the Final EIS.

Sincerely,

KIMURA INTERNATIONAL INC.

Glenn T. Kimura
President

cc: Gary Gill, OEQC

Stephen K. Yamashiro
Mayor

County of Hawaii
POLICE DEPARTMENT
349 Kapiolani Street • Hilo, Hawaii 96720-3998
(808) 935-3311 • Fax (808) 961-2702

Wayne G. Carvalho
Police Chief

James S. Correa
Deputy Police Chief

RECEIVED
JUL 18 1996

July 16, 1996

Ms. Esther Ueda
Executive Officer
State Land Use Commission
P. O. Box 2359
Honolulu, HI 96804-2359

Dear Ms. Ueda:

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT
KALOKO TOWN CENTER, NORTH KONA, HAWAII
TMK: 3RD DIV: 7-3-09: POR. 17

Staff concludes that the Kaloko Town Center project will have a definite impact on police services and the North Kona community.

It is expected that by the year 2000, the project will increase the North Kona population by 10%. Staff concurs with the findings that our Department has a staffing shortfall that has not kept pace with the increased population in North Kona. This project will negatively impact police services and traffic. Refer to pages 1-14, 3-46, 6-24, and the Social Impact Assessment on page 53.

Suggested mitigation measures to reduce the traffic congestion and police services to the project area may reduce police service calls, but we believe that overall requested services for police will increase. Refer to pages 6-25.

Staff recommends the following intersection improvements for the project:

1. Signalize the intersection at Queen Ka'ahumanu Highway and Hina Lani Drive.

2. Widen the intersection at Queen Ka'ahumanu Highway and Hina Lani Drive to provide exclusive left turn lane, right turn lane and through lanes for Queen Ka'ahumanu Highway.

3. Signalize the intersection at Kanalani Street and Hina Lani Drive.

4. Widen the intersection at Kanalani Street and Hina Lani Drive to provide exclusive left and right turn lanes for Kanalani Street and right turn and through lanes for Hina Lani Drive.

5. Signalize the intersection at Road B and Hina Lani Drive.

6. Widen the intersection at Road B and Hina Lani Drive to provide exclusive left and right turn lanes for Road B and exclusive left and right turn lanes and through lane for Hina Lani Drive.

7. Signalize the intersection at Road F and Hina Lani Drive.

8. Widen the intersection at Road F and Hina Lani Drive to provide exclusive left turn lane and right turn lane for Road F and an exclusive right turn lane, left turn lane and through lane for Hina Lani Drive.

9. Signalize the intersection at Mamalahoa Highway and Hina Lani Drive.

10. Widen the intersection at Mamalahoa Highway and Hina Lani Drive to provide exclusive right turn lane and left turn lane for Hina Lani Drive and exclusive left turn lane, right turn lane and through lane for Mamalahoa Highway.

Finally, all traffic signals should be synchronized to maximize vehicles per hour movement to mitigate traffic congestion during peak traffic hours.

Thank you for the opportunity to comment.

Sincerely,

Wayne G. Carvalho
WAYNE G. CARVALHO
POLICE CHIEF

HWH:lk

cc: Mr. Ned Dewey, Tokyo Green Hawaii
Mr. Glenn T. Kimura, Kimura International

KIMURA INTERNATIONAL

16 September 1996

Police Chief Wayne G. Carvalho
Police Department
County of Hawaii
349 Kapiolani Street
Hilo, Hawaii 96720-3998

Dear Chief Carvalho:

Kaloko Town Center
Draft Environmental Impact Statement (DEIS)
North Kona, Hawaii

Thank you for your comments on the draft environmental impact statement (DEIS) for the above project received by letter dated 16 July 1996. We concur with the Police Department recommendations for Hina Lani Drive. Each traffic improvement is expected to be implemented by the responsible agency and/or private developer in a timely manner.

Again, thank you for taking the time to review the DEIS. A copy of your letter and this response letter will be appended to the Final EIS.

Sincerely,

KIMURA INTERNATIONAL INC.

Glenn T. Kimura
President

cc: Esther Ueda, LUC
Gary Gill, OEQC

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

BANK OF HAWAII
CHALON INTERNATIONAL
EASLEY CORPORATION
FIRST HAWAIIAN BANK
GENTRY PACIFIC, LTD.
GERRY BOTT & ASSOCIATES
HAWAII ELECTRIC LIGHT CO.
HAWAII LAND COMPANY
HOLUALOA MANAGEMENT CORP.
HUALALAI DEVELOPMENT CO.
KAHUA RANCH LIMITED
KAI MALINO RANCH
KAMEHAMEHA INVESTMENT CORP.
KAMEHAMEHA SCHOOLS BISHOP ESTATE
KAUPULEHU DEVELOPMENTS
KEALAKEKUA DEVELOPMENT CORPORATION
KEALAKEKUA RANCH, LTD.
KEALIA RANCH
KEHOHA BEACH, INC.
KIEWIT PACIFIC COMPANY
KONA TRANSPORTATION
LANIHAU PARTNERS L.P.
MACFARMS OF HAWAII

RECEIVED
JUL 19 1996

HAWAII LEEWARD PLANNING CONFERENCE
P.O. BOX 635 • KAILUA-KONA, HAWAII 96745-0635

MARTI DEVELOPMENT, INC.
MAUNA KEA PROPERTIES
MAUNA LANI RESORT, INC.
McCANDLESS RANCH
MOORES ENTERPRISES
OCEANSIDE 1250
ORCHARD MARINE, INC.
PARKER RANCH
PONO HOLO RANCH
QUEEN LILIUOKALANI TRUST
R. M. TOWILL CORPORATION
REAL ESTATE DEV. CONSULTANTS INC.
REALTY INVESTMENT
REID & ASSOCIATES, INC.
RIEHM OWENSBY PLANNERS ARCHITECTS
SUN CABLEVISION
THE QUEEN EMMA FOUNDATION
TIBAG ENGINEERING
WAIKOLOA DEVELOPMENT COMPANY
WAIMEA WATER SERVICES, INC.
WEST HAWAII CONCRETE
WIMBERLY, ALLISON, TONG & GOO

July 18, 1996

Ms. Esther Ueda
Executive Officer
State Land Use Commission
P. O. Box 2359
Honolulu, HI 96804-2359

Dear Ms. Ueda:

I reviewed the Draft Environmental Impact Statement for the Kaloko Town Center. I have only one comment. I feel that it is important that the improvements on Queen Kaahumanu Highway and Hina Lani Drive be done first in the initial stages of development. This intersection is already dangerous and should be improved prior to the additional traffic load which the town center would create.

Thank you for the opportunity to comment.

Sincerely,

H. Peter L'Orange
President

HPL/ba

cc: State of Hawaii
Office of Environmental Quality Control

Mr. Ned Dewey
Tokyo Green Hawaii, Inc.

✓Mr. Glenn T. Kimura
Kimura International Inc.

HAWAII LEEWARD PLANNING CONFERENCE
P.O. BOX 635 • KAILUA-KONA, HAWAII 96745-0635

KIMURA INTERNATIONAL

16 September 1996

H. Peter L'Orange
President
Hawaii Leeward Planning Conference
PO Box 635
Kailua-Kona, Hawaii 96745-0635

Dear Mr. L'Orange:

Kaloko Town Center
Draft Environmental Impact Statement (DEIS)
North Kona, Hawaii

Thank you for your comments on the draft environmental impact statement (DEIS) for the above project received by letter dated 18 July 1996.

The intersection of Queen Ka'ahumanu Highway and Hina Lani Drive is expected to be completed when the proposed Kaloko Town Center begins its initial phase of development in the Year 2000. The proposed improvements at the intersection of Queen Ka'ahumanu Highway and Hina Lani Drive are part of the Queen Ka'ahumanu Highway Widening Project, proposed by the Hawaii State Department of Transportation (DOT). DOT plans to complete the first phase of the project between Kailua and Keahole Airport by the Year 2000.

Again, thank you for taking the time to review the DEIS. A copy of your letter and this response letter will be appended to the Final EIS.

Sincerely,

KIMURA INTERNATIONAL INC.

Glenn T. Kimura
President

cc: Esther Ueda, LUC
Gary Gill, OEQC

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

United States Department of Agriculture

Natural Resources Conservation Service

P. O. Box 50004
Honolulu, HI
96850-0001

July 22, 1996

RECEIVED
JUL 24 1996

Ms. Esther Ueda, Executive Officer
State Land Use Commission
P.O. Box 2359
Honolulu, Hawaii 96804-2359

Dear Ms. Ueda:

Subject: Draft Environmental Impact Statement (DEIS) - Kaloko Town Center, North Kona, Hawaii

We have reviewed the above-mentioned document and offer the following comments:

The first sentence in Chapter 3-6 in the first paragraph, "The Kaloko Town Center site is not within a watershed or within close proximity to water resources." The sentence is misleading in that everything is in some watershed somewhere on the landscape. Also the area "near" the proposed project is above groundwater resources and less than a mile (4/5ths of a mile according to the document) from coastal and estuarine resources.

Further along in the same paragraph, the sentence, "Such uptake suggests that the pond may be nutrient limited with respect to plant growth," leads one to believe that added nutrients in the estaurine environment would be beneficial. This goes against most known marine biological knowledge on the nature of nutrient flux on mid-Pacific islands. Most mid-Pacific islands are in fact oligotrophic (nutrient poor) due to their distance from nutrient producing land masses and lack of upwelling of nutrient rich bottom waters migrating in the benthos from polar areas. This phenomenon makes our coastal and estaurine areas sensitive to nutrient pulses that are in excess of normal background levels. Concern should therefore be directed toward reducing outside nutrient entry in our coastal and estaurine environments.

The overall effect of nutrient input from present and future development is perhaps the most important issue in looking at the potential for coastal, estaurine, and ground water contamination. All projects should attempt to limit the addition of nutrients to bare minimums based upon economic and technological constraints. The adoption of this philosophy should serve to protect water resources from combined larger effects of each developments's "minor" contribution to the problem and foster holistic and sustainable community growth.

The Natural Resources Conservation Service formerly the Soil Conservation Service, works hand-in-hand with the American people to conserve natural resources on private lands.

AN EQUAL OPPORTUNITY EMPLOYER

Thank you for the opportunity to comment on this DEIS. If you should have any questions, please contact Steve Skipper, District Conservationist, at the Kealakekua Field Office at (808) 322-2484.

Sincerely,

KENNETH M. KANESHIRO
State Conservationist

cc:
Mr. Ned Dewey, Tokyo Green Hawaii, Inc., c/o Pacific Land Services, Inc. 810 Richards Street, Suite 900, Honolulu, HI 96813
Mr. Glenn T. Kimura, Kimura International Inc., 1600 Kapiolani Blvd., Suite 622, Honolulu, HI 96814

KIMURA INTERNATIONAL

16 September 1996

Mr. Kenneth M. Kaneshiro
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
PO Box 50004
Honolulu, Hawaii 96850-0001

Dear Mr. Kaneshiro:

Kaloko Town Center
Draft Environmental Impact Statement (DEIS)
North Kona, Hawaii

Thank you for your comments on the draft environmental impact statement (DEIS) for the above project received by letter dated 22 July 1996.

In retrospect, we agree that the word "watershed" was incorrectly used and the Final EIS will be revised accordingly.

Regarding your comment that nutrient limitation "leads one to believe that added nutrients in the estuarine environment would be beneficial", it was not our intent to suggest that this was true. Rather, input of nutrients was one of the main concerns of our study that were addressed in the baseline assessment, primarily because the addition of nutrients can be detrimental to marine and pond ecosystems.

To clarify this issue, the Final EIS will be revised as follows:

"Such intake suggests that the pond may be nutrient limited with respect to plant growth. As a result, increased nutrient concentrations in water entering the pond may result in increases in plant abundance, which in turn may have the potential to alter the community composition of the pond environment. Estimates of changes in groundwater dynamics associated with Kaloko Town Center indicate that nutrient concentrations in groundwater should not increase above present concentrations as a result of landscaping. Volume of groundwater discharges into the pond may increase slightly, but the increases appear to be within the natural variability of flow that presently enters the Pond. Because the flow rates are not expected to increase beyond the present range, and the nutrient concentrations of groundwater are not expected to increase, there appears to be little potential for changes in plant uptake compared to the present situation. In addition, because of the strong vertical stratification of the Pond, the small increases of groundwater flow would likely have the effect of altering water composition of only the surface layer, and would be exposed to the organisms that live on the pond floor. Therefore, the potential for impact to marine and pond communities as a result of the development of the Kaloko Town Center project appears to be minimal".

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

Again, thank you for taking the time to review the DEIS. A copy of your letter and this response letter will be appended to the Final EIS.

Sincerely,

KIMURA INTERNATIONAL INC.

Glenn T. Kimura
President

cc: Esther Ueda, LUC
Gary Gill, OEQC

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P.O. BOX 621
HONOLULU, HAWAII 96809

MICHAEL D. WILSON
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTY
GILBERT S. COLOMA-AGARAN

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT
WATER RESOURCE MANAGEMENT

RECEIVED
JUL 26 1996

July 24, 1996

LD-NAV
Ref.:EALUCKTCHI.ROM

Mr. Glenn T. Kimura
President
Kimura International Inc.
1600 Kapiolani Blvd., Suite 622
Honolulu Hawaii 96814

Dear Mr. Kimura:

SUBJECT: Draft Environmental Impact Statement for the Kaloko Town Center Project
North Kona, Hawaii Tax Map Key: 7-3-9: por. 17

Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement for the Kaloko Town Center project.

We are pleased to inform you that the Department of Land and Natural Resources divisions have no comments on the subject matter, as submitted.

Should you or your staff have any questions, please feel free to contact Mr. Nicholas A. Vaccaro of the Land Division at 587-0438.

Aloha,

for Gilbert S. Coloma-Agaran
MICHAEL D. WILSON

C: Hawaii Board Member
Colbert M. Matsumoto
Hawaii District Land Office

KIMURA INTERNATIONAL

16 September 1996

Mr. Michael D. Wilson
Chairperson
Department of Land and Natural Resources
PO Box 621
Honolulu, Hawaii 96809

Dear Mr. Wilson:

Kaloko Town Center
Draft Environmental Impact Statement (DEIS)
North Kona, Hawaii

Thank you for your taking the time to review the draft environmental impact statement (DEIS) for the above project. We have received your letter dated 24 July 1996 which notes that the Department of Land and Natural Resources divisions have no comments.

A copy of your letter and this response letter will be appended to the Final EIS.

Sincerely,

KIMURA INTERNATIONAL INC.

Glenn T. Kimura
President

cc: Esther Ueda, LUC
Gary Gill, OEQC

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

Stephen K. Yamashiro
Mayor

RECEIVED
JUL 26 1996

George Yoshida
Director

Juliette M. Tulang
Deputy Director

County of Hawaii
DEPARTMENT OF PARKS AND RECREATION

25 Aupuni Street, Room 210 • Hilo, Hawaii 96720-4252
(808) 961-8311

July 25, 1996

Ms Esther Ueda, Executive Officer
State Land Use Commission
P.O. Box 2359
Honolulu, HI 96804-2359

Subject: Kaloko Town Center, North Kona, Hawaii
Draft Environmental Impact Statement

Dear Ms Ueda:

The projected population of 2,300 persons would generate the need for 11.5 acres of park, based on a recommended standard of 5 acres of park per 1000 population. Therefore, the proposed 13 acre school/park site would not be sufficient in size to accommodate both functions.

If any questions should arise, please contact this office.

Thank you for the opportunity to be included in the review process.

Sincerely,

George Yoshida
Director

cc Office of Environmental Quality Control
Tokyo Green Hawaii, Inc.
Kimura International Inc.

KIMURA INTERNATIONAL

16 September 1996

Mr. George Yoshida
Director
County of Hawaii
Department of Parks and Recreation
25 Aupuni Street, Room 210
Hilo, Hawaii 96720-4252

Dear Mr. Yoshida:

Kaloko Town Center
Draft Environmental Impact Statement (DEIS)
North Kona, Hawaii

Thank you for your comment on the draft environmental impact statement (DEIS) for the above project received by letter dated 25 July 1996.

On Page 3-16, we indicate that an additional 10.5 acres of park would need to be dedicated in the residential areas in accordance with the county's prescribed ratio of 281 square feet per person. This additional park acreage would be in addition to the playground area allocated for the elementary school and park.

We note that the formula we used may be outdated, since you note that the recommended standard is 5 acres of park per 1000 population. At any rate, we apologize for not clearly indicating the requirement for additional park space in the introductory sections of the EIS and will revise the document accordingly.

Again, that you for taking the time to review the DEIS. A copy of your letter and this response letter will be appended to the Final EIS.

Sincerely,

KIMURA INTERNATIONAL INC.

Glenn T. Kimura
President

cc: Esther Ueda, LUC
Gary Gill, OEQC

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

RECEIVED 31 July 96

(P)1458.6

JUL 29 1996

State Land Use Commission
P. O. Box 2359
Honolulu, Hawaii 96804-2359

Attention: Ms. Esther Ueda

Gentlemen:

Subject: Kaloko Town Center
North Kona, Hawaii
Draft Environmental Impact Statement

Thank you for the opportunity to review the subject document. We have the following general comments on the proposed subdivision project related to the proposed elementary school site (13 acres, maximum):

1. Acceptance of the school site should be subject to DOE review and approval.

2. DAGS recommends:

   A. The school site comply with the following general conditions:

      (1) The site will be dedicated and deeded to the State within a year after the subdivision approval.

      (2) The shape of the school site is limited to about a 1.5 to 1 ratio of site dimensions (average length vs. average width).

      (3) The school site is relatively flat with an average slope of less than 5% and contains no known archaeological artifacts or historically significant findings (such as: burial graves; heiau; caves; lava tubes; monuments; wetlands; sanctuaries; preserves; rare or endangered flora and fauna, etc.).

   B. The subdivision infrastructure systems be completed for the State's connection and use <u>prior</u> to the scheduled school opening. This includes:

      (1) Subdivision roadways to the school site.

      (2) Off-site utility systems (such as: water; sewer; drainage; power; telephone; data; CATV; gas, etc.) needed to service the school site.

      (3) Other off-site improvements (such as: potable water wells; reservoirs; transmission lines; drainage basins; power substation; etc.) needed to service the subdivision development.

   C. The subdivision development commits to providing the State with <u>adequate allocations</u> for the various utility connections (such as: potable water for domestic, irrigation and fire flow requirements; sewage flows; surface runoff; power; telephone; data; CATV; gas, etc.) based on the school's design capacity and ultimate site plan layout.

If there are any questions, please have your staff contact Mr. Ralph Yukumoto of the Planning Branch at 586-0488.

Very truly yours,

Gordon Matsuoka

GORDON MATSUOKA
State Public Works Engineer

RY:jy
cc: Tokyo Green Hawaii, Inc.
Kimura International Inc.
DOE Facilities Branch
OEQC

KIMURA INTERNATIONAL

16 September 1996

Mr. Gordon Matsuoka
State Public Works Engineer
State of Hawaii
Department of Accounting and General Services
1151 Punchbowl Street, Room 426
Honolulu, HI 96813

Dear Mr. Matsuoka:

Kaloko Town Center
Draft Environmental Impact Statement (DEIS)
North Kona, Hawaii

Thank you for your comments regarding the proposed elementary school site as discussed in the draft environmental impact statement (DEIS) for the above project received by letter dated 29 July 1996. The applicant agrees to make the acceptance of the school site subject to the Department of Education's review and approval and will work closely with the DOE to ensure that its requirements are met regarding site conditions, infrastructure requirements and utility allocations.

We appreciate the time and effort you took in reviewing the draft EIS. A copy of your letter and this response letter will be appended to the Final EIS.

Sincerely,

KIMURA INTERNATIONAL INC.

Glenn T. Kimura
President

cc: Esther Ueda, Land Use Commission
Gary Gill, OEQC

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

Stephen K. Yamashiro
Mayor

County of Hawaii
FIRE DEPARTMENT
777 Kilauea Avenue • Mall Lane, Room 6 • Hilo, Hawaii 96720-4239
(808) 961-8297 • Fax (808) 961-8296

Nelson M. Tsuji
Fire Chief

Edward Bumatay
Deputy Fire Chief

RECEIVED
AUG 05 1996

July 31, 1996

State Land Use Commission
P. O. Box 2359
Honolulu, HI 96804-2359

Attention: Ms. Esther Ueda, Executive Officer

Subject: Draft Environmental Impact Statement
Kaloko Town Center
North Kona, Hawaii
TMK: 3rd Div: 7-3-09: por. 17

The Fire Department's requirements as stated in the Fire Code are:

"Fire Apparatus Access Roads

"Sec. 10.207. (a) General. Fire apparatus access roads shall be provided and maintained in accordance with the provisions of this section.

"(b) Where Required. Fire apparatus access roads shall be required for every building hereafter constructed when any portion of an exterior wall of the first story is located more than 150 feet from fire department vehicle access as measured by an unobstructed route around the exterior of the building.

"EXCEPTIONS: 1. When buildings are completely protected with an approved automatic fire sprinkler system, the provisions of this section may be modified.

"2. When access roadways cannot be installed due to topography, waterways, nonnegotiable grades or other similar conditions, the chief may require additional fire protection as specified in Section 10.301 (b).

"3. When there are not more than two Group R, Division 3 or Group M Occupancies, the requirements of this section may be modified, provided, in the opinion of the chief, fire-fighting or rescue operations would not be impaired.

"More than one fire apparatus road may be required when it is determined by the chief that access by a single road may be impaired by vehicle congestion, condition of terrain, climatic conditions or other factors that could limit access.

"For high-piled combustible storage, see Section 81.109.

"(c) Width. The unobstructed width of a fire apparatus access road shall meet the requirements of the appropriate county jurisdiction.

"(d) Vertical Clearance. Fire apparatus access roads shall have an unobstructed vertical clearance of not less than 13 feet 6 inches.

"EXCEPTION: Upon approval vertical clearance may be reduced, provided such reduction does not impair access by fire apparatus and approved signs are installed and maintained indicating the established vertical clearance.

"(e) Permissible Modifications. Vertical clearances or widths required by this section may be increased when, in the opinion of the chief, vertical clearances or widths are not adequate to provide fire apparatus access.

"(f) Surface. Fire apparatus access roads shall be designed and maintained to support the imposed loads of fire apparatus and shall be provided with a surface so as to provide all-weather driving capabilities." (20 tons)

"(g) Turning Radius. The turning radius of a fire apparatus access road shall be as approved by the chief." (45 feet)

"(h) Turnarounds. All dead-end fire apparatus access roads in excess of 150 feet in length shall be provided with approved provisions for the turning around of fire apparatus.

"(i) Bridges. When a bridge is required to be used as access under this section, it shall be constructed and maintained in accordance with the applicable sections of the Building Code and using designed live loading sufficient to carry the imposed loads of fire apparatus.

"(j) Grade. The gradient for a fire apparatus access road shall not exceed the maximum approved by the chief." (15%)

"(k) Obstruction. The required width of any fire apparatus access road shall not be obstructed in any manner, including parking of vehicles. Minimum required widths and clearances established under this section shall be maintained at all times.

"(l) Signs. When required by the fire chief, approved signs or other approved notices shall be provided and maintained for fire apparatus access roads to identify such roads and prohibit the obstruction thereof or both."

"INSTALLATION AND MAINTENANCE OF FIRE-PROTECTION, LIFE-SAFETY SYSTEMS AND APPLIANCES

"Installation

"Sec. 10.301. (a) Type Required. The chief shall designate the type and number of fire appliances to be installed and maintained in and upon all buildings and premises in the jurisdiction other than private dwellings. This shall be done according to the relative severity of probable fire, including the rapidity with which it may spread. Such appliances shall be of a type suitable for the probable class of fire associated with such building or premises and shall have approval of the chief.

"(b) Special Hazards. In occupancies of an especially hazardous nature or where special hazards exist in addition to the normal hazard of the occupancy, or where access for fire apparatus is unduly difficult, additional safeguards may be required consisting of additional fire appliance units, more than one type of appliance, or special systems suitable for the protection of the hazard involved. Such devices or appliances may consist of automatic fire alarm systems, automatic sprinkler or water spray systems, standpipe and hose, fixed or portable fire extinguishers, suitable asbestos

blankets, breathing apparatus, manual or automatic covers, carbon dioxide, foam, halogenated and dry chemical or other special fire-extinguishing systems. Where such systems are installed, they shall be in accordance with the applicable Uniform Fire Code Standards or standards of the National Fire Protection Association when Uniform Fire Code Standards do not apply.

"(c) Water Supply. An approved water supply capable of supplying required fire flow for fire protection shall be provided to all premises upon which buildings or portions of buildings are hereafter constructed, in accordance with the respective county water requirements. There shall be provided, when required by the chief, on-site fire hydrants and mains capable of supplying the required fire flow.

"Water supply may consist of reservoirs, pressure tanks, elevated tanks, water mains or other fixed systems capable of providing the required fire flow.

"The location, number and type of fire hydrants connected to a water supply capable of delivering the required fire flow shall be protected as set forth by the respective county water requirements. All hydrants shall be accessible to the fire department apparatus by roadways meeting the requirements of Section 10.207.

"(d) Fire Hydrant Markers. When required by the chief, hydrant locations shall be identified by the installation of reflective markers.

"(e) Timing of Installation. When fire protection facilities are to be installed by the developer, such facilities including all surface access roads shall be installed and made serviceable prior to and during the time of construction. When alternate methods of protection, as approved by the chief, are provided, the above may be modified or waived.

"(f) All fire alarm systems, fire hydrant systems, fire extinguishing systems (including automatic sprinklers), Class I, II, III (combination standpipe system) and combined systems, basement inlet pipes, and other fire protection systems and appurtenances thereto shall meet the approval of the fire department as to installation and location and shall "(i) Bridges. When a bridge is required to be used as access under this section, it shall be constructed and maintained in accordance with the applicable sections of the Building Code and using designed live loading sufficient to carry the imposed loads of fire apparatus.

"(j) Grade. The gradient for a fire apparatus access road shall not exceed the maximum approved by the chief." (15%)

"(k) Obstruction. The required width of any fire apparatus access road shall not be obstructed in any manner, including parking of vehicles. Minimum required widths and clearances established under this section shall be maintained at all times.

"(l) Signs. When required by the fire chief, approved signs or other approved notices shall be provided and maintained for fire apparatus access roads to identify such roads and prohibit the obstruction thereof or both."

"INSTALLATION AND MAINTENANCE OF FIRE-PROTECTION, LIFE-SAFETY SYSTEMS AND APPLIANCES

"Installation

"Sec. 10.301. (a) Type Required. The chief shall designate the type and number of fire appliances to be installed and maintained in and upon all buildings and premises in the jurisdiction other than private dwellings. This shall be done according to the relative severity of probable fire, including the rapidity with which it may spread. Such appliances shall be of a type suitable for the probable class of fire associated with such building or premises and shall have approval of the chief.

"(b) Special Hazards. In occupancies of an especially hazardous nature or where special hazards exist in addition to the normal hazard of the occupancy, or where access for fire apparatus is unduly difficult, additional safeguards may be required consisting of additional fire appliance units, more than one type of appliance, or special systems suitable for the protection of the hazard involved. Such devices or appliances may consist of automatic fire alarm systems, automatic sprinkler or water spray systems, standpipe and hose, fixed or portable fire extinguishers, suitable asbestos

blankets, breathing apparatus, manual or automatic covers, carbon dioxide, foam, halogenated and dry chemical or other special fire-extinguishing systems. Where such systems are installed, they shall be in accordance with the applicable Uniform Fire Code Standards or standards of the National Fire Protection Association when Uniform Fire Code Standards do not apply.

"(c) Water Supply. An approved water supply capable of supplying required fire flow for fire protection shall be provided to all premises upon which buildings or portions of buildings are hereafter constructed, in accordance with the respective county water requirements. There shall be provided, when required by the chief, on-site fire hydrants and mains capable of supplying the required fire flow.

"Water supply may consist of reservoirs, pressure tanks, elevated tanks, water mains or other fixed systems capable of providing the required fire flow.

"The location, number and type of fire hydrants connected to a water supply capable of delivering the required fire flow shall be protected as set forth by the respective county water requirements. All hydrants shall be accessible to the fire department apparatus by roadways meeting the requirements of Section 10.207.

"(d) Fire Hydrant Markers. When required by the chief, hydrant locations shall be identified by the installation of reflective markers.

"(e) Timing of Installation. When fire protection facilities are to be installed by the developer, such facilities including all surface access roads shall be installed and made serviceable prior to and during the time of construction. When alternate methods of protection, as approved by the chief, are provided, the above may be modified or waived.

"(f) All fire alarm systems, fire hydrant systems, fire extinguishing systems (including automatic sprinklers), Class I, II, III (combination standpipe system) and combined systems, basement inlet pipes, and other fire protection systems and appurtenances thereto shall meet the approval of the fire department as to installation and location and shall be subject to periodic tests as required herein. Plans and specifications shall be submitted to the fire department for review and approval prior to installation."

NELSON M. TSUJI
Fire Chief

NMT/mo

cc: Tokyo Green Hawaii, Inc.
Kimura International, Inc.

KIMURA INTERNATIONAL

16 September 1996

Fire Chief Nelson M. Tsuji
County of Hawaii
Fire Department
777 Kilauea Ave. Mall Lane, Room 6
Hilo, Hawaii 96720-4239

Dear Chief Tsuji:

Kaloko Town Center
Draft Environmental Impact Statement (DEIS)
North Kona, Hawaii

Thank you for your comments on the draft environmental impact statement (DEIS) for the above project received by letter dated 18 July 1996.

The Fire Code requirements you cite will be incorporated into the design and development of the proposed project.

Again, thank you for taking the time to review the DEIS. A copy of your letter and this response letter will be appended to the Final EIS.

Sincerely,

KIMURA INTERNATIONAL INC.

Glenn T. Kimura
President

cc: Esther Ueda, LUC
Gary Gill, OEQC

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

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

LAWRENCE MIIKE
DIRECTOR OF HEALTH

RECEIVED 8 Aug 96

In reply, please refer to:

August 1, 1996

95-201B/epo

TO: Esther Ueda, Executive Officer
State Land Use Commission

FROM: Lawrence Miike [signature] for
Director of Health

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
Kaloko Town Center
North Kona, Hawaii
TMK: 7-3-09: por. of 17

Thank you for allowing us to review and comment on the subject document. Beside the comments that we provided on the petition for amendment to the State Land District Boundaries, dated December 6, 1995 (attached), we have the following additional comments to offer:

Solid Waste

In the discussion of solid waste impacts, the DEIS states that the development should encourage recycling and waste diversions as we had requested in our previous comments of December 6, 1995. We also encourage that a commitment be made to include recycled content building materials in the development whenever feasible. Recycled plastic lumber is a weather resistant alternative to traditional lumber, and glasphalt is mandated by Act 201, HSL 1994, for paving purposes. Locally produced compost may be a valuable landscaping product, particularly in the North Kona area, as it enhances water retention. We are attaching recommended waste minimization measures for implementation in the design and construction of new developments.

Also, the DEIS erroneously states that residential refuse will be collected by the County's Refuse Division. The County of Hawaii provides no collection services for residents or businesses, and all refuse must be self-hauled to a county transfer station or collected by a private company on a contractual basis.

Should you have any questions on this matter, please contact Ms. Carrie McCabe of the Office of Solid Waste Management at 586-4240.

Polluted Runoff Control

Proper planning, design, and use of erosion control measures and management practices, such as those found in Hawaii's Coastal Nonpoint Pollution Control Program Draft Management Plan, will substantially reduce the total volume of runoff and limit the potential impact to the coastal waters from polluted runoff. The following measures are suggested steps that can be taken to minimize erosion during construction:

1. Conduct grubbing and grading activities during the low rainfall months.

2. Replant or cover bare areas as soon as grading or construction is completed. New plantings will require soil amendments, fertilizers, and temporary irrigation to become established. Use high planting and/or seeding rates to ensure rapid stand establishment.

3. Properly dispose of sediment and debris from construction activities.

4. Minimize amount of construction time spent in the stream beds.

If you should have any questions on this matter, please contact Mr. Randy Rush of the Environmental Planning Office at 586-7550.

General Comments

The Department of Health recommends that the developer and/or contractor be required to hold a public informational meeting in the surrounding community to describe the project and potential environmental impacts and to respond to concerns relating to the project.

Attachments

c: OSWM
EPO
OEQC
Kimura International
Tokyo Green Hawaii

KIMURA INTERNATIONAL

16 September 1996

Dr. Lawrence Miike
Director of Health
P.O. Box 3378
Honolulu, HI 96801

Dear Dr. Miike:

Kaloko Town Center
Draft Environmental Impact Statement (DEIS)
North Kona, Hawaii

Thank you for your comments on the draft environmental impact statement (DEIS) for the above project received by letter dated 1 August 1996. Responses to your comments are provided below:

Solid Waste: We will further recommend that a commitment be made to include recycled content building materials in the development whenever feasible, including recycled plastic lumber and glasphalt for paving purposes and the use of locally produced compost for landscaping. The recommended waste minimization measures you provided will be forwarded to the owner and developer. We stand corrected that the County's Refuse Division does not provide collection services for residences and businesses. Refuse collection will be contracted privately.

Polluted Runoff Control: The suggested measures for minimizing erosion during construction will be recommended to the owner and developer. I would appreciate receiving a copy of the Nonpoint Pollution Control Program Management Plan, when it is finalized.

General Comment: Your recommendation that the developer and/or contractor hold a public informational meeting in the surrounding community will be forwarded to the applicant.

We appreciate the time and effort you took in reviewing the draft EIS. A copy of your letter and this response letter will be appended to the Final EIS.

Sincerely,

Glenn T. Kimura
President

cc: Esther Ueda, Land Use Commission
Gary Gill, OEQC

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Ecoregion
300 Ala Moana Blvd, Room 3108
P.O. Box 50088
Honolulu, HI 96850

phone: 808-541-3441; fax: 808-541-3470

RECEIVED 7 Aug 96

In Reply Refer To: Hawaii County–Kona Surveys (MMB)

AUG 05 1996

Ms. Ester Ueda, Executive Officer
State Land Use Commission
P.O. Box 2359
Honolulu, Hawaii 96804-2359

Dear Ms. Ueda:

Thank you for the opportunity to comment on the Draft Environmental Impact Statement (EIS) for Kaloko Town Center, to convert conservation district to urban land use.

The U.S. Fish and Wildlife Service (Service) has conducted botanical, cave invertebrate, and *Plutella* moth surveys in the project areas. The Service found no endangered, threatened, proposed, or candidate species or other biological resources that would prohibit the zoning change of these parcels from conservation to urban.

The Service's concerns regarding the project's potential effects on water-related resources, as stated our March 8, 1995, letter responding to the Petition for Amendment to the State Land Use District Boundaries Docket No. A94-705, have been addressed.

The Service has no objection to this Kaloko Town Center as planned in this draft EIS. If you have any questions about these or previous comments, please call Fish and Wildlife Biologist Marie Bruegmann at 808-541-3441.

Sincerely,

Mary Stahl

for Brooks Harper
Field Supervisor
Ecological Services

LAND USE COMMISSION
STATE OF HAWAII
AUG 6 10 09 AM '96

cc: Lorene Maki, Office of State Planning

KIMURA INTERNATIONAL

16 September 1996

Mr. Brooks Harper
Field Supervisor
Ecological Services
United States Department of the Interior
Fish and Wildlife Service
Pacific Islands Ecoregion
PO Box 50088
Honolulu, HI 96850

Dear Mr. Harper:

Kaloko Town Center
Draft Environmental Impact Statement (DEIS)
North Kona, Hawaii

Thank you for your comments on the draft environmental impact statement (DEIS) for the above project received by letter dated 5 August 1996.

We appreciate the time and effort you took in reviewing the draft EIS. A copy of your letter and this response letter will be appended to the Final EIS.

Sincerely,

KIMURA INTERNATIONAL INC.

Glenn T. Kimura

Glenn T. Kimura
President

cc: Esther Ueda, Land Use Commission
Gary Gill, OEQC

1600 Kapiolani Blvd., Suite 612
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF BUDGET AND FINANCE
HOUSING FINANCE AND DEVELOPMENT CORPORATION
677 QUEEN STREET, SUITE 300
HONOLULU, HAWAII 96813
FAX (808) 587-0600

RECEIVED 8 Aug 96
ROY S. OSHIRO
EXECUTIVE DIRECTOR

IN REPLY REFER TO:

96:PPE/2872

August 5, 1996

TO: Esther Ueda, Executive Officer
State Land Use Commission

FROM: Roy S. Oshiro
Executive Director

SUBJECT: Draft Environmental Impact Statement (DEIS) for Kaloko Town Center, North Kona, Hawaii

Policies A(3) and B(3) of the State Housing Functional Plan seek to ensure that housing projects and projects which impact housing provide a fair share/adequate amount of affordable homeownership and rental housing opportunities.

The DEIS notes that residential products will be targeted to entry level and first time, move up buyers. Additionally, buyers and renters are expected to be in the low and moderate income levels. We hope that more detailed information regarding housing affordability will be available as the planning for the project progresses.

Thank you for the opportunity to comment on the subject DEIS.

c: OEQC
Tokyo Green Hawaii
Kimura International Inc.

HFDC

KIMURA INTERNATIONAL

16 September 1996

Mr. Roy S. Oshiro
Executive Director
State of Hawaii
Department of Budget and Finance
Housing Finance and Development Corporation
877 Queen Street, Suite 300
Honolulu, HI 96813

Dear Mr. Oshiro:

Kaloko Town Center
Draft Environmental Impact Statement (DEIS)
North Kona, Hawaii

Thank you for your comments on the draft environmental impact statement (DEIS) for the above project received by letter dated 5 August 1996.

The applicant is committed to making housing more affordable in the North Kona district and will work with the appropriate State and County agencies in fulfilling this goal. The applicant will keep you informed of further details as planning for this project proceeds.

We appreciate the time and effort you took in reviewing the draft EIS. A copy of your letter and this response letter will be appended to the Final EIS.

Sincerely,

KIMURA INTERNATIONAL INC.

Glenn T. Kimura
President

cc: Esther Ueda, Land Use Commission
Gary Gill, OEQC

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
220 SOUTH KING STREET
FOURTH FLOOR
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186

GARY GILL
DIRECTOR

RECEIVED

August 7, 1996

Esther Ueda
State Land Use Commission
335 Merchant Street #104
Honolulu HI 96813

Dear Ms. Ueda:

RE: Draft Environmental Impact Statement (EIS) for Kaloko Town Center, North Kona; TMK 7-3-9: por. 17

In the final EIS:

1. Please include the *status of permit and approval applications* in addition to a listing of the required permits and approvals needed for the project.

2. Please include a full discussion of impacts of all development projects for the subject area. Regional *cumulative impacts* were covered in the appended traffic study and in the acoustic study, but only a brief summary discussion of cumulative impacts appeared in chapter 8 of the text of the draft EIS.

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

Sincerely,

Gary Gill
Director

c: Ned Dewey, Tokyo Green Hawaii
Glenn Kimura, Kimura International

KIMURA INTERNATIONAL

16 September 1996

Mr. Gary Gill
Director
State of Hawaii
Office of Environmental Quality Control
220 South King Street, Fourth Floor
Honolulu, HI 96813

Dear Mr. Gill:

Kaloko Town Center
Draft Environmental Impact Statement (DEIS)
North Kona, Hawaii

Thank you for your comments on the draft environmental impact statement (DEIS) for the above project received by letter dated 7 August 1996. Responses to your comments are provided below:

1. Status of permits and approval applications: The status of permit and approval applications hinges on receiving Land Use Commission district boundary amendment approval. This EIS is being prepared as supporting documentation for the Land Use District Boundary Amendment Petition that was filed on September 12, 1995. Chapter 6E, Review by the Department of Land and Natural Resources is currently being conducted.

Pending receipt of Land Use Commission approval, it is envisioned that an application for County General Plan Amendment and Rezoning will take place around March to May of 1997, followed thereafter by a request for subdivision approval. Applications for other State and County permits listed will be made at appropriate times as the project proceeds with engineering design.

2. Regional cumulative impacts: Cumulative impact analyses have been inserted in the Final EIS in relevant chapters of the document. To evaluate the cumulative impacts of regional development, we have turned to what we believe to be the best source of available information on environmental impacts: the final environmental impact statements for four major projects in the region that have been proposed since 1990. Common environmental impact parameters were abstracted from these impact statements and used to formulate an assessment of regional cumulative impacts. The use of these parameters is justified in our opinion because these impact statements were used as supporting documentation for successfully obtaining Urban reclassification from the State Land Use Commission. The four major projects include:

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

1. Villages of La'i'opua, a State sponsored development project by the Housing and Finance Development Corporation
2. Liliuokalani Trust Kealakehe Lands, proposed by the Liliuokalani Trust Estate
3. Kaupulehu Resort Expansion, proposed by the Kaupulehu Developers, and
4. Urban Expansion of State Lands, Keahole to Kailua Region by the Office of State Planning.

These four projects account for some 6,000 acres of future development in the region over the next 20 to 30 years. As noted in our discussion, other projects were not included in this evaluation for various reasons. The evaluation of cumulative impacts took into account potential future impacts to the region with and without the proposed 224 acre Kaloko Town Center. Evaluating cumulative impacts is difficult at best and quite speculative given the long term, market dependent, development schedules noted for each project. Nonetheless, we have endeavored to make our assessment as comprehensive as possible.

We appreciate the time and effort you took in reviewing the draft EIS. A copy of your letter and this response letter will be appended to the Final EIS.

Sincerely,

KIMURA INTERNATIONAL INC.

Glenn T. Kimura
President

cc: Esther Ueda, Land Use Commission

University of Hawai'i at Mānoa

Environmental Center
A Unit of Water Resources Research Center
2550 Campus Road • Crawford 317 • Honolulu, Hawai'i 96822
Telephone: (808) 956-7361 • Facsimile: (808) 956-3980

August 7, 1996
RE:0674

Mr. Ned Dewey
Tokyo Green Hawaii, Inc.
c/o Pacific Land Services, Inc.
810 Richards Street, Suite 900
Honolulu, Hawaii 96813

Dear Mr. Dewey:

Draft Environmental Impact Statement (EIS)
Kaloko Town Center
North Kona, Hawaii

The referenced draft EIS concerns a proposed project located immediately mauka of Queen Kaahumanu Highway and bordered by Hina Lani Drive and the existing Kaloko Industrial Subdivision to the south and privately owned industrial and commercial land to the north. The project site, currently vacant, is characterized by uniformly sloping a'a and pahoehoe lava flows with little or no topsoil material. The applicant seeks a State Land Use Commission boundary amendment from Conservation to Urban District for approximately 224 acres of land in the Kaloko-Kohanaiki sub-districts of North Kona on the island of Hawaii. The proposed development would allocate a mixture of land uses in a master planned community. Approximately 36 acres would be used for commercial/retail use, 20 acres for office/commercial/retail use, 48 acres and 480 units for multi-family apartment use, 80 acres and 370 units for residential use, and 13 acres for a school/park. Access to the proposed project would be via Hina Lani Drive and a new intersection off Queen Kaahumanu Highway.

This review was completed with the assistance of Peter Flachsbart, Urban and Regional Planning; George Taoka, Civil Engineering; and Tom Hawley, Environmental Center.

An Equal Opportunity/Affirmative Action Institution

General Comments

The draft EIS supports the applicant's request for a zoning change from Conservation to Urban pending before the State Land Use Commission. The proposed development lies between an existing and a proposed industrial park near the Keahole Airport. Our reviewers note that this project contains several major projects in various stages of development. Although all of them are consistent with state and county land use plans, some currently are dormant due to regional economic conditions. Clearly at full build-out the proposed projects will have a dramatic, cumulative impact on the entire area. Though we recognize that it is impossible for one developer to mitigate each and every cumulative effect, it is important that the applicant for the proposed action formulate adequate mitigative measures for long-term impact scenarios.

The region of the proposed project currently has a limited road network, yet the project presents the potential for a substantial increase in trip generation. Our reviewers expressed surprise that the project's local street system is not the grid street system typical of a town center, but instead looks more like a residential subdivision with curvilinear streets. County plans call for four new roadways to carry north-south traffic, but the state Department of Transportation appears committed to only two roadway improvement projects for the near future. The traffic analyst for the draft EIS assumed that only the committed improvement projects would be in place by the projected target year of 2020 and that no new north-south roadways would be built as proposed in the county plans.

Using this two-road scenario, the traffic analyst projected the level of service (LOS) during peak traffic conditions at two critical intersections near the project site. Our reviewers expressed concern that the future LOS during the peak morning and evening hours, both with and without the proposed project, will be at an "F" level--the worst level of congestion--for the intersection of Mamalahoa Highway north of Hina Lani Drive. The introduction and summary of the draft EIS (pages 1-13), fail to fully convey this information, although implementation of new roadways and roadway improvements is recommended. Strongly urge that the applicant devise a solution to these anticipated traffic problems. At the very least, the applicant should engage in negotiations with the state and county about the possibility of proceeding with county plans for four new north-south roadways. In any event, LOS F is an unacceptable traffic load for any intersection, and must be mitigated accordingly.

Water Resources

Clearly one of the most pressing issues on the Big Island is development and allocation of fresh water resources. Our reviewers are concerned that the draft EIS lacks adequate information about how the proposed action will satisfy its water needs. On page 6-17, the document states that the "... water source for this project will *most likely* come from high level wells to be developed with reservoirs and connecting pipelines at elevations 900' and 1200'" [emphasis added]. We suggest that a project of this magnitude in an area of such scarce water resources must provide the public more

Mr. Ned Dewey
August 6, 1996
Page 3

comprehensive information at the draft EIS stage regarding water availability. Without knowing the full details of the proposed project's water allocation plans, reviewers cannot make an adequate assessment of its impacts. We strongly urge the applicant to clarify its plans in this regard prior to preparation of the final EIS.

Project Segmentation

Our reviewers expressed concern that the draft EIS does not fully disclose the scope of intended actions by the landowner on the subject property. Failure to fully discuss such actions constitutes project segmentation, which is expressly prohibited by Department of Health rules concerning environmental impact statements. As stated in Section 11-200-7, Hawaii Administrative Rules,

> A group of actions proposed by an agency or an applicant shall be treated as a single action when:
>
> (1) The component actions are phases or increments of a larger total undertaking;
> (2) An individual project is a necessary precedent for a larger project;
> (3) An individual project represents a commitment to a larger project; or
> (4) The actions in question are essentially identical and a single statement will adequately address the impacts of each individual action and those of the group of actions as a whole.

If the applicant envisions additional future development on its property, an environmental impact statement on the entire parcel is required by law. Preparation of separate EISs for piecemeal development of the subject parcel is prohibited, regardless of the status of planning efforts for these other uses.

It appears that the current proposal is part of a larger total undertaking. As the map on page 2-2 of the draft EIS shows, the applicant owns a large amount of land surrounding the proposed project area. Further, the letter contained in the draft EIS from the Office of State Planning states, "The proposal for the development of the 224 acres in the Petition area could lead to the development of the entire property owned by the Petitioner (about 1,000 acres)." What are the applicant's intentions for the remainder of the parcel not included in this draft EIS? Is there a master plan for the entire parcel? If so, any and all anticipated uses must be fully disclosed and their impacts assessed.

Mr. Ned Dewey
August 6, 1996
Page 4

Kaloko Dry Forest

Several commenters mentioned the proximity of the Kaloko Dry Forest in the southeast section of the project parcel. Though it lies outside of the project area, we are concerned that impacts from the proposed action may be felt in this area. Given that the Office of State Planning characterized this as an area of "prime botanical importance," we find it disconcerting that no substantive discussion of this area occurs in the draft EIS. Similarly, none of the maps of the proposed project provided in the draft EIS show the location of the Kaloko Dry Forest in relation to the proposed action. Such information must be provided in the final EIS.

Thank you for the opportunity to comment.

Sincerely,

John T. Harrison
Environmental Coordinator

cc: OEQC
Roger Fujioka
State Land Use Commission
Kimura International, Inc.
George Taoka
Peter Flachsbart
Tom Hawley

KIMURA INTERNATIONAL

16 September 1996

Mr. John T. Harrison
Environmental Coordinator
University of Hawaii at Manoa
Environmental Center
A Unit of Water Resources Research Center
2550 Campus Road, Crawford 317
Honolulu, Hawaii 96822

Dear Mr. Harrison:

Kaloko Town Center
Draft Environmental Impact Statement (DEIS)
North Kona, Hawaii

Thank you for your facsimile which was received on 7 August 1996. We appreciate the time your agency took to review the draft document and offer the following responses to your comments.

General Comments: Your reviewers note "that this project contains several major projects in various stages of development. Although all of them are consistent with state and county land use plans, some currently are dormant due to regional economic conditions. Clearly at full build-out the proposed projects will have a dramatic, cumulative impact on the entire area. Though we recognize that it is impossible for one developer to mitigate each and every cumulative effect, it is important that the applicant for the proposed action formulate adequate mitigative measures for long term impact scenarios."

We agree that it is impossible for one developer to mitigate each and every cumulative effect of regional development in the area. However, we have evaluated the cumulative effects of regional development by turning to what we believe to be the best source of available information on environmental impacts: the final environmental impact statements for four major projects in the region that have been proposed and approved since 1990. Common environmental impact parameters were abstracted from these impact statements and used to formulate an assessment of regional cumulative impacts. The use of these parameters is justified, in our opinion, because these impact statements were accepted as supporting documentation for successfully obtaining Urban reclassification from the State Land Use Commission. The four major projects include:

1600 Kapiolani Blvd., Suite 612
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

1. Villages of La'i'opua, a state sponsored development project by the Housing and Finance Development Corporation;
2. Liliuokalani Trust Kealakehe Lands, proposed by the Liliuokalani Trust Estate;
3. Kaupulehu Resort Expansion, proposed by the Kaupulehu Developers; and
4. Urban Expansion of State Lands, Keahole to Kailua Region proposed by the Office of State Planning.

These four projects account for some 6,000 acres of future development in the region over the next 20 to 30 years. The evaluation of cumulative impacts took into account potential future impacts to the region with and without the proposed 224 acre Kaloko Town Center. Cumulative impact analyses have been inserted in the Final EIS in relevant chapters of the document. As you note, evaluating cumulative impacts is difficult at best and quite speculative given the long term, market dependent, development schedules noted for each project. Nonetheless, we have endeavored to make our assessment as comprehensive as possible..

Roadway Improvements: The Traffic Impact Analysis Report (TIAR) identifies the LOS "F" conditions at the mauka intersection of Mamalahoa and Hina Lani Drive during the AM and PM peak hours of traffic without the project. The TIAR goes on to recommend the installation of traffic signals and the addition of exclusive turning lanes at the intersection to mitigate this deficiency, which is expected to occur without the project. Figures 7 and 8 in the TIAR summarize the results of the capacity analysis of the intersection of Mamalahoa Highway and Hina Lani Drive with the proposed project under both the existing unsignalized conditions and the recommended signalized conditions. Under signalized conditions, the Hina Lani Drive will continue to operate at LOS "F". However under the recommended signalized conditions, the intersection is expected to operate at "near capacity" conditions.

The County of Hawaii plans to extend four north-south roadways to Hina Lani Drive. These north-south roadways are expected to relieve traffic demands along Hina Lani Drive and at its intersections with Mamalahoa Highway and Queen Ka'ahumanu Highway. It is understood that the implementation is a long-term cooperative process involving the County of Hawaii and affected landowners.

Project's Local Street System Design: It is our opinion that the project's local street system is appropriate for a mixed use development consisting of commercial, residential and public uses. A gridiron pattern, although more efficient and appropriate for urban areas, would make for a boring and monotonous environment. The commercial areas are sited along Queen Ka'ahumanu Highway and Hina Lani Drive for visual exposure to potential markets. They have been designed with enough depth to allow design flexibility for storefronts, parking and circulation with a landscaped buffer along Queen Ka'ahumanu Highway. The relatively level terrain in this area is appropriate for commercial shopping areas. In addition, they have been sited along major travel corridors because commercial operations and facilities are not as adversely affected by traffic noise as residential uses. Furthermore, curvilinear streets are designed as collector streets for the residential and elementary/park site, not the commercial areas, per se. Their curvilinear designs are meant, in addition to being more aesthetic, to encourage slower traffic speeds.

Water Resources: The draft EIS reported information that was obtained from the County Department of Water Supply by our civil engineer. The reason the words *most likely* were used in the draft EIS was because provision of water to users is based on water commitments obtained from the County Department of Water Supply as a particular project moves forward toward reality. As you are aware, there are thousands of acres with recent Urban reclassification that have been proposed for development by the State and other large landowners in the region that have not moved forward for various economic and political reasons.

According to Mr. Milton Pavao, Manager, Department of Water Supply, (tel con with Rodney Kawamura, Hilo Engineering, 21 Aug 96), the Department currently has 2 high level wells on line with 2 more coming on line in the near future. The Department is planning to drill and equip another high level well in the area. According to a report by Tom Nance Water Resource Engineering, there are also 3 other high level wells in the area which have been drilled but not outfitted. If need be, the applicant could enter into a joint venture, at full build-out, to outfit one of the drilled wells. Furthermore, according to the Department of Water Supply, water is available through the existing system located along Hina Lani Drive, however 2 reservoirs situated at the 900-foot and 1200-foot elevations and connecting waterlines are required for the proposed project (letter, Department of Water Supply, County of Hawaii, 19 August 1996).

Cumulative demand for potable water, at the end of build-out 20+ years hence, would range from 13.05 to 15.05 million gallons per day (mgd) without the project and 13.92 to 15.92 mgd with the proposed project. The projects in the region cover two aquifer systems, the Kiholo and Keauhou aquifer systems. The State Water Resources Protection Plan (Geo. A.L. Yuen & Associates, March 1992) indicates a sustainable yield of 38 mgd for the Keauhou system and 18 mgd for the Kiholo

system. Present use is about 10 mgd in Keauhou and 2 mgd in Kiholo. Supplying water for urbanization is more a function of source and transmission system development rather than availability. In order to be cost-effective, the development of water source and transmission systems will need to coincide with the development phases of major projects in the region.

Project Segmentation: The proposed action is a stand alone project which: is not part of a larger total undertaking; is not a necessary precedent for a larger project; is not an individual project which represents a commitment to a larger project; and the action in question is not essentially identical to any other action so as to make a single statement adequate for addressing the impacts of each individual action and those of the group of actions as a whole. Although the same landowner owns an additional 925 acres, the proposed action occurs on a legally subdivided and separate Tax Map Key parcel. The owner's decision to develop 224 acres of its total property was a consciously made business decision and assessment of market conditions. It is no different than other proposed projects, such as the Urban Expansion of State Lands, Keahole to Kailua Region; Liliuokalani Trust Keahuolu Lands of Kailua-Kona, the State's Housing and Finance Development Corporation's Kealakehe Planned Community and the Kaupulehu Resort Expansion Project on Bishop Estate lands, all of which occur on only a portion of much larger landholdings. The owner has not authorized the preparation of a master plan for the remaining property. Preliminary investigations regarding the remaining area were begun by the applicant. However, the large dryland forest with significant species of native vegetation has prompted the owner to not proceed with plans for the mauka area.

Kaloko Dry Forest: A reconnaissance-level field survey was conducted by Char & Associates in October 1995 of the area consisting of a'a lava located on the southern part of the property, mauka of the existing Kaloko Industrial Subdivision and adjacent to the Lanihau/Palani Ranch property. The survey found three plants of 'aiea (*Nothocestrum breviflorum*), a small to medium sized tree belonging to the tomato family, which is a listed endangered species. Although not found in this survey, *Mariscus fauriei*, a member of the sedge family and listed as an endangered plant is known to occur on the site, as well as the following: ko'oko'olau (*Bidens micrantha* ssp. *ctenophylla*), a member of the daisy family with large masses of yellow flowers; ma'oloa (*Neraudia ovata*), a much-branched, rounded shrub belonging to the nettle family; and hala pepe (*Pleomele hawaiiensis*), a small to medium sized tree belonging to the dracaena family. All three are Category 1 candidate endangered species.

The applicant has met with US Department of the Interior, Fish and Wildlife Service (FWS) representatives regarding the dry land forest and has come to an agreement, in principle, to preserve the portions of the a'a flow with these listed and candidate endangered species as well as the remnant dry forest community in which they occur in accordance with Federal and State endangered species laws. Because of the owner's decision to not proceed with planning the mauka portions of the property, no further work has been done with respect to the dry land forest. The boundaries of the forest have not been surveyed (however it is generally located on the mauka side of the existing Kaloko Industrial Park and to the south of Hina Lani Drive). and a management plan has not been prepared. Nonetheless, the applicant will continue to work with the US Fish and Wildlife Service and the State Department of Land and Natural Resources to ensure that the forest is preserved and measures are taken to protect it from future development. Attached is a copy of a letter from FWS which supports the proposed reclassification from Conservation to Urban.

We appreciate the time and effort you took in reviewing the draft EIS. A copy of your facsimile and this response letter will be appended to the Final EIS.

Sincerely,

KIMURA INTERNATIONAL INC.

Glenn T. Kimura
President

encl
cc: Esther Ueda, Land Use Commission
Gary Gill, OEQC

United States Department of the Interior

RECEIVED 7 Aug 96

FISH AND WILDLIFE SERVICE
Pacific Islands Ecoregion
300 Ala Moana Blvd, Room 3108
P.O. Box 50088
Honolulu, HI 96850
phone: 808-541-3441; fax: 808-541-3470

In Reply Refer To: Hawaii County–Kona Surveys (MMB)

AUG . 05 1996

Ms. Ester Ueda, Executive Officer
State Land Use Commission
P.O. Box 2359
Honolulu, Hawaii 96804-2359

Dear Ms. Ueda:

Thank you for the opportunity to comment on the Draft Environmental Impact Statement (EIS) for Kaloko Town Center, to convert conservation district to urban land use.

The U.S. Fish and Wildlife Service (Service) has conducted botanical, cave invertebrate, and *Plutella* moth surveys in the project areas. The Service found no endangered, threatened, proposed, or candidate species or other biological resources that would prohibit the zoning change of these parcels from conservation to urban.

The Service's concerns regarding the project's potential effects on water-related resources, as stated our March 8, 1995, letter responding to the Petition for Amendment to the State Land Use District Boundaries Docket No. A94-705, have been addressed.

The Service has no objection to this Kaloko Town Center as planned in this draft EIS. If you have any questions about these or previous comments, please call Fish and Wildlife Biologist Marie Bruegmann at 808-541-3441.

Sincerely,

Brooks Harper
Field Supervisor
Ecological Services

LAND USE COMMISSION
STATE OF HAWAII
AUG 6 10 09 AM '96

cc: Lorene Maki, Office of State Planning

RECEIVED 14 Aug 96 by fax

LIFE OF THE LAND

HAWAI'I'S OWN ENVIRONMENTAL ACTION GROUP
EDUCATION, RESEARCH, LOBBYING & LITIGATION
PROTECTING HAWAI'I'S FRAGILE ENVIRONMENT

Tokyo Green Hawaii, Inc
c/o Pacific Land Services, Inc
810 Richards Street, Suite 900
Honolulu, HI 96813
Fax: 534-1004

Glenn Kimura
Kimura Intl Inc
1600 Kapiolani Blvd, Suite 622
Honolulu, HI 96813
fax: 941-8999

Gary Gill
Office of Environmental Quality Control
220 S King St
Honolulu, HI 96813
Fax: 586-4186

Ms Ester Ueda
State Land Use Commission
P. O. Box 2359
Honolulu, HI 96813
Fax: 587-3822

Comments on the DEIS
Kaloko Town Center
North Kona, Hawaii

<u>HAR §11-200-17(f)</u> "The draft EIS shall contain any known alternatives for the action. These alternatives which could feasibly attain the objectives of the action -- even though more costly -- shall be described and explained as to why they were rejected. A rigorous exploration and objective evaluation of the environmental impacts of all reasonable alternative actions, particularly those that might enhance environmental quality or avoid or reduce some or all of the adverse environmental benefits, costs, and risks shall be included in the agency review process in order not to prematurely forclose options which might enhance environmental quality or have less detrimental effects."

1111 Bishop Street, Suite 503 • Honolulu, HI 96813 • ph: 533-3454 • fax: 533-0993

<u>NO ACTION ALTERNATIVE</u>

"... [t]he no alternative will not create additional employment, income, tax revenue or other economic benefits <u>to an area that is facing the effects of a Statewide economic downturn.</u> [emphasis added]." Chapter 7. Alternatives to the Proposed Action. *7.5 Analysis and Conclusion.* page 7-3

The North Kona District is a broad region that extends from Pu'u Anahulu Homestead Tract to Keauhou and Kainalu. Population falls into five census tracts: Census Tract (CT) 215.01 which covers the area from Pu'u Anahulu to Kealakehe and includes the project site .... Like the fast growing north Kona district, the population increased almost six times from 2,600 in 1970 to 12,600 in 1990 and registered annual growth rates of 11.4% from 1970 to 1980 and 5.4% from 1980 to 1990 .... The median income of the project site census tract was $37,500. This was higher than the county's median of $29,712 and the district's median of $35,364 in 1990 .... North Kona has a high proportion of people who moved into their house some time in the five years prior to the 1990 census .... North Kona residents and in particular the residents in the project site census tract were very active in the labor force and were able to find jobs. In 1990, 71.2% of the residents 16 years and older participated in the civilian labor force as compared to the 64% participation rate for the County. Chapter 5. Socio-Economic Factors: *Profiles of the Existing Community.* pages 5-1, 5-3.

"The consequence of this no action alternative could be a pocket of undeveloped land surrounded by urban uses. The no action alternative is rejected because its benefits are diminutive when compared to the missing opportunities and consequences of no development. Chapter 7. Alternatives to the Proposed Action. *7.5 Analysis and Conclusion.* page 7-4.

"...[t] no action alternative is a future option for the projected area. If pursued, this action would be inconsistent with expressed government policies recommending urbanization ..." 8. Relationship Between Local Short-Term Uses of the Environment and Maintenance and Enhancement of Long Term Productivity. page 8-3.

<u>Alternative Land Uses</u>

"In terms of infrastructure, one of the major reasons for establishing the 'Subregional Planning Area' designation which encompasses the project area in the West Hawaii Regional Plan was to enable the County to 'include existing landowners, and affected government agencies so that infrastructure requirements of all landowners can be determined and 'sized' in order to attend to existing and anticipated problems. Opportunities for joint infrastructure financing, economies of scale, and creative urban design will be explored and developed in order to provide an environment that can support the 'preferred' quality of life.' (West Hawaii Regional Plan, 1989:22)." Chapter 7. Alternatives to the Proposed Action. *7.5 Analysis and Conclusion.* pages 7-3,4

"The proposed project is projected to take 15 to 20 years to complete following the receipt of land use and zoning approvals. In general, development will most likely occur in phases starting with commercial uses ... Retail land is projected for development in conjunction with residential and visitor population growth ... Office spaces would most likely be developed in two phases: the first would consist of an approximately 3 acre complex built by the year 2010 ... depending upon market conditions ..." Chapter 2. Description of the Proposed Action. 2.5 Project Phasing. page 2-15.

"The second alternative which considers varying intensities of land use is also rejected. Granted, the benefits of reducing the amount of commercial uses, lowering residential densities or increasing the amount of land area allocated for the school and park are not unreasonable considerations. The effect of these changes in intensities could mean corresponding decreases in traffic demand, infrastructure demand and so forth. In terms of impacts to natural systems, for example, the groundwater, pond and nearshore environments, studies conclude that the currently proposed uses would have nominal impacts. By varying the intensities of these uses, significant improvements relative to natural systems are not anticipated. On the other hand, the effects could mean corresponding decreases in socio-economic benefits in terms of improved facilities and housing, and increased employment, income, tax revenue and other economic benefits. The land uses and densities proposed are supported by market studies and are consistent with State and County policies and plans for the region. It is difficult to predict the environmental consequences of varying land use intensities in terms of regional impacts... [i]t is better in the long run to propose uses which make economic sense and are consistent with overall public policies and plans. For these reasons, the alternative which considers other land uses is rejected." Chapter 7. Alternatives to the Proposed Action. *7.5 Analysis and Conclusion.* pages 7-4,5.

<u>Environmental Impacts</u>

"Knowledge of groundwater conditions in the vicinity of the project site ..." Chapter 4. Physical and Natural Environment. *4.3 Groundwater.* page 4-6. "The natural rate of groundwater flow beneath the project site to the shoreline is relatively modest." Chapter 4. Physical and Natural Environment. *4.3 Groundwater.* page 4-15. "An assessment of the pond and marine environments downslope of the proposed Kaloko Town Center was prepared .... This assessment was conducted in response to concerns that development of the proposed project would negatively impact the fishpond complex within the Kaloko-Honokohau Historic Park. Chapter 4. Physical and Natural Environment. *4.4. Marine and Pond Environments.* page 4-19. "... if fertilizers are applied reasonably in the landscape areas of the project ... Chapter 4. Physical and Natural Environment. *4.4. Marine and Pond Environments.* page 4-23.

<u>Cumulative Impacts</u>

"The North Kona Distict covers some 568 square miles, which is slightly smaller than the entire County of Honolulu; the West Hawaii region greatly exceeds the size of Oahu. The cumulative impacts resulting from the eventual development of all projects currently permitted and those desiring permits would be in keeping with governmental policies... Looking at potential environmental impacts from a cumulative perspective, the short term action of urbanizing the petition area would be a contributing move toward the broader urbanization of the region. In the very long term, the character of the area will change from its broad, open expanses of lava fields, to a more urban type environment with new residential communities, commerce and resort destinations." 8. Relationship Between Local Short-Term Uses of the Environment and Maintenance and Enhancement of Long Term Productivity. page 8-2.

<u>Summary</u>

In short the developer is stating that it is not wise to alter the project (0.35 square mile) since it is part and parcel of a broader county plan (568 square miles), that there are no environmental impacts for the particular site (0.35 square mile), and that all long term cumulative impacts concern only the desired goal of urbanization: Furthermore the land uses can not be varied for this particular site, even though the land uses are not yet firmly defined and will depend on future economic growth and market studies!

The environmental impacts (groundwater, runoff, marine and pond impacts, etc.) are limited to the particular project site. The cumulative impacts deals only with the positiveness of urbanization ... the short term action of urbanizing the petition area would be a contributing move toward the broader urbanization of the region. In the very long term, the character of the area will change ... to a more urban type environment with new residential communities, commerce and resort destinations.

The need for the 'project' and the impact from the 'project' needs to be discussing the same 'project'. One 'project' can not be 568 square miles in size and the other 'project' less than 1 square mile in size. Furthermore, the courts have consistently ruled that the 'project' being considered must be the larger 'project'. Therefore a section on the true cumulative environmental impact of this project must be included in the EIS. Mahalo.

Henry Q Curtis

Henry Q Curtis
Executive Director

KIMURA INTERNATIONAL

16 September 1996

Mr. Henry Q. Curtis
Executive Director
Life of the Land
1111 Bishop Street, Suite 503
Honolulu, HI 96813

Dear Mr. Curtis:

Kaloko Town Center
Draft Environmental Impact Statement (DEIS)
North Kona, Hawaii

Thank you for your comments on the draft environmental impact statement (DEIS) for the above project which we received by facsimile on August 14, 1996.

We apologize if the document gives you the impression that discussion of governmental policies and environmental impacts are concerned only with the desired goal of urbanization for the project.

I surmise from your letter that a discussion of the true cumulative environmental impact of this project be included in the EIS. To comply with your request, cumulative impact analyses have been inserted in the Final EIS in relevant chapters of the document. To evaluate the cumulative impacts of regional development, we have turned to what we believe to be the best source of available information on environmental impacts: the final environmental impact statements for four major projects in the region that have been proposed since 1990. Common environmental impact parameters were abstracted from these impact statements and used to formulate an assessment of regional cumulative impacts. The use of these parameters is justified in our opinion because these impact statements were used as supporting documentation for successfully obtaining Urban reclassification from the State Land Use Commission. The four major projects include:

1. Villages of La'i'opua, a State sponsored development project by the Housing and Finance Development Corporation
2. Liliuokalani Trust Kealakehe Lands, proposed by the Liliuokalani Trust Estate
3. Kaupulehu Resort Expansion, proposed by the Kaupulehu Developers, and
4. Urban Expansion of State Lands, Keahole to Kailua Region by the Office of State Planning.

These four projects account for some 6,000 acres of future development in the region over the next 20 to 30 years. As noted in our discussion, other projects were not

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

included in this evaluation for various reasons. The evaluation of cumulative impacts took into account potential future impacts to the region with and without the proposed 224 acre Kaloko Town Center. Evaluating cumulative impacts is difficult at best and quite speculative given the long term, market dependent, development schedules noted for each project. Nonetheless, we have endeavored to make our assessment as comprehensive as possible.

We appreciate the time and effort you took in reviewing the draft EIS. A copy of your facsimile and this response letter will be appended to the Final EIS.

Sincerely,

KIMURA INTERNATIONAL INC.

Glenn T. Kimura
President

cc: Esther Ueda, Land Use Commission
Gary Gill, OEQC

OFFICE OF PLANNING

Department of Business, Economic Development & Tourism

BENJAMIN J. CAYETANO, Governor

MAILING ADDRESS: P.O. BOX 2359, HONOLULU, HAWAII 96804-2359
STREET ADDRESS: 235 SOUTH HOTEL STREET, 4TH FLOOR
TELEPHONE: (808) 587-2846, 587-2800

FAX: Director's Office 587-2848
Planning Division 587-2824

Ref. No. P-6218

August 9, 1996

RECEIVED
AUG 15 1996

MEMORANDUM

TO: Ms. Esther Ueda, Executive Officer
Land Use Commission

FROM: Rick Egged
Director, Office of Planning

SUBJECT: Kaloko Town Center Draft Environmental Impact Statement (DEIS), North Kona, Hawaii; TMK: 7-03-09: por. 17

We have reviewed the DEIS for the proposed Kaloko Town Center commercial/retail, office, multi-family apartment, residential and a 13-acre school and park site uses, which was filed with your office to fulfill application requirements for a Land Use Boundary Petition to reclassify approximately 224 acres of land from the Conservation to the Urban District. While most of our previous concerns have been addressed in the DEIS, we would like to offer additional comments and concerns at this time.

1. Appendix G, Record Research of Roadways and Trails at Kohanaiki and Kaloko, North Kona, Island of Hawaii, Hawaii, May 1995, does not clarify whether the old roadways mentioned on the Petition area are owned by the State of Hawaii. Ownership of the roadways and trails on the site should be made clear.

2. Pages 4-30 to 4-35, Noise, indicate that residential uses may be set back from 257 to 282 feet from the centerline of Queen Kaahumanu Highway and from 86 to 173 feet from the centerline of Hina Lani Drive. Are these figures based on a four-lane Queen Kaahumanu Highway as indicated in the Traffic Impact Analysis?

3. Pages 4-67 to 4-68, Visual Resources, indicate that a 100-foot landscaped buffer is proposed to mitigate visual impacts along Queen Kaahumanu Highway. In previous petitions, the Office of Planning has expressed concern about visual impacts along the State Highway. How was the width of the buffer established?

4. The U.S. Fish and Wildlife Service (FWS) letter dated December 18, 1995, indicates that the FWS has done surveys for botanical species, cave invertebrates and the Plutella moth on the petition area. This information and the results of those surveys should be included in the Final EIS.

We request that these concerns and issues be addressed in the Final Environmental Impact Statement. Thank you for the opportunity to comment on this document. If there are any questions, please contact Lorene Maki of the Land Use Division at 587-2888.

cc: Mr. Gary Gill, OEQC
Mr. Glenn T. Kimura
Tokyo Green Hawaii, Inc. c/o Pacific Land Services, Inc.

KIMURA INTERNATIONAL

16 September 1996

Mr. Rick Egged
Director
Office of Planning
PO Box 3540
Honolulu, HI 96811-3540

Dear Mr. Egged:

Kaloko Town Center
Draft Environmental Impact Statement (DEIS)
North Kona, Hawaii

Thank you for your comments on the draft environmental impact statement (DEIS) for the above project received by letter dated 9 August 1996. Responses to your comments are provided below:

1. Ownership of roadways and trails: According to Mr. Russell Figuieroa of R.M. Towill, ownership of the roadways which traverse the mauka-southern corner of the project site is not a government or public road (see attached letter).

2. Projected noise: According to Y. Ebisu and Associates, noise set back distances were calculated from the centerline of Queen Ka'ahumanu Highway based on a future four-lane configuration. The traffic projections provided by the Traffic Impact Analysis Report were used as the basis for calculating future noise conditions.

3. Width of landscaped buffer: The 100-foot landscaped buffer along Queen Ka'ahumanu Highway was recommended by the Keahole to Kailua Development Plan (prepared by the Department of Planning, County of Hawaii and R.M. Towill Corporation, 1991). On page 3-8 of the development plan report, a 100-foot wide "Open" zone is shown on both sides of Queen Ka'ahumanu Highway to serve as a permanent buffer zone on both sides of the highway with the objective of establishing this zone as a dedicated open space strip.

4. US Fish and Wildlife Services (FWS) surveys: FWS conducted preliminary surveys of the property in October 1995. Their findings were documented in letter form and are attached for your information. The letter will be appended to the botanical survey in the Final EIS.

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

We appreciate the time and effort you took in reviewing the draft EIS. A copy of your letter and this response letter will be appended to the Final EIS.

Sincerely,

KIMURA INTERNATIONAL INC.

Glenn T. Kimura
President

encl
cc: Esther Ueda, Land Use Commission
Gary Gill, OEQC

R. M. TOWILL CORPORATION

420 Waiakamilo Rd. #411 Honolulu, HI 96817-4941 (808) 842-1133 Fax (808) 842-1937

September 6, 1996

RECEIVED 12 Sep 96

Mr. Glenn Kimura
Kimura International
1600 Kapiolani Blvd., #622
Honolulu, Hawaii 96814

Dear Glenn:

Subject: Roadways Affecting
Lot 7-A-1 Being Portion of
Grant 2942 and
R.P. 8214, L.C. Aw. 7715, Ap11
At Kohanaiki and Kaloko,
North Kona, Hawaii
Tax Map Key: 7-3-09:17

In response to your request regarding the ownership of the roadway which is shown in purple on the attached Exhibit "A", we submit the following:

The roadway was depicted on a map prepared by J.S. Emerson in September of 1888. Unlike the government roads which are labeled as such and which are still being referred to as being owned by State of Hawaii, the roadway (identified in purple) is only referred to as "road" on Emerson's map.

It is possible that it could have connected to the "Kohanaiki Road" as shown in orange on Exhibit "A", however Emerson does not show that connection on the 1888 survey nor does the Kohanaiki Road appear on said survey. Emerson does however show the "Kohanaiki Road" on Map No. 6 of the Homestead Lots, Akahipuu Section which was prepared in January 1989.

The portion of the Kohaniki Road which is presently a County maintained roadway adjoins Grant 2030 to Kaiakoili and forms the South boundary of said Grant. The portion of Kohanaiki Road which goes through Grant 2942 is shown only as a dashed line and is not recognized as a government road and is not being utilized as a roadway and is within property that is privately owned.

The Department of Transportation (DOT), State of Hawaii prepared a right-of-way map for the Kailua-Kawaihae Road - Section II and it shows the boundary corner called "Kumuohe" which was also shown on Emerson's 1888 map and which is in close proximity to the "Road", however the parcel map prepared by DOT does not reflect the roadway.

A subdivision map which created the subject parcel and which was prepared by Control Point Surveying and Engineering, Inc. in 1991 does not show any roadways reflecting the subject parcel.

Based on the preceding we are of the opinion that the road shown by Emerson in his 1888 survey is not a government or public road and the subject parcel is not affected by any roadway within the boundaries or limits of Lot 7-A-1.

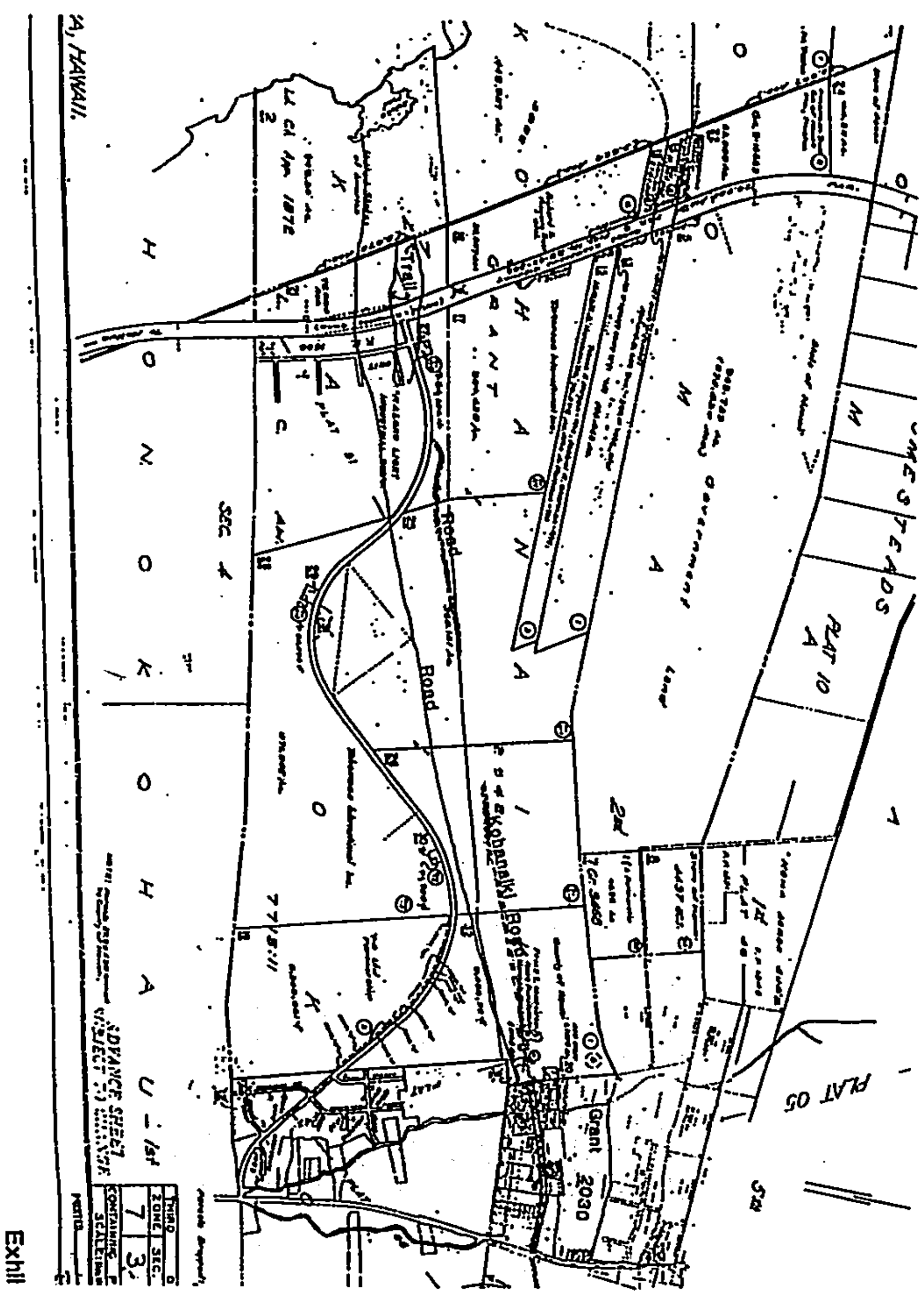
Should you have any questions, please call the undersigned at (808) 842-1133.

Very truly yours,

Russell Figueiroa
Vice President and Manager
Photogrammetry and Surveying Services

R-F:ke
encl.

DOCUMENT CAPTURED AS RECEIVED



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Ecoregion
300 Ala Moana Blvd, Room 3108
P.O. Box 50088
Honolulu, HI 96850

FILE COPY

In Reply Refer To: Kaloko Dry Forest (MMD)

DEC 1 1 1995

Tokyo Green Hawaii
c/o Mr. Ned Dewey
Pacific Land Services, Inc.
810 Richards Street, Suite 900
Honolulu, Hawaii 96813

Dear Mr. Dewey:

The U.S. Fish and Wildlife Service (Service), at your request, conducted preliminary surveys of Tokyo Green's property in the Kaloko area, North Kona, Hawaii, on October 14 - 17, 1995. We would like to commend Tokyo Green on its interest in protecting this biologically valuable area. We are very interested in working with Tokyo Green to create a plan that can both protect endangered species habitat and allow for the development of the rest of Tokyo Green lands.

The survey of Tokyo Green lands was conducted to identify areas that support important biological resources. The botanical survey covered the 'a'a lava flow on the parcel south of Hina Lani Road and several smaller 'a'a lava flows on the parcel north of Hina Lani Road. The land not on these 'a'a flows was strategically surveyed to cover areas most likely to include native plants. In addition to the plant survey, the lands were also surveyed for *Plutella* moths and for cave/lava tube insects. These moth and insect surveys did not find any important biological resouces on the Tokyo Green parcel.

The unique assemblage of dry forest plants living on the Tokyo Green 'a'a lava flows are some of the best examples of this type of forest that remain in the Kona area. These 'a'a lava flows, including a narrow (50 foot) buffer for plants occurring on the edge of the flows, represents a unique and discrete area that can be protected and managed for the dry forest and endangered species while still allowing development of the remaining area. The area outside of these flows is highly degraded and difficult to manage for the long-term survival of native plants. This degraded land is most of the Tokyo Green parcel and can be used for development without impacting the 'a'a lava flow dry forest plants.

The Tokyo Green 'a'a lava flow dry forest is relatively free of alien grasses and ungulates and contains several rare plant species. These features make it a unique and important forest area on the Kona Coast. The rare plant species include the endangered tree 'aiea *(Nothocestrum breviflorum)*, the endangered sedge *Mariscus fauriei*, the last five individuals of the proposed

DOCUMENT CAPTURED AS RECEIVED

endangered *Neraudia ovata*, about one-third of all remaining individuals of the proposed endangered hala pepe (*Pleomele hawaiiensis*), the candidate endangered ko'oko'olau (*Bidens micrantha* ssp. *ctenophylla*), and one species of special concern to the Service, the pua pilo (*Capparis sandwichiana*). Individuals of these last two species can be found outside of the 'a'a lava flow areas, but most occur within the flow.

Service biologists surveyed of about 25 or 30 caves within the parcel. Of these, six caves had some of the necessary physical and biotic conditions needed to support native cave insects. However, no significant cave insect communities were found. Sparse vegetation above the caves, lack of a significant assemblage of plant roots inside the caves, and low subterranean moisture most likely account for the lack of native cave insects. The only native insect observed in these surveys was a *Shrankia* moth. This moth was seen in all six caves, and is may be an undescribed species. Several adults were collected and sent to the Bishop Museum. During the surveys in the caves, numerous old Hawaiian structures, such as water catchments and fire pits were seen. However, no Hawaiian burials or signs of burials were observed.

Some effort was spent on searching for larvae and adults of the native *Plutella* moth, which lives on the pua pilo plants discussed above. Numerous plants had signs of feeding damage and a single larva was found. This individual may be the native *Plutella* moth, but work is required to confirm this. None of the insects seen in the surveys are important to the Service and none are endangered, proposed endangered, or candidate species.

The Service is interested in working with Tokyo Green through a cooperative agreement to protect the endangered species found on the 'a'a lava flow that defines the Kaloko dry forest. Protection and management of the 'a'a lava flow dry forest on the Tokyo Green parcel would facilitate Tokyo Green's development plans for areas outside of this dry forest. The Service would provide all necessary active management of the area if Tokyo Green allows access and long-term protection of the 'a'a lava flow dry forest through this agreement. Protection of this dry forest would ensure that Tokyo Green would be shielded from additional endangered species concerns within the Kaloko parcel.

The Service is willing to write a letter of support for Tokyo Green's petition for the land use changes once a conservation agreement has been approved by both parties. This conservation agreement may possibly include one or more access roads through the 'a'a lava flow on the north side of Hina Lani Road, to allow access to the proposed golf course development. A draft conservation agreement for the protection of this dry forest is enclosed, including a map of the area the Service would like to have protected.

We look forward to working with you to protect this valuable resource while also allowing your development projects to continue. If you have any questions, please contact me or Marie Bruegmann at 808-541-3441.

Sincerely,

Brooks Harper

Brooks Harper
Field Supervisor
Ecological Services

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

COPY

RECEIVED
AUG 20 1996

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

MICHAEL D. WILSON, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTY
GILBERT COLOMA-AGARAN

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION DIVISION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

August 15, 1996

MEMORANDUM

LOG NO: 17315 ✓
DOC NO: 9607PM18

TO: Ms. Esther Ueda, Executive Officer
State Land Use Commission

FROM: Don Hibbard, Administrator
State Historic Preservation Division

SUBJECT: Draft Environmental Impact Statement for the Proposed Kaloko Town Center
Kaloko and Kohanaiki, North Kona, Hawaii Island
TMK: 7-3-09: Por. 17

At this time we have completed a review of the archaeological inventory survey report (Appendix F), but not the Native Hawaiian cultural impact assessment study (Appendix K). Review comments have been sent to the applicant's archaeological consultant, Cultural Surveys Hawaii, requesting a number of revisions. Until we have received an acceptable report and concurred with all of the significance evaluations and recommended mitigation treatments for the 55 historic sites identified in the project area we cannot make any recommendations to the Land Use Commission. We suspect that the cultural impact study report will also require some revisions. Lastly, it is our understanding that the firm that prepared the DEIS did not consult with the National Park Service about the possible effects of the proposed development on Kaloko-Honokohau National Historic Park. Consultation with the National Park Service should be undertaken and the results presented in the Final EIS.

PM:jk

c. Mr. Ned Dewey, Tokyo Green Hawaii, Inc.
Mr. Glenn Kimura, Kimura International Inc.

KIMURA INTERNATIONAL

16 September 1996

Mr. Don Hibbard
Administrator
State Historic Preservation Division
Department of Land and Natural Resources
State of Hawaii
33 South King Street, 6th Floor
Honolulu, HI 96813

Dear Mr. Hibbard:

Kaloko Town Center
Draft Environmental Impact Statement (DEIS)
North Kona, Hawaii

Thank you for your comments on the draft environmental impact statement (DEIS) for the above project which we received by memorandum on August 20, 1996.

We understand that comments on the archaeological inventory survey report were sent to Cultural Surveys Hawaii and until you have received an acceptable report and have concurred with their recommendations, you cannot make any recommendations to the Land Use Commission. Further, you indicate that your review of the Native Hawaiian cultural impact study was not complete but you suspect that revisions will be required. We would like to proceed with publishing the Final EIS and hope that we can receive your comments in a timely manner.

With respect to your recommendation that consultation with the National Park Service be undertaken and presented in the Final EIS, the State Land Use Commission and Office of Environmental Quality Control did not recommend that we include the National Park Service in our distribution list, nor did the National Park Service ask to be a consulted party. The National Park Service was interviewed in the course of preparing the Draft EIS section on social impact and was made aware of the proposed project. Other agencies and parties, including the US Department of Interior, Fish and Wildlife Service, cited concern over groundwater quality of the Kaloko fish pond complex as a result of the proposed action. The EIS includes an entire section devoted to the project's potential effects on water-related resources. Comments received from the Service indicate that their concerns have been addressed. Please see attached letter.

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

We appreciate the time and effort you took in reviewing the draft EIS. A copy of your memorandum and this response letter will be appended to the Final EIS.

Sincerely,

KIMURA INTERNATIONAL INC.

Glenn T. Kimura
President

cc: Esther Ueda, Land Use Commission
Gary Gill, OEQC

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Ecoregion
300 Ala Moana Blvd, Room 3108
P.O. Box 50088
Honolulu, HI 96850
phone: 808-541-3441; fax: 808-541-3470

RECEIVED 7 Aug 96

In Reply Refer To: Hawaii County--Kona Surveys (MMB)

AUG 05 1996

Ms. Ester Ueda, Executive Officer
State Land Use Commission
P.O. Box 2359
Honolulu, Hawaii 96804-2359

Dear Ms. Ueda:

Thank you for the opportunity to comment on the Draft Environmental Impact Statement (EIS) for Kaloko Town Center, to convert conservation district to urban land use.

The U.S. Fish and Wildlife Service (Service) has conducted botanical, cave invertebrate, and *Plutella* moth surveys in the project areas. The Service found no endangered, threatened, proposed, or candidate species or other biological resources that would prohibit the zoning change of these parcels from conservation to urban.

The Service's concerns regarding the project's potential effects on water-related resources, as stated our March 8, 1995, letter responding to the Petition for Amendment to the State Land Use District Boundaries Docket No. A94-705, have been addressed.

The Service has no objection to this Kaloko Town Center as planned in this draft EIS. If you have any questions about these or previous comments, please call Fish and Wildlife Biologist Marie Bruegmann at 808-541-3441.

Sincerely,

for Brooks Harper
Field Supervisor
Ecological Services

LAND USE COMMISSION
STATE OF HAWAII
AUG 6 10 09 AM '96

cc: Lorene Maki, Office of State Planning

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAII
25 AUPUNI STREET • HILO, HAWAII 96720
TELEPHONE (808) 969-1421 • FAX (808) 969-6996

August 19, 1996

Ms. Esther Ueda, Executive Officer
State Land Use Commission
P.O. Box 2359
Honolulu, HI 96804-2359

DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED KALOKO TOWN CENTER
APPLICANT - TOKYO GREEN HAWAII, INC., C/O PACIFIC LAND SERVICES, INC.
TAX MAP KEY 7-3-9: PORTION OF 17

We have reviewed the subject Draft Environmental Impact Statement.

Please be informed that the water improvements along Hina Lani Drive are not complete. The two reservoirs situated at the 900-foot and 1200-foot elevations and connecting waterlines are required for the proposed project.

For your information, effective July 31, 1996, our new telephone number is (808) 961-8660 and fax number is (808) 961-8657.

Milton D. Pavao, P.E.
Manager

WA:cmk

copy - Tokyo Green Hawaii, Inc.
Kimura International Inc.

... *Water brings progress* ...

KIMURA INTERNATIONAL

16 September 1996

Mr. Milton D. Pavao, P.E.
Manager
Department of Water Supply
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Pavao:

Kaloko Town Center
Draft Environmental Impact Statement (DEIS)
North Kona, Hawaii

Thank you for your comments on the draft environmental impact statement (DEIS) for the above project which we received by letter on August 19, 1996.

We acknowledge from your letter that water improvements along Hina Lani Drive are not complete and that two reservoirs situated at the 900-foot and 1200-foot elevations and connecting lines are required for the proposed project. We will work closely with your Department to ensure that all county requirements are met.

We appreciate the time and effort you took in reviewing the draft EIS. A copy of your letter and this response letter will be appended to the Final EIS.

Sincerely,

KIMURA INTERNATIONAL INC.

Glenn T. Kimura
President

cc: Esther Ueda, Land Use Commission
Gary Gill, OEQC

1600 Kapiolani Blvd., Suite 622
Honolulu, Hawaii 96814
Tel (808) 944-8848 • Fax (808) 941-8999

Chapter 13
REFERENCES

Kaloko Town Center

FINAL
ENVIRONMENTAL IMPACT STATEMENT

13. *References*

Apple, Russell A. Trails: From Steppingstones to Kerbstones, B.P. Bishop Museum. Special Publication, 53, Bishop Museum Press, Honolulu. 1965.

Char & Associates. Botanical Survey, Kaloko Town Center, North Kona District, Island of Hawaii. Prepared for Kimura International Inc. November 1995.

Cordy, Ross, Joseph Tainter, Robert Renger, and Robert Hitchcock. An Ahupua`a Study: The 1971 Archaeological Work at Kaloko Ahupua`a, North Kona, Hawai`i, Archaeology at Kaloko-Honokohau National Historical Park. National Park Service, U.S. Dept. of the Interior. 1991

County of Hawaii, Department of Planning and R.M. Towill Corporation. Keahole to Kailua Development Plan, North Kona, Island of Hawaii. April 1991.

County of Hawaii, Department of Planning. The General Plan, Hawaii County. November 1989.

County of Hawaii. Zoning Code. 1985.

Cultural Surveys Hawaii. An Archaeological Inventory Survey and Limited Subsurface Testing of 224.43 Acre Parcel within Portions of Kaloko and Kohanaiki Ahupua'a. April 1996.

Cultural Surveys Hawaii. Native Hawaiian Cultural Impact Assessment on the Development of 224.43 Acre Parcel within Portions of Kaloko and Kohanaiki Ahupua'a. April 1996.

Earthplan. Kaloko Town Center Social Impact Assessment. Prepared for Kimura International Inc. March 1996.

Helber, Hastert & Fee, Planners. Final Environmental Impact Statement, Urban Expansion State Lands, Keahole to Kailua Region, North Kona, Hawaii. July 1993.

Kamakau, Samuel M. Ruling Chiefs of Hawaii, The Kamehameha Schools Press, Honolulu (2 vols.) 1961.

KPMG Peat Marwick. Economic and Fiscal Impact Assessment for the Kaloko Town Center. Prepared for Pacific Land Services, Inc. May 1996.

KPMG Peat Marwick. Market Assessment for the Kaloko Town Center. Prepared for Pacific Land Services, Inc. April 1996.

Marine Research Consultants. An Assessment of Potential Effects to the Marine and Pond Environments in the Vicinity of the Kaloko Town Center, North Kona, Hawaii. May 1996.

Ogden Environmental and Energy Services. Air Quality Impact Analysis, Kaloko Town Center, North Kona, Hawaii. Prepared for Tokyo Green Hawaii, Inc. March 1996.

Rana Productions Ltd. Faunal Survey for the Kaloko Town Center, Environmental Impact Statement, District of North Kona, Island of Hawaii, Hawaii. December 1995.

R.M. Towill Corporation. Record Research of Roadways and Trails at Kohanaiki and Kaloko, North Kona, Island of Hawaii. May 1995.

State of Hawaii. Chapter 205, Land Use Commission, Hawaii Revised Statutes, as amended.

State of Hawaii. Chapter 205A, Coastal Zone Management, Hawaii Revised Statutes, as amended.

State of Hawaii. Chapter 343, Environmental Impact Statements, Hawaii Revised Statutes, as amended.

State of Hawaii, Office of the Governor, Office of State Planning. State Land Use District Boundary Review, Hawaii. 1992.

State of Hawaii, Office of the Governor, Office of State Planning. The Hawaii State Plan, Chapter 226, Hawaii Revised Statues. 1991.

State of Hawaii, Office of the Governor, Office of State Planning. The Hawaii State Plan, Functional Plans in accordance with Chapter 226, Hawaii Revised Statues. 1989 -1991.

State of Hawaii, Office of the Governor, Office of State Planning. West Hawaii Regional Plan. 1989.

The Honolulu Advertiser. Hurricane Iniki. Mutual Publishing. 1992

The Honolulu Advertiser. "Hawaii 9th in ratio of state jobs, population". (pgs A-1, A-2), April 29, 1996.

The Honolulu Star Bulletin. ""Big Isle, Big VOG". (Pgs A-1, A-6). May 1, 1996.

The State and Federal Hazard Mitigation Team. Hazard Mitigation Team Report for the Kilauea Volcano Eruption, Hawaii County, Hawaii, FEMA-864-DR-HI. October 1990.

Traffic Management Consultant. Traffic Impact Analysis Report for the Kaloko Town Center. Prepared for Kimura International Inc. May 1996.

Uniform Building Code, 1991 Edition. 1991.

US Army Corps of Engineers, Flood Plain Management Section, Planning Branch, Engineering Division, POD. Post Disaster Report, Hurricane Iwa. March 1983.

United States, Department of Agriculture Soil Conservation Service. Soil Survey of the Island of Hawaii, State of Hawaii. US Government Printing Office, Washington D.C. 1973.

University of Hawaii, Land Study Bureau. Detailed Land Classification - Island of Hawaii. 1965.

West's Hawai'i Reports vol. 79, "Pub. Access Shoreline v. City. Planning Commission (pgs. 425-452)

_____ Public Access Shoreline Hawaii v. Hawai'i County Planning Commission (pgs. 246-255)

Y. Ebisu & Associates. Acoustic Study for the Kaloko Town Center, North Kona, Hawaii. Prepared for Pacific Land Services, Inc. February 1996.

APPENDICES

Kaloko Town Center

FINAL
ENVIRONMENTAL IMPACT STATEMENT

A

An Assessment of Potential Effects to the Marine and Pond Environments in the Vicinity of the Kaloko Town Center, North Kona, Hawaii

Marine Research Consultants, May 5, 1996

1.0 PURPOSE

Tokyo Green Hawaii, Inc. proposes to develop 224 acres of a 1100 acre parcel of land mauka of the Queen Kaahumanu Highway between Honokohau Harbor and the Keahole Airport in North Kona on the Island of Hawaii. The project, called Kaloko Town Center, includes residential, commercial, retail, a school and park, as well as roads and open space. None of the proposed land uses includes any alteration of the coastal areas or nearshore waters.

A somewhat unique characteristic of the project is the location relative to Kaloko Pond, a large brackish pond separated from the ocean by a basaltic rock wall. Water in the pond is a mixture of seaward-flowing, low salinity groundwater, and landward-flowing seawater. As a result, water chemistry in the pond can potentially be influenced by changes in groundwater composition and runoff of surface water. Leaching of materials such as fertilizer nutrients and pest control agents to groundwater could alter pond water chemistry. In addition, as pond water exchanges with ocean water in the nearshore area, there is also potential for alteration of marine water chemistry. Such alterations in water chemistry can, in turn, affect the structure of marine biotic communities in the nearshore area.

In the interest of addressing these concerns and assuring maintenance of environmental quality, it has been deemed appropriate to conduct an assessment of the pond and marine environments that are downslope from the proposed Kaloko Town Center. The rationale of this assessment is to determine the contribution of groundwater to the pond and marine environments, and the effects of such input on marine community structure at the present time before the commencement of any construction activities. Combining this information with estimates of changes in groundwater flow rates and chemical composition of groundwater that will enter the ponds that will result from construction of the project, it will be possible to evaluate the potential effects to the marine and pond environments. Changes in groundwater flow rates and groundwater chemistry have been supplied by Tom Nance Water Resource Engineering (TNWRE). Results of this evaluation will indicate if, and to what degree, there is the potential for negative effects to the aquatic environments from the proposed project. Presented below are the methods, results and conclusions of the assessment of the marine and pond environments at Kaloko.

2.0. METHODS

2.1. WATER CHEMISTRY

2.11. Sampling Sites

The Kaloko-Honokōhau National Historical Park is located seaward of the planned Kaloko Town Center. Over half of this 1160-acre park is comprised of ocean waters. Contained within its boundaries are also two large fishponds (Kaloko and 'Aimakapā), tidal areas and wetlands. Because of its archeological and cultural values and the importance of the ocean resource, the area near the Kaloko fishpond was chosen as the study site. Three transect sites directly offshore of the massive boulder seawall that separates Kaloko fishpond from the ocean were selected as sampling locations. A fourth transect was established within Kaloko fishpond to obtain baseline information on the composition and stratification of pond waters. Figure 1 is a map showing the shoreline and topographical features of the Kaloko area, and the location of the sampling transects. Two ocean transects were run perpendicular to the shoreline extending from the seawall seaward to what is considered open coastal ocean. Transect 1 is located near the northern boundary of the seawall and Transect 2 bisects the area off the center of the seawall. A third, shorter transect was established in a small inlet on the southern edge of the seawall where the influx of groundwater was clearly visible. Transect 4 spanned the approximate 200 m length of Kaloko fishpond.

2.12. Sampling Protocol

All field work was conducted on March 15, 1996 by divers swimming from shore. Environmental conditions during sample collection consisted of calm seas and a surf break of approximately 1-2 feet. Water samples were collected at six stations along two ocean transects (Transects 1 and 2) that extend from the seawall to approximately 150 meters (m) offshore at each site. Such a sampling scheme was designed to span the greatest range of salinity with respect to freshwater efflux at the shoreline. Sampling was more concentrated in the nearshore zone because this area is most likely to show the effects of alteration in groundwater composition. With the exception of the two stations closest to the shoreline, samples were collected at two depths; a surface sample was collected within approximately 10 centimeters (cm) of the sea surface, and a bottom sample was collected within one m of the sea floor. Surface water samples were also collected from four locations in the small inlet located to south of the seawall (Transect 3). Within Kaloko pond, surface and deep samples were collected at five equally spaced locations from the seawall to the landward edge of the pond (Transect 4).

Water samples were collected by opening 1-liter polyethylene bottles at the desired depth. Subsamples for nutrient analyses were immediately placed in 125-milliliter (ml) acid-washed, triple rinsed, polyethylene bottles and stored on ice until returned to Honolulu. Water for other analyses was subsampled from 1-liter polyethylene bottles and kept chilled until analysis.

2.13 Monitoring Constituents

Water quality parameters evaluated included the 10 specific criteria designated for open coastal waters in Chapter 11-54, Section 06 (Open Coastal waters) of the Water Quality Standards, Department of Health, State of Hawaii. These criteria include: total dissolved nitrogen (TDN) which is defined as dissolved inorganic nitrogen plus dissolved organic nitrogen, nitrate + nitrite nitrogen (NO_3^- + NO_2^-, hereafter referred to as NO_3^-), ammonium (NH_4^+), total dissolved phosphorus (TDP) which is defined as dissolved inorganic phosphorus plus dissolved organic phosphorus, chlorophyll a (Chl a), turbidity, temperature, pH and salinity. In addition, orthophosphate phosphorus (PO_4^{-3}) and silica (Si) were reported because these constituents are sensitive indicators of biological activity and the degree of groundwater mixing, respectively.

2.14. Analytical Methodology

Analyses for NH_4^+, PO_4^{3-}, and NO_3^- + NO_2^- (hereafter termed NO_3^-) were performed using a Technicon autoanalyzer according to standard methods for seawater analysis (Strickland and Parsons 1968, Grasshoff 1983). TDN and TDP were analyzed in a similar fashion following digestion. Dissolved organic nitrogen (DON) and dissolved organic phosphorus (DOP) were calculated as the difference between TDN and dissolved inorganic N, and TDP and dissolved inorganic P, respectively. The level of detection for the dissolved nutrients is 0.2 μM for TDN and Si, 0.02 μM for TDP, NO_3^- and NH_4^+, and 0.01 μM for PO_4^{3-}.

Turbidity was determined on 60-ml subsamples fixed with $HgCl_2$ to terminate biological activity. Fixed samples were kept refrigerated until turbidity was measured on a Monitek Model 21 90-degree nephelometer, and reported in nephelometric turbidity units (ntu, level of detection 0.01 ntu). Chl a was measured by filtering 300 ml of water through glass fiber filters; pigments on filters were extracted in 90% acetone in the dark at -5° C for 12-24 hours, and the fluorescence before and after acidification of the extract was measured with a Turner Designs fluorometer (level of detection 0.01 µg/L). Salinity was determined using an AGE Model 2100 laboratory salinometer with a precision of 0.0003‰. pH was determined using a lab meter with combination electrode and a precision of 0.01 pH units.

All lab analyses were conducted by Marine Analytical Specialists (Laboratory Certification NO. HI-0009).

2.2 ASSESSMENT OF MARINE BIOLOGICAL COMMUNITY STRUCTURE

2.2.1. Analytical Methodology

Evaluation of the marine biological community was conducted by qualitative reconnaissance surveys along the length of the area fronting Kaloko Pond from the shoreline out to the 10 meter (30 foot) depth contour. Information gathered during the surveys included abundance estimates of the dominant flora and fauna, as well as observations on the factors that affect these biotic assemblages. Quantitative surveys of the offshore area were not possible as the entire region off the pond was subjected to breaking surf which makes deployment of sampling gear impossible.

3.0 RESULTS

3.1 WATER CHEMISTRY

3.1.1 Horizontal Stratification

Table 1 shows results of all marine and pond water chemical analyses for samples collected in the vicinity of the proposed Kaloko Town Center development on March 15, 1996 reported in micromolar units (µM). Table 2 shows similar results presented in units of micrograms per liter (µg/L). Concentrations of eleven chemical constituents in surface and deep water samples are plotted as functions of distance from the seawall in Figures 2-5. Figure 6 is a mixing diagram showing dissolved nutrients as a function of salinity.

Examination of Figures 2-5 show distinct differences in patterns of horizontal stratification of pond water. Salinity within the pond showed surprisingly little variation from the ocean to the shoreward side of the pond (27-30‰). Similarly, there is little horizontal stratification of nutrients in the surface water of the pond with similar concentrations throughout the sampling transect. The lack of a strong horizontal gradient indicates that the pond is either very well mixed (unlikely owing to the lack of physical mixing processes) or that there is restricted input of both groundwater at the mauka side and seawater at the seawall.

Several nutrients (TN, TP, DON, DOP) exhibited substantially elevated concentrations in bottom waters at the landward side of the pond with decreasing concentrations with proximity to the seawall. The pattern of NH_4^+ was the opposite, with low concentrations near the landward end of the pond, which increased with distance toward the ocean. None of these constituents occurs in high concentrations in groundwater.

Within a zone extending from the wash of waves near the boulder wall separating the pond from the ocean (denoted as Seawall in Figures 2-4) to a distance of approximately 50 m offshore concentrations of dissolved Si, NO_3^-, PO_4^{3-}, TDP and TDN on Transects 1 and 2 decrease with distance from shore (Figures 2 and 3, Tables 1 and 2). Salinity shows the opposite trend, with distinctly lower values close to the seawall (Figure 3). Horizontal gradients in dissolved nutrients were slightly steeper at the northern transect (Transect 1) compared to the central transect (Transect 2) for sampling stations within 50 m of the seawall (Figures 2 and 3). Beyond 50 m of the seawall at these two locations, horizontal gradients were less steep and showed little variation with distance from shore. In addition, beyond 50 m from the seawall the concentrations of dissolved nutrients were similar between the two sites.

Transect 3, located in a small shoreline inlet along the southern edge of Kaloko Pond had the most distinct horizontal gradients of Si, NO_3^-, PO_4^{3-}, TDP and TDN. Concentrations of these constituents decreased by nearly 10-fold and salinity increased by 23% within 10 m of the shoreline (Figures 2 and 3). Concentrations of Si, NO_3^-, PO_4^{3-} and TDN were also nearly an order of magnitude higher at Transect 3 compared to Transects 1 and 2 (Tables 1 and 2). Similarly, salinity within the inlet was approximately 5‰ lower than corresponding stations near the seawall on Transects 1 and 2 (Figure 3, Tables 1 and 2).

The pattern of elevated Si, NO_3^- and PO_4^{3-} with corresponding low salinity is indicative of groundwater entering the ocean near the shoreline. Low salinity groundwater, which contains high concentrations of Si, NO_3^-, and PO_4^{3-}, often percolates to the ocean near the shoreline, resulting in a distinct zone of mixing in the nearshore region.

Dissolved nutrient constituents that are not associated with groundwater input (NH_4^+, DON, DOP) showed varying patterns with respect to distance from the shoreline. The concentration of DON and DOP were relatively constant along all three ocean transects sampled (Figure 4). The concentration of DON was of equal magnitude at all three ocean sites while the concentration of DOP in the inlet was about half that measured at Transects 1 and 2 (Tables 1 and 2). The concentration of NH_4^+ along Transects 1 and 2 decreased with increasing distance from the seawall while at Transect 3, the concentration increased with increasing distance from the shoreline (Figure 4).

At all three ocean sites, the surface concentration of Chl a was slightly higher near the shoreline compared to samples collected beyond 10 m of the shoreline (Figure 5). Chl a values were of the same magnitude at all three locations (Tables 1 and 2). With the exception of the sample collected 0.1 m from the shoreline at Transect 3, turbidity was essentially constant along the entire length of the transects and was of the same magnitude at the different locations (Figure 5).

With the exception of Chl a, measurements of surface water in the ponds showed no horizontal gradients in any of the constituents (Figures 2-5). In general, concentrations were constant from the seawall across the 200 m length of the pond. Chl a in the pond was highest near the seawall (0.18 µg/L) and lowest on the back side of the pond (0.06 µg/L).

In general, pond water had distinctly higher concentrations of water chemistry constituents compared to ocean water samples collected directly offshore of the seawall (Transects 1 and 2) (Figures 2-5). Concentrations of Si, TDN, NH_4^+, and turbidity were 5-6 times higher in surface pond water than measured in surface ocean water while NO_3^-, PO_4^{3-}, TPN, DON and DOP had a 2 to 3-fold enrichment in surface pond water (Tables 1 and 2). Salinity was approximately 6‰ lower in surface pond water compared to surface ocean waters (Figure 3). The distinct discontinuity between concentrations of water chemistry constituents between the seaward end of the pond and the nearshore portion of the ocean indicates that the boulder rampart is an effective barrier preventing free exchange between the pond and ocean. In addition, vigorous mixing action in the marine environment (primarily by breaking waves) results in mixing of the entire water column in the nearshore ocean. Such mixing does not occur in the pond owing to the boulder barrier that shields the pond from most wave action. As a result while separated by only several feet of boulder barrier, pond and ocean water display very different characteristics with little apparent communication.

It can also be seen that the concentrations of inorganic nutrients on Transect 3 (Si, NO_3^-, and PO_4^{3-}) located in the ocean were substantially higher than on Transect 4, located within Kaloko Pond. Dissolved organic nutrients (NH_4^+, DON, DOP), however, were substantially higher in the pond than in the ocean. These results suggest that groundwater input into Kaloko Pond is either lower than in the inlet sampled on Transect 3, or that the inorganic nutrients are rapidly taken up by pond plants and converted to organic material. As the salinity in the pond is similar to the most landward sampling point of Transect 3, it is likely that the input of nutrients into the two bodies of water is similar, but that there is considerably more uptake of nutrients in the pond than the ocean.

3.1.2 Vertical Stratification

In many areas of the Hawaiian Islands, input of low salinity groundwater to the nearshore ocean creates a distinct buoyant surface lens that persists for some distance from shore. Buoyant surface layers are generally found in areas where turbulent processes (primarily wave action) are insufficient to completely mix the water column in the nearshore zone. Figures 2 - 5 and Tables 1 and 2 show concentrations of water chemistry constituents with respect to vertical stratification for Transects 1 and 2 and the fishpond. Vertical stratification, as revealed by higher nutrient concentrations in the surface layer compared to the subsurface waters, was apparent for Si, NO_3^-, and TDN in samples collected beyond 50 m of the seawall at Transects 1 and 2. Similarly, salinity was lower in the surface layer as a result of incomplete mixing of groundwater effluxing from the shoreline with ocean water. Buoyant surface plumes were not evident within 50 m of the seawall, most likely a result of the shallow depths and breaking waves.

In general, the concentrations of NH_4^+, DON, DOP, turbidity and Chl a were not different in the surface water compared to deep water at either Transect 1 or Transect 2 (Tables 1 and 2).

Vertical stratification was clearly evident for all constituents measured in Kaloko Pond (Figures 2-5). Concentrations of TDN, TDP, DON, DOP, turbidity and salinity were distinctly higher in deep water compared to surface water (Figures 3-5). The concentration of PO_4^{3-} was higher in deep water for samples collected in the landward end of the pond; closer to the seawall the concentration of PO_4^{3-} was about the same in surface and deep water (Figure 2). Concentrations of NO_3^- and Si were distinctly lower in the deep water (Figure 2). Vertical stratification in Chl a did not follow an overall trend with respect to location in the pond (Figure 5).

3.1.3 Conservative Mixing Analysis

A useful treatment of water chemistry data for interpreting the extent of material input from land is application of a hydrographic mixing model. In the simplest form, such a model consists of plotting the concentration of a dissolved chemical species as a function of salinity. Comparison of the curves produced by such plots with conservative mixing lines provides an indication of the origin and fate of the material in question (Officer 1979, Dollar and Atkinson 1992, Smith and Atkinson 1993). Figures 6 and 7 shows plots of concentrations of four chemical constituents (Si, NO_3^-, PO_4^{3-}, NH_4^+) as functions of salinity for the samples collected at each transect in March 1996. Each graph on Figure 6 also shows a conservative mixing line that was constructed by connecting the end member concentrations of open ocean water and groundwater from a potable well located upland of Kaloko, while Figure 7 shows a conservative mixing line constructed by connecting the end member concentrations of open ocean water and *groundwater from* a potable well located upland of Kaloko.

If the parameter in question displays purely conservative behavior (no input or removal from any process other than physical mixing), data points should fall on, or very near, the conservative mixing line. If, however, external material is added to the system through processes such as leaching of fertilizer nutrients to groundwater, data points will fall above the mixing line. If material is being removed from the system by processes such as uptake by biotic metabolic processes, data points will fall below the mixing line.

Dissolved Si represents a check on the model as this material is present in high concentration in groundwater, but is not a major component of fertilizer. In addition, Si is not utilized rapidly within the nearshore environment by biological processes. It can be seen in Figures 6 and 7 that most of the data points fall very close to the conservative mixing line for Si; such agreement indicates that the end members used to construct the lines are representative of the system. In Figure 6, data points for Si from Transect 3 fall slightly above the conservative mixing line indicating that groundwater entering the ocean at this location is of a slightly different Si content than water in the pond. Similarly, in Figure 7, most data points for Si fall slightly above the mixing line, indicating that the Si content of the high level groundwater used to construct the mixing line has slightly lower Si content than groundwater entering the pond or ocean.

The plots of NO_3^- versus salinity reveal distinctly different results than plots of Si. Plots of concentrations of NO_3^- in Figure 6 show that most of the data points from the ocean fall above the conservative mixing line; data from Transect 3 (inlet) falls well above the line. Inspection of Figure 7 shows that the data points for NO_3^- in the pond are well below the conservative mixing line, while data point for the inlet samples fall above the line. This relationship suggests that most of the NO_3^- that enters Kaloko Pond via groundwater input is removed from the water column by plant uptake. The discontinuity between the pond and ocean samples suggests that there is little exchange between the pond and the ocean. The other form of dissolved inorganic nitrogen, NH_4^+, does not show a linear pattern of distribution with respect to salinity for any of the data points (Figures 6 and 7). Contrary to the pattern for NO_3^-, pond samples had the highest concentrations of NH_4^+. These relationships indicate that the concentrations of NH_4^+ are not a result of input to the pond or ocean from groundwater. Rather, NH_4^+ concentrations are a result of biological activity in the water column.

PO_4^{3-} is also a major component of fertilizer, but is usually not found to leach to groundwater to the extent of NO_3^-, owing to a high absorptive affinity of phosphorus in soils. Similar to the results for NO_3^-, the PO_4^{3-} data points for pond samples fall below the mixing line indicating uptake by pond plants (Figure 7). Data points from the ocean samples fall on the mixing line, while data points from Transect 3 fall above the conservative mixing line (Figure 7).

Several points can be made to summarize the results of mixing analyses. The lack of a substantial slope of the data lines of NO_3^- and PO_4^{3-} in pond waters indicate little gradations in constituents that are found in high concentrations in groundwater. This suggests that there is either little groundwater entering the pond, or uptake by plants is much more rapid than input. The lack of continuity in the lines prescribed by the data points indicates that there is little free exchange between the pond and the ocean; the boulder seawall is relatively effective in isolating pond water from the ocean. This exchange, however, is likely to vary as a function of tidal flow.

3.1.5 Compliance with DOH Standards

Tables 1 and 2 also show samples that exceed DOH water quality standards for open coastal waters under "wet" and "dry" conditions. These criteria are applied depending upon whether the area is likely to receive less than (dry) or greater than 3 million gallons (mgd) of groundwater input per mile per day (wet). TNWRE (1996) states that it is clear that the rate of groundwater flow to the shoreline in the Kalaoa area is quite limited. It is definitely less than 3 mgd per coastal mile, and is more likely in the range of 1-2 mgd per mile. However, for comparative purposes both wet and dry criteria area shown in Tables 1 and 2. DOH standards include specific criteria for three situations; criteria that are not to be exceeded during either 10% or 2% of the time, and criteria that are not to be exceeded by the geometric mean of samples. With only one sample collected from each sampling station, comparison of the 10% or 2% of the time criteria for any sample is not statistically meaningful. However, comparing sample concentrations to these criteria provide an indication of whether water quality is near the stated specific criteria.

Boxed values in Tables 1 and 2 show instances where measurements exceed the DOH standards under dry conditions while boxed and shaded values show instances where measurements exceed DOH standards under wet conditions. Thirteen of the 24 samples collected exceeded the 10% criteria for NO_3^- under dry conditions while 9 samples exceeded the 10% criteria under wet conditions in the March 1996 survey (Tables 1 and 2). It is important to note that all of the measurements at Transect 3, where groundwater influx was most evident, exceeded DOH criteria. Thus, it appears that input of natural groundwater can result in ocean water quality measurements that can be interpreted to exceed DOH standards.

In addition to NO_3^-, results from the March 1996 survey indicated that one measurement of NH_4^+, 3 measurements of TDP, and 3 measurements of TDN exceeded the 10% DOH criteria under dry conditions. If wet criteria are applied, only the 3 measurements of TDN exceed the DOH water quality standards. During the March 1996 survey, no measurements of turbidity or Chl a exceeded any DOH water quality standards.

3.2. BIOLOGICAL COMMUNITY ASSESSMENT

Marine community structure as represented in this report can be defined as the abundance, diversity, and distribution of benthos (bottom dwelling organisms), including stony and soft corals, marine plants (algae), motile benthos such as echinoderms, pelagic species such as reef fish, and federally protected species. When considering environmental changes caused by changes in land use or changes in non-point input of water of altered composition, benthic communities are probably the most useful biological assemblages for direct evaluation of environmental impacts to the offshore marine environment. Because benthos are generally long-lived, immobile, and can be significantly affected by exogenous input of sediments and other potential pollutants, these organisms must either tolerate the surrounding conditions within the limits of adaptability or die.

3.2.1 Physical Structure

As described above, Kaloko Pond and the open ocean are separated by a rampart of basaltic boulders. The main structural feature of the offshore area seaward of the rampart is a basaltic ledge of pahoehoe lava. Adjacent to the Kaloko Pond frontage the shoreline is composed of a rocky shoreline composed primarily of outcrops of lava that extend seaward.

Because of the structure of the boulder rampart that separates the pond from the ocean, there is virtually no intertidal area. Beyond the boulder shoreline, the structure of the offshore environment off of Kaloko generally conforms to the pattern that has been documented as characterizing much of the west coast of the Island of Hawaii (Dollar 1975, 1982, Dollar and Tribble 1993).

The zonation scheme consists of three predominant regions. Beginning at the shoreline and moving seaward, the shallowest zone beyond the shoreline is comprised of a seaward extension of the basaltic shoreline bench. *Pocillopora meandrina*, a sturdy hemispherical coral is the dominant colonizer of the nearshore area. This species is able to flourish in areas that are physically too harsh for most other species, particularly due to wave stress. The shallow flat pavement area directly in front of the Kaloko Pond seawall appears to be an ideal habitat for *Pocillopora meandrina*.

Moving seaward, the flat nearshore bench area terminates in a ledge that has a roughly vertical face that extends to a depth of approximately 25 feet. Beyond the ledge, bottom topography consists of a reef platform that is typical of West Hawaii. The transition area between the shallow flat pavement zone and the reef platform zone is characterized by high relief in the form of undercut ledges and basaltic boulder pinnacles. As wave stress in this region is less than in the shallower areas, and suitable hard substrata abound, the area provides an ideal locale for colonization by attached benthos, particularly reef corals, and generally the widest assortment of species and growth forms are encountered in this region. The predominant coral in the area in *Porites lobata*, which occurs in a variety of growth forms.

The seaward edge of the reef platform (at a depth of about 50 feet) is marked by an increase in slope to an angle of approximately 20-30 degrees. In the deep slope zone, substratum changes from the solid continuation of the island mass to an aggregate of generally unconsolidated sand and rubble. The predominant coral cover in the slope

zone is typically interconnected mats of "finger coral" (*Porites compressa*), which grow laterally over unconsolidated substrata.

3.2.2 Biotic Community Structure

3.2.2.1 Coral Communities

Table I shows abundance estimates of invertebrates observed throughout the region of study. The predominant taxon of macrobenthos (bottom-dwellers) throughout the reef zones off of Kaloko Pond are Scleractinian (reef- building) corals.

In total, twelve species of "stony" corals, and two "soft corals" were observed throughout the region of study. The dominant species in all of the zones off Kaloko was *Porites lobata*. The second and third most abundant species were *Porites compressa* and *Pocillopora meandrina*. Other species that were common in the shallow nearshore areas were *Montipora verrucosa*, *M. patula* and *Pavona varians*. It was estimated that coral cover on the shallow bench comprised approximately 15% of bottom cover. It was not apparent that community structure in the shallow nearshore areas adjacent to the boulder rampart separating the ocean from the pond was affected by freshwater flow from the pond.

The mid-depth reef platform zone had the highest number of coral species at three of the four survey sites. In the mid-depth zone, dominant species were *Porites lobata* and *Porites compressa*. *Porites lobata* occurs in various growth forms including flat encrustations and large dome-shaped colonies, which are responsible for much of the true "reef" accumulation in the mid-depth zones. The abundance of suitable solid surfaces for coral settlement and growth, as well as the reduced wave stress compared to the shallower boulder zones provides a suitable setting for a variety of smaller encrusting coral species. Coral cover on the outer reef platform comprised approximately 40-60% of bottom cover.

3.2.2.2 Other Benthic Macroinvertebrates

The other dominant group of macroinvertebrates are the sea urchins (Class Echinoidea). The most common urchin was *Echinometra matheai*, which occurred in all reef zones. *E. matheai* are small urchins that are generally found within interstitial spaces bored into basaltic and limestone substrata. *Tripneustes gratilla*, and *Heterocentrotus mammillatus* were other species of urchins that occurred commonly throughout the reef. Both of these urchins occur as larger individuals (compared with *E. matheai*) that are generally found on the reef surface, rather than within interstitial spaces.

Sea cucumbers (Holothurians) observed during the survey consisted of three species, *Holothuria atra*, *H. nobilis*, and *Actinopyga obesa*. Individuals of these species were distributed sporadically across the mid-reef and deep reef zones (Table 1). Numerous sponges were also observed on the reef surface, often under ledges and in interstitial spaces.

Frondose benthic algal zonation was not apparent at the study area off of Kaloko. However, encrusting red calcareous algae (*Porolithon spp.*, *Peysonellia rubra*, *Hydrolithon spp.*) were common on the boulders and exposed rocks throughout the study area. These algae were also abundant on bared limestone surfaces, and on the non-living parts of coral colonies.

The design of the reef survey was such that no cryptic organisms or species living within interstitial spaces of the reef surface were enumerated. Since this is the habitat of the majority of mollusks and crustacea, detailed species counts were not included in the assessment. No dominant communities of these classes of biota were observed during the reef surveys at any of the study stations.

3.2.2.3 Reef Fish Community Structure

Reef fish community structure was largely determined by the topography and composition of the benthos. The reef fish community off Kaloko is typical of that found along most of the Kona Coast, as described by Hobson (1974), and Walsh (1984). Fish community structure can be divided into six general categories: juveniles, planktivorous damselfishes, herbivores, rubble-dwelling fish, swarming tetrodonts, and surge-zone fish.

Surgeonfish (*Acanthuridae*) were the most abundant family of fish. The most common species were the yellow tang (lau'i-pala, *Zebrasoma flavescens*) and the goldring surgeonfish (kole, *Ctenochaetus strigosus*). On the shallower reef terrace, adult whitebar surgeonfish (maikoiko, *Acanthurus leucopareius*), orangeband surgeonfish (na'ena'e, *A. olivaceus*), and parrotfish (uhu, *Scarus spp.*) were also common. Planktivorous damselfish, principally of the genus *Chromis* were abundant in all areas surveyed. In areas where coral rubble was abundant, common fish included potters angelfish (*Centropyge potteri*), and several species of wrasses, notably fourline wrasse (*Psuedochilinus tetrataenia*), eightline wrasse (*P. octotaenia*), and yellowtail wrasse (aki-lolo, *Coris gaimard*).

Surge zone fish consisted principally of herbivores such as rudderfish (nenue, *Kyphosus bigibbus*), surgeonfish (*Acanthurus spp.*), and unicornfish (mostly umaumalei, *Naso lituratus*). Saddle wrasse (hinalea lau-wili, *Thallassoma trilobatum*) and surge wrasse (hou, *T. purpureum*) were also abundant in the surge zone. Black durgeon (humuhumu-ele'ele, *Melanichthys niger*) and pinktail durgeon (humuhumu-hi'u-kole, *M. vidula*) were also observed congregating in the water column over the reef platform.

Several species of "food fish" (taken by subsistence and/or recreational fishermen) were observed during the survey. Rocky ledges and large coral heads sheltered fair numbers of squirrelfish (u'u, *Myripristes berndti*). Other food fishes included parrotfish (uhu, *Scarus spp.*), goatfish (moana kea and malu, *Parupaneus cyclostomus* and *P. bifasciatus*), jacks (papio, *Caranx melamphygus*), and grouper (roi, *Cephalopholus argus*). None of these species were particularly abundant. Orange-eyed surgeonfish (kole, *Ctenochaetus strigosus*), while abundant, was generally not large enough to be considered suitable as "food fish." Overall, fish community structure at Kaloko appeared fairly typical of the assemblages found in West Hawaii reef environments.

3.2.2.4 Endangered and Protected Species

Several species of marine animals that occur in Hawaiian waters have been declared threatened or endangered by Federal jurisdiction. The threatened green sea turtle (*Chelonia mydas*) occurs commonly along the Kona Coast, and is known to feed on selected species of macroalgae. The endangered hawksbill turtle (*Eretmochelys imbricata*) is known infrequently from waters off the Kona Coast. Several green sea turtles were sighted on the surface and underwater during the baseline surveys off Kaloko Pond.

Populations of the endangered humpback whale (*Megaptera novaeangliae*) are known to winter in the Hawaiian Islands from December to April. The present survey was conducted in March, when whales were present in Hawaiian waters. No whales were observed during the course of the survey. Similarly, no Hawaiian monk seals (*Monachus schlauslandi*) were observed in the area.

4.0 CONCLUSIONS

The purpose of this baseline survey is to provide the data for to make valid estimates of the potential for impact to the marine and Kaloko pond environment from shoreline development. There are, however, no plans for any direct alteration of the shoreline or offshore areas. Therefore, potential impacts to the marine environment can only be considered from activities on land that may result in delivery of materials to the ocean through infiltration to groundwater, changes in surface runoff, and wind transport. The project may have an impact on groundwater as a result of: 1) disposal of wastewater generated on-site; 2) disposal of stormwater runoff; and 3) percolating water from landscape irrigation. Presented below are considerations of potential impacts from sedimentation, nutrient enrichment and biocides that may are considerations for the planned project.

4.1 SEDIMENTATION AND RUNOFF

A potential mechanism for negative impact to nearshore marine and pond systems is increased sedimentation from wind and surface runoff as a consequence of grading and changes in land use. There appears to be little potential for alteration to the marine community offshore of Kaloko Town Center from increased sedimentation associated with the project for several reasons. The climate of the Kaloko area is one of the driest in the Hawaiian Islands. On an annual basis rainfall is likely to be far exceeded by evaporation at the proposed project site. Surface water runoff from storm events is infrequent. The basaltic composition of the land surface is highly porous and is capable of absorbing rainfall with little or no surface Even in the event of heavy rainfall, the porous nature of the soil ground cover is such that sheet flow carrying suspended sediment toward the ocean would be expected to be relatively small. Rather, most rainwater that would enter the ocean as runoff would do so following percolation through the surface rock layers to the water table, followed by groundwater extrusion at the shoreline.

The project site is presently comprised of extensive areas of exposed soil, with relatively little vegetative groundcover. During the construction phases, it is likely that permit regulations will limit the area of excavation at any one time, and require dust-control measures. In addition, the predominant direction of wind (land breezes) generated by thermal convection from solar heating of the land mass is inland, resulting in transport of dust inland, and not toward the ocean. As a result, it appears that there is little potential for significant input of sediment to the marine and pond environment resulting from the proposed project.

Within the marine environment, the nearshore area contains locally high regions of cover of calcareous sands of marine origin. Corals and other reef organisms are capable of removing sediment suspended by natural phenomena, up to threshold levels of deposition where cleaning mechanisms are overwhelmed and organisms become buried. Because of the existence of natural sands, and the normally turbulent conditions which continually resuspend natural sediment, biotic community structure is presently adapted to extremes in sediment stress from natural conditions. Organisms that do occur in the region are therefore capable of withstanding the stress associated with large natural sediment loads. In comparison to the frequent natural sediment resuspension within the study area, any additional input from land resulting from construction activity would probably not have the potential to accumulate to the point were organisms could be buried.

The entire floor of Kaloko Pond is covered with a thick layer of fine mud-sand sediment. Pond biota is adapted to this high sediment composition. Should a small amount of sediment reach the pond as a result of construction activity, it is not likely that there will be any qualitative change to sediment composition.

4.2 ALTERATION OF GROUNDWATER FLOW

TNWRE (1996) provides a detailed description of the hydrology of the Kaloko area and the potential for changes that may occur to groundwater discharge to the ocean as a result of the Kaloko Town Center project. In summary, TNWRE found that natural groundwater discharge to the ocean is quite limited, with a likely range of 1-2 million gallons per day per shoreline mile. Salinity and temperature profiles across Kaloko Pond reveal little evidence of direct input of low temperature groundwater. Results of the present study also indicate that based on salinity, water in the pond is a mix of about 80% seawater to 20% freshwater (not accounting for evaporation). In addition, the lack of distinct horizontal gradients of salinity within the pond suggest that the input of groundwater is relatively small.

There appear to be no potential effects to Kaloko Pond or the adjacent offshore areas from wastewater generated by the Kaloko Town Center since sewage generated by the project would be conveyed via lift stations to a force main along Queen Kaahumanu Highway to the County Kealakehe Waste Water Treatment Plant.

Percolation to water supplied by the DWS drinking water system and used for landscape irrigation within the project is estimated at 40,000 to 50,000 gallons per day. The irrigation return flow would amount to an increase of 3% to 4% to the 1.2 mgd groundwater flows directly beneath the 224-acre site (TNWRE 1996). If the change in additional groundwater flowed into Kaloko Pond also equaled an increase of 3% (assuming that the groundwater has a salinity of zero) the change in salinity would be less than 1‰. This small change is well within the natural variability of the system as salinity measured in Kaloko Pond varied from 27-30‰. In addition, the strong vertical stratification of Pond waters indicates that incoming groundwater is restricted to a surface layer that is not in contact with the pond bottom. Thus, any increase in groundwater input would likely have the effect of only decreasing salinity in the surface layer. The distinct break in salinity between pond water and ocean water indicates that there is little direct mixing of water through the boulder seawall. Thus, any increase in freshwater input would have little effect on the ocean side of the wall.

TNWRE (1996) also estimates that if fertilizers are applied reasonably in the landscaped areas of the project, the nutrient concentrations of the percolate will be of the same magnitude as natural underlying groundwater. It was determined through the use of mixing diagrams that the inorganic nutrients that occur in groundwater (primarily NO_3^- and PO_4^{3-}) were depleted in Kaloko Pond as a result of uptake by plants. Such uptakes suggests that the Pond may be nutrient limited with respect to plant growth. Should there be a slight increase in groundwater delivery to the Pond without alteration in nutrient concentration t is not likely that there would be any change to the Pond chemistry or biota.

As discussed above, with the exceptionally permeable character of the project site in the natural state, surface runoff during even extreme storm events in not known to occur. The high surface permeability enables all rainfall to infiltrate and percolate downward rather than flow across the site as runoff. With the project in place, impervious surfaces would be created and drainage facilities would be installed to convey runoff to onsite dry wells and/or seepage pits. TNWRE (1996) calculates that the amount of rainwater that reaches underlying groundwater over the 224-acre site is 0.1 to 0.15 mgd. With development, part of this water would be captured by drainage conveyance systems and disposed of in onsite wells or pits. As a result, the quantity of rainfall which would ultimately reach groundwater to flow to Kaloko Pond and the ocean would not be altered from natural conditions.

While water volume of surface runoff would not change, TNWRE (1996) estimates that the nutrient content of runoff will be 50% higher when the site is fully developed. Thus, for the 8-12% of the groundwater increase resulting from surface runoff nutrient concentrations could increase about 5 µM for nitrogen and from 0.2 µM for phosphorus. When this water is mixed with the natural underlying groundwater, the change would be on the order of an increase of 0.5 µM for nitrogen and 0.02 µM for phosphorus. Measured concentrations of total nitrogen and total phosphorus in high level wells above Kaloko range from 79-88 µM and 3.58-3.59 µM, respectively. Thus the potential increases in nutrient concentrations from surface runoff are well within the natural range of variability.

4.3 POTENTIAL EFFECTS TO PROTECTED SPECIES

As mentioned in the Results there are several protected marine species that may inhabit the offshore environment. Because there is no plan for any work in the nearshore region, there is no potential for blasting or excavation that might affect behavior of whales, monk seals and other marine mammals. Similarly, as described above, there is little potential for changes in water quality resulting from construction. As the Kaloko area is a National Park, the Kaloko Town Center project will not alter access to the shoreline. Thus, there is little potential for any negative factors associated with the project that may affect turtles or other protected species.

5.0 SUMMARY

The potential for impact to marine and pond communities as a result of development of the Kaloko Town Center project appears to be minimal. Water in Kaloko Pond is presently a mixture of seawater and groundwater that is strongly stratified vertically, and weakly stratified horizontally. These patterns suggest that input of groundwater to the pond is small in magnitude, and there is little mixing within the pond by physical processes. Inorganic nutrients entering the pond from groundwater input are removed from the water column by plant uptake. The distinct discontinuity between concentrations of water chemistry constituents between the seaward end of the pond and the nearshore portion of the ocean indicates that the boulder rampart is an effective barrier preventing free exchange between the pond and ocean. In addition, vigorous mixing action in the marine environment (primarily by breaking waves) results in mixing of the entire water column in the nearshore ocean. Such mixing does not occur in the pond owing to the boulder barrier that shields the pond from most wave action. As a result while separated by only several feet of boulder barrier, pond and ocean water display very different characteristics with little apparent communication. In addition, the marine communities adjacent to the boulder rampart do not appear to be affected by freshwater intrusion.

Estimates of changes in groundwater flow volume and composition from the Kaloko Twon Center project indicate that there does not appear to be potential to induce long-term changes in physio-chemical composition of pond or marine waters of a magnitude sufficient to cause changes in biological community structure. No wastewater produced by the project would be disposed onsite. Increases in groundwater input from irrigation of landscaping would be small in relation to natural groundwater flow. Onsite stormwater disposal would not result in a change in discharge volume, but would result in a small addition to the nutrient content of the groundwater. However, this addition is well within the natural variability of uncontaminated groundwater. Aquatic and marine environments are routinely subjected to stresses that can be much more destructive than the small changes that might result from any development activity.

Tolerance to such changes appears to already be part of the physiological range of the community.

6.0 REFERENCES CITED

Dollar, S. J. and M. J. Atkinson. 1992. Effects of nutrient subsidies from groundwater to nearshore marine ecosystems off the Island of Hawaii. Est. Coast. Shelf Sci. 35:409- 424.

Grasshoff, K. 1983. Methods of seawater analysis. Verlag Chemie, Weinheim, 419 pp.

Hobson, E. S. 1974. Feeding relationships of teleostean fishes on coral reefs in Kona, Hawaii. Fishery Bull. 72:915-1031.

Tom Nance Water Resource Engineering. 1996. Potential impact on groundwater from Kaloko Town Center. Prepared for Tokyo Green.

Officer, C. B. 1979. Discussion of the behavior of nonconservative dissolved constituents in estuaries. Est. Coast. Mar. Sci. 9:569-576.

Smith, S. V. and M. J. Atkinson 1993. Mass balance analysis of C, N, and P fluxes in coastal water bodies, including lagoons. Coastal Lagoon Processes. (ed) B. Kjerfve, Elsevier Oceanography Series, 60. pp. 123-145.

Strickland J. D. H. and T. R. Parsons. 1968. A practical handbook of sea-water analysis. Fisheries Research Bd. of Canada, Bull. 167. 311 p.

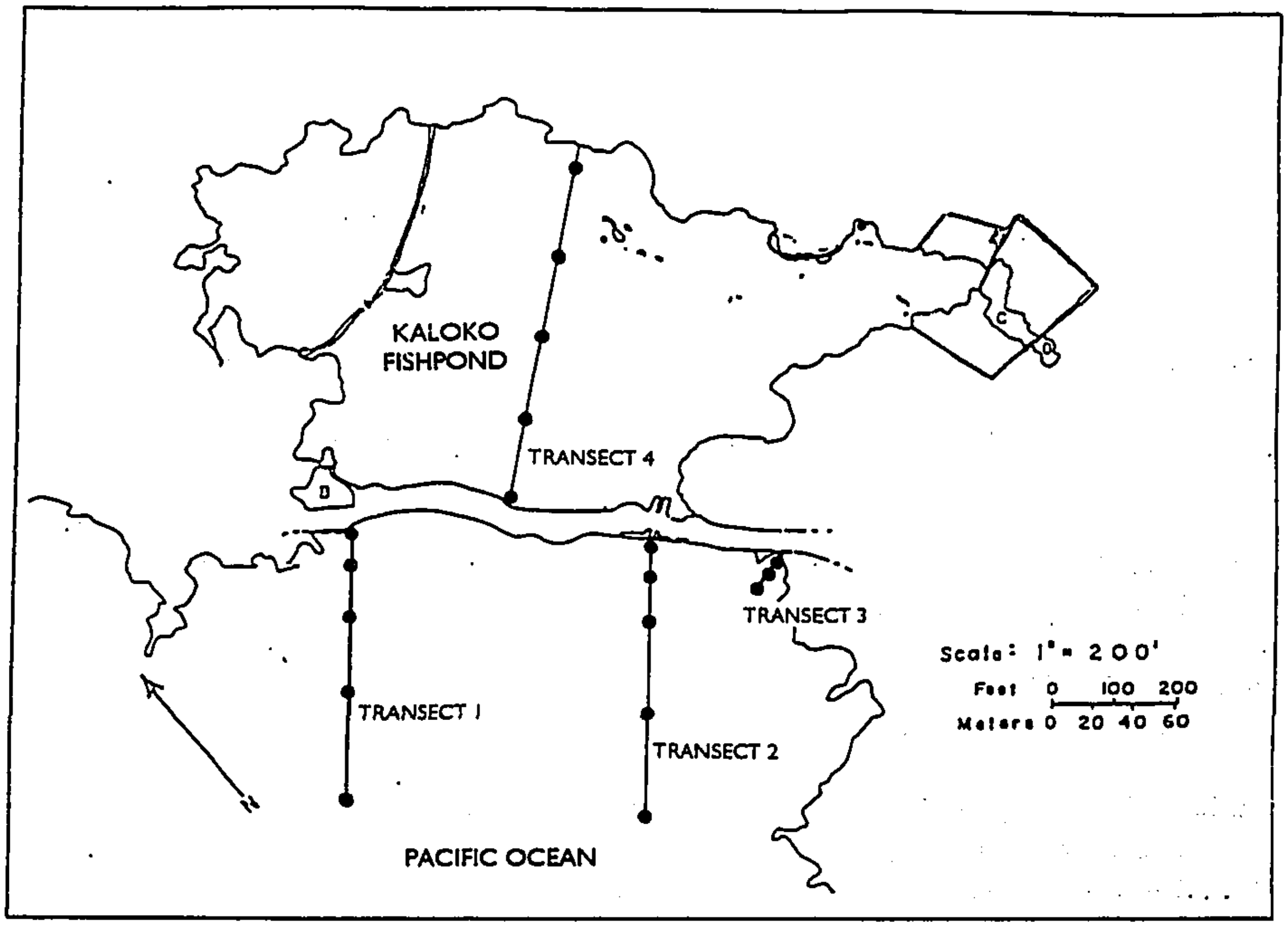


FIGURE 1. Map showing boundaries of Kaloko Fishpond and locations of four water sampling transects in the pond and ocean. Circles on transect lines indicate approximate location where water samples were collected.

TABLE 1. Water chemistry measurements from ocean (KTC-1, KTC-2 and KTC-3) and pond samples collected in the vicinity of the Koloko Town Center project on March 15, 1996. Abbreviations as follows: DFS=distance from seawall; S=surface; D=deep. Boxed values exceed DOH criteria for open coastal waters under "dry" conditions; boxed and shaded values exceed DOH criteria for open coastal waters under "wet" conditions. For sampling site locations, see Figure 1.

SITE	NO.	DFS (m)	PO4 (µM)	NO3 (µM)	NH4 (µM)	Si (µM)	DOP (µM)	DON (µM)	TDP (µM)	TDN (µM)	TURB (NTU)	SALINITY (o/oo)	CHL a (µg/L)	pH
KTC-1-	1-S	1	0.28	2.09	0.35	33.86	0.27	6.93	0.55	9.37	0.12	33.019	0.08	8.27
	2-S	5	0.21	1.32	0.21	29.70	0.26	6.49	0.47	8.02	0.11	33.151	0.09	8.26
	3-S	20	0.19	1.18	0.19	24.37	0.29	6.36	0.48	7.73	0.10	33.354	0.08	8.23
	3-D	20	0.27	1.61	0.38	32.99	0.25	6.69	0.52	8.68	0.10	33.006	0.08	8.27
	4-S	50	0.17	0.53	0.11	10.94	0.27	6.10	0.44	6.74	0.10	33.917	0.09	8.18
	4-D	50	0.16	0.51	0.14	9.56	0.29	6.53	0.45	7.18	0.08	33.933	0.07	8.18
	5-S	100	0.12	0.65	0.05	11.82	0.30	6.22	0.42	6.92	0.10	33.843	0.08	8.17
	5-D	100	0.15	0.44	0.05	8.50	0.30	6.44	0.45	6.93	0.08	34.000	0.08	8.16
	6-S	150	0.18	0.72	0.13	12.43	0.26	7.04	0.44	7.89	0.09	33.902	0.07	8.16
	6-D	150	0.13	0.27	0.04	4.01	0.32	6.15	0.45	6.46	0.12	34.160	0.06	8.16
KTC-2-	1-S	1	0.20	1.45	0.20	24.70	0.29	6.44	0.49	8.09	0.09	33.310	0.10	8.23
	2-S	5	0.14	0.49	0.11	11.88	0.29	5.53	0.43	6.13	0.10	33.844	0.13	8.20
	3-S	20	0.16	0.64	0.16	15.59	0.29	6.16	0.45	6.96	0.10	33.688	0.07	8.21
	4-S	50	0.18	0.73	0.11	17.19	0.27	6.18	0.45	7.02	0.10	33.653	0.08	8.20
	4-D	50	0.17	0.73	0.08	16.84	0.28	6.12	0.45	6.93	0.12	33.659	0.10	8.21
	5-S	100	0.16	0.58	0.12	12.91	0.26	5.71	0.42	6.41	0.10	33.815	0.08	8.18
	5-D	100	0.14	0.18	0.11	4.44	0.28	5.91	0.42	6.20	0.10	34.123	0.07	8.17
	6-S	150	0.16	0.75	0.15	14.40	0.28	6.28	0.44	7.18	0.14	33.774	0.08	8.19
	6-D	150	0.13	0.12	0.05	3.85	0.28	6.02	0.41	6.19	0.09	34.166	0.07	8.16
KTC-3-	1-S	0.1	1.08	21.99	0.18	194.17	0.14	6.14	1.22	28.31	0.07	26.805	0.12	8.22
	2-S	2	1.06	20.89	0.27	183.36	0.16	6.95	1.22	28.11	0.13	27.195	0.12	8.22
	3-S	5	0.83	14.80	0.32	136.65	0.19	6.63	1.02	21.75	0.17	29.030	0.09	8.24
	4-S	10	0.25	2.03	0.38	29.11	0.27	7.03	0.52	9.44	0.11	33.188	0.09	8.26
POND	1-S	1	0.33	1.52	0.89	135.56	0.59	21.76	0.92	24.17	0.53	28.500	0.18	
	1-D	1	0.32	0.43	0.71	105.49	0.77	25.59	1.09	26.73	0.51	29.780	0.08	
	2-S	50	0.37	3.19	0.61	168.08	0.56	21.04	0.93	24.84	0.49	27.169	0.10	
	2-D	50	0.41	0.49	0.54	118.00	0.94	27.96	1.35	28.99	0.42	29.304	0.15	
	3-S	100	0.46	0.78	0.61	145.72	0.55	22.60	1.01	23.99	0.48	28.136	0.18	
	3-D	100	0.33	0.14	0.23	104.55	1.12	30.32	1.45	30.69	0.73	29.969	0.13	
	4-S	150	0.45	1.94	0.71	177.03	0.53	20.07	0.98	22.72	0.51	26.846	0.12	
	4-D	150	0.64	0.24	0.38	102.84	3.00	58.58	3.64	59.20	0.66	30.262	0.14	
	5-S	200	0.42	2.57	0.68	167.54	0.61	20.93	1.03	24.18	0.47	27.256	0.06	
	5-D	200	0.71	0.08	0.14	112.80	12.81	179.21	13.52	179.43	1.03	29.982	0.09	
DOH W.Q. STDS for "DRY" COND.														
NOT TO EXCEED 10%				0.71	0.36				0.96	12.86	0.50		0.50	
NOT TO EXCEED 2%				1.43	0.64				1.45	17.86	1.00		1.00	
DOH W.Q. STDS for "WET" COND.														
NOT TO EXCEED 10%				1.00	0.60				1.29	17.85	1.25		0.90	
NOT TO EXCEED 2%				1.78	1.07				1.93	25.00	2.00		1.75	

TABLE 2. Water chemistry measurements (in µg/L) from ocean (KTC-1, KTC-2 and KTC-3) and pond samples collected in the vicinity of the Koloko Town Center project on March 15, 1996. Abbreviations as follows: DFS=distance from seawall; S=surface; D=deep. Boxed values exceed DOH criteria for open coastal waters under "dry" conditions; boxed and shaded values exceed DOH criteria for open coastal waters under "wet" conditions. For sampling site locations, see Figure 1.

SITE	NO.	DFS (m)	PO4 (µg/L)	NO3 (µg/L)	NH4 (µg/L)	Si (µg/L)	DOP (µg/L)	DON (µg/L)	TDP (µg/L)	TDN (µg/L)	TURB (NTU)	SALINITY (o/oo)	CHL a (µg/L)	pH
KTC-1-	1-S	1	8.68	29.26	4.90	951.5	8.37	97.02	17.05	131.18	0.12	33.019	0.08	8.27
	2-S	5	6.51	18.48	2.94	834.6	8.06	90.86	14.57	112.28	0.11	33.151	0.09	8.26
	3-S	20	5.89	16.52	2.66	684.8	8.99	89.04	14.88	108.22	0.10	33.354	0.08	8.23
	3-D	20	8.37	22.54	5.32	927.0	7.75	93.66	16.12	121.52	0.10	33.006	0.08	8.27
	4-S	50	5.27	7.42	1.54	307.4	8.37	85.40	13.64	94.36	0.10	33.917	0.09	8.18
	4-D	50	4.96	7.14	1.96	268.6	8.99	91.42	13.95	100.52	0.08	33.933	0.07	8.18
	5-S	100	3.72	9.10	0.70	332.1	9.30	87.08	13.02	96.88	0.10	33.843	0.08	8.17
	5-D	100	4.65	6.16	0.70	238.9	9.30	90.16	13.95	97.02	0.08	34.000	0.08	8.16
	6-S	150	5.58	10.08	1.82	349.3	8.06	96.56	13.64	110.46	0.09	33.902	0.07	8.16
	6-D	150	4.03	3.78	0.56	112.7	9.92	86.10	13.95	90.44	0.12	34.160	0.06	8.16
KTC-2-	1-S	1	6.20	20.30	2.80	694.1	8.99	90.16	15.19	113.26	0.09	33.310	0.10	8.23
	2-S	5	4.34	6.86	1.54	333.8	8.99	77.42	13.33	85.82	0.10	33.844	0.13	8.20
	3-S	20	4.96	8.96	2.24	438.1	8.99	86.24	13.95	97.44	0.10	33.688	0.07	8.21
	4-S	50	5.58	10.22	1.54	483.0	8.37	86.52	13.95	98.28	0.10	33.653	0.08	8.20
	4-D	50	5.27	10.22	1.12	473.2	8.68	85.68	13.95	97.02	0.12	33.659	0.10	8.21
	5-S	100	4.96	8.12	1.68	362.8	8.06	79.94	13.02	89.74	0.10	33.815	0.08	8.18
	5-D	100	4.34	2.52	1.54	124.8	8.68	82.74	13.02	86.80	0.10	34.123	0.07	8.17
	6-S	150	4.96	10.50	2.10	404.6	8.68	87.92	13.64	100.52	0.14	33.774	0.08	8.19
	6-D	150	4.03	1.68	0.70	108.2	8.68	84.28	12.71	86.66	0.09	34.166	0.07	8.16
KTC-3-	1-S	0.1	33.48	307.86	2.52	5456.2	4.34	85.96	37.82	398.34	0.07	26.805	0.12	8.22
	2-S	2	32.86	292.46	3.78	5152.4	4.96	97.30	37.82	393.54	0.13	27.195	0.12	8.22
	3-S	5	25.73	207.20	4.48	3839.9	5.89	92.82	31.62	304.50	0.17	29.030	0.09	8.24
	4-S	10	7.75	28.42	5.32	818.0	8.37	98.42	16.12	132.16	0.11	33.188	0.09	8.26
POND	1-S	1	10.23	21.28	12.47	3809.2	18.29	304.64	28.52	338.38	0.53	28.500	0.18	-
	1-D	1	9.92	6.02	9.94	2964.3	23.87	358.26	33.79	374.22	0.51	29.780	0.08	-
	2-S	50	11.47	44.66	8.54	4723.0	17.36	294.56	28.83	347.76	0.49	27.169	0.10	-
	2-D	50	12.71	6.86	7.56	3315.8	29.14	391.44	41.85	405.86	0.42	29.304	0.15	-
	3-S	100	14.26	10.92	8.54	4094.7	17.05	316.40	31.31	335.86	0.48	28.136	0.18	-
	3-D	100	10.23	1.96	3.22	2937.9	34.72	424.48	44.95	429.66	0.73	29.969	0.13	-
	4-S	150	13.95	27.16	9.94	4974.5	16.43	280.98	30.38	318.08	0.51	26.846	0.12	-
	4-D	150	19.84	3.36	5.32	2889.8	93.00	820.12	112.84	828.80	0.66	30.262	0.14	-
	5-S	200	13.01	36.00	9.52	4706.2	18.89	293.15	31.90	338.67	0.47	27.256	0.06	-
	5-D	200	22.01	1.12	1.96	3169.7	397.11	2508.94	419.12	2512.02	1.03	29.982	0.09	-
DOH W.Q. STDS for "DRY" COND.														
NOT TO EXCEED 10%				10.00	5.00				30.00	180.00	0.50		0.50	
NOT TO EXCEED 2%				20.00	9.00				45.00	250.00	1.00		1.00	
DOH W.Q. STDS for "WET" COND.														
NOT TO EXCEED 10%				14.00	8.50				40.00	250.00	1.25		0.90	
NOT TO EXCEED 2%				25.00	15.00				60.00	350.00	2.00		1.75	

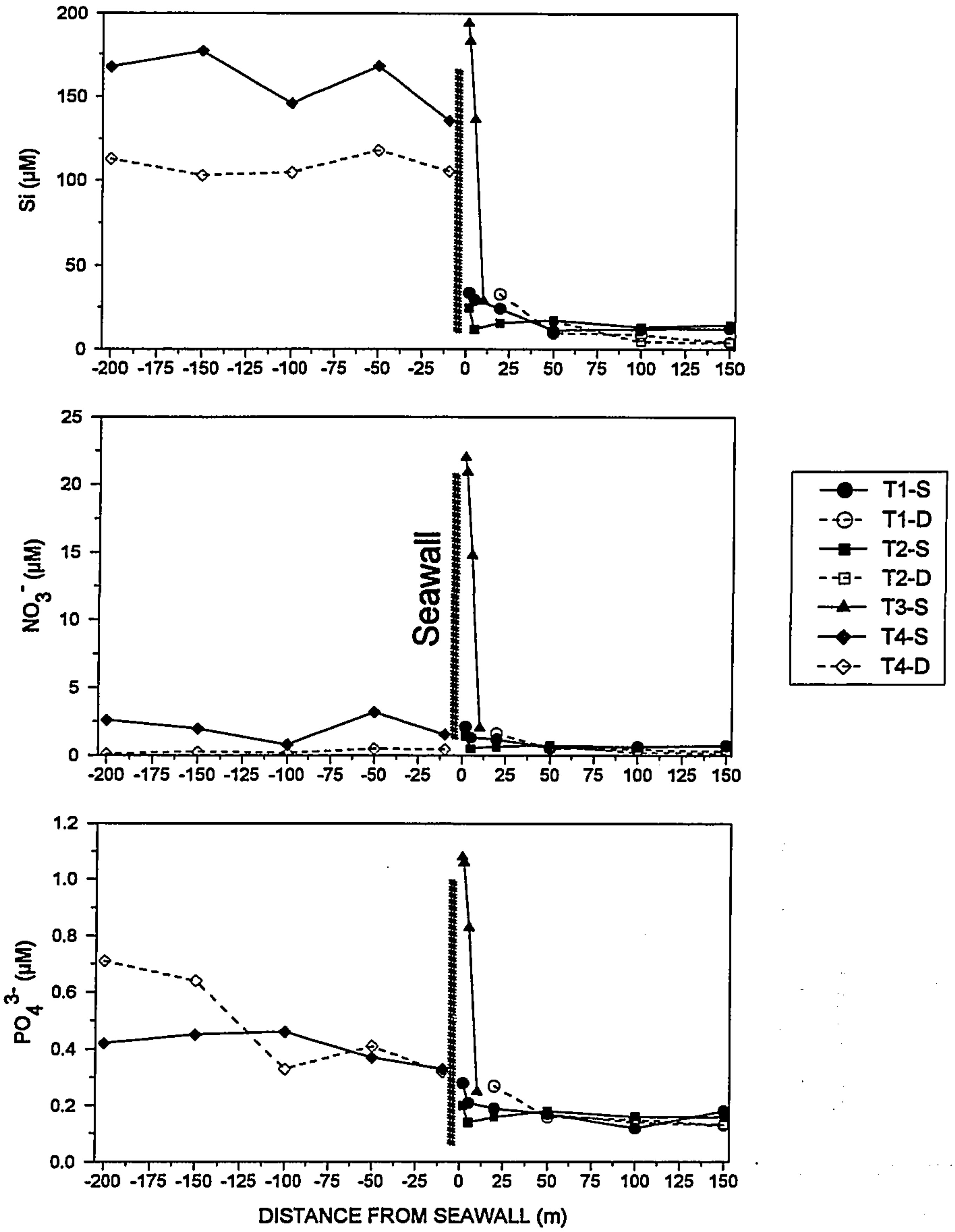


FIGURE 2. Plots of water chemistry constituents in surface (S) and deep (D) samples collected on three ocean transects and in the Koloko fishpond on March 15, 1996 as a function of distance from the seawall. Positive distances are distances from the seawall into the ocean, negative distances are distances from the seawall into the fishpond. For transect locations, see Figure 1.

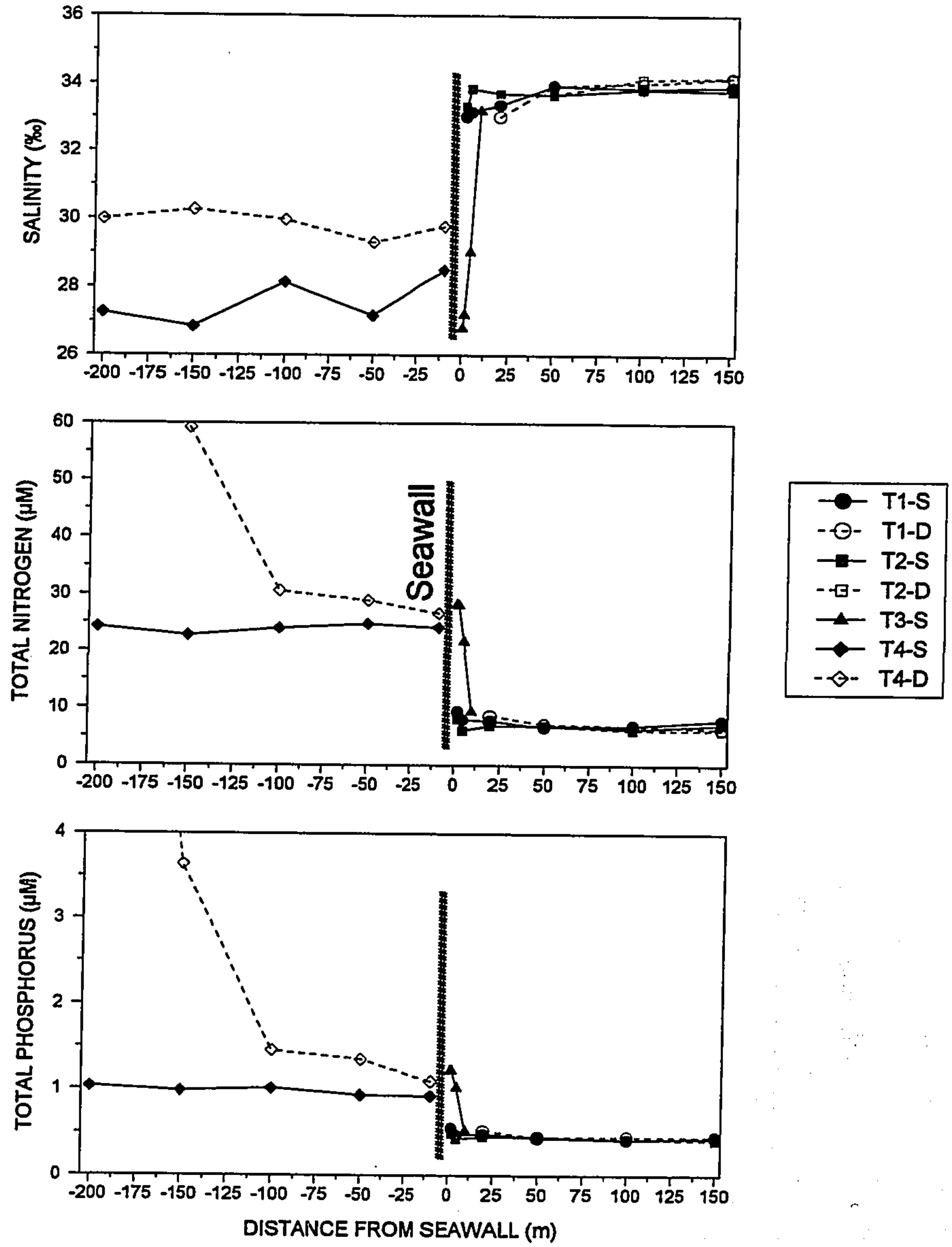


FIGURE 3. Plots of water chemistry constituents in surface (S) and deep (D) samples collected on three ocean transects and in the Koloko fishpond on March 15, 1996 as a function of distance from the seawall. Positive distances are distances from the seawall into the ocean, negative distances are distances from the seawall into the fishpond. For transect locations, see Figure 1.

CORRECTION

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

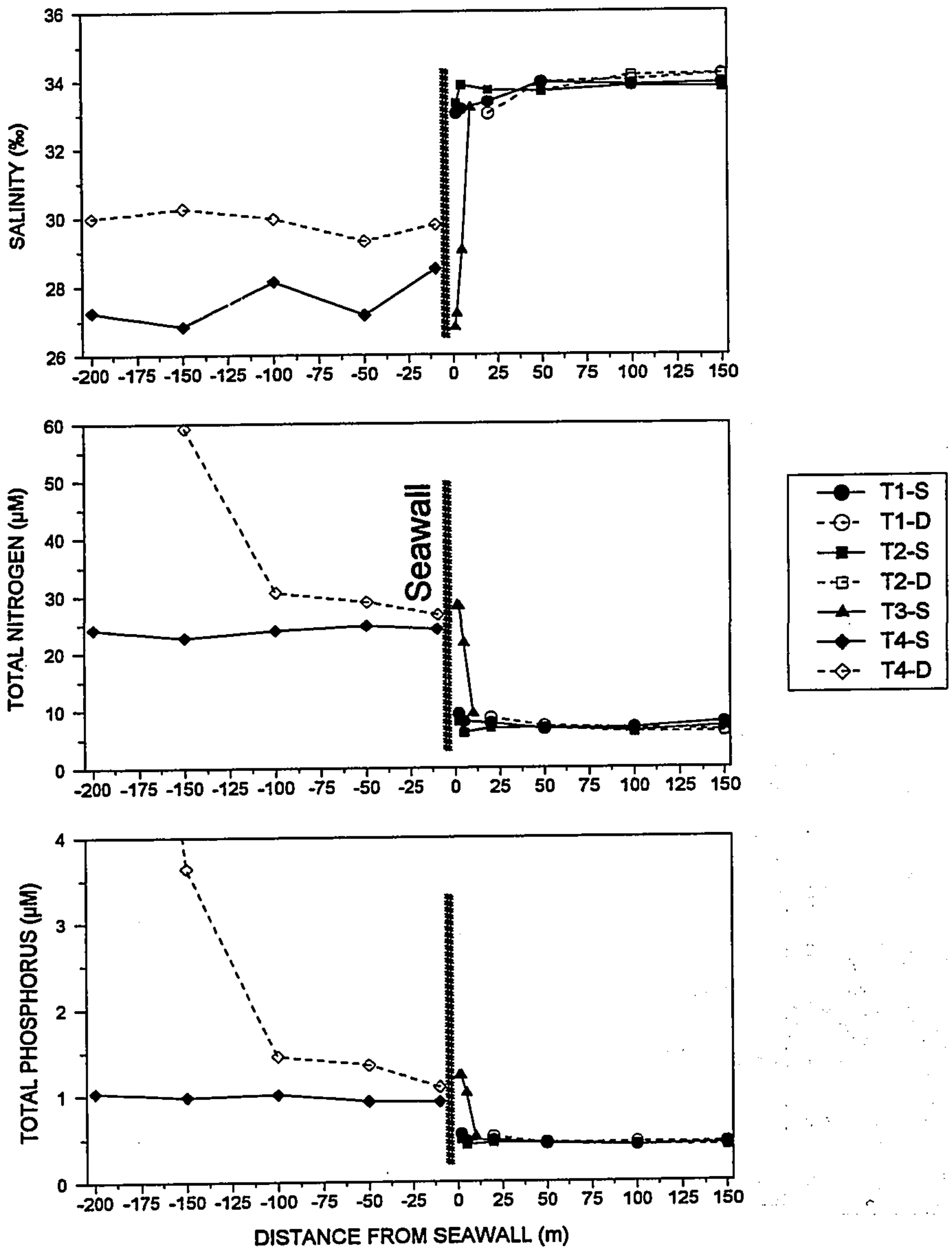


FIGURE 3. Plots of water chemistry constituents in surface (S) and deep (D) samples collected on three ocean transects and in the Koloko fishpond on March 15, 1996 as a function of distance from the seawall. Positive distances are distances from the seawall into the ocean, negative distances are distances from the seawall into the fishpond. For transect locations, see Figure 1.

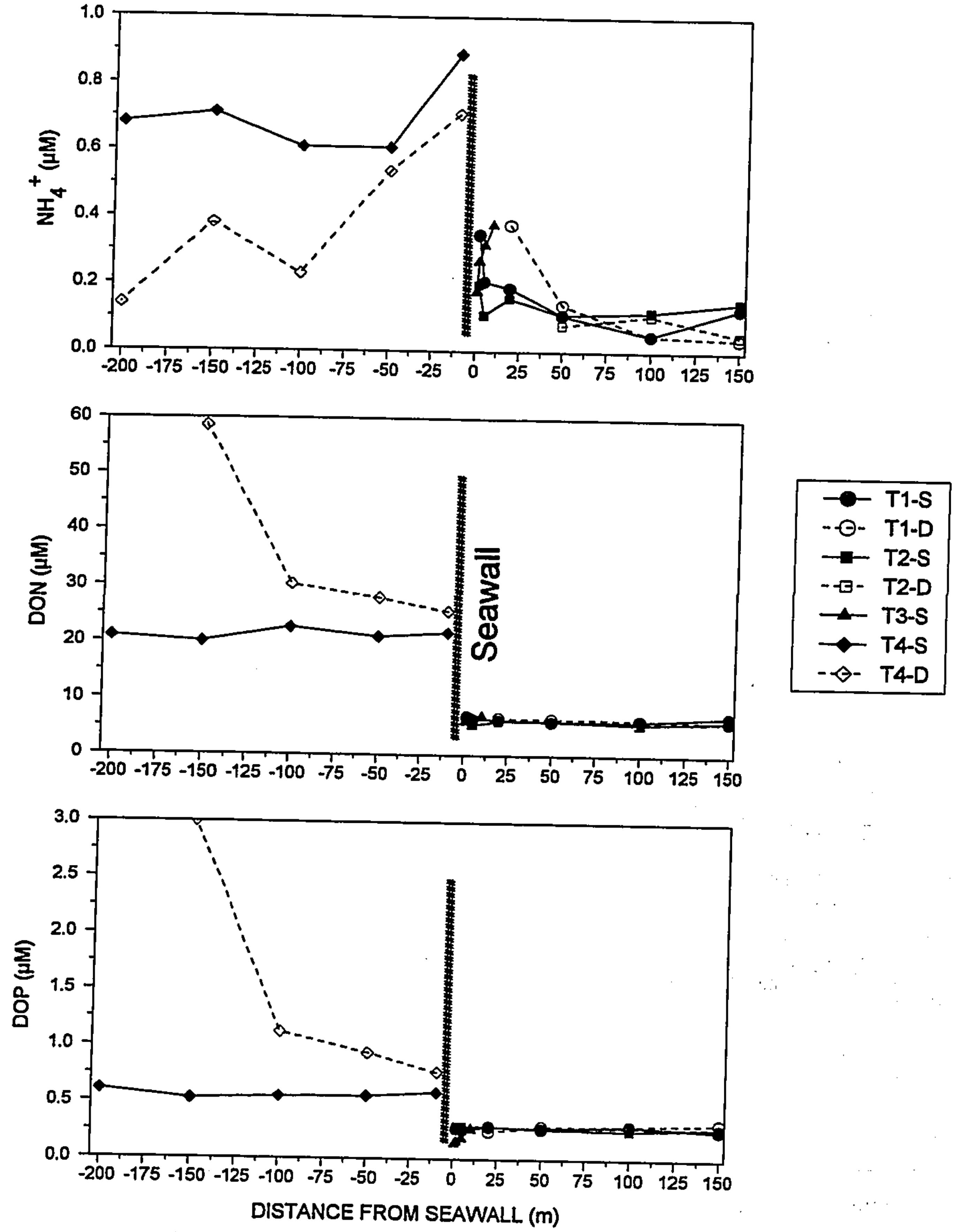


FIGURE 4. Plots of water chemistry constituents in surface (S) and deep (D) samples collected on three ocean transects and in the Koloko fishpond on March 15, 1996 as a function of distance from the seawall. Positive distances are distances from the seawall into the ocean, negative distances are distances from the seawall into the fishpond. For transect locations, see Figure 1.

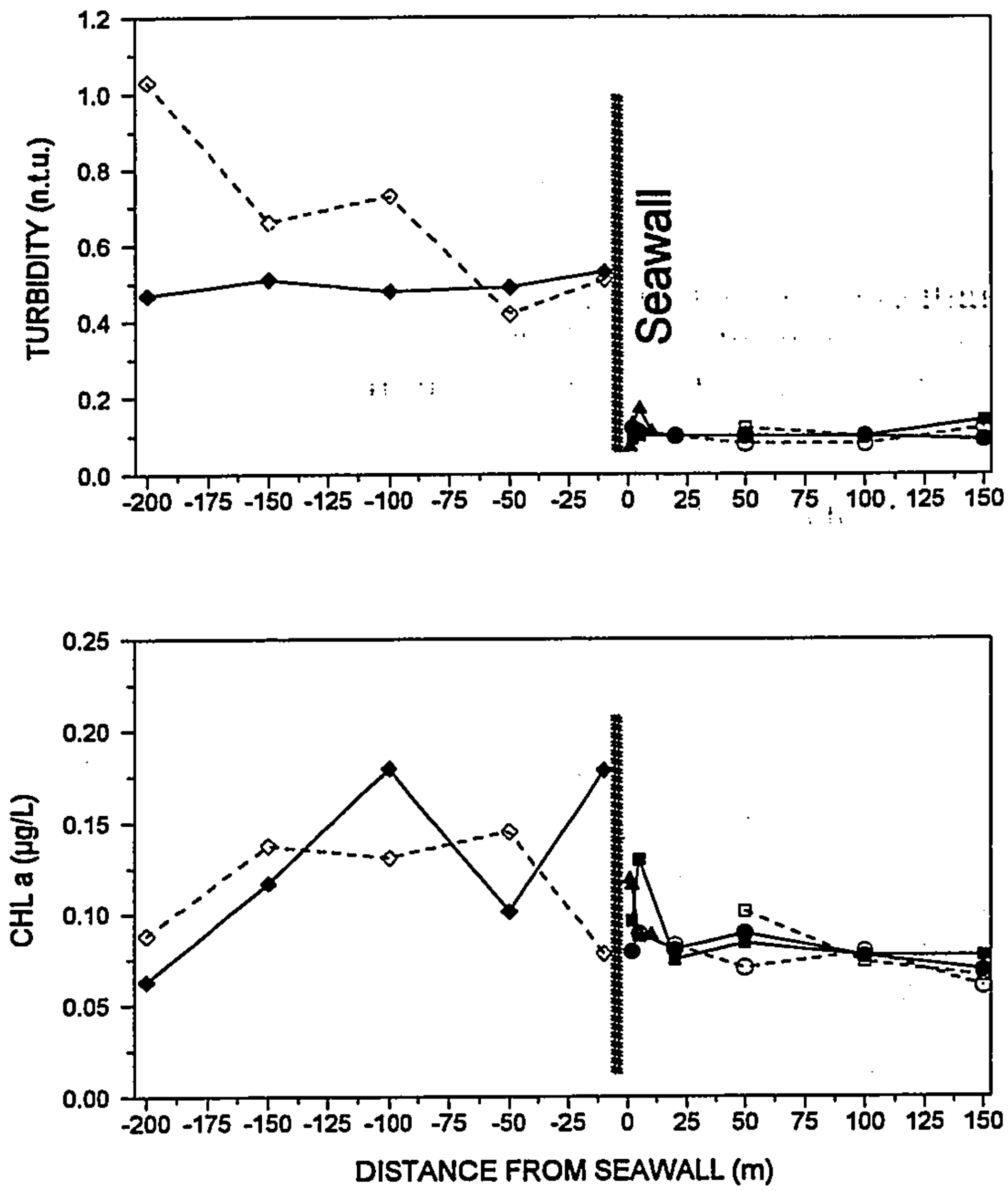


FIGURE 5. Plots of water chemistry constituents in surface (S) and deep (D) samples collected on three ocean transects and in the Koloko fishpond on March 15, 1996 as a function of distance from the seawall. Positive distances are distances from the seawall into the ocean, negative distances are distances from the seawall into the fishpond. For transect locations, see Figure 1.

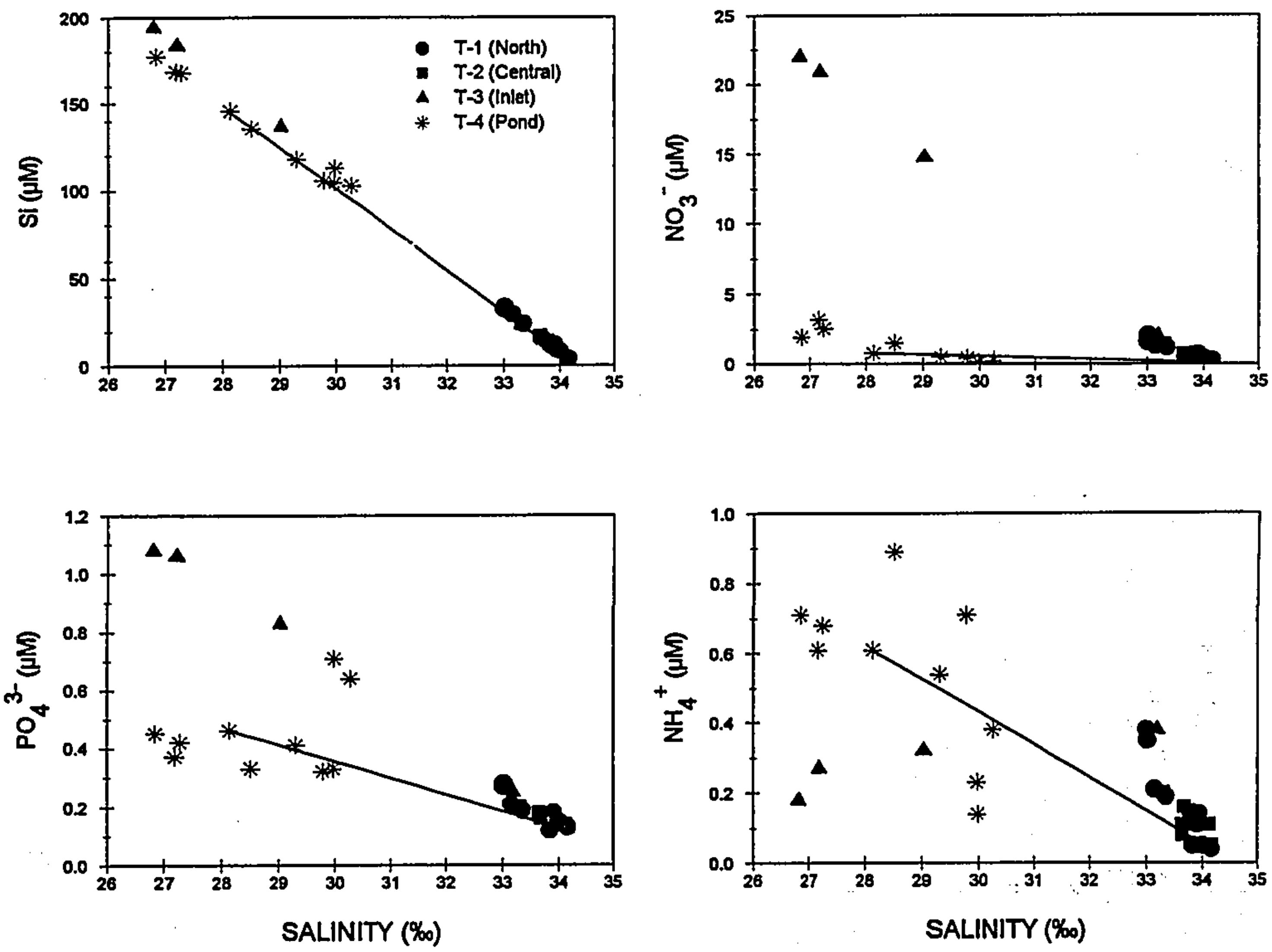


FIGURE 6. Mixing diagram showing concentration of dissolved nutrients from samples collected at three offshore transects and within the Koloko fishpond in March 1996 as functions of salinity. Straight line in each plot is conservative mixing line constructed by connecting the concentrations in open coastal water with surface water from the middle of Koloko pond. For sampling transect locations, see Figure 1.

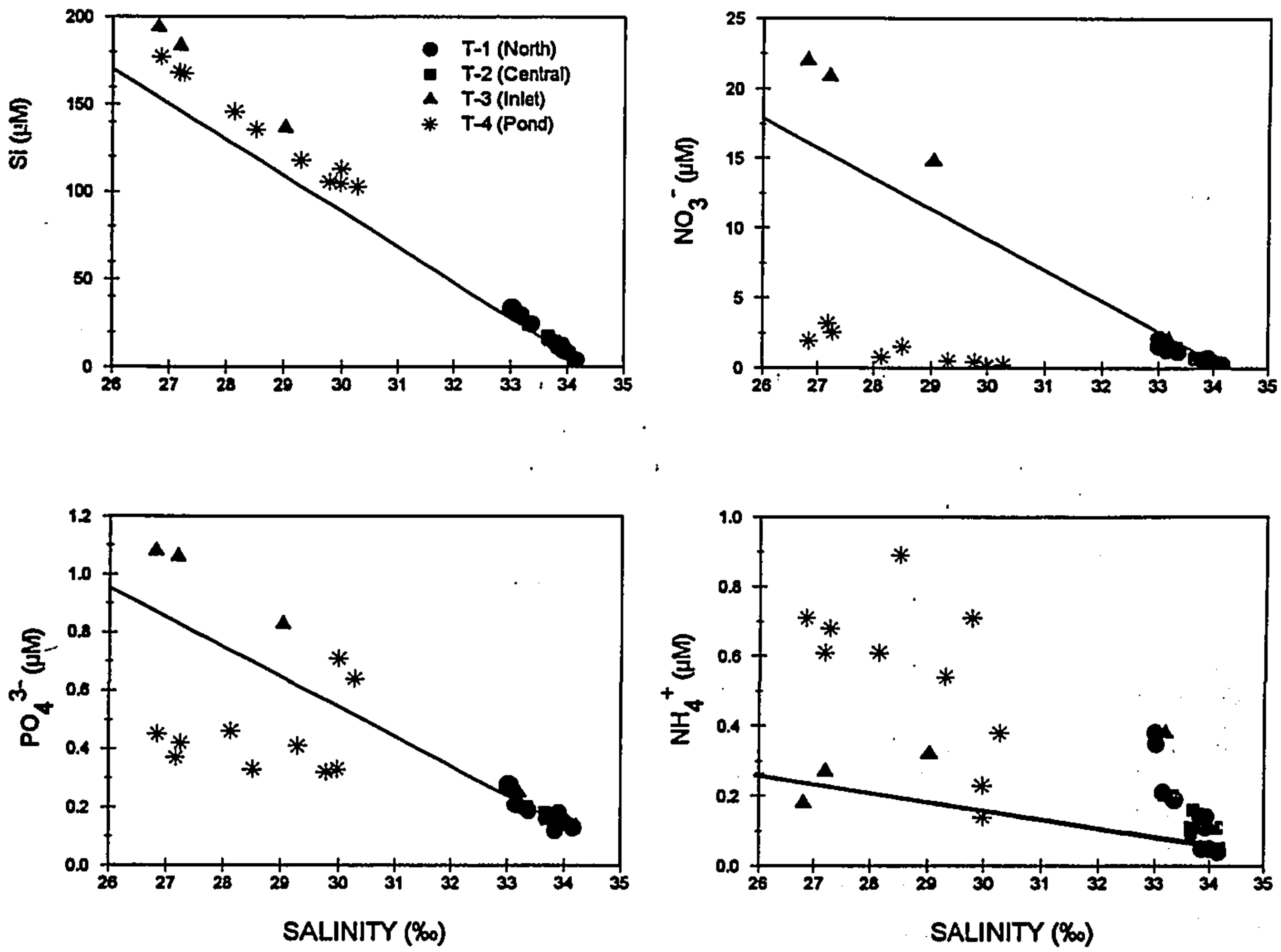


FIGURE 7. Mixing diagram showing concentration of dissolved nutrients from samples collected at three offshore transects and within the Koloko fishpond in March 1996 as functions of salinity. Straight lines in Si, nitrate and phosphate plots are conservative mixing lines constructed by connecting the concentrations in open coastal water with groundwater from a nearby well (State ID#4158-02). For sampling transect locations, see Figure 1.

Acoustic Study for the Kaloko Town Center, North Kona, Hawaii

Y. Ebisu & Associates, February 1996

ACOUSTIC STUDY FOR THE KALOKO TOWN CENTER NORTH KONA, HAWAII

Prepared for:

PACIFIC LAND SERVICES, INC.

Prepared by:

Y. EBISU & ASSOCIATES
1126 12th Avenue, Room 305
Honolulu, Hawaii 96816

FEBRUARY 1996

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER I. SUMMARY

The existing and future traffic noise levels in the vicinity of the proposed Koloko Town Center Project in North Kona, Hawaii were evaluated for their potential impact on present and future noise sensitive areas. The future traffic noise levels along the primary access roadways to the project were calculated for the Year 2020.

Along the existing Queen Ka'ahumanu Highway, traffic noise levels are expected to increase by 3.5 to 3.9 Ldn between CY 1996 and CY 2020 as a result of both project and non-project traffic. Along Hina Lani Drive, traffic noise levels are predicted to increase by 5.0 to 5.8 Ldn. Traffic noise increases due to project traffic are predicted to be less than the noise increases caused by non-project traffic along Queen Ka'ahumanu Highway, and are expected to range from 1.3 to 1.5 Ldn. Along Hina Lani Drive, traffic noise increases due to project traffic will be greater than those from non-project traffic, and are predicted to range between 3.7 to 4.7 Ldn. These increases in traffic noise levels associated with project traffic range from the moderately significant to the significant. The larger and more significant increases in traffic noise levels are expected to occur along Hina Lani Drive, where the lands along the highway Rights-of-Way are generally undeveloped, in light industrial use near the Queen Ka'ahumanu Highway intersection, and in residential use near the Mamalahoa Highway intersection.

Future project residents should not be impacted by traffic noise from Queen Ka'ahumanu Highway due to the adequate setback distances which have been provided from the highway, and the planned commercial property buffer between the multi-family units and the highway. Along Hina Lani Drive, minimum setback distances of 129 FT from the centerline of the roadway will be required for the single and multi-family units of the project to minimize risks of adverse traffic noise impacts.

Based on previously published FAR Part 150 aircraft noise contours for Keahole Airport, the project site is located outside of the existing and forecasted 55 Ldn airport noise contours, and is considered to be acceptable for the development of noise sensitive uses as planned. Aircraft noise measurements, which were performed during this study, confirm that the project site is outside of the Keahole Airport 55 Ldn noise contours, and special aircraft noise attenuation measures are not required over the project area. The implementation of the airport noise disclosure provisions of **Reference 4** is not considered to be necessary over the entire project area because the existing and forecasted 55 Ldn noise contours are not expected to encompass noise sensitive developments within the project area.

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 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 Koloko Town Center 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 site. A specific objective was to determine 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 Keahole Airport 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 (Ldn). This descriptor incorporates a 24-hour average of instantaneous A-Weighted Sound Levels as read on a standard Sound Level Meter. By definition, the minimum averaging period for the Ldn 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 Ldn descriptor. A more complete list of noise descriptors is provided in **APPENDIX B** to this report.

TABLE 1, derived from **Reference 1**, presents current federal noise standards and acceptability criteria for residential land uses. Land use compatibility guidelines for various levels of environmental noise as measured by the Ldn descriptor system are shown in **FIGURE 1**. As a general rule, noise levels of 55 Ldn 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, Ldn levels generally range from 55 to 65 Ldn, and are usually controlled by motor vehicle traffic noise. Residences which front major roadways are generally exposed to levels of 65 Ldn, and as high as 75 Ldn when the roadway is a high speed freeway. Due to noise shielding effects from intervening structures, interior lots are usually exposed to 3 to 10 Ldn 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 (FHA/HUD and VA), an exterior noise level of 65 Ldn or lower is considered acceptable. This standard is applied nationally (**Reference 2**), including Hawaii. Because of our open-living conditions, the predominant use of naturally ventilated dwellings, and the relatively low exterior-to-

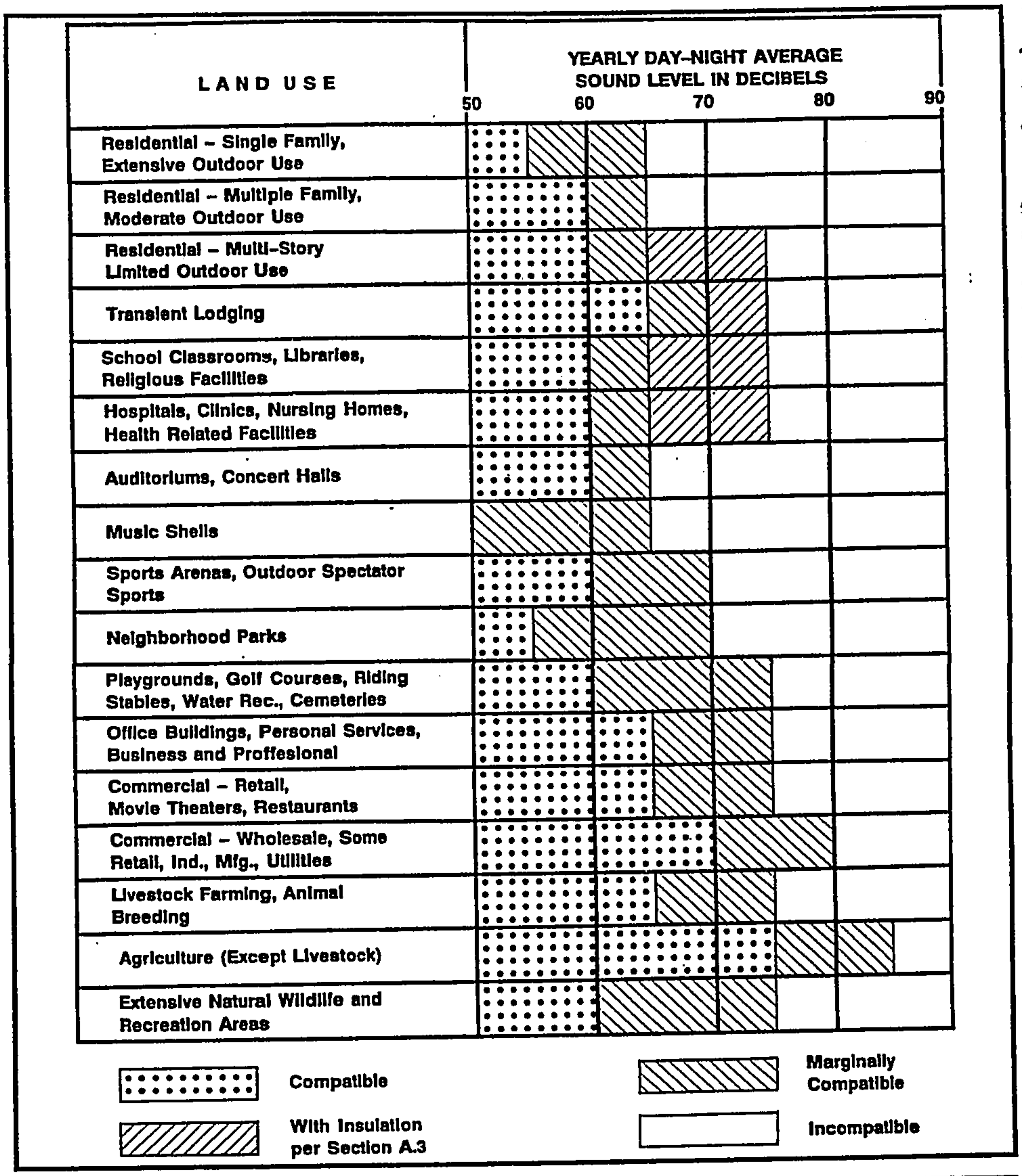
TABLE 1

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 Ldn	Not Exceeding 55 Leq	Unconditionally Acceptable
Moderate Exposure	Above 55 Ldn But Not Above 65 Ldn	Above 55 Leq But Not Above 65 Leq	Acceptable(2)
Significant Exposure	Above 65 Ldn But Not Above 75 Ldn	Above 65 Leq But Not Above 75 Leq	Normally Unacceptable
Severe Exposure	Above 75 Ldn	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.



LAND USE COMPATIBILITY
WITH YEARLY DAY–NIGHT AVERAGE SOUND LEVEL
AT A SITE FOR BUILDINGS AS COMMONLY CONSTRUCTED
(Source: American National Standards Institute S12.40–1990)

FIGURE 1

interior sound attenuation afforded by these naturally ventilated structures, an exterior noise level of 65 Ldn does not eliminate all risks of noise impacts. Because of these factors, and as recommended in **Reference 3**, a lower level of 55 Ldn is considered as the "Unconditionally Acceptable" (or "Near-Zero Risk") level of exterior noise. However, after considering the cost and feasibility of applying the lower level of 55 Ldn, government agencies such as FHA/HUD and VA have selected 65 Ldn as a more appropriate regulatory standard.

For aircraft noise, the State Department of Transportation, Airports Division, has recommended that 60 Ldn be used as the common level for determining land use compatibility in respect to noise sensitive uses near its airports. In addition, for those noise sensitive land uses which are exposed to aircraft noise greater than 55 Ldn, the division recommends that disclosure of the aircraft noise levels be provided prior to any real property transactions. **Reference 4** 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 Part 150 - Airport Noise Compatibility Planning (14 CFR Part 150).

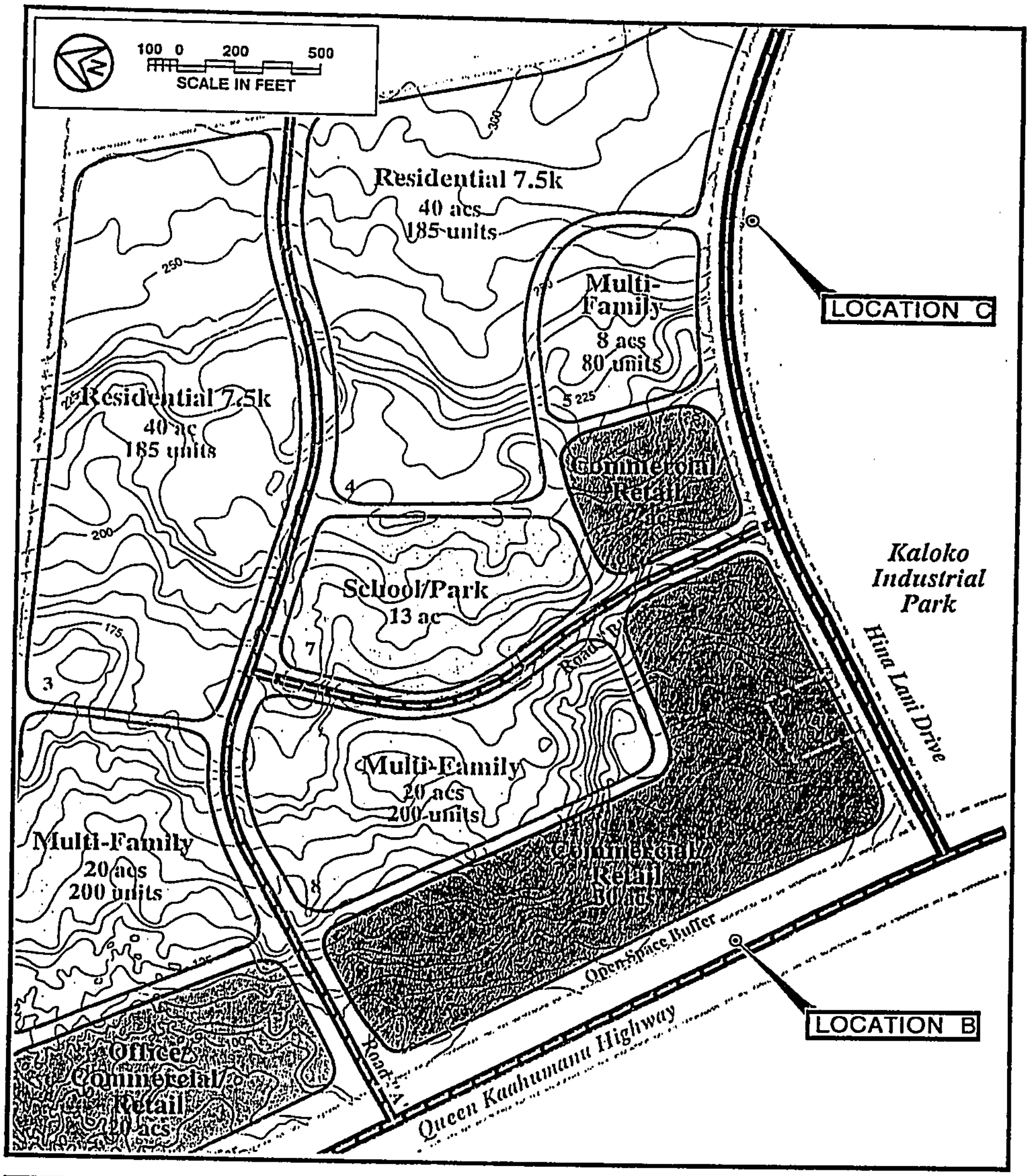
CHAPTER IV. GENERAL STUDY METHODOLOGY

Existing traffic and aircraft noise levels were measured at three locations in the project environs. The traffic noise measurements were made to provide a basis for developing the traffic noise contours along the roadways which will service the proposed development: Queen Ka'ahumanu Highway and Hina Lani Drive. The aircraft noise measurements were made to verify that the project site is clear of the existing 55 Ldn aircraft noise contours as well as those aircraft noise contours previously developed during the FAR Part 150 Noise Compatibility Program for Keahole Airport (**Reference 5**).

The locations of the traffic noise measurement sites are shown in **FIGURE 2**. Noise measurements were performed during the period between December 1995 and January 1996. The traffic noise measurement results, and their comparisons with computer model predictions of existing traffic noise levels are summarized in **TABLE 2**. 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 6**). Traffic data entered into the noise prediction model were: hourly traffic volumes, average vehicle speeds, estimates of traffic mix, and soft ground propagation loss factor. The traffic study for the project (**Reference 7**) and Hawaii State Department of Transportation counts on Queen Ka'ahumanu Highway (**Reference 8**) 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 0.3 dB greater than the 24-hour Ldn along each roadway segment. This assumption was based on computations of both the hourly Leq and the 24-hour Ldn of traffic noise on Queen

DOCUMENT CAPTURED AS RECEIVED



LOCATIONS OF NOISE MEASUREMENT SITES

FIGURE 2

TABLE 2

TRAFFIC NOISE MEASUREMENT RESULTS

LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	--Hourly Traffic Volume-- AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
A. 50 FT from the center-line of Queen Ka'ahumanu Highway (1/3/96)	1500 TO 1600	60	1,431	17	33	71.7	71.5
B. 50 FT from the center-line of Hina Lani Drive (1/3/96)	1500 TO 1600	55	235	9	4	63.9	63.7

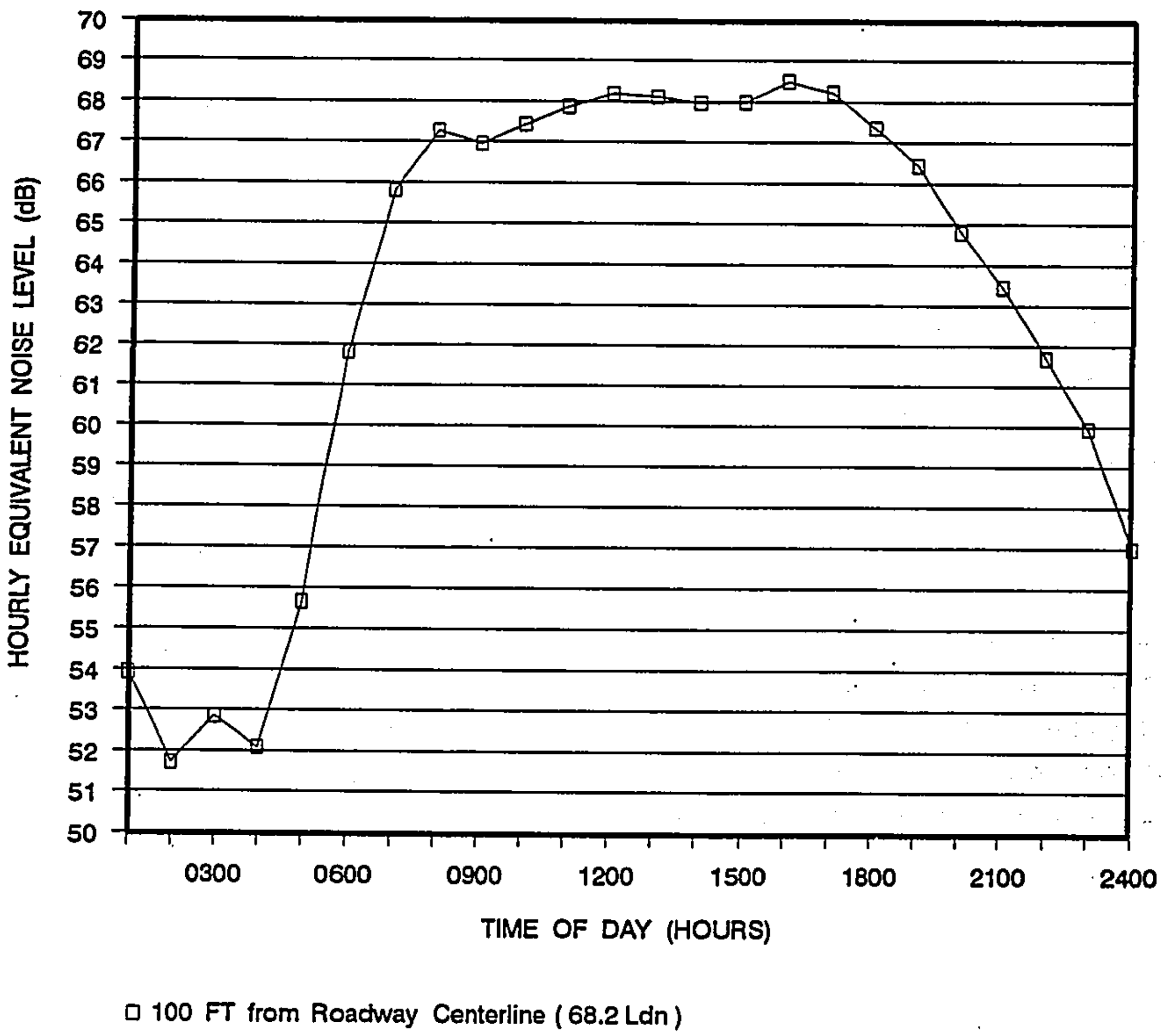
Ka'ahumanu Highway (see **FIGURE 3**).

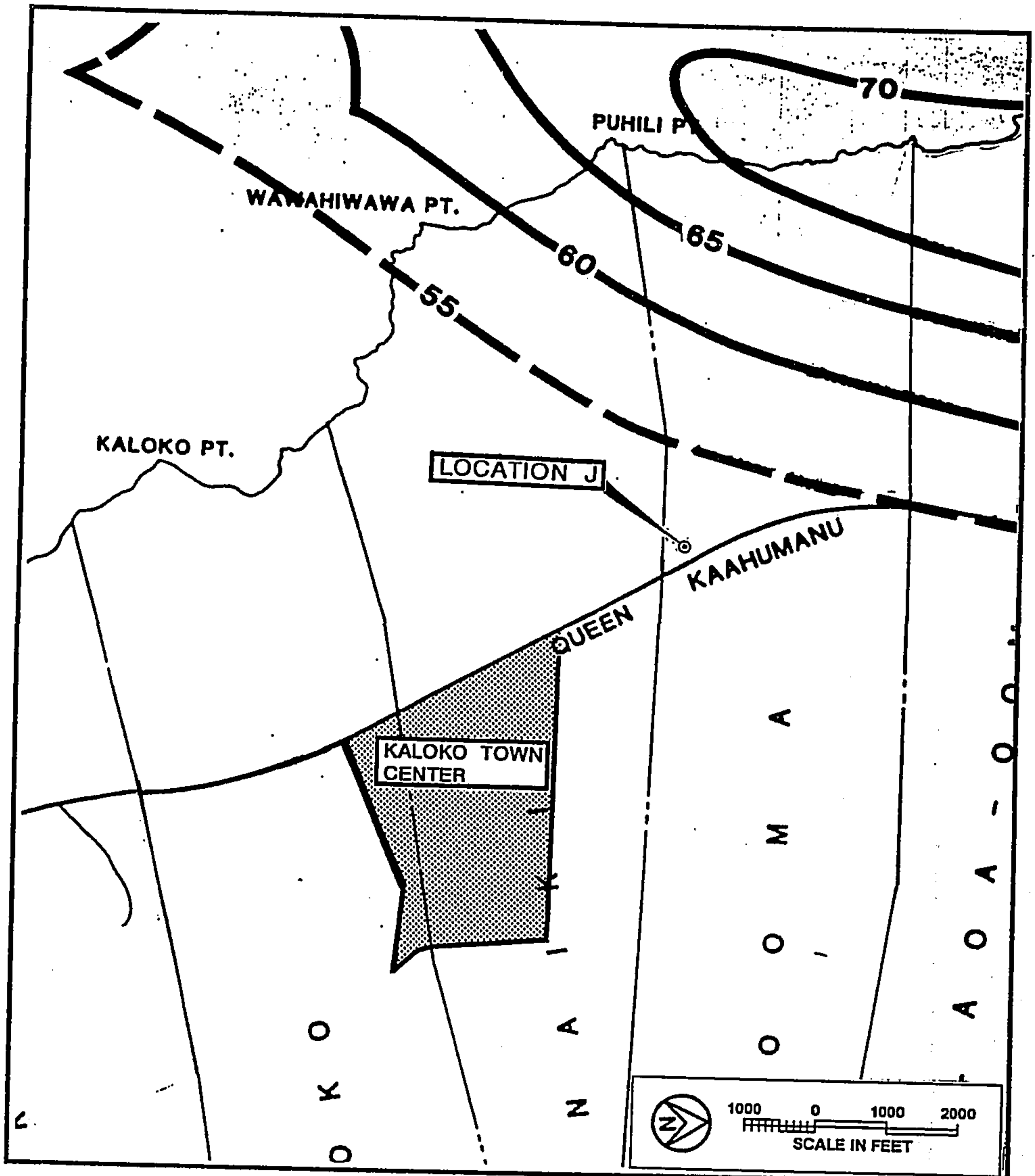
Traffic noise calculations for both the existing and future conditions in the project environs were developed for ground level receptors without the benefit of shielding effects. Traffic assignments with and without the project were obtained from the project's traffic study (**Reference 7**). The forecasted 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.

Aircraft noise measurements were obtained at Location "J" (see **FIGURE 4**). The relationships of measurement Location "J" to the project site and the Year 1990 and 2005 noise contours (in Ldn) for Keahole Airport are shown in **FIGURES 4 and 5**. The aircraft noise measurements obtained at Location "J" were used to verify that the project site is located outside the Keahole Airport's 55 Ldn contour. Aircraft noise measurements were made to confirm that single event noise levels associated with aircraft operations at Keahole Airport were consistent with the noise data and Year 1985 thru 2005 contours which were developed during the last FAR Part 150 Program for Keahole Airport. The measurements at Location "J" were also performed to confirm the helicopter and light aircraft flight tracks in the project environs, which were originally reported in **Reference 5**. In addition, 1995 airline schedules were also used to obtain the best estimate of the aircraft operations at Keahole Airport during CY 1995.

FIGURE 3

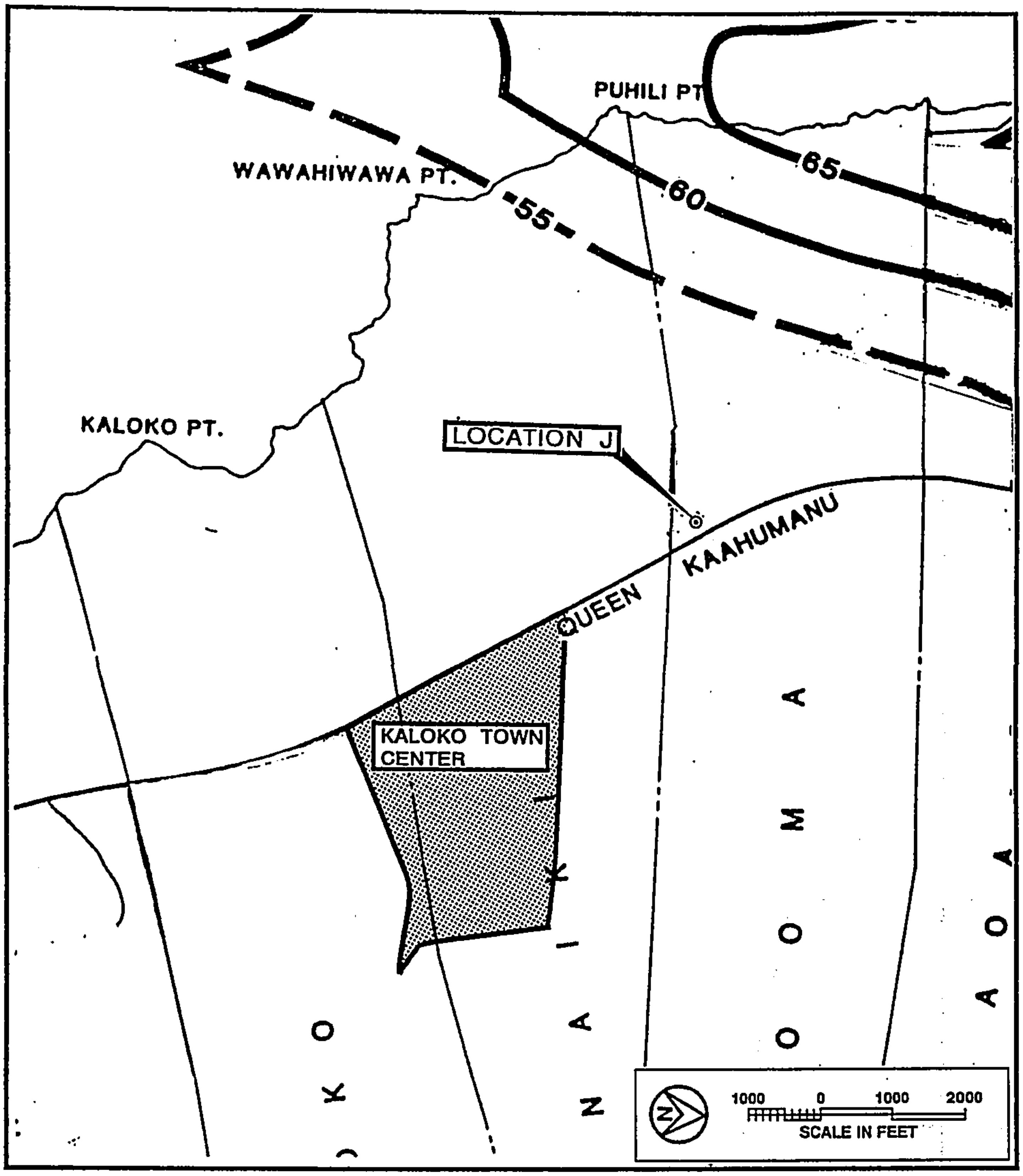
HOURLY VARIATIONS OF TRAFFIC NOISE AT 100 FT SETBACK DISTANCE FROM THE CENTERLINE OF QUEEN KA'AHUMANU HIGHWAY AT KEALAKEHE PARKWAY (STA. C-8-D, 7/19/94)





LOCATIONS OF CY 1990 AIRCRAFT NOISE CONTOURS IN PROJECT ENVIRONS FROM FAR PART 150 REPORT

FIGURE 4



LOCATIONS OF CY 2005 AIRCRAFT NOISE CONTOURS FROM FAR PART 150 REPORT

FIGURE 5

CHAPTER V. EXISTING NOISE ENVIRONMENT

<u>Traffic Noise</u>. The existing traffic noise levels in the project environs vary from levels of approximately 65 Ldn along the south and west (makai) property boundaries, to less than 55 Ldn at the interior locations of the project site. Traffic noise levels along Queen Ka'ahumanu Highway are less than 65 Ldn at 166 FT or greater setback distances from the highway centerline. Traffic noise levels along Hina Lani Drive are less than 65 Ldn at 81 FT or greater setback distances from the highway centerline.

Calculations of existing traffic noise levels during the PM peak traffic hour are presented in **TABLE 3**. 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 60, 65, and 70 Ldn contours were also calculated as shown in **TABLE 4**. 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 4**, it was concluded that the existing 65 Ldn traffic noise contours over the project site are located approximately 142 FT from the centerline of Queen Ka'ahumanu Highway, and approximately 81 FT from the centerline of Hina Lani Drive.

Existing traffic noise levels at the interior portions of the project site are low (less than 55 Ldn) due to their large setback distances from the two roadways at the south and west ends of the project site. At these interior locations on the project site, distant traffic and aircraft noise are the loudest 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 35 to 45 dB. During calm wind periods, background ambient noise levels decrease to levels less than 35 dB. The minimum background ambi-

TABLE 3

COMPARISONS OF CY 1996 AND CY 2020 TRAFFIC NOISE LEVELS ALONG ACCESS ROADS TO PROJECT SITE (PM PEAK HOUR AND 50 FT FROM ROADWAY CENTERLINES)

LOCATION	SPEED (MPH)	VPH	****** HOURLY LEQ IN dB ****** AUTO	MT	HT	ALL VEH
EXISTING (CY 1996) PM PEAK HOUR:						
Queen Ka'ahumanu Hwy. (North)	60	1,279	68.2	64.6	68.3	72.1
Queen Ka'ahumanu Hwy. (South)	60	1,609	69.2	65.6	69.3	73.1
Queen Ka'ahumanu Hwy. (Front)	60	1,279	68.2	64.6	68.3	72.1
Hina Lani Drive (at Queen K. Hwy.)	55	573	64.3	60.9	64.9	68.4
Hina Lani Drive (East of Road B)	55	302	61.5	58.1	62.1	65.7
Hina Lani Drive (at Mamalahoa Hwy.)	45	316	58.4	55.3	60.1	63.1
FUTURE (CY 2020) PM PEAK HOUR WITH PROJECT:						
Queen Ka'ahumanu Hwy. (North)	60	3,100	72.1	68.5	72.1	76.0
Queen Ka'ahumanu Hwy. (South)	60	3,565	72.7	69.1	72.7	76.6
Queen Ka'ahumanu Hwy. (Front)	60	3,127	72.1	68.5	72.2	76.0
Hina Lani Drive (at Queen K. Hwy.)	55	1,800	69.3	65.8	69.8	73.4
Hina Lani Drive (East)	55	1,158	67.3	63.9	67.9	71.5
Hina Lani Drive (at Mamalahoa Hwy.)	45	1,172	64.1	61.0	65.8	68.8

Note:

The following assumed traffic mixes of autos, medium trucks, and heavy vehicles were used for existing and future conditions:

(a) Queen Ka'ahumanu Highway: 93.0% Autos; 3.5% Medium Trucks; and 3.5% Heavy Trucks and Buses.

(b) Hina Lani Drive: 93.0% Autos; 3.5% Medium Trucks; and 3.5% Heavy Trucks and Buses.

TABLE 4

EXISTING AND CY 2020 DISTANCES TO 60, 65, AND 70 Ldn CONTOURS

STREET SECTION	60 Ldn SETBACK (FT)		65 Ldn SETBACK (FT)		70 Ldn SETBACK (FT)	
	EXISTING	CY 2020	EXISTING	CY 2020	EXISTING	CY 2020
Queen Ka'ahumanu Hwy. (North)	306	553	142	257	66	119
Queen Ka'ahumanu Hwy. (South)	357	607	166	282	77	131
Queen Ka'ahumanu Hwy. (Front)	306	556	142	258	66	120
Hina Lani Drive (at Queen K. Hwy.)	174	374	81	173	38	80
Hina Lani Drive (East of Road B)	114	278	53	129	24	60
Hina Lani Drive (at Mamalahoa Hwy.)	77	185	36	86	17	40

Notes:

(1) All setback distances are from the roadways' centerlines.
(2) See TABLE 3 for traffic volume, speed, and mix assumptions.
(3) Ldn assumed to be equal to PM Peak Hour Leq minus 0.3 dB along all roadways.
(4) Setback distances are for unobstructed line-of-sight conditions.
(5) Soft ground conditions assumed along all roadways.

ent noise levels at these interior locations are controlled by distant traffic and wind noise.

<u>Aircraft Noise</u>. Aircraft noise sources in the project environs are associated with fixed and rotary wing aircraft operations at Keahole Airport. Occasionally, depending on weather, visibility, or air traffic conditions, helicopter and fixed wing aircraft may cross over the project site, but the vast majority of the aircraft flight tracks typically remain west or northwest of the project site and are aligned with Keahole Airport's single runway.

TABLE 5 summarizes the results of the aircraft noise measurements obtained at Location "J". Aircraft noise levels on the project site should be less than those measured at Location "J" since the project site is more distant from the airport. The noise data at Location "J" is considered to be representative of the higher noise levels expected at that location from jet aircraft departing on Keahole Airport's Runway 17. These worst case conditions typically occur during south flow traffic pattern conditions at the airport, which occur approximately 90 percent of the time. Typical maximum noise levels recorded at Location "J" from the noisier jet aircraft ranged from 78 to 82 dB. The newer, and quieter jet aircraft were typically less than 70 dB. Noise levels from helicopters, fixed wing air taxi, and general aviation aircraft were generally less than 75 dB at Location "J". The highest noise level (82 dB) of a light fixed wing aircraft occured during an overflight of Location "J".

FIGURE 4 depicts the locations of the 55 thru 70 Ldn aircraft noise contours during the CY 1990 period, which were obtained from **Reference 5**. These noise contours were developed during the most recent FAR Part 150 Noise Compatibility Study for Keahole Airport, and depict forecasted conditions in CY 1990 prior to the extension of the airport's single runway. **FIGURE 5**, from the same FAR Part 150 study, depicts forecasted conditions in CY 2005 following the

TABLE 5

SUMMARY OF AIRCRAFT NOISE MEASUREMENTS AT LOCATION "J"

AIRCRAFT TYPE	MAXIMUM SOUND LEVELS Lmax (in dB)	SOUND EXPOSURE LEVELS Lse (in dB)
B-737(200) (G1B-G2A)	82.4; 74.7 (AVG.=78.6)	86.4; 83.6 (PRED.=79.2-82.0) (AVG.=85.2)
B-737(200) (T1B-T2A)	76.9; 72.8; 75.0; 76.5; 73.2; 70.6; 76.4; 74.0; 71.8; 77.3; 70.9; 73.1; 73.9; 77.9 (AVG.=74.3)	83.3; 81.1; 80.2; 82.2; 82.2; 78.5; 84.5; 80.1; 79.8; 84.8; 78.0; 79.4; 81.6; 82.0 (PRED.=78.7-80.3) (AVG.=81.7)
B-737(300) (G2A)	69.3 (AVG.= 69.3)	77.4 (PRED.=64.7) (AVG.= 77.4)
B-737(300) (T2A)	69.4; 66.9 (AVG.=68.2)	74.4; 72.5 (PRED.=64.7) (AVG.=73.6)
DC-9(50) (G1B-G2A)	78.9 (AVG.=78.9)	87.9 (PRED.=86.2) (AVG.=87.9)
DC-9(50) (T1B-T2A)	74.0; 73.3; 71.4; 72.0; 73.9;69.3; 69.5; 78.1; 78.0 (AVG.=73.3)	77.8; 81.5; 79.0; 81.4; 81.1; 77.5; 75.4; 85.0; 83.9 (PRED.=82.6-83.4) (AVG.=81.3)
DC-9(50) (T1A)	76.5; 72.5 (AVG.=74.5)	83.8; 80.0 (PRED.=84.0) (AVG.=82.3)
ATR-42 (G2A)	59.2; 62.9; 58.8 (AVG.=60.3)	69.8; 69.7; 64.4 (PRED.=58.1) (AVG.=68.6)
KR-135 (T22)	72.0; 69.1; 78.0; 72.6; 72.9; 65.5; 68.8; 74.0; 68.4; 70.6; 70.4; 76.7 (AVG.=71.6)	76.9; 74.2; 80.6; 75.8; 80.5; 72.4; 73.5; 78.7; 74.4; 75.5; 76.6; 83.1 (PRED.=82.9) (AVG.=78.1)
DC-10 (T1A)	56.3; 66.3 (AVG.=61.3)	65.9; 73.0 (PRED.=73.3) (AVG.=70.8)
BUS JET (T1A)	61.2; 55.4; 62.8; 56.6 (AVG.=59.0)	71.2; 64.0; 68.9; 65.1 (PRED.=69.6) (AVG.=68.2)

TABLE 5 (CONTINUED)

SUMMARY OF AIRCRAFT NOISE MEASUREMENTS AT LOCATION "J"

AIRCRAFT TYPE	MAXIMUM SOUND LEVELS Lmax (in dB)	SOUND EXPOSURE LEVELS Lse (in dB)
BUS JET (III–II)	64.7; 67.5; 53.7; 72.5 (AVG.=64.6)	70.1; 74.5; 62.6; 78.4 (AVG.=74.4)
BUS JET (R. HANDED T&G)	49.3; 66.1 (AVG.=57.7)	56.0; 69.3 (AVG.=66.5)
GA–2 (G2A)	55.5; 48.4; 52.9 (AVG.=52.3)	60.8; 57.2; 59.5 (PRED.=62.9) (AVG.=59.4)
GA–2 (OVERHEAD)	82.1 (AVG.=82.1)	85.6 (AVG.=85.6)
GA–1 (G1A)	64.0; 63.2 (AVG.=63.6)	68.5; 68.3 (PRED.=64.6) (AVG.=68.4)
GA–1 (T20D)	72.3 (AVG.=72.3)	78.1 (AVG.=78.1)
GA–1 (IV–I)	57.7 (AVG.=57.7)	64.1 (AVG.=64.1)
HELO (I–IV)	63.8; 66.1; 67.4; 71.2 (AVG.=67.1)	71.3; 76.0; 73.6; 79.9 (AVG.=76.4)
HELO (II–III)	62.8 (AVG.=62.8)	66.9 (AVG.=66.9)
HELO (III–II)	71.8 (AVG.=71.8)	80.4 (AVG.=80.4)
HELO (II–I)	67.1; 65.1; 70.9; 65.6 (AVG.=67.2)	73.7; 72.9; 79.8; 76.2 (AVG.=76.5)

TIME AT LOCATION "J": 12.08 hours
AVERAGE NOISE LEVEL: 52.0 Leq

runway extension. The aircraft noise levels in CY 1995 over the project site are estimated to be less than 55 Ldn as depicted in **FIGURES 4 and 5**, with measured average noise level at Location "J" being 52 Leq during approximately 8 hours of south flow traffic pattern conditions (see **TABLE 5**). Aircraft noise levels over the proposed residential areas of the project site, which are at least 4,000 FT southeast of the 55 Ldn airport noise contours shown in **FIGURES 4 and 5**, should also be less than 55 Ldn, and as such, are considered to be in the "Minimal Exposure, Unconditionally Acceptable" category for the planned noise sensitive land uses on the project site.

CHAPTER VI. FUTURE NOISE ENVIRONMENT

<u>Traffic Noise</u>. Predictions of future traffic noise levels were made using the traffic volume assignments of **Reference 7** for CY 2020 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 3** for the PM peak hour of traffic. As indicated in **TABLE 3**, by CY 2020 and following complete project build-out, traffic noise levels on Queen Ka'ahumanu Highway in the areas fronting the project are predicted to increase by 3.9 Ldn. Along Hina Lani Drive, traffic noise levels are predicted to increase by 5.0 to 5.8 Ldn. South of the project, and along Queen Ka'ahumanu, traffic noise levels are predicted to increase by 3.5 Ldn. North of the project, and along Queen Ka'ahumanu, traffic noise levels are predicted to increase by 3.9 Ldn. This range of increases in traffic noise levels from 3.5 to 5.8 Ldn is considered to be significant, and reflects the large growth in forecasted project and non-project traffic in the project environs by CY 2020.

TABLE 4 summarizes the predicted increases in the future setback distances to the 60, 65, and 70 Ldn traffic noise contour lines along the roadways in the project environs and attributable to both project plus non-project traffic in CY 2020. The setback distances in **TABLE 4** 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 4**, the setback distances to the 65 Ldn contour are predicted to range from 257 to 282 FT from the centerline of Queen Ka'ahumanu Highway following project build-out in CY 2020. Along Hina Lani Drive, setback distances to the 65 Ldn contour are predicted to range from 86 to 173 FT from the centerline of the east-west roadway.

TABLE 6 presents the predicted increases in traffic noise levels associated with non-project and project traffic by CY 2020,

TABLE 6

CALCULATIONS OF PROJECT AND NON-PROJECT TRAFFIC NOISE CONTRIBUTIONS (CY 2020)

STREET SECTION	NOISE LEVEL INCREASE (Ldn) DUE TO NON-PROJECT TRAFFIC	PROJECT TRAFFIC
Queen Ka'ahumanu Hwy. (North)	2.4	1.4
Queen Ka'ahumanu Hwy. (South)	2.1	1.3
Queen Ka'ahumanu Hwy. (Front)	2.4	1.5
Hina Lani Drive (at Queen K. Hwy.)	1.3	3.7
Hina Lani Drive (East of Road B)	1.1	4.7
Hina Lani Drive (at Mamalahoa Hwy.)	1.1	4.6

and as measured by the Ldn descriptor system. As indicated in **TABLE 6**, the increases in traffic noise along Queen Ka'ahumanu Highway due to project traffic are less than those resulting from non-project traffic. Along Hina Lani Drive, project traffic is expected to be the primary contributor to traffic noise increases. Project traffic contributions to future increases in noise levels along these two roadways range from 1.3 to 4.7 Ldn by CY 2020. The larger increases in traffic noise levels attributable to project traffic along Hina Lani Drive are to be expected due to the relatively low volumes of existing traffic along the roadway. Overall, the increases in noise levels associated with project traffic are expected to be manageable along Queen Ka'ahumanu Highway and Hina Lani Drive.

Aircraft Noise. Predictions of future aircraft noise levels in the project environs for the CY 2005 period had been prepared during the FAR Part 150 study for Keahole Airport (**Reference 5**). The CY 2005 noise contours for the Keahole Airport which were extracted from **Reference 5** are depicted in **FIGURE 5**. The noise contours developed during the Part 150 effort indicated that noise levels at Keahole Airport would decrease between CY 1990 and 2005. For this to occur, essentially all of the older interisland jet aircraft, and particularly the nighttime jet cargo aircraft, would require quieting. It is possible that this may occur due to recent work toward the development of hush kits for older B-737 and DC-9 aircraft.

Based on more recent trends regarding the slowdown and reversal of earlier airline plans to replace the older B-737 and DC-9 with quieter aircraft, it is considered less likely that the smaller CY 2005 noise contours shown in **FIGURE 5** will occur as was originally forecasted by **Reference 5**. The most recently developed airport noise contours for Keahole Airport were published in March 1991 in conjunction with the proposed Lands of Ka'u Project. Using the available airport operations forecasts from the State

DOT, assuming only 80 percent of the interisland B-737 and DC-9 fleet would be quieted by CY 2010, and assuming that the nighttime jet cargo aircraft would not be quieted by CY 2010, CY 2010 noise contours for Keahole Airport were constructed. Even though the CY 2010 contours developed for the Lands of Ka'u Project were larger than the CY 2005 contours developed during the FAR Part 150 study, the Koloko Town Center project site remained outside (or beyond) Keahole Airport's 55 Ldn contour.

Updated Keahole Airport noise contours are expected to be developed in CY 1996 by the State DOT during the Keahole Airport Master Plan and FAR Part 150 Study Update. However, based on the aircraft noise measurements obtained at Location "J", airport noise contours previously developed thru CY 2010, as well as the most recent forecasts of airport operations thru CY 2020 (**Reference 9**), it was concluded that the noise sensitive areas within project site should remain outside the 55 Ldn contour of Keahole Airport, and risks of adverse noise impacts from aircraft noise should therefore be minimal within the project site.

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 2020 are predicted to range from 1.3 to 1.5 Ldn along Queen Ka'ahumanu Highway, where traffic noise levels are expected to be above 65 Ldn along the highway Right-of-Way. These increases in traffic noise levels along Queen Ka'ahumanu Highway which are attributable to the project are considered to be in the moderate category, and are less 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, or are developed with commercial, agricultural, or industrial land uses. For these reasons, traffic noise impacts along Queen Ka'ahumanu Highway and resulting from project traffic are not considered to be serious. However, setback distances to the 65 Ldn contour are expected to increase as a result of both project and non-project traffic.

Relatively large increases in traffic noise levels along Hina Lani Drive are expected to occur as a result of the proposed project. By CY 2020, project traffic is expected to increase traffic noise levels along Hina Lani Drive by approximately 3.7 to 4.7 Ldn. This level of increase is considered to be significant, and traffic noise impacts resulting from project traffic may occur. In order to minimize potential risks of traffic noise impacts on future project residents, setback distances of at least 129 FT from the centerline of Hina Lani Drive should be provided.

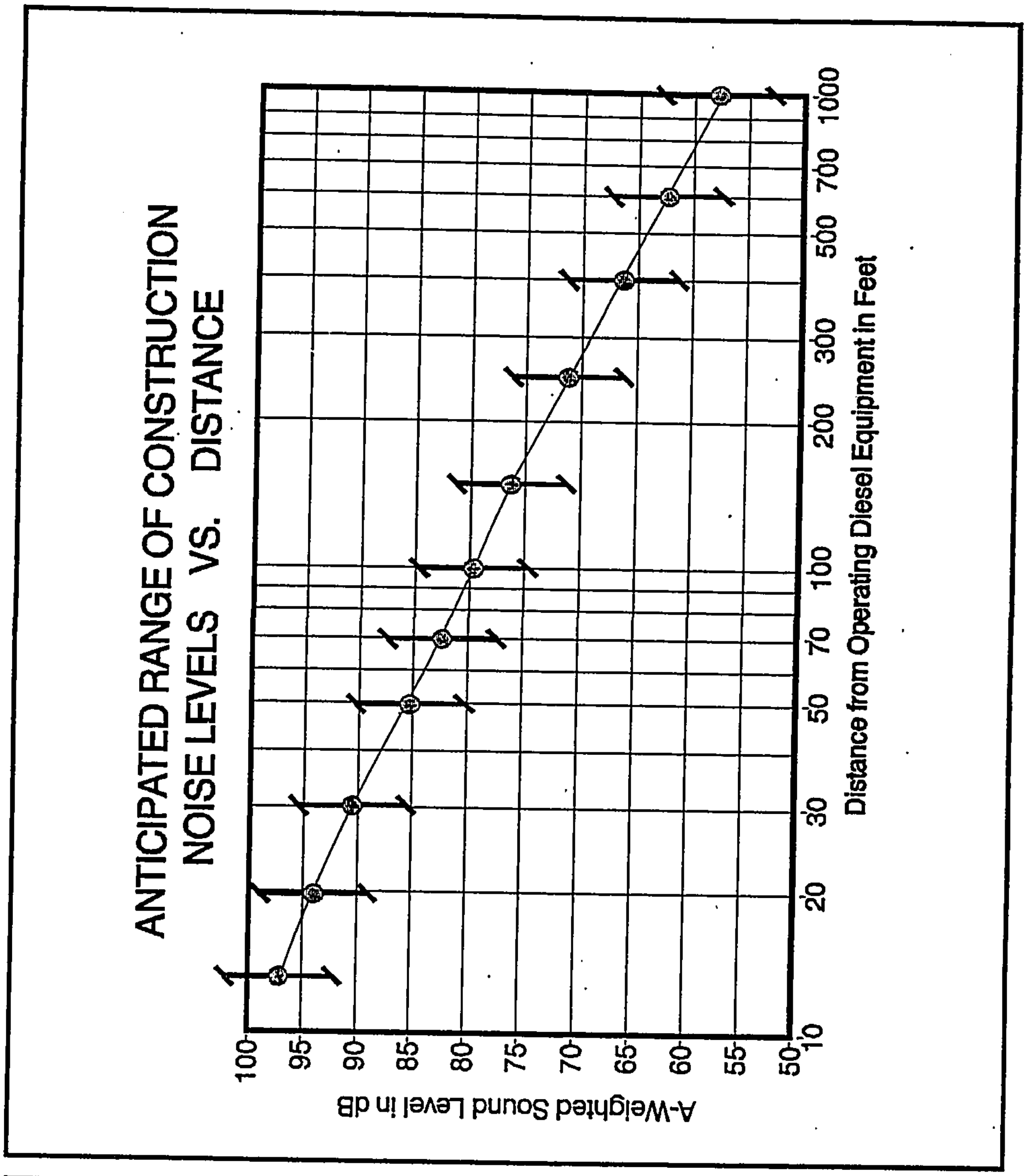
Along the eastern section of Hina Lani Drive at the Mamalahoa Highway intersection, potential noise impacts from project and non-project traffic are possible, both in respect to existing and planned noise sensitive receptors located along this roadway. Existing and future residences which are located along Hina Lani Drive may be impacted by the future traffic noise along the roadway if their setback distances from the highway centerline are less than 86 FT. Because traffic noise along public roadways such as Hina Lani Drive are generated by non-project as well as project traffic, mitigation of off-site 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 Ldn 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.

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 Chapter 508D, Hawaii Revised Statues, is not required because the existing and forecasted 55 Ldn 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 Ldn. Traffic noise levels may exceed 65 Ldn along the highway corridors and major thoroughfares which service the project. If the traffic noise level equals 65 Ldn and the aircraft noise level equals 60 Ldn at a project dwelling, the total noise level will be 66 Ldn, which exceeds the FHA/HUD standard of 65 Ldn. However, existing and forecasted aircraft noise levels over the project site should not exceed 55 Ldn. Under these more favorable conditions with aircraft noise levels less than 55 Ldn, combined traffic and aircraft noise levels should not exceed 65 Ldn when traffic noise levels are less than 65 Ldn. Where traffic noise levels exceed 65 Ldn, 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 Ldn 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 6**. The noise sensitive properties which are predicted to experience the highest noise levels during construction activities on the project site are the future residential parcels of the project. Nearby properties are currently in light industrial uses, so construction noise impacts are not expected at these adjacent properties. 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



CONSTRUCTION NOISE LEVELS VS. DISTANCE

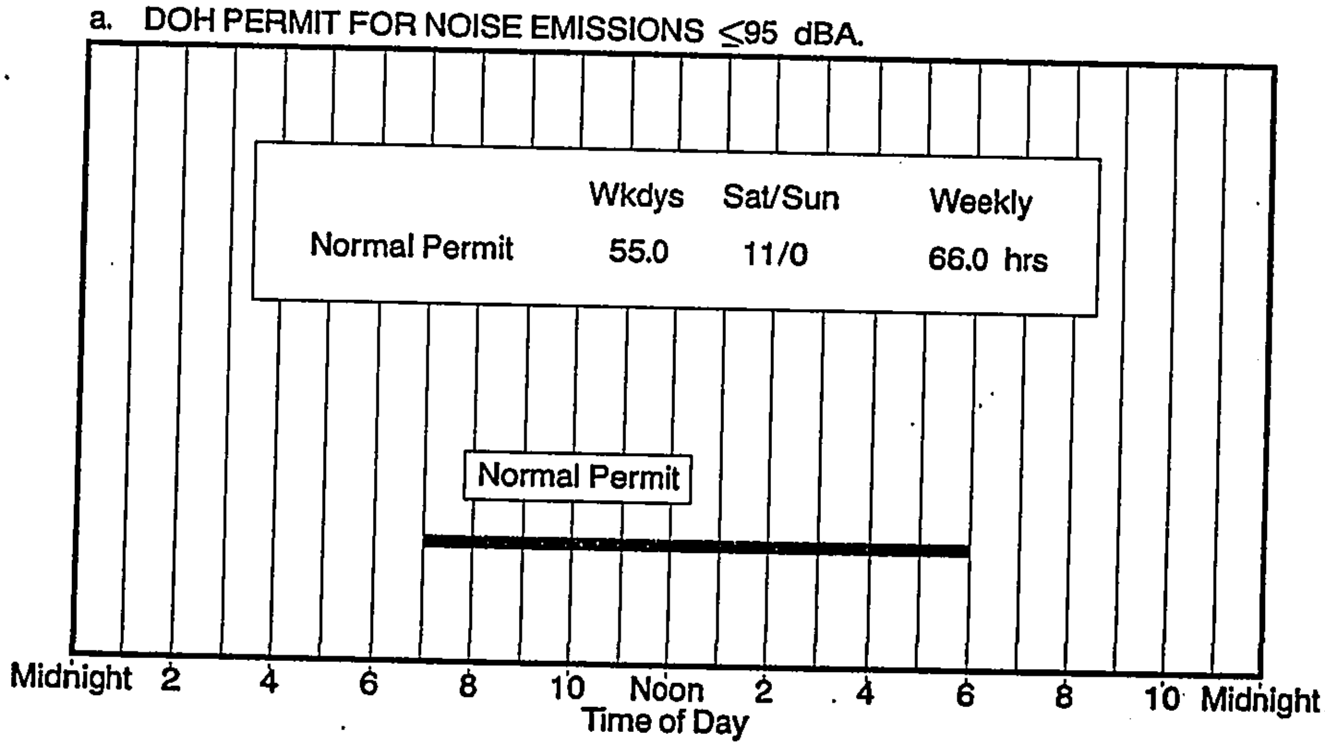
FIGURE 6

incorporation of State Department of Health construction noise limits and curfew times, which are applicable on the island of Oahu (**Reference 10**), is another noise mitigation measure which can be applied to this project. **TABLE 7** depicts the allowed hours of construction for normal construction noise (levels which do not exceed 95 dB at the project's property line) and for construction noise which exceeds 95 dB at the project's property line. Noisy construction activities are not allowed on holidays under the DOH permit procedures.

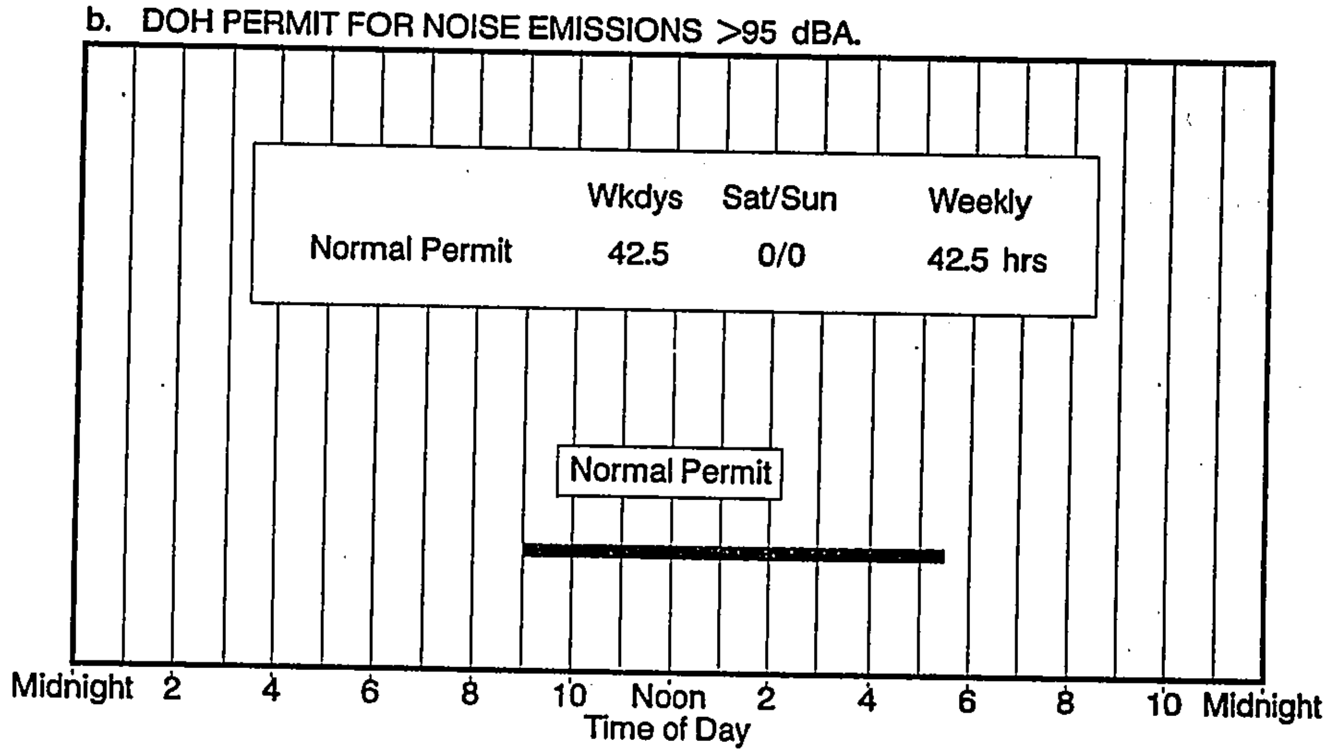
TABLE 7

AVAILABLE WORK HOURS UNDER DOH PERMIT PROCEDURES FOR CONSTRUCTION NOISE

a. DOH PERMIT FOR NOISE EMISSIONS ≤95 dBA.



b. DOH PERMIT FOR NOISE EMISSIONS >95 dBA.



APPENDIX A. REFERENCES

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

(2) "Environmental Criteria and Standards, Noise Abatement and Control, 24 CFR, Part 51, Subpart B;" U.S. Department of Housing and Urban Development; April 1, 1995.

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

(4) Chapter 508D, "Mandatory Seller Disclosures in Real Estate Transactions;" Hawaii Revised Statutes; July 1, 1995.

(5) "Final Report - Noise Compatibility Program; Keahole Airport, Hawaii;" Hawaii State Department of Transportation, Airports Division; November 1987.

(6) Barry, T. and J. Reagan, "FHWA Highway Traffic Noise Prediction Model;" FHWA-RD-77-108, Federal Highway Administration; Washington, D.C.; December 1978.

(7) Traffic projections for the Koloko Town Center Project; The Traffic Management Consultant's transmittal dated February 8, 1996.

(8) 24-Hour Traffic Counts; Station C-8-D, Queen Ka'ahumanu Highway at Road to Kealakehe Parkway (Honokohau); Hawaii State Department of Transportation; July 19, 1994.

(9) "Update of Hawaii Aviation Demand Forecasts;" Aries Consultants Ltd.; October 1994.

(10) "Title 11, Administrative Rules, Chapter 43, Community Noise Control for Oahu;" Hawaii State Department of Health; November 6, 1981.

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, NOISE REGULATION REPORTER.

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.

Air Quality Impact Analysis, Kaloko Town Center, North Kona, Hawaii

Ogden Environmental and Energy Services Co., March 1996

AIR QUALITY IMPACT ANALYSIS
Kaloko Town Center
North Kona, Hawaii

Prepared For
Tokyo Green Hawaii, Inc.
c/o Pacific Land Services, Inc.
810 Richards Street, Suite 900
Honolulu, Hawaii 96813

Prepared By
Ogden Environmental and Energy Services Co.
680 Iwilei Road, Suite 660
Honolulu, Hawaii 96817

March 1996

TABLE OF CONTENTS

LIST OF FIGURES

TABLE OF CONTENTS (Continued)

LIST OF TABLES

ACRONYMS

$\mu g/m^3$	Micrograms per Cubic Meter
°F	Degrees Farenheit
CAA	Clean Air Act
CFR	Code of Federal Regulations
CO	Carbon Monoxide
DBEDT	Department of Business, Economic Development & Tourism
DOH	Hawaii State Department of Health
EPA	U.S. Environmental Protection Agency
H_2S	Hydrogen Sulfide
HAR	Hawaii Administrative Rules
HC	Hydrocarbons
HELCO	Hawaii Electric Light Company
LOS	Level of Service
mph	Miles per Hour
mps	Meters per Second
MSL	Mean Sea Level
NAAQS	National Ambient Air Quality Standards
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
O_3	Ozone
Pb	Lead
PM	Particulate Matter
PM_{10}	Particulate Matter Less Than 10 Microns in Diameter
ppm	Parts per Million
SAAQS	State Ambient Air Quality Standards
SO_2	Sulfur dioxide
TMK	Tax Map Key
USCS	U.S. Soils Conservation Service
VOG	Volcanic Smog

SECTION 1
INTRODUCTION

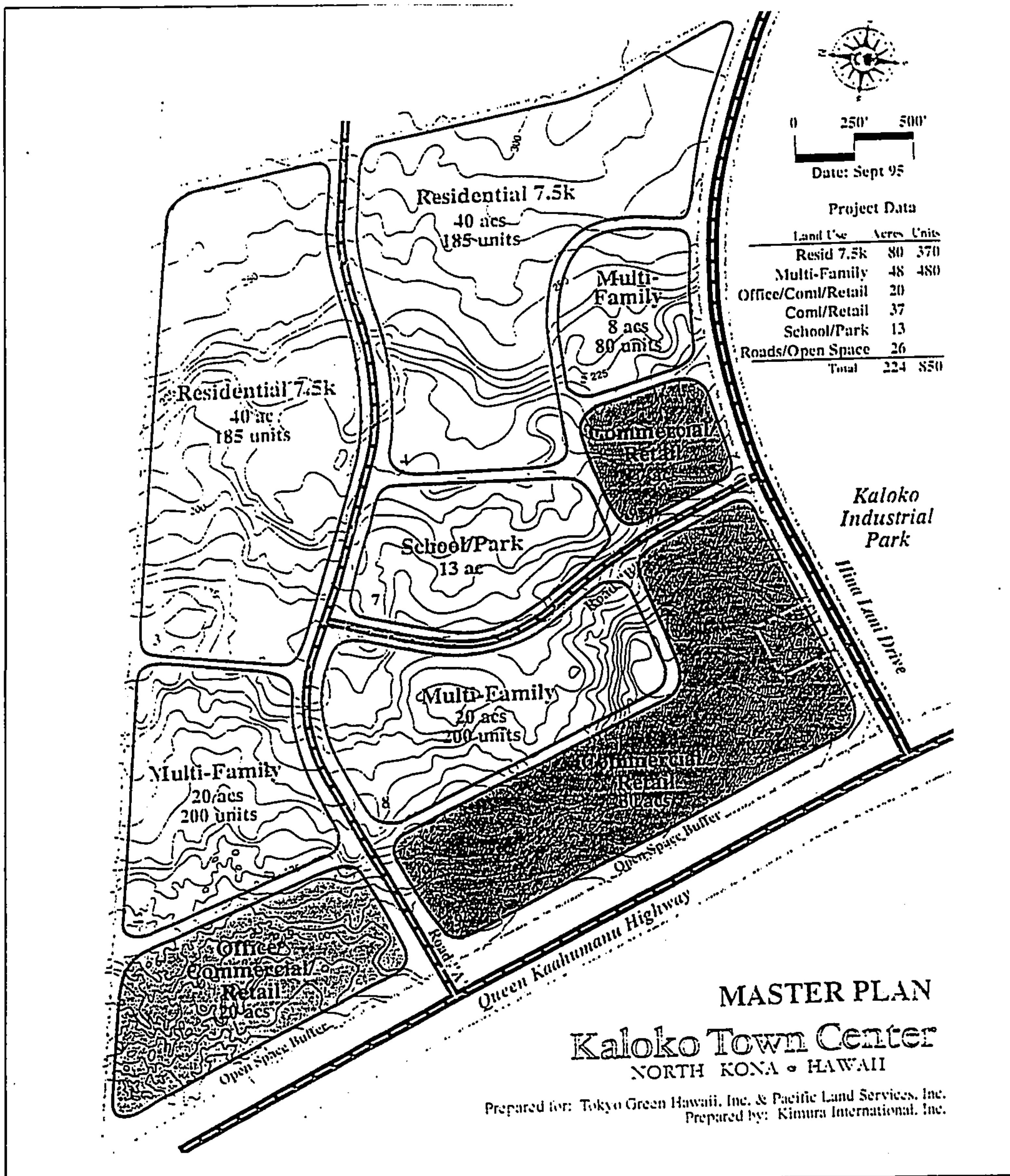
Tokyo Green Hawaii, Inc. and Pacific Land Services, Inc. are proposing to develop 224.43 acres of undeveloped land in the Kaloko-Kohanaiki subdistricts of North Kona on the Island of Hawaii (Tax Map Key (TMK) No. 3rd Division, 7-3-09-017). The property is located approximately 2.8 miles south of Keahole Airport and 4 miles north of Kailua-Kona Town. The proposed development site, referred hereinafter as the Kaloko Town Center, will urbanize the property by incorporating multi- and single-family residential housing units, industrial/commercial sites, office/commercial/retail sites, and sites for a school and park (Kimura International, Inc. 1995). Figure 1-1 shows the Kaloko Town Center as presented in the Master Plan prepared by Kimura International, Inc.

The purpose of this report is to assess the local and regional impact of the Kaloko Town Center on air quality. Impacts to the air quality that exceed either the National Ambient Air Quality Standards (NAAQS) or the State Ambient Air Quality Standards (SAAQS) would constitute a significant impact. Impacts to the air quality that do not exceed either the NAAQS or SAAQS would be considered insignificant.

The overall development is an "indirect source" of air pollution as defined in the Federal Clean Air Act (CAA) because its primary association with air pollution is due to its inherent generation of motor vehicle traffic that will be generated by residential and industrial/commercial activities. Thus, the focus of this report is on the development's potential to impact air quality due to increased traffic volume. In addition, this report addresses the short-term impacts due to on-site construction activities, and the indirect impacts off-site due to increased demand for electrical energy. Over 90 percent of the energy generated in the State of Hawaii is by combustion of fossil fuel (Hawaii State Department of Business, Economic Development & Tourism (DBEDT) 1993).

The remaining sections of this report are summarized in the following sections. Section 2 describes the environmental background and regulatory setting. Section 3 discusses the potential environmental impacts of the Kaloko Town Center. Section 4 discusses

DOCUMENT CAPTURED AS RECEIVED



OGDEN

PROJECT LOCATION, KALOKO TOWN CENTER
NORTH KONA, ISLAND OF HAWAII

FIGURE 1-1

appropriate mitigation measures when deemed necessary. References are presented in Sections 5.

SECTION 2
ENVIRONMENTAL AND REGULATORY BACKGROUND

This section addresses the environmental and regulatory background that is pertinent to the Kaloko Town Center. A summary of the existing air quality and physical conditions (i.e., meteorology, climate, and topography) affecting air pollution dispersion at the Kaloko Town Center and surrounding area is presented. In addition, applicable regulations governing the NAAQS and SAAQS are discussed.

2.1 CLIMATOLOGY

The Island of Hawaii is located within the North Pacific trade wind band. The trade winds are controlled by a semipermanent high pressure system that is located north-northeast of the Hawaiian Islands. Wind circulation generated by this high pressure system is clockwise and outward from the center. The prevailing winds arrive from the northeast to east direction. The winds are more persistent in the summer than in the winter, averaging 90 and 50 percent, respectively, and stronger in the afternoon than at night (University of Hawaii 1983).

The average temperature measured in Kailua-Kona, which is located south of the development site, is 72.1 degrees Fahrenheit (72.1°F) during the coolest month of year. The average temperature during the warmest month of the year is 77.3°F. Data also indicates that the lowest and highest (extreme) temperatures on record are 54°F and 93°F, respectively. Average annual precipitation in the vicinity of the Kaloko Town Center have been measured at 25 inches near Kailua-Kona. However, in 1992 the average annual precipitation at Keahole Point and Waikaloa were 11.5 inches. These two sites are also near the Kaloko Town Center (DBEDT 1993).

2.2 TOPOGRAPHY

The Kaloko Town Center will cover approximately 224 acres of land near the western coast of the Island of Hawaii, four miles north of Kailua-Kona Town. The property is bordered by Queen Kaahumanu Highway to the west, the Kaloko Industrial Park to the south, and privately owned land to the north and east. The Pacific Ocean lies approximately 4,000 feet west of the Kaloko Town Center.

Topographic maps indicate that the land is generally flat. Ground elevation rises from approximately 100 feet above mean sea level (MSL) on the western boundary to about 300 feet MSL on the eastern boundary. Soils are classified by the U.S. Soils Conservation Service (USCS) as pahoehoe lava, with small patches of a'a lava in the northern area. The majority of the site consists of bare a'a and pahoehoe lava flows with no topsoil material and is considered poorly suited for agricultural cultivation (Kimura International, Inc. 1995). Figure 2-1 is a topographic map showing the topography of the Kaloko Town Center.

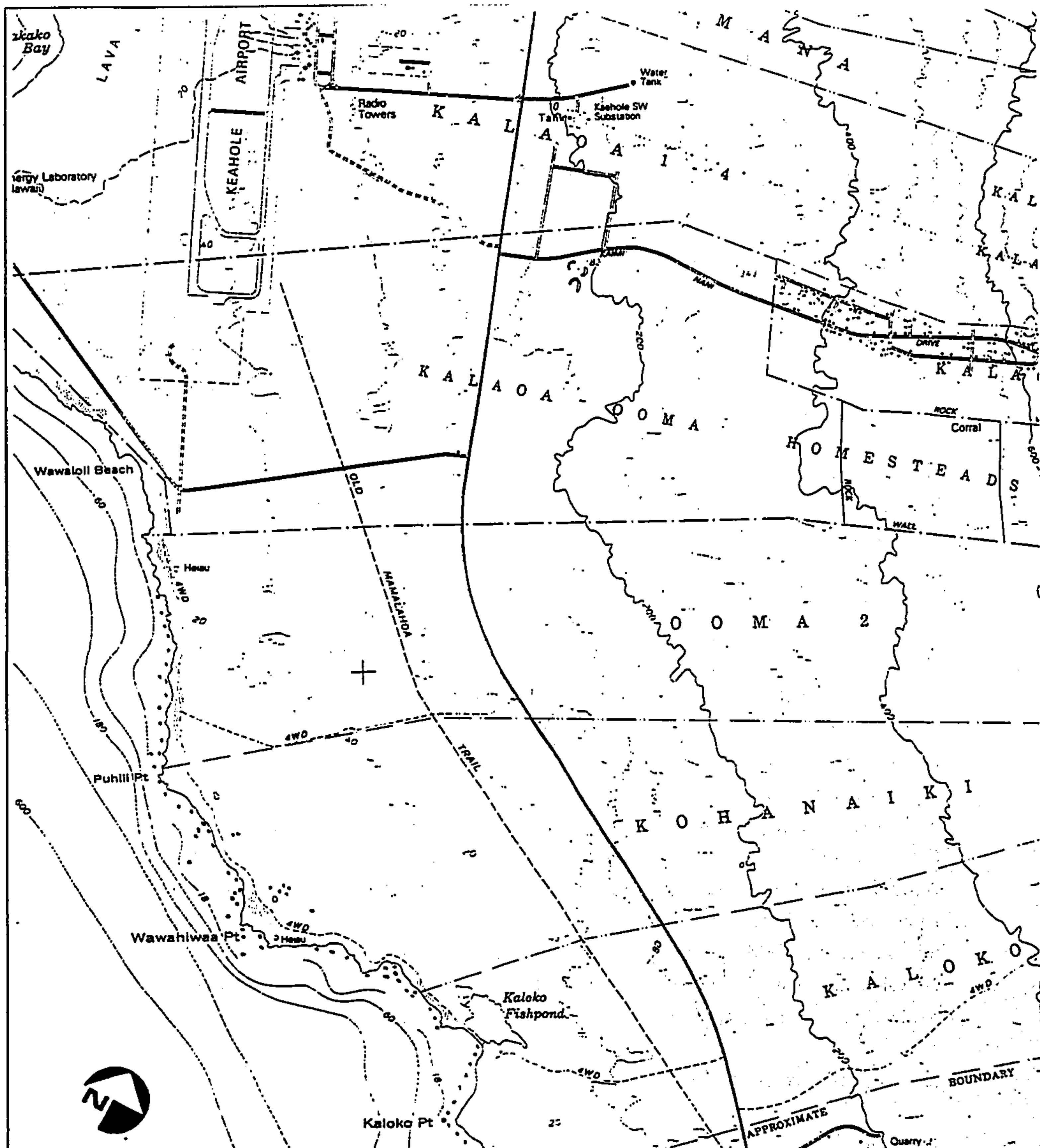
2.3 Regulatory Setting

The Federal CAA (amended November 15, 1990) set forth NAAQS with States retaining the option to develop more stringent standards. These standards represent the maximum levels of pollution considered safe, with an adequate margin of safety, to protect the public health and welfare. The six pollutants for which NAAQS have been established (criteria pollutants) are sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), particulate matter less than 10 microns in diameter (PM_{10}), and lead (Pb). SAAQS were established for these same pollutants in Chapter 11-59 of the Hawaii Administrative Rules (HAR), Ambient Air Quality Standards (HAR 1993). In the amendment of Chapter 11-59, the SAAQS for particulate matter (PM) was removed and a new standard for PM_{10} was implemented to match the NAAQS for PM_{10}. The State of Hawaii also adopted a hydrogen sulfide (H_2S) standard as well. Both NAAQS and SAAQS are summarized in Table 2-1.

2.4 Ambient Air Quality Levels

In evaluating the compliance of a new source with applicable standards, ambient background concentrations of the criteria pollutants are added to the maximum predicted concentrations resulting from implementation of the Kaloko Town Center, and compared with existing NAAQS and SAAQS. Typically, the maximum background concentrations

DOCUMENT CAPTURED AS RECEIVED



Scale: 1:24,000

US Geological Survey, 7.5 Minute Topographic Map, 1982.

OGDEN

TOPOGRAPHIC MAP
NORTH KONA, ISLAND OF HAWAII

FIGURE
2-1

Table 2-1
SUMMARY OF NAAQS AND SAAQS
($\mu g/m^3$)

Pollutant	NAAQS Primary Standard[a]	NAAQS Secondary Standard[b]	SAAQS
Carbon Monoxide (CO)			
1 hour	40,000	40,000	10,000
8 hour	10,000	10,000	5,000
Nitrogen Dioxide (NO_2)			
1 hour	--	--	--
24 hour	--	--	--
Annual (Arithmetic)	100	100	70
Particulate Matter-10[c] (PM_{10})			
24 hour	150	150	150
Annual (Arithmetic)	50	50	50
Ozone (O_3)			
1 hour	235	235	100
Sulfur Dioxide (SO_2)			
3 hour	--	1,300	1,300
24 hour	365	--	365
Annual (Arithmetic)	80	--	80
Lead (Pb)			
3 months (Arithmetic)	1.5	1.5	1.5
Hydrogen Sulfide (H_2S)			
1 hour	--	--	35

a Designed to prevent adverse effects on public health.
b Designed to prevent adverse effects on public welfare including effects on comfort, visibility, vegetation, animals, aesthetics values, and soiling and deterioration of materials.
c Particulate Matter which is 10 microns or less in diameter.
-- No established standard

recorded within the previous three years are used to represent baseline conditions for the air quality analysis. As for the Kaloko Town Center area under consideration, ambient concentrations have not been monitored regularly by the Department of Health (DOH) - Clean Air Branch. According to the Hawaii Air Quality Data Report for 1991 through 1993 (DOH 1995), no pollutants have been monitored by DOH until very recently. In January of 1996, DOH installed a monitoring station at 81-941 Hale Kii in Kealakekua to collect ambient concentrations of PM_{10}. While there are no ambient concentration data available for the criteria pollutants, it is safe to assume that the air quality relative to these pollutants is good. The State of Hawaii is presently considered by the U.S. Environmental Protection Agency (EPA) to be in attainment for all criteria pollutants (i.e., not violating the NAAQS or SAAQS) as codified in the Code of Federal Regulations (CFR) - Title 40 §81.312 (US Code of Federal Regulations 1992).

According to Ms. Lisa Young, Manager of the Monitoring Section of the Clean Air Branch at the DOH, the State of Hawaii is in attainment with the NAAQS and SAAQS for PM_{10}. The worst air pollution episodes experienced in Hawaii County are due to the infrequent and unpredictable volcanic eruptions. While volcanic emissions are somewhat variable and have not been fully characterized, it is well known that visibility is frequently affected by the presence of fine particles resulting directly from volcanic activity, as well as, secondarily from forest fires caused by lava flows. This source of natural pollution is often referred to as volcanic smog (VOG). In addition, there are substantial increases in the ambient concentrations of SO_2 and other toxic air contaminants (Personal Communication 1996).

SECTION 3
POTENTIAL ENVIRONMENTAL IMPACTS

This section describes the potential environmental impacts of the Kaloko Town Center. Impacts have been broken down into three groups: short-term, long-term, and indirect. Each of these groups is discussed below.

3.1 SHORT-TERM POLLUTANT IMPACTS

Short-term pollutant impacts of the Kaloko Town Center are considered to be those associated with construction activities. Emission sources primarily include tailpipe emissions from heavy-duty construction equipment and workers' vehicles and fugitive dust generated during demolition and construction activities, particularly site clearing and land grading.

During the construction of the development, various types of equipment (i.e., scrapers, dozers, and water trucks) will be utilized. The operation of the heavy-duty construction equipment will cause the emission of SO_2, oxides of nitrogen (NO_x), hydrocarbons (HC), CO, and PM_{10}. Typically, diesel-powered equipment will emit more NO_x, SO_2, and PM_{10} than will gasoline-powered equipment. The latter, however, will emit more HC and CO. In addition, exhaust emissions from workers' vehicles will add to the total pollutants emitted. While localized increases of these pollutants are expected to occur, they are not considered significant.

Fugitive dust generation (i.e., PM) from clearing vegetation and other heavy-duty construction operations is estimated at the rate of 1.2 tons per acre per month of activity (EPA 1985). According to the Environmental Assessment Master Plan, approximately 224.43 acres will be disturbed over the 15 to 20 year development lifetime. With an estimated 11.2 acres of land being disturbed per year, the amount of fugitive dust generated per month is expected to be less than one ton per month. Therefore, fugitive dust impacts to the air quality during the construction phase of the Kaloko Town Center will be localized, temporary, and considered insignificant.

3.2 LONG-TERM POLLUTANT IMPACTS

Long-term pollutant impacts of the proposed Kaloko Town Center project are considered to be those associated with everyday use of the development. The most significant long-term emission sources are motor vehicles, with the most significant tailpipe emission being CO.

High short-term concentrations of CO, known as "hot spots", can occur at locations where traffic is congested, such as at intersections and along highways. For this development, the intersection of Queen Kaahumanu Highway and Hina Lani Drive was modeled because this location has the greatest traffic volume (in terms of vehicles per peak hour) of all the intersections in the area (The Traffic Management Consultant 1996). In addition, the intersection is expected to operate at a Level of Service (LOS) "F" rating in the future with and without the development of the Kaloko Town Center. Consequently, traffic at this intersection was modeled for both morning and evening peak hour traffic volumes. Air quality impacts were predicted using the existing 1996 traffic data, the projected 2020 traffic data assuming the Kaloko Town Center is not built, 2020 traffic data assuming the Kaloko Town Center is built, and 2020 traffic data assuming the Kaloko Town Center is built with recommended mitigation measures from the Traffic Management Consultant. The modeling results provide the worst-case scenario of CO concentration levels to be produced with or without the development of the Kaloko Town Center.

Westbound traffic along Hina Lani Drive is controlled by a stop sign prior to entering the intersection with Queen Kaahumanu Highway. North and south bound traffic moving along Queen Kaahumanu is not controlled by any stop signals. Traffic along Queen Kaahumanu Highway turning east bound onto Hina Lani Drive are required to yield in turning lanes that have been provided for this purpose.

The CAL3QHC air quality model developed by the EPA was used to analyze the potential air quality impacts at specific receptors surrounding the intersection. CAL3QHC is presently listed in Supplement B to the EPA Guideline on Air Quality

Models (Revised) as the preferred air quality model to use for mobile air pollution emissions (EPA 1987, EPA 1990a).

Vehicle emissions were generated for 1996 and 2020 using MOBILE 5.0 emission factors, assuming the national average vehicle mix (EPA 1993a). The idle emission factors were generated by the MOBILE 4.1 model, as recommended in CAL3QHC documentation and were adjusted for site-specific conditions (EPA 1993b, EPA 1995). The DOH has indicated that the average miles traveled per gallon per vehicle in the State of Hawaii is higher than the national average. This higher average is due to a higher number of fuel efficient vehicles (most likely rental cars) in operation. Therefore, using the national vehicle mix emission rates is conservative. Different emission factors were used for the various estimated speeds approaching the intersections (i.e., 45 miles per hour (mph) along Hina Lani Drive and 55 mph along Queen Kaahumanu Highway). The MOBILE emission rates were used as input into CAL3QHC.

The CAL3QHC model is designed to calculate CO concentrations at signalized intersections. Because the intersection of concern is operated by a stop sign along Hina Lani Drive, some adjustments to the modeling approach were made. According to Braverman and Wholley (Personal Communication 1992), a stop sign can be simulated by CAL3QHC by modeling queue lengths with an arbitrary signal time of 100 seconds of which 70 seconds are set as red time. Using this scenario, the model will generate the number of vehicles per hour that need to pass along the queue to generate an appropriate emission rate for the intersection. Where there is no signal or stop sign controlling the movement of traffic, such as along the north and south bound Queen Kaahumanu Highway, the CAL3QHC model still produces appropriate CO concentrations based on CALINE-3 algorithms (Benson 1979).

The maximum 1-hour average concentration of CO was estimated based on the worst-case meteorological conditions of a wind speed of 1.0 meters per second (mps) and a stability class of D. This stability class is considered appropriate for the study involved. Wind directions for the modeling analysis were selected at 10 degree increments. Receptors (i.e., locations where the ambient CO concentrations are calculated) were placed outside of the mixing zone 20-feet from the roadways.

For the 1-hour modeling scenarios, there are no potential violations of the NAAQS or SAAQS. The results shown in Table 3-1 list the maximum predicted CO concentrations for the wind direction that caused the highest overall concentration.

Based on EPA guidelines, a persistence factor of 0.7 was used to estimate the 8-hour average CO concentration from the predicted 1-hour values (EPA 1985). For the 8-hour modeling scenarios, there are no potential violations of the NAAQS or SAAQS. The results shown in Table 3-2 list the maximum predicted CO concentrations for the wind direction that caused the highest overall concentration.

The modeling results indicate that the project is not expected to exceed the CO NAAQS or SAAQS. One interesting note regarding the difference between existing conditions and future conditions is that the projected improvements in vehicular emissions expected in future years outweighs the increased traffic expected in 2020. In other words, predicted CO concentrations are expected to decrease. Therefore, the total CO impacts (i.e., concentrations from the proposed project together with the assumed background concentrations) with or without the Kaloko Town Center are not significant.

Other air pollution sources (primarily combustion sources) will also contribute to regional air quality background concentrations. Commercial-size combustion sources like boilers and water heaters will emit primarily NO_x, although smaller quantities of pollutants such as reactive organic gases, CO, SO_2, and PM are also produced. The quantities of pollutants emitted from residential water heaters and the like are relatively small. Such impacts are very project-specific and, therefore, were not quantified for this analysis. However, these impacts are generally not considered significant in attainment areas.

3.3 Indirect Pollutant Impacts

The Kaloko Town Center will have additional air quality impacts beyond those associated with construction and traffic. For example, street lights have no direct emissions of air pollutants. However, these lighting fixtures will increase energy demand from power generating facilities. This increased demand, though minimal, will also

Table 3-1
MAXIMUM PREDICTED 1-HOUR CO CONCENTRATIONS
(ppm)

Year	Ambient	Base Year	No Project	With Project	Traffic Mitigation	Total Concentration	SAAQS	NAAQS
1996 am	2.00	2.00				4.00	9	35
pm	2.00	2.90				4.90	9	35
2020 am	2.00		0.90			2.90	9	35
pm	2.00		1.30			3.30	9	35
2020 am	2.00			1.20		3.20	9	35
pm	2.00			1.90		3.90	9	35
2020 am	2.00				1.10	3.10	9	35
pm	2.00				1.70	3.70	9	35

Note: 1-hour CO SAAQS of 9 ppm is equivalent to 10,000 μg/m3.
1-hour CO NAAQS of 35 ppm is equivalent to 40,000 μg/m3.

Table 3-2
MAXIMUM PREDICTED 8-HOUR CO CONCENTRATIONS
(ppm)

Year	Ambient	Base Year	No Project	With Project	Traffic Mitigation	Total Concentration	SAAQS	NAAQS
1996 am	1.40	1.40				2.80	4	9
pm	1.40	2.03				3.43	4	9
2020 am	1.40		0.63			2.03	4	9
pm	1.40		0.91			2.31	4	9
2020 am	1.40			0.84		2.24	4	9
pm	1.40			1.33		2.73	4	9
2020 am	1.40				0.77	2.17	4	9
pm	1.40				1.19	2.59	4	9

Note:. 8-hour CO SAAQS of 4 ppm is equivalent to 5,000 µg/m3.
8-hour CO NAAQS of 9 ppm is equivalent to 10,000 µg/m3.

contribute to the regional air pollution background. However, total air pollution generated will have little impact in the area and will remain below the NAAQS and SAAQS. Therefore, impacts beyond those associated with construction and traffic are considered to be insignificant.

As the population on the Island of Hawaii grows, increased demand will dictate that the Hawaii Electric Light Company (HELCO) be able to provide additional electricity. Though HELCO is presently investigating increasing electrical output on the Island of Hawaii, currently the majority of the island's electricity is generated by burning fuel oil which emits SO_2, NO_x, PM, and HC. The impact from these emissions will be external to the Kaloko Town Center, but because additional electrical demands will be generated by the development, a portion of these emissions are attributable to it. This increase in electrical demand as a result of the project will have little impact in the area and pollutant concentrations are expected to remain below the NAAQS and SAAQS. Therefore, impacts associated with electrical demand are considered to be insignificant.

SECTION 4
MITIGATION MEASURES

Although there are no significant impacts to the air quality as a result of the Kaloko Town Center to warrant required mitigation measures, this section describes various mitigation measures that can be employed to minimize or reduce the potentially adverse environmental impacts from the Kaloko Town Center. The mitigation measures vary according to impact type. The following subsections discuss mitigation measures for short-term, long-term, and indirect pollutant impacts.

4.1 SHORT-TERM MEASURES

Fugitive dust and heavy equipment use are the primary short-term emission sources. Fugitive dust emissions can be mitigated by ensuring that appropriate brush clearing and construction operations are practiced. These include:

- minimizing the number of concurrent brush clearing and construction activities; and
- watering, which can minimize fugitive dust emissions by fifty percent.

Onsite personnel should determine the locations and application times for watering based on construction activities and local meteorological conditions.

Although the exhaust emissions from the construction equipment are not expected to be significant, the following measures can be taken to reduce potential impacts. These measures include:

- utilizing electrical equipment; or
- fuel burning equipment with air pollution control technologies applied (i.e., source catalytic converter and fuel injection timing retard).

4.2 LONG-TERM MEASURES

The increase in traffic volume as a result of the Kaloko Town Center is not expected to significantly raise the CO concentration in the surrounding areas. However, there are mitigation measures designed to reduce motor vehicle trip generation that can be incorporated into the overall project strategy. Implementation of the following measures are suggested:

- implement traffic flow improvement measures, such as proper signalization and road widening for intersections with poor LOS ratings;
- encourage ride-sharing/car pooling or use of public transportation by employees;
- limit the number of passenger parking spaces to promote the use of shuttle services and public transportation;
- discourage idling vehicles at drop-off points;
- implement bicycle lanes for bicycling; or
- encourage walking.

4.3 INDIRECT MEASURES

Although the indirect air pollution sources are not considered to be significant, energy conservation measures can be employed to minimize the emissions from electrical power generation brought about by the Kaloko Town Center. Energy conservation measures include:

- passive solar water heating;
- low pollutant emitting systems for water heating; and
- developing integrated energy systems that provided services to more than one dwelling unit by a centralized system and building design.

An example of an integrated energy system is a centralized water heating system, appropriate for residential developments involving multifamily occupancy. In addition, when building design is taken into account, energy conservation measures can be significant in reducing emissions. Examples of these techniques include:

- avoidance of large glass areas;
- efficient use of shading;
- maximizing natural light;
- placement of high usage rooms to avoid summer heat; and
- proper use of attic fans or other ventilation systems.

SECTION 5
REFERENCES

Benson, P. 1979. CALINE-3 - A Versatile Dispersion Model for Predicting Air Pollutant Levels Near Highways and Arterial Streets. Office of Transportation, California DOT, Sacramento, California. FHWA/CA/TL-79/23, Nov./1979.

DBEDT, 1993. The State of Hawaii Data Book 1992: A Statistical Abstract, 1993.

Department of Health (DOH), 1995. Hawaii Air Quality Data: 1991-1993, 1995.

Environmental Protection Agency (EPA), 1985. Compilation of Air Pollution Emission Factors, AP-42, Fourth Edition, Department of the Interior, Environmental Protection Agency, Research Triangle Park, NC.

EPA, 1987. Guideline On Air Quality Models (Revised), Department of the Interior, Environmental Protection Agency, Research Triangle Park, NC.

EPA, 1990a. Supplement B to Guideline on Air Quality Models (Revised), Department of the Interior, Environmental Protection Agency, Research Triangle Park, NC. September 1990.

EPA, 1993a. User's Guide to MOBILE 5.0 (Mobile Source Emission Factor Model), Department of the Interior, Environmental Protection Agency, Research Triangle Park, NC. March 1993.

EPA, 1993b. User's Guide to MOBILE 4.1 (Mobile Source Emission Factor Model), Department of the Interior, Environmental Protection Agency, Research Triangle Park, NC. July 1991.

EPA, 1995. User's Guide to CAL3QHC Version 2.0, Department of the Interior, Environmental Protection Agency, Research Triangle Park, NC. November 1995.

Federal Clean Air Act Amendments, 1990.

HAR, Chapter 11 - 59, Ambient Air Quality Standards, 1993.

Kimura International, Inc. 1995. Kaloko Town Center: North Kona, Hawaii - Environmental Assessment. August 1995.

Personal communication, Braverman, T., technical representative for CAL3QHC at Research Triangle Park, 1992.

Personal communication, Wholley, T., principal author of CAL3QHC, 1992.

Personal communication, Young, L., Manager of the Monitoring Section of the Clean Air Brach at the DOH, 1996.

The Traffic Management Consultant, 1996. Traffic Impact Report for the Proposed Kaloko Town Center Development, Island of Hawaii.

University of Hawaii, 1983. *Atlas of Hawaii.* Department of Geography, University of Hawaii, Honolulu HI.

US Code of Federal Regulations (CFR) - Title 40 §81.312, 1992.

US Geological Survey, 1982. 7.5 Minute Topographic Map: North Kona Quadrangle

D

Botanical Survey Kaloko Town Center, North Kona District, Island of Hawaii

Char & Associates, November 1995

BOTANICAL SURVEY
KALOKO TOWN CENTER
NORTH KONA DISTRICT, ISLAND OF HAWAI'I

by

Winona P. Char

CHAR & ASSOCIATES
Botanical Consultants
Honolulu, Hawai'i

Prepared for: KIMURA INTERNATIONAL INC.

November 1995

Table of Contents

EXECUTIVE SUMMARY

A study of the flora or botanical resources on the proposed ±224-acre Kaloko Town Center was conducted by Char & Associates in June 1995. A dense cover of fountain grass (Pennisetum setaceum) with scattered thickets of koa-haole (Leucaena leucocephala) occurs on the weathered pahoehoe flows which are found throughout most of the site. On the smaller fingers and patches of 'a'a lava which are found primarily on the northern portion of the property, the vegetation is sparser and tends to be found in low-lying areas where soil and debris accumulate. On the 'a'a flows the vegetation consists of scattered patches of shrubs such as koa-haole, Christmas berry (Schinus terebinthifolius), and maiapilo (Capparis sandwichiana); clumps of fountain grass; and a few trees of 'ohi'a (Metrosideros polymorpha).

None of the plants found during the field studies is a listed, proposed, or category 1 (high priority) candidate endangered species. The maiapilo is considered a category 2 (low priority) candidate endangered species; category 2 plants do not have enough data to support listing proposals at this time by the U.S. Fish and Wildlife Service. The maiapilo can be found scattered along the coast and in lowland scrub vegetation throughout all the main Hawaiian Islands and on some of the northwest, leeward islands. No sensitive native plant-dominated communities exist on the site today. The bulk of the vegetation on the property is composed of introduced or alien species such as fountain grass and koa-haole.

In summary, the proposed development of the ±224-acre site should not have a significant negative impact on the botanical resources. Some of the more easy to grow and ornamental native lowland species are recommended for landscaping the common areas.

BOTANICAL SURVEY
KALOKO TOWN CENTER
NORTH KONA DISTRICT, ISLAND OF HAWAI'I

INTRODUCTION

The proposed Kaloko Town Center project site consists of about 224 acres of land, identified as Tax Map Key: 3rd Division, 7-3-09:17. The project site is situated immediately mauka of Queen Ka'ahumanu Highway, and bounded by Hina Lani Drive and the existing Kaloko Light Industrial Subdivision to the south and privately owned industrial and commercial zoned land to the north. Land to the east was previously amended from Agriculture to Urban for golf course use. The undeveloped land supports dense fountain grass with scattered patches of koa-haole shrubs and kiawe trees on areas with weathered pahoehoe flows. The smaller fingers of 'a'a lava, which are found primarily on the northern portion of the project site, are sparsely vegetated.

With the exception of 21,281 square feet which is designated Urban, the remaining 223.96 acres is zoned Conservation. The proposed project seeks a State Land Use Commission boundary amendment from Conservation to Urban District to allow the development of a mixture of land uses in a master planned community.

Field studies to assess the botanical resources found on the proposed Kaloko Town Center were conducted on 14 June 1995; four botanists, working in teams of two each, were used to gather the data contained in this report. The primary objectives of the survey were to: 1) provide a description of the vegetation; 2) inventory the flora; 3) search for threatened and endangered species protected by Federal and State laws; and 4) identify areas of potential environmental problems or concerns and propose appropriate mitigation measures.

SURVEY METHODS

Prior to undertaking the field studies, a search was made of the pertinent literature to familiarize the principal investigator with other botanical studies conducted in the general area. Topographic maps and a very recent, colored aerial photograph were examined to determine vegetation cover patterns, terrain characteristics, access, boundaries, and reference points. Access onto the site was from Hina Lani Drive.

The 'a'a lava flows, and rocky outcrops in the pahoehoe areas were intensively surveyed as these portions of the property were more likely to harbor native plant communities and, perhaps, rare plants. A walk-through (pedestrian) survey method was used. Notes were made on plant associations and distribution, substrate types, disturbance, drainage, topography, exposure, etc. Plant identifications were made in the field; plants which could not be positively identified were collected for later determination in the herbarium (University of Hawai'i, Manoa -- HAW), and for comparison with the recent taxonomic literature.

The species recorded on the property are indicative of the season ("rainy" vs. "dry") and the environmental conditions at the time of the survey. A survey taken at a different time of the year and under varying environmental conditions would no doubt yield minor differences in the species checklist, especially of the weedy, annual plants.

DESCRIPTION OF THE VEGETATION

The average annual percipitation for the project site is around 11 to 12 inches. The topography is characterized by a relatively uniform slope which rises gently from Queen Ka'ahumanu Highway, at about 100 ft. elevation, to its mauka boundary at about 300 ft. elevation (Kimura International Inc. 1995).

The substrate throughout most of the project site consists of weathered pahoehoe lava, identified as "rLW" on the soil maps (Sato *et al*. 1973), with smaller fingers and patches of 'a'a lava, identified as "rLV" on the soil maps.

The pahoehoe flows support dense fountain grass grassland with koa-haole shrubs forming somewhat dense thickets in low-lying swale areas. The 'a'a lava flows are sparsely vegetated, but the majority of the native species occur here. The two vegetation types found on the subject property are described in more detail below, and a checklist of all the plants inventoried during the field studies is presented at the end of the report.

Fountain Grass Grassland

Fountain grass (*Pennisetum setaceum*), an introduced or alien species native to northern Africa, is the most abundant plant on the project site and adjacent properties. It is the dominant ground cover in dry, open areas of North Kona and South Kohala. Fountain grass is a fire-adapted bunchgrass that has spread rapidly since its introduction into the Hawaiian Islands in the early part of the 20th century. It is able to invade lava flows previously dominated by native vegetation, where it interferes with native plant regeneration, upsets natural succession, and increases the likelihood of fire (Cuddihy and Stone 1990). Its large accumulated dry biomass burns swiftly and hot (Wagner *et* al. 1990).

Scattered through the dense fountain grass cover in low-lying swale areas are thickets of koa-haole or ekoa shrubs (Leucaena leucocephala), 3 to 8 ft. tall. This native of the American tropics is very common in low elevation, dry, disturbed habitats on all of the main Hawaiian Islands. Recently, a heavy infestation of a Carribbean psyllid (Heteropsylla cubana) has caused much defoliation of the plants (Wagner et al. 1990). Other woody introduced species found occasionally in this grassland include scattered trees of kiawe (Prosopis pallida), and a few shrubs of klu (Acacia farnesiana), lantana (Lantana camara), and Christmas berry (Schinus terebinthifolius). Smaller, nonwoody, components include indigo (Indigofera suffruticosa), Natal redtop grass (Rhynchelytrum repens), partridge pea (Chamaecrista nictitans), air plant (Kalanchoe pinnata), hairy spurge (Chamaesyce hirta), and Guinea grass (Panicum maximum).

Native plants, with the exception of 'uhaloa (Walteria indica) which is locally common, occur generally as scattered individuals and in small numbers. Some native plants found on the project site are shrubs of 'ilima (Sida fallax), the native caper or maiapilo (Capparis sandwichiana), alahe'e (Canthium odoratum), and a'ali'i (Dodonaea viscosa) as well as the diminutive kumu-niu fern (Doryopteris decipiens), and two vines: koali-'awa (Ipomoea indica) and huehue (Cocculus trilobus).

'A'a Lava Flow

The rough, scoriaceous 'a'a substrates tend to be largely barren, except for small pockets of plants which occur in depressions where some soil and debris has accumulated. Fountain grass and shrubs of koa-haole and Christmas berry occur in these depressions along with a number of dryland native species. These include a few trees of 'ohi'a (Metrosideros polymorpha) -- 20 to 25 ft. tall, the native persimmon or lama (Diospyros sandwicensis), and 'ohe (Reynoldsia sandwicensis). Also present are shrubs of naio (Myoporum sandwicense), maiapilo, and alahe'e; and smaller plants such as alena (Boerhavia repens), huehue, and 'uhaloa.

Native species occur with more frequency on the 'a'a substrates because the rough, clinkery, and loose/unstable 'a'a tends to discourage garzing animals such as goats and cattle. The aggressive fountain grass also does not colonize this substrate as readily as the pahoehoe flows.

DISCUSSION AND RECOMMENDATIONS

The vegetation on the project site is not complex or species rich, and is dominated by the introduced fountain grass with small thickets of koa-haole. Fountain grass grassland occurs on the pahoehoe flows which comprise most of the project site. A few native species are found on the property, many of them associated with the small fingers and patches of 'a'a lava. A total of 48 plant species have been inventoried on the proposed Kaloko Town Center. Of these, 29 (60.5%) are introduced or alien species, 2 (4%) are originally of Polynesian introduction, and 17 (35.5%) are native. Of the natives, 5 are endemic, that is, they are found only in the Hawaiian Islands; and 12 are indigenous, that is, they occur in the Hawaiian Islands and also eleswhere. The endemic plants are the kumu-niu fern (Doryopteris decipiens), 'ohe (Reynoldsia sandwicensis), maiapilo (Capparis sandwichiana), lama (Diospyros sandwicensis), and 'ohi'a (Metrosideros polymorpha).

None of the plants found during the survey is a listed, proposed, or category 1 (high priority) candidate endangered species (U.S. Fish and Wildlife Service 1994a, 1994b, 1995). The maiapilo is considered a category 2 candidate species (U.S. Fish and Wildlife

Service 1994b). Category 2 plants are species for which there is some evidence of vulnerability, but for which there are not enough data to support listing proposals at this time by the U.S. Fish and Wildlife Service. The maiapilo can be found scattered along the coast and lowland scrub vegetation throughout all of the main Hawaiian Islands and on some of the northwest, leeward islands (Wagner et al. 1990). No sensitive native plant-dominated communities (Hawai'i Natural Heritage Program 1994) exist on the property today. The plant species inventoried on the project site can also be found on the surrounding properties, the West Hawai'i region, and other dry lowland areas throughout the state.

Given the findings above, the proposed davelopment of the site should not have a significant negative impact on the botanical resources. It is recommended, however, that some of the more ornamental, easy to grow native species be propagated and used to landscape the common areas. These plants are adapted to the local growing conditions and would thus require less water, soil, and nutrients then some of the more commonly used, introduced landscaping material.

Some of the native species which are found on the site which could be used include:
Maiapilo -- A shrubby member of the caper family with large, white, fragrant and attractive flowers.

Alahe'e -- A shrub to small tree with glossy green leaves and fist-sized clusters of very fragrant white flowers; a member of the coffee family.

Lama -- This native persimmon has dark, hard wood; grayish-green leaves; and small ornamental fruits which are yellow to reddish-orange when mature. One of the plants sacred to Laka, goddess of the hula.

'Ohe -- A handsome, relatively fast-growing tree with a reddish, lacquered-looking trunk and rounded canopy of leaves.

Naio -- A shrub to small tree, easily propagated from cuttings. Fragrant flowers and wood which was once used in place of sandal-wood; hence, another common name for this plant is false sandal-wood.

'Ohi'a -- Small to medium-sized tree with showy red flowers; dry lowland forms with fuzzy, silver-green leaves and corky, gray bark.

Other native plants found in the same area could also be used; these include wiliwili (Erythrina sandwicensis), mamane (Sophora chrysophylla), kolomona (Senna gaudichaudii), 'ulei (Osteomeles anthyllidifolia), etc.

PLANT SPECIES LIST -- Kaloko Town Center

A checklist of all the terrestrial vascular plants inventoried on the project site during the field studies is presented below. The species are arranged alphabetically by families into three groups: Ferns, Monocots, and Dicots. The taxonomy and nomenclature of the Ferns follow Lamoureux (1988), while the flowering plants, Monocots and Dicots, are in accordance with Wagner *et al*. (1990).

For each species, the following information is provided:

1. Scientific name with author citation.
2. Common English and/or Hawaiian name(s), when known.
3. Biogeographic status. The following symbols are used:
   - E = endemic = native *only* to the Hawaiian Islands.
   - I = indigenous = native to the Hawaiian Islands and also elsewhere throughout the Pacific and the tropics.
   - P = Polynesian = plants originally of Polynesian introduction prior to Western contact (Cook's discovery of the islands in 1778); not native.
   - X = introduced or alien = all those plants brought to the islands by humans, intentionally or accidentally, after Western contact; not native.
4. Presence (+) or absence (-) of a particular species within each of two general vegetation types recognized on the project site (see text for discussion):
   - fg = Fountain Grass Grassland
   - l = 'A'a Lava Flow

Scientific name	Common name	Status	Vegetation type fg	Vegetation type 1
FERNS				
NEPHROLEPIDACEAE (Sword Fern Family)				
Nephrolepis multiflora (Roxb.) Jarrett ex Morton	'okupukupu, pamoho, ni'ani'au	X	-	+
SINOPTERIDACEAE (Cliffbrake Family)				
Doryopteris decipiens (Hook.) J. Sm.	kumu-niu, manawahua, 'iwa'iwa	E	+	-
FLOWERING PLANTS				
MONOCOTS				
POACEAE (Grass Family)				
Dactyloctenium aegyptium (L.) Willd.	beach wiregrass	X	+	-
Heteropogon contortus (L.) P. Beauv. ex Roem. & Schult.	pili, piligrass	I	+	-
Panicum maximum Jacq.	Guinea grass	X	+	-
Pennisetum setaceum (Forssk.) Chiov.	fountain grass	X	+	+
Rhynchelytrum repens (Willd.) Hubb.	Natal redtop grass	X	+	+
DICOTS				
AMARANTHACEAE (Amaranth Family)				
Amaranthus viridus L.	slender amaranth, pakai	X	+	-
ANACARDIACEAE (Mango Family)				
Schinus terebinthifolius Raddi	Christmas berry	X	+	+

Scientific name	Common name	Status	Vegetation type fg	Vegetation type 1
APOCYNACEAE (Dogbane Family)				
Catharanthus roseus (L.) G. Don	periwinkle	X	+	-
ARALIACEAE (Ginseng Family)				
Reynoldsia sandwicensis A. Gray	'ohe	E	-	+
ASTERACEAE (Daisy Family)				
Ageratum conyzoides L.	maile hohono	X	-	+
Bidens cynapiifolia Kunth	West Indian beggar's tick	X	+	-
Emilia fosbergii Nicolson	red pualele	X	-	+
Pluchea symphytifolia (Mill.) Gillis	pluchea, sourbush	X	-	+
CACTACEAE (Cactus Family)				
Opuntia ficus-indica (L.) Mill.	prickly pear, panini	X	-	+
CAPPARACEAE (Caper Family)				
Capparis sandwichiana DC.	maiapilo, pua pilo	E	+	+
CONVOLVULACEAE (Morning-glory Family)				
Ipomoea indica (J. Burm.) Merr.	koali 'awa	I	+	-
CRASSULACEAE (Orpine Family)				
Kalanchoe pinnata (Lam.) Pers.	air plant	X	+	-
CUCURBITACEAE (Squash Family)				
Cucumis dipsaceus Ehrenb. ex Spach	wild cucumber, spiny cucumber	X	+	-
Momordica charantia L.	wild bittermelon, balsam pear	X	-	+
EBENACEAE (Ebony Family)				
Diospyros sandwicensis (A. DC.) Fosb.	lama	E	-	+

Scientific name	Common name	Status	Vegetation type fg	Vegetation type l
EUPHORBIACEAE (Spurge Family)				
Chamaesyce hirta (L.) Millsp.	hairy spurge, garden spurge	X	+	-
FABACEAE (Pea Family)				
Acacia farnesiana (L.) Willd.	klu	X	+	-
Chamaecrista nictitans (L.) Moench	partridge pea, lauki	X	+	-
Desmodium tortuosum (Sw.) DC.	Florida beggarweed	X	+	-
Indigofera suffruticosa Mill.	indigo, 'iniko	X	+	-
Leucaena leucocephala (Lam.) de Wit	koa-haole, ekoa	X	+	+
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	kiawe	X	+	-
Senna occidentalis (L.) Link	'aukoi	X	+	-
Tephrosia purpurea (L.) Pers.	'auhuhu, ahuhu	P	+	-
MALVACEAE (Mallow Family)				
Abutilon incanum (Link) Sweet	hoary abutilon, ma'o	I?	+	-
Sida fallax Walp.	'ilima	I	+	-
MENISPERMACEAE (Moonseed Family)				
Cocculus trilobus (Thunb.) DC.	huehue	I	+	+
MYOPORACEAE (Myoporum Family)				
Myoporum sandwicense A. Gray	naio	I	-	+
MYRTACEAE (Myrtle Family)				
Metrosideros polymorpha Gaud.	'ohi'a, 'ohi'a lehua, lehua	E	-	+
NYCTAGINACEAE (Four-o'clock Family)				
Boerhavia repens L.	alena	I	-	+
PIPERACEAE (Pepper Family)				
Peperomia leptostachya Hook. & Arnott	'ala'ala wai nui	I	+	-

Scientific name	Common name	Status	Vegetation type fg	1
PORTULACACEAE (Purslane Family)				
Portulaca oleracea L.	common purslane, pigweed, 'ihi	X	+	-
Portulaca pilosa L.		X	+	-
Talinum triangulare (Jacq.) Willd.	talinum, flame flower	X	-	+
PROTEACEAE (Protea Family)				
Grevillea robusta A. Cunn. ex R. Br.	silk oak, 'oka kalika	X	+	-
RUBIACEAE (Coffee Family)				
Canthium odoratum (G. Forster) Seem.	alahe'e, walahe'e	I	+	+
Morinda citrifolia L.	noni	P	+	-
SAPINDACEAE (Soapberry Family)				
Dodonaea viscosa Jacq.	a'ali'i	I	+	-
SOLANACEAE (Nightshade Family)				
Solanum americanum Mill.	popolo	I?	+	-
STERCULIACEAE (Cacao Family)				
Waltheria indica L.	'uhaloa, hi'aloa, kanakaloa	I?	+	+
VERBENACEAE (Verbena Family)				
Lantana camara L.	lantana, lakana	X	+	+

LITERATURE CITED

Cuddihy, L.W. and C.P. Stone. 1990. Alteration of native Hawaiian vegetation: effects of humans, their activities and introductions. Cooperative National Park Resources Studies Unit, University of Hawai'i, Manoa.

Hawai'i Natural Heritage Program, The Nature Conservancy of Hawai'i. 1994. Summary listing of Hawaiian natural communities. Memorandum. February 1994.

Kimura International Inc. 1995. Kaloko Town Center, North Kona, Hawaii, Environmental Assessment. Prepared for Tokyo Green Hawaii, Inc., and Pacific Land Services, Inc. August 1995.

Lamoureux, C.H. 1988. Draft checklist of Hawaiian pteridophytes, "Kupukupu O Hawai'i Ne'i". Lyon Arboretum, University of Hawai'i, Manoa.

Sato, H.H., W. Ikeda, R. Paeth, R. Smythe, and M. Takehiro, Jr. 1973. Soil survey of the island of Hawaii, State of Hawaii. U.S. Department of Agriculture, Soil Conservation Service, Washington, D.C.

U.S. Fish and Wildlife Service. 1994a. Endangered and threatened wildlife and plants; Determination of endangered or threatened status for 21 plants from the island of Hawaii, State of Hawaii. Final rule. Federal Register 59(43): 10305-10325. March 4, 1994.

__________ . 1994b. Plants, Hawaiian Islands, Listed, proposed or candidate species under the U.S. Endangered Species Act, Updated: December 15, 1994. Unpublished list, Pacific Islands Office, Honolulu.

__________ . 1995. Endangered and threatened wildlife and plants; Proposed endangered status for thirteen plants from the island of Hawaii, State of Hawaii. Proposed rule. Federal Register 60(185): 49377-49392. September 25, 1995.

Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1990. Manual of the flowering plants of Hawai'i. 2 vols. University of Hawai'i Press and B.P. Bishop Museum Press, Honolulu. B.P. Bishop Museum Special Publication No. 83.

Faunal Survey for the Kaloko Town Center, Environmental Impact Statement, District of North Kona, Island of Hawaii

Reginald E. David, Rana Productions, Ltd., Feb, 1996

REPORT:

Faunal Survey for the Kaloko Town Center, Environmental Impact Statement, District of North Kona, Island of Hawai'i, Hawaii

Prepared by:

Reginald E. David
Rana Productions Ltd.
P.O. Box 1371
Kailua-Kona, Hawaii 96745

Table of Contents

Tables

Figures

Introduction

This report summarizes the results of a three day ornithological and mammalian survey conducted between November 8th and 10th, 1995; of a 224.43 acre parcel of Tokyo Green Hawaii, Inc. land located in Kaloko, District of North Kona, Island of Hawai'i, Hawaii (TMK: 7-3-9-17, 27) { Fig.1}. This property is currently zoned as conservation.

Avian phylogenetic order used in this report follows *Birds Of The World: A Checklist* (Clements 1991); scientific nomenclature follows *The AOU Checklist of North American Birds* (AOU 1983) and the *35th through the 39th Supplements to The AOU Checklist* (AOU 1985-1993). Mammal scientific names follow *Mammals in Hawaii* (Tomich 1986), and plant names follow *Manual of the Flowering Plants of Hawaii* (Wagner et al. 1990).

Site Description

The subject property is located directly north of the existing Kaloko Light Industrial Park. It is bounded on the west by Queen Ka'ahumanu Highway, by Hina Lani Drive to the south and undeveloped lands to the north and east (Fig.1). The property gently slopes towards the ocean to the west from an altitude of 300' to approximately 100' elevation at Queen Ka'ahumanu Highway.

The site is equally divided between Pahoehoe lava flows, covered with a mix of introduced plants dominated by fountain grass (*Pennisetum setaceum*) and Koa Haole (*Leucaena leucocephala*). and a'a lava from the 1800-1801 Hualalai flow which has very little vegetation on it. The terrain is very uneven and there are very few trees to be found on the site. For a more detailed description of the flora found on the site please see (Char 1995).

Previous Surveys

In the mid 1970's it became obvious to scientists and wildlife resource managers in Hawaii that they were witnessing a significant decline in native Hawaiian avian species, it was also obvious that they lacked the baseline data on which to base scientifically credible management strategies. In an attempt to address this paucity of information the United States Fish & Wildlife Service (USFWS) designed a statewide ornithological survey of all lands that were thought to still had enough native vegetation to support endemic forest birds. The Hawaiian Forest Bird Survey (HFBS) started in 1976 and continued until 1983 (Scott et al. 1986).

During the course of the HFBS the subject lands were not included in the surveys due to their low altitude and lack of native forest. In recent years there have been several EIS, EA and other like studies conducted on lands to the south, north and in one case a small portion of the subjects property bordering the Queen Ka'ahumanu Highway (Wilson Okamoto & Assoc. 1981, PBR 1991, CH2M Hill 1993, 1994,).

Study Methods

Two transects were laid through the proposed development site (Fig. 1) A total of 13 count stations were placed 200 meters apart along these transects (Fig. 1). Eight-minute unlimited distance circular plot counts (Reynolds et al. 1980) were made at each of the count stations. All stations were visited at least twice. Field observations were made with the aid of Leica 10 X 42 binoculars and by listening for vocalizations. Counts were concentrated during the early morning hours (between 0600 hrs. and 1000 hrs.), the peak bird activity time. These counts are the basis for the relative abundance estimates in this report (see Table 1). Three crepuscular counts were conducted in an attempt to detect usage of site by Hawaiian hoary bat or 'Ope'ape'a (*Lasiurus cinereus semotus*) and Pueo (*Asio flammeus sandwichensis*). Time on site not spent either laying or counting transects was spent "prospecting" in pockets of vegetation away from the transects, in an attempt to locate any species not recorded during count periods .

Historical Perspective

The isolation of the Hawaiian Islands from the nearest continental land mass coupled with the volcanic nature of their creation has resulted in the penultimate display of adaptive radiation and endemism in the world. The high degree of adaption and specialization displayed by many of Hawaii's endemic avian species has contributed to their vulnerability in a rapidly changing world. To date more than 60% of Hawaii's endemic avifauna has gone extinct.

Within historical times a total of 69 endemic avian species and sub-species have been described from Hawaii (Pyle 1992). Of these, 23 have gone extinct; of the remaining 46 a total of 32 are currently listed as endangered or threatened by the United States Fish and Wildlife Service (USFWS 1992). Thirteen of these are critically endangered or may in fact have already gone extinct. A further 35 species of extinct endemic birds have been described from sub-fossil remains(Olson & James 1982,1991, James & Olson 1991). There may be as many as 26 more undescribed species amongst the bones that have already been collected (Olson & James 1991, James & Olson 1991, Giffin 1993). In addition, the only endemic terrestrial mammalian species in Hawaii, the Hawaiian hoary bat (*Lasiurus cinereus semotus*), is also listed as endangered (USFWS 1992). Of the 32 currently listed endangered avian species and sub-species found in Hawaii a total of 13 are found on the Island of Hawai'i, as is the endangered Hawaiian hoary bat see (Table 1).

Given the altitude, vegetation and the total lack of standing water on the proposed development site the only endangered avian species which might be expected to utilize the site occasionally is the Hawaiian Hawk (*Buteo solitarius*). It should be noted that if there is any utilization of the site by this species, it would be of a foraging nature. The site lacks any vegetation that would provide nesting habitat for this endemic raptor (R. David, pers. obs., Morrision et al. 1994, Banko 1980 c).

Avian Resources

The avifauna of the lowland dry grasslands of North Kona is dominated by introduced species (David 1994,1993,1992,1991,1990,1989). This alien avifauna is augmented from September to the end of April by any number of the 82 species of migratory and extra limital shorebirds and waterfowl which have so far been recorded in Hawaii (David 1991b Pyle et al. 1988,). It is also probable that in the summer months there is some passage of nesting pelagic seabirds over the site, as they fly upslope to their nesting sites on Hualalai and Mauna Loa (Banko et al. 1991, Banko 1980 a, 1980 b).

Results

A total of 126 birds of 7 species representing 7 families were detected during station or crepuscular counts (Table 2). One additional species was detected while on site (Table 3). Of the 7 species recorded, 6 are alien (introduced by man). And the seventh is a native migratory shorebird. No avian species currently listed as endangered by either the USFWS or the State of Hawaii Division of Forestry and Wildlife was detected.

Avian Species Accounts

In the following species accounts I briefly discuss the natural history and origin of each of the avian species detected during the course of this survey. Species are addressed in taxonomic order.

<u>Pacific Golden Plover</u>: *Pluvialis fulva* Kolea

The most common of the migratory shorebirds that visit Hawaii each year. Pacific Golden Plover usually start arriving from their arctic breeding grounds in August. They spend the winter here and on other islands in the Pacific. Many defend wintering grounds and are site retentive, this meaning that they return to the same territory every year. They leave Hawaii to head back to their arctic breeding grounds in late April and early May. Some individuals oversummer in Hawaii. During this survey a total of 2 Pacific Golden Plover were recorded.

Introduced Avian Species

During the last hundred years more than a 160 species of alien birds have been introduced to the Hawaiian Islands (Long 1981, HAS 1993). A markedly larger number than introduced to any other area on the planet. Many of these species were game birds introduced by a combination of private landowners, the Territorial Board of Agriculture & Forestry, and following statehood, by the State Division of Forestry and Wildlife. These birds were introduced in the hope that they would become established and provide a recreational hunting resource; which in turn would generate federal funding through the Pittman Robinson Act for the maintenance of game bird hunting. Less than a quarter of these introductions have been successful. On the island of Hawai'i more than 60 species of game birds have been introduced. Currently 14 of these alien introductions have survived and are considered to be established on the Island (Pyle 1992, David, in prep.). Little is known of the effect that these species have on Hawaii's native bird populations. Many of these alien birds out compete Hawaii's native species for food, cover and nesting resources. They have been implicated in the spread of alien plant species, which all to often have proven to have a deleterious effect on our ecosystems. Some are thought to be reservoirs for diseases, some of which negatively impact Hawaii's endemic avifauna. Systematic scientific studies of these problems have commenced, but all are nascent.

<u>Spotted Dove:</u> *Streptopelia chinensis*

This species is native to a large part of southeast Asia and the Malay Archipelago (Sibley & Monroe Jr. 1990). The race *Streptopelia chinensis chinensis* was introduced to the Hawaiian Islands prior to 1900 (Caum 1933). This species is found in residential as well as in most other habitats throughout the main Hawaiian Islands.

Spotted Doves eat seed, grain plant material and scraps. In Hawaii they breed from February to October. They usually lay two eggs in a messy platform nest made of small sticks which is usually placed from 8 to 40 feet in vegetation or on buildings (Terres 1980). During this survey 1 bird was recorded during station counts, and several more were seen while laying transect and while transiting the study area.

<u>Common Myna:</u> *Acridotheres tristis*

The Common Myna is native to southern and southeast Asia (Sibley & Monroe Jr. 1990). It was introduced to the Hawaiian Islands in 1865 by Dr. Hillebrandt, in the hope that they would prey on army worms and other insect pests (Caum 1933, Munro 1960). This very aggressive species rapidly became established and has become ubiquitous. It tends to be a commensal species and is found in extremely large numbers in cities and towns. Due to its gregarious nature and it proclivity to roost communally - up to 5000 birds in one tree, many late rising humans have been less than enchanted with this species.

Common Mynas are omnivorous feeders eating everything from nectar to orts. In Hawaii they breed from February to August often times having as many as three broods per season. They lay between two and five eggs in a messy nest made of twigs, trash, plant bits and often times paper or plastic (Long 1981, R. David, pers. obs.). During this survey a total of 14 individuals of this species were recorded during station counts.

Japanese White-eye: *Zosterops japonica*

The Japanese White-eye is native to east Asia from southern China to Korea and Japan, and in winter, Thailand, Burma and Laos (Sibley & Monroe Jr. 1990). Exactly when this species was first introduced to Hawaii is uncertain. In 1929 the Territorial Board of Agriculture & Forestry released birds from Japan on O'ahu (Caum 1933, Munro 1960). There were several more releases by both the Territorial Board of Agriculture & Forestry and by the Hui O Manu. It appears that, with exception of the Island of Hawai'i where this species was introduced in 1937, the Japanese White-eye colonized all the other Hawaiian Islands unassisted by man. This species has been considered to be established on all main Islands since at least the mid 1950's (Berger 1972, Hawaii Audubon Society 1993).

Locally called Majiro this ubiquitous species is probably the most common bird in the state. It feeds on a mixed diet of arthropods, nectar, fruit and berries. It has been recorded nesting from February through November; its nest is a small, tidy, deeply cupped affair well finished out of a blend of grasses and often lined with lichens and spider webs. In Hawai'i, Japanese White-eyes lay three to four eggs; slightly more than in its native range. During this survey a total of 66 individuals of this species were recorded during station counts, easily making it the most common avian species encountered during this study.

Warbling Silverbill or African Silverbill: *Lonchura cantans* (*malabarica*)

Warbling Silverbills are native to North Africa ranging from Mauritania in the west to Somalia in the east, south to Tanzania, and southeastern Saudi Arabia and Oman. There is some taxonomic debate over whether the Indian Silverbill(*Lonchura malabarica*), which ranges from Oman east through the Indian sub-continent and the Warbling Silverbill, or as it is now know African Silverbill, are separate species or simply subspecies of the same species. Recognizable integrates are found where the two species meet in the Middle East (Sibley & Monroe Jr. 1990, Clement et al. 1993). It is unclear when this popular cage bird was first released in Hawaii. It is thought that they probably first released at Pu'u Wa'awa'a Ranch in North Kona. Berger first reported them in 1974 from the Kohala mountains (Berger 1975). Since then this species has expanded rapidly it is now to be found from sea level up to more than 9000 feet along the Kona Coast South to the Volcano and north through the Kohala's (David 1989, 1991,1992,1993)

This species feeds primarily on grass and weed seeds and appears to follow the seeding of grasses. Large flocks of birds are commonly seen on the dry side of the island. It would appear that they breed year round. When the nests are placed in trees they are domed, with a side entrance, when found in caves cracks etc. they can be as little as a handful of grass stuffed into the cavity (R. David, pers. obs.). They lay 5-6 eggs. Two Warbling SIlverbills were detected on station counts.

Nutmeg Mannikin or Scaly-breasted Munia: *Lonchura punctulata*

Nutmeg Mannikins are native to Southern and Southeast Asia from India east to Java and the Philippines (Sibley & Monroe 1990). The race (*Lonchura punctulata topela*) was introduced to Hawaii by Dr. Hillebrand around 1865 (Caum 1933, Berger 1981).

Little is known about this species life history in Hawaii. In Malaysia this species breed from February through August; Berger reports that he found nests in all months except August (Berger 1981). Nutmeg Mannikins build a large covered nest which has a side tunnel entrance. They lay between three and four eggs per clutch. They continue to use the nest as a dormitory following fledging, and often build nests specifically for this purpose (Clement et al. 1993). They feed on seeds, rice and occasionally insects. None were detected during the course of station counts; however, several were seen while transiting the study area.

House Finch: *Carpodacus mexicanus*

House finches are native to western U.S.A. from west of Kansas, north to British Columbia and south to central Mexico (AOU 1983, Sibley & Monroe Jr. 1990). This species has been successfully introduced to the Eastern U.S.A.. House Finches have been in the Hawaiian Islands since the 1870's; they were popular cage birds and probably escaped soon after their first arrival in Hawaii. The race (*Carpodacus mexicanus frontalis*) from California has been established on all main Islands since the early 1920's (Caum 1933, Berger 1972, Hawaii Audubon Society 1975).

This species is considered an agricultural pest in its native range (Terres 1980). In Hawaii, House Finches feed on fruit, berries and insects. Papaya farmers consider this species a pest, as they apparently do some damage to this commercially grown fruit crop. They nest year round, making a nest built of grass and twigs, which is usually placed in a tree cavity, roof or tree crown. Clutch size ranges from 2 to 6 eggs (Long 1981). During this survey a total of 38 detections of this species were made during station counts, making it the second most common species detected.

Yellow-billed Cardinal: *Paroaria capitata*

Yellow-billed Cardinals are a south American species native to southwestern Brazil, Bolivia and western Paraguay and the northern parts of Argentina (Ridgely et al. 1989). This species was first reported in Hawaii from the Kona Coast in 1973 (Collins 1976). Since that time it has expanded its range and can now be found throughout the North and South Kona Districts on the Island of Hawai'i from the intertidal zone up to approximately 500 meters in altitude (R. David, pers. obs.).

Very little is known of this species life history in Hawaii or for that matter in it's native range (Ridgely et al. 1989). It is a *gregerious species* often seen in flocks of up to 15 birds (R. David, pers. obs.). This species feeds primarily on insects and spiders. Nothing is known of its breeding biology. During the course of this survey a total of 3 Yellow-billed Cardinals were seen.

Mammalian Resources

The Hawaiian hoary bat (*Lasiurus cinereus semotus*) or 'Ope'ape'a is Hawaii's only endemic terrestrial mammal. All the other resident mammals were introduced by man. This process started when the first aboriginal settlers landed in the Islands some 1500 years ago (Stone et al. 1985). The aboriginal peoples brought numerous alien species such as pigs (*Sus scrofa*), dogs (*Canis familiaris*) and Polynesian rats (*Rattus exulans*); as well as non-native plants and insects of many kinds with them. Many of Hawaii's endemic birds, especially the flightless and ground nesting ones, were easy prey for the introduced dogs and hungry humans (Kirch 1982, Steadman. 1989, Banko et al. 1990). Both the aboriginal people and their pigs proceeded to markedly alter the endemic ecosystems. The humans cleared and burned the lowlands for agricultural purposes and the pigs moved into the wet forests where they found abundant food in the myriad of endemic understory plants (Kirch 1982). Very little is known of what effect the introduced insect species had, but it is safe to surmise that they had a large effect on the endemic insect and plant populations and in turn on the native avian specie. The European re-discovery of the Islands in the late 1700's heralded another wave of introductions that included European rabbits (*Oryclolagus cuniculus*), roof rats (*Rattus rattus*), Norway rats (*Rattus norvegicus*), European house mice (*Mus domesticus*), small Indian mongooses (*Herpestes auropunctatus auropunctatus*), cats (*Felis catus*), horses (*Equus caballus*), cattle (*Bos taurus*), goats (*Capra hircus*) and sheep (*Ovis aries*), as well as countless insect and plants species. All of the introduced mammalian species including man have had a deleterious effect on the native avian and mammalian populations of the Islands.

During the course of this survey the only mammalian species detected were 2 flocks of feral goats (*Capra hircus*). A flock of 13 animals was seen on the evening of the 8th of November at the top of the proposed development site, and on the 10th of November a flock of 9 goats was seen at the bottom of transect B approximately 400 meters east of the Queen Ka'ahumanu Highway. It would be surprising if roof rats (*Rattus rattus*), Norway rats (*Rattus norvegicus*), European house mice (*Mus domesticus*), small Indian mongooses (*Herpestes auropunctatus auropunctatus*), and cats (*Felis catus*) do not utilize the site.

Table 5 on page 20 represents additional mammalian species that are likely to utilize the site at least upon occasion, but were not detected during the course of this survey.

Endangered Mammalian Species

During the course of this survey no endangered mammalian species were detected. The author has seen Hawaiian hoary bats at Aimakapa Pond and within the Kaloko Light Industrial Park in the past. It is probable that this species may transit the proposed development site occasionally.

<u>Hawaiian hoary bat</u>: *Lasiurus cinereus semotus* 'Ope'ape'a

The Hawaiian hoary bat is Hawaii's only endemic terrestrial mammal. It was first listed as endangered by the USFWS in 1970 (USFWS 1992). Originally considered to be a distinct species, it is now taxonomically classified as an endemic Hawaiian sub-species of the American hoary bat (Tomich 1986). There has been very little scientific work attempted on this species due to the fact that this bat is usually a solitary arboreal rooster and therefor difficult to study. Hawaiian hoary bats have been seen within the area, and are frequently found at Aimakapa Fish Pond within the Kaloko Honokohau National Historical Park which is located directly west of the site across Queen Ka'ahumanu Highway (R. David, pers. obs.).

Limitations of this Report

A one time survey can not provide a total picture of the Wildlife utilizing any given area. Certain species will not be observed for one reason or another. Seasonal variations in populations coupled with seasonal usage and availability of resources will cause different usage patterns throughout a year or, in fact over a number of years. A one time survey can usually provide only baseline information. Coupling that baseline information with data gathered from similar habitat, and from previous studies in the same general area, can greatly enhance the value of the gathered baseline data, resulting in a much more complete assessment of the natural resources and their utilization at the given site.

During the course of this survey both traffic and aircraft noise was intrusive at all times, and may have hampered the detection of some individual birds. It was extremely dry during the course of this survey, which may have skewed census data, even with these limitations we feel confident that by combining and comparing our data set with published accounts of the faunal makeup of the area we have identified and addressed the terrestrial vertebrate usage of the area.

Discussion

The lack of avian species diversity coupled with the extremely low densities encountered during the course of this survey graphically illustrate how little the proposed development site has to offer terrestrial vertebrate species in general. From a faunal perspective there is nothing unique about the site; furthermore, none of the habitat within the site is essential habitat for any of the species detected or those that might utilize the habitat occasionally. There is abundant similar habitat within the lowland areas of the Kona coast.

The development and urbanization of this property will in all probability result in the increase in many commensal avian species such as House Sparrows (*Passer domesticus*) and Rock Doves

(*Columba livia*), as well as several less welcome vertebrate species such as roof rats (*Rattus rattus*), Norway rats (*Rattus norvegicus*), European house mice (*Mus domesticus*), small Indian mongooses (*Herpestes auropunctatus auropunctatus*) and cats (*Felis catus*).

Literature Cited

American Ornithologist's Union 1983. Check-list of North American Birds. 6th edition. AOU. Washington D.C. 877 pp.

——— 1985. 35th Supplement to AOU Checklist. Auk vol. 102: 680-686

——— 1987. 36th Supplement to AOU Checklist. Auk vol. 104: 591-596

——— 1989. 37th Supplement to AOU Checklist. Auk vol. 106: 532-596

——— 1991. 38th Supplement to AOU Checklist. Auk vol. 108: 750-754

——— 1993. 39th Supplement to AOU Checklist. Auk vol. 110: 675-682

Banko, W.E. 1980. Population Histories- Species Accounts Seabirds: Newell's Shearwater ('A'o). Cooperative National Park Resources Studies Unit, University of Hawaii at Manoa, Department of Botany, Technical Report #5A.

——— 1980 b. Population Histories- Species Accounts Seabirds: Hawaiian Dark-rumped Petrel ('Ua'u). Cooperative National Park Resources Studies Unit, University of Hawaii at Manoa, Department of Botany, Technical Report #5B.

——— 1980 c. Population Histories- Species Accounts Forest Birds: Hawaiian Hawk ('Io). Cooperative National Park Resources Studies Unit, University of Hawaii at Manoa, Department of Botany, Technical Report #6A.

Banko, W. E., P. C. Banko, R. E. David 1991. First and Subsequent Specimens, Breeding Activity, and Observations of the Band-rumped Storm-Petrel (*Oceanodroma castro*) on the Island of Hawaii. The Wilson Bulletin, Vol. 103, No. 4.

Berger. A.J. 1972. Hawaiian Birdlife. The University Press of Hawaii, Honolulu, Hawaii. 270 pp.

——— 1975. The Warbling Silverbill, a New Nesting Bird in Hawaii. Pacific Science 29: 51-54.

——— 1981. Hawaiian Birdlife, 2nd edition. The University Press of Hawaii, Honolulu, Hawaii. 259 pp.

Caum, E. L. 1933. The Exotic Birds of Hawaii. Occasional Papers Bernice P. Bishop Museum. 10 (9) : 1-55

Char,W. 1995.

Clement, P., A. Harris and J Davis. 1993. Finches & Sparrows: An Identification Guide. Princeton University Press, Princeton. N.J. 500 pp.

Clements, J.F. 1991. Birds Of The World: A Checklist. Ibis Publishing Co., Vista, California. 617 pp.

Collins, M. S. 1976. South American Cardinal Populations on the Big Island. 'Elepaio Vol. 37 No. 1: 1-2.

David, R. E. 1989. North Kona Christmas Count - 1988 -. 'Elepaio Vol.49, No. 9.

_____ 1990 b. North Kona Christmas Count 1989. 'Elepaio Vol. 50, No. 5. (Pg. 41-42).

_____ 1991. North Kona Christmas Count 1990. 'Elepaio Vol. 51, No. 6. (Pg. 37).

_____ 1992. North Kona Christmas Count 1991. 'Elepaio Vol. 52, No. 3. (Pg. 20-21).

_____ 1993. North Kona Christmas Count 1992. 'Elepaio Vol., No. . (Pg.).

_____ 1994. The Birds of Koloko - Honokohau National Historical Park, Hawaii: A Fieldcard. National Park Service UH/CPSU.

_____ 1995. Close-barred Francolin (*Francolinus adspersus*), Hawaii's forgotten Francolin (in prep.).

Ellis-Joseph, S., C. Kuehler, R. Lacy, K. Hughes, and U.S. Seal, 1993. Hawaiian Forest Birds: Conservation Assessment and Management Plan. CBSG 131 pp.

Giffin, J.G. 1993. New Species of Fossil Birds Found at Pu'u Wa'awa'a. 'Elepaio Vol. 53 (1) pg.1-3.

Hawaii Audubon Society 1975. Third edition. Hawaii's Birds. Hawaii Audubon Society, Honolulu, Hawaii 104 pp.

_____ 1993. R. David editor Fifth edition. Hawaii's Birds. Hawaii Audubon Society, Honolulu, Hawaii 112 pp.

Hill, CH2M. 1992. Environmental Impact Statement - Keahole-Kailua 69KV Transmission Line Project. Prepared for HEI, Honolulu Hawaii.

Hill, CH2M. 1993. Appendixes: Environmental Impact Statement - Keahole-Kailua 69KV Transmission Line Project. Prepared for HEI, Honolulu Hawaii.

James H.F., S.L. Olson 1991. Descriptions of Thirty-two New Species of Birds from the Hawaiian Islands: Part 2. Passeriformes. American Ornithological Union, Washigton D.C. 88 pp.

Kirch, P.V. 1982. The Impact of the prehistoric Polynesians on the Hawaiian ecosystem. Pac. Sc. 36 (1): 1-14

Long, J.L. 1981. Introduced Birds of the World. Universe Books, New York. 528 pp..

Morrison, M. L., L. S. Hall and P. H. Bloom 1994. Final Report: Hawaiian Hawk (*Buteo Solitarius*) Population Survey. Unpbl Man. 50 p.p.

Munro, G.C. 1944 (1960 reprint). Birds of Hawaii. Tuttle, Vermont 192 pp.

Olson, S.L., and H.F. James 1982. Prodromus of the fossil aviafauna of the Hawaiian Islands. Smithsonian Contr. Zool. 365: 1-59.

——— 1991. Descriptions of Thirty-two New Species of Birds from the Hawaiian Islands: Part 1. Non Passiformes . American Ornithological Union, Washigton D.C. 88 pp.

PBR, Hawaii 1991. Environmental Impact Statment - Kohanaiki Mauka.

Pyle, P. B., P. V. Donaldson, R. E, David and R. L. Pyle 1988. The Status of Small *Calidris* Sandpipers in the Hawaiian Islands, Documentation of Three First Records for the State. 'Elepaio Vol. 48, No. 9. (Pg. 71-77).

Pyle, R. L. 1992. Checklist of the Birds of Hawaii - 1992. 'Elepaio 52:(8) 53-62

Reynolds, R.T., J.M. Scott and R.A. Nussbaum. 1980. A variable circular plot method for estimating bird numbers. Condor. 82:309-313

Ridgely, R. S., and G. Tudor. 1989. The Birds of South America: The Oscine Passerines. The University of Texas Press, Austin, Texas 516 pp.

Sibley, C. G., Burt Monroe Jr. 1990. Distribution and Taxonomy of Birds of the World. Yale University Press, New Haven. 1111pp.

Scott, J. M., S. Mountainspring, F. L. Ramsey and C. B. Kepler. 1986. Forest Bird Communities of the Hawaiian Islands: Their Dynamics, Ecology, and Conservation. Studies in Avian Biology No. 9. Lawrence, Kansas: Allen Press Inc. 431 pp.

Steadman, D. W. 1989. Extinction of Birds in Eastern Polynesia: A Review of the Record, and Comparisons with Other Pacific Island Groups. Journal of Archaeological Sci. (16): 177-205.

Stone, C.P. and J. M. Scott 1985. Hawai'i's Terrestrial Ecosystems Preservation and Management. CPSU, University of Hawaii, Honolulu, Hawaii. 584 pp.

Terres, J. K. 1980. The Audubon Society, Encyclopedia of North American Birds. Knopf, New York. 1109 pp.

Tomich, P.Q. 1986. Mammals in Hawaii. Bishop Museum Press. Honolulu, Hawaii. 375 pp.

U.S. Fish and Wildlife Service 1992. Endangered & Threatened Wildlife and Plants. 50CFR 17:11 & 17:12. United States Department of the Interior. Washington. 34 pp.

USFWS 1993. Federal Register 1993. Vol. 58, No 149. Proposed Rules Pg. 41684-41688

Wagner, W.L., D.R Herbst, S.H. Sohmer 1990. Manual of the Flowering Plants of Hawai'i. University of Hawaii Press, Honolulu, Hawaii 1854 pp.

Walker, R.L. 1967. A Brief History of Exotic Game Birds and Mammal Introductions into Hawaii - with a look to the Future. Proc. 47th. annual Conference western Association of State Game, Fish Commnrs. Honolulu, Hawaii. 16-20 1967 : 94-112.

Wilson Okamoto & Assoc. 1981. Environmental Impact Statement Kaloko Light Industrial Subdivision, Kaloko, North Kona, Hawaii. Prepared for Takemasa Internaational Inc., Honolulu, Hawaii. 60 p.p.

Personal Observations

David, R. E. Unpublished field notes 1980-1995

Table 1

ENDANGERED AND THREATENED TERESTRIAL VERTEBRATE SPECIES ON THE ISLAND OF HAWAI'I

COMMON NAME	HAWAIIAN NAME	SCIENTIFIC NAME
Dark-rumped Petrel	Ua'u	*Pterodroma phaeopygia sandwichensis*
Newell's Shearwater	'A'o	*Puffinus newelli*
Hawaiian Goose	Nene	*Branta sandvicensis*
Hawaiian Duck	Koloa	*Anas wyvilliana*
Hawaiian Hawk	'Io	*Buteo solitarius*
Hawaiian Coot	'Alae ke'oke'o	*Fulica alai*
Black-necked Stilt	Ae'o	*Himantopus mexicanus knudseni*
Hawaiian Crow	'Alala	*Corvus hawaiiensis*
'O'u **	'O'u	*Psittirostra psittacea*
Palila	Palila	*Loxoides bailleui*
Akiapola'au	Akiapola'au	*Hemignathus munroi*
Hawai'i Creeper	'Alauahio	*Oreomystis mana*
Hawai'i 'Akepa	'Akakane	*Loxops coccineus coccineus*
Hawaiian hoary bat	'Ope'ape'a	*Lasiurus cinereus semotus*

** This species is critically endangered, or in fact may have gone extinct.

All of the above species and sub-species are listed as endangered by the USFWS, with the exception of the Newell's Shearwater which is listed as threatened (USFWS 1992).

Key to Table 2.

Status
IM = Indigenous Migratory Species
A = Alien/ introduced species

Relative abundance = the number of times recorded during the survey

A = Abundant (≥50) individuals recorded

C = Common (≥25≤49) individuals recorded

U = Uncommon (≥5≤24) individuals recorded

R = Rare (≤4) individuals recorded

Table 2.

RELATIVE ABUNDANCE OF AVIAN SPECIES RECORDED DURING STATION AND/OR CREPUSCULAR COUNTS

COMMON NAME	*SCIENTIFIC NAME*	*STATUS*	*RELATIVE ABUNDANCE*
PLOVERS & LAPWINGS - Charadriidae			
Pacific Golden Plover.	Pluvialis fulva.	IM	R -2
PIGEONS & DOVES - Columbidae			
Spotted Dove.	*Streptopeia chinensis.*	A	R -1
STARLINGS - Sturnidae			
Common Myna.	*Acridotheres tristis.*	A	U -14
SILVEREYES - Zosteropidae			
Japanese White-Eye.	*Zosterops japonica.*	A	A - 66
WAXBILLS & ALLIES - Estrilididae			
Warbling Silverbill (African Silverbill)	*Lonchura malabarica (Cantans)*	A	R -2

FRINGILLIDS - Fringillidae			
House Finch.	*Carpodacus mexicanus mexicanus.*	A	C - 38
EMBERIZIDS - Emberizadae			
Yellow-billed Cardinal.	*Paroaria capitata*	A	R - 3

Key to Table 3

Status
A = Alien/ introduced species

Table 3

ADDITIONAL AVIAN SPECIES DETECTED WHILE ON SITE

COMMON NAME	*SCIENTIFIC NAME*	*STATUS*	*NUMBER*
WAXBILLS & ALLIES - Estrilididae			
Nutmeg Mannikin (Scaly-breasted Munia)	*Lonchura punctulata topela*	A	3

Table 4.

MAMMALIAN SPECIES DETECTED

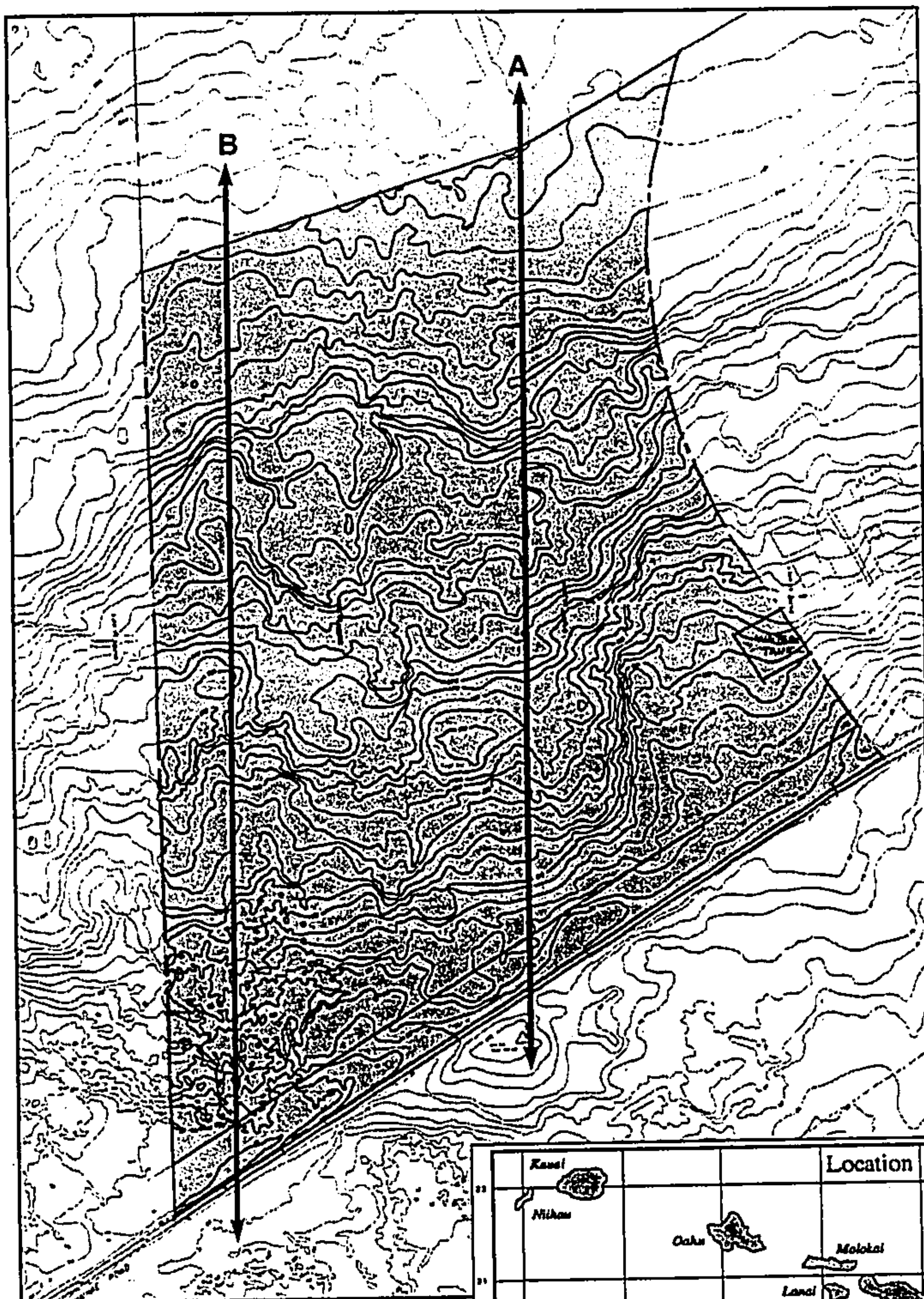
Goat	*Capra hircus*

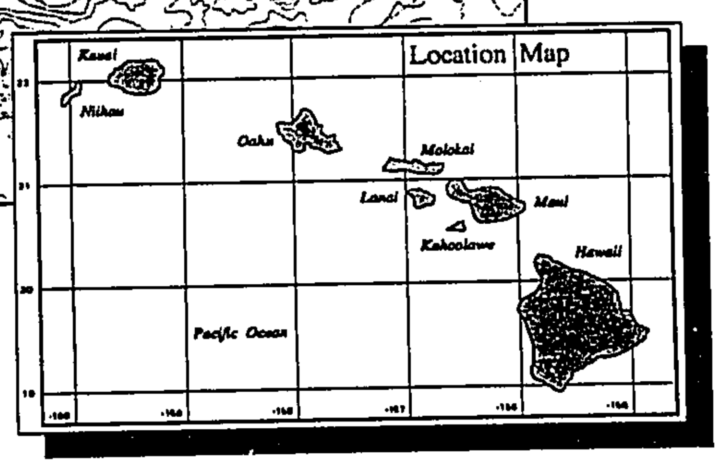
Table 5.

ADDITIONAL MAMMALIAN SPECIES TO BE EXPECTED ON THE SITE

Hawaiian hoary bat	*Lasiurus cinereus semotus*
Roof rat	*Rattus rattus rattus*
Norway rat	*Rattus norvegicus norvegicus*
Polynesian rat	*Rattus exulans hawaiiensis*
European house mouse	*Mus domesticus*
Domestic dog	*Canis familiaris familiaris*
Small Indian mongooses	*Herpestes auropunctatus auropunctatus*
Cat	*Felis catus*
Pig	*Sus scrofa scrofa*

FIGURE 1 - SITE MAP
FAUNAL SURVEY TRANSECTS & CREPUSCULAR COUNT SITES





LEGEND

Crepuscular Count Site

Transect Line

An Archaeological Inventory Survey and Limited Subsurface Testing of 224.43 Acre Parcel within Portions of Kaloko and Kohanaiki Ahupua'a

Cultural Surveys Hawaii, April 1996

An Archaeological Inventory Survey and Limited Subsurface Testing of 224.43 Acre Parcel within Portions of Kaloko and Kohanaiki *Ahupua'a* (TMK 7-4-09:17 and portion of 2)

by

Brian L. Colin, B.A.
Thomas K. Devereux, B.A.
Douglas F. Borthwick, B.A.

and

Hallett H. Hammatt, Ph.D.

Prepared for

KIMURA INTERNATIONAL

Cultural Surveys Hawaii
April 1996

ABSTRACT

An archaeological inventory survey with limited subsurface testing was conducted by Cultural Surveys Hawaii within a 224.43-acre project site (TMK 7-4-09:17 por.2) for Kimura International. The project area is located within Kaloko and Kohanaiki *ahupua'a* between roughly 90.0 ft. a.m.s.l. and 340.0 ft. a.m.s.l.

The survey and limited testing were conducted over a period of two months. During the survey 55 sites were identified within the project area. The traditional Hawaiian sites, which contain a variety of formal site and feature types, include *ahu*, simple agricultural features, recurrent and temporary habitation sites, trails, enclosures, walls, and a quarry.

Subsurface testing was conducted at 8 of the project sites to determine site function and to collect charcoal for radiocarbon dating. Two charcoal samples were sent to Beta Analytic Inc. for testing.

All of the sites in the project area are evaluated as having varied levels of archaeological significance. Of the 55 sites, it is recommended that 40 sites be subjected to a program of data recovery. Ten of the sites are recommended for preservation. One of the sites is recommended for both data recovery and preservation. No further research is recommended for the remaining 4 sites in the project area, as they are deemed to have been subjected to sufficient data recordation.

ACKNOWLEDGEMENTS

Recognition is given to the field crew for their hard work and experience. John Winieski preformed the cataloging and analysis of the cultural materials. Daria Creed was draftsperson for this project.

A special note of thanks is extended to Mr. Glen Kimura and Mr. Ned Dewey for their coordination of the project, and to Rev. Norman Keanaaina for his invaluable sharing of knowledge and assistance.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

I. INTRODUCTION

A. Project Area Description

An archaeological inventory survey with limited subsurface testing was conducted by Cultural Surveys Hawaii within the 224.43 acre Kaloko Project site for Kimura International. The survey focused on portions of Kaloko and Kohanaiki *ahupua'a*, North Kona District, Island of Hawaii (Figures 1-4).

Queen Ka'ahumanu Highway serves as the western boundary of the project area. The project area extends 3600 ft. *mauka*, from the corner of Hina-Lani Road and Queen Ka'ahumanu Highway, to the southeastern corner of the project along Hina-Lani Rd. (therefore Hina-Lani Rd. is the southern boundary). The northern boundary of the project (which is non-demarcated) extends 4400 ft. at 91.5° TN from Queen Ka'ahumanu Highway to the northeastern corner of the project. An existing fence line serves as the eastern property boundary. From the northeastern corner of Hina-Lani Road and Queen Ka'ahumanu Highway. the property extends approximately 3500 ft. to the north along Queen Ka'ahumanu Highway.

B. Scope of Work

The primary goal of the inventory survey was the identification of any and all cultural resources within the project area. The survey was designed to meet the requirements of the Department of Land and Natural Resources-State Historic Preservation Division (DLNR-SHPD) guidelines. Survey procedures included:

1) A complete (100 percent) ground survey within the project area. All archaeological sites were located, described and mapped. Field documentation included photographs and scale drawings of most, if not all, of the sites. All sites were assigned State site numbers. Interpretive evaluations including the archaeological significance and recommended treatment of each site were devised;

2) Limited subsurface testing to determine depth and quantity of cultural materials within archaeological sites, and to obtain datable samples for chronological information.

3) Research on historic and archaeological background, including investigation of historic maps, written records, Land Commission Awards, and Native Testimony. This research focused on the specific area with general background on the *ahupua'a* and district and emphasized settlement patterns;

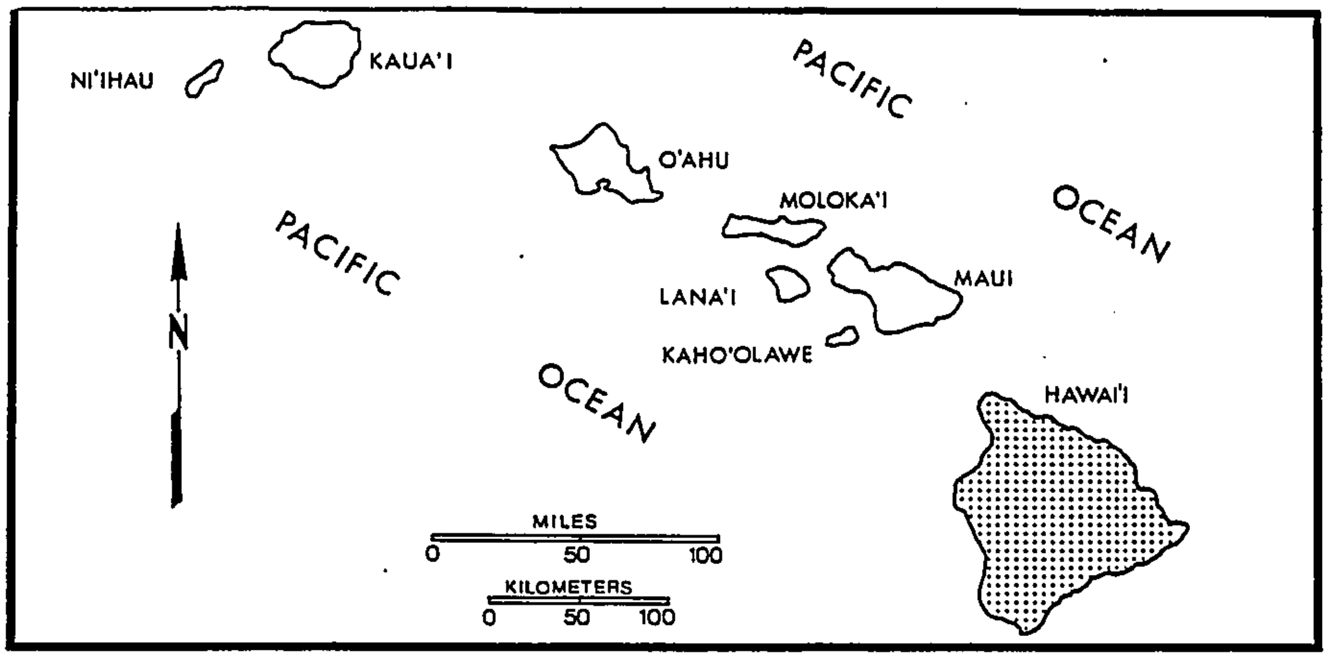


FIGURE 1
State of Hawai'i

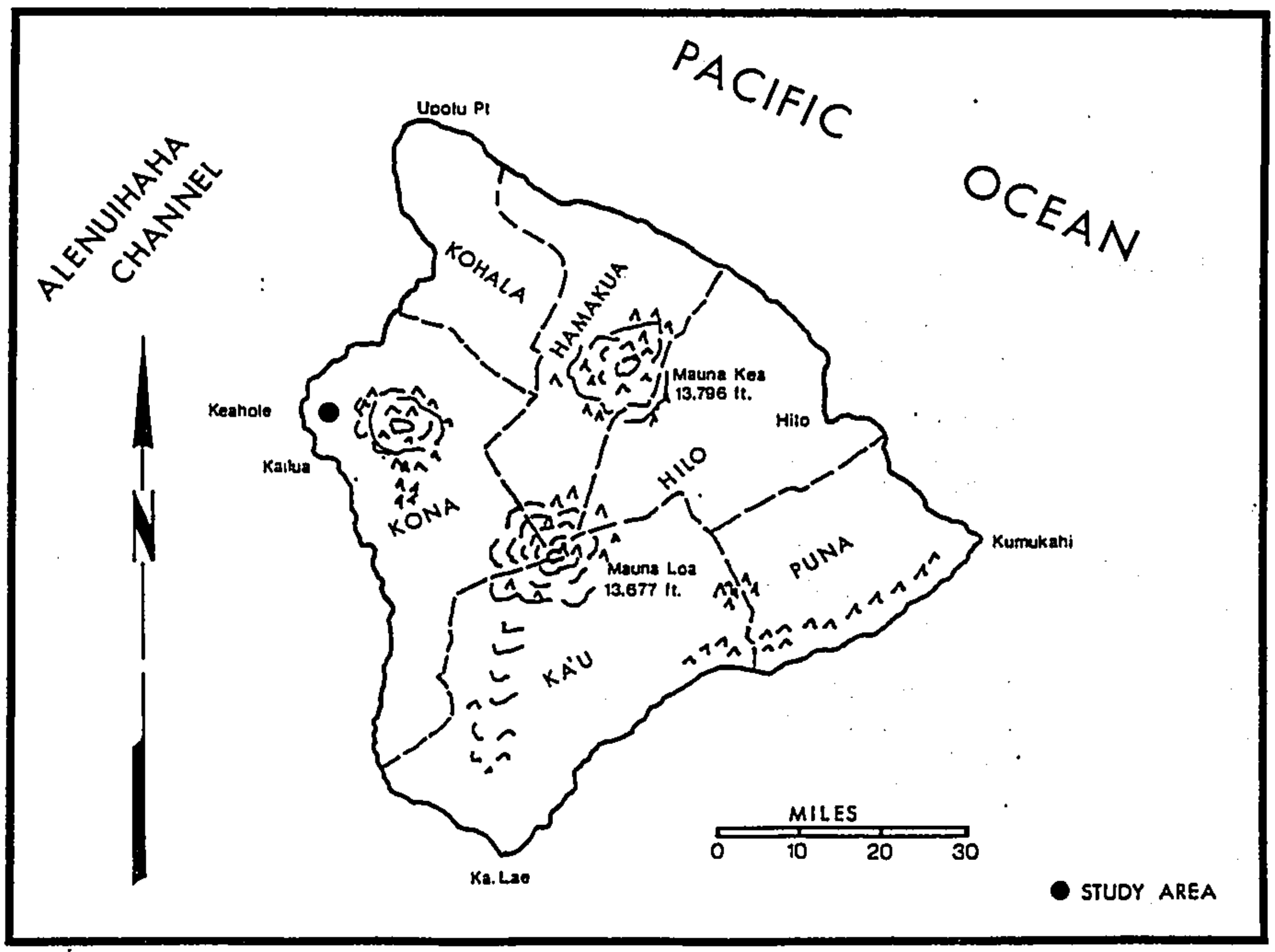


FIGURE 2
General Location Map, Hawai'i Island

DOCUMENT CAPTURED AS RECEIVED

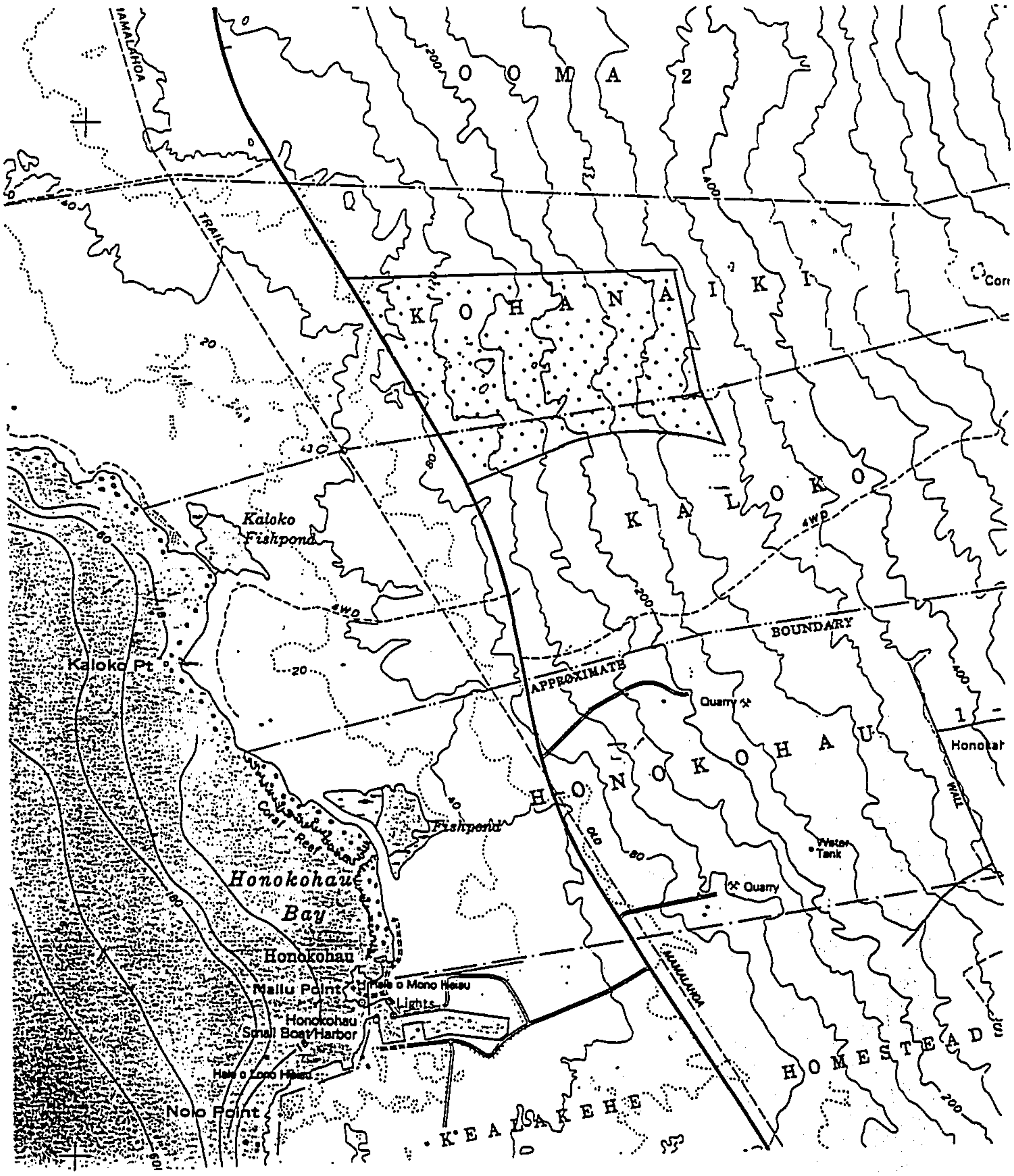


Figure 3 Portion of USGS 7.5 Minute Series Topographical Map, Keahole Point Quadrangle, showing Project Area

DOCUMENT CAPTURED AS RECEIVED

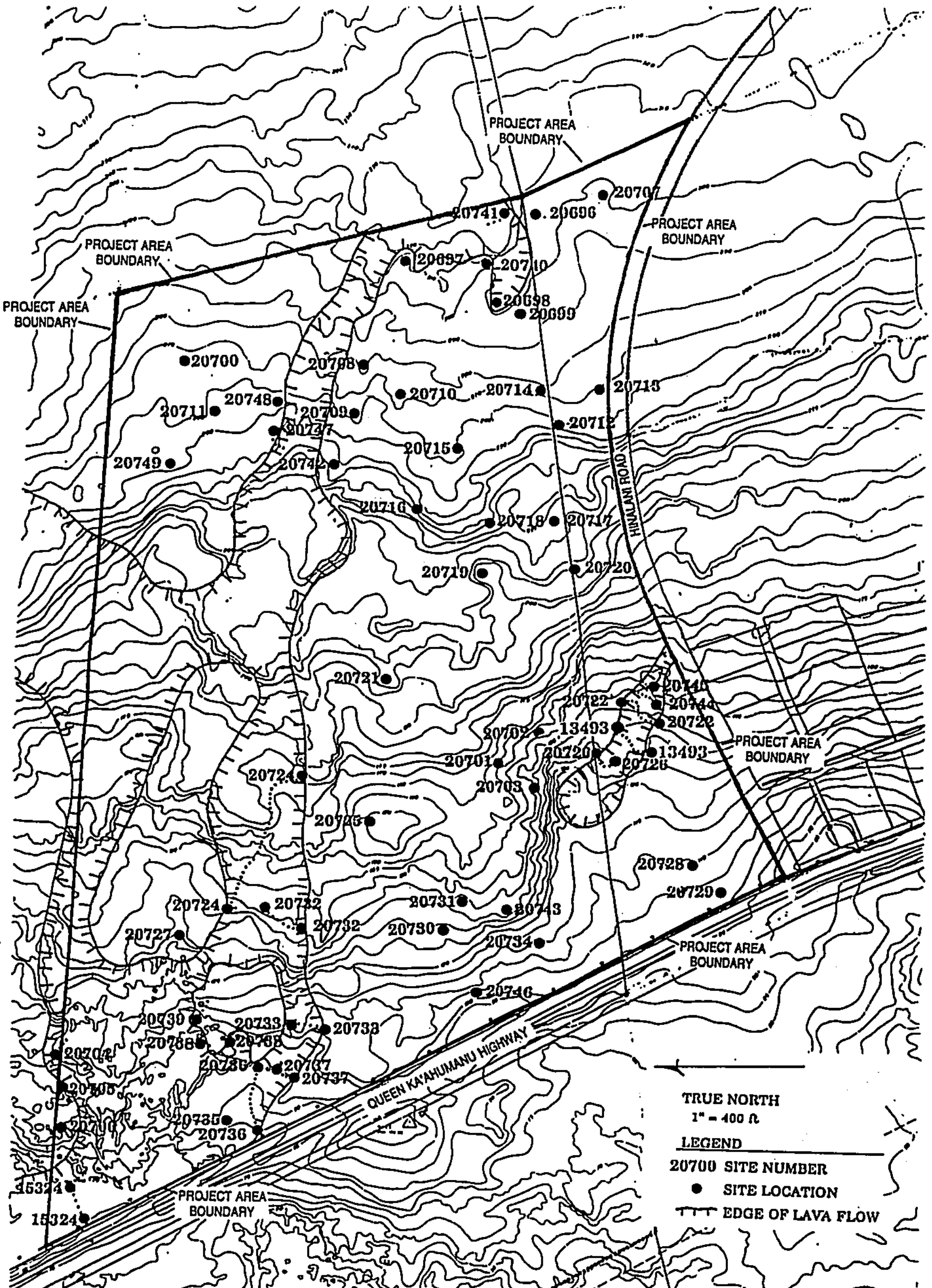


Figure 4 Project Map Showing Location of Archaeological Sites

4) Preparation of this survey report which includes the following:

   a. A topographic map of the survey area showing all archaeological sites and site areas;

   b. Description of all archaeological sites with selected photographs, scale drawings, and discussions of function;

   c. Historic and archaeological background sections summarizing prehistoric and historic land use as the relate to the archaeological features;

   d. A summary of site categories, their significance in an archaeological and historic context;

   e. Recommendations based on all information generated which will specify what steps should be taken to mitigate impact of development on archaeological resources - such as data recovery (excavation) and preservation of specific areas. These recommendations will be developed in consultation with the landowner and the State and County agencies.

C. Methods

The ground survey was conducted using pedestrian sweeps which were generally oriented in a NE/SW direction, cross-cutting the slope. *Mauka-makai* (east/west) sweeps were also conducted along the northern boundary of the project area, and included establishing a north boundary line by means of tape and compass from the survey marker at Queen Ka'ahumanu Highway. The sweep lines were arranged according to a set compass bearing at intervals spaced between 10.0 m. (32.8 ft.) and 20.0 m. (66.0 ft.) depending on ground visibility. Each located site was recorded in detail and all sites were mapped to scale. Temporary site numbers (prefixed by CSH) and feature designations, if necessary, were assigned to each site. Yellow flagging tape labelled with the temporary site number and other pertinent information was tied above the site and a second marker - using a white plastic tag - was placed on the site structure itself. Each site was recorded by formal site type using descriptive categories presented in the Survey Results section of this report. Significance and recommended treatment were determined on the basis of site complexity, configuration, and apparent function. All sites were plotted onto a 1 in.= 400 ft. project map using: (1) measurements with tape and compass to known landmarks; (2) compass bearing triangulations from known points; and (3) correlation to specific topographic features on project area contour map.

During the fieldwork an attempt was made to consolidate related features into site complexes. Evaluations of feature association were typically based on the following considerations: proximity, similarity in construction technique and preservation, and function interrelationships.

Table 1 presents all sites located and documented during the inventory survey. The table indicates site numbers, site type, and site function, along with significance and age evaluations and recommended treatment.

Subsurface testing was conducted at 8 sites with a total of 9 test units being excavated ranging in size from 0.5 m. by 0.5 m. to 1.0 m. by 1.0.. All material collected was screened through 1/8 inch mesh and, later in the laboratory, washed and sorted. Midden was sorted down to the species level (see Table 5 below). Charcoal was separated, weighed, and catalogued; two samples were sent for dating analysis (see Table 7 below). Artifacts were sorted, identified, measured, weighed, and cataloged (see Table 8 below). Three wood samples were also collected, and catalogued (see Table 6 below).

Though a stratigraphic profile is usually generated for at least one soil profile per test unit, only four profiles - from the nine test units - are presented in this report. The remaining five test units had such shallow (5 cm. or less) soil layers, with only a single soil stratum present, that graphic presentations would not aid in strata description and are therefore not included with the testing results.

Table 1 - Archaeological Site Summary

State Site # (50-10-27-)	CSH Site #/ Feature	Formal Site Type	Functional Interpretation	Signif-icance	Prob. Age	Recommended Treatment
13493	30	Trail	Transportation	D	P	DR
15324		Trail	Transportation	D,E*	P	DR,Preserve
20696	1	Lava tube	Indeterminate	D	P	NFW
20697	2	Modified tumulus	Hab. (T)	D	P	DR
20698	3	Pavements	Hab. (T)	D	P	DR
20698	A	Pavement	Hab. (T)			
20698	B	Pavement	Hab. (T)			
20699	4	Modified tumulus	Indeterminate	D	P	DR
20700	5	Complex	Hab. (T)/Ag.	D	P	DR
20700	A	Modified tumulus	Hab. (T)			
20700	B	Enclosure	Ag.			
20701	6	Modified tumulus	Hab. (T)	D	P	DR
20702	7	Mod. tumulus/mound	Burial (poss.)	D,E*	P	Preserve
20702	A	Modified tumulus	Burial (poss.)			
20702	B	Linear mound	Burial (poss.)			
20703	8	Complex	Hab. (T)/Mining	C,D	P	Preserve
20703	A	Platform	Hab. (T)			
20703	B	Pavement	Hab. (T)			
20703	C	Quarry	Mining			
20704	9	Complex	Hab. (T)/transportatio	D	P	DR
20704	A	Trail	Transportation			
20704	B	Wall	Hab. (T)			
20704	C	Trail	Transportation			
20704	D	Trail	Transportation			
20704	E	Trail	Transportation			
20705	10	Modified tumulus	Burial (poss.)	D,E*	P	Preserve
20706	11	Modified tumulus	Hab. (T)	D	P	DR
20707	12	Lava tube	Indeterminate	D	P	NFW
20708	13	Modified tumulus	Hab. (T)	D	P	DR
20709	14	Complex	Hab. (R)/Ag./Storage	C,D	P	Preserve
20709	A	Platform	Hab. (R)			
20709	B	Enclosure	Ag.			
20709	C	Enclosure	Ag.			
20709	D	Lava blister	Storage			
20710	16	Complex	Hab. (T)	D	P	DR
20710	A	Lava tube	Hab. (T)			
20710	B	Alignment	Hab. (T)			
20710	C	Mound	Hab. (T)			
20710	D	Modified tumulus	Hab. (T)			
20711	17	Enclosure	Hab. (T)	D	P	DR
20712	18	C-shape	Hab. (T)	D	P	DR
20713	19	Ahu	Marker	D	P	DR

Table 1 continued

State Site # (50-10-27-)	CSH Site #/ Feature	Formal Site Type	Functional Interpretation	Signif-incance	Prob. Age	Recommended Treatment
20714	20	Wall	Indeterminate	D	P	DR
20715	22	Terrace	Hab. (T)	D	P	DR
20716	23	Modified tumulus	Burial (poss.)	D,E*	P	Preserve
20717	24	Modified tumulus	Burial (poss.)	D,E*	P	Preserve
20718	25	Modified tumulus	Ag.	D	P	DR
20719	26	Complex	Hab.(T)/Ag./Marker	D	P	DR
20719	A	Rock shelter	Hab. (T)			
20719	B	Ahu	Marker			
20720	27	Terrace	Burial (poss.)	D,E*	P	Preserve
20721	28	Modified tumulus	Hab. (T)	D	P	DR
20721	A	Pavement	Hab. (T)			
20721	B	Modified tumulus	Hab. (T)			
20721	C	Pavement	Hab. (T)			
20721	D	Pavement	Hab. (T)			
20722	29	Trail	Transportation	D	P	DR
20724	31	Trail	Transportation	D	P	DR
20725	32	Modified tumulus	Hab. (T)	D	P	DR
20725	A	Terrace	Hab. (T)			
20725	B	Platform	Hab. (T)			
20725	C	Filled crevice	Hab. (T)			
20725	D	Pavement	Hab. (T)			
20726	33	Trails	Transportation	D	P	DR
20726	A	Trail	Transportation			
20726	B	Trail	Transportation			
20727	34	Lava tube	Hab. (T)	D	P	DR
20728	35	Enclosure	Hab. (T)	D	P	DR
20729	36	Modified tumulus	Indeterminate	D	P	NFW
20730	37	Modified tumulus	Hab. (T)	D	P	DR
20731	38	Modified tumulus	Burial (poss.)	D,E*	P	Preserve
20732	39	Trail	Transportation	D	P	DR
20733	40	Trail	Transportation	D	P	DR
20734	41	Planting area	Ag.	D	P	DR
20735	42	Complex	Hab. (T)/Storage/Tran	D	P	DR
20735	A	Wall	Hab. (T)			
20735	B	Modified depression	Storage			
20735	C	Mound	Hab. (T)			
20735	D	Trail	Transportation			
20736	43	Trail	Transportation	D	P	DR
20737	44	Trail	Transportation	D	P	DR
20738	45	Enclosures	Ag.	D	P	DR
20738	A	Enclosure	Ag.			
20738	B	Enclosure	Ag.			

Table 1 continued

State Site # (50-10-27-)	CSH Site #/ Feature	Formal Site Type	Functional Interpretation	Signif-incance	Prob. Age	Recommended Treatment
20739	46	Enclosure/trail	Storage/transportation	D	P	DR
20739	A	Enclosure	Storage			
20739	B	Trail	Transportation			
20740	47	Modified tumulus	Ag.	D	P	DR
20741	48	Complex	Hab. (T)/Ag./Transpor	D	P	DR
20741	A	Platform	Hab. (T)			
20741	B	Modified tumulus	Hab. (T)			
20741	C	Trail	Transportation			
20741	D	Enclosure	Ag.			
20741	E	Modified tumulus	Hab. (T)			
20741	F	Lava blister	Hab. (T)			
20742	50	Lava tube	Hab. (T)	D	P	DR
20743	51	Modified tumulus	Burial (poss.)	D,E*	P	Preserve
20744	53	Trail	Transportation	D	P	DR
20745	54	Trail	Transportation	D	P	DR
20746	55	Lava tube	Storage	D	P	DR
20747	57	Trail	Transportation	D	P	DR
20748	58	Lava tube	Indeterminate	D	P	NFW
20749	59	Terrace/lava tube	Hab. (T)/burial (poss.)	D,E*	P	Preserve
20749	A	Terrace	Hab. (T)			
20749	B	Lava tube	Hab. (T)/burial (poss.)			

KEY
C Site is an excellent example of a site type
D Site may be likely to yield information important in prehistory or history
E Site has cultural significance; religious structures and/or burials present
E* Site is a possible burial or possible religious structure
(P) Permanent
(T) Temporary
Ag. Agricultural
Hab. Habitation
(Poss.) Possible
DR Data Recovery
NFW No Further Work
P Prehistoric
CSH Cultural Surveys Hawaii

II. NATURAL SETTING

The project area comprises approximately 224 acres in the *ahupua'a* of Kaloko and Kohanaiki. The lands are located on the leeward coast of Hawai'i Island within the district of North Kona on the lower west slope of Hualalai Volcano. The project area stretches *mauka* from Queen Ka'ahumanu Highway, and is bordered by Hina-Lani Road to the southwest. Elevation within the project area range from 90 ft. a.m.s.l. at Queen Ka'ahumanu Highway to 340 ft. a.m.s.l. along the eastern boundary.

Kona weather is typified by afternoon showers brought on by warm air which has been moved inland by light sea breezes. The humid air gradually condenses over higher altitudes throughout the day. At night the land cools resulting in breezes which send warm air back out to sea. Rainfall in the Kaloko project area averages 10 inches per year (Cordy 1991). There are no natural springs or perennial streams within the project area.

The land surface is comprised predominately of exposed a'a and pahoehoe lava. Two a'a lava flows occur along the north side of the project area, extending in a *mauka / makai* direction for the entire length of the project area. A smaller a'a flow is also located in the south west corner of the project area, and extends in a roughly SE/NW direction. The surface of the a'a lava ranges from roughly level expanses to rough fractured ridges.

Pahoehoe lava covers the central and south sections of the project area from *mauka* to *makai*. The surface is generally uneven and characterized by numerous tumuli and pressure ridges with depressions or undulations in the pahoehoe having thin soil pockets. Collapsed portions of lava tubes also contribute to the uneven surface of the pahoehoe flows.

Grasses dominate the project area vegetation, with predominately non-native fountain grass (*Pennisetum sectacacum or sectacacum*) and the less common native *pili* (*Heteropogon contortus*). Shrubs and trees present include: the native *'ilima* (*Sida fallax*) in scattered numbers, the non-native *klu* (*Acasia fornesiana*), lantana (*Lantana camera*), native *noni* (*Morinda citrifolia*), and a few *kiawe (Prosopis pallida)*, and *'ōhi'a (Metrosideros polymorpha)* trees, along with an abundance of the non-native *koa haole* (*Leucanena glauca*).

Portions of the a'a flow in the *mauka* southeast corner of the project area have been bulldozed. Bulldozer pushpiles and tracks are also visible around the edges of the a'a within this area including an adjacent fence line and cattle gate.

III. KALOKO AND KOHANAIKI *AHUPUA'A*: CULTURAL AND HISTORICAL BACKGROUND

Pre-Contact to 1800

The *ahupua'a* of Kohanaiki and Kaloko lie at the southern end of Kekaha, the portion of North Kona extending from Honokōhau to 'Anaeho'omalu. The character of Kekaha - as it had been established in the Hawaiian consciousness - is represented in a traditional saying recorded by Mary Kawena Pukui and in a brief description by John Papa I'i. The saying, "*Kekaha wai 'ole na Kona*", is defined by Pukui as "waterless Kekaha of the Kona district" and explicated by her as "Kekaha in Kona, Hawai'i, is known for its scarcity of water but is dearly loved by its inhabitants" (Pukui 1983:184). Ii describes

> ...a cold wind from Kekaha, the Hoolua. Because of the calm of that land, people often slept outside of [*sic*] the tapa drying sites at night. It is said to be a land that grows cold with a dew-laden breeze, but perhaps not so cold as in Hilo when the Alahonua blows. [Ii 1959:122]

These passages suggest that Kekaha was firmly identified with its austere physical environment.

Describing the apportioning of land by the *ali'i* before the ascendancy of Kamehameha, the pioneer nineteenth-century Hawaiian historian Samuel M. Kamakau records:

> Waimea was given to the Pa'ao kahuna class in perpetuity and was held by hem up to the time of Kamehameha III when titles had to be obtained. But there was one land title held by the kahuna class for many years and that was Puuepa in Kohala. In the same way the land of Kekaha was held by the kahuna class of Ka-uahi and Nahulu. (Kamakau 1961:231)

Kamakau further records that during the 1770s, "Kekaha and the lands of that section" were held by descendants of the Nahulu line, the Ka-me'e-ia-moku and Ka-manawa, the twin half brothers of Ke'e-au-moku, the Hawai'i island chief (*Ibid.*:310).

Kamakau mentions Kaloko in an episode that suggests that *ahupua'a*'s significance within the pre-contact Kekaha landscape. Kamakau recounts an extraordinary day's reconnaissance of the west coast of Hawai'i island by the spy Ka-uhi-o-ka-lani, sent to the island by Kama-lala-walu, chief of Maui. Having reached Kawaihae by canoe at night, Ka-uhi-o-ka-lani "ran about that same evening [reaching as far south as Ka'awaloa] and returned before the canoes were dismantled..." Ka-uhi-o-ka-lani, recounting his journey and the landmarks he had observed, relates: "I went on to the long stretch of sand, to the small bay with a point on that side and one on this side. There are large inland ponds." He is told that the "sandy stretch is 'Ohiki, and the walled-in ponds are Kaloko and Honokōhau" (Kamakau 1961:56). This event unfolds during the time of the sixteenthcentury Hawai'i Island *ali'i* Lono-i-ka-makahiki, suggesting that by the 1500s Kaloko and its fishpond were well-known features in the Kekaha landscape.

Intensive archaeological investigation during recent decades has clarified the picture of pre-contact Hawaiian life within Kekaha and the two *ahupua'a* under study. Especially detailed study of Kaloko has resulted in the following analysis of the development of pre-contact settlement throughout the *ahupua'a*:

> Throughout its span of occupation Kaloko was but part of a larger society. Kaloko was apparently a unified community after A.D. 1200-1300. When initially occupied (A.D. 1000-1500), it may have been an outlier of another community. Nevertheless, from its initial occupation, Kaloko had 1 or more internal local residence groups containing constituent households. By A.D. 1200-1300 at least 2 residential groups were present in the community, and by contact (*circa* A.D. 1778) at least 4 residential groups had dwelled in the area. Each residential group performed religious functions as well as being a leisure unit. Members of the group held use rights to adjacent farm lands and probably to areas where forest and marine resources were located. Within each residential group, 1 household seems to have been dominant, being the spatial focus for its group's religious activities. It is suggested that such dominance was a function of consanguineal seniority and/or wealth. (Cordy *et al.* 1993:45)

While exact population figures for Kaloko were not possible, the study suggested that the "community seems to have gradually grown in size but could never have been larger than 118 and most likely was about 60-100 in size" (*Ibid.*:45). The general pattern of land use and settlement suggested for Kaloko may also have existed within the similar environment of neighboring Kohanaiki.

Into the last decades of the 18th century - following western contact - Kohanaiki and Kaloko - as elements of the larger Kekaha area -remained under the control of Ka-me'e-ia-moku, who resided to the north at Ka'upulehu (Kamakau 1961:147).

1800 to 1850s

By the first decades of the 19th century, the inhabitants of Kaloko and Kohanaiki would have long experienced the social pressures and consequences of western contact. "As early as 1788, Hawaiians began enlisting as seamen on the foreign ships that stopped at Island ports, and their number increased rapidly with the growth of whaling in the Pacific" (Schmitt 1973:16). As harbor facilities were developed at Kailua and Kealakekua during the early 1800s, these burgeoning ports became centers of a population drawn from increasingly isolated (economically and socially) areas like Kaloko and Kohanaiki. Newly-introduced diseases cut the population severely.

Kaloko is recorded by Kamakau as the site where Kamehameha's bones were cached after his death in 1819:

> Kamehameha had...entrusted his bones to Ulu-maheihei Hoa-pili with instructions to put them in a place which would never be pointed out to anyone. At midnight, therefore, when black darkness had fallen and no one was likely to be on the road and the rough lava plains of Pu'ukaloa lay hushed, Hoa-pili sent his man, Ho'olulu, to bring the container of wicker work in which the bones of Kamehameha were kept to Kaloko in Kekaha...The next morning Hoa-pili and Ke-opu-lani took canoe to Kaloko where Hoa-pili met the man who had charge of the secret cave and together they placed the bones there. (Kamakau 1961:215)

Kamakau's account, if accurate, suggests that Kaloko's population, toward the end of the 19th century's second decade, had diminished to such an extent that the *ahupua'a* could provide the necessary isolation and secrecy for the burial.

Missionary censuses of the 1830s chart the diminishing population of Kekaha and North Kona. In 1834, the total population of Kekaha is recorded as 1,244, comprising 21% of the total North Kona population of 5,957 (Schmitt 1973:31). The North Kona figure represents a population loss of 692 since the previous census of 1831 (during which no figure specific to Kekaha was noted), which recorded 6,649 persons in the district (*Ibid.*:9). One factor - inter-island migration - inducing the diminishing population of Kona was specifically noted by missionaries in 1832: "We have been sensible for some time that the number of inhabitants in this island is on the decrease. There is an almost constant moving of the people to the leeward islands, especially since the removal of the governor (*Kuakini*) to Oahu. Some leave by order of the chiefs, and others go on their own responsibility" (cited in *Ibid.*:16).

Records generated during the 1840s for Land Commission Awards (LCAs) conferred at mid-century document the disposition of population and land use within Kohanaiki and Kaloko *ahupua'a* that had evolved since western contact. At the *Mahele* of 1848, Kaloko was claimed by and awarded (LCA 7715) to Lot Kamehameha (Kamehameha V). Kohanaiki was classified as Government Land. Subsequently, 18 *kuleana* claims - by commoners claiming to occupy and/or cultivating land parcels - were made in Kaloko. Twelve of these claims were awarded. All claims were for *mauka* lands - between 1200 and 1700 ft. elevation - adjacent to or just *makai* of the Government Road. Only testimony for Kahiona's LCA 9205/9237 claim (which was not awarded) mentions a fishpond; no site within the coastal area is claimed. Farm lands claimed are *mala*, *kihapai*, and *mo'o*, *i.e.* forms of dryland agriculture; actual crops identified in the award testimonies are taro and sweet potato. Only five of the total 18 claims mention residence on or use of the Kaloko lands dating to the time of Kamehameha I, the first decades of the nineteenth century; the remaining claims testify to residence/use beginning in the 1830s and 1840s.

Parcels within Kohanaiki, having become Government Land, were subject to sale - designated grants - by the Hawaiian government. Land sales began in the 1850s with Grant 2030 to Kaiakoili in 1856, awarding 102 acres adjacent to and *makai* of the Government Road. Also beginning in the 1850s, the first taxpayer rolls for Kohanaiki and Kaloko were documented: they indicate, within Kohanaiki, 8, 13 and 12 taxpayers during the years 1857, 1859 and 1860, respectively; within Kaloko, during the same years, 19, 21 and 23 taxpayers were recorded. Just past the middle of the 19th century, the populations of Kaloko and Kohanaiki have been drawn beyond the original subsistence-based economy into the western commercial paradigm.

As Cordy notes about Kaloko: "The historical documents suggest that by the 1840s-1850s, the Coastal Zone had been abandoned as a residential area, except probably for a house used by the fishpond's caretaker. This pattern would have been a stunning change from prehistoric and early historic times, when many coastal residences were present" (Cordy 1991:288). This pattern likely also held for Kohanaiki.

1860-1900

The division of Kohanaiki - through sales of Government lands -continued throughout the remainder of the 19th and into the 20th century. Grant 2942 in 1864 awarded to Hulikoa 929.75 acres which included the width of the *ahupua'a*, extending *makai* from Kaiakoili's grant. In 1871, Grant 3086 awarded 154 acres to Kapena; this parcel extended *makai* from Hulikoa's grant to the shoreline.

Kaloko is documented during the 1870s in testimonies by Hawaiians before the government's Boundary Commission. Testifying on August 12, 1873, Nahuina (who had earlier received LCA 10327 in Kaloko) describes himself as "born at Kaloko North Kona Hawaii at the time of Keikepuipui, the building of the heiau at Kailua, and have always lived there" and states that the boundaries of Kaloko were shown to him by his father, the former *konohiki* of the *ahupua'a*. Identifying the *mauka* portions of the boundary, Nahuina notes bounds defined by vegetation and a wall (*iwi aina*), and recalls a former habitation site:

> ...From the makai side of Kaupulehu the boundary runs along said land, the koa being on Kaloko and the mamani and pukeawe [*sic*] on Kaupulehu to the corner of Lanihau 2nd Keahuolu and Honokohaunui...Ohiawela, a pali, on the road through the woods is a point on the boundary. this place is above Honokohaunui, thence turn makai to Kahua, a place in the fern where houses used to stand, from thence the boundary runs makai along an iwi aina to Kapokalani, at the Government road. Thence makai still following the iwi aina to Kiikii an ili aina, thence to Kaohe, a grove of trees thence to aa...

Nahuina adds that Kaloko has "ancient fishing rights extending out to sea." Testifying on the same date, Hoohia, who "moved to Honokohauiki when quite small and reside there now", adds details that suggest the *mauka* Kaloko-Honokohau boundary was defined by different vegetation that also reflected former traditional gathering rights: "Honokohaunui ends at Ohiawela, a pali. Kaloko takes the koa, and Honokohaunui, the ohia...The olona grows on Honokohaunui and Kealakehe and the koa on Kaloko."

During the 1880s, Kona lands - including Kaloko and Kohanaiki - were surveyed by J.S. Emerson for the Hawaiian government. A portion of the map of North Kona derived from Emerson's survey (Figure 5) shows the locations of the three Kohanaiki grants described above. Also indicated are "Kealiihelepa Hse" at the coast above the Kaloko fish pond and, near the government roads, "Kaloko Cath. Church" and "Kohanaiki Church" which is likely the Protestant church recorded as built by a minister, Kaanohimaka, and his congregation in the 1870s (Kelly 1971:14). As noted by Cordy (1991:418), Emerson's map of the area including the Kohanaiki Church indicates "a set of about 16 stone house enclosures and a Protestant church, collectively called the Kohanaiki Homesteads"; Cordy suggests a "late 1880s age or the formation of the Kohanaiki Homesteads". Kelly (1971) notes that the Kohanaiki Homesteads would draw people as other areas of North Kona were abandoned. Government records of Kohanaiki grants show 18 parcels ranging in size from .73 acres to 25.45 acres awarded between 1895 and 1904.

Kaloko continued to be held by the *ali'i* throughout the remainder of the 19th century, passing, after the death of Lot Kamehameha, successively to Bernice Pauahi Bishop, Kalākaua and Kapi'olani.

DOCUMENT CAPTURED AS RECEIVED

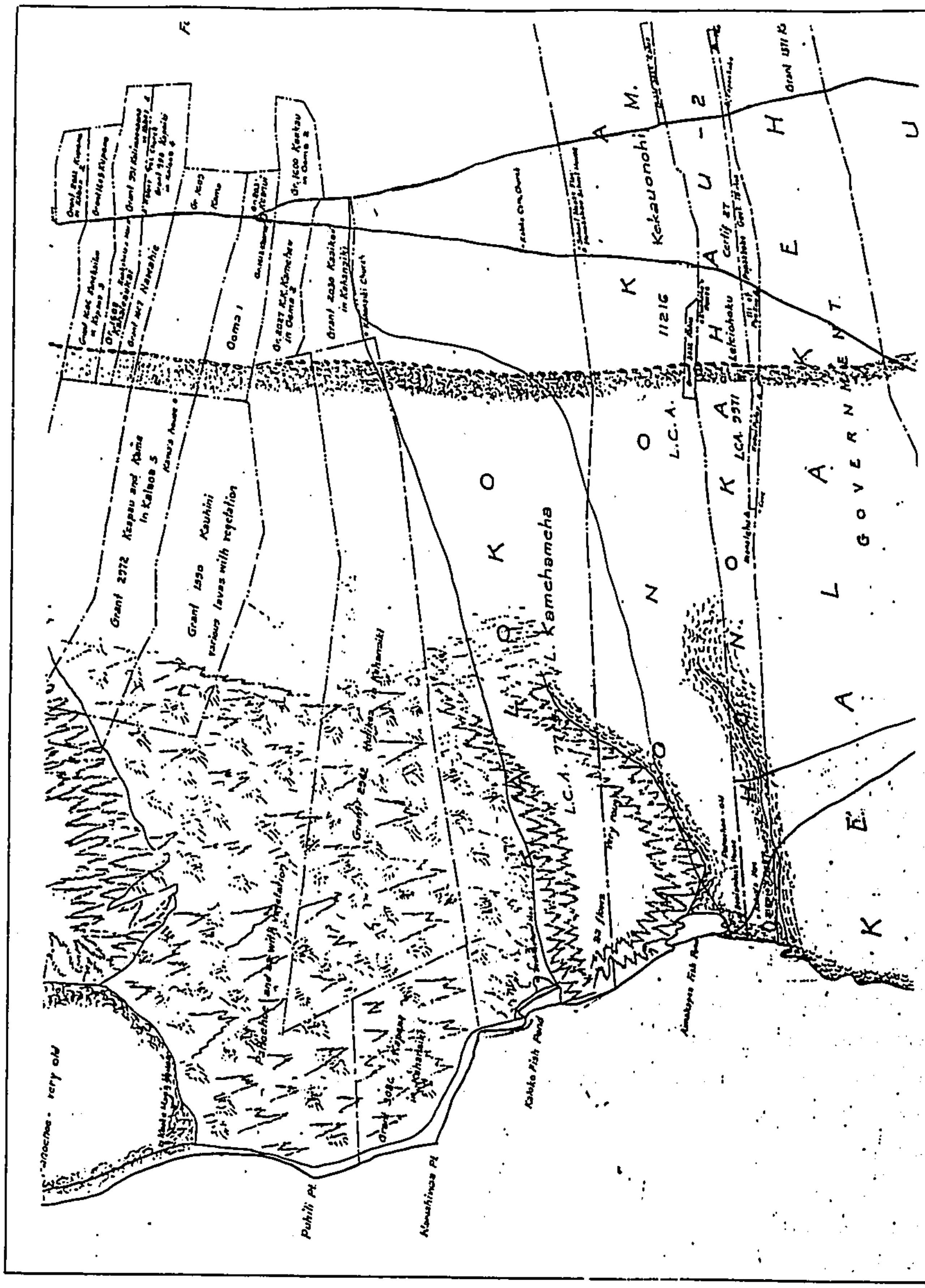


Figure 5 Portion of 1888 survey map by J.S. Emerson (modern tracing) showing Kaloko and Kohanaiki *ahupua'a*.

1900-Present

During the 20th century, major developments focused on Kaloko *ahupua'a*. After John Maguire purchased the former chiefly lands of Kaloko in 1906, the uplands of the *ahupua'a* were developed into the Huehue Ranch. The Kaloko fishpond - leased from the ranch - continued as a commercial fishing operation until the 1950s. During the 1970s, the pond was incorporated into the newly-established Kaloko-Honokohau National Historic Park.

IV. PREVIOUS ARCHAEOLOGICAL RESEARCH

A. Archaeological Studies within Kaloko

Previous archaeological surveys conducted within portions of Kaloko *ahupua'a* began with the early coastal survey conducted by John Reinecke for the Bernice P. Bishop Museum in 1929-1930 (Reinecke 1930). This was a cursory survey in which approximate site locations and very brief site descriptions were recorded. The next survey was undertaken by Kenneth Emory and Lloyd Soehren in 1961 (Emory and Soehren 1971). This was also a coastal survey, and focused specifically upon the coast of Kaloko, Honokohau and Kealakehe. In 1970 and 1971, Robert Renger and students from the University of California at Santa Barbara conducted an intensive survey of Kaloko and Honokohau between present day Queen Ka'ahumanu Highway and the coast (Cordy *et al.* 1991). This survey also included subsurface testing of selected sites. These three surveys identified a total of 94 sites within Kaloko between the coast and Queen Ka'ahumanu Highway as of 1971.

Additional survey work was undertaken in 1970-71 by Renger inland of the highway - *i.e.* that middle zone of Kaloko which includes a portion of the present study area. Although the findings of much of this fieldwork within the middle zone were recently written up in detail (Cordy *et al.* 1991), the findings from the survey sample conducted specifically within the project area (*i.e.* that portion of the middle zone situated on the inland side of the Queen Ka'ahumanu Highway) were not included because, "regrettably... it appears that the maps and survey records have been misplaced since the end of the 1971 field season" (*Ibid*:340). Renger's summary of the findings from that part of the survey indicated that fifteen features were identified:

> Very few sites were discovered within the "transitional middle zone" ... between the coastal and upland exploitation zones ...Seven lava tube shelters, four trails (coast-upland), three platforms, two cairns ... two low-walled enclosures, and an L-shaped structure were recorded. (cited in Cordy *et al.* 1991:340)

Additional archaeological work and historical research undertaken within or about Kaloko during the 1970s and 1980s include: an historical study by Marion Kelly (Kelly 1971); research relating to the establishment of the Kaloko-Honokohau National Park (e.g. Honokohau Study Advisory Commission 1974, National Park Service 1975); research stemming from the fieldwork conducted by Renger in 1970-71 (see the list presented in Cordy et al. 1991:2); several reconnaissance-level studies (Ching 1980, Soehren 1983, Kennedy 1983) and one intensive survey (Kennedy 1984).

The reconnaissance and subsequent intensive survey undertaken by Joseph Kennedy in 1983 and 1984 was of a parcel that adjoins the present project area to the east. This parcel also lies within the Middle Zone as described by Cordy. The intensive survey identified:

> 45 separate cave openings and approximately 200 chambers in these caves. In addition there were 4 walls recorded, 5 enclosures, 13 platforms, 9 *ahu*, 2 trails and 2 sets of petroglyphs. Out of the 79 separate features on the property, 30 were judged to be worthy of re-investigation ... the remaining 49 sites that were not reinvestigated were comprised almost exclusively of relatively shallow caves with little or no evidence of cultural remains or associated modifications. (Kennedy 1984:18)

In 1987, Paul H. Rosendahl Inc. accomplished an archaeological reconnaissance survey of three one-acre parcels - proposed water tank sites - in Kaloko (TMK: 7-3-09:Por.1,17) (Rosendahl and Haun 1987), along the south side of the then "main access road between Queen Ka'ahumanu Highway and Kona Heavens Subdivision" - *i.e.* the present Hina-Lani Road. The parcels were located at 350 ft. above mean sea level (A.M.S.L.), 630 ft. A.M.S.L., and 910 ft. A.M.S.L. Only one site (State site 10-28-10887) - an historic wall interpreted as a boundary or cattle wall - was recorded within the *mauka*-most parcel. Subsequently, in 1989, an additional water tank site parcel (TMK: 3-7-3-10:Por.17) - measuring 360 ft. N/S and E/W - was subject of an archaeological inventory survey (Rosendahl 1989). The parcel bordered the north side of the then "proposed Kamanu Street extension in the Kaloko Light Industrial Park" - *i.e.* within the present project area at the south boundary along Hina-Lani Road. One site was recorded:

> a steppingstone trail segment measuring 7.5 m long (E-W) by 0.6-0.7 m wide (N-S)...located on a section of aa lava...The segment consists of approximately six flat and roughly round pahoehoe slab steppingstones set on worn aa gravel. The steppingstones measure c. 0.4 m in diameter by 0.1 m thick. The trail is oriented c. 159 degrees Az. (magnetic). No portable remains were present in association with the trail. The trail appears to be prehistoric, and appears to have been used as a secondary transportation route. (Rosendahl 1989:1)

The site was designated State site 50-10-27-13493. It was reexamined during the present survey (see SITE DESCRIPTIONS section below).

In 1993, Paul H. Rosendahl Inc. conducted an inventory survey (Fager and Graves 1993) of an approximately 15-acre parcel adjacent to, and *mauka* of the Kaloko Industrial

Park, which includes a road corridor extended from the main project area to Kamanu Street. The survey recorded 17 sites incorporating 60 component features. The sites were judged

> ...in poor to good condition and comprised the following formal types: terraces, modified outcrops, mounds, walls, caves, pahoehoe excavations, cairns, filled cracks, enclosures, and a trail. The formal types comprised the following functional types: animal husbandry, temporary habitation, agriculture, marker, quarry, and transportation. (Fager and Graves 1993:ii)

In 1995, Cultural Surveys Hawaii conducted an archaeological inventory survey with limited subsurface testing within a narrow strip of land, averaging 300 ft wide, along Queen Ka'ahumanu Highway between Palani Road and the Keahole Airport entrance road (Walsh and Hammatt 1995). Three sites were identified in Kohanaiki: two trails and a set of three cairns. One of the trails - a *mauka-makai* trail - had been previously identified and designated Site 50-10-27-15324 (The report notes: "A PHRI site tag was found along the trail on the *mauka* side of the highway labelled 92-1118 1118-12. This site is now known to be state site #15324. The inventory survey report containing the site description and significance evaluations developed by PHRI was not available to the public at the time of this report" [Walsh and Hammatt 1995:51].) The site is described as consisting of

> ...two converging trail segments designated Features A and B...Both trail segments extend in a roughly *mauka-makai* direction, but angle toward each other and converge into one trail that continues inland. The point where the two trails meet is located at the edge of the bulldozed portion of the present highway right of way, 164 feet (50 m.) from the *makai* edge of the highway pavement...On the *mauka* side of the highway, the trail was observed at the edge of the bulldozed portion of the powerline (the new right-of-way boundary) and continuing inland at 65 degrees T.N. for at least another 100 feet (30 m.). (*Ibid.*:51)

This is trail site is located within the present study area and was re-examined during the present survey (see SITE DESCRIPTIONS section below).

B. Archaeological Studies within Kohanaiki

John Reinecke (1930) recorded eight sites at the coast of Kohanaiki during the survey noted above; the sites - minimally documented and mapped - included habitation and a *heiau*. Cordy (1981) conducted a survey of the coastal area (up to 1/2 mile inland) of Kohanaiki in 1975; twelve sites were recorded including: pavings, platforms, enclosures and a trail. Eleven of the sites were interpreted as habitation constructs including sleeping houses, men's houses, special purpose, and a canoe house/men's house.

During the 1980s, PHRI began investigations of the entire *makai* portion of the *ahupua'a*, bounded by its boundaries with Ooma 2 and Kaloko, and by the Pacific Ocean and the Mamalahoa Trail. During an inventory survey in 1986 (Donham 1986), "14 previously recorded sites were relocated and 91 sites were newly identified...Habitation sites represented over half of the identified site total, and included habitation complexes, habitation/ceremonial and/or habitation/burial complexes, and temporary habitation sites" (Donham 1986:7-8). In 1991, PHRI performed data recovery of the project area (O'Hare and Goodfellow 1992); this work included: "detailed recording of (a) 31 sites (224 features) previously recorded in the project area, and (b) seven sites newly recorded during the Phase II work" (*Ibid.:* ii). Summarizing Kohanaiki settlement pattern within the zones represented by the project area, the report notes:

> The data recovery work indicates that permanent habitation sites between Puhili and Wawahiwaa Points are concentrated in the coastal zone, near the shoreline. In the coastal area south of Wawahiwaa Point permanent habitation sites were near the shoreline and further inland. Temporary habitation sites were present in all areas of the coastal zone and in the barren rockland zones. The radiocarbon date ranges indicate that sites in the northern coastal zone might have been inhabited as early as AD 1020. Sites in the southern coastal zone may have been inhabited as early as AD 1370, and sites in the barren rockland zones may have been inhabited as early as AD 1180. In the barren rockland zones, use of the sites was terminated before the historic period, and in the coastal zone most of the sites were not used in the historic period. (*Ibid.*:ii)

In 1985, Barrera (1985) surveyed approximately 409 acres within Kaloko and Kohanaiki *ahupua'a*; the 409 acre parcel is located between Mamalahoa Highway and Queen Ka'ahumanu Highway, *mauka* of the present project area. Four sites were recorded in Kaloko, including an enclosure, a lava tube cave, a wall and a platform (possible burial). Fifty-five sites were recorded within Kohanaiki and include mounds, platforms, habitation complexes, walls, and terraces. A portion of the study area included the historic period Kohanaiki Homestead. Barrera's site #59 comprises constructions associated with the homestead and is described as a "series of Habitation areas enclosed by large stone walls." No estimate is given of the ages of the other fifty-eight sites.

In 1991, Archaeological Consultants of Hawaii (Kennedy 1991) performed a reconnaissance survey of a narrow corridor - 500 ft. N/S by 7260 ft. *mauka/makai* E/W (TMK: 7-3-09:15) - in Kohanaiki extending *mauka* from Queen Ka'ahumanu Highway, located north of the present study area. No sites or features were observed; seven caves "were examined to term and were determined to be devoid of cultural materials" (Kennedy 1991:C-1).

In 1995, Cultural Surveys Hawaii conducted an archaeological inventory survey with limited subsurface testing within a narrow strip of land, averaging 300 ft wide, along Queen Ka'ahumanu Highway between Palani Road and the Keahole Airport entrance road (Walsh and Hammatt 1995). Five sites were identified in Kaloko and include: a pahoehoe excavation, an enclosure, a modified outcrop complex, a wall, and a trail.

V. SETTLEMENT PATTERN AND PROJECT AREA PREDICTIVE MODEL

Kaloko and Kohanaiki *ahupua'a* are located within the Kekaha region of North Kona. The Kekaha region, or "Kekaha-Waiole, the desolate land without water" (Kelly 1973:74) refers to the barren lava fields extending north from Kailua-Kona to Anaeho'omalu (ibid.).

As has been observed in Kaloko, Kohanaiki and other *ahupua'a* in Kekaha, this band of barren lava fields does not encompass entire *ahupua'a* nor does it inhibit land usage from occurring along the coast and inland where rainfall is sufficient for intensive agriculture. Instead, Kekaha refers more accurately to portions or "zones" of the regions where lava flows encompass the lands which - according to elevation - sustain little rainfall. Correspondingly, the lands of Kekaha are suggested, based on ethnographies, ethno-histories and archaeological sources, to contain three general terrestrial zones that directly influenced land usage of prehistoric and historic populations. These three zones include: (1) Coastal; (2) Intermediate or Transitional and; (3) Upland. Based on the archaeological record of the present study area and previous archaeology in the Kaloko *ahupua'a* (Cordy et al. 1991) a land usage summary of each zone is provided below.

A. Coastal Zone

The Coastal zone begins at sea level and extends to approximately 15 ft. a.m.s.l. The zone contains evidence of prehistoric and historic settlement in both Kaloko and Kohanaiki.

Traditional Hawaiian Land Use-Coastal Zone

Kaloko contained a permanent settlement concentrated along the coast. The settlement probably comprised "several local residential groups with constituent households. One household headed each residential group" (Cordy et al. 1991:522). Radiocarbon dating for the coastal region within Kaloko *ahupua'a* has produced dates ranging between A.D. 920 and A.D. 1430 (Ibid.:465). Cordy concludes that one site (D13-3) on the Kaloko coast - with date ranges between A.D. 920-980 and A.D. 1005-1290 is one of the oldest permanent habitation known in leeward Hawaii (ibid.,473).

Although few absolute dates are known for the construction of fishponds, Cordy conjectures that the Kaloko and Honokohau fishponds were constructed by at least the A.D. 1400-1500 period (ibid.,576).

B. Intermediate Zone

The Intermediate Zone extends from the *mauka* margin of the coastal zone (15 ft. a.m.s.l.) to approximately 400 ft. a.m.s.l. (The present project area is located within this zone). Similar to other portions of Kekaha, the intermediate zone of Kaloko and Kohanaiki is characterized by low rainfall and uneroded lava terrain.

Traditional Hawaiian Land Use-Intermediate Zone

The Intermediate Zone of Kaloko and Kohanaiki contained a scattered distribution of habitations of different modes (i.e. temporary and recurrent) which were generally located within the vicinity of *mauka/makai* trails or in association with other functional site types like agricultural an lithic resource procurement.

The general lack of consistent rainfall and virtual absence of soil directly limits agricultural use within the Intermediate Zone. Nonetheless, small concentrations of mounds, modified outcrops (enclosing minimal soil areas), enclosures, and some pahoehoe excavations evidence a degree of agricultural productivity. Lava tubes and blisters are abundant in this zone and contain temporary components, and post-habitation burial interments.

The Intermediate Zone is also characterized by an extensive network of *mauka/makai* trails. These trails facilitated inter-*ahupua'a* travel of residence between their coastal habitation and the Upland agricultural fields.

Within the Intermediate Zone permanent habitation may occur directly adjacent to the Coastal Zone and are associated with small scale agricultural activities.

C. Upland Zone

The Upland Zone of Kaloko and Kohanaiki begins at approximately 400 ft. a.m.s.l. and continues *mauka*. The Upland Zone is characterized by an increase in permanent habitation sites, in association with intensive non-irrigated (dryland) agricultural features. Gradually, the ascending natural landscape contains a greater soil base and due to an increase in elevation, the rainfall is more plentiful and consistent.

Traditional Hawaiian Land Use-Upland Zone

Intensive non-irrigated agriculture is characteristic of the Kona slopes and other regions of Hawaii and Maui where irrigation, because of the lack of perennial waterways, is not possible. The "Kona Field System" - generally defined by a grid-like patterning of stone constructed field boundaries - represents an interrelated network of intensive non-irrigated agriculture covering an estimated area of 139 km.[2] (Kirch 1985:225) between Kealakekua Bay and Kailua Bay. Archaeological studies beyond the arbitrary northern boundary of the "Kona Field System", have documented evidence of intensive non-irrigated agriculture in the Kekaha region within the Upland Zone between 400 to 1200 ft. a.m.s.l. (i.e., Cordy 1985; Hammatt et al. 1987; Walker and Rosendahl 1990; Robins et al. 1993).

Intensive non-irrigated agriculture is characterized by concentrated occurrences of similar feature types (i.e. field walls, modified a'a lava, pahoehoe excavations, and mound complexes). Variations in the methods of non-irrigated agriculture occur as a response to topographical and geological variation, and rainfall in the region. Radiocarbon dates taken from upland field shelters within the Kona Field System indicates that intensive agriculture began developing between *ca.* A.D. 1400 - 1600 and intensified with permanent upland settlements between *ca.* A.D. 1600 - 1779 (Schilt 1984).

D. Settlement Pattern Summary

The settlement pattern described above reveals a variety of land uses across all zones - including the Intermediate Zone - during the prehistoric and early historic period. The pattern then dramatically changed during the middle to late historic period (post *mahele ca.* 1850's).

The original settlement of both Kaloko and Kohanaiki was focused on the coast starting around 900 A.D. (Cordy et al. 1991). These earlier settlers were likely drawn to the coast by the presence of potable water found in the brackish ponds, the excellent fishing, and Kaloko specifically to which offered one of the most protected inlets on the Kona Coast (Ibid.:575).

Radiocarbon dates from the Kekaha region, may indicate that all three zones of the Kaloko and Kohanaiki *ahupua'a* were utilized to some degree or another as early as A.D. 1280 (Walker and Haun 1988). This period of time correlates with an apparent population increase and geographical expansion in the Hawaiian islands identified as the "Expansion Period" (Kirch 1985:303) or the middle of the "Pioneer Settlement" (Schilt 1984:276). Permanent settlement continued to be centered on the coast and agriculture developed upland as the endemic forest lands were gradually reduced by slash-and-burn methods.

Development of the intensive upland agricultural system probably occurred between *ca.* A.D. 1400 and 1650 (Schilt 1984:277) and focused along the more prime agricultural lands, at elevations where soil was abundant and rainfall sufficient for productive cultivation. During this period permanent settlement continued to be centered at the coast but also began to be developed in the upland localities of Kaloko and Kohanaiki, as the distance between the upland farms and original coastal settlement expanded.By the end of this period it is expected that most of the upland permanent habitations were occupied. This period is when the fishponds in Kaloko were likely constructed and a four class hierarchy: "ruler, high chiefs, local chiefs and commoners" was formed in Hawaii (Cordy et al. 1991:575).

During early historic times (*ca* A.D. 1800-1840) following western contact, Kaloko and Kohanaiki populations undoubtedly declined rapidly due to disease, and a major shift in the traditional Hawaiian settlement pattern. The residents who survived disease likely shifted their residences to economic centers - such as Kailua-Town - or in closer proximity to major roadways and localities of churches and schools established by the missionaries.

Following the Mahele (*ca* 1850's), Kaloko and Kohanaiki shorelines were virtually abandoned "with the Kohanaiki Homesteads the new upland population focus in the Kaloko area" (*Ibid.*:580). As a result, the vacant lands were subsequently acquired for cattle ranching.

E. Project Area Predictive Model

The present project area's location within the interpreted "intermediate zone" places it outside the major areas of pre-contact Hawaiian habitation and activity which would have focused at the coast. It is thus suggested that traditional Hawaiian sites likely to occur within the project area would include:

1) temporary or recurrent habitations;
2) limited agricultural activity areas including pahoehoe excavations and minimal soil enclosures;
3) *mauka/makai* trails connecting coastal residences and upland agricultural areas, with branch trails extending to specific use areas within the project area;

and

4) burial sites utilizing features of the terrain - including lava tubes and cracks.

As noted above, during the decades following western contact, populations of both *ahupua'a* would have declined significantly - reduced by disease and out migration to developing commercial centers. As the western commercial model continued to displace the traditional subsistence economy, localities like the present project area would have been further marginalized and abandoned. Land Commission Award documents indicate that by the middle of the 19th century, habitation and activity within Kaloko (and likely Kohanaiki as well) had shifted far *mauka* to land between 1200 and 1700 ft. elevation near the Government Road. During the second half of the 19th century this *mauka*-ward shift is fully established with the formation of the Kohanaiki Homesteads near the Government Road. Throughout the 19th century, use of the project area would likely have been limited to use of existing *mauka/makai* trails for ocean access by *ahupua'a* residents of the uplands.

Into the 20th century, major developments within Kohanaiki and Kaloko have occurred outside the project area, which has remained undeveloped. Activities of the Huehue Ranch (established early in the century) - including walls and fencing - may have impacted the project area. Such activities are evidenced by the wall along the Kaloko-Kohanaiki boundary - site 40 - recorded by Kennedy (1984) in a project area immediately *mauka* of the present project area; as Cordy (1991) notes, documentary evidence - including the absence of the wall in J.S. Emerson's 1888 notes and maps - suggests that the wall was constructed for the ranch in this century.

VI. SITE DESCRIPTIONS

State Site #:	50-10-27-13493	**CSH SITE #:** 30
Site Type:	Trail	
Function:	Transportation	
Features (#):	1	
Dimension:	31.0 m.^{2} (101.7 ft.^{2})	
Elevation:	120 ft. a.m.s.l.	

Description: Site 50-10-27-13493 is a stepping stone trail in good condition located on an undulating a'a flow. No soil is present on the flow and only sparse vegetation is present.

The trail crosses the a'a flow in a SW/NE direction for 31.0 m. (101.7 ft.). It is constructed of flat pahoehoe slabs set into a'a cobbles at evenly spaced intervals, creating an easily traveled well constructed path across the a'a flow. The trail was not discernable on the pahoehoe lava on either side (*mauka* or *makai*) of the a'a flow. The trail was originally allotted State site -13493 based on survey work within the adjoining new water tank parcel (Rosendahl 1989).

No midden or artifacts were observed.

Excavation potential is poor.

State Site #: 50-10-27-15324
Site Type: Trail
Function: Transportation
Features (#): 2
Dimension: 91 $m.^2$ (298.5 $ft.^2$)
Elevation: 80 ft. a.m.s.l.

Description : Site 15324 consists of two converging trail segments designated Features A and B. Both trail segments extend in a roughly *mauka-makai* direction, but angle toward each other and converge into one trail that continues inland. The point where the two trails meet is located at the edge of the bulldozed portion of the present Queen Ka'ahumanu Highway right-of-way, 50 m. (164.0 ft.) from the *makai* edge of the highway pavement. Both trail segments were observed to continue over 91 m. (300.0 ft.) *makai*. On the *mauka* side of the highway (i.e. present project area), the trail was observed at the edge of the bulldozed portion of the existing powerline and continuing inland at 65 degrees true north for at least another 30 m. (100.0 ft.), to pahoehoe lava.

Both trail segments (Features A and B) average 0.6 m. (2.0 ft.) wide and consist of a trodden surface that meanders over pahoehoe and a'a lava surfaces. A few isolated stepping stones consisting of pahoehoe slabs were observed along Feature B. Both trail segments are well worn and clearly visible, on a'a lava surfaces.

A PHRI site tag was found along the trail on the *mauka* side of the highway labelled 92-1118 1118-12. This site was allotted State Site 15324. Though the inventory survey report containing the site description and significance evaluations developed by PHRI was not available to the public at the time of this report (i.e. not yet submitted to DLNR).

State Site #: 50-10-27-20696 **CSH SITE #:** 1
Site Type: Lava tube
Function: Indeterminate
Features (#): 1
Dimension: 257.4 $m.^2$ (2769.2 $ft.^2$)
Elevation: 305 ft. a.m.s.l.

Description: Site 50-10-27-20696 (Figure 6) is a lava tube with an entrance in a small sink located beneath a gently sloping pahoehoe terrain. Vegetation on the surface is primarily *koa haole* and various grasses.

The tube measures approximately 26.0 m. (85.28 ft.) long E/W and 5.3 m. (17.4 ft.) wide. Maximum ceiling height is 1.3 m. (4.7 ft.). The lava tube is unmodified with the only evidence of utilization consisting of a few burnt sticks located at the northeast end of the tube, and a bamboo pole situated near the entrance. The western end of the tube contained no cultural material or evidence of utilization.

Excavation potential is considered poor.

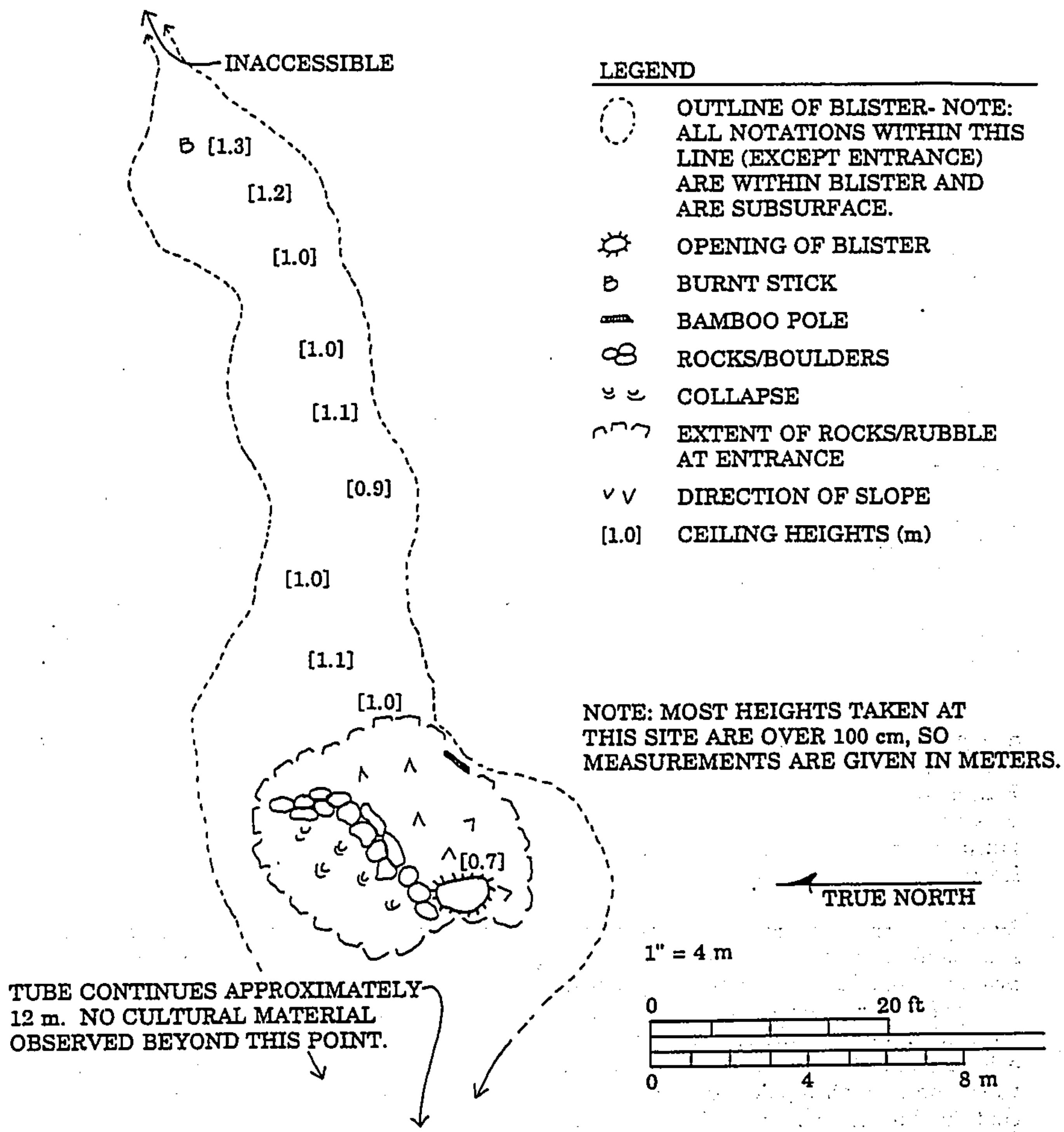


Figure 6 State site 50-10-27-20696, Plan View

State Site #: 50-10-27-20697 **CSH SITE #: 2**
Site Type: Modified tumulus
Function: Temporary habitation
Features (#): 1
Dimension: 9.8 m.^{2} (106.7 ft.^{2})
Elevation: 310 ft. a.m.s.l.

Description: Site 50-10-27-20697 (Figure 7) is a modified pahoehoe tumulus consisting of a level paved area formed by well-stacked to piled boulders on the dome shaped surface to the tumulus. The terrain consists of undulating pahoehoe with the site situated on the edge of a moderate slope to the west. Vegetation consists of various grasses, *klu*, and *koa haole*.

Modifications to the top of the tumulus consist of a C-shaped paved area with some raised edges constructed of small boulders and cobbles. The pavement measures 2.7 m. (8.9 ft.) N/S by 2.1 m. (6.9 ft.) E/W, with a maximum height of 0.9 m. (3.0 ft.) along the southwest facing edge. Along the northeast to east sides of the paved area is a long hollow space, up to a maximum of 50 cm. (1.6 ft.) in depth, created by the natural lip of the tumulus and well placed vertical slabs and with slab cap stones. The hollow space is assumed to be related to storage.

No artifacts or midden were observed. Excavation potential is considered poor.

State Site #: 50-10-27-20698 **CSH SITE #: 3**
Site Type: Pavements
Function: Temporary habitation
Features (#): 2
Dimension: 69.0 m.^{2} (742.9 ft.^{2})
Elevation: 300 ft. a.m.s.l.

Description: Site 50-10-27-20698 (Figure 8) consists of two paved areas (Features A and B) constructed atop at the *makai* edge to an a'a flow. The surrounding terrain consists of an a'a and pahoehoe which slope gently to the southwest. Vegetation at the site consisted of *koa haole*, and various grasses.

Feature A is a paved area located on the southwest edge of a large a'a flow and is thus elevated above the surrounding terrain. The paved area measures 4.5 m. (14.8 ft.) N/S by 3.4 m. (11.2 ft.) E/W, and is constructed with large pebbles to small cobbles. The south and west sides are retained by small vertically placed boulders with a maximum height of 0.5 m. (1.6 ft.). Extending from the southwest corner of Feature A, a small cobble-paved area 1.5 m. (4.9 ft.) NW/SE by 0.7 m. (2.3 ft.) NE/SW resembling a pathway extends south between two a'a boulders. On the southern edge of this pathway is a pile of small boulders creating a ledge 0.5 m. (1.6 ft.) above an excavated and leveled depression which may have been for storage.

Feature B is located 2.0 m. (6.6 ft.) northeast of Feature A. Feature B is a small 2.0 m. (6.6 ft.) triangular area paved with a'a pebbles. The southeast portion of the paved area lies under an overhang created by an adjoining large natural a'a slab. The overhang affords some protection from wind and sun.

This site is in good condition with a fair excavation potential.

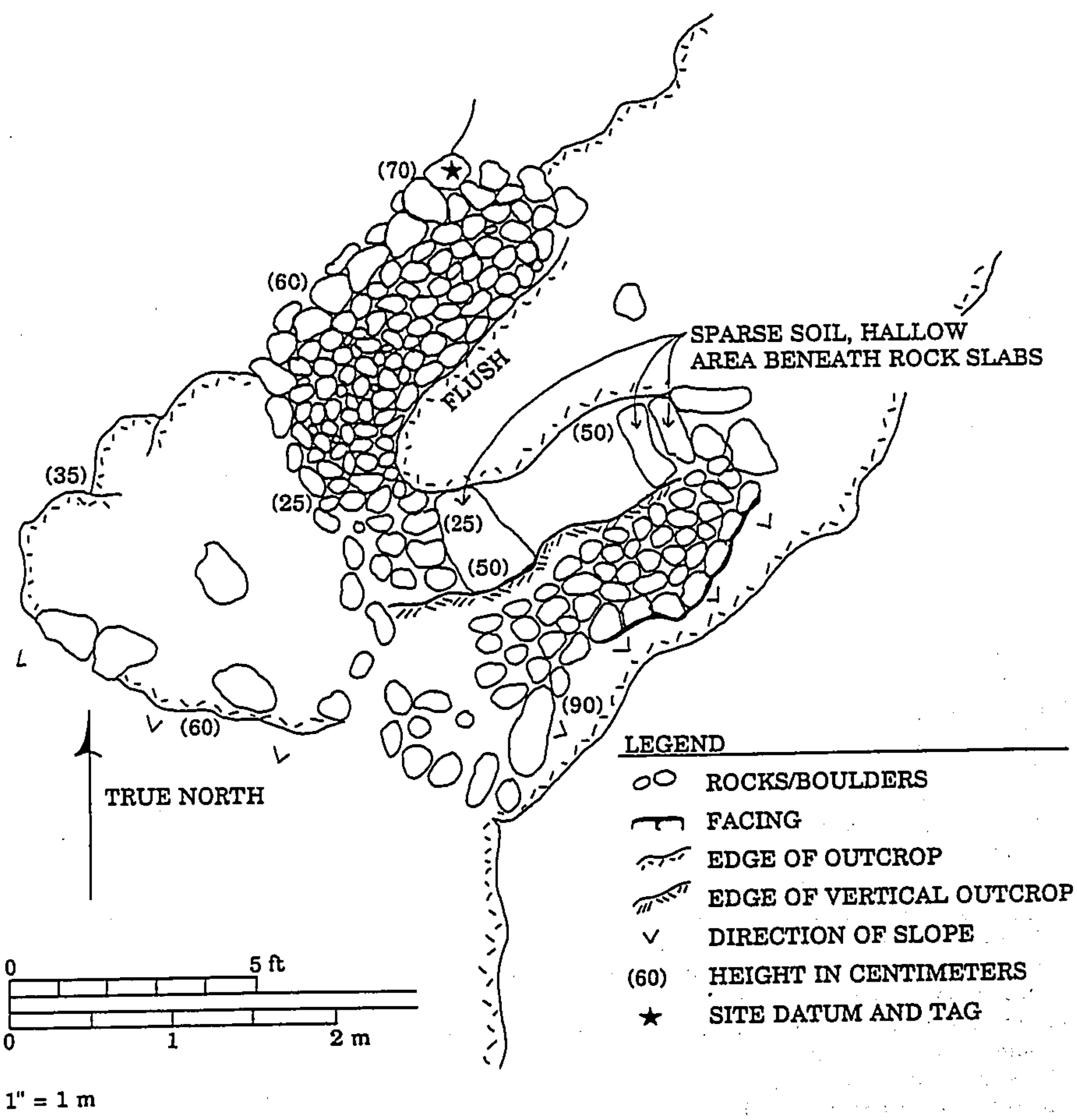


Figure 7 State site 50-10-27-20697, Plan View

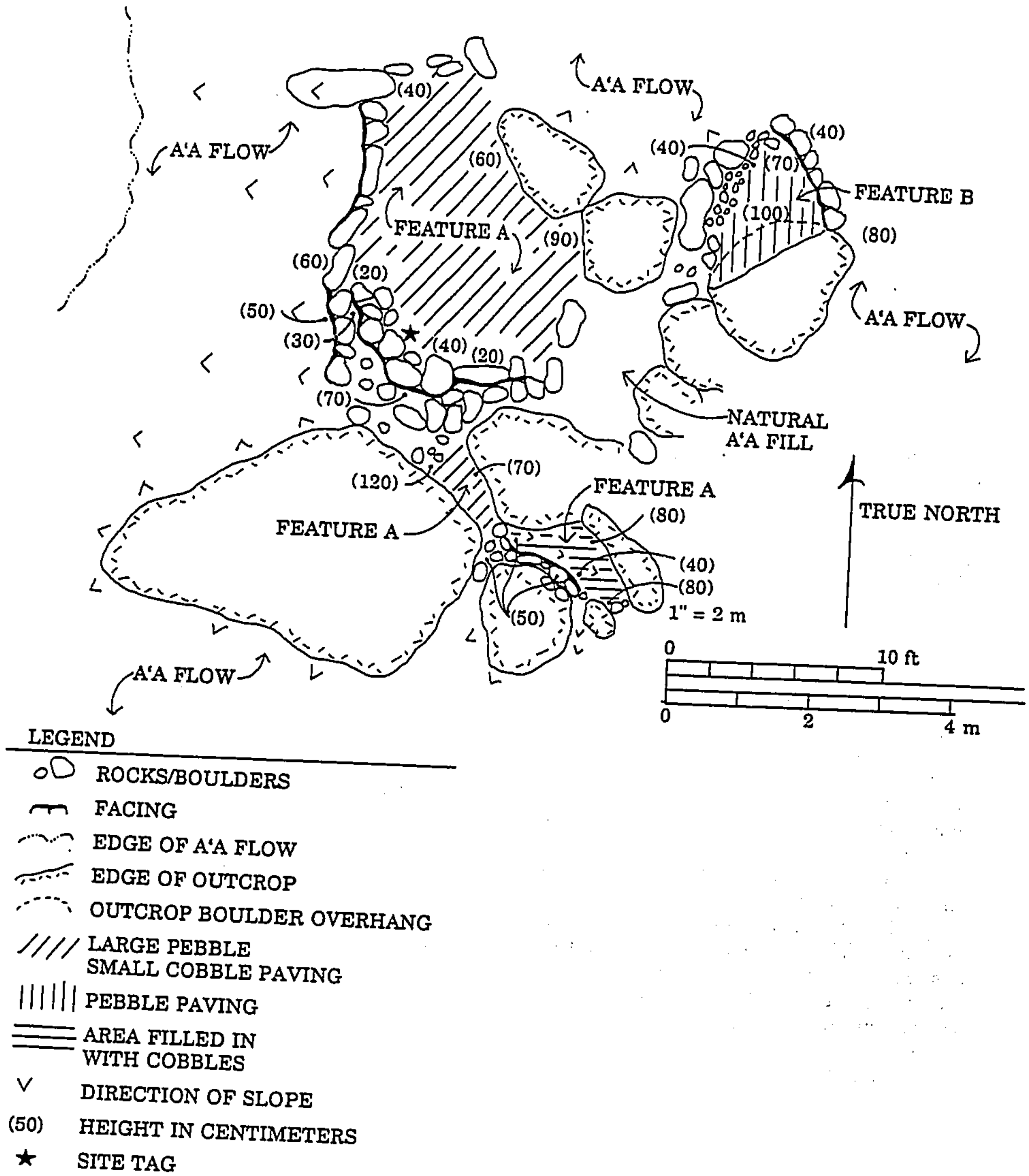


Figure 8 State site 50-10-27-20698, Site Complex, Plan View

State Site #:	50-10-27-20699	**CSH SITE #:** 4
Site Type:	Modified tumulus	
Function:	Indeterminate	
Features (#):	1	
Dimension:	9.8 m.^{2} (41.0 ft.^{2})	
Elevation:	290 ft. a.m.s.l.	

Description: Site 50-10-27-20699 (Figure 9) consists of a modified tumulus measuring 3.9 m. (12.8 ft.) N/S by 2.5 m. (8.2 ft.) E/W. Modification consists of small to large cobbles placed between cracks in the tumulus to create a roughly level area ranging in height from 0.2 m. (0.7 ft.) to 0.4 m. (1.3 ft.). Due to the lack of midden/artifacts, and informal construction the function is indeterminable.

Excavation potential is poor.

State Site #:	50-10-27-20700	**CSH SITE #:** 5
Site Type:	Complex	
Function:	Temporary habitation/Agriculture	
Features (#):	2	
Dimension:	195.8 m.^{2} (624.1 ft.^{2})	
Elevation:	270 ft. a.m.s.l.	

Description: Site 50-10-27-20700 (Figure 10) is a complex consisting of two primary features: a roughly constructed terrace (Feature A), and a semi-circular enclosure (Feature B). The site is located on the southwest side of a pahoehoe tumulus sloping gently to the south-southwest. Vegetation at the site consists of various grasses and *koa haole*.

Feature A is a filled crevice in the top of a pahoehoe tumulus extending to the western edge of the tumulus. At the edge a small terraced area constructed of pahoehoe cobble and small boulders measuring 2.4 m. (7.9 ft.) NE/SW by 4.5 m. (14.7 ft.) with a maximum height of 0.9 m. (2.9 ft.), lies flush with the pahoehoe bedrock. 3.5 m. (11.5 ft.). To the south of the terrace, 3.5 m. (11.5 ft.), is a small informal pile of pahoehoe boulders.

Pieces of marine shell were observed at the site. Condition of the feature is good and excavation potential is fair.

Feature B is a semi-circular enclosure which is located west and down slope from Feature A. The enclosure which measures 7.3 m. (24.1 ft.) E/W by 13.0 m. (42.9 ft.) N/S has walls which are constructed of large pahoehoe cobbles and small boulders with a maximum height of 0.9 m. (2.9 ft.), and maximum width of 1.0 m. (3.28 ft.). Portions of the wall are collapsed and only a small area of facing remains on the southern end of the enclosure.

Condition of the feature is fair and excavation potential is poor.

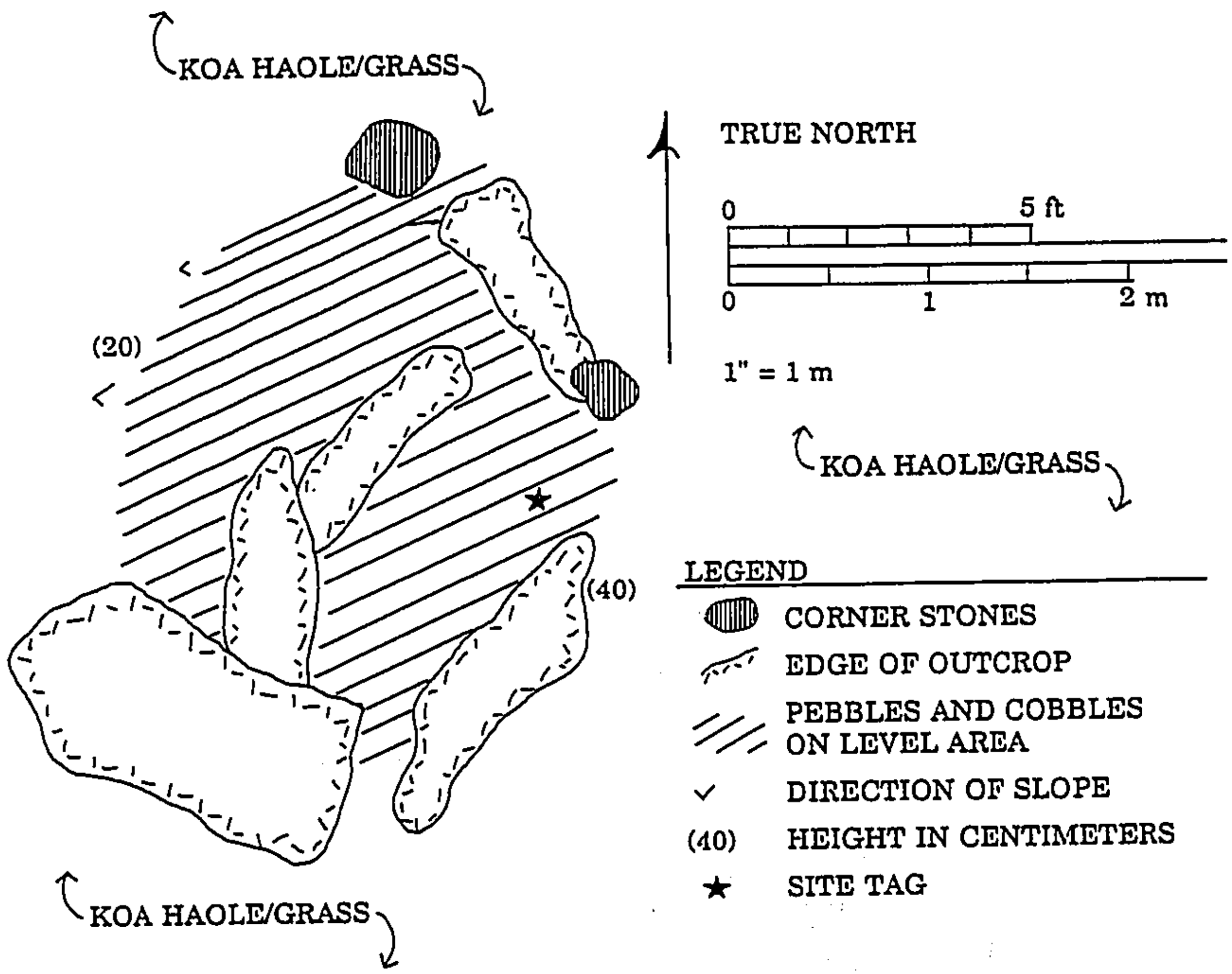


Figure 9 State site 50-10-27-20699, Plan View

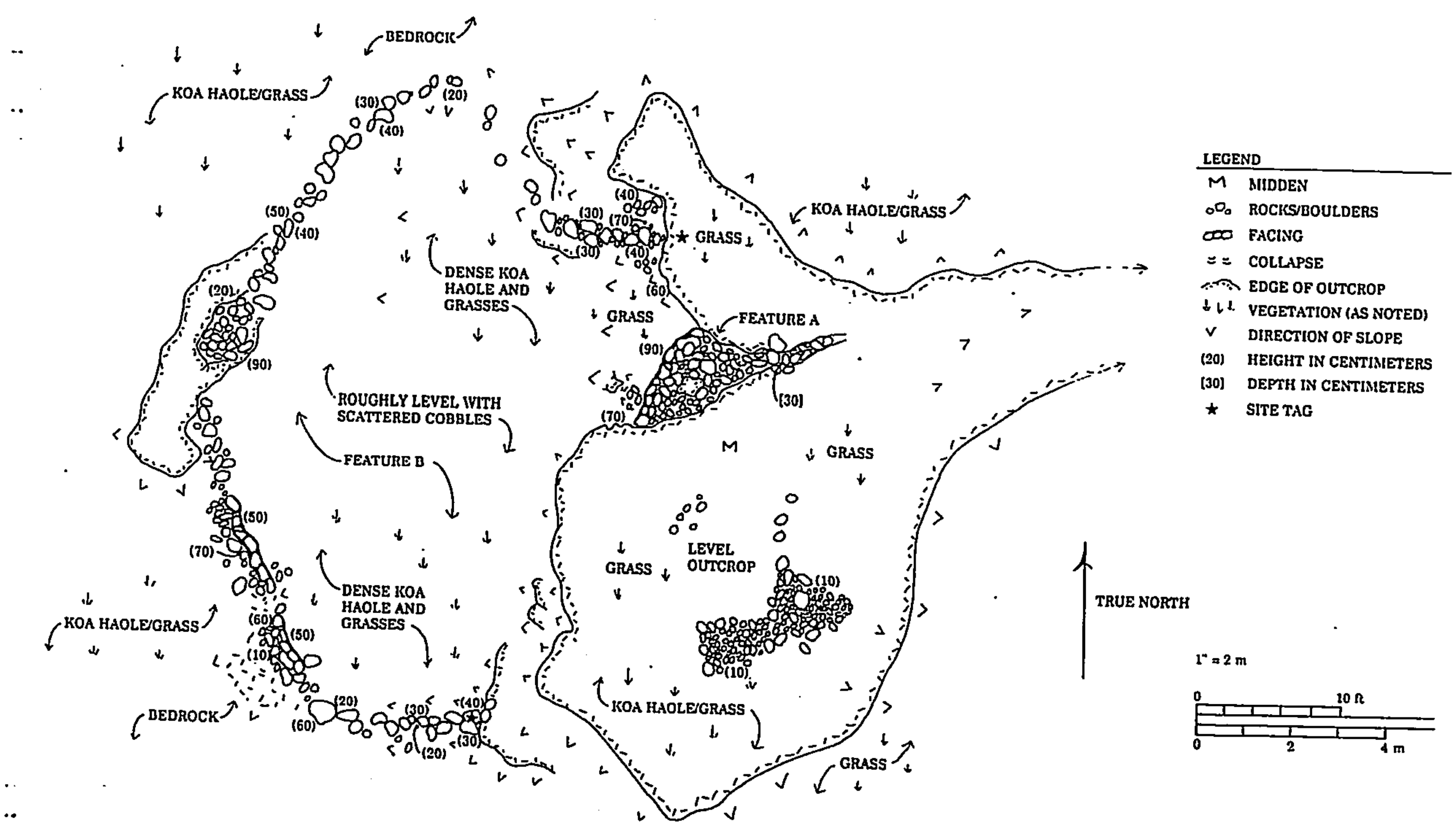


Figure 10 State site 50-10-27-20700, Site Complex, Plan View

State Site #:	50-10-27-20701	**CSH SITE #:** 6
Site Type:	Modified tumulus	
Function:	Temporary habitation	
Features (#):	1	
Dimension:	4.0 m.^{2} (13.1 ft.^{2})	
Elevation:	100 ft. a.m.s.l.	

Description: Site 50-110-27-20701 (Figure 11) is a wall segment extending 4.0 m. (13.1 ft.) E/W by 1.0 m. (3.3 ft.) N/S atop a pahoehoe tumulus. Vegetation surrounding the site consists of *koa haole* and various grasses sporadically dispersed on the undulating pahoehoe flow.

No cultural material was observed. The site exhibits poor excavation potential.

State Site #:	50-10-27-20702	**CSH SITE #:** 7
Site Type:	Modified tumulus/Mound	
Function:	Possible burial	
Features (#):	2	
Dimension:	46.4 m.^{2} (497.8 ft.^{2})	
Elevation:	160 ft. a.m.s.l.	

Description: Site 50-10-27-20702 (Figure 12) consists of two possible burial features designated A and B. These features are deemed related because of proximity. The terrain consists of rugged pahoehoe moderately sloping to the west. Vegetation at the site consists of *Christmas berry*, *koa haole*, and various grasses.

Feature A is a large crevice 3.0 m. (9.8 ft.) SW/NE by 2.0 m. (6.6 ft.) which has been filled and roughly leveled with small to medium angular basalt boulders. The depth of the fill was determined to be 2.0 m. (6.6 ft.).

Feature B is a terraced area composed of small to medium boulders located 2.6 m. (8.5 ft.) southeast from Feature A abutting the southeast side of the tumulus. The terrace is 7.9 m. (25.9 ft.) SW/NE by 1.6 m. (5.2 ft.) SE/NW, with a maximum height of 0.4 m. (1.3 ft.) along the southeastern edge.

No artifacts or midden were observed at this site.

State Site #:	50-10-27-20703	**CSH SITE #:** 8
Site Type:	Complex	
Function:	Habitation/Quarry	
Features (#):	3	
Dimension:	1204.5 m.^{2} (3950.8 ft.^{2})	
Elevation:	120 ft. a.m.s.l.	

Description: Site 50-10-27-20703 (Figure 13) is a complex of three features designated A through C, consisting of a small paved area, a terrace, and a quarry. The site is situated along the southern edge of an undulating pahoehoe flow and is centered around a prominent tumulus. Sparse pockets of soil at the site supported various grasses and *koa haole*. The site overlooks an a'a flow which runs along the southern boundary of the project area on which trail sites 13493, 20722, 20726, 20744, and 20745 are located.

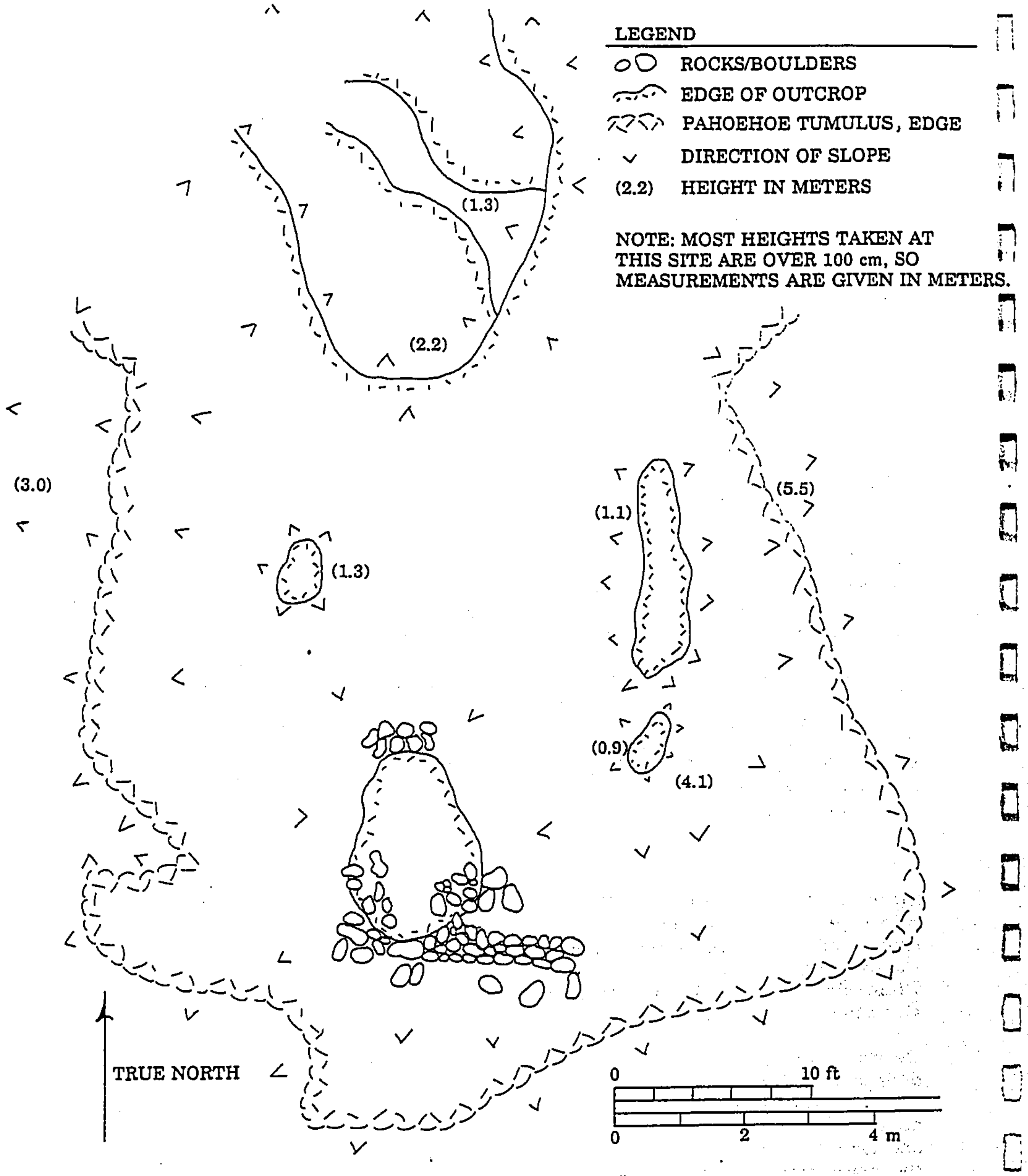


Figure 11 State site 50-10-27-20701, Plan View

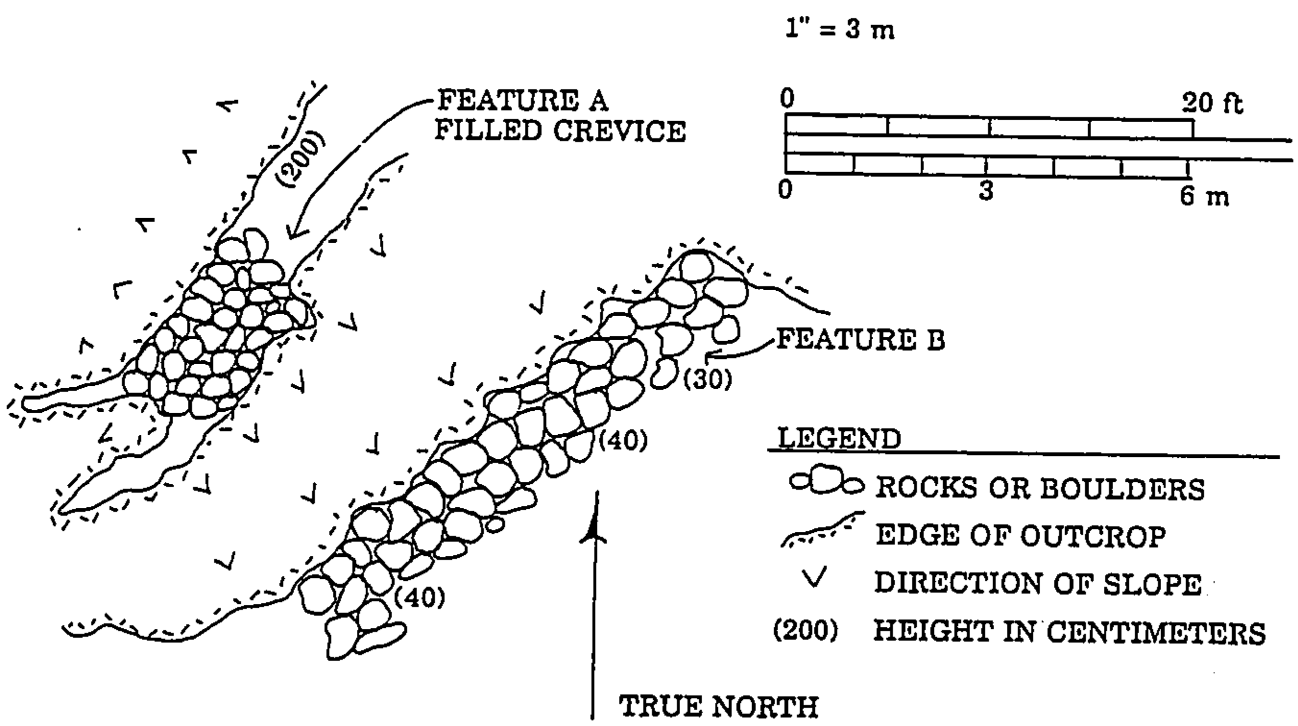


Figure 12 State site 50-10-27-20702, Site Complex, Plan View

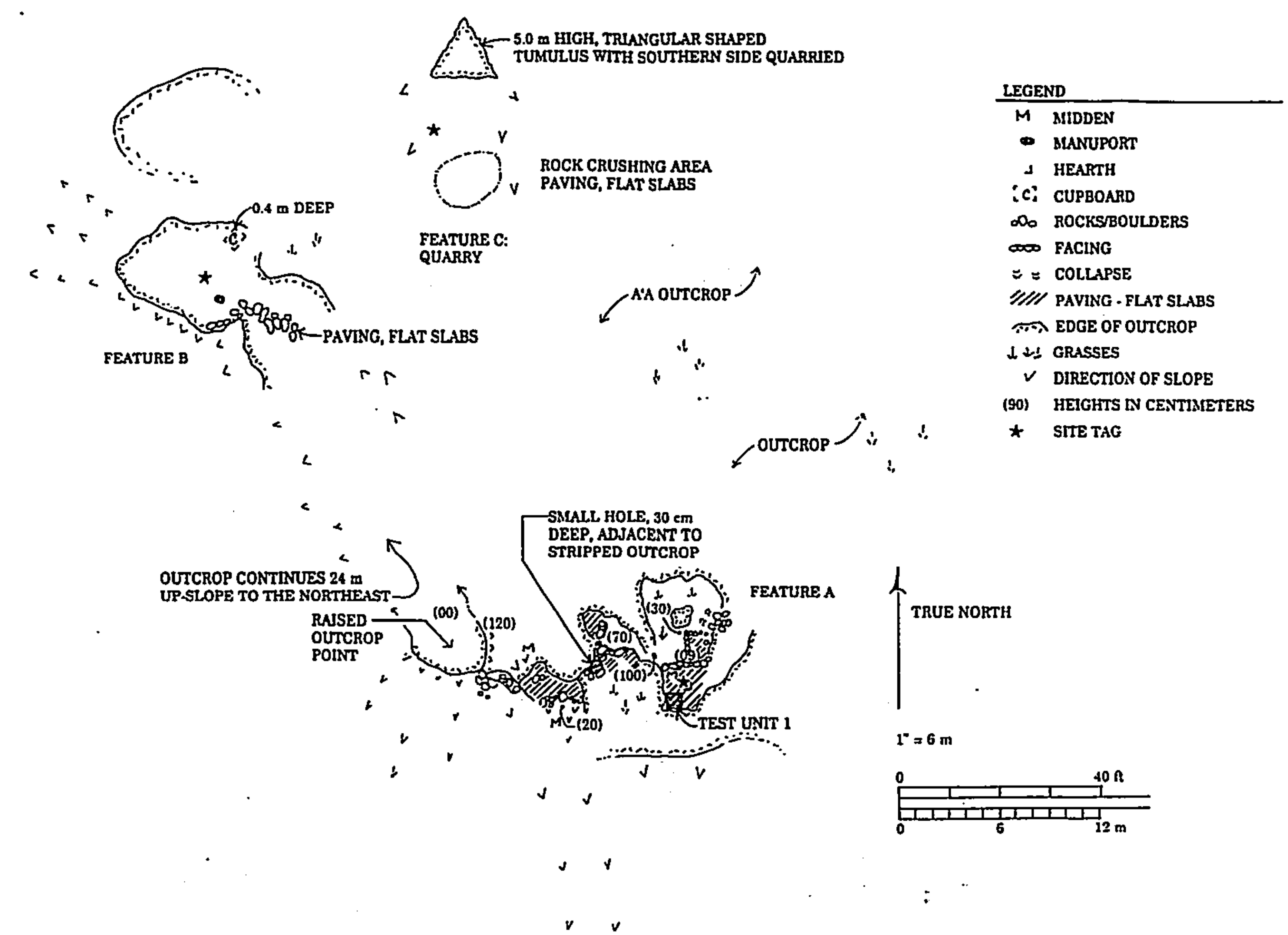


Figure 13 State site 50-10-27-20703, Site Complex, Plan View

Feature A is a terrace located on a low point between two high points in the undulating pahoehoe terrain and is constructed to form a level terraced section joining the high points. It measures 7.0 m. (23.0 ft.) E/W by 1.9 m. (6.2 ft.) N/S, with a maximum height on the north-facing side of 0.9 m. (2.9 ft.). The south side of the terrace lies flush with the pahoehoe bedrock sloping gently to the south. The terrace wall on the north side is constructed of medium to large pahoehoe boulders stacked 2 to 3 courses high. The level paved surface of the terrace is composed of small to medium pahoehoe cobbles. An L-shaped hearth lies directly in the center of the terrace. Some small amounts of midden were observed at this feature. Condition of the terrace is good and excavation potential is fair.

Feature B is a small paved area which lies northwest of Feature A on the top of a pahoehoe blister which measures 1.4 m. (4.6 ft.) NW/SE by 1.6 m. (5.2 ft.) NE/SW. A storage area is located in the north corner of the paved area. A large water rounded boulder was observed at the feature. No other cultural material was observed. Excavation potential is poor.

Feature C is a quarry located to the northeast of Feature B, at the northern edge of the complex. The quarry consists of a large, sharply protruding tumulus in which the south facing side has been extensively quarried. This face is 5.0 m. (16.4 ft.) in height, and 4.0 m. (13.1 ft.) wide at its base. Evidence of mining on the southern face consists of sections where the outer layer of the tumulus has been broken away, presumably for the scoriaceous outer surface of the pahoehoe. Broken angular boulders lie at the base of the tumulus as well as being scattered about the complex.

No cultural material was observed, and excavation potential is poor.

Testing Results (Figure 14)

Subsurface testing was conducted at Feature A to better define the function of the feature and to collect charcoal for radiocarbon analysis. A 1.0 m. (3.3 ft.) by 1.0 m. (3.3 ft.) test unit was placed in the center of Feature A terrace incorporating Feature A's hearth at the northeast corner of the unit. Marine shell midden was observed on the surface of the test unit within the hearth feature.

The hearth fill was removed from the test unit and bagged for analysis (1/8-inch mesh screening). The hearth extended to a maximum of 16.5 cm below the surface and consisted of a grey (5Y 6/1) silt or ash intermixed with a'a gravel and pebbles. A variety of assorted marine shell and scant terrestrial midden was recovered from the hearth portion of the test unit, including the following: 0.3 gms. of snakehead cowrie (*lehokupu* or *Cypraea caputserpentis*); 0.2 gms. polished nerite (*kupe'e* or *Nerita polita*); 0.4 gms. *Theodoxus cariosus*; 0.1 gms. *Isognomon*; 3.8 gms. sea urchin (*Echinoderm*); and 1.4 gms. of charcoal.

The remaining portion of the test unit - outside the hearth feature - was excavated to a maximum depth of 20 cm. below the surface where pahoehoe bedrock was reached. The profile revealed a relatively homogenous a'a cobble and small boulder fill (Stratum I) with no consolidated soil encountered. Small pockets of organic material were encountered to the maximum depth of excavation. Material collected from this Stratum consisted of 1.3 gms. of snakehead cowrie (*Cypraea caputserpentis*); 0.4 gms. pitchy sea snail (*pipipi* or *Nerita picea*); 1.4 gms. *Theodoxus cariosus*; 4.4 gms. *Isognomon*; 0.1 unidentified bone; and 18.3 gms. of *kukui* endocarps; and 0.4 gms. *Echinoderm*. 3.3 gms. of charcoal was also collected.

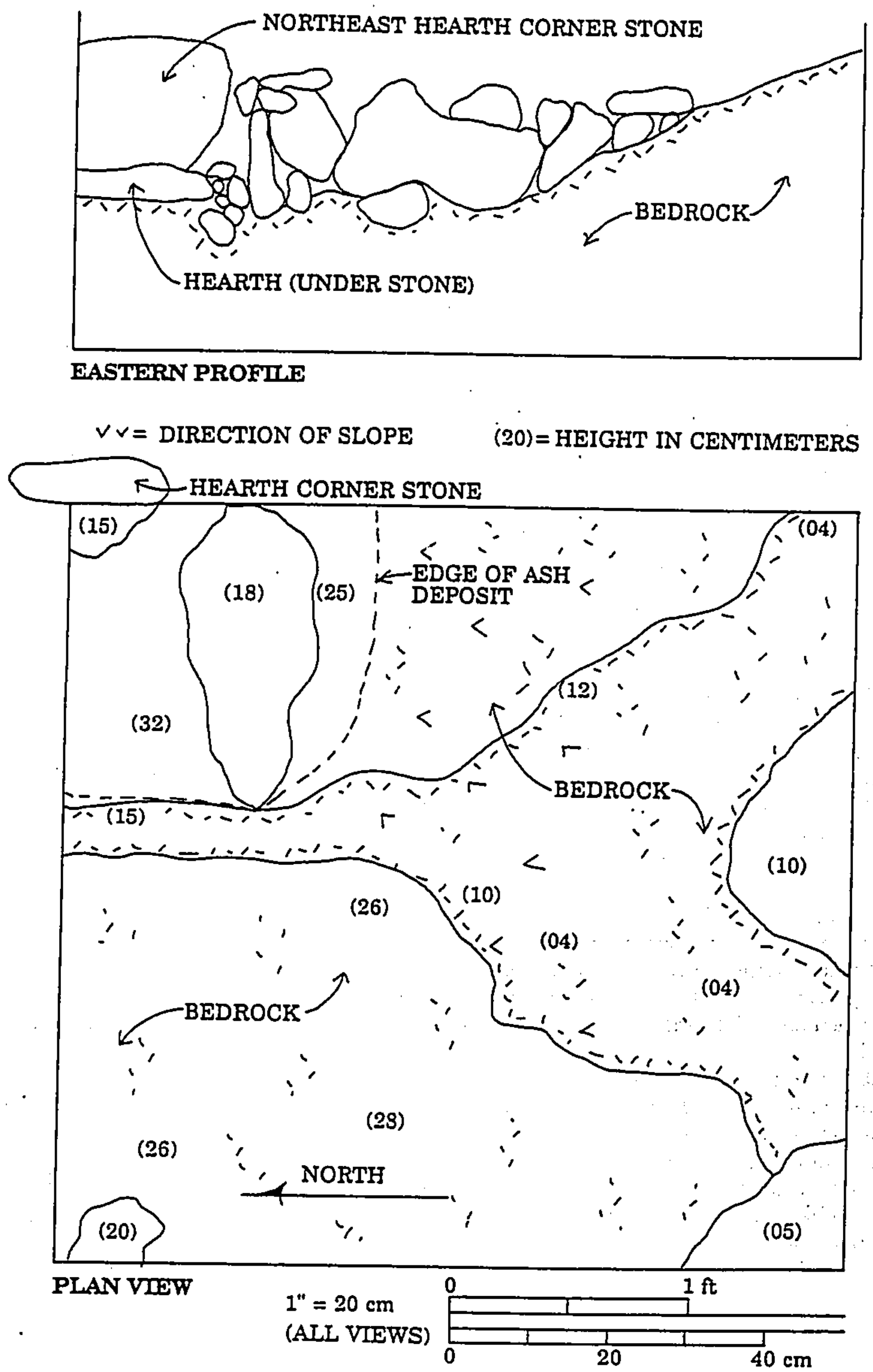


Figure 14 State site 50-10-27-20703, Feature A, Test Unit, Plan View and Profile, Post Excavation

State Site #: 50-10-27-20704 **CSH SITE #:** 9
Site Type: Complex
Function: Temporary habitation/trails
Features (#): 5
Dimension: 3255.0 m.^{2} (35,018.6 ft.^{2})
Elevation: 100 ft. a.m.s.l.

Description: Site 50-10-27-20704 (Figure 15) is a complex consisting of five features designated A to E. The features are believed associated because of similar construction style, proximity, and similar states of preservation. The site is located on the northern edge of an a'a flow. Only sparse grasses occur in the site area.

The site includes a series of trails, wall segments, and a small agricultural area.

Feature A is a trail, 92.5 m. (303.4 ft.) long extending NW to SE, and is characterized primarily by a worn a'a cobble path. A 13.5 m. (44.3 ft.) segment of the NW portion of the trail is constructed of flat pahoehoe stepping stones averaging 0.3 m. (1.0 ft.) in size. At 6.5 m. (21.3 ft.) from the northwest edge of Feature A is an intersection with Feature C trail.

Feature B is an L-shaped wall constructed of large stacked a'a cobbles and medium boulders, measuring 8.1 m. (26.6 ft.) N/S by 13.5 m. (44.3 ft.) E/W, with a maximum height of 0.8 m. (2.6 ft.). Two segments of facing are present on the E/W leg of the wall consisting of upright stones. A flat area of a'a pebbles and small cobbles is present along the east side of the N/S wall segment.

Feature C is a trail segment constructed of a'a pebbles that extends between the E/W segment of Feature B wall, 4.4 m. (14.4 ft.) from the east end of the wall segment toward the northwest end of Feature A.

Feature D is a trail segment consisting of a worn a'a path and scattered stepping stones. This segment extends 10.0 m. (32.8 ft.) northeast from the midpoint of Feature B wall 6.7 m. (22.0 ft.) from its eastern edge. The trail is no longer visible once atop a pahoehoe flow to the north.

Feature E consists of a trail segment and wall. The trail segment is composed of worn a'a cobbles along with scattered pahoehoe stepping stones extending roughly N/S for 8.4 m. (27.5 ft.) leading to Feature E wall. The wall is composed of medium to large a'a cobbles. It measures 2.5 m. (8.2 ft.) N/S and 0.7 m. (2.3 ft.) high, with a width no greater than 0.6 m. (2.0 ft.). This wall is located within a depressed area of a'a, possibly used for agriculture.

The site is in good condition, however excavation potential is deemed poor due to the lack of observed cultural material.

State Site #: 50-10-27-20705 **CSH SITE #:** 10
Site Type: Modified tumulus
Function: Possible burial
Features (#): 1
Dimension: 9.2 m.^{2} (99.1 ft.^{2})
Elevation: 100 ft. a.m.s.l.

Description: Site 50-10-27-20705 (Figure 16) is a modified pahoehoe tumulus defined by a filled crevice on its surface. The terrain consists of undulating pahoehoe lava with small amounts of soil present supporting various grasses, kiawe, and *koa haole*.

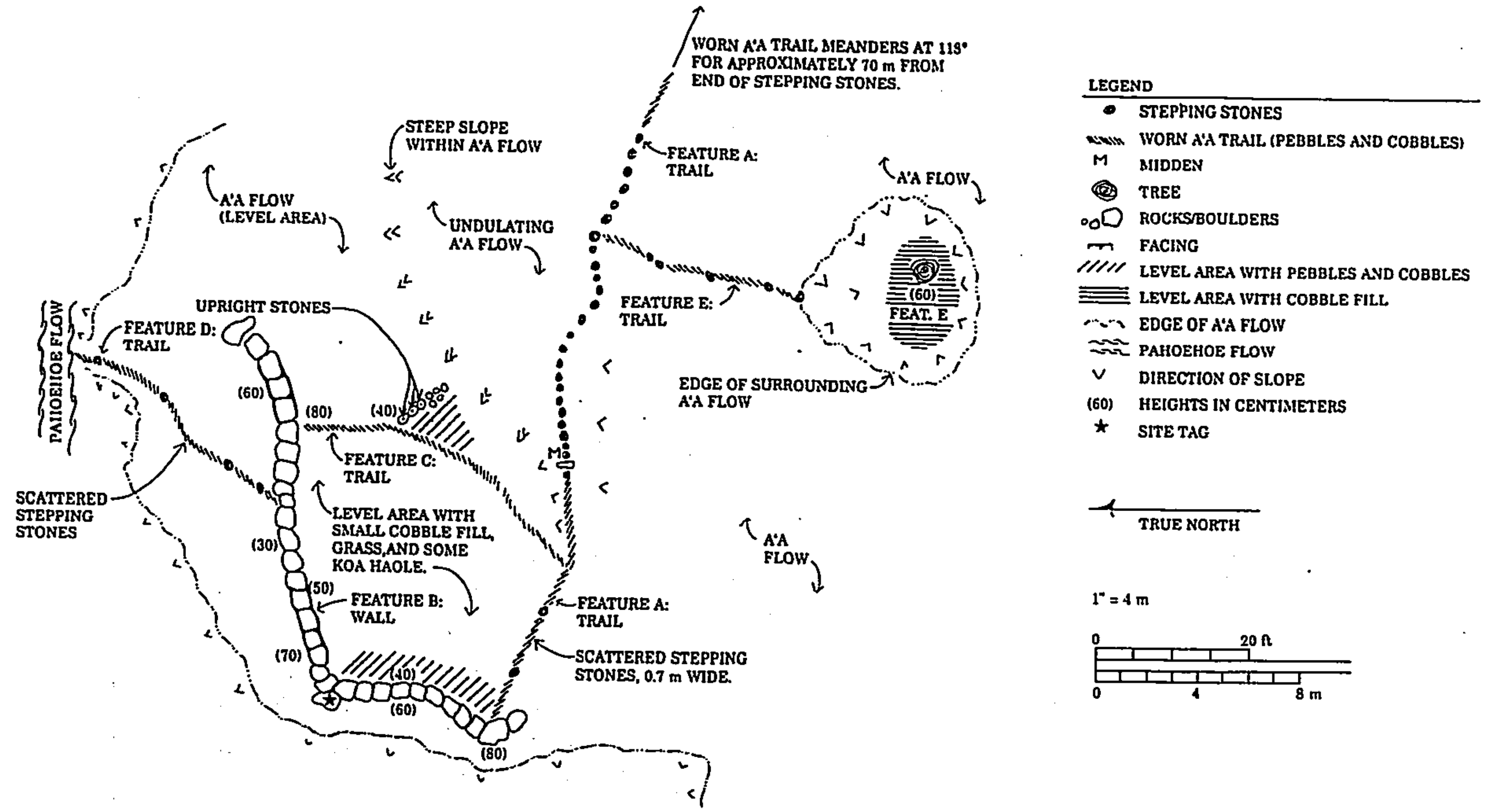


Figure 15 State site 50-10-27-20704, Site Complex, Plan View

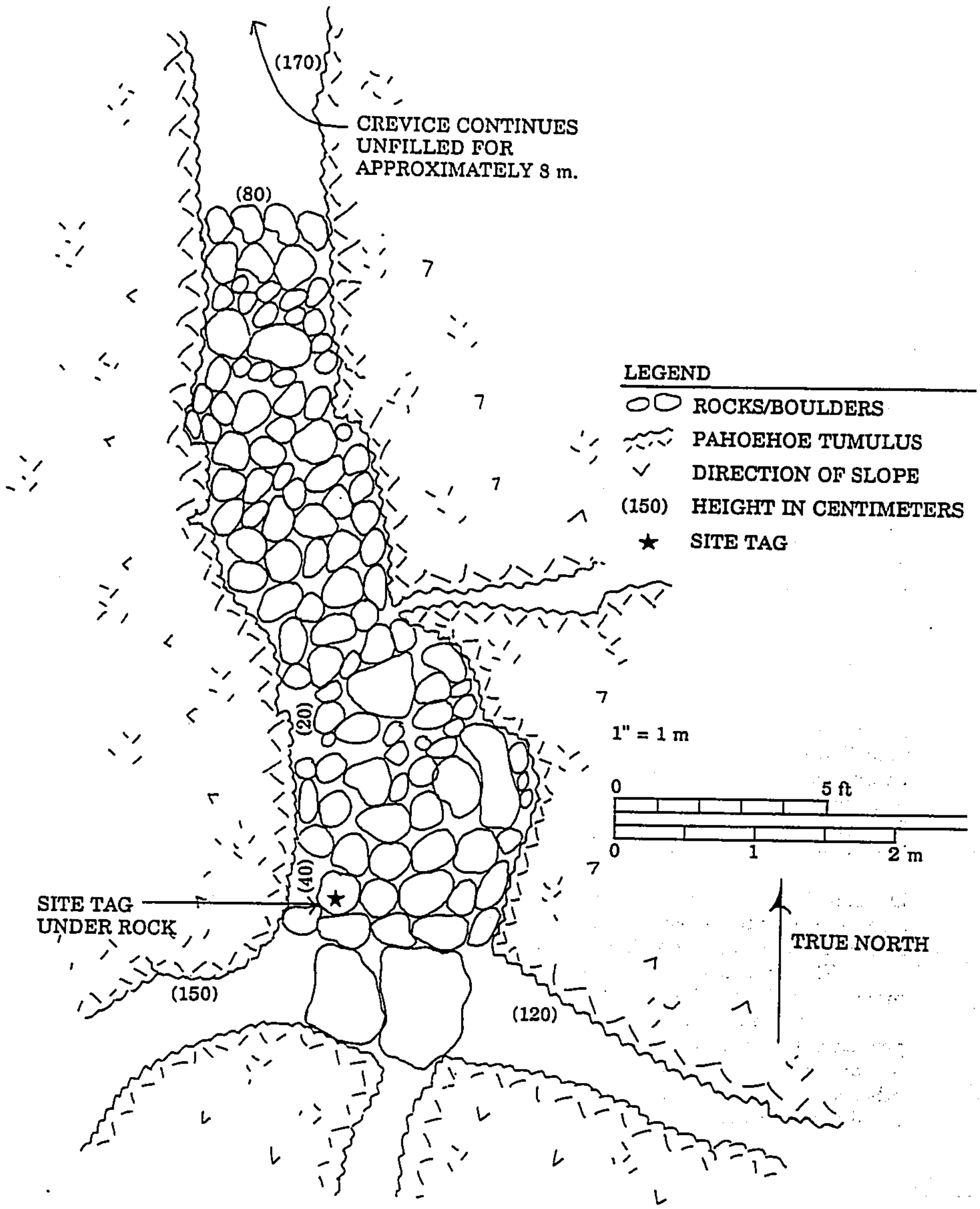


Figure 16 State site 50-10-27-20705, Plan View

The crevice runs roughly N/S and is filled neatly with small to medium pahoehoe cobbles. The fill does not extend over the entire crevice. 5.4 m. (17.7 ft.) of the crevice is filled N/S, at a width of no greater than 1.7 m. (5.6 ft.). Fill appears to range from 0.8 m. (2.6 ft.) to an indeterminate depth.

The condition of the site is good.

CSH SITE #: 11

State Site #:	50-10-27-20706
Site Type:	Modified tumulus
Function:	Temporary habitation
Features (#):	1
Dimension:	17.6 m.^{2} (189.6 ft.^{2})
Elevation:	80 ft. a.m.s.l.

Description: Site 50-10-27-20706 (Figure 17) is a modified pahoehoe tumulus defined by a filled crevice of a pahoehoe outcrop. The terrain consists of undulating pahoehoe and a'a with a gentle to moderate southward slope to the south. Vegetation at the site consists of *kiawe*, *koa haole*, and various grasses.

The crevice measures 6.5 m. (21.3 ft.) E/W by 2.7 m. (8.9 ft.) N/S at the top of an abruptly steep pahoehoe tumulus. The crevice has been filled with flat slabs of pahoehoe, medium boulders and cobbles to form a level surface. At the east end of the tumulus the level area slopes into the crevice where cobble has been piled on the floor to form a mostly natural storage area measuring 0.6 m. (2.0 ft.) by 0.4 m. (1.3 ft.), with a maximum depth of 0.7 m. (2.3 ft.).

No artifacts or midden were present at the site. Excavation potential is poor.

CSH SITE #: 12

State Site #:	50-10-27-20707
Site Type:	Lava tube
Function:	Indeterminate
Features (#):	1
Dimension:	21.8 m.^{2} (234.4 ft.^{2})
Elevation:	300 ft. a.m.s.l.

Description: Site 50-10-27-20707 (Figure 18) is an unmodified lava tube located in a moderate southwest-sloping pahoehoe flow. There are sparse patches of soil at the site and on the surrounding pahoehoe flow that support various grasses, *ficus*, and *koa haole*.

The lava tube measures 4.1 m. (13.5 ft.) N/S by 6.4 m. (21.0 ft.) E/W, with a maximum height of 1.2 m. (3.9 ft.).

The main entrance measuring 0.8 m. (2.6 ft.) in diameter is located in the central portion of the accessible chamber. Very sparse cultural material was observed beneath the entrance consisting of two to four pieces of marine shell and a few *kukui* endocarps. No other artifacts or midden were observed on the bare bedrock tube floor. The site is in fair condition but exhibits no excavation potential.

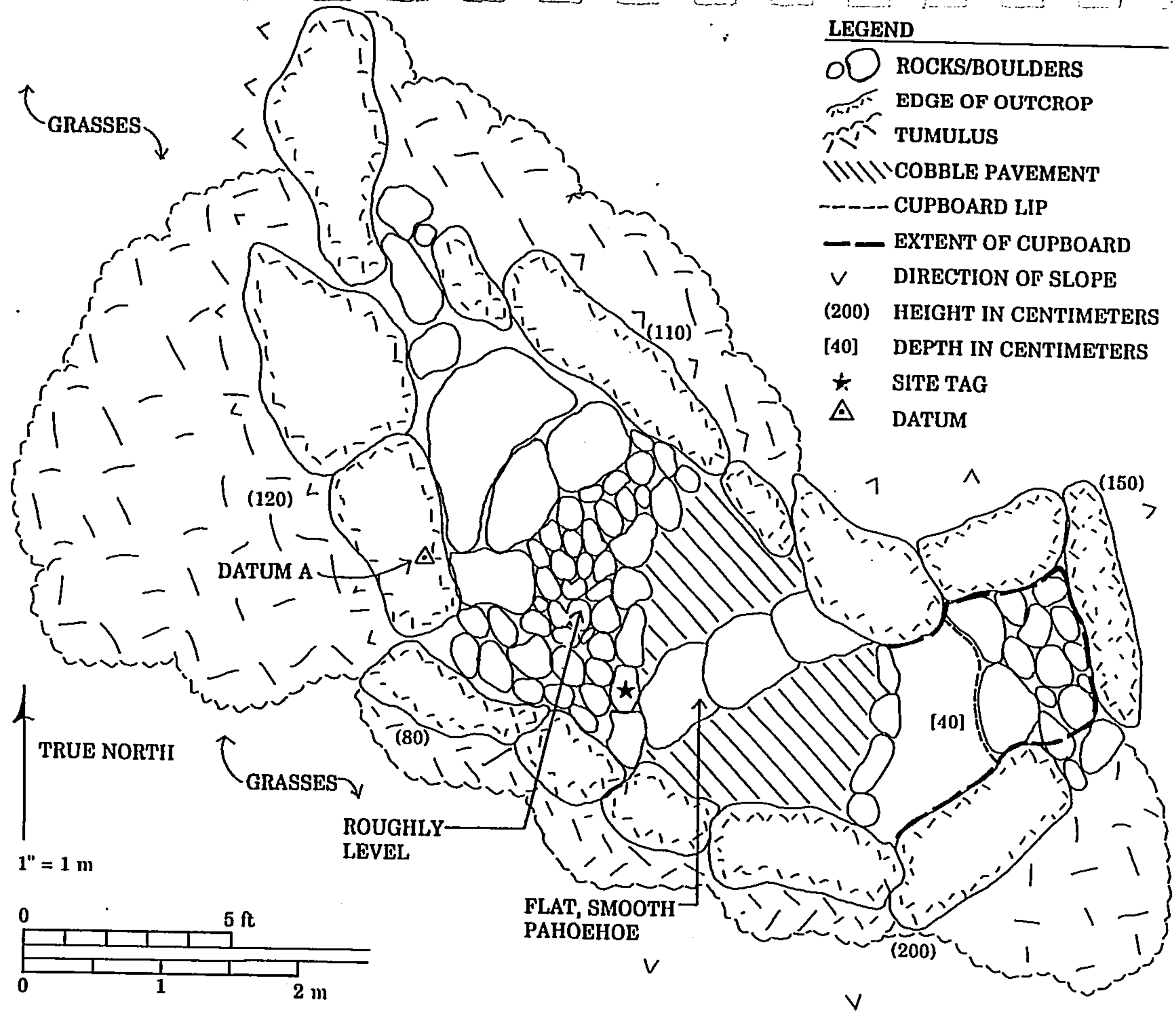


Figure 17 State site 50-10-27-20706, Plan View

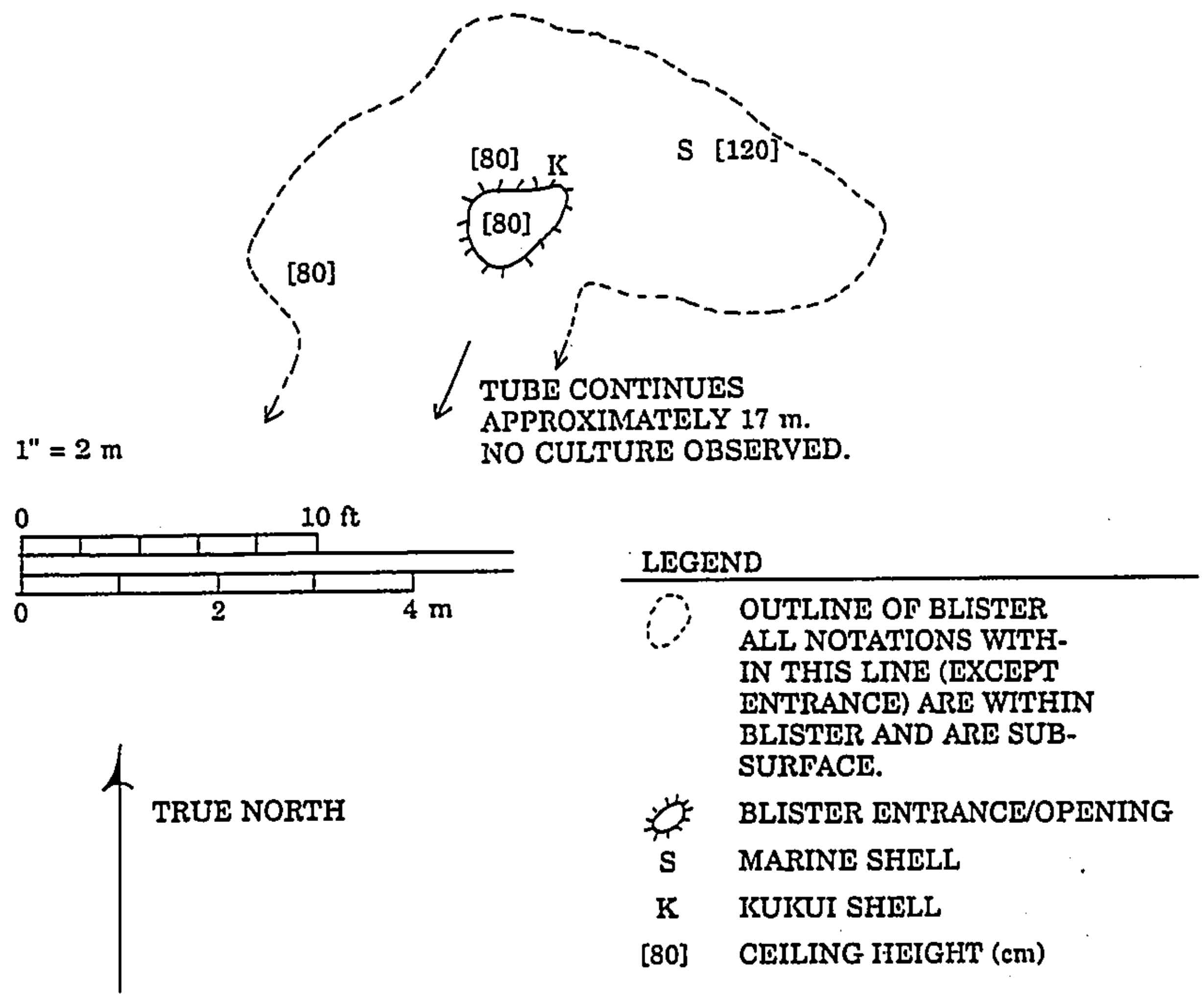


Figure 18 State site 50-10-27-20707, Plan View

State Site #: 50-10-27-20708 **CSH SITE #:** 13
Site Type: Modified tumulus
Function: Temporary habitation
Features (#): 1
Dimension: 34.3 m.^{2} (367.4 ft.^{2})
Elevation: 300 ft. a.m.s.l.

Description: Site 50-10-27-20708 (Figure 19) is a partially filled crevice of a pahoehoe tumulus, with an adjoining two level paved area. The terrain consists of moderately sloping undulating pahoehoe, with vegetation consisting of various grasses and *Christmas berry*.

The cleared out crevice area measures 9.8 m. (32.1 ft.) SW/NE by 3.4 m. (11.1 ft.) SE/NW with a roughly level interior surface 0.8 m. below the lip of the crevice. Adjoining, the cleared out crevice to the NE, is the two level paved areas. The lowest paved area abuts the cleared out portion of the crevice and measures 1.3 m. (4.3 ft.) SW/NE by 2.2 m. (7.2 ft.) SE/NW. This level paved area is constructed of medium pahoehoe boulders - buffers the second paved area which is 0.3 m. (1.0 ft.) above the first. The upper oval-shaped, paved area measuring 2.0 m. (6.6 ft.) by 3.0 m. (9.8 ft.) is constructed of medium pahoehoe boulders. The edges of this level area form a small lip 0.2 m. (0.7 ft.) higher than the existing pahoehoe tumulus.

No artifacts or midden were observed at the site. The site is in fair condition; excavation potential is poor.

State Site #: 50-10-27-20709 **CSH SITE #:** 14
Site Type: Complex
Function: Recurrent habitation
Features (#): 4
Dimension: 1000.3 m.^{2} (10,761.9 ft.^{2})
Elevation: 260 ft. a.m.s.l.

Description: Site 50-10-27-20709 (Figure 20) is a complex consisting of four features, designated A to D, located on the surface of a gently sloping pahoehoe flow to the southwest. Vegetation at the site consists of various grasses and *koa haole*.

Feature A is an irregular,.well constructed platform measuring 6.8 m. (22.3 ft.) N/S by 4.0 m. (13.2 ft.) E/W with a maximum height of 0.9 m. (3.0 ft.) on its east side. It is constructed directly on pahoehoe bedrock. The south and east sides are well faced, and the surface paved level with small cobbles. A hearth is located in the central area of the platform. Four large flat pahoehoe slabs placed at right angles create the square-shaped hearth. There is a thin rocky soil base within the hearth, as well as assorted marine shell fragments. A manuport was observed 0.3 m. (1.0 ft.) east of the hearth on the platform surface.

Feature B is an irregularly shaped enclosure. The enclosing wall extends from the north corner of Feature A for a length of 25.6 m. (84.0 ft.) with a maximum height of 1.1 m. (3.6 ft.). The wall is bi-faced and is constructed of stacked basalt boulders and cobbles. The enclosure appears to have been associated with agriculture.

Feature C is a semi-circular enclosure extending from a small paved area, measuring 1.5 m. (4.9 ft.) N/S by 2.0 m. (6.6 ft.) E/W, 3.8 m. (12.5 ft.) below the southern edge of Feature A. This enclosure extends 25.0 m. (82.0 ft.) to the southeast to

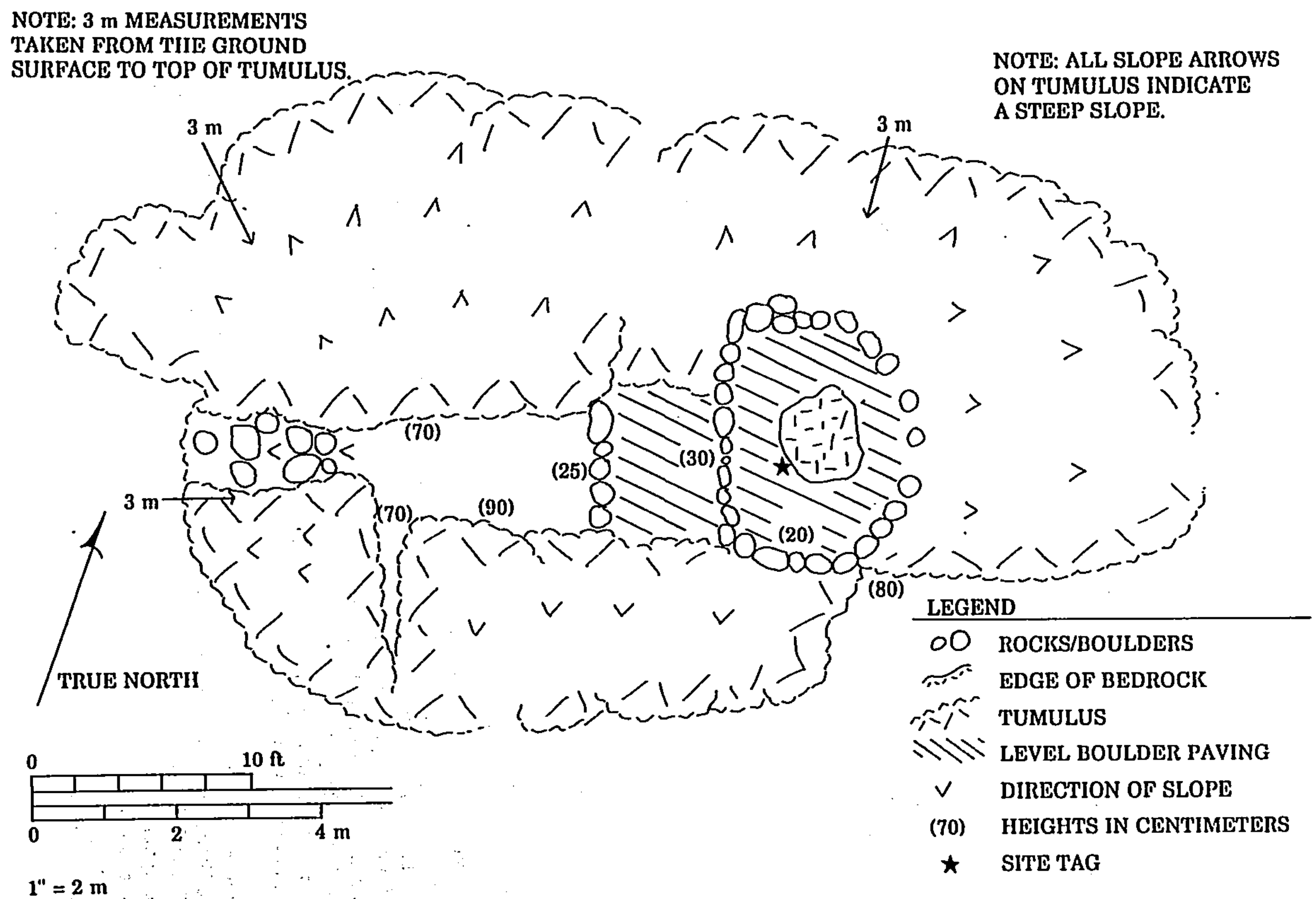


Figure 19 State site 50-10-27-20708, Plan View

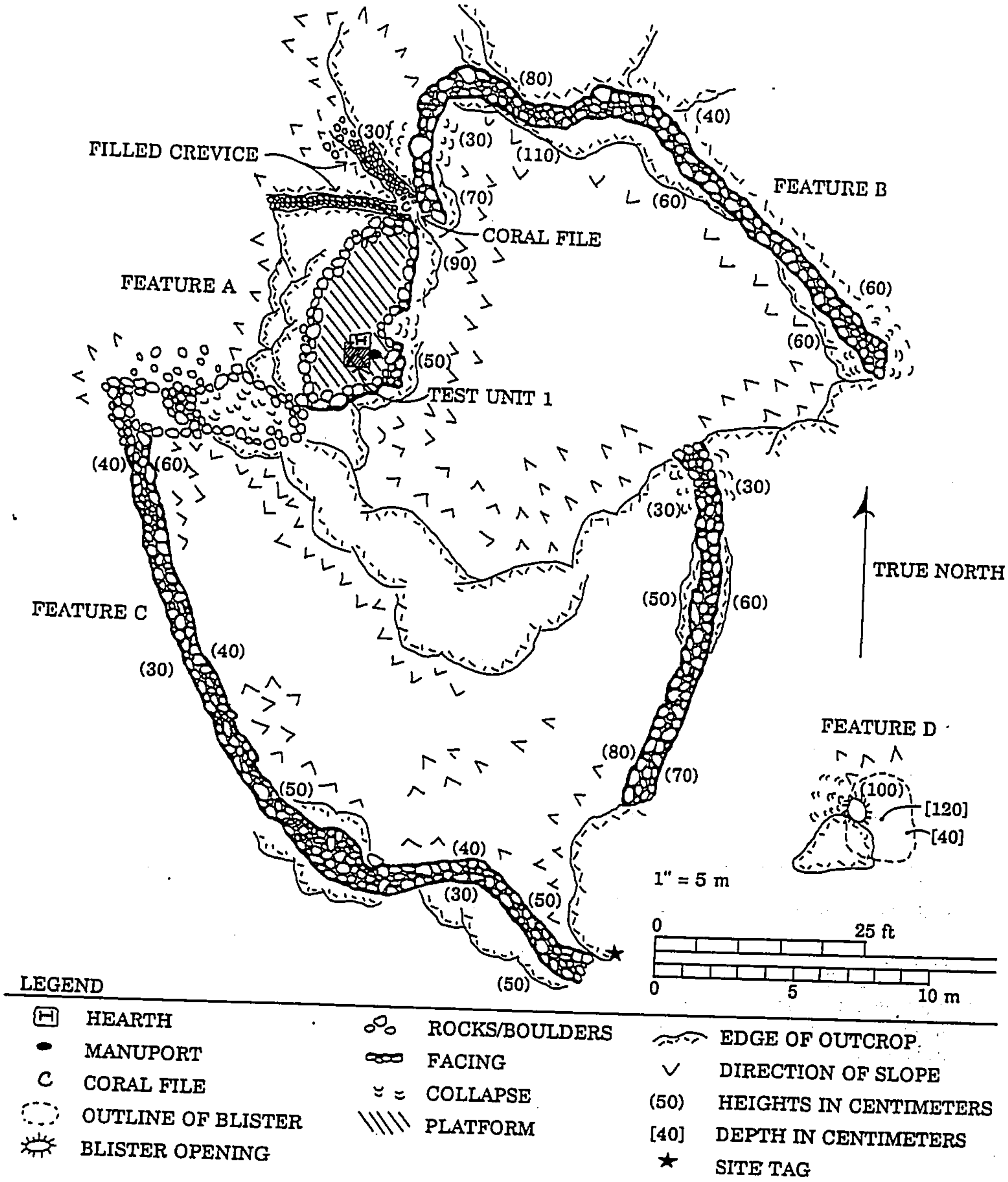


Figure 20 State site 50-10-27-20709, Site Complex, Plan View

the base of a large pahoehoe tumulus, then extends 13.9 m. (45.6 ft.) northwest to the wall edge of a sink that Feature B buffers to the north. Maximum height of the enclosure is 0.8 m. (2.6 ft.) it is constructed of stacked basalt boulders, and appears to have been associated with agriculture.

Feature D consists of an unmodified lava blister located 23.1 m. (75.8 ft.) southeast of Feature A, measuring 3.5 m. (11.5 ft.) N/S by 2.5 m. (8.2 ft.) with a maximum height of 1.2 m. (3.9 ft.). Some *kukui* endocarps were observed. This feature could have been used as a storage area.

The site is in good condition and excavation condition is good.

Testing Results (Figure 21)

Limited testing was conducted at Feature A to determine the site's function, examine subsurface deposits and to collect charcoal for radiocarbon dating. The 1.0 m. (3.3 ft.) by 1.0 m. (3.3 ft.) test unit overlapped the southern half of the hearth feature and a portion of the surrounding Feature A pavement. Marine shell midden was observed on the surface of the test unit within the hearth feature.

The hearth fill was removed from the test unit and bagged for laboratory analysis. The subsurface extent of the hearth extended to a maximum of 6.0 cm. below the surface to the hearth understone and consisted of a grey (10 YR 4/3) ash intermixed with soil, charcoal, and midden. An abundance of marine midden and sparse terrestrial midden was recovered from the hearth portion of the test unit, including the following: 5.8 gms. cone shell (*pupu'ala* or *Conus sp.*); 76.7 gms. snakehead cowrie (*lehokupu* or *Cypraea caputserpentis*); 6.6 gms. pitchy sea snail (*pipipi* or *Nerita picea*); 12.5 gms. dyeshells (*papua* or *Thaididae sp.*); 2.5 gms. *Tellina palatam*; 129.0 gms. sea urchin (*wana* or *Echinoderm*); 2.3 gms. misc. shell; 0.2 gms. unidentified bone; and 1.6 gms. of *kukui* endocarp. A total of 36.7 gms. of charcoal was collected.

The south and southwestern portions of the test unit - outside the hearth feature - excavated to a maximum depth of 43 cm. and terminated upon reaching bedrock. Stratum I - 34 cm. thick - consisted of loosely compacted, dark brown (10 YR 4/3) fine grained ash soil with numerous rootlets, and angular basalt cobbles. Marine and terrestrial midden were recovered from Stratum I and include the following: 34.8 gms. snakehead cowrie (*lehokupu* or *Cypraea caputserpentis*); 3.4 gms. pitchy sea snail (*pipipi* or *Nerita picea*; 3.6 gms. *Theodoxus cariosus*; 1.0 gms. dye shells (*papua* or *Thaididae*); 0.6 gms. *Brachidontes crebristratus*; 1.1 gms. *Isognomon*; 43.6 gms. *Tellina palatam*; 99.7 gms. sea urchin (*wana* or *Echinoderm*); 23.4 gms. unidentified shell; 2.1 gms. fish bone; and 75.9 gms. of *kukui* endocarp. A total of 59.8 gms. of charcoal was collected.

A thin layer designated Stratum II - 3 cm. thick - consisted of orange brown gravel of decomposing bedrock. However because of the loose matrix and filtration from Stratum I; Stratum II contained: 0.9 gms. snakehead cowrie (*lehokupu* or *Cypraea caputserpentis*); 0.3 gms. pitchy sea snail (*pipipi* or *Nerita picea*); 0.1 gms. *Theodoxus cariosus*; 1.2 gms. *Brachidontes crebristriatus*; 4.5 gms. *Tellina palatam*; 5.8 gms. sea urchin (*wana* or *Echinoderm*); and 1.4 gms. of unidentified shell.

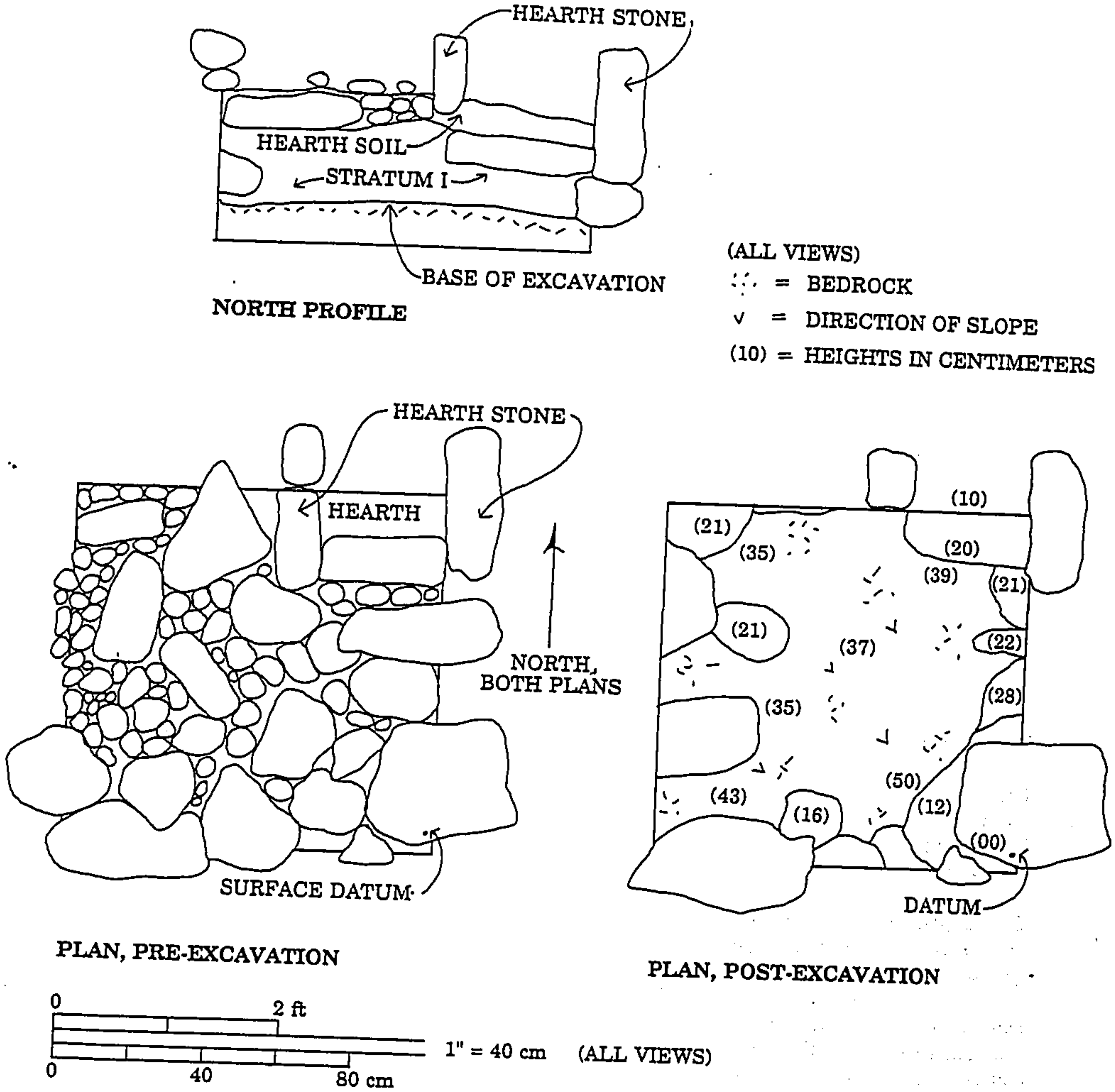


Figure 21 State site 50-10-27-20709 Feature A, Plan View Pre-excavation, Plan View and Profile Post-excavation

State Site #: 50-10-27-20710 **CSH SITE #:** 16
Site Type: Complex
Function: Temporary habitation
Features (#): 5
Dimension: 769.5 $m.^2$ (8563.8 $ft.^2$)
Elevation: 270 ft. a.m.s.l.

Description: Site 50-10-27-20710 (Figure 22) consists of five features designated A through E that are located on an uneven pahoehoe terrain, gently sloping to the southwest. Sparse pockets of soil support various types of grasses and *koa haole* at the site.

Feature A is a lava tube extending 12.1 m. (39.7 ft.) N/S by 6.0 m. (19.9 ft.) E/W. The tube is located under the western edge of the pahoehoe outcropping. *Kukui* endocarps and various marine shell fragments were observed on the surface of the tube floor. Excavation potential is poor due to the lack of soil within the tube.

Feature B is a low semi-circular mound measuring 3.6 m. (11.8 ft.) N/S, with a maximum height of 0.5 m. (1.6 ft.). It is constructed of pahoehoe cobble and no facing is apparent. No culture was observed.

Feature C is similar to Feature B: it is a low mound of pahoehoe cobbles measuring 1.5 m. (4.9 ft.) long, 0.5 m. (1.7 ft.) wide, with a maximum height of 0.4 m. (1.3 ft.).

Feature D is a filled crevice on top of the pahoehoe tumulus measuring 1.1 m. (3.6 ft.) N/S by 1.0 m. (3.3 ft.) E/W. The fill is composed of small to medium pahoehoe cobbles. No culture was observed.

Feature E is a circular paved area within an undulation in the pahoehoe lava 8.3 m. (27.2 ft.) southeast of Feature A's entrance. The paved area measures 3.6 m. (11.8 ft.) N/S. One piece of coral was observed on the surface.

Excavation potential of the site is poor.

State Site #: 50-10-27-20711 **CSH SITE #:** 17
Site Type: Enclosure
Function: Temporary habitation
Features (#): 1
Dimension: 19.4 $m.^2$ (212.2 $ft.^2$)
Elevation: 230 ft. a.m.s.l.

Description: Site 50-10-27-20711 (Figure 23) is a square-shaped enclosure located in terrain consisting of undulating pahoehoe. Vegetation at the site consists of various grasses and *koa haole*.

The enclosed area is defined by wall segments located along the northeast side of the enclosure and pahoehoe ledges, which form the remaining sides. The walled bi-faced northeast section of the enclosure is constructed of large pahoehoe slabs stacked 3 or 4 courses high, and 1 or 2 courses wide. Maximum exterior height along this side was 0.8 m. (2.6 ft.); maximum width was 0.6 m. (2.0 ft.). The remaining sides of the enclosure are composed of pahoehoe bedrock 0.3 m. (1.0 ft.) to 0.7 m. (2.3 ft.) higher than the leveled surface of the interior of the enclosure. The enclosure paving is small to medium pahoehoe cobbles.

No artifacts or midden were observed.

Excavation potential of the site is fair.

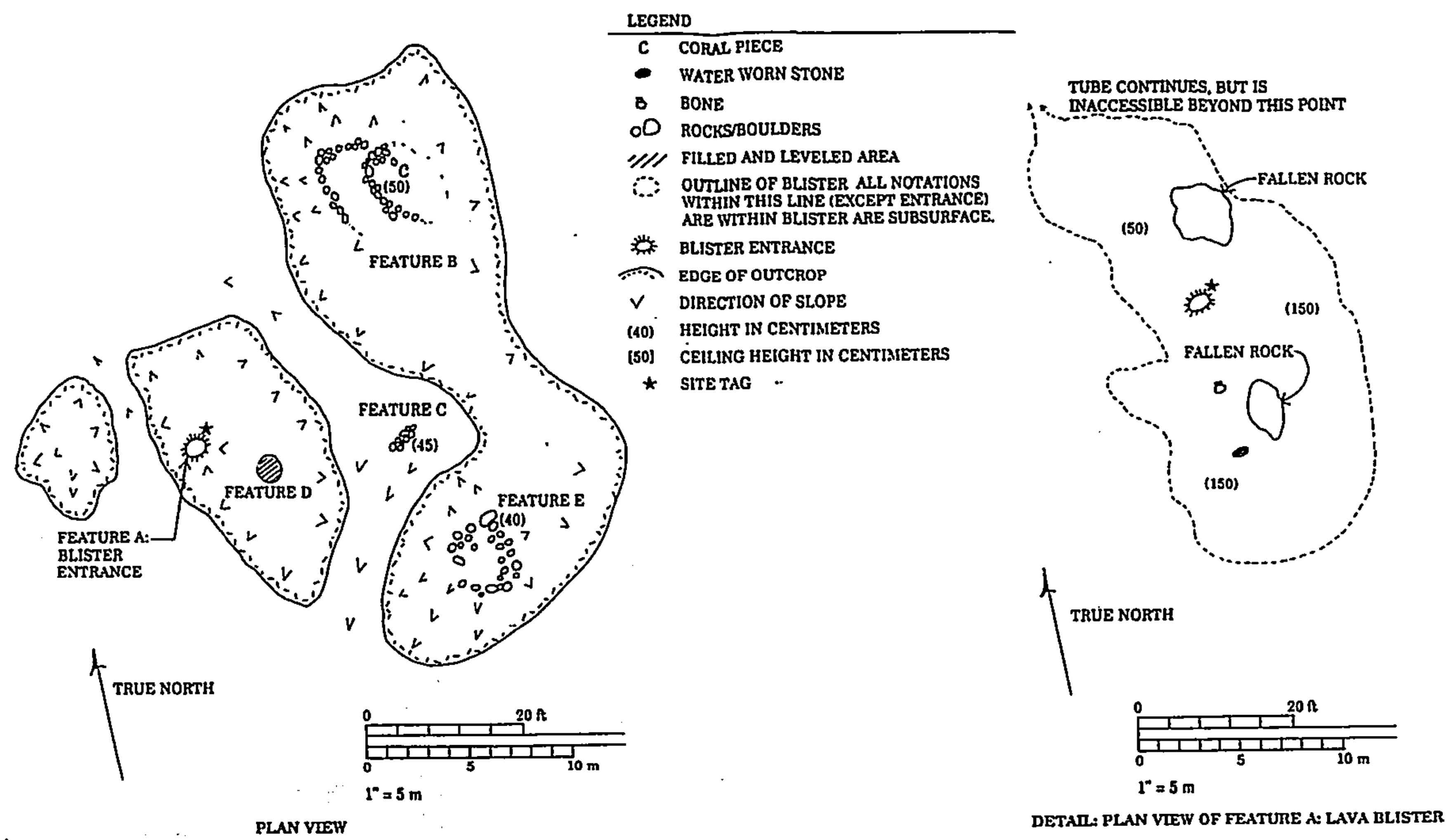
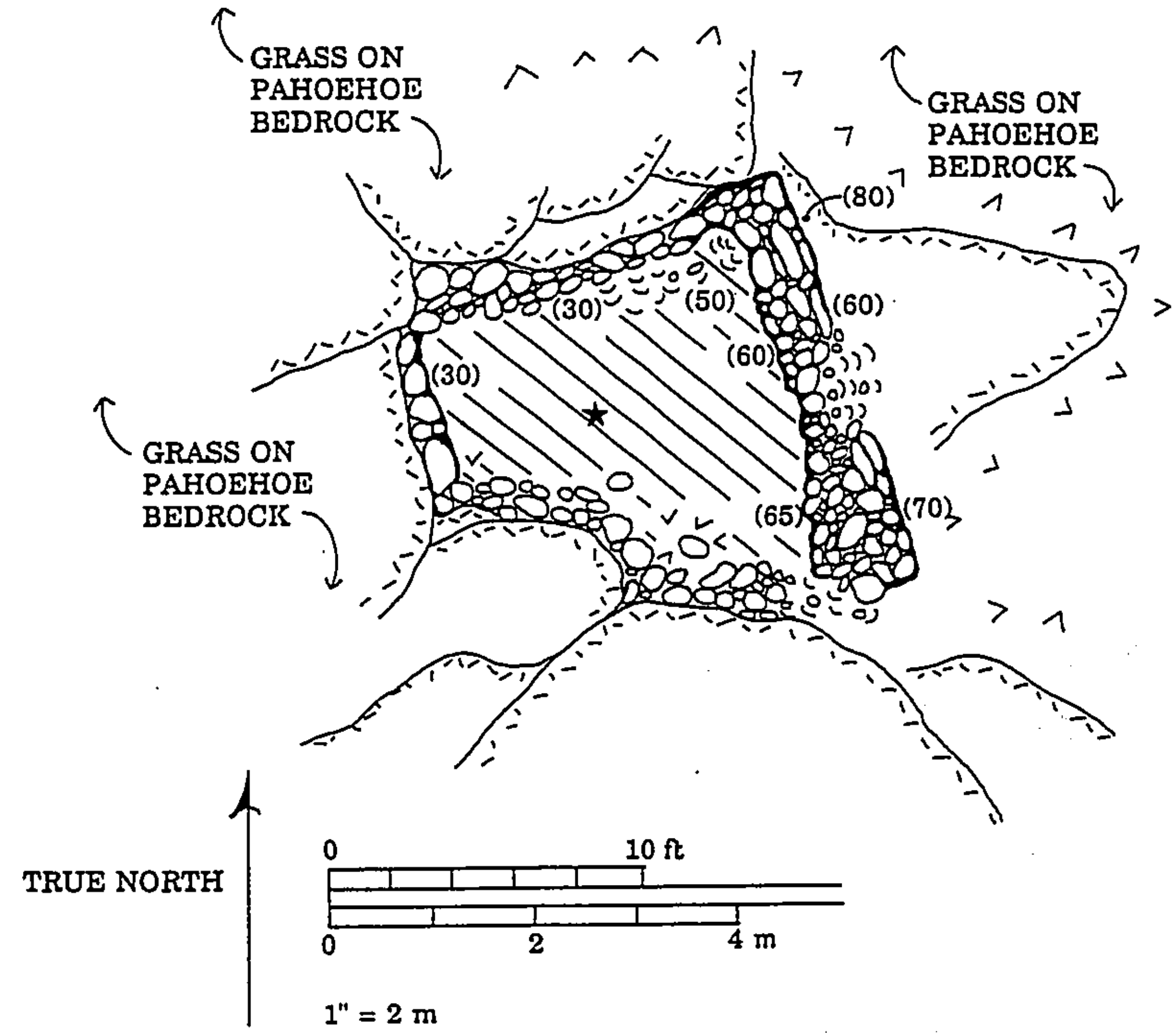


Figure 22 State site 50-10-27-20710, Site Complex, Plan View



LEGEND

- ROCKS/BOULDERS
- FACING
- COLLAPSE
- COBBLE AND PAHOEHOE FILL
- EDGE OF OUTCROP
- DIRECTION OF SLOPE
- (50) HEIGHTS IN CENTIMETERS
- ★ SITE TAG

Figure 23 State site 50-10-27-20711, Plan View

State Site #: 50-10-27-20712 **CSH SITE #:** 18
Site Type: C-shape
Function: Temporary habitation
Features (#): 1
Dimension: 12.0 $m.^2$ (85.9 $ft.^2$)
Elevation: 250 ft. a.m.s.l.

Description: Site 50-10-27-20712 (Figure 24) is a rough C-shape constructed of large piled cobbles to small boulders, partially enclosing a small level area of pahoehoe lava. Vegetation at the site consisted of various grasses and *koa haole*.

The C-shape measures 4.0 m. (13.2 ft.) E/W by 3.0 m. (9.8 ft.) N/S; at a maximum height of 0.45 m. (1.5 ft.). The center of the C-shape is the pahoehoe bedrock absent of any soil or vegetation. No cultural material was observed at the site; excavation potential is poor.

State Site #: 50-10-27-20713 **CSH SITE #:** 19
Site Type: *Ahu*
Function: Marker
Features (#): 1
Dimension: 0.4 $m.^2$ (1.3 $ft.^2$)
Elevation: 270 ft. a.m.s.l.

Description: Site 50-10-27-20713 (Figure 25) is an *ahu* located on a pahoehoe tumulus which slopes to the southwest. Vegetation at the site consists of various grasses and *koa haole*.

The *ahu* is constructed of fifteen pahoehoe boulders and measures 0.55 m. (1.8 ft.) N/S by 0.7 m. (2.3 ft.); E/W maximum height of 0.6 m. (2.0 ft.).

The *ahu* is located on the northern edge of a large crevice atop a high point of tumulus. The site is in good condition. No artifacts or midden were observed. The site has a poor excavation potential.

State Site #: 50-10-27-20714 **CSH SITE #:** 20
Site Type: Wall
Function: Indeterminate
Features (#): 1
Dimension: 3.7 $m.^2$ (12.1 $ft.^2$)
Elevation: 270 ft. a.m.s.l.

Description: Site 50-10-27-20714 (Figure 26) is a low wall located on pahoehoe lava which slopes to the southwest. The area has pockets of soil supporting various grasses and *koa haole*.

The wall measures 3.7 m. (12.1 ft.) long NE/SW by 1.0 m. (3.3 ft.) wide NW/SE, with a maximum height of 0.35 m. (1.2 ft.). It is constructed of small boulders 1 row wide

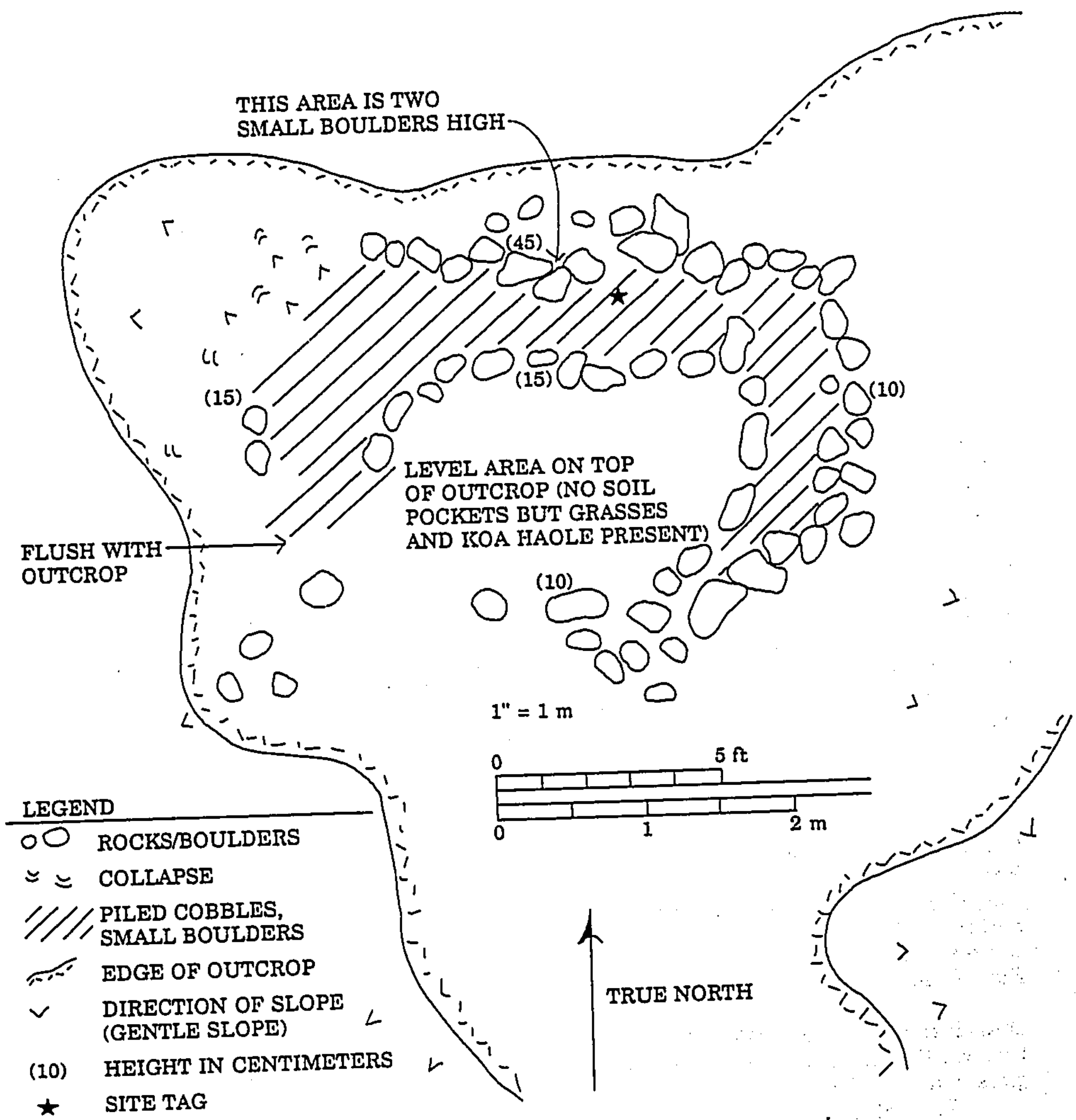


Figure 24 State site 50-10-27-20712, Plan View

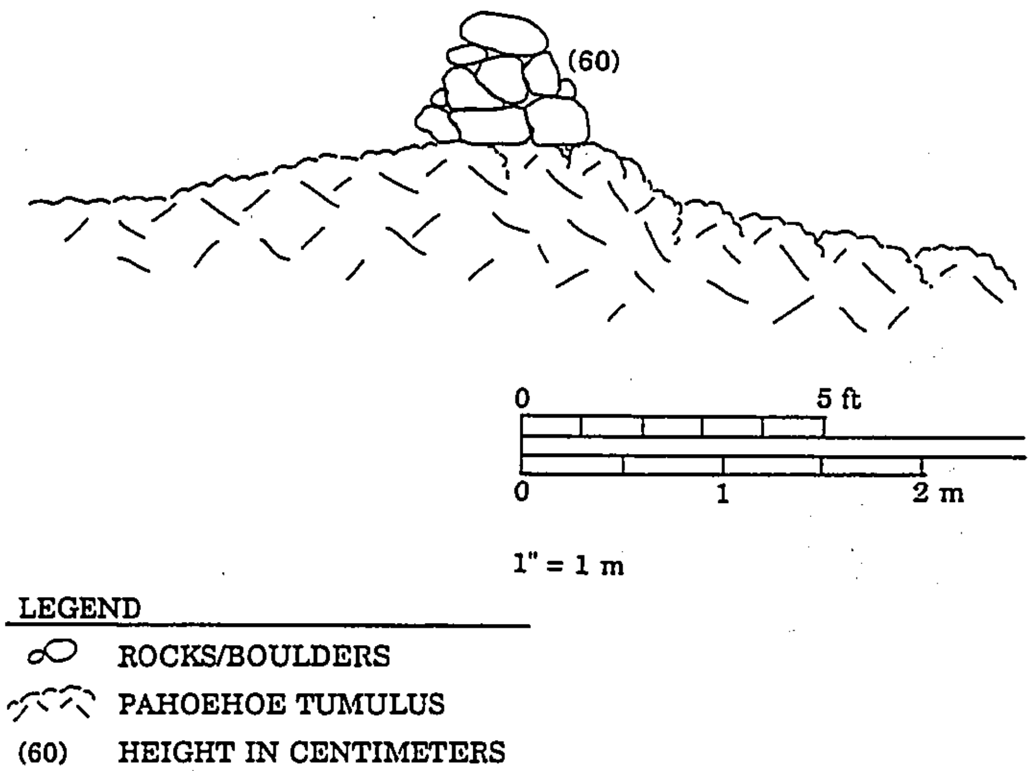


Figure 25 State site 50-10-27-20713, Cross Section

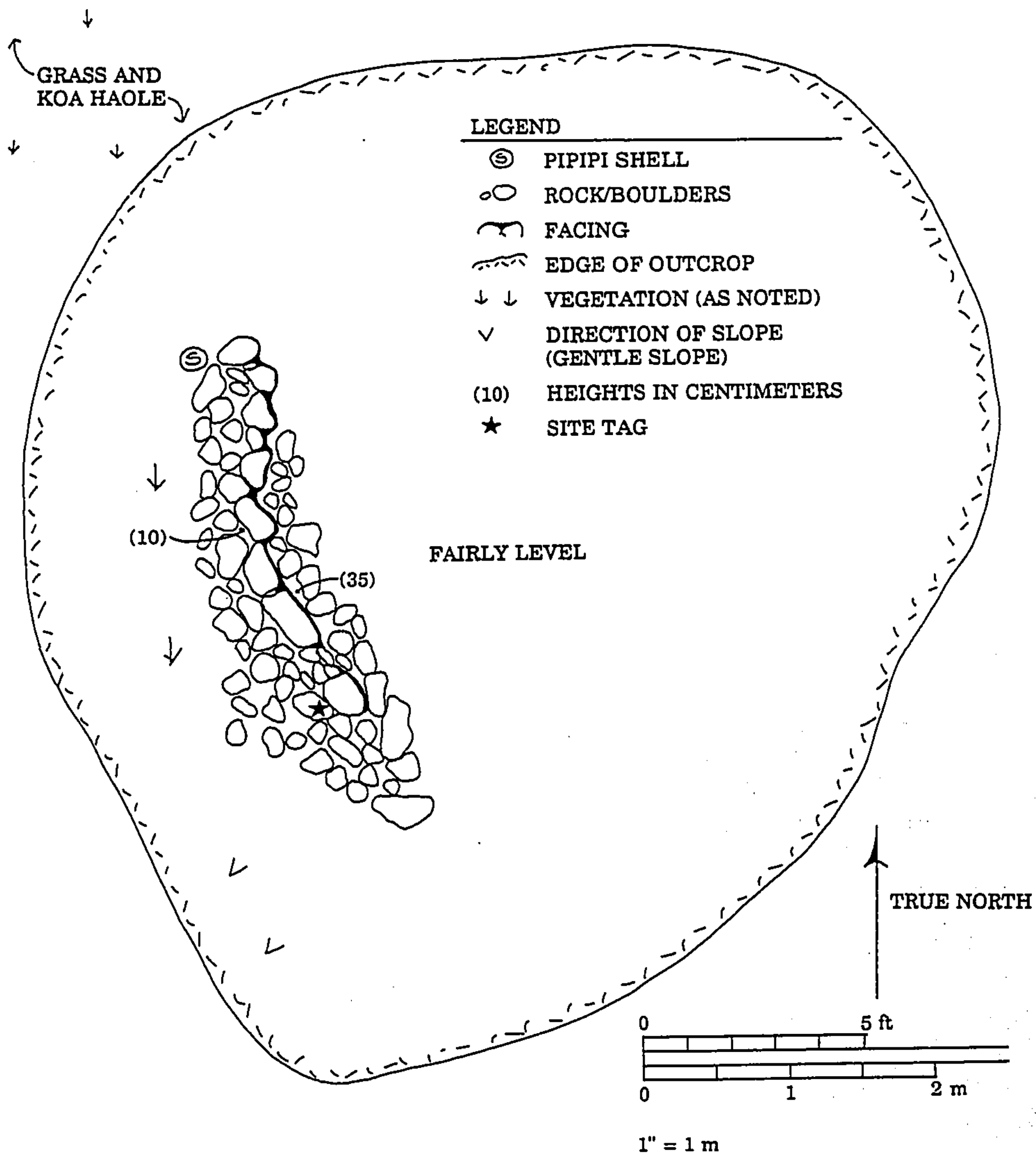


Figure 26 State site 50-10-27-20714, Plan View

and 2-3 courses high. The wall is constructed along the top of a relatively level exposed pahoehoe bedrock. One piece of marine midden was observed.

It is in good condition; excavation potential is poor.

State Site #:	50-10-27-20715	**CSH SITE #:** 22
Site Type:	Terrace	
Function:	Temporary habitation	
Features (#):	1	
Dimension:	6.5 m.^{2} (70.3 ft.^{2})	
Elevation:	260 ft. a.m.s.l.	

Description: Site 50-10-27-20715 (Figure 27) is a terrace located at the top of a pahoehoe tumulus surrounded by undulating pahoehoe gently sloping to the south. Vegetation at the site consists of various grasses.

The terrace is roughly rectangular in shape measuring 3.1 m. (10.2 ft.) SW/NE by 2.1 m. (6.9 ft.) SE/NW, with a maximum height of 0.95 m. (3.1 ft.) on its west facing side. It is constructed with a boulder perimeter and a pebble surface pavement. The east side of the terrace buffers higher elevated bedrock to create its eastern edge.

No midden of artifacts were observed. Excavation potential is fair.

State Site #:	50-10-27-20716	**CSH SITE #:** 23
Site Type:	Modified tumulus	
Function:	Possible burial	
Features (#):	4	
Dimension:	8.0 m.^{2} (85.6 ft.^{2})	
Elevation:	230 ft. a.m.s.l.	

Description: Site 50-10-27-20716 (Figure 28) is a modified tumulus defined by a filled crevice of a pahoehoe tumulus. The terrain consists of gently sloping pahoehoe. Vegetation consists of various grasses, and *koa haole*.

The crevice has been filled with medium to large cobbles and small boulders in four separate areas designated Features A to D.

Feature A measures 7.8 m. (25.6 ft.) N/S by 2.1 m. (6.9 ft.) E/W with the fill surface level with the existing bedrock. Feature A buffers Feature B on its northwest edge which is separated by a semi-circular boulder fill.

Feature B consists of a cobble filled area measuring 2.1 m. (6.9 ft.) N/S by 1.4 m. (4.6 ft.) E/W. The filled portion of Feature B extends to the northwest edge of the pahoehoe tumulus. The southwest edge of Feature B buffers the northeast edge of Feature C, separated only by large boulder fill, and existing bedrock.

Feature C consists of a cobble filled area measuring 2.7 m. (8.9 ft.) NE/SW by 1.1 m. (3.6 ft.) NW/SE. The filled portion of Feature C extends to the northwest edge of the pahoehoe tumulus.

Feature D lies 0.3 m. (1.0 ft.) southeast from the southern end of Feature A and measures 0.7 m. (2.3 ft.) E/W by 0.6 m. (2.0 ft.) N/S. The paved surface of Feature D is level with the surrounding bedrock.

No artifacts or midden were observed.

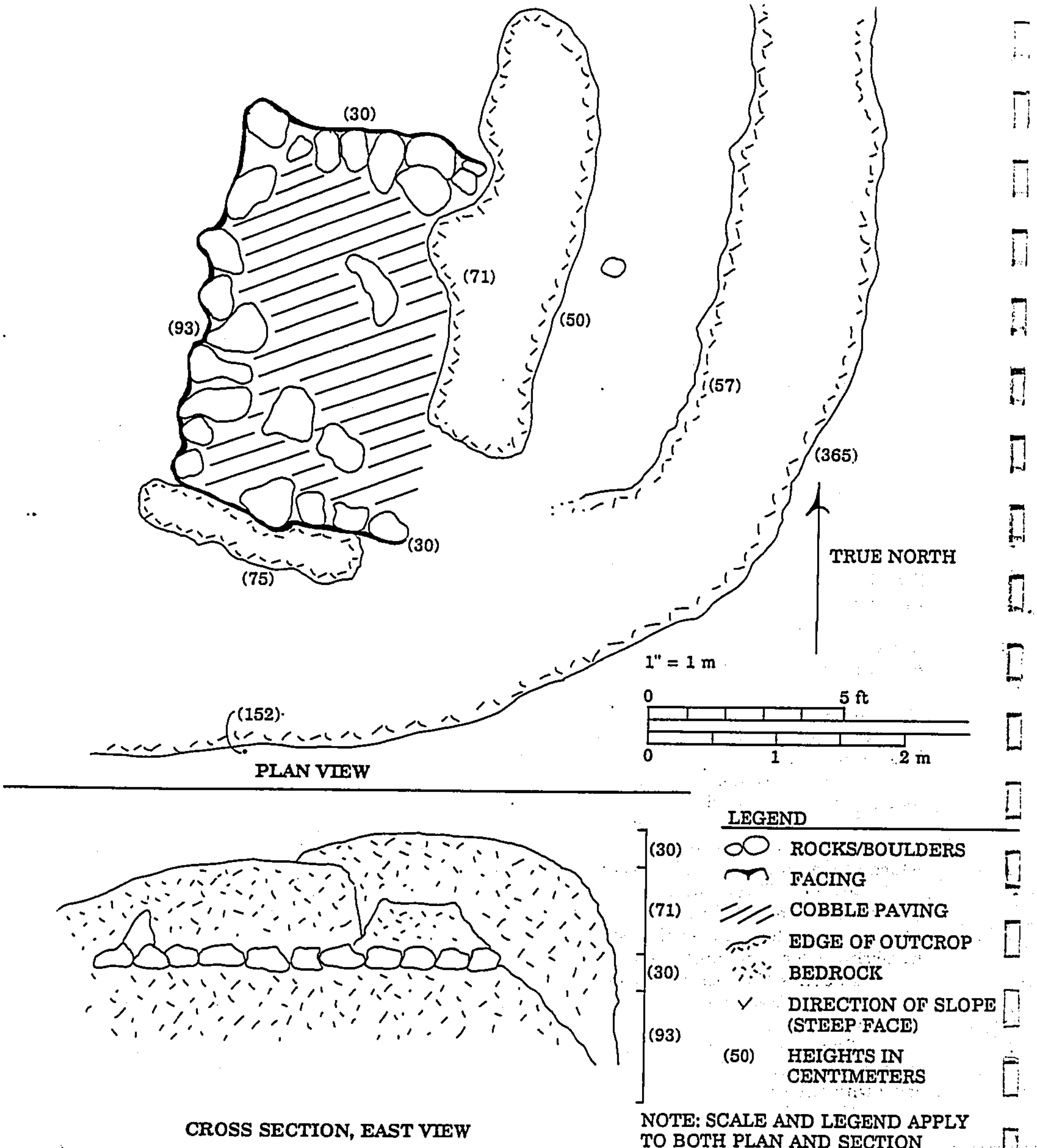


Figure 27 State site 50-10-27-20715, Plan View and Cross Section

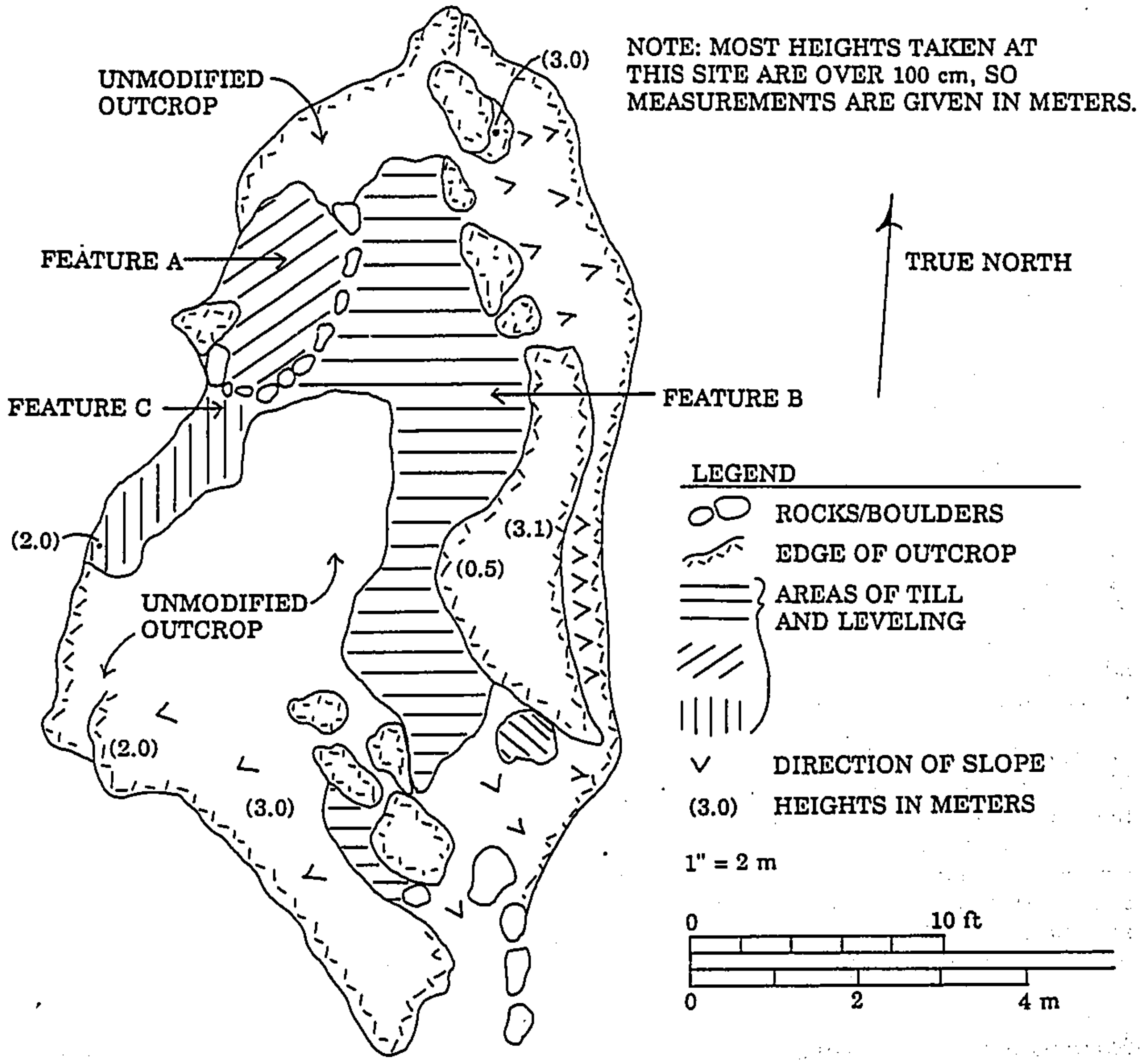


Figure 28 State site 50-10-27-20716, Plan View

State Site #: 50-10-27-20717 **CSH SITE #:** 24
Site Type: Modified tumulus
Function: Possible burial
Features (#): 1
Dimension: 5.8 m.^{2} (61.9 ft.^{2})
Elevation: 220 ft. a.m.s.l.

Description: Site 50-10-27-20717 (Figure 29) is a modified tumulus defined by a filled crevice. The surrounding terrain consists of undulating pahoehoe lava with sparse soil pockets that support various grasses and *koa haole*.

The crevice has been filled with large cobbles to small boulders and measures 2.5 m. (8.2 ft.) N/S by 2.3 m. (7.5 ft.) E/W. The eastern edge of the leveled area is delineated by a single row of medium boulders, forming an alignment which is flush with the fill on the west side.

The depth of cobble fill measured 0.4 m. (1.3 ft.) at its shallowest; maximum depth was indeterminate. The possible substantial depth of the fill along with the absence of planting areas or other features suggest the site may contain a burial.

No cultural material was observed.

State Site #: 50-10-27-20718 **CSH SITE #:** 25
Site Type: Modified tumulus
Function: Agriculture
Features (#): 1
Dimension: 5.0 m.^{2} (54.3 ft.^{2})
Elevation: 225 ft. a.m.s.l.

Description: Site 50-10-27-20718 (Figure 30) is a modified tumulus defined by a filled and leveled crevice. The terrain consists of undulating pahoehoe gently sloping to the northwest, with sparse soil deposits that support various grasses and *koa haole*.

The crevice measuring 2.8 m. (9.2 ft.) NE/SW by 1.8 m. (5.9 ft.) NW/SE, has been leveled using large cobbles and small boulder's. The northeast portion of the crevice is characterized by dense grass growth. The filled area is shallow, 0.2 m. (0.6 ft.) in depth, and the existing bedrock was visible through spaces between the cobble and small boulder fill. No cultural material was found. Excavation potential of the site is poor.

State Site #: 50-10-27-20719 **CSH SITE #:** 26
Site Type: Complex
Function: Temporary habitation/Agriculture/Marker
Features (#): 2
Dimension: 35.6 m.^{2} (382.4 ft.^{2})
Elevation: 210 ft. a.m.s.l.

Description: Site 50-10-27-20719 (Figures 31 & 32) is a small modified rock shelter, Features A, and an *ahu*, Feature B, located on undulating pahoehoe lava. The surface vegetation consists of various grasses and *koa haole*.

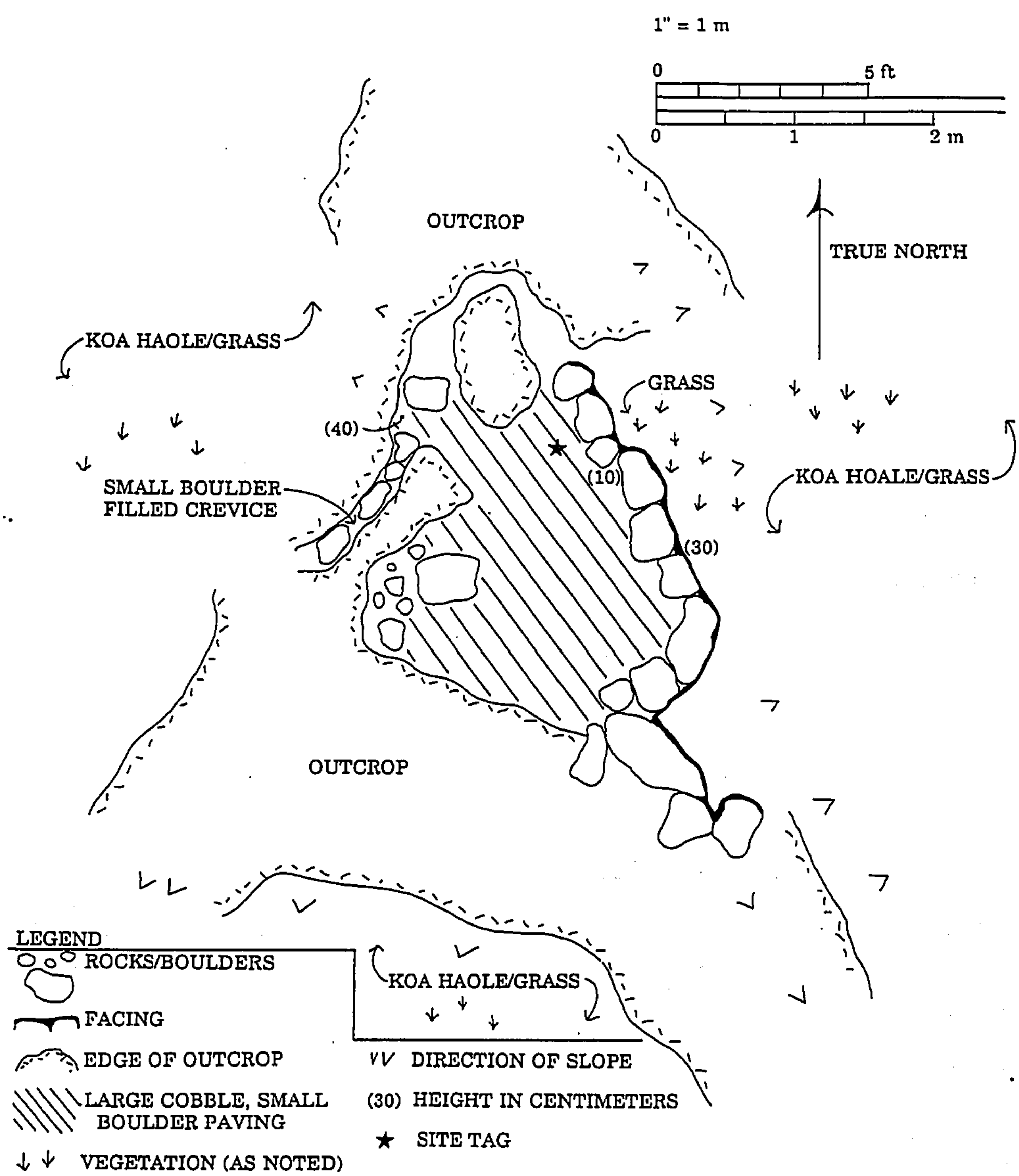


Figure 29 State site 50-10-27-20717, Plan View

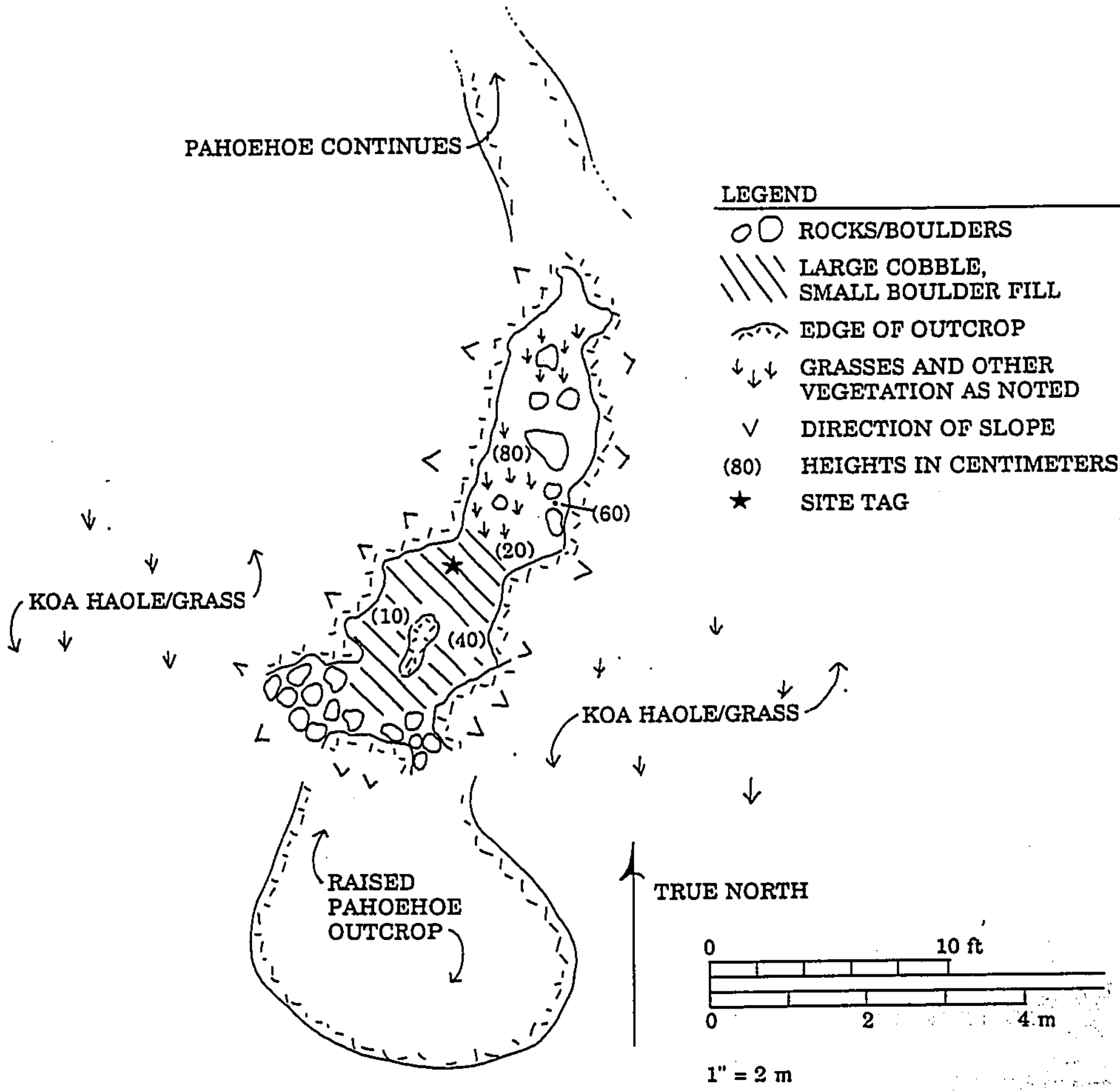


Figure 30 State site 50-10-27-20718, Plan View

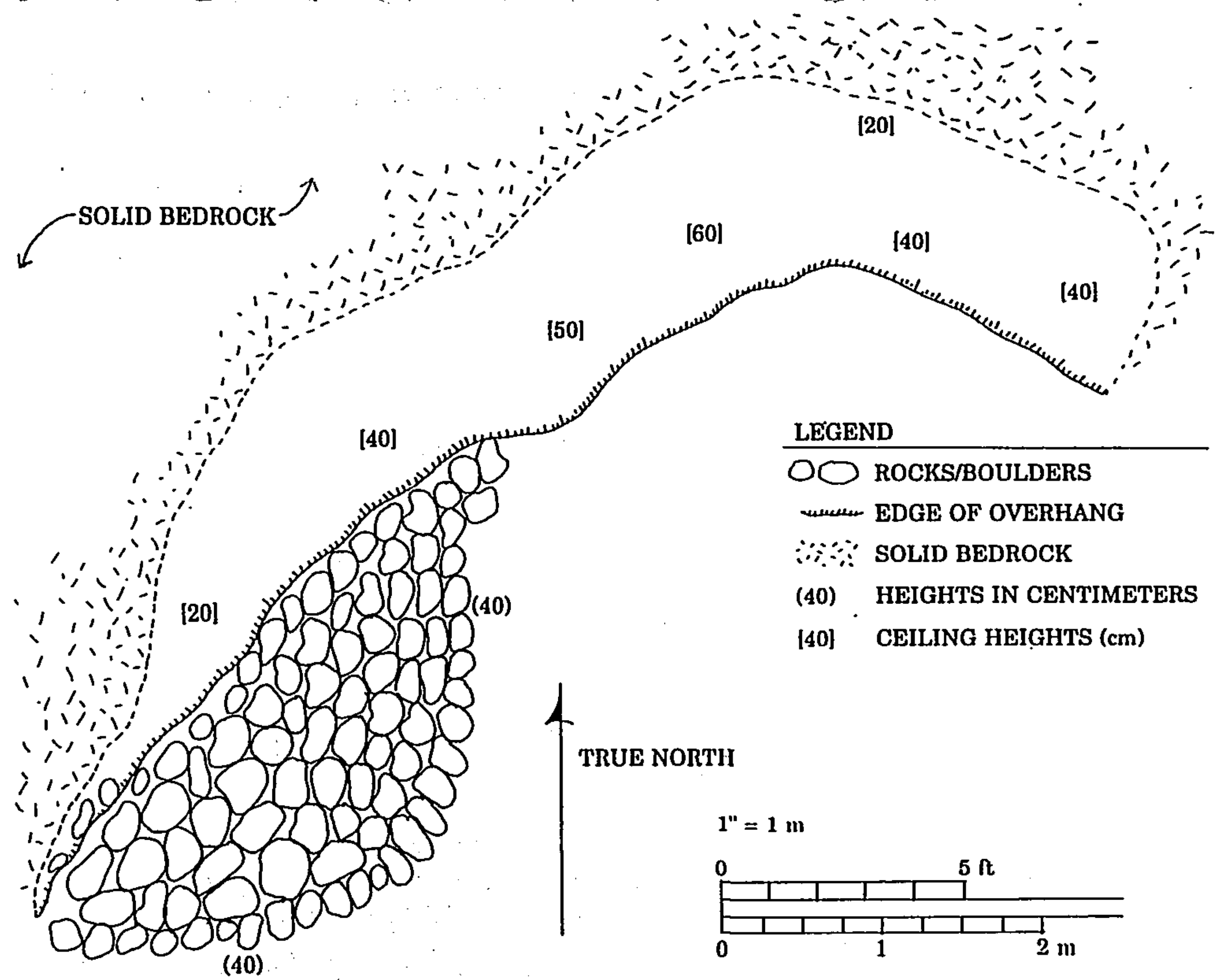


Figure 31 State site 50-10-27-20719 Feature A, Plan View

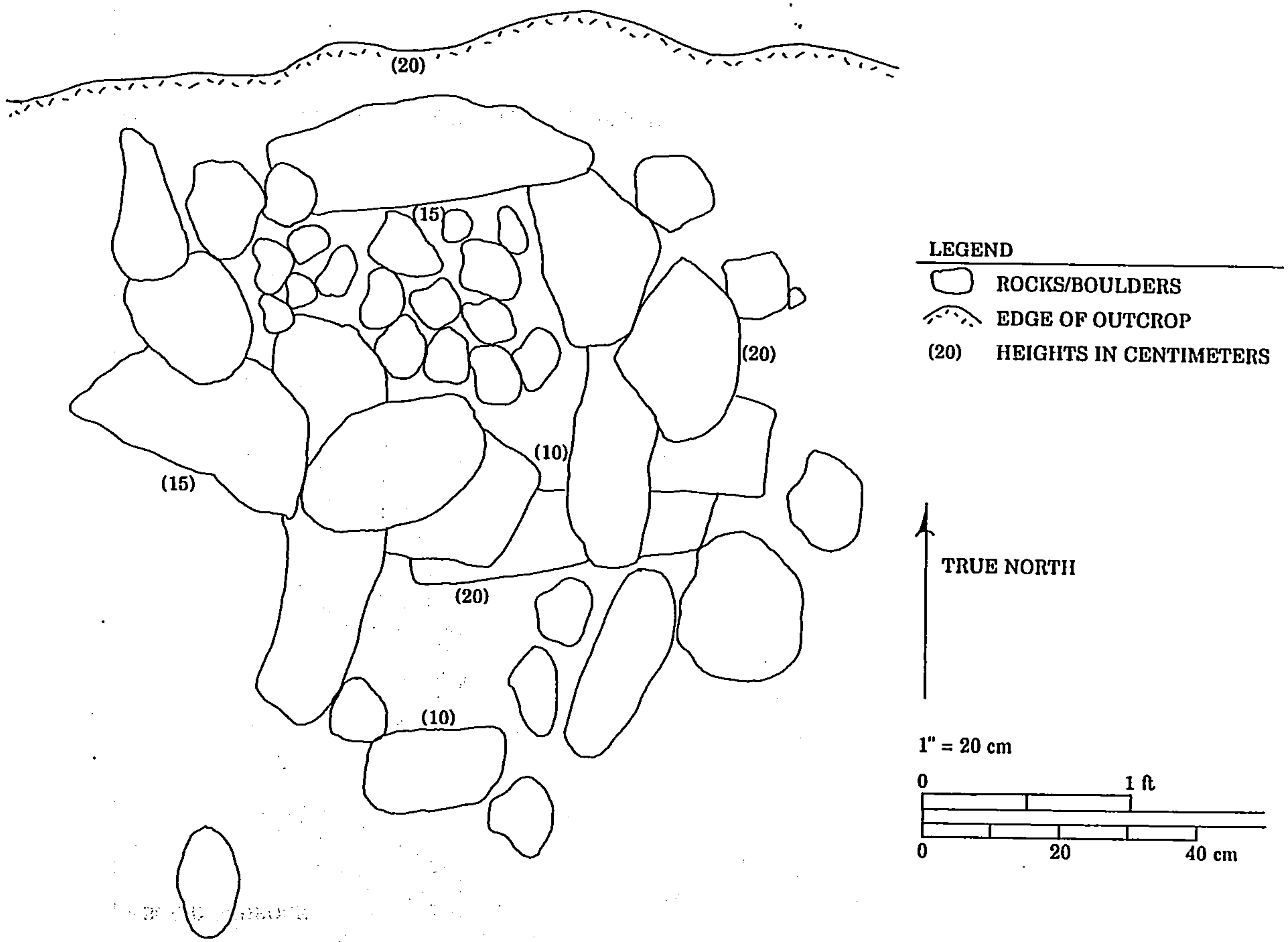


Figure 32 State site 50-10-27-20719 Feature B, Plan View

Feature A is a shelter that utilizes a natural overhang that is partially terraced on the southwest end. The terrace is constructed of small basalt boulders and cobbles which measures 4.1 m. (13.4 ft.) SW/NE by 1.7 m. (5.6 ft.) SE/NW with a maximum height of 0.4 m. (1.3 ft.) on the southeast edge. The natural outcropping forms an overhang that extends to the northeast for 4.0 m. (13.1 ft.) from the northwest corner of the terraced area has a maximum depth of 0.6 m. (2.0 ft.). A 17.7 gms. wood sample was collected from an adjacent otherwise unmodified lava tube.

Feature B is a hearth or a possible *ahu* located to the south of Feature A. It consists of two courses of medium flat pahoehoe slabs on exposed bedrock, arranged in a semi-circular pattern measuring 0.8 m. (2.6 ft.) N/S by 0.85 m. (2.8 ft.) E/W, with a maximum height of 0.15 m. (0.5 ft.).

No culture was observed at either feature. Excavation potential is fair.

CSH SITE #: 27

State Site #: 50-10-27-20720
Site Type: Terrace
Function: Possible burial
Features (#): 1
Dimension: 7.4 m.^{2} (79.2 ft.^{2})
Elevation: 210 ft. a.m.s.l.

Description: Site 50-10-27-20720 (Figure 33) is a terrace located on an undulating pahoehoe that slopes gently southward. Sparse and dispersed soil pockets support various grasses and *koa haole.*

The terrace measures 3.2 m. (10.5 ft.) N/S by 2.3 m. (7.5 ft.) E/W with a maximum facing height of 0.3 m. (1.0 ft.). The perimeter of the terrace to the west and south is composed of medium boulders, with small cobbles used for the level surface fill. The northeast and northwest sides of the terrace buffer the existing bedrock to form a flush edge with the surface of the bedrock.

No artifacts or midden were observed. Excavation potential is fair.

CSH SITE #: 28

State Site #: 50-10-27-20721
Site Type: Modified Tumulus
Function: Temporary habitation
Features (#): 3
Dimension: 226.3 m.^{2} (2430.2 ft.^{2})
Elevation: 200 ft. a.m.s.l.

Description: Site 50-10-27-20721 (Figure 34) comprises three features designated A through C located on the surface of a large pahoehoe tumulus. Scattered pockets of soil support various grasses and *koa haole.*

All three features are leveled paved areas on the surface of the tumulus. These features are deemed associated because of proximity, similarity of construction styles, and degree of preservation.

Feature A is a leveled area located on the western side of the tumulus measuring 3.0 m. (9.8 ft.) N/S by 2.8 m. (9.2 ft.) E/W. The fill consists of small to medium pahoehoe

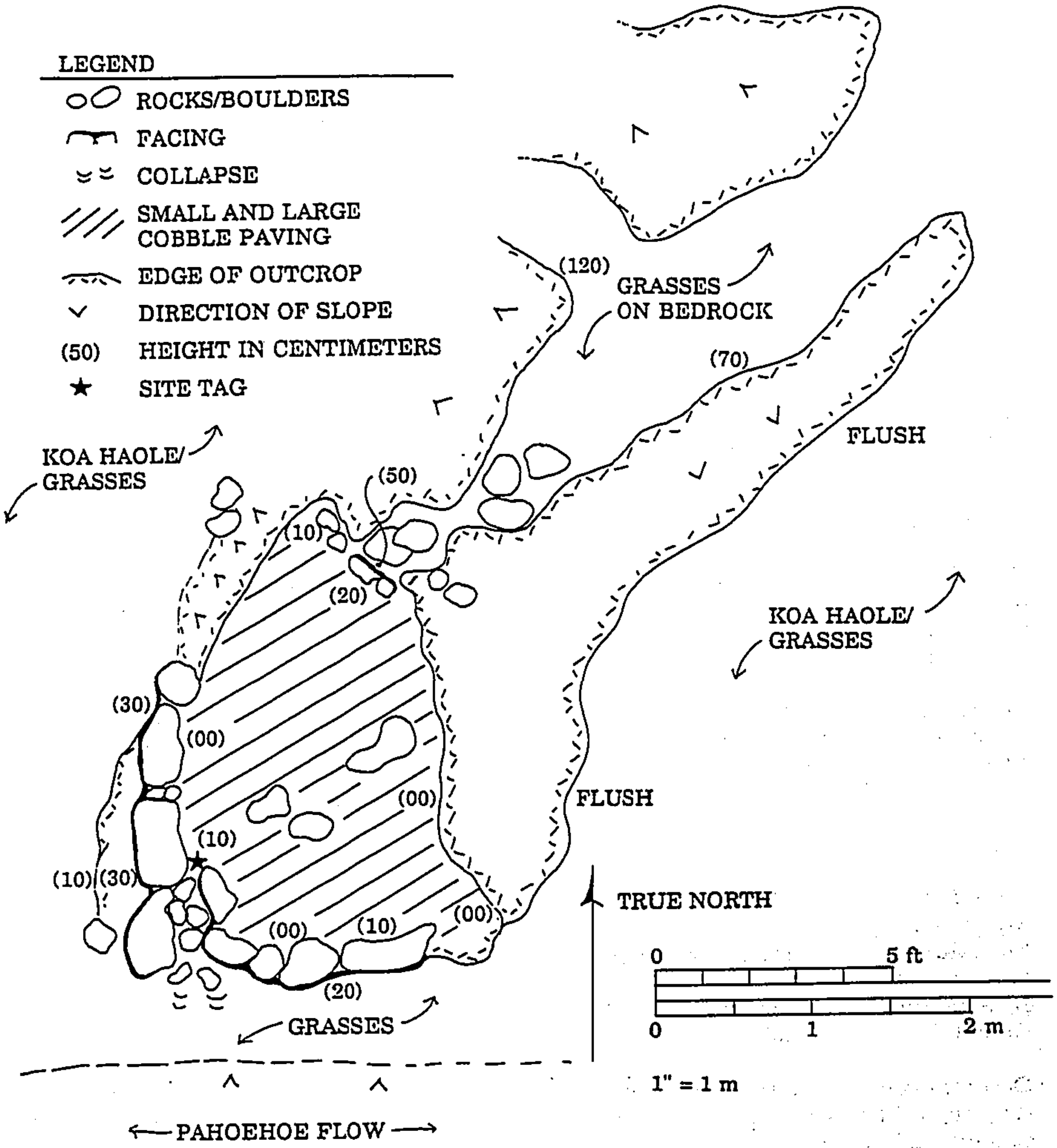


Figure 33 State site 50-10-27-20720, Plan View

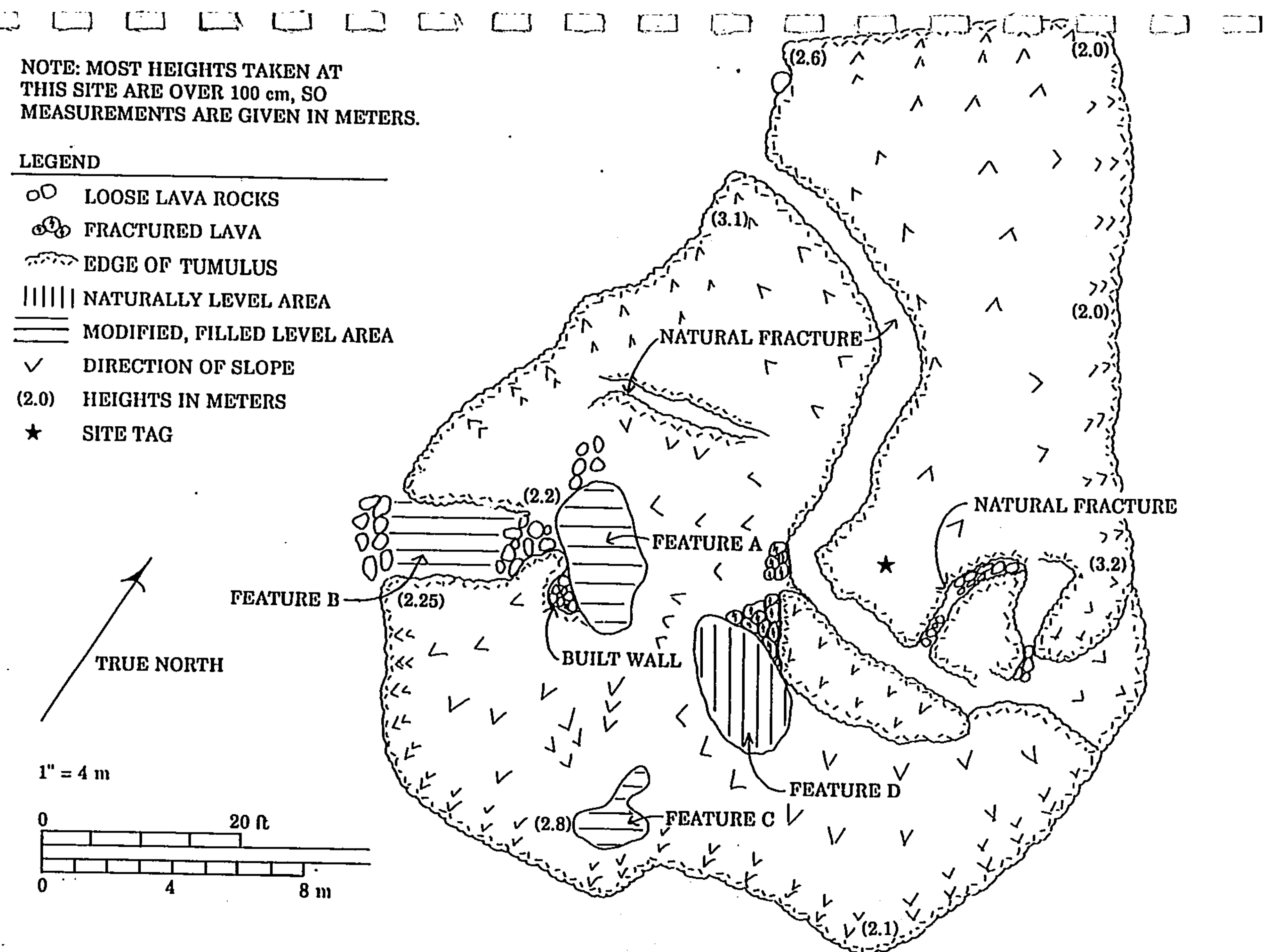


Figure 34 State site 50-10-27-20721, Site Complex, Plan View

cobbles. Directly below Feature A to the west is Feature B on the side of the pahoehoe tumulus. No culture was observed.

Feature B is located 1.5 m. (4.9 ft.) below the western edge of Feature A buffering the edge of the tumulus. It measures 3.4 m. (11.2 ft.) N/S by 2.6 m. (8.5 ft.) E/W. It is also composed of small to medium pahoehoe cobbles. No culture was observed.

Feature C is a leveled paved area located on the southwest portion of the tumulus. Its small leveled surface measures 1.0 m. (3.3 ft.) N/S by 2.3 m. (7.5 ft.) E/W, and is constructed of small to medium pahoehoe cobble. No culture was observed.

State Site #: 50-10-27-20722 **CSH SITE #:** 29
Site Type: Trail
Function: Transportation
Features (#): 1
Dimension: 123.2 m.^{2} (404.9 ft.^{2})
Elevation: 100 ft. a.m.s.l.

Description: Site 50-10-27-20722 is a stepping stone trail located on a'a lava. No soil is present and the area is virtually barren of all vegetation.

From the *makai* edge of the lava flow the trail is oriented in a N/S direction for some 13.1 m. (43.0 ft.) it then forks, with one leg extending 41.0 m. (134.5 ft.) to the northwest, and the other 23.4 m. (76.8 ft.) to the northeast to the *mauka* side of the a'a flow where they disappear on the pahoehoe.

The trail is constructed of flat pahoehoe slabs set into small a'a cobbles at evenly spaced intervals creating an easily traveled well constructed path across the a'a flow.

No midden or artifacts were observed.

Excavation potential is poor.

CSH SITE #: 31

State Site #: 50-10-27-20724
Site Type: Trail
Function: Transportation
Features (#): 1
Dimension: approximately 205 m.^{2} (675.0 ft.^{2})
Elevation: 130-160 ft. a.m.s.l.

Description: Site 50-10-27-20724 is a trail located on an rough a'a lava. No soil is present, and vegetation consists of sparse areas of various grasses and *koa haole*.

The trail crosses the a'a flow in a *mauka/makai* direction. The trail is formed by the clearing of large angular a'a boulders leaving only well worn sub-angular cobbles and pebbles.

No artifacts or midden were observed. Excavation potential is poor.

CSH SITE #: 32

State Site #: 50-10-27-20725
Site Type: Modified tumulus
Function: Temporary habitation
Features (#): 4
Dimension: 187.5 m.^{2} (1995.8 ft.^{2})
Elevation: 170 ft. a.m.s.l.

Description: Site 50-10-27-20725 (Figures 35 & 36) is a modified tumulus consisting of four features. A terrace (Feature A), a platform (Feature B), a modified *crevice* (Feature C), and a small paved area (Feature D). Small pockets of soil at the site support various grasses and *koa haole*.

Feature A terrace is located at the northern end of the tumulus. The terrace measures 2.5 m. (8.2 ft.) N/S by 2.4 m. (7.9 ft.) E/W. It is composed of small to medium pahoehoe boulders and cobbles. Two sides of the terrace are faced; a maximum height of 1.7 m. (5.6 ft.) is reached along the northeast side.

No culture was observed. Excavation potential is fair.

Feature B platform abuts the southern side of Feature A terrace. This platform measures 5.1 m. (16.7 ft.) N/S by 6.0 m. (19.7 ft.) E/W, with a maximum height of 0.4 m. (1.3 ft.) on the northeastern edge. It is constructed of small to medium pahoehoe boulders and some cobble fill. There is facing present along the north and southeast sides.

No culture was observed. Excavation potential is fair.

Feature C is a filled crevice on the surface of the pahoehoe tumulus, which extends southward from the southeast corner of Feature B platform. The crevice has been filled with weathered pahoehoe cobbles and small boulders. The fill does not extend beyond the sides of the crevice.

No culture was observed. Excavation potential is poor.

Feature D paved area is located in the center of the pahoehoe tumulus, 1.3 m. (4.3 ft.) south of the southern edge of Feature B platform. The paved area measures 4.2 m. (13.9 ft.) N/S by 1.6 m. (5.2 ft.), and is constructed of pahoehoe boulders.

No culture was observed. Excavation potential is poor.

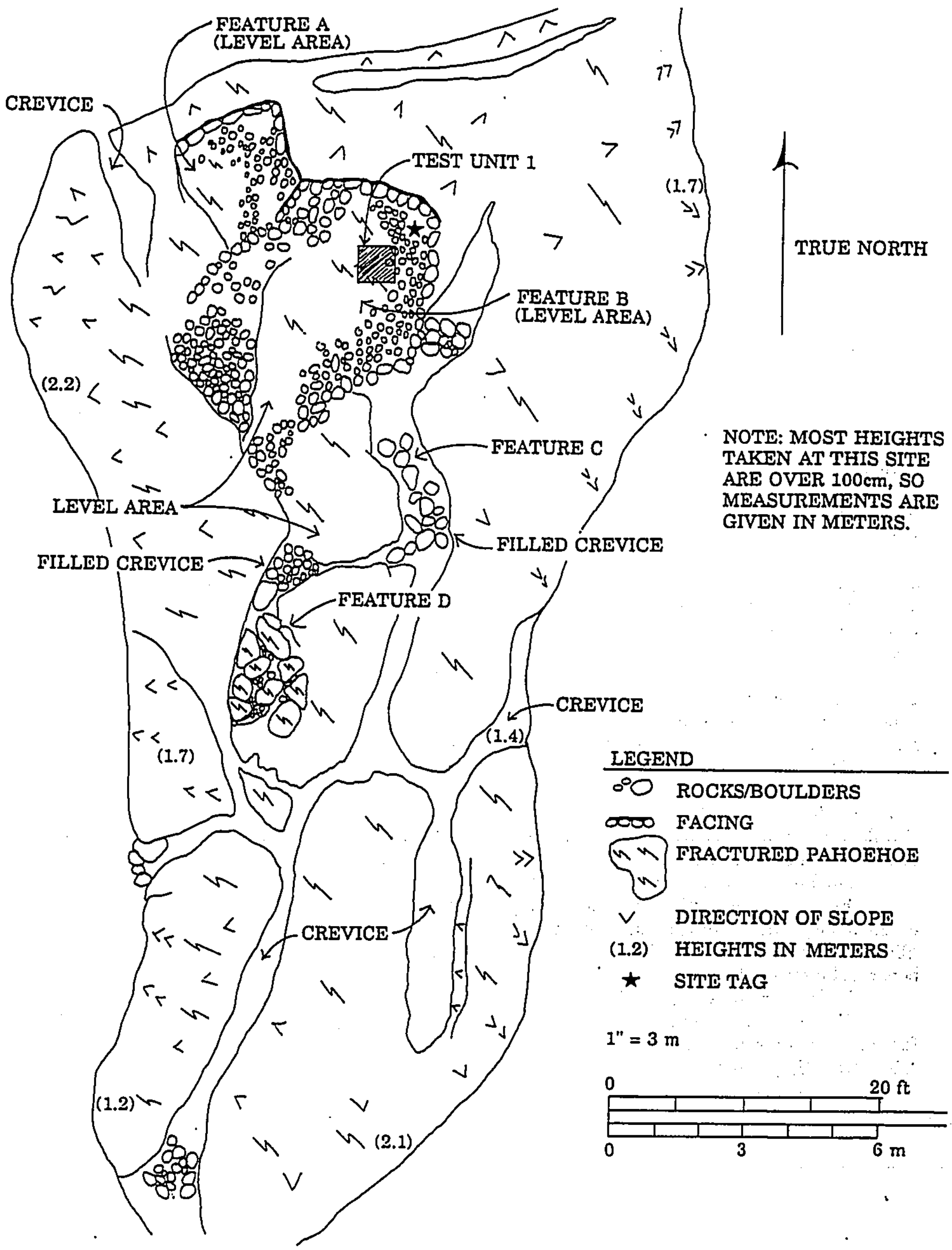


Figure 35 State site 50-10-27-20725, Site Complex, Plan View

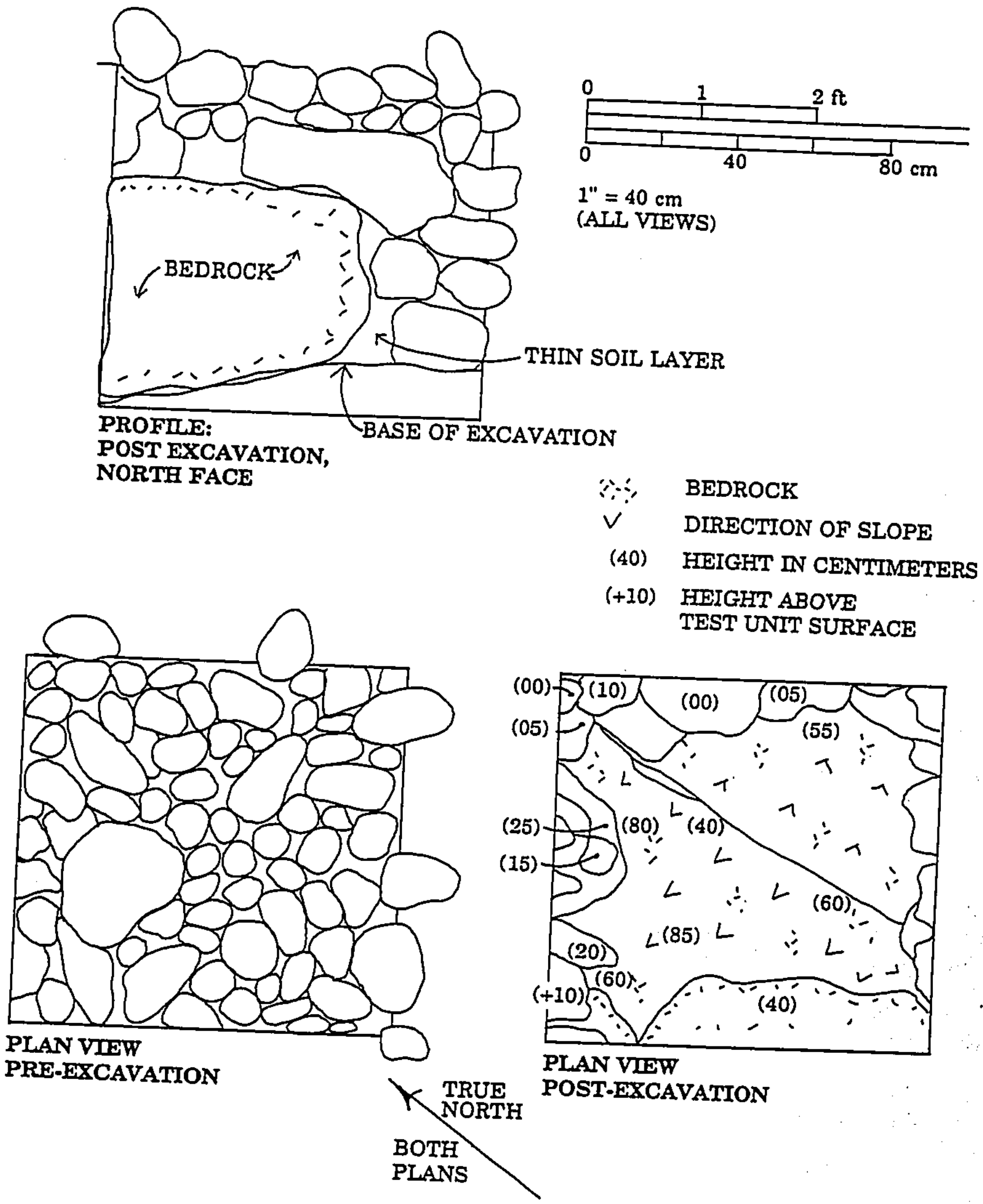


Figure 36 State site 50-10-27-20725 Feature B, Plan View Pre-excavation, Plan View and Profile Post-excavation

Testing Results (see Figure 36)

A 1.0 m. by 1.0 m. test unit was placed in the northeast portion of Feature B, and excavated to a maximum depth of 86 cm. below the platform surface. The excavation extended through the platform fill and into a small section of underlying soil located in a thin crevice at 85 cm.. The platform fill (Stratum I) consisted of small to medium pahoehoe boulders and large cobbles. The soil excavated was very dark brown (10 YR 4/3) silt loam but contained only 0.4 gms. of *kukui* endocarp and 2.2 gms. of charcoal.

A large segment of the test unit reached a vertical bedrock formation in the center portion of the unit. This bedrock impeded further excavation beneath 86 cm.

CSH SITE #: 33

State Site #: 50-10-27-20726
Site Type: Trail
Function: Transportation
Features (#): 2
Dimension: 16.7 m.^{2} (54.8 ft.^{2})
Elevation: 120 ft. a.m.s.l.

Description: Site 50-10-27-20726 comprises two trails (one stepping stone, one cobble), designated Features A and B, which are in good condition located on a'a lava.

Feature A stepping stone trail crosses the a'a flow in a SW/NE direction for a total length of 16.7 m. (54.8 ft.) before it disappears. Construction of the trail consists of flat pahoehoe slabs set into a'a cobbles at random intervals. More stepping stones are present on the northern section of the trail, and decreases significantly as the trail extends southward.

No midden or artifacts were observed.

Excavation potential is poor.

Feature B is a worn (i.e. trodden path) cobble trail that extends for a measured length of 45.3 m. (148.6 ft.). The total length of the trail cannot be determined however due to losing the trail on pahoehoe lava on either side *(mauka and makai)* of the a'a flow on which the trail segments are visible.

No culture was observed.

Excavation potential is poor.

CSH SITE #: 34

State Site #: 50-10-27-20727
Site Type: Lava tube
Function: Temporary habitation
Features (#): 1
Dimension: 188.7 m.^{2} (2030.8 ft.^{2})
Elevation: 130 ft. a.m.s.l.

Description: Site 50-10-27-20727 (Figure 37) is a medium sized lava tube shelter located beneath a generally level pahoehoe lava surface. The surface vegetation consists of various grasses and *koa haole*.

The tube measures 5.1 m. (16.8 ft.) N/S by 37.0 m. (121.4 ft.) E/W with a maximum height of 0.9 m. (3.0 ft.). There are three openings into the tube, the largest one located

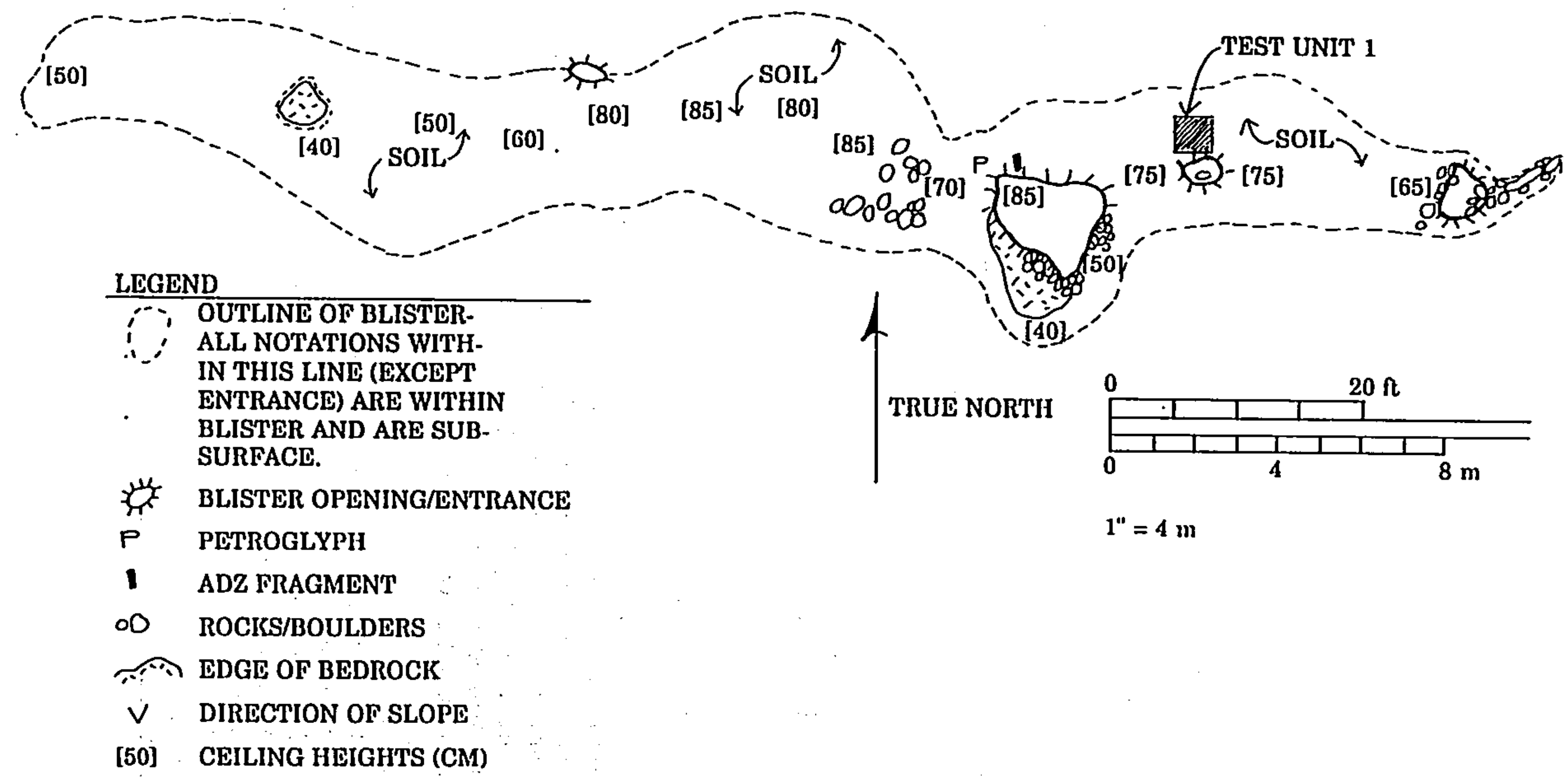


Figure 37 State site 50-10-27-20727, Plan View

11.0 m. (36.1 ft.) from the western edge of the tube. Another opening is located directly at the end of the western edge of the tube. The third opening lies 13.1 m. (43.0 ft.) from the eastern edge of the tube. The floor of the tube is generally exposed bedrock with some scattered areas of soil. A variety of marine shell,along with *pipipi*, *urchin*, *kukui* endocarps, and adz fragment were observed. Many large mammal bones were also apparent within the tube.

On the surface of the tube directly outside the largest opening on the northwest edge is a small L-shaped petroglyph.

The tube is in good condition.

Excavation potential of the site is fair.

Testing Results

Limited testing was conducted at Site 20727 lava tube to determine the function of the site, examine subsurface deposits, and to collect charcoal for radiocarbon dating analysis. The testing consisted of excavating a 1.0 m. by 1.0 m. test unit placed within a soil area beneath the lava tube's western entrance. On the surface of the unit was one piece of marine midden.

The unit was excavated to underlying bedrock to a maximum depth of 2 cm. One stratigraphic layer - Stratum I - was observed during excavation. Stratum I was a very dark grayish brown (10 YR 3/2) fine silty loam.

The midden inventory includes the following: 1.4 gms. of unidentified marine shell; 0.5 gms. sea urchin (*wana* or *Echinoderm*); 4.2 gms. pig bone; and 2.6 gms. of *kukui* endocarp.

State Site #:	50-10-27-20728	**CSH SITE #:** 35
Site Type:	Enclosure	
Function:	Temporary habitation	
Features (#):	1	
Dimension:	18.2 $m.^2$ (194.7 $ft.^2$)	
Elevation:	110 ft. a.m.s.l.	

Description: Site 50-10-27-20728 (Figure 38) is a somewhat circular enclosure - constructed of medium pahoehoe boulders-located on undulating pahoehoe lava terrain.

The enclosure, measuring 3.4 m. (11.1 ft.) N/S by 5.3 m. (17.3 ft.), has a faced eastern segment with a maximum height of 0.65 m. (2.1 ft.). The south, north, and west sides of the enclosure are existing bedrock. The interior of the enclosure is bedrock with small amounts of scattered boulders.

No artifacts or midden were observed.

Testing Results

Subsurface testing was conducted at Site 20728 to determine site function, examine cultural deposits and to collect datable charcoal for radiocarbon analysis.

A 1.0 m. by 1.0 m. test unit was placed at the center interior of the southern side of the enclosure over a boulder, cobble, and bedrock floor. The unit was excavated to a maximum depth of 18 cm. below surface and terminated upon reaching bedrock covered by a 2-3 cm. layer of organic humus and rootlets. The boulder cobble fill of the enclosure floor extended to bedrock; there was no soil layer present and only 7.5 gms. of *kukui* endocarp were recovered from the test unit.

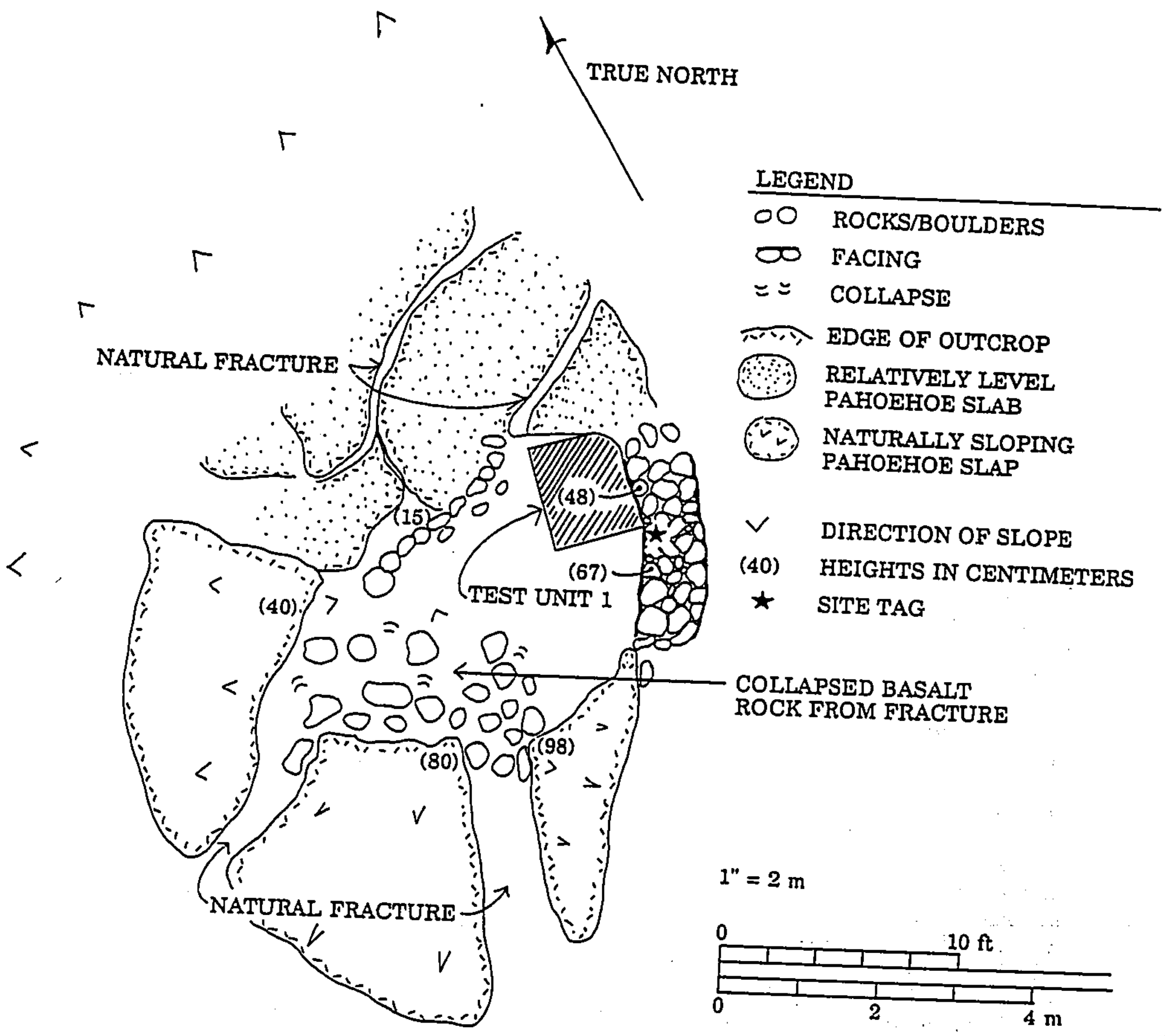


Figure 38 State site 50-10-27-20728, Plan View

State Site #: 50-10-27-20729 **CSH SITE #:** 36
Site Type: Modified tumulus
Function: Undetermined
Features (#): 1
Dimension: 27.0 m.^{2} (290.4 ft.^{2})
Elevation: 100 ft. a.m.s.l.

Description: Site 50-10-27-20729 (Figure 39) is a modified tumulus with the modification consisting of a discontinuous piled rock alignment. The terrain consists of pahoehoe gently sloping *makai*, with sparse soil deposits which support various grasses, *kiawe, noni,* and *koa haole*.

The alignment is constructed of large cobbles to small boulders on an exposed raised portion of the pahoehoe tumulus. The stacking is never more than 2 courses high with a maximum height of 0.2 m. (0.7 ft.), forming a discontinuous alignment with bare bedrock visible under the piled rocks.

No artifacts or midden were observed and excavation potential of the site is poor.

State Site #: 50-10-27-20730 **CSH SITE #:** 37
Site Type: Modified tumulus
Function: Temporary habitation
Features (#): 1
Dimension: 69.3 m.^{2} (741.2 ft.^{2})
Elevation: 140 ft. a.m.s.l.

Description: Site 50-10-27-20730 (Figure 40) is a modified tumulus defined by a leveled modification on the surface of a small terraced area at the tumulus base. The terrain consists of undulating pahoehoe lava with sparse deposits of soil that support various grasses and *koa haole*.

The leveled area measures 4.6 m. (15.1 ft.) SE/NW by 3.3 m. (10.8 ft.) SW/NE, with a maximum facing height of the northeast edge being 0.4 m. (1.3 ft.). It is composed of medium pahoehoe cobbles with the interior consisting of small pahoehoe pebbles and the pahoehoe bedrock at the base of the tumulus at 4.2 m. (13.8 ft.) northwest from the western edge of the leveled area is a small terraced area, measuring 2.6 m. (8.5 ft.) SE/NW by 1.1 m. (3.6 ft.) with a maximum height of 0.4 m. (1.3 ft.). It is composed of small to medium sized pahoehoe boulders.

No midden or artifacts were observed, and excavation potential is poor.

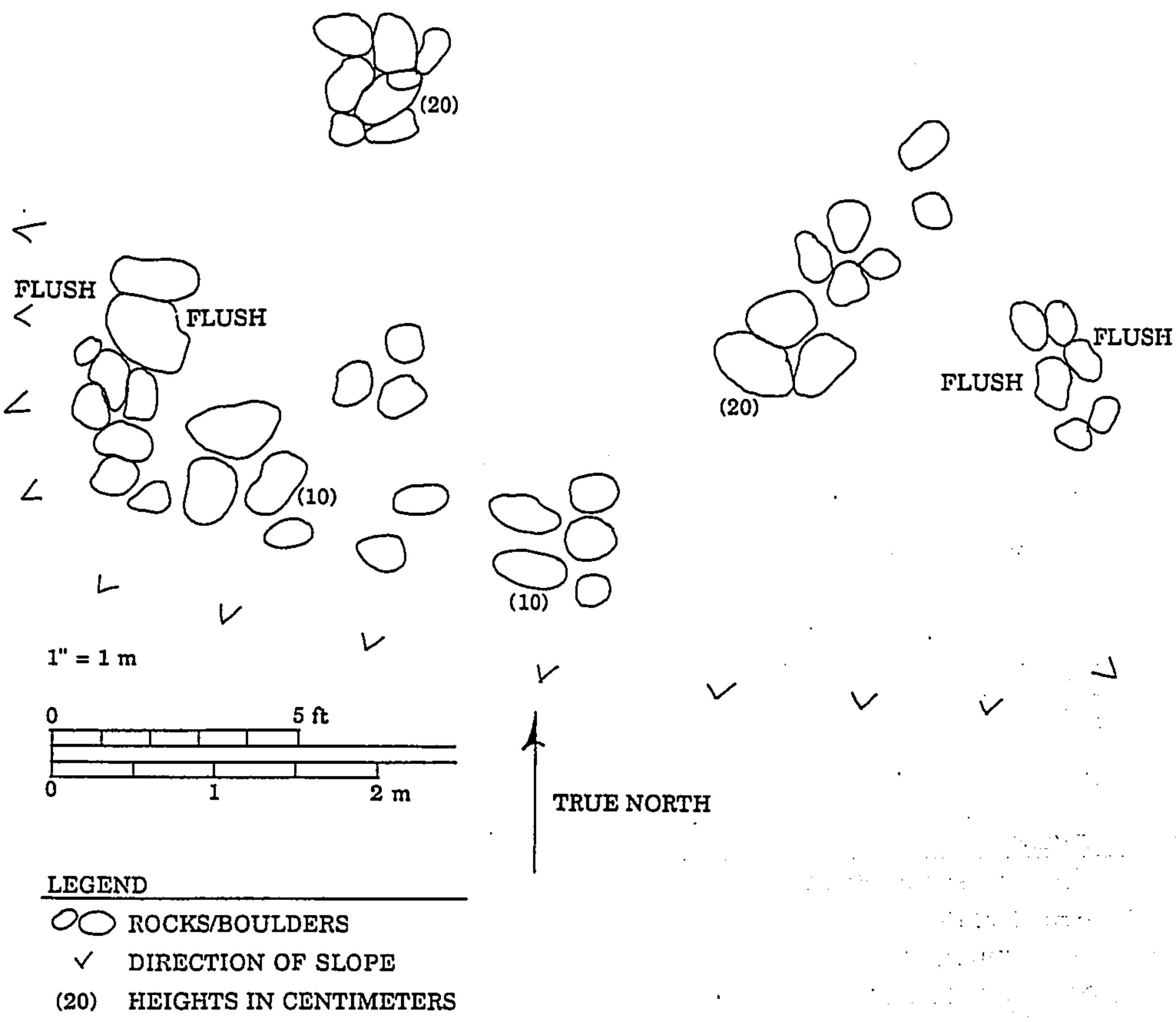


Figure 39 State site 50-10-27-20729, Plan View

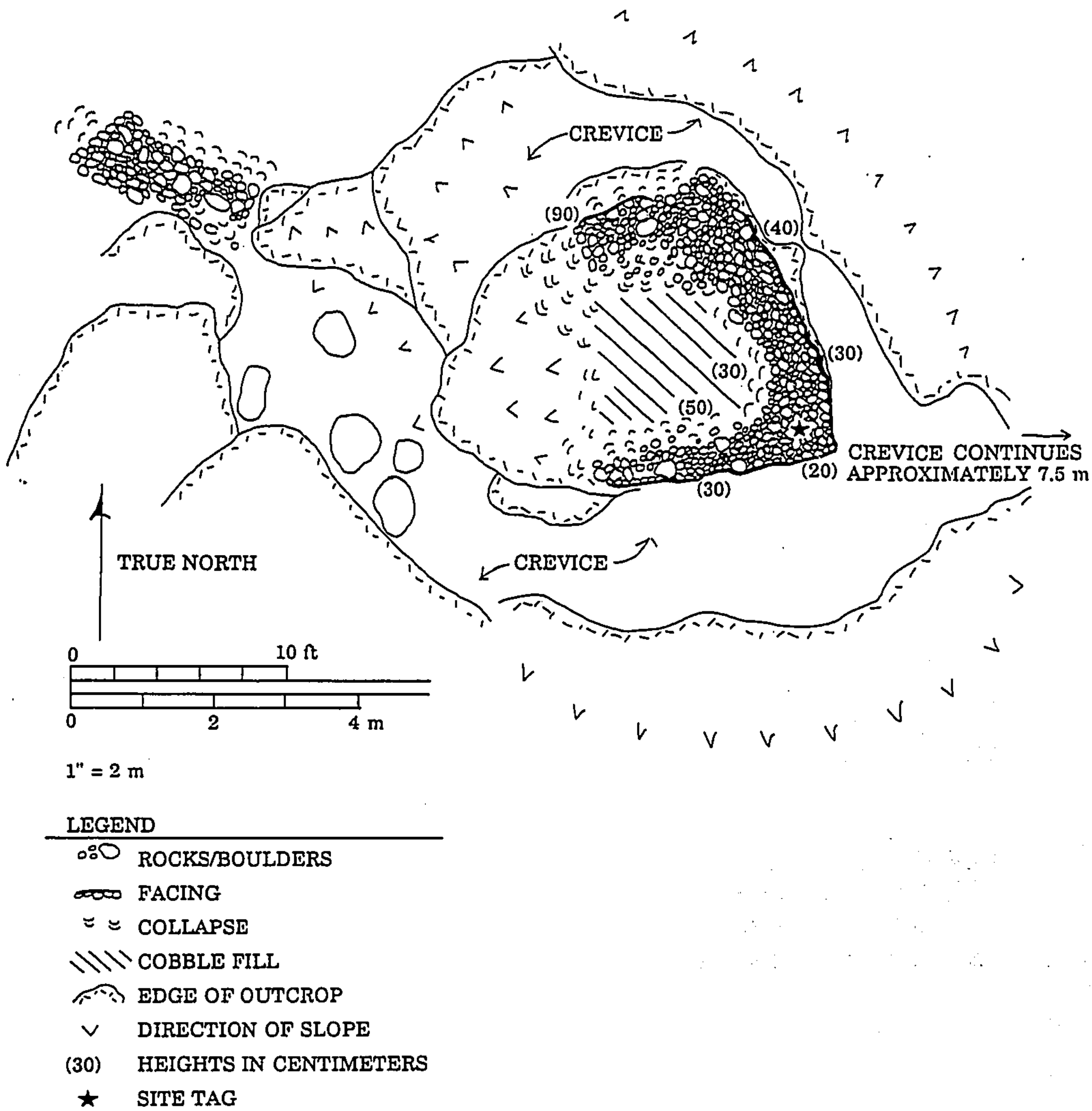


Figure 40 State site 50-10-27-20730, Plan View

State Site #: 50-10-27-20731 **CSH SITE #:** 38
Site Type: Modified tumulus
Function: Possible burial
Features (#): 1
Dimension: 3.0 m.^{2} (32.5 ft.^{2})
Elevation: 120 ft. a.m.s.l.

Description: Site 50-10-27-20731 (Figure 41) is a modified tumulus defined by a filled crevice. The terrain consists of undulating pahoehoe lava gently sloping to the southwest. Vegetation at the site consists of various grasses and *koa haole*.

The filled crevice measures 3.7 m. (12.1 ft.) E/W by 1.5 m. (4.9 ft.) N/S. The fill consists of small to medium sized pahoehoe boulders which is not level with the surrounding bedrock outcrop.

No artifacts or midden were observed.

State Site #: 50-10-27-20732 **CSH SITE #:** 39
Site Type: Trail
Function: Transportation
Features (#): 1
Dimension: approximately 50.3 m.^{2} (165.0 ft.^{2})
Elevation: 100 ft. a.m.s.l.

Description: Site 50-10-27-20732 is a discontinuous pahoehoe stepping stone trail located on a rough undulating a'a flow. No soil is present, and vegetation consists of sparse grass.

The trail travels in a *mauka/makai* direction, and appears to just terminate in the center of the a'a flow.

No artifacts or midden were observed. Excavation potential of the site is poor.

State Site #: 50-10-27-20733 **CSH SITE #:** 40
Site Type: Trail
Function: Transportation
Features (#): 1
Dimension: approximately 45.1 m.^{2} (148.0 ft.^{2})
Elevation: 110 ft. a.m.s.l.

Description: Site 50-10-27-20733 is a cobble trail located on the surface of the undulating a'a lava.

The trail crosses the a'a flow in a NW/SE direction. It is constructed of large a'a pebbles to small a'a cobbles. Larger a'a boulders have been cleared from the trail. The stones are worn and rounded, suggesting extensive use in the past. The only portion of the trail visible is that which lays across the a'a flow as the trail disappears once on the surrounding pahoehoe.

The site is in poor remnant condition offering no excavation potential.

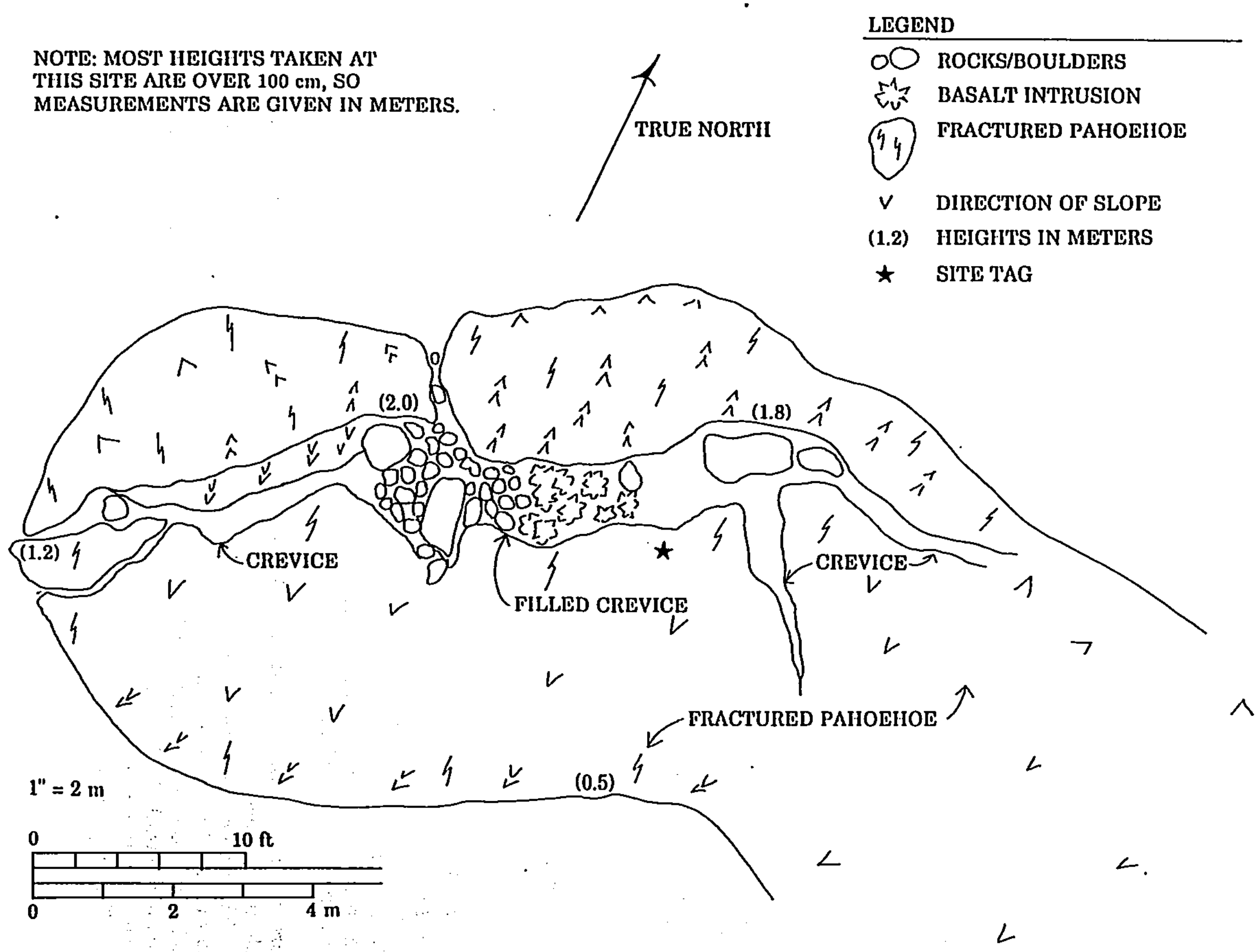


Figure 41 State site 50-10-27-20731, Plan View

State Site #:	50-10-27-20734	**CSH SITE #:** 41
Site Type:	Planting area	
Function:	Agriculture	
Features (#):	1	
Dimension:	3.6 m.^{2} (38.6 ft.^{2})	
Elevation:	125 ft. a.m.s.l.	

Description: Site 50-10-27-20734 (Figure 42) is a small narrow planting area located in gently sloping pahoehoe lava flow. Vegetation at the site consists of various grasses and *koa haole* located in sparse pockets of soil.

The planting area consists of a natural depression within the exposed pahoehoe measuring 3.0 m. (9.8 ft.) N/S by 1.2 m. (3.9 ft.) E/W that has been cleared of all internal boulders and cobble. This fill has been thrown onto the surrounding outcrop creating a depression with a maximum depth of 0.6 m. (2.0 ft.).

No cultural material was observed. Excavation potential is poor.

State Site #:	50-10-27-20735	**CSH SITE #:** 42
Site Type:	Complex	
Function:	Temporary habitation/storage/transportation	
Features (#):	4	
Dimension:	1539.0 m.^{2} (16,555.3 ft.^{2})	
Elevation:	80 ft. a.m.s.l.	

Description: Site 50-10-27-20735 (Figure 43) consists of four features designated A-D. Feature A is a *mauka-makai* running wall. Feature B is a storage area consisting of nine separate sunken pits. Feature C is a mound, and Feature D a cobble trail extending eastward. The site is located on a rough a'a flow that slopes gently *makai*. Vegetation at the site consists of sparse areas of various grasses and *koa haole*.

Feature A is a wall located in the northwest portion of the site on top of an a'a ridge, and runs in a general E/W direction for 27.5 m. (90.2 ft.), with a maximum height of 1.2 m. (3.9 ft.), and width ranging from 0.7 m. (2.3 ft.) to 2.5 m. (8.2 ft.). The wall is constructed of roughly piled a'a cobbles and boulders with some facing apparent in various portions of the wall. A level area of a'a pebbles measuring 2.5 m. (8.2 ft.) N/S by 2.0 m. (6.6 ft.) E/W is located 1.6 m. (5.2 ft.) north of the eastern end of Feature A. On the south side of Feature A wall (between Feature A and Feature B) is a large leveled area of a'a pebbles. The southeast edge of this level area slopes south for 2.5 m. (8.2 ft.) to the northern edge of Feature B. No culture was observed.

Feature B consists of nine pits and several small leveled areas within an area measuring 10.0 m. (32.8 ft.) N/S by 12.0 m. (39.4 ft.) E/W. located south of Feature A wall and west of Feature D trail. The pits vary slightly in size and condition the smallest is 0.3 m. (0.9 ft.) by 0.2 m. (0.6 ft.) and 0.3 m. (0.9 ft.) deep; and the largest 0.6 m. (2.0 ft.) by 0.5 m. (1.7 ft.) and 0.8 m. (2.6 ft.) deep. All are constructed of a'a cobbles and small

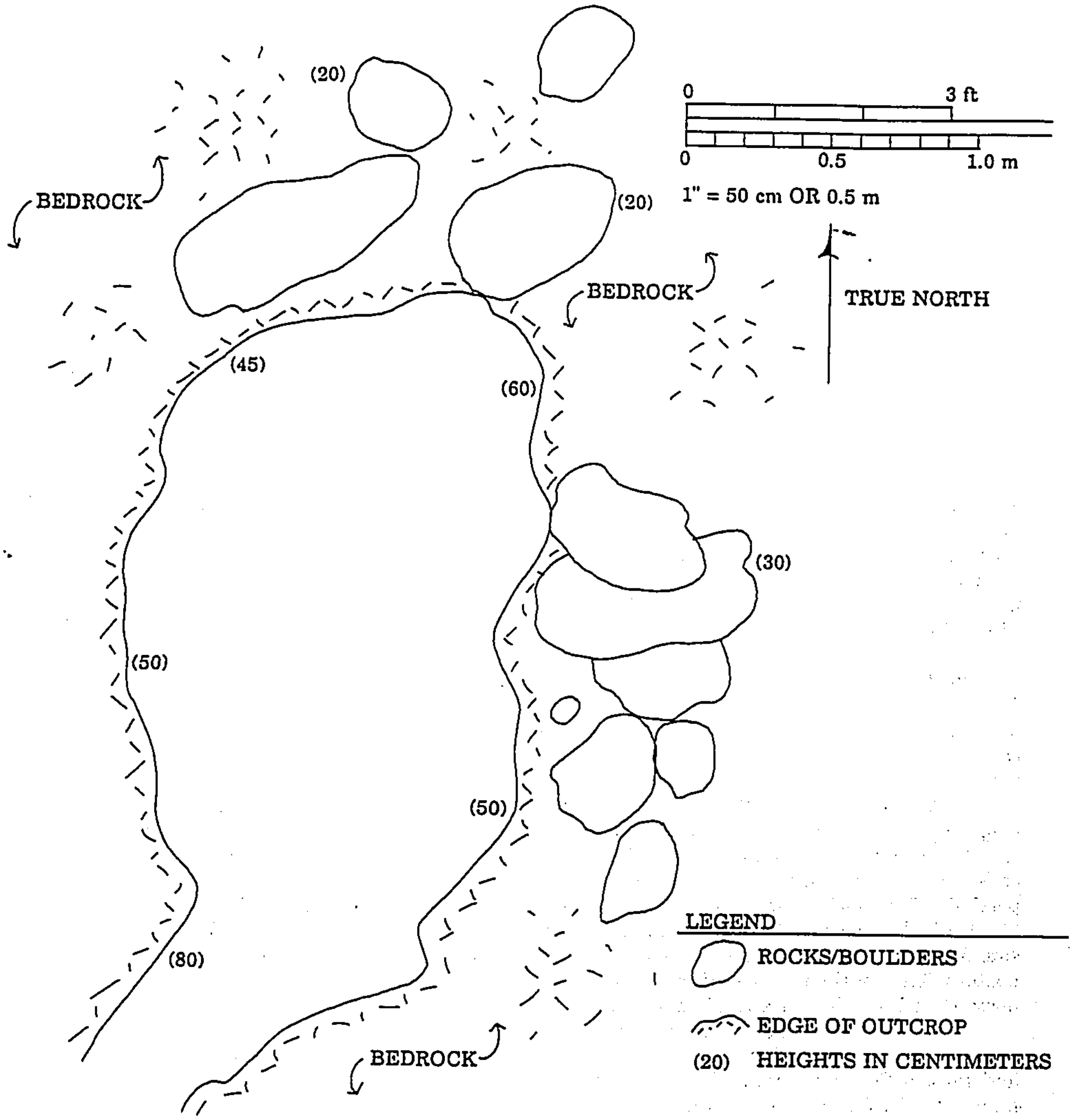


Figure 42 State site 50-10-27-20734, Plan View

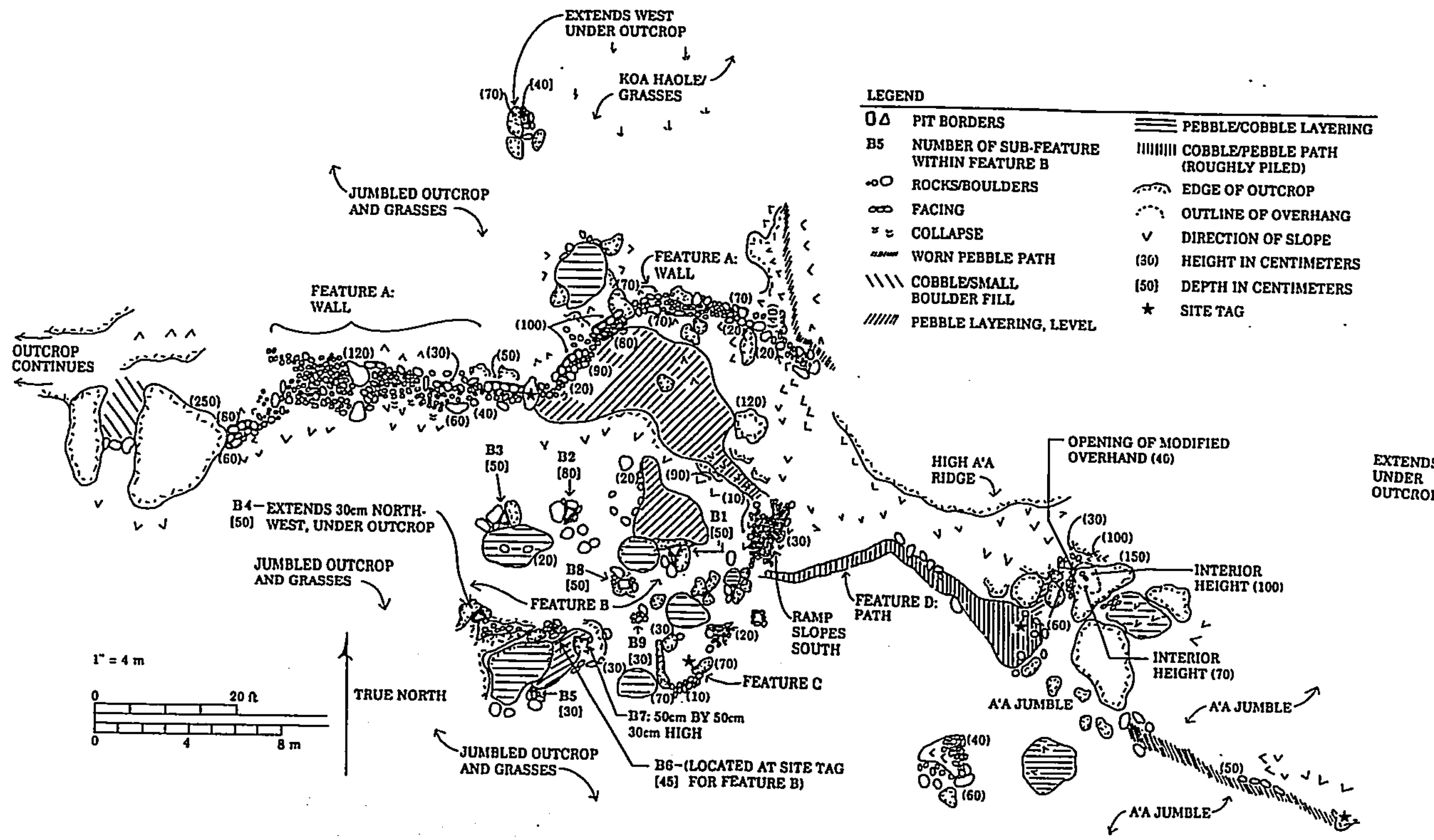


Figure 43 State site 50-10-27-20735, Site Complex, Plan View

boulders placed upright at angles to create a small enclosed space. The pits bases are filled with small a'a pebbles. Between these pits are sporadic areas of leveled a'a using small to medium sized a'a cobbles. No culture was observed at these presumed water container receptacle pits.

Feature C is a mound located at the southeast corner of Feature B. The modification consists of an a'a cobble and small boulder fill area between two protruding accretion boulders.

Feature D consists of a path and adjacent modified a'a overhang. The cobble trail runs roughly NW/SE from the eastern edge of Feature B for 26.5 m. (86.9 ft.) where it ends in the center of an a'a flow. Construction of the trail is minimal consisting of a trodden path of small rounded a'a cobbles suggesting heavy use at one time.

No culture was observed. Excavation potential is fair.

State Site #:	50-10-27-20736	**CSH SITE #:** 43
Site Type:	Trail	
Function:	Transportation	
Features (#):	1	
Dimension:	approximately 85.3 m.^{2} (280.0 ft.^{2})	
Elevation:	95 ft. a.m.s.l.	

Description: Site 50-10-27-20736 is a stepping stone trail located on an undulating a'a lava. Vegetation consists sparse areas of *koa haole*.

The trail consists of small to medium sized pahoehoe boulder slabs set into an extensively cleared path through the a'a flow. The trail runs in a *mauka-makai* direction. Near the discernable *mauka* end, the trail forks, with one fork heading to the northwest. Both branches continue for another 10-13 m. (32.8-42.6 ft.), where each disappears into the surrounding vegetation and pahoehoe lava.

At the end of the trail segment that branches off to the northwest is an *ahu* constructed of pahoehoe boulders stacked five courses high.

The condition of the trail is good. The excavation potential of the site is poor.

State Site #:	50-10-27-20737	**CSH SITE #:** 44
Site Type:	Trail	
Function:	Transportation	
Features (#):	1	
Dimension:	approximately 32.0 m.^{2} (105.0 ft.^{2})	
Elevation:	80 ft. a.m.s.l.	

Description: Site 50-10-27-20737 is a trodden path type trail located on an undulating a'a flow. The trail is composed of small to medium a'a cobbles that are worn smooth by trail use. The trail is only visible on the surface of the a'a flow and disappears once off it (i.e. onto pahoehoe lava), thus the total length of the trail is undetermined.

No culture or midden were observed.

Excavation potential is poor.

State Site #: 50-10-27-20738 **CSH SITE #:** 45
Site Type: Enclosures
Function: Agriculture
Features (#): 2
Dimension: 159.1 m.^{2} (1707.7 ft.^{2})
Elevation: 100 ft. a.m.s.l.

Description: Site 50-10-27-20738 (Figures 44 & 45) consists of two features, designated A and B, located adjacent to an a'a flow. The features are considered associated because of their proximity. The terrain consists of undulating a'a and pahoehoe. Vegetation at the site consists of various grasses, *kiawe* and *koa haole*.

Feature A is a C-shaped enclosure measuring 8.6 m. (28.2 ft.) N/S by 5.9 m. (19.3 ft.) E/W in which both ends abut the vertical edge of the a'a flow. The wall is bi-faced in most areas with a maximum height of 0.6 m. (2.0 ft.), except where collapse has taken place. The wall is constructed of well stacked boulders and cobbles. The interior of the enclosure consists of areas of sparse soil and exposed bedrock. No midden or artifacts were observed on the surface. Feature A is in good condition.

Feature B is a semi-circular enclosure which also abuts the a'a flow. The enclosure measures 8.0 m. (26.2 ft.) N/S by 3.4 m. (11.2 ft.) E/W, with a maximum interior height of 0.8 m. (2.6 ft.). A large portion of the enclosure's wall is composed of pahoehoe outcrop which has been filled and leveled with small boulders to form the wide,low enclosure. The exterior of the wall is flush with the surrounding terrain. No midden or artifacts were observed on the surface of Feature B. Feature B is in good condition.

Excavation potential for both of the features is poor.

State Site #: 50-10-27-20739 **CSH SITE #:** 46
Site Type: Enclosure/trail
Function: Storage/transportation
Features (#): 2
Dimension: 2.5 m.^{2} (8.4 ft.^{2})
Elevation: 160 ft. a.m.s.l.

Description: Site 50-10-27-20739 (Figure 46) is a rectangular enclosure on pahoehoe lava and a short trail segment located on an adjacent a'a lava. The enclosure is within a small pahoehoe *kipuka* surrounding terrain, to the east and west, consists of two separate a'a flows. Vegetation at the site consists of various grasses and *koa haole*.

This small storage enclosure, measuring 1.7 m. (5.6 ft.) N/S by 1.5 m. (4.9 ft.) E/W with a maximum interior height of 0.4 m. (1.3 ft.), sits directly on the surface of the pahoehoe flow. It is constructed of small to medium pahoehoe boulders stacked 1-4 courses high. The a'a cobble trail segment runs roughly SW/NE along the southwest edge of the small enclosure and disappears once off the surface of the a'a flow to the west.

No artifacts or midden were observed at the site.

Excavation potential is poor.

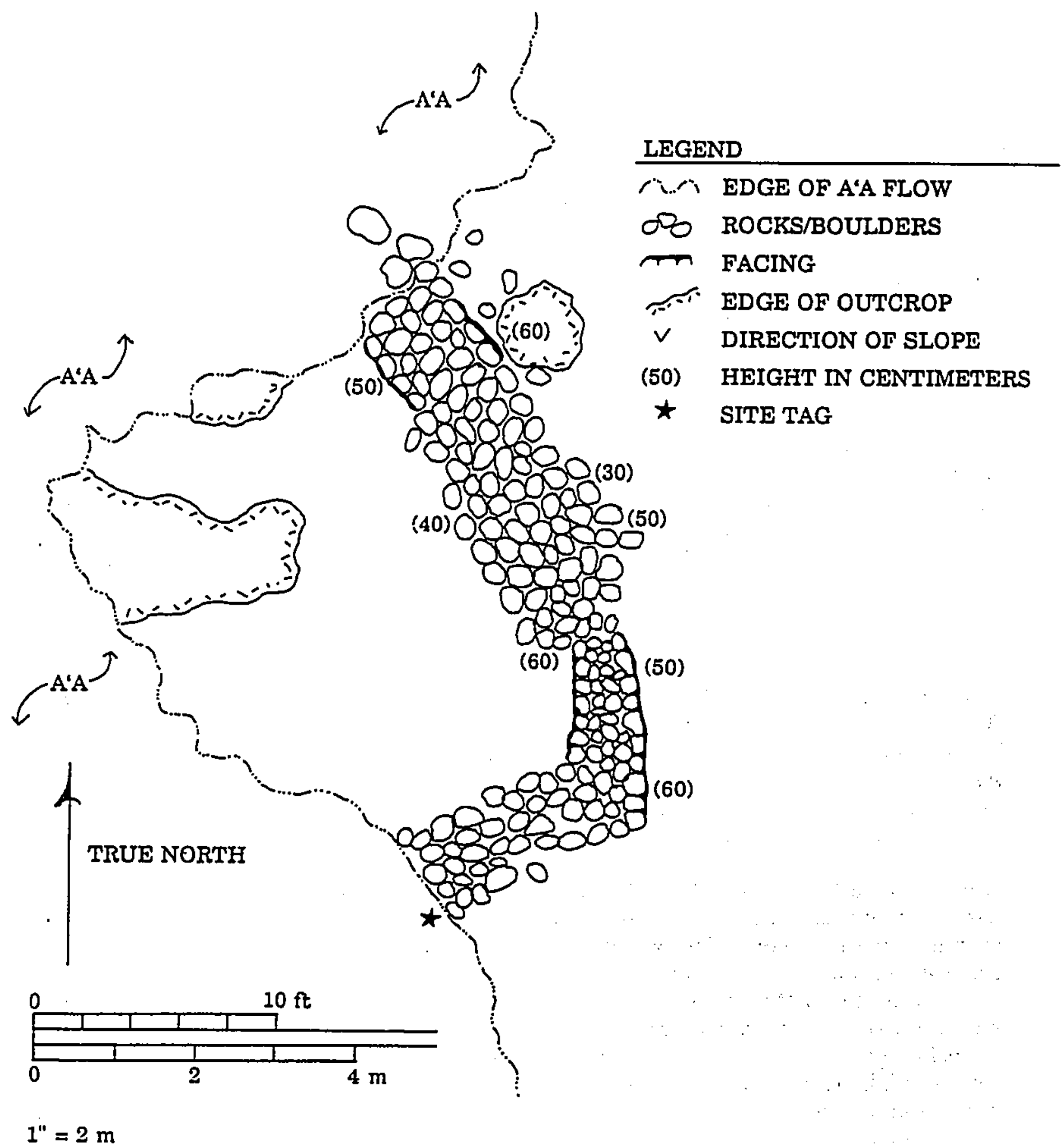


Figure 44 State site 50-10-27-20738 Feature A, Plan View

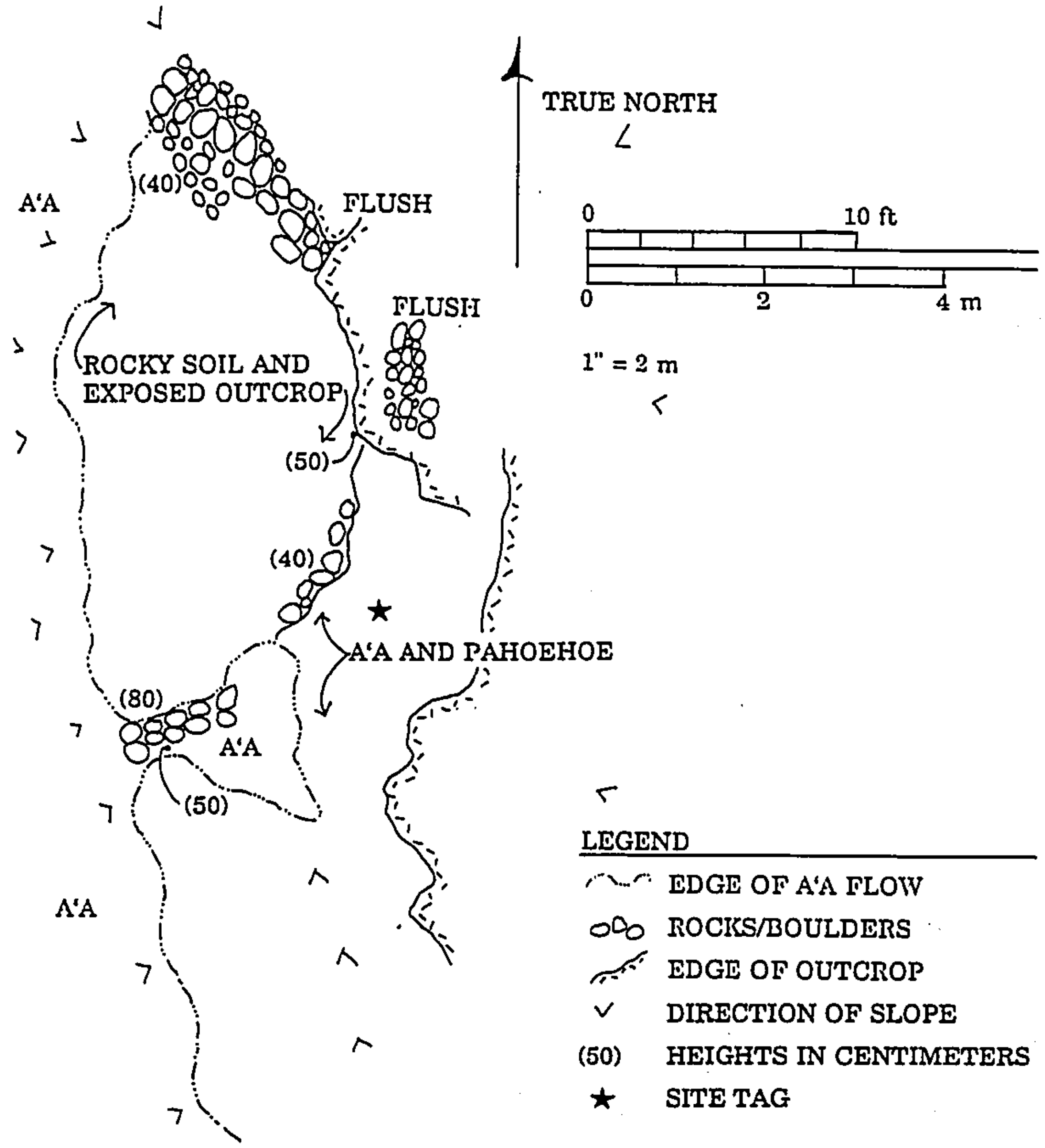


Figure 45 State site 50-10-27-20738 Feature B, Plan View

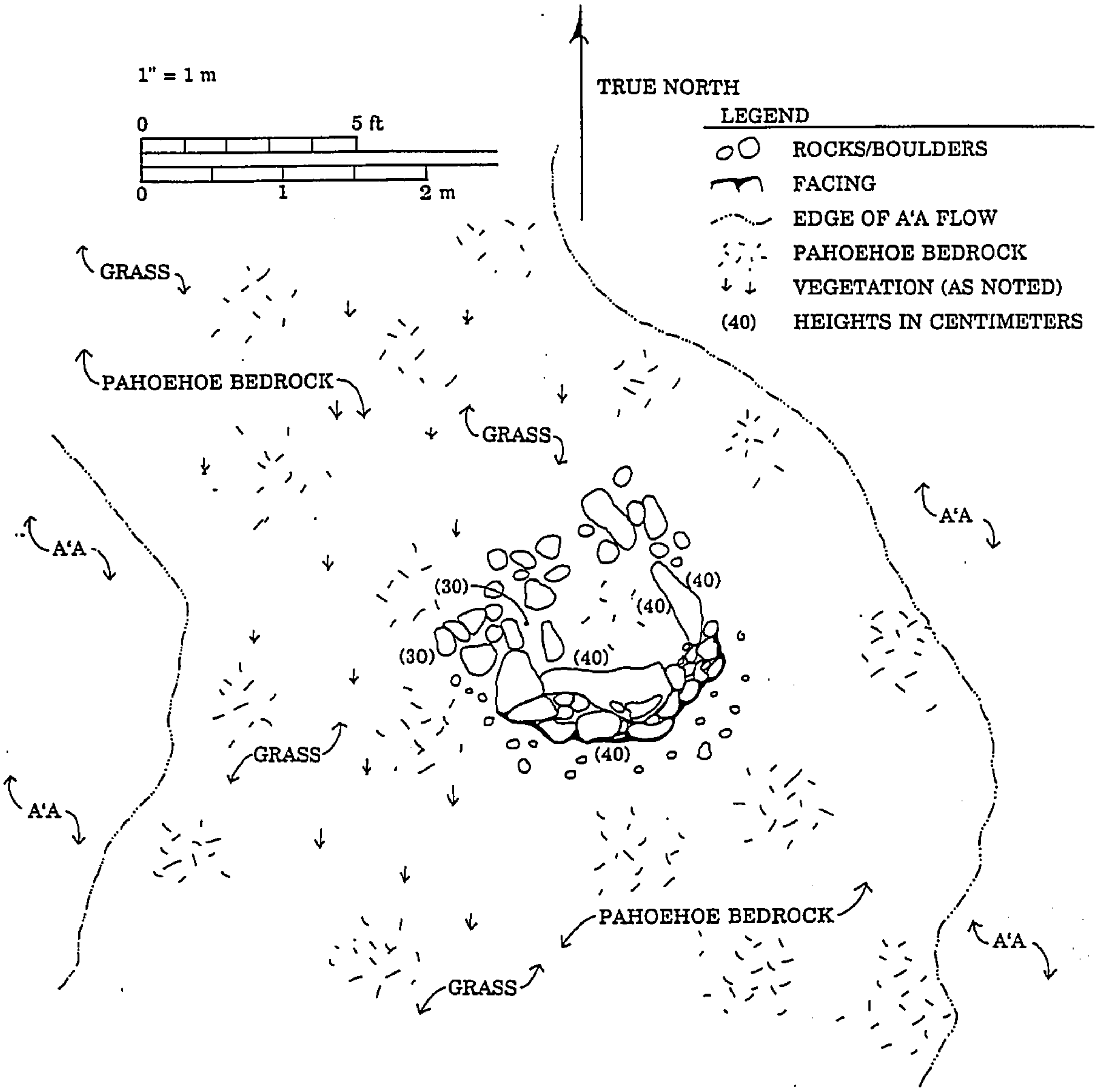


Figure 46 State site 50-10-27-20739, Plan View

State Site #: 50-10-27-20740 **CSH SITE #:** 47
Site Type: Modified tumulus
Function: Agriculture
Features (#): 1
Dimension: 4.2 m.^{2} (45.3 ft.^{2})
Elevation: 310 ft. a.m.s.l.

Description: Site 50-10-27-20740 (Figure 47) is a C-shaped alignment constructed around a filled crevice located on the surface of a pahoehoe tumulus, with the surrounding undulating pahoehoe terrain sloping to the southwest. Vegetation at the site consists of various grasses and *koa haole*.

The C-shaped alignment measures 2.1 m. (6.8 ft.) N/S by 2.0 m. (6.6 ft.) E/W, and is constructed of a single row of vertically placed small boulders and large cobbles. A small blister opening measuring 0.5 m. (1.6 ft.) is located directly adjacent to the C-shaped alignments northeast edge and extends into a small lava tube measuring 0.7 m. (2.3 ft.) in diameter with a maximum height of 0.5 m. (1.6 ft.).

At 2.0 m. (6.6 ft.) northwest from the northern edge of the C-shaped enclosure lies another filled crevice measuring 2.1 m. (6.8 ft.) N/S by 0.4 m. (1.3 ft.). The crevice is filled with small to medium pahoehoe cobbles and is flush with the surface of the outcropping.

No cultural material was observed. Excavation potential is fair.

State Site #: 50-10-27-20741 **CSH SITE #:** 48
Site Type: *Complex*
Function: see below
Features (#): 6
Dimension: 607.5 m.^{2} (6240.2 ft.^{2})
Elevation: 320 ft. a.m.s.l.

Description: Site 50-10-27-20741 (Figure 48) is a complex consisting of 6 features designated A to F. These features are believed associated because of similar construction style, proximity, and similar states of preservation. The site is located on the edge of a barren a'a flow steeply sloping to the southwest. Only sparse grass and *koa haole* occur in the site area.

The site includes a series of pavements and trail segments occurring along the southwest outer edge of the a'a flow and a natural C-shape enclosure on pahoehoe lava abutting the base of the a'a flow.

Feature A is a paved area measuring 7.0 m. (22.9 ft.) N/S by 7.3 m. (23.9 ft.) E/W. It consists of a leveled area upon the a'a flow that has been cleared of all large a'a boulders and paved with small to medium sized a'a cobble.

No artifacts or midden was observed.

Feature B is a small paved area located on the tip of the a'a flow directly below the southern edge of Feature A, and measures 2.3 m. (7.5 ft.) N/S by 2.0 m. (6.6 ft.) E/W. Construction consists of small to medium sized a'a cobbles creating a level surface.

No artifacts or midden were observed.

Feature C is an a'a cobble trail extending north/northeast from the north corner of Feature A, for 9.8 m. (32.1 ft.). It is constructed of small worn a'a cobbles. Larger a'a

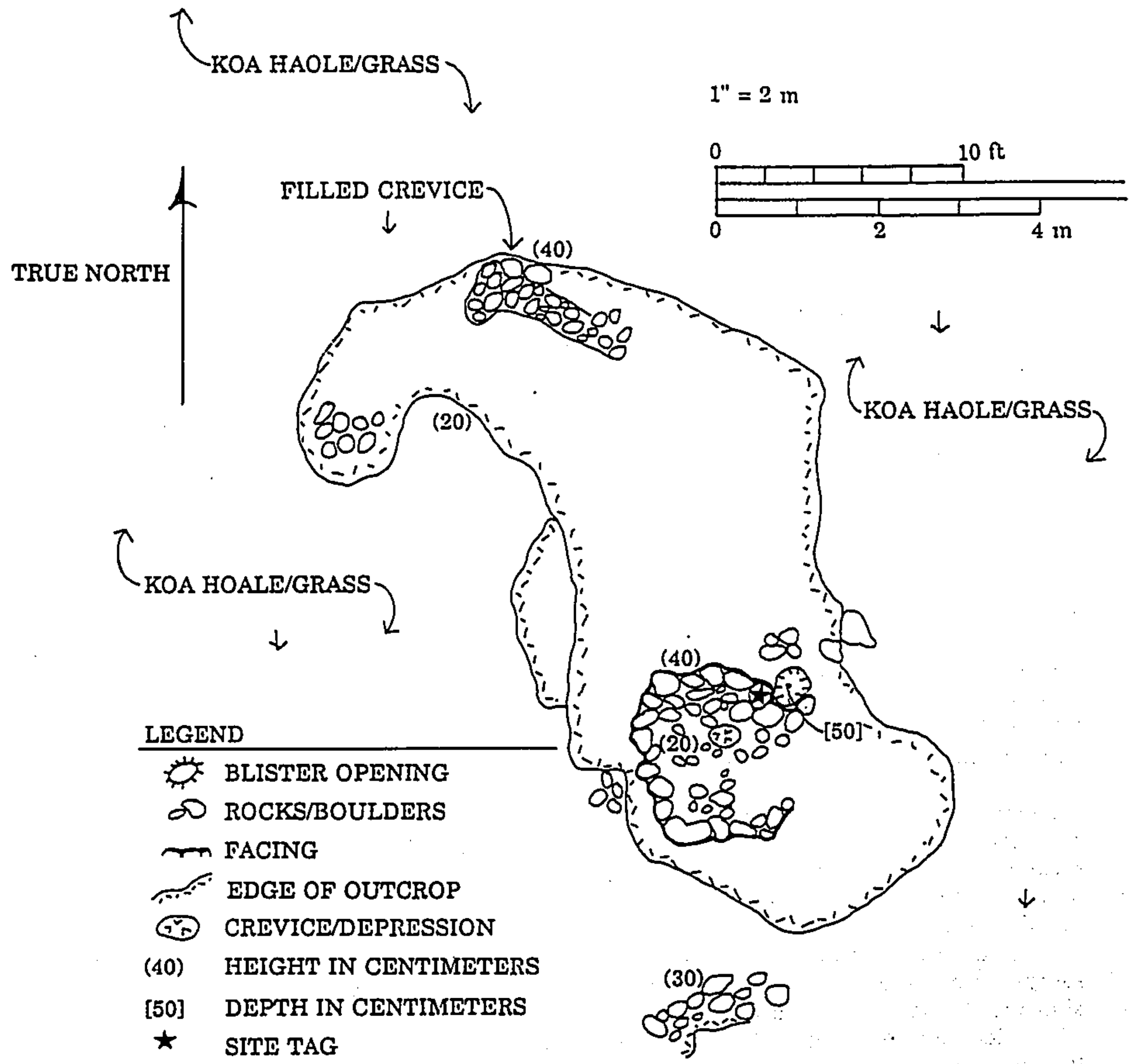


Figure 47 State site 50-10-27-20740, Plan View

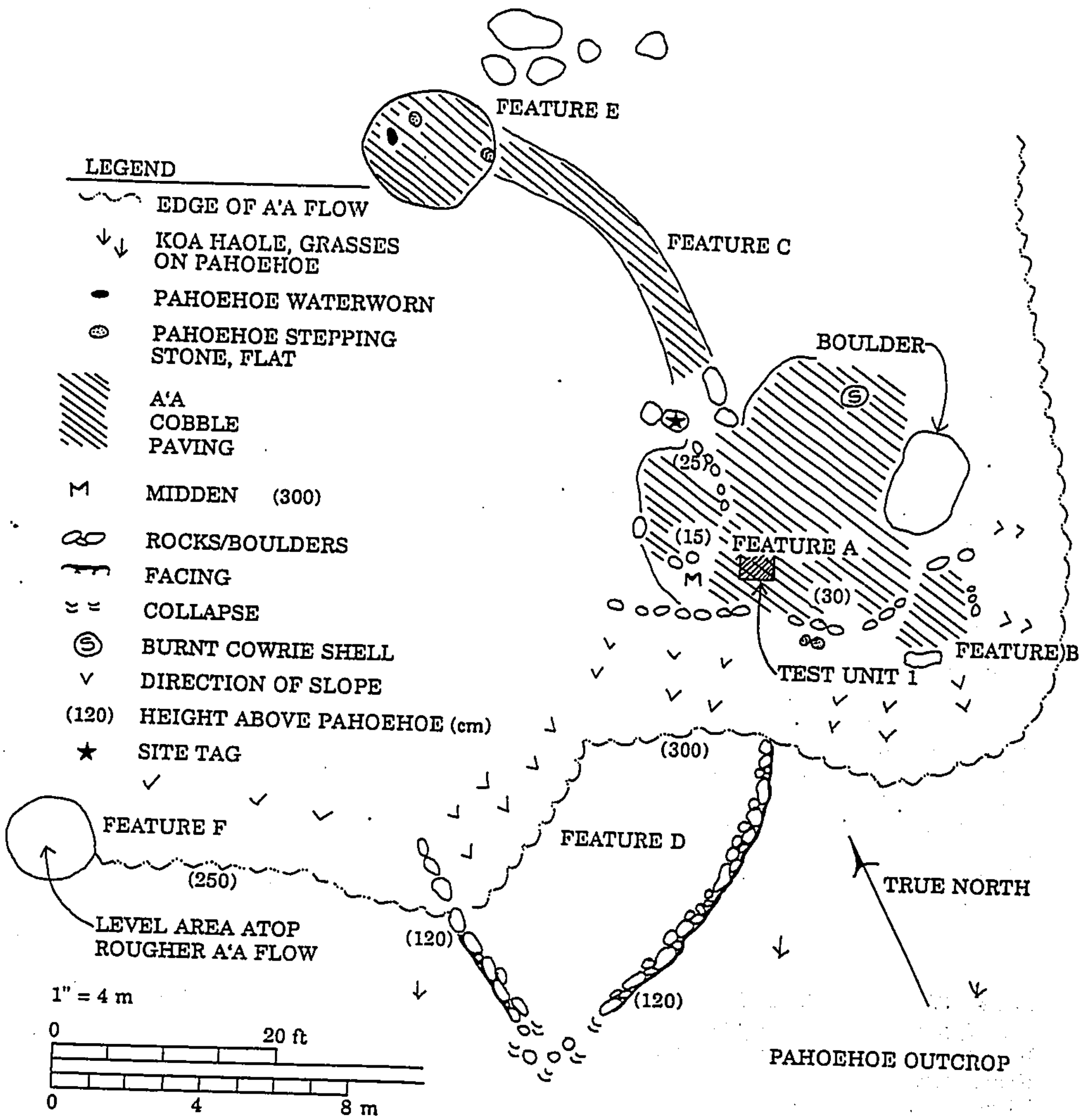


Figure 48 State site 50-10-27-20741, Site Complex, Plan View

boulders have been removed from the base of the path to create a semi-smooth surface. The trail is 0.9 m. (2.9 ft.) at its widest.

No artifacts or midden was observed.

Feature D is a C-shaped enclosure buffering the base of the a'a flow, and is located 4.1 m. (13.4 ft.) down the steep face of the a'a flow. The N/S running portion of the enclosure wall measures 5.1 m. (16.7 ft.) and is bi-faced except at the southern end where the wall has collapsed. The other wall segment extends eastward for 9.4 m. (30.8 ft.) until it connects with the steep a'a flow which forms the whole northern side of the enclosure. Maximum height of the enclosure's walls is 1.2 m. (3.9 ft.). The interior is a depression that has been partially filled with a'a crumble from the steep a'a embankment to the north.

No cultural material was observed.

Feature E is a small leveled area measuring 2.1 m. (6.8 ft.) N/S by 2.6 m. (8.5 ft.) E/W located at the northern end of Feature C trail. It is consists of a level area that has been cleared of all existing large a'a boulders and paved with small to medium a'a cobbles.

No artifacts or culture were observed.

Feature F is a small leveled area measuring 2.0 m. (6.6 ft.) N/S by 2.2 m. (7.2 ft.) E/W abutting the western tip of the a'a flow 17.0 m. (55.8 ft.) west of the western edge of Feature A.

No culture was observed at the Feature.

Excavation potential of the site is fair.

Testing Results

Subsurface testing was conducted at Feature A of Site 20741. Feature A was tested to determine site function, examine cultural deposits, and collect datable charcoal for radiocarbon analysis.

A 1.0 m. by 1.0 m. test unit was placed in the northeast section of Feature A, on the surface of the a'a cobble paved area. The unit was excavated to a maximum depth of 36 cm., and terminated upon reaching bedrock. The a'a cobble fill, designated Stratum I, of the paved area extended to bedrock. There was no soil layer present.

Stratum I (0-36 cm.) consisted of angular a'a cobble loosely compacted with little organic material present. Marine midden was recovered from Stratum I, included only 5.3 gms. of snakehead cowrie (*lehokupu* or *Cypraea caputserpentis*).

CSH SITE #: 50

State Site #:	50-10-27-20742
Site Type:	Lava tube
Function:	Temporary habitation
Features (#):	1
Dimension:	70.1 m.^{2} (754.4 ft.^{2})
Elevation:	290 ft. a.m.s.l.

Description: Site 50-10-27-20742 (Figure 49) is a lava tube with an entrance located in a small crevice. The terrain is undulating pahoehoe lava. Vegetation at the site consists of various grasses and *koa haole*.

The lava tube is oriented N/S; the entrance is located approximately midway

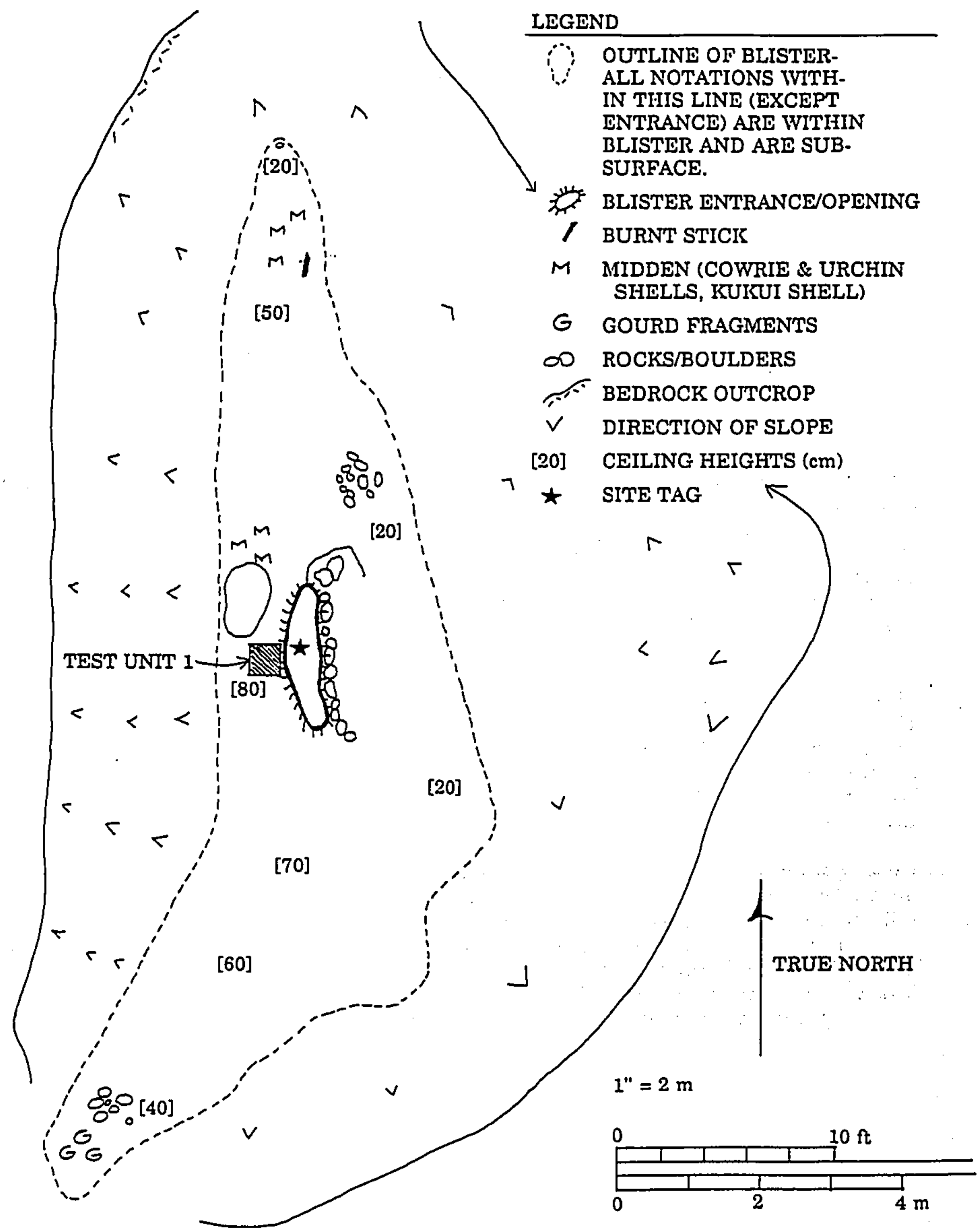


Figure 49 State site 50-10-27-20742, Plan View

between the tube's north and south ends. The floor of the tube is generally rough lava with sporadic areas of sparse soil. The tube measures 17.1 m. (56.1 ft.) N/S long; width ranges from 3.2 m. (10.5 ft.) near the entrance, to approximately 1.0 m. (3.3 ft.) at the north and south ends. Ceiling height does not exceed 0.8 m. (2.6 ft.).

Some midden -including *kukui*, urchin, and cowrie- was observed, along with several fragments of gourd, located in the southern end of the tube.

Testing Results

Limited testing was conducted at Site 20742 lava tube to determine the function of the site, examine subsurface deposits, and to collect charcoal for radiocarbon dating analysis. The testing consisted of excavating an 50 cm. by 50 cm. unit placed within a soil area beneath the lava tube's entrance. The surface of the unit did contain some scattered marine midden.

The unit was excavated to underlying pahoehoe bedrock to a maximum depth of 5 cm. One stratigraphic layer - Stratum I - was observed during the excavation. Stratum I was a very dark grayish brown (10 YR 3/2) silty loam.

An ash sample was taken from the NE corner of the test unit from 3-5 cm. below the surface which contained 1.3 gms. pitchy sea snail (*pipipi* or *Nerita picea*); 0.9 gms. sea urchin (*wana* or *Echinoderm*); and 0.5 gms. of charcoal. Total midden collected from the rest of the test unit consists of: 13.2 gms. snakehead cowrie (*lehokupu* or *Cypraea caputserpentis*); 1.7 gms. pitchy sea snail (*pipipi* or *Nerita picea*); 0.2 gms. dye shells (*papua* or *Thaididae sp.*); 0.9 gms. *Isognomon sp.*; 4.0 gms. sea urchin (*wana* or *Echinoderm*); 0.4 gms. unidentified bone; and 2.7 gms. *kukui* endocarp. 7.8 gms. of charcoal were collected.

State Site #: 50-10-27-20743 **CSH SITE #:** 51
Site Type: Modified tumulus
Function: Possible burial
Features (#): 1
Dimension: 4.0 m.^{2} (13.1 ft.^{2})
Elevation: 115 ft. a.m.s.l.

Description: Site 50-10-27-20743 (Figure 50) is a modified tumulus defined by a filled crevice. The terrain consists of undulating pahoehoe lava with scattered pockets of soil which support various grasses and *koa haole*.

The filled crevice in the top of a pahoehoe tumulus measures 2.0 m. (6.6 ft.) N/S by 2.0 m. (6.6 ft.) E/W. Fill consists of small to medium sized pahoehoe cobbles to create a level area upon the tumulus surface.

No artifacts or midden were observed at the site.

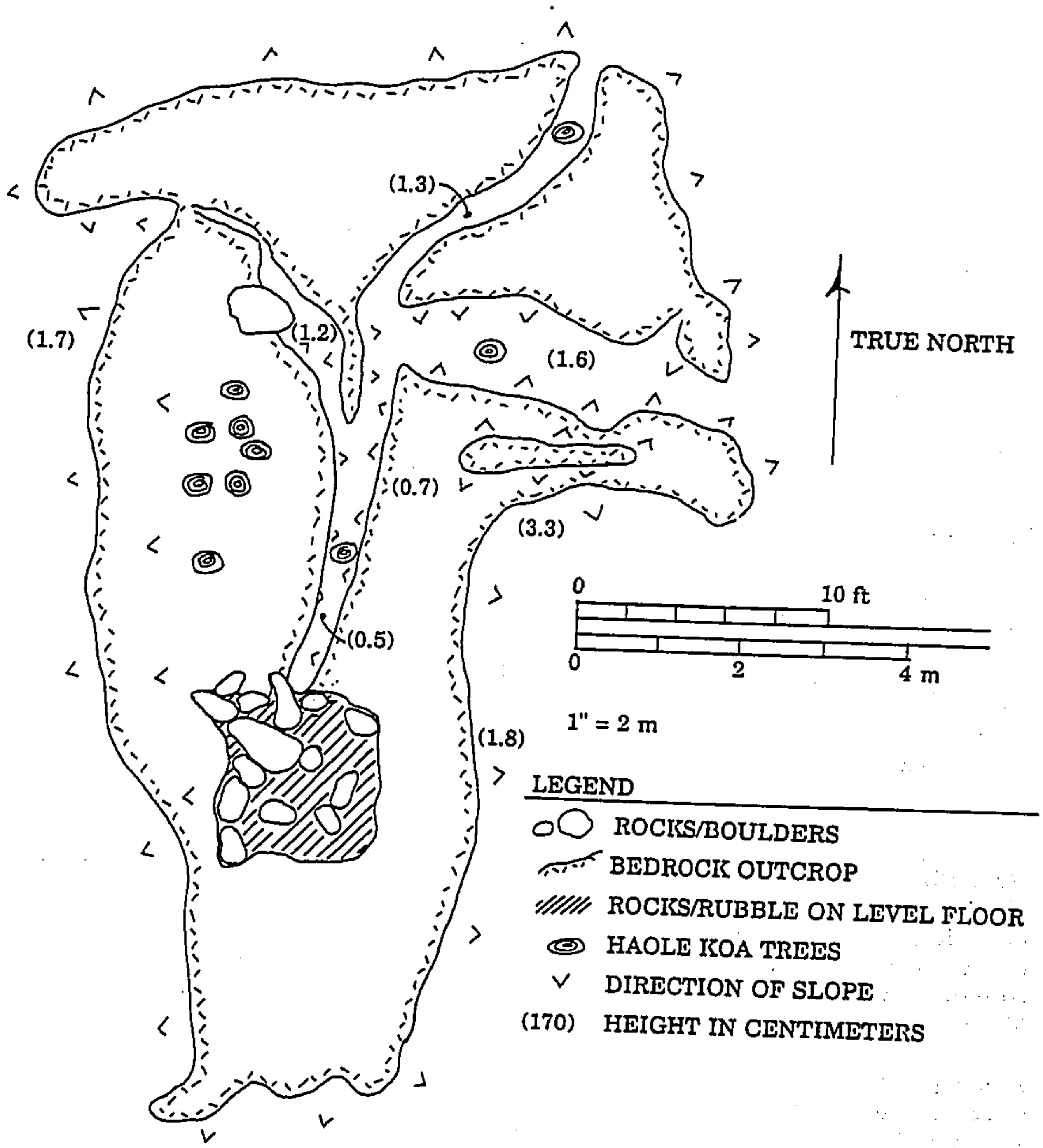


Figure 50 State site 50-10-27-20743, Plan View

State Site #: 50-10-27-20744 **CSH SITE #:** 53
Site Type: Trail
Function: Transportation
Features (#): 1
Dimension: 11.0 m.^{2} (36.1 ft.^{2})
Elevation: 120 ft. a.m.s.l.

Description: Site 50-10-27-20744 is a stepping stone trail segment located on an undulating a'a lava.

The trail segment crosses an a'a flow in a N/S direction and measures 11.0 m. (36.1 ft.) in length by 0.5 m. (1.6 ft.) wide. The trail is composed of well laid pahoehoe stepping stones set into small a'a cobbles. The stones are evenly spaced and continue for the length of the trail. The trail disappears once off the a'a flow, thus the total length of the trail is not known.

No artifacts or midden were observed. Excavation potential is poor.

State Site #: 50-10-27-20745 **CSH SITE #:** 54
Site Type: Trail
Function: Transportation
Features (#): 1
Dimension: 28.0 m.^{2} (91.8 ft.^{2})
Elevation: 120 ft. a.m.s.l.

Description: Site 50-10-27-20745 is a stepping stone trail located on a'a lava. The trail crosses the a'a flow in a SW/NE direction and measures 28.0 m. (91.8 ft.) long by 0.5 m. (1.6 ft.) wide. The trail is composed of pahoehoe stepping stones laid into small worn a'a cobbles. The stones are evenly spaced and continue for the entire length of the trail. The trail is only visible on the surface of the a'a flow and disappears once on the bordering flow of pahoehoe. Thus the total length of the trail is not known.

No midden or artifacts were observed. Excavation potential is poor.

State Site #: 50-10-27-20746 **CSH SITE #:** 55
Site Type: Lava tube
Function: Storage
Features (#): 1
Dimension: 48.2 m.^{2} (653.2 ft.^{2})
Elevation: 80 ft. a.m.s.l.

Description: Site-50-10-27-20746 (Figure 51) is a lava tube located in the southwest corner of the project area in undulating pahoehoe terrain. Vegetation at the site consists of various grasses and *koa haole* within small sporadic patches of soil.

The tube measures 11.2 m. (36.7 ft.) NE/SW by 5.2 m. (17.1 ft.) NW/SE, with a maximum height of 1.4 m. (4.6 ft.). There is only one entrance into the tube located in the northeast corner measuring 0.5 m. (1.6 ft.) wide. A wooden artifact was observed directly 1.7 m. (5.6 ft.) northeast of the tube entrance; it measures 36.0 cm long, by 5.8 cm. wide with a maximum thickness of 5.6 cm. and is presumed to be a tapa beater.

No other culture was observed. Excavation potential of the site is poor.

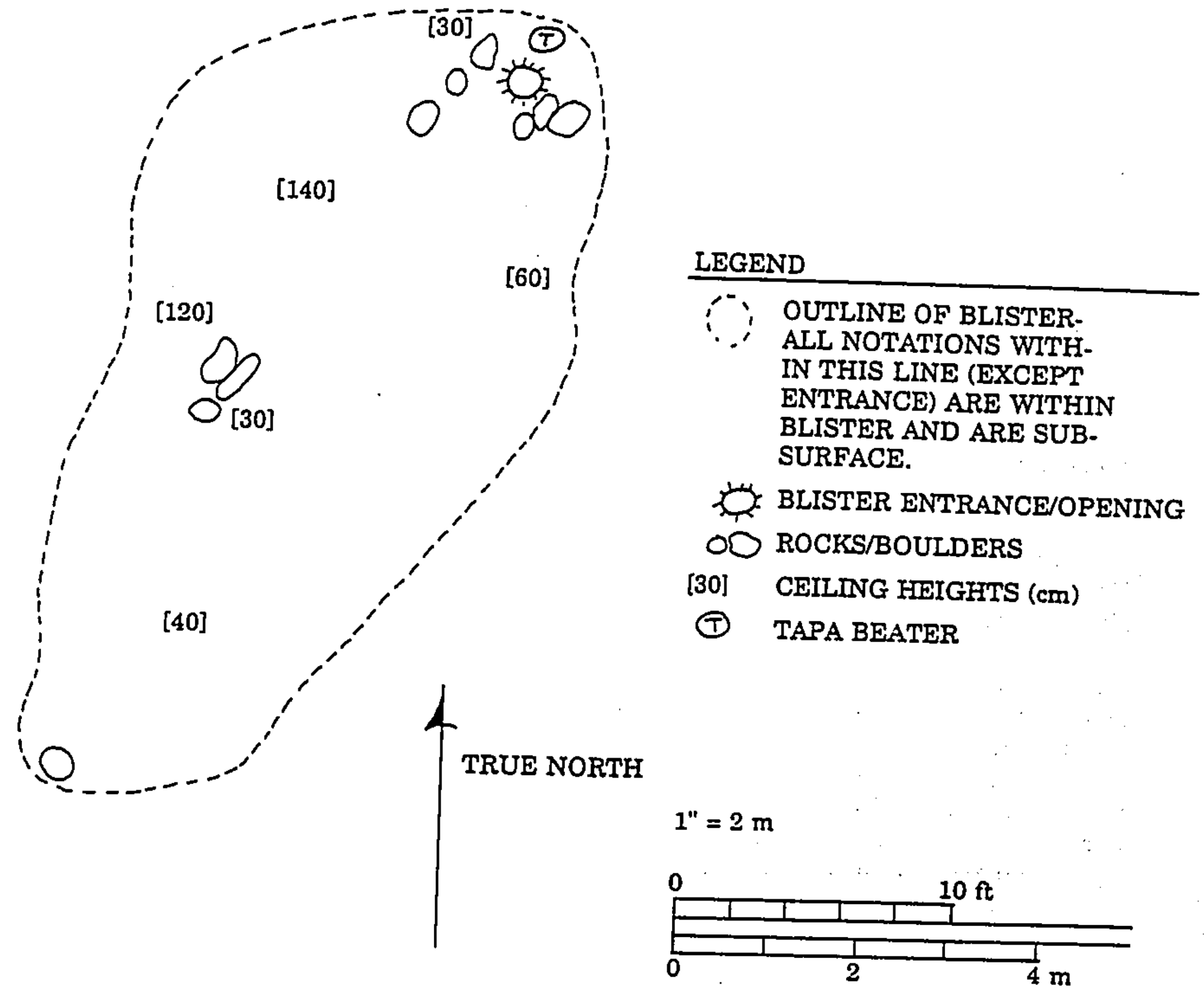


Figure 51 State site 50-10-27-20746, Plan View

State Site #: 50-10-27-20747 **CSH SITE #:** 57
Site Type: Trail
Function: Transportation
Features (#): 1
Dimension: 21.0 m.^{2} (69.9 ft.^{2})
Elevation: 270 ft. a.m.s.l.

Description: Site 50-10-27-20747 is comprised of two short segments, of a pahoehoe stepping stone trail, which extends roughly NE/SW along the north-eastern edge of a large a'a flow. The longer of the two segments extends for 11.0 m. (36.6 ft.) and is composed of flat pahoehoe slabs placed upon the a'a. The trail then disappears over a pahoehoe area. The second segment, measuring 10.0 m. (33.3 ft.) and extends to the southwest from the area where the first segment disappeared. It is composed of flat pahoehoe slabs placed upon the a'a and also disappears once on the pahoehoe lava terrain.

No culture was observed. Excavation potential is poor.

State Site #: 50-10-27-20748 **CSH SITE #:** 58
Site Type: Lava tube
Function: Indeterminate
Features (#): 1
Dimension: 66.0 m.^{2} (216.5 ft.^{2})
Elevation: 280 ft. a.m.s.l.

Description: Site 50-10-27-20748 (Figure 52) is a lava tube located beneath a generally level pahoehoe lava surface that is surrounded by an a'a flow. The surface vegetation consists of various grasses and *koa haole.*

The lava tube measures 11.0 m. (36.1 ft.) NW/SE by 6.0 m. (19.7 ft.) with a maximum height of 0.8 m. (2.6 ft.). In the northeast corner of the tube were 4 flat pahoehoe slabs in no particular arrangement. No soil was present inside the tube.

No artifacts or midden were observed.

Excavation potential of the site is poor.

State Site #: 50-10-27-20749 **CSH SITE #:** 59
Site Type: Terrace/Lava tube
Function: Temporary habitation/Possible burial
Features (#): 2
Dimension: 106.7 m.^{2} (351.7 ft.^{2})
Elevation: 200-250 ft. a.m.s.l.

Description: Site 50-10-27-20749 (Figures 53 & 54) consists of two features designated A and B. Feature A is a terrace buffering a pahoehoe outcrop. Feature B is a

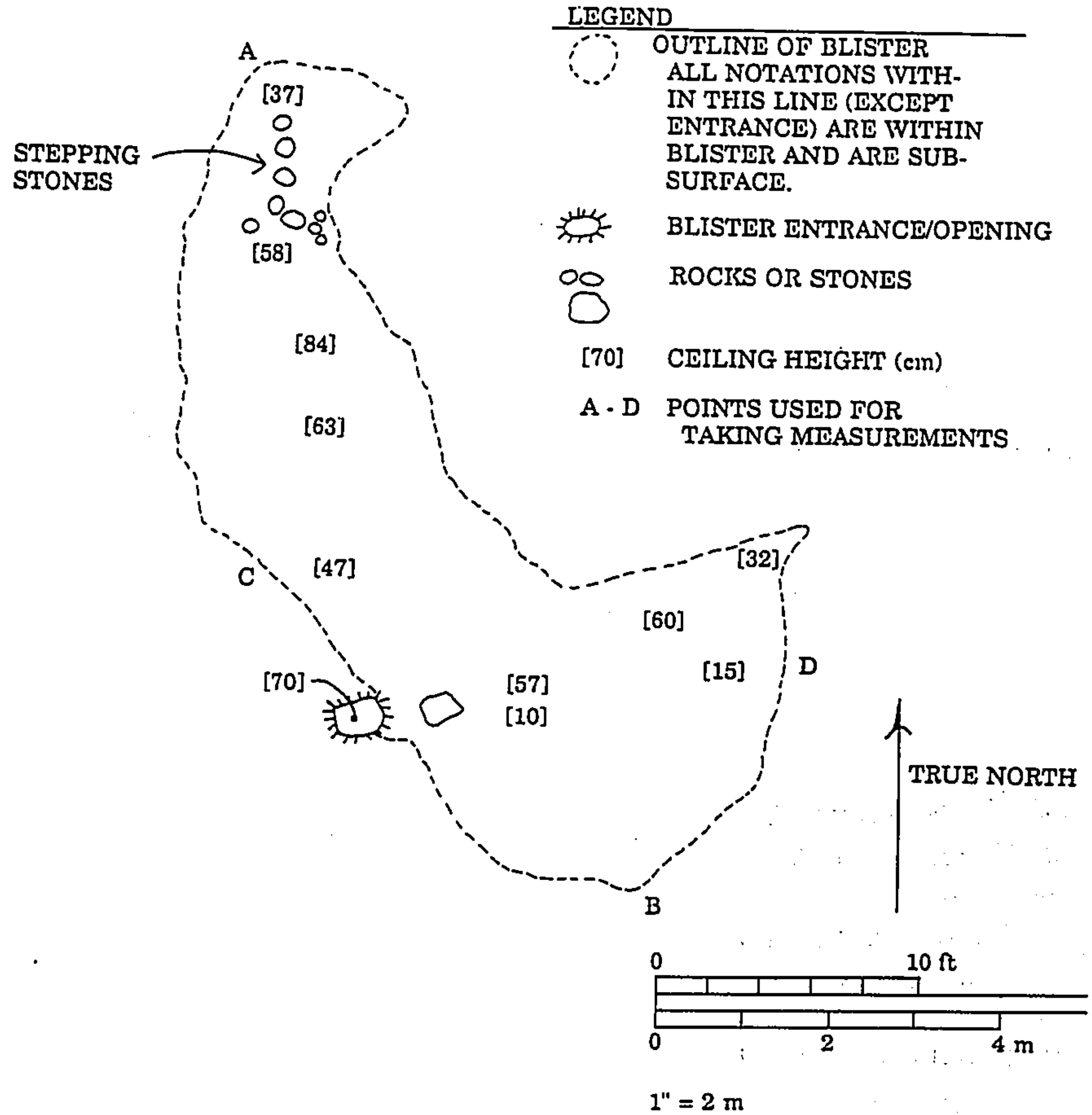


Figure 52 State site 50-10-27-20748, Plan View

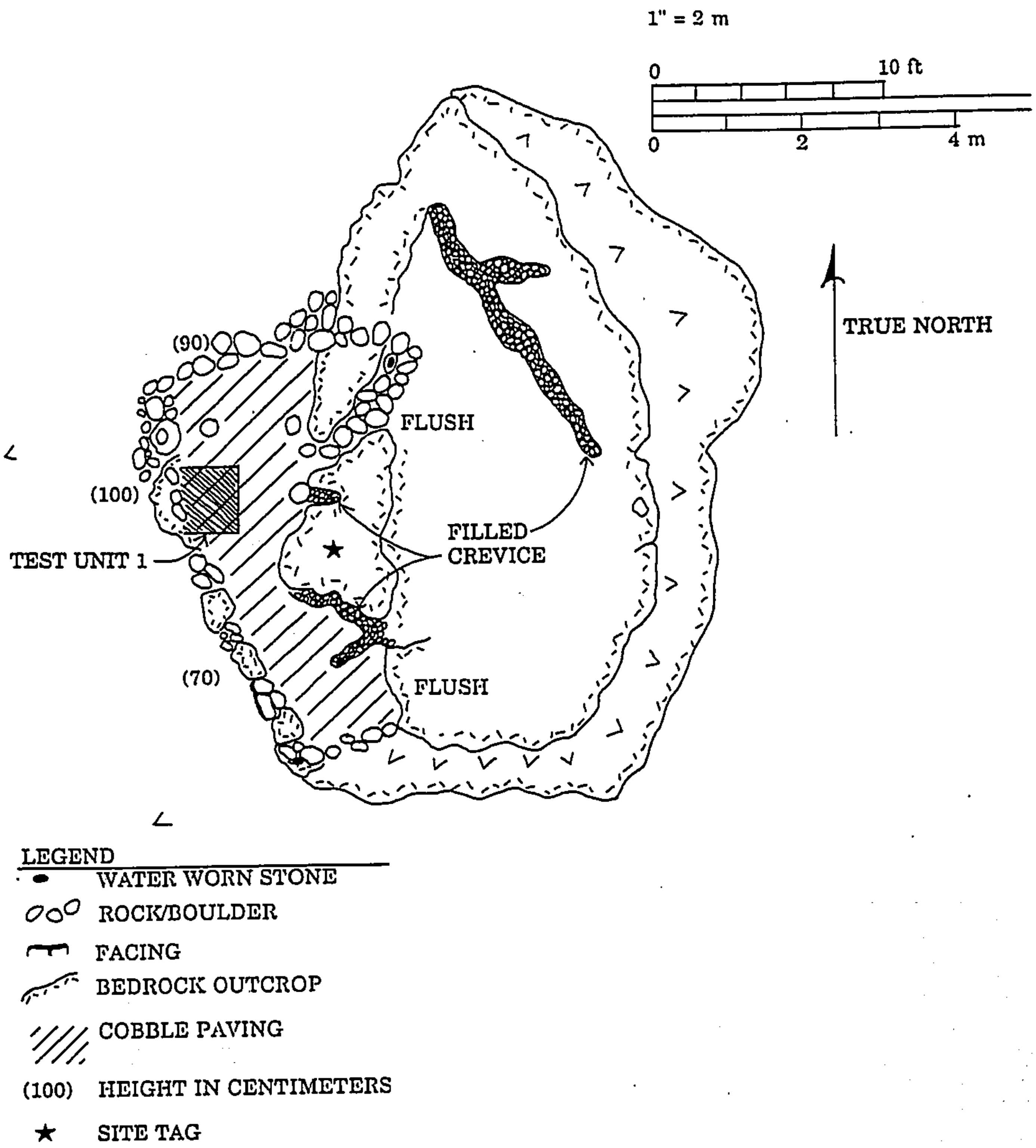


Figure 53 State site 50-10-27-20749 Feature A, Plan View

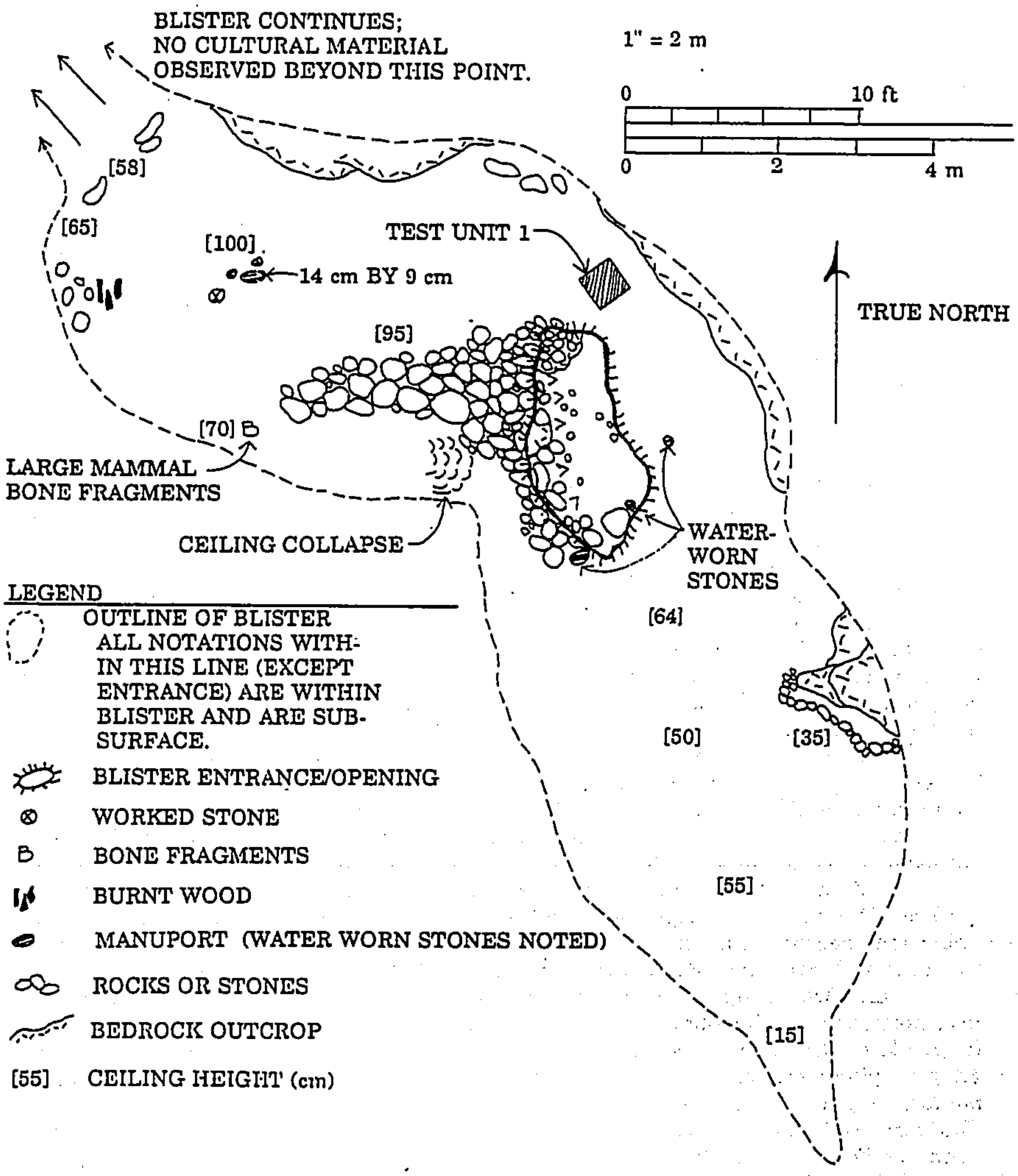


Figure 54 State site 50-10-27-20749 Feature B, Plan View

lava tube. The two features are located on the top (i.e. Feature A) and northeast flank (i.e. Feature B) of a pahoehoe tumulus which slopes gently to the southwest. Vegetation at the site consists of various grasses and *koa haole*.

Feature A is a terraced structure abutting the southwest edge of the pahoehoe tumulus. It measures 5.7 m. (18.8 ft.) N/S by 2.2 m. (7.3 ft.) E/W, with a maximum height on the southwest side of 1.0 m. (3.3 ft.). The surface of the terrace is level and paved with small to medium pahoehoe cobbles and large flat pahoehoe slabs. No cultural material was observed.

Excavation potential is fair.

Feature B is a lava tube located just *mauka* of Feature A at the base of the pahoehoe tumulus. The lava tube contained one entrance situated above the center of the tube. The tube extended in a NE/SW direction for a total length of 18.1 m. (59.4 ft.), with a maximum height of 0.9 m. (3.0 ft.) in the northeast section of the tube.

Significant amounts of midden were observed in the tube, including of various marine shell fragments, mammal bone, *kukui* endocarps, burnt wood, and possible human bone fragments. There were also 6 artifacts scattered throughout the tube. The floor contained ample amounts of soil near the entrance, and sparse pockets scattered in small areas.

Excavation potential of this site is good.

Testing Results (Figure 55)

Subsurface testing was conducted at Features A and B of Site 20749. The features were tested to determine site function, examine natural and cultural deposits and to collect datable charcoal for radiocarbon analysis.

A 1.0 m. by 1.0 m. unit (test unit 1) was placed at the center of Feature A terrace over a small boulder, large cobble leveled surface. The unit was excavated to a maximum depth of 42 cm. below surface and terminated upon reaching bedrock. The boulder-cobble fill of the terrace reached a maximum depth of 30 cm., designated Stratum I. A soil layer, designated Stratum II was present at the base of the rock fill and extended to the underlying bedrock at 42 cm..

Stratum I (0-30 cm.) consisted of angular basalt cobbles. No soil was present. Terrestrial midden was recovered, including: 2.3 gms. sea urchin (*wana* or *Echinoderm*); 0.3 gms. unidentified bone; 47.1 gms. *kukui* endocarp; and 4.1 gms. of charcoal.

Stratum II (12 cm. thick) consisted of loosely compacted, dark brown (7.5 YR 3/2) silt loam with a 5% basalt pebble content and many rootlets. No culture was observed.

A 1.0 m. by 1.0 m. unit (test unit 2) was excavated in Feature B lava tube. The surface of the unit was covered with scattered marine midden. The unit was excavated to underlying bedrock to a maximum depth of 3 cm. One stratigraphic layer - Stratum I - was observed. Stratum I was a very dark grayish (10 YR 3/1) silt loam.

Terrestrial and marine midden was collected from Stratum I. The midden inventory includes the following: 2.0 gms. limpets (*'opihi* or *Cellana*); 39.9 gms. cone shell (*pupu'ala* or *Conus sp.*; 16.8 gms. snakehead cowrie (*lehokupu* or *Cypraea caputserpentis*); 4.9 gms. pitchy sea snail (*pipipi* or *Nerita picea*); 1.4 gms. polished nerite (*kupe'e* or *Nerita polita*); 1.0 gms. auger shell (*pupulolo* or *Terebra sp.*); 1.5 gms. dye shell (*papua* or *Thaididae sp.*); 0.8 gms. *Isognomon*; 17.6 gms. unidentified shell; 20.8 gms. sea urchin (*wana* or *Echinoderm*; 2.2 gms. unidentified bone; 61.9 gms. *kukui* endocarp; and 48.2 gms. of charcoal. Artifacts collected in the test unit consisted of: 1 bird bone pick; 1 basalt manuport; 1 volcanic glass scraper; and 9 flakes of volcanic glass. Also, two wood samples were collected from the surface of the lava tube.

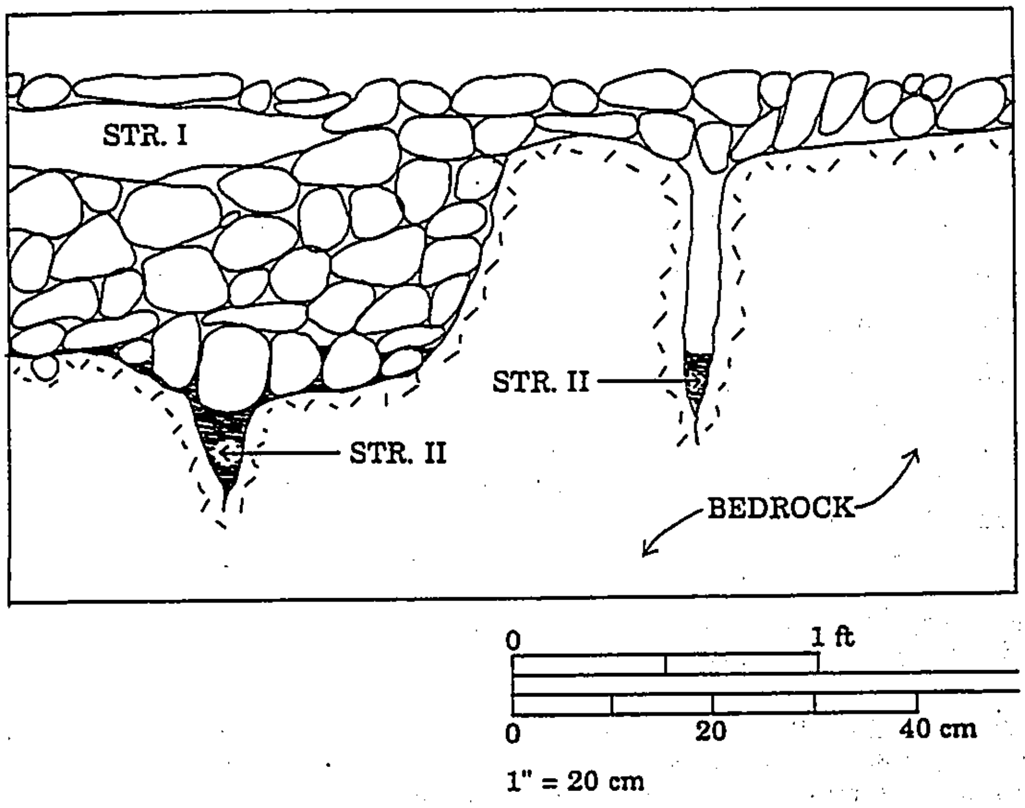


Figure 55 State site 50-10-27-20749 Feature A, Post-excavation Profile

VII. SURVEY RESULTS

During the inventory survey, a total of 90 structural and non-structural (lava tubes, blisters and rock shelters) features were identified within the project area. Fifty (50) of these features were combined into fifteen (15) complexes and the remaining forty (40) sites are single-feature sites. As a result of the inventory survey, 55 sites were recorded with the project area.

It is believed that all prehistoric and historic sites in the project area have been identified and properly recorded.

A. Formal Feature Types

Formal feature type designations are descriptive - based on physical characteristics - and commonly refer to structural elements of a site. Seventeen primary feature types were identified within the project area. The following are brief descriptions of the different feature types encountered during the inventory survey:

Ahu: A cairn of stacked or piled stones.
Alignment: A single row of stones one courses high.
C-shape: A walled structure which partially encloses an area.
Enclosure: A walled structure which completely encloses an area.
Lava blister: A small subterranean lava formation. Unlike lava tubes, however, they tend to be circular and do not extend in any direction for a great length.

Lava tube: Modifications or apparent usage of a subterranean lava formation characteristic of pahoehoe lava flows.

Modified depression: An area in which stones have been removed, usually on a lava flow, to create a depression. A modified depression differs from a planting area in that it appears to have functioned as a storage area rather than a planting area.

Modified tumulus: An area within an existing lava flow in which a portion of the flow has been humanly modified by the placement or removal of stones (a modified tumulus differs from a modified outcrop in that a modified tumulus is in a field of exposed outcrop whereas a modified outcrop may be surrounded by soil).

Mound: Linear, circular or amorphous stone pile which typically lacks a vertical face and level surface.

Pavement: A stone-filled floor or surface.
Planting area: An area in which the only modification consists of the removal of stones to create an area suitable for agriculture either in soil or possibly through mulching.

Platform: A raised free-standing stone structure with three or more vertical faces.
Quarry: A area in which there has been clearly definable mining of stone.
Rock shelter: Varying degrees of construction which modifies a rock shelter (or outcrop overhang). This structure is distinguished by an apparent primary focus on the enhancement of natural features.

Terrace: A raised stone construction partially built against, or level to, a ground or outcrop surface. These structures commonly resemble platforms. Unlike platforms, however, they are not totally free-standing.

Trail: A trodden lava surface, pavement or stone alignment set into the ground or outcrop surface.

Wall: A bi-faced and free-standing stone structure which is an isolated segment or defines large boundaries.

Table 2 tallies the total occurrences of these formal feature types in the project area.

Table 2 - Occurrences of Formal Feature Types

Total number of features: 90

FORMAL FEATURE TYPE	NUMBER	PERCENTAGE
Ahu	2	0.022
Alignment	1	0.011
C-shape	1	0.011
Enclosure	9	0.100
Lava blister	2	0.022
Lava tube	8	0.089
Modified depression	2	0.022
Modified tumulus	22	0.244
Mound	2	0.022
Pavement	7	0.078
Planting area	1	0.011
Platform	4	0.044
Quarry	1	0.011
Rockshelter	1	0.011
Terrace	4	0.044
Trail	20	0.222
Wall	3	0.033

B. Functional Categories

Function interpretation of a site or feature is determined by criteria which included: site construction and complexity; locational context (association with other sites and/or geological determinates); analysis of cultural remains (surface and subsurface); and external correlations with other archaeological sites in Hawai'i.

Eight primary function categories were identified among the sites within the project area: agriculture; habitation; human burial (possible only); indeterminate; marker; mining; storage; and transportation.

TABLE 3 below tallies site function not feature function.

Table 3 - Occurrences of Formal Function Types

Total number of sites in project 55

FUNCTION	No. of Sites
Agriculture	4
Possible burial	7
Recurrent habitation/Agriculture/Storage	1
Temporary habitation/Mining	1
Temporary habitation	15
Temporary habitation/Agriculture	1
Temporary habitation/Agriculture/Transportation	1
Temporary habitation/Storage/Transportation	1
Temporary habitation/Possible burial	1
Temporary habitation/Transportation	1
Temporary habitation/Agriculture/Marker	1
Indeterminate	6
Marker	1
Storage	1
Storage/Transportation	1
Transportation	12

DOCUMENT CAPTURED AS RECEIVED

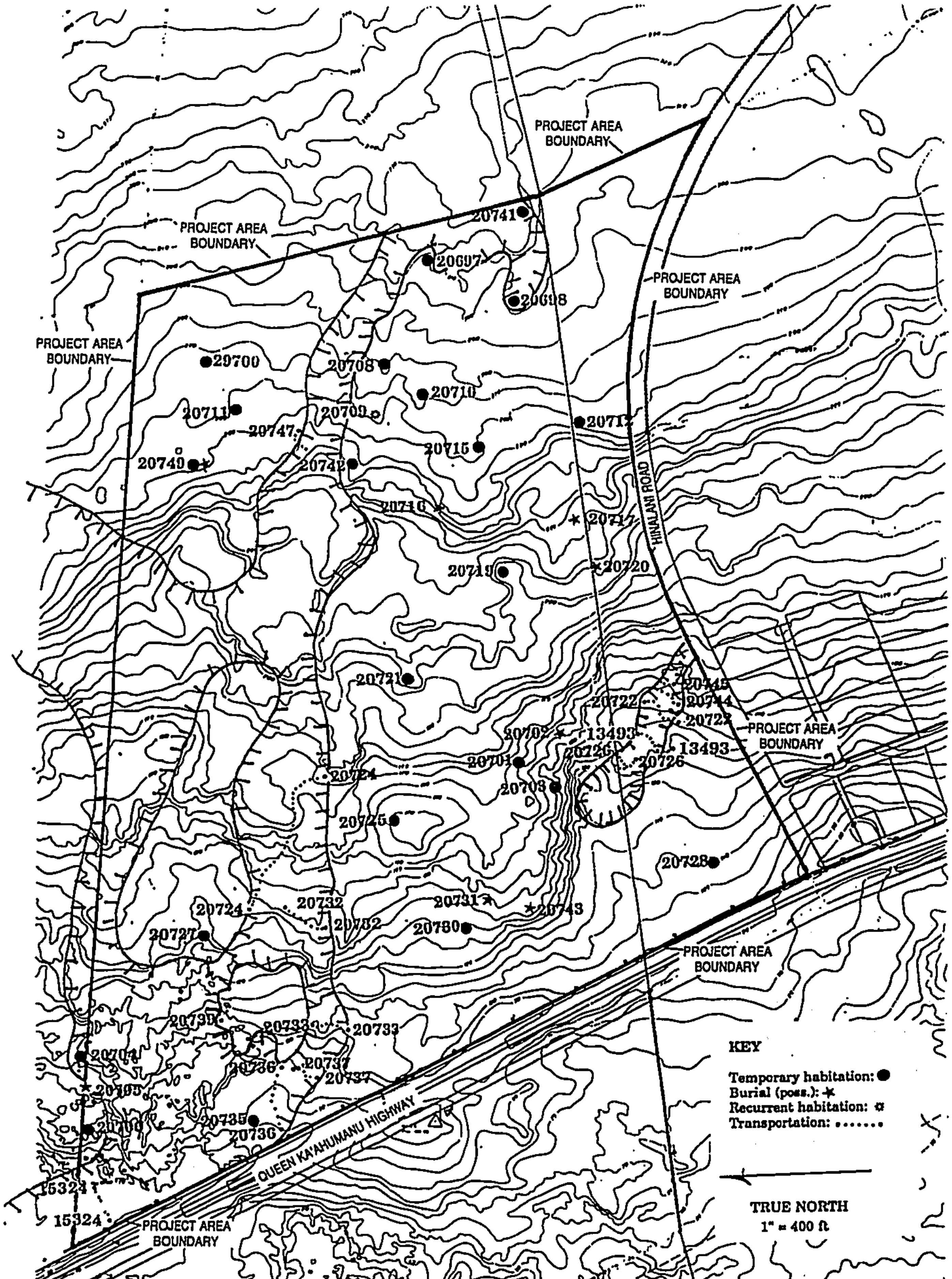


Figure 56 Archaeological site map of temporary and recurrent habitations, possible burials, and transportation

Agriculture

During the inventory survey eight sites, or 14.6 percent of the total sites, were considered to function, in whole or part, in an agricultural capacity (State sites 20700, 20709, 20718, 20719, 20734, 20738, 20740, 20741) . Features of agricultural function numbered nine, 10.0 percent of the feature total. Four of the features designated as agricultural are part of complexes (Sites 20700, 20709, 20719, 20741) with more than one function assigned to its features. Habitation, either temporary or recurrent, was at least one of the functions assigned to the additional features in the complex for all of the multiple function sites associated with agriculture.

The agriculture within the project area are collectively characteristic of and are a variation of what is currently termed the "Kona Field System" (State site 50-10-37-6601).

The Kona Field System is an intensive, non-irrigated dryland agriculture complex which has been identified along the upland slopes of North and South Kona, leeward Hawai'i, from Kealakekua Bay to beyond the northern limits of Kailua Town. Numerous archaeological studies in this region (e.g., Newman 1970; Yen 1978; Schilt 1984; Barrera 1990; Hammatt et al. 1995, among others) define the field system as a grid-like patterning of rectangular fields formed by earthen and stone boundaries. Although variants occur, the fields' long axis walls (*kuaiwi*) extend in a *mauka/makai* direction and are intersected by shorter walled boundaries cross-cutting the slope.

The definition of the Kona Field System as a "system" appears to rely on the interaction of four terrestrial ecozones or subzones classifying areas of differential agricultural use in *ahupua'a* or district, as it is most commonly applied. Classification of these subzones were initially introduced by T. Stell Newman (1970) with subsequent contributions by Marion Kelly (1983). Newman defined the terrestrial subzones using aerial photography in correlation with historic accounts of early visitors to Hawai'i. Kelly's subsequent research of the Native Claims Registers (from 1846 to 1848) provided Hawaiian names of the subzones and, based on reported claims, what type of traditional or historic crop was cultivated in each subzone. The subzones follow rainfall gradients generally predicted by elevation in Kona and, thus, delineate optimum areas for intensive agriculture. Rose Schilt in *Subsistence and Conflict in Kona Hawai'i* presents a comprehensive summary of the subzones using Newman and Kelly's studies and rainfall data compiled during her research (Schilt 1984:6). The following subzone classifications are based on Schilt's compiled data (the first zone *kula* is applicable to the present study area):

Kula Subzone/Coastal Area
Elevation: Sea level to 500 ft. (0 to 150 m.)
Annual Rainfall: c. 30-50 in. (0.8-1.2 mm.)
Late Prehistoric crops: Sweet potatoes, gourd, and *wauke*.

Kaluulu Subzone/Seaward Slope
Elevation: 500-1000 ft. (c. 150-300 m.)
Annual Rainfall: c. 40-55 in. (1.00-1.35 mm.)
Late Prehistoric Crop: Breadfruit, with sweet potatoes and *wauke* interspersed; mountain apple and some taro.

'Apa'a Subzone/Upland Slope
Elevation: 1000-2500 ft. (300-750 m.)
Annual Rainfall: c. 55-80 in. (1.35-2.00 mm.)
Late Prehistoric Crop: Taro, sweet potatoes, ti, and sugarcane.

'Ama'u Subzone / Upland Jungle
Elevation: 2500-4000 ft. (750-1200 m.)
Annual Rainfall: c. 80 in. (2.0 mm.)
Prehistoric Crops: Bananas and plantains

Note: Historic period crops were also cultivated in the Kaluulu and 'Apa'a subzones and to a lesser degree in the Kula subzone. These crops included cabbage, melons, onions, oranges, tobacco, beans, coffee, corn, cotton, pineapple, Irish potatoes, and pumpkin.

The agricultural sites within the project area are regarded as interrelated components of a non-intensive non-irrigated field system with the *ahupua'a*, and are believed to generally reflect utilization of the *kula* subzone presented above.

Agricultural sites within the project area ranged from minimal constructions, characterized by the removal of stones to clear a small depression within pahoehoe type lava (Site 20734, 20718, and 20740), to larger more defined enclosures (Site 20700, 20709, 20738, and 20741) typically abutting a'a lava flows and probably placed to maximize water retention. The scattered nature and rough constructions (indicating little energy expended) suggest that intensive agricultural activity was not practiced within the project area. The agricultural features within the project represent agriculture activity associated with temporary habitation and the numerous trails within the project.

Sweet potato was likely the most abundantly grown crop in the project area because of its adaptability to stony and dry environments. It was commonly planted in mounds and in pahoehoe excavations. Henry J. Lyman son of missionary couple who first arrived in Hilo in 1831, describes features in Puna similar to pahoehoe clearings, as seen in the project, which were cultivated with sweet potatoes:

> Whereever the lava could be pounded into scoria, a plantation of sweet potatoes was laboriously formed by digging among the stones and filling in the holes with dried grass brought from the mountainside. Placed in the nest, the tuberous buds were covered with gravel, and there grew with astonishing luxuriance, yielding the largest and finest potatoes on the island. (in Frierson 1991:167)

During the mid 1800's, Captain Charles Wilkes of the American Exploring Team comments on the agricultural use of pahoehoe excavations (similar to the modification of pahoehoe outcrop seen in the project) which he observed specifically in the Kona region:

> Cultivation is carried on in many places where it would be deemed almost impractible in any other country.. The natives, during the rainy season, also plant, in excavations among the lava rocks, sweet potatoes, melons, and pine-apples, all of which produce a crop. (Wilkes 1845:91)

Sweet potatoes were also cultivated within walled fields or depressions in the walls themselves. E.S. Craighill Handy and Elizabeth Green Handy reveal this method using an account taken from the Hawaiian newspaper Ka Nupepa Ku'oko'a March 24, 1922):

> Rocky lands in the olden days were walled up all around with the big and small stones of the patch until there was a wall (*kuaiwi*) about 2 feet high and in the enclosure were put weeds of every kind, *'ama'u* tree ferns and so on, and then topped well with soil taken from the patch itself, to enrich ti, or in other words to rot the rubbish and weeds to make soil.
>
> After several months, the rotted weeds were converted into soil of the best grade. The farmer waited for the time when he knew that the rains would fall, then he made the patch ready for planting. If for sweet potatoes, he made mounds for them and for taro too, on some places on Hawai'i. (in Handy and Handy 1972:131)

The above accounts describe agricultural modifications in rough rocky terrain similar to that of the present project area, though no walled (*i.e. kuaiwi*) fields are present.

Burial

A total of eight sites within the project area are considered possible burial sites (State sites 20702, 20705, 20716, 20717, 20720, 20731, 20743, 20749). Within the eight sites there are nine features considered possible burials consisting of: modified tumuli (6 features), linear mound (1 feature), terrace (1 feature) and a lava tube (1 feature).

Of the nine features designated as possible burials, eight of the features consist of structural modifications which are modifying existing cracks or crevices within the exposed pahoehoe lava. These features are designated as possible burials due to a number of criterion which are as follows: lack of suitability for habitation (rough unsuitable surfaces for habitation and size and location); apparent filling of existing crevices (which would be suitable for human burial); and local informant information (Rev. Norman Keanaaina personal communication). Testing of these site types is one of the main research questions that will need to be addressed prior to finalization of any development plans.

The final feature that has been designated as a possible burial consists of a lava tube (Site 20749 Feature B) in which there are a number of broken bone fragments that appear to have been humanly modified and are possibly human long bone fragments. Due to the possibility of the fragments as human the feature has been designated as a possible burial. The firm identification of the fragments as either human or other mammal is another component that must be addressed along with other possible burial related issues.

Habitation

Twenty three (23) sites (41.8 percent of the total sites) in the project area, in part or in whole, are interpreted as habitation sites (20697, 20698, 20700, 20701, 20703, 20704, 20706, 20708, 20709, 20710, 20711, 20712, 20715, 20719, 20721, 20725, 20727, 20728, 20730, 20735, 20741, 20742, and 20749). Eight of these sites also contain non-habitation component features (20700, 20703, 20704, 20709, 20719, 20735, 20741, and 20749), such as: agriculture, possible burial, marker, mining, storage, and transportation.

Two specific types of habitation types - recurrent and temporary - are used in the present analysis of these sites. Distinction of the typology of the habitation sites is based primarily on Dr. Ross Cordy's Model (Cordy et al. 1991) with one exception: site 20709 is termed a "recurrent habitation" which is a variation of temporary habitation based on Jeffrey Todd Clark's model (Clark 1986).

Of the total 23 habitation sites in the project area, 22 sites fit the characteristics of temporary habitation units. The single site classified as recurrent habitation is a borderline site that has characteristic of both a temporary and permanent habitation but due to its location and isolation from other substantial habitation features it is believed to had utilized on a extended or semi-annual basis rather than on a permanent basis.

Temporary Habitation

Twenty-two (22) of the habitation sites (95.7% of the total 23 habitation sites) including 49 structural and natural features (92.5% of the total 53 habitation features) are interpreted to be temporary habitation. Of these 22 sites, 15 are solely temporary habitation in use and seven sites contain non-habitation components, including: agriculture, possible burial, marker, mining, storage, and transportation.

Elements of Interpretation - Temporary Habitation:

(Temporary Habitations, Short-term Camps - [Cordy et al. 1991:529]

Shape of Structures (Formal Types): Platforms, pavings, low enclosures, C- and L-shaped enclosures, caves.

Size of Structures: Small. <16 m^2

Substantiveness of Construction: Insubstantial (often poorly made w/unifaced walls).

Internal Features: Numerous features of internal stratification (eg., firepits, lenses, thin layers).

Associated Structures: None or similar small structures.

Geographic Context: Along trails, among agricultural fields, on coast, in forest.

Table 4 - Temporary Habitation Structures: Floor Area Measurements

Site No./ Feature	*Formal Type	♣Floor Size ($m.^2$)
20697	Modified tumulus	7.3
20698/A	Pavement	14.0
20698/B	Pavement	3.6
20700/A	Modified tumulus	6.1
20701	Modified tumulus	6.0
20703/A	Terrace	9.3
20703/B	Pavement	2.2
20704/B	Wall	12.0
20706	Modified tumulus	7.2
20708	Modified tumulus	13.3
20710/B	Alignment	8.8
20710/C	Mound	0.75
20710/D	Modified tumulus	12.3

20711	Enclosure	10.2
20712	C-shape	6.6
20715	Terrace	5.6
20719/A	Rock shelter	7.4
20721/A	Pavement	11.4
20721/B	Modified tumulus	8.1
20721/C	Pavement	4.0
20721/D	Pavement	11.1
20725/A	Terrace	6.3
20725/B	Platform	13.5
20725/C	Modified tumulus	4.5
20725/D	Pavement	4.6
20728	Enclosure	13.2
20730	Modified tumulus	11.1
20735/A	Wall	13.0
20735/C	Modified tumulus	3.0
20741/A	Platform	8.0
20741/B	Modified tumulus	5.3
20741/E	Modified tumulus	10.8
20741/G	Modified depression	3.1
20749/A	Terrace	13.8

* Excluding lava tubes and lava blisters
♣ Floor area measurements for probable roofed area

In general, the term temporary habitation has been used for sites which contain structures that are relatively small and are not elaborately constructed. The utilization of temporary habitation sites within the project range from probable single use sites to sites that were utilized for short periods of time although this utilization in some instances was probably repeated.

Cordy proposes that temporary habitation structures generally measure less than 16.0 m.^{2}. The temporary habitation structures (excluding lava tubes and lava blisters) in the present study area have floor areas which measure between 0.75 to 14.0 m.^{2} (Table 4). The shape of the structures encountered within the project also fit with Cordy's model with features ranging in shape from platforms (2), terraces (4), enclosures (2), C-shapes (1), pavements (7), and rockshelters (1). There were a number of different structural types, within the project area, identified as temporary habitation that were not included within Cordy's model but fit within the temporary habitation model due to other criteria and interpretation, these include; modified tumuli (12), walls (2), alignment (1), mound (1), and modified depression (1). These formal structural types, although not listed within Cordy's model, are believed to have similar characteristics to the structural types listed within Cordy's model. The modified tumulus (12) and modified depression (1) categories generally include filling and levelling of a crevice, thus similar to Cordy's "paving"; the walls (2) and alignment approximate Cordy's C and L shaped enclosures.

The substantiveness of construction for temporary habitation sites within the project area is generally low. The majority of structures appear to have been constructed with relatively little effort and time.

The majority of temporary habitation sites within the project area are generally isolated from other sites within the project and are limited to a single or only a few (less than three) associated structures. Due to the difficulty in following trails on the pahoehoe lava areas of the project (where the majority of the temporary habitation sites are located) it can not be firmly established that these sites were situated along trails but this is a distinct possibility based on the alignments in adjoining a'a lava.

It is due to the aforementioned criterion that it is believed that the findings within the present study relating to temporary habitation fit Cordy's model of expected finds for the present study area.

Distribution of Temporary Habitation

The majority of the temporary habitation sites within the project area are located on the pahoehoe flow which dominates the majority of the project area (81.8 percent of the temporary habitation sites are located on pahoehoe lava). In terms of elevation the sites appear fairly evenly distributed within the project area. The majority of sites are located on raised areas of either pahoehoe (*i.e.* tumuli) or a'a lava.

Recurrent Habitation

One (1) of the habitation sites (4.3 percent of the total habitation sites) is regarded as recurrent in use. The site is comprised of four features; Feature A - platform (recurrent habitation); Feature B and Feature C - enclosures (Agriculture); and Feature D - Lava blister (Storage).

Interpretation Criteria - Recurrent Habitation

(Recurrent-Use Shelters - [Clark 1987:198])

Shape: C, U, Box-C, Linear, enclosures, irregular, and caves.

Construction: Similar to single-use shelters, although the larger and more frequently used features may be somewhat more formalized or modified - e.g., perhaps distinguishable living areas.

Size: A good deal of variation but generally small; less than 30 $m.^2$, but most from 7 to 12 $m.^2$.

Associations: Usually found in associations with agricultural features or specialized resource areas. Generally not associated with other structural features such as burial monuments.

Geographic Context: Predominantly in leeward areas, and most commonly in agricultural zones, along trails, and scattered along the coast.

Cultural Deposit: Midden and artifacts likely to be present but in small quantities and relatively limited in range. Clear cultural deposit, although evidence of sequential abandonment and reoccupation may not be obvious. Multiple short-use fireplaces at different horizontal and vertical locations and/or charcoal flecks and possibly ash scattered through deposit.

A recurrent habitation feature is considered to be more substantially constructed than other temporary habitation feature, and commonly exhibits formal construction elements similar to permanent habitations sites, albeit, on a smaller scale. Clark suggest that recurrent habitation structures measure less than 30 $m.^2$. The recurrent habitation structure within the present study area has a floor size of 27.2 $m.^2$. for Feature A.

Midden and artifacts associated with recurrent habitation are generally more abundant than at less intensively utilized temporary habitation features but less abundant than at permanent habitation features; however, a limited range of artifact types and midden species may be represented at both temporary and recurrent habitation features, a key constituent of recurrent use, Clark maintains, is the horizontal distribution of multiple hearths or charcoal and ash flecking throughout a cultural deposit (Clark 1986:200). Although this may be difficult to prove through excavation a small structural features with little surface area (e.g. terraces and platforms).

The midden collected from site 20709 fits the model: it is substantial in amount though limited in variety, and considerably more plentiful than what was recovered from the other temporary habitation sites that were tested. A total of 540.7 gms. of midden was collected from the 1.0 $m.^2$ test unit but no artifacts were observed or collected during testing. Only eight different species of marine shell were represented in the findings. The excavation revealed charcoal flecking virtually throughout the entire trench. The material collected from the hearth, which was cross-sectioned, proved to be relatively sparse with a high percentage of the volume excavated consisting of ash.

Indeterminate

A total of six sites within the project area, or 10.9 percent, lacked characteristics that would, upon field inspection, help to determine function (State sites 20696, 20699, 20707, 20714, 20729, 20748). These sites have therefore been listed as "indeterminate." Of the six sites, two are modified tumuli, one is a wall and three are lava tubes. These sites were also listed as indeterminate due to their lack of modification, lack of cultural material and their lack of any excavation potential whatsoever.

In general the modified tumuli listed as indeterminate consist of a few placed stones on top of a tumulus never more than a single coarse high and containing no formality to construction style. The lava tubes listed within this category generally lacked modification, contained only a few fragments of midden and completely lacked any soil that could provide further information through data recovery or test excavations.

The wall was a unique feature within the project area and could possibly be considered a mound. The wall only measured 3.7 m. (12.1 ft.) in length with a maximum width of 1.0 m. (3.3 ft.). Due to its isolation from other sites within the project, its lack of formality of construction and absence of any cultural material on the exposed pahoehoe lava around the wall it is considered to be indeterminate in function.

Marker

Two sites within the project area are considered to function as markers. They consist of two *ahu* (State sites 20713 and 20719). Site 20713 is an *ahu* situated directly off of the Hina-Lani Road. This site possibly functioned as a boundary marker demarcating the Kaloko/Kohanaiki *ahupua'a* boundary or border. The second marker (site 20719) possibly functioned as a site specific location marker but this is unclear due to the location of the *ahu* in an apparently non-conspicuous location adjacent to the other features within the site.

Mining

One site in the project area (Site 20703 Feature C) appears to have been utilized as a quarry area for scoria. The site is located in the southwestern portion of the project area and is adjacent to (i.e. north of) a number of trails (e.g. Sites 13493, 20722, 20726, 20744, and 20745). Feature C consists of an area in which it appears that the outer crust of a high pahoehoe tumulus was removed as a layer of low grade scoria. Mining activities do not appear to have been extensive and there is no evidence of further processing of the mined material (i.e. abrader basins or partially worked pieces of scoria). Due to the quality of the scoria and the lack of evidence of extensive mining it is believed by the authors that the activities represent a localized (*ahupua'a*) exploitation of a resource for local consumption.

Storage

A total of four sites within the project area contain features that have been designated as storage in function (Sites 20709/D, 20735/B, 20739/A, and 20746). Basically two types of storage activities have been identified within the project area; storage associated with water collection; and storage associated with habitation. The first type of storage activities identified within the project consists of small modified depressions and a very small enclosure both of which are associated with existing transportation routes. These features are believed to be areas in which an opportunistic approach was taken to water catchment in which small areas were cleared to hold water catchment receptacles (i.e. gourds) that would be left in these depressions to retain rainfall if and when it occurred.

The second type of storage activities noted within the project area consist of lava tubes or blisters associated with habitation activities. These features are believed to have been utilized as storage of articles associated with habitation activities.

Trails

Twenty trails (22.2 percent of the total features) were encountered during the inventory survey which were encompassed within sixteen sites (29 percent of the total 55 sites) (State sites 13493, 15324, 20704, 20722, 20724, 20726, 20732, 20733, 20735, 20736, 20737, 20739, 20741, 20744, 20745, 20747). All of the trails within the project area appear to be prehistoric in nature. Russell A. Apple (1965) provides classifications ("Types A through D") of Hawaiian trails based on architectural design, location and orientation. As a result of these classifications, it can be suggested what method of transportation (i.e. foot, horse or wheeled vehicle) was facilitated by the trail and during what time period. "Type A" trails appear to be the only type applicable to the present study area.

Apple defines "Type A" trails as being prehistoric and early historic (prior to abolishment of the *kapu* system) "single-file foot trails" that follow the configuration of the shoreline and extend between the coast and upland localities (Apple 1965: Appendix 2). "Type A" trails were designed in accordance to the *kapu* system, for example: trails would not cross *ahupua'a* boundaries because the *kapu* system prohibited residents to go beyond their *ahupua'a* boundaries. Apparently only one trail (encircling the perimeter of each island crossed *ahupua'a* boundaries. This trail was used during the *makahiki* festival for tax collection purposes (ibid.,25). All of the stepping-stone trails are considered to be "Type A" trails. The identified sections of the stepping-stone trails in the project area cross over a'a lava terrain and are believed to be associated with localized travel between the coast and uplands, as well as accessing project area-specific sites and/or features (*i.e.* agriculture, lithic resource and temporary habitations).

The large number of trails within the project area reveal that the residents of both Kaloko and Kohanaiki had a significant network of travel routes that provided access to resources and exchange of resources between the coast and upland regions of the two *ahupua'a*. The fact that all of the trails within the project area are of Apple's "Type A" attests to the fact that while the area within the project was commonly traversed during the prehistoric period it was not as heavily traversed in the historic and modern period.

The Kohanaiki road traverses - in a *mauka/makai* direction - through the southeastern portion of the project. The road proved hard to follow with some places being clearly bulldozed (bulldozer scars on the pahoehoe), some sections only evident through apparent stunted vegetation, and there is an old wooden gate in a fenceline which parallels the *mauka* project boundary, believed to have been related to the former road.

Attempts were made with all trails in the project area to follow them to their full extent and where possible make relevant correlations. It proved impossible to follow trails on the grass-covered pahoehoe adjacent to the a'a lava where the trails were still visible. The uniformity of the terrain (usually consisting of undulating pahoehoe) surrounding the a'a flows negates the necessity of extensive trail construction and leads the authors to believe that while the trails followed a single route over the a'a flows once the trail exited the a'a more than one path may have been traversed by travelers.

VIII. TESTING RESULTS

Limited subsurface testing was conducted at 8 sites (9 features) during the course of the inventory survey. The testing phase of the site inventory survey was conducted to 1) clarify feature or site function 2) attempt to collect charcoal for radiocarbon dating analysis and; 3) inspect the nature of natural and cultural deposits. The representative features chosen for excavation include the following functional types: one recurrent habitation; and eight temporary habitations.

Prior to all excavations, scaled photographs were taken and plan views of the test units were drawn. Strata were designated to natural soil layers beginning at ground surface or at the base of stone structures. The units were excavated within natural strata by arbitrary 10 cm. levels where applicable. Contents were screened in the field through a 1/8 inch mesh. All excavations were back-filled and structures were reconstructed as close as possible to their original forms. Detailed results of excavation are included with the **Site Descriptions** and **Testing results.**

Site 50-10-27-20703

Subsurface testing at Site 20703 was conducted at Feature A. The unit (1.0 m. by 1.0 m.) was placed in the center of Feature A terrace incorporating Feature A's hearth into the northeast corner of the unit.

The hearth fill was removed *en masse* from the test unit and bagged for later laboratory analysis. The subsurface extent of the hearth extended to a maximum of 16.5 cm. below surface to pahoehoe bedrock. A variety of assorted marine midden with a total weight of 4.8 gms. was collected (see Table 5). A total of only 1.4 gms. of charcoal was recovered from the hearth fill.

The remaining portion of the test unit- outside the hearth feature- was excavated to a maximum depth of 20 cm. below the surface to pahoehoe bedrock. Material collected from the unit consisted of 7.9 gms. marine midden, 18.4 gms. terrestrial midden, and 3.3 gms. of charcoal (see Table 7).

Interpretation: Based on the relatively small amount of midden recovered (35.8 gms. total including charcoal) from Feature A and the presence of a quarry feature (i.e. Feature C), and hearth within Feature A, the site is interpreted as temporary habitation associated with the quarrying activities.

Site 50-10-27-20709

Testing at Site 20709 consisted of the excavation of a 1.0 m. (3.3 ft.) by 1.0 m. (3.3 ft.) test unit placed so that it cross-sectioned the southern half of the hearth and a portion of the surrounding platform of Feature A.

The hearth fill was removed, *en masse*, from the test unit and bagged for later laboratory analysis. The subsurface extent of the hearth extended to a maximum of 20.0 cm. below the surface to pahoehoe bedrock. An abundance of midden - including marine midden weighing 235.4 gms., 1.8 gms. of terrestrial midden and 36.7 gms. of charcoal - was recovered from the hearth fill.

The south and southwestern portions of the test unit -outside the hearth feature- extended to a maximum depth of 43.0 cm. below the surface to pahoehoe bedrock. Recovered from the outside of the hearth was 213.3 gms. of marine midden, 75.9 gms. of terrestrial midden, and 59.8 gms. of charcoal.

Interpretation: Based on the relative abundance of midden recovered from the test unit, and the presence of the well defined hearth feature as well as other factors such as size, and associated features, Site 20709 is interpreted as a recurrent habitation site.

Site 50-10-27-20725

Testing at Site 20725 consisted of a 1.0 m. by 1.0 m. test unit placed in the northeast portion of Feature B Excavation was conducted to a maximum depth of 86.0 cm. below the surface. The only cultural material removed consisted of 0.4 gms. of terrestrial midden and 2.2 gms. of charcoal. A large segment of the test unit was composed of a vertical bedrock formation that existed in the center portion of the unit.

Interpretation: Based on the scant midden recovered from the site and nature of the site's construction it is interpreted as a temporary habitation site.

Site 50-10-27-20727

Limited testing was conducted at Site 20727 lava tube and consisted of excavating a 1.0 m. by 1.0 m. test unit which was placed within a soil area beneath the lava tube's western entrance. One piece of marine midden was observed on the surface of the test unit prior to excavation.

The unit was excavated to underlying bedrock to a maximum depth of 2 cm. One stratigraphic layer -Stratum I- was observed during excavation from which only 6.8 gms.

of marine midden and 1.9 gms. of terrestrial midden were recovered.

No charcoal was observed.

Interpretation: Based on the scant amount of midden recovered from the lava tube interior and the lack of any other associated surface pavements, it is interpreted as a temporary habitation site.

Site 50-10-27-20728

Subsurface testing conducted at Site 20728 consisted of a 1.0 m. by 1.0 m. test unit placed within the center interior of the southern side of the enclosure. The unit was excavated to a maximum depth of 18 cm. below surface and terminated upon reaching bedrock which was covered by a 2-3 cm. layer of organic humus and rootlets. A total of only 7.5 gms. of terrestrial midden was recovered from the test unit.

Interpretation: Based on the paucity of midden recovered from the test unit and the lack of other primary features, Site 20728 is interpreted as a temporary habitation site.

Site 50-10-27-20741

Subsurface testing was conducted at Feature A of Site 20741.

A 1.0 m. by 1.0 m. test unit was placed in the northeast section of Feature A, on the surface of a paved area. The unit was excavated to a maximum depth of 36 cm., and terminated upon reaching bedrock. The a'a cobble fill, designated Stratum I, of the paved area extended to bedrock. There was no soil layer present.

Stratum I (0-36 cm.) yielded only 5.3 gms. of marine midden.

Interpretation: Based on the very small amount of midden recovered from the platform test unit and that the site does contain other primary features, Site 20741 is interpreted as a temporary habitation site.

Site 50-10-27-20742

Limited testing was conducted at Site 20742 lava tube. The testing consisted of excavating 50 cm. by 50 cm. unit which was placed within a soil area beneath the lava tube's entrance. The surface of the unit did contain some scattered marine midden.

The unit was excavated to underlying pahoehoe bedrock to a maximum depth of 5 cm. One stratigraphic layer -Stratum I- was observed during the excavation.

An ash sample was taken from the northeast corner of the test unit from 3-5 cm. below the surface, which contained 2.2 gms. of marine midden, 0.5 gms. terrestrial midden, and 1.6 gms. of charcoal. Midden and charcoal collected from Stratum I, excluding the ash sample, consisted of 30.0 gms. marine midden, 3.1 gms. terrestrial midden, and 6.2 gms. of charcoal.

Interpretation: Based on the relative small amount (43.6 gms. total) of midden recovered from the lava tube interior and that the site contains no other associated features, it is interpreted as a temporary habitation site.

Site 50-10-27-20749

Subsurface testing was conducted at Features A, and B of Site 20749. A 1.0 m. by 1.0 m. unit (test unit 1) was placed at the center of Feature A terrace. The unit was excavated to a maximum depth of 42 cm. below surface and terminated upon reaching bedrock. The boulder cobble fill of the terrace reached a maximum depth of 30 cm., designated Stratum I. A soil layer, designated Stratum II was present at the base of the rock fill and extended to the underlying bedrock at 42 cm below surface.

Marine and terrestrial midden was recovered from Stratum I including the following: 2.3 gms. of marine midden and 47.4 gms of terrestrial midden. A total of 4.1 gms. of charcoal was also recovered.

Stratum II -12 cm.- thick contained no culture materials.

A 1.0 m. by 1.0 m. unit (test unit 2) was excavated at Site 20749 lava tube (Feature B). The surface of the unit was covered with scattered marine midden. The unit was excavated to underlying bedrock at a maximum depth of 3 cm. below surface. One stratigraphic layer-Stratum I- was observed during excavation.

The midden collected consisted of 106.7 gms. of marine midden, 64.1 gms. of terrestrial midden and 48.2 gms. of charcoal. Artifacts collected in the test unit include: 1 bird bone pick; 1 basalt manuport; 1 volcanic glass scraper; and 9 flakes of volcanic glass. Two wood samples were also collected from the surface of the lava tube.

Interpretation: Based on the relative abundance and variety of cultural material and association with Feature A, Feature B lava tube is interpreted as a component feature for temporary habitation, utilized more intensively than the other temporary habitation sites and more closely approximating quantities from the recurrent habitation site, 20709.

IX. ARTIFACT AND MIDDEN ANALYSIS

A. Midden Analysis

Midden was recovered from all 9 of the test units excavated during the testing phase of the project.

Marine midden (vertebrate and invertebrate) accounted for 73.2% (614.1 gms.) of all the midden recovered from the project area. Of the total marine midden inventory, 99.6% represents shellfish (invertebrates), and the remaining 0.4% consists of unidentifiable fish bone.

The most common components of marine midden recovered in the project area include the following types in descending order: Sea urchin (*Echinoderm*), Snakehead cowrie (*Cypraea caputserpentis*), Rough tellina (*Tellina palatam*), and Cone shells (*Conus sp.*). Other shellfish types represented in the midden inventory include the following (in descending order): pitchy sea snail (*Nerita picea*), Auger shell (*Terebra sp.*), dye shell (*Thaididae sp.*), *Theodoxus cariosus*, Pearl shell (*Isognomon*), Striate Mussel (*Brachidontes crebristriatus*), polished nerite (*Nerita polita*), and limpets (*Cellana*). The majority of these shellfish species are typically found in the tidal zone along rocky shores or sandy areas. Unidentified fish bone accounted for only 0.4% of the marine midden inventory.

Of the total midden inventory, 26.8% was terrestrial midden. Of the total terrestrial midden inventory 1.9% represented pig bone (*Sus scrofa*), 96.7% *kukui* endocarps, and the remaining 1.4% consisted of unidentifiable mammal bone.

The predominance of marine midden recovered from the project area clearly attests that coastal resources were a primary source of protein-related food for the residents of the Kaloko and Kohanaiki *ahupua'a*.

The shellfish types represented in the midden inventory are typically found in the tidal zones (shallow water) of both rocky and sandy areas with the Bivalves of Isognomon possibly from a fish pond environment (Cordy et al. 1991:559). Most of the shellfish species were likely obtained locally along the Kaloko/Kohanaiki coastline and are attributable to near shore shellfish collection.

Table 5 - Midden Catalog

CULTURAL SURVEYS HAWAII
Project: Kaloko 2

State Site #50-10-27-	20703	20703	20709	20709	20709	20709	20725	20727	20728	20741
Feature	A	A	A	A	A	A	B		A	
Trench	1	1/NE quad	1	1	1/hearth	1/hearth	1	1	1	1
Depth/Stratum	I (rockfill)	Hearth	0-2/I	II	0-10/fill	10-20/fill	I	0-2/I	30-42/II	I (rockfill)
Cellana sp.										
Conus sp.					5.8					
Cypraea caputserpentis	1.3	0.3	34.8	0.9	64.6	12.1				5.3
Nerita picea	0.4	0.2	3.4	0.3	6.3	0.3				
Nerita polita										
Theodoxus cariosus	1.4	0.4	3.6	0.1						
Terebra sp.										
Thaididae sp.			1	1.2	8.8	3.7				
Brachidontes crebristriatus			0.6							
Isognomon sp.	4.4	0.1	1.1							
Periglypta sp.										
Tellina palatam			43.6	4.5		2.5				
Misc./Unident. shell			23.4	1.4		2.3		1.4		
Total shell midden	7.5	1	111.5	8.4	85.5	20.9	0	1.4	0	5.3
Echinoderm	0.4	3.8	99.7	5.8	87.9	41.1		0.5		
Fish bone			2.1	0.1						
Total marine midden	7.9	4.8	213.3	14.3	173.4	62	0	1.9	0	5.3
Pig bone								4.2		
Misc./Unident. bone	0.1					0.2				
Kukui endocarp	18.3		75.9			1.6	0.4	2.6	7.5	
Total Midden	26.3	4.8	289.2	14.3	173.4	63.8	0.4	8.7	7.5	5.3

Table 5 - Midden Catalog -continued

CULTURAL SURVEYS HAWAII

Project: Kaloko 2

State Site #50-10-27-	20742	20742	20749	20749
Feature		Ash		B
Trench	1	1	1	1
Depth/Stratum	0-6/I	2-7/I	0-30/I	0-3/I
Cellana sp.				2
Conus sp.				39.9
Cypraea caputserpentis	13.2			16.8
Nerita picea	1.7	1.3		4.9
Nerita polita				1.4
Theodoxus cariosus				
Terebra sp.				1
Thaididae sp.	0.2			1.5
Brachidontes crebristriatus				
Isognomon sp.	0.9			0.8
Periglypta sp.				
Tellina palatam				
Misc./Unident. shell				17.6
Total shell midden	16	1.3	0	85.9
Echinoderm	4	0.9	2.3	20.8
Fish bone				
Total marine midden	20	2.2	2.3	106.7
Pig bone				
Misc./Unident. bone	0.4		0.3	2.2
Kukui endocarp	2.7		47.1	61.9
Total Midden	23.1	2.2	49.7	170.8

Table 6 - Botanical Samples Catalog

CULTURAL SURVEYS HAWAII
Project: Kaloko 2

Acc #	State Site # 50-10-27-	Feature	Depth (cm.)	Weight (gms.)	Description
B-1	20719	A	Surface	17.7	One intact wood stick
B-2	20749	B	Surface	10	Multiple wood fragments
B-3	20749	B	Surface	7.3	One intact wood stick

Table 7 - Charcoal Sample Catalog

CULTURAL SURVEYS HAWAII

Project: Kaloko 2

Acc #	State Site # 50-10-27-	Feature	Trench	Stratum	Depth (cm.)	Weight (gms.)	Description
C-1	20703	A	1	I (rock fill)		3.3	Small charcoal flecks
C-2	20703	A	1/NE quad	Hearth fill		1.4	Small charcoal flecks
C-3	20709	A	1	I	0-?	59.8	Small charcoal flecks
C-4	20709	A	1	II		3.1	Small charcoal flecks
C-5	20709	A	1	Hearth fill	0-10	4.1	Small charcoal flecks
*C-6	20709	A	1	Hearth fill	10-20	32.6	Small charcoal flecks
C-7	20725	B	1	I		2.2	Small to large charcoal flecks
C-8	20742		1	I	0-6	6.2	Small charcoal flecks
C-9	20742		1	I	3-5	1.6	Small charcoal flecks
C-10	20742		1	Ash sample	2-?	0.5	Small charcoal flecks
C-11	20749	A	1	I	0-30	4.1	Small charcoal flecks
*C-12	20749	B	1	I	0-3	48.2	Small charcoal flecks

* = Sample sent to Beta Analytic for dating analysis

B. Artifact Analysis

A total of 13 indigenous Hawaiian artifacts were recovered from surface and subsurface contexts of sites in the project area. No historic artifacts were recovered from the surface or subsurface contexts of sites in the project area.

The majority of the indigenous artifacts (77%) is made up of volcanic flakes (9) and the 1 scraper. All of the volcanic glass artifacts were recovered from a single test unit at Site 50-10-27-20749 Feature B (lava tube).

Single items consisting of, 1 waterworn basalt manuport (Site 20749), 1 bird bone pick (Site 20749), and one wooden *tapa* beater (Site 20746) complete the artifact inventory.

The basalt artifact (Acc #3 Table 8) is a small basalt water-rounded manuport that did not show evidence of utilization.

The bird bone pick (Acc #2 Table 8) probably represents a tool utilized during food consumption and or processing.

The *tapa* beater (i.e, wooden club) appears to be a "preliminary stage" beater termed "*Hohua*" (Buck 1964:170).

Site 20749 Feature B contained 12 of the 13 recovered artifacts, thus attesting to its more intensive use. Additionally the cave environment from which all 13 artifacts were recovered provides for some protection from the elements, especially the more fragile bone and wood artifacts.

Table 8 - Indigenous Artifact Catalog

CULTURAL SURVEYS HAWAII

Project: Kaloko 2

Acc #	State Site # 50-10-27-	Feature	Trench	Stratum	Depth (cm.)	# pieces	Length (cm.)	Width (cm.)	Thickness (cm.)	Weight (gms.)	Material	Function	Comments
1	20746			Lava tube	Surface	1	36	5.8	5.6	274	Wood	tapa beater	stage one
2	20749	B	1	I	0-3	1	4.0	0.6	0.4	0.6	Bone	pick	
3	20749	B	1	I	0-3	1	2.4	2.3	1.1	12.2	Basalt	manuport	water-rounded pebble
4	20749	B	1	I	0-3	1	2.6	1.1	0.2	0.8	V-glass	scraper	
5	20749	B	1	I	0-3	9	0.9/1.3	0.4/1.3	0.2/0.3	1.9	V-glass	flakes	

X. SUMMARY

The inventory survey of the 224-acre parcel resulted in the identification and documentation of 55 archaeological sites. Based on historic background literature and previous archaeological studies, the site density may appear somewhat high (see CULTURAL AND HISTORIC BACKGROUND and SETTLEMENT PATTERN AND PROJECT AREA PREDICTIVE MODEL sections of this report). However, the types, functions, and distribution of sites present match closely the anticipated finds for the intermediate zone of the Kekaha region of North Kona within which the project area lies.

The site (or feature) type designation refers to the actual structural or non-structural (*i.e.* lava tube, blister, rock shelter) elements of a site (or feature). The specific breakdown of the 90 feature types within the 55 sites is discussed in detail in the SURVEY RESULTS section of the report. The most prevalent types are modified tumuli (22), trails (20), enclosures (9), and lava tubes and blister (10).

Modified tumuli refers to the "dome shaped hillocks" (MacDonald and Abbott 1970:28) of pahoehoe lava that have been humanly modified for a variety of functions (*e.g.* temporary habitation and possible burial). These modified tumuli are equivalent to the "modified outcrops" mentioned in other studies done in the region.

The twenty trails or trail segments observed during the inventory survey indicate a network of transportation corridors. The network includes both *mauka/makai* and cross slope-oriented trails. The network of trails thus provides fairly direct coast-to-uplands routes via the project area and access to activity areas within the project area. The activity areas include: lithic resource procurement (Site 20703), agricultural pursuits (*e.g.* Site 20738), and temporary and recurrent habitation sites (*e.g.* Sites 20709, 20735, and 20741).

Enclosures are a commonly identified feature type and have a number of functional uses. In the project area, enclosures were utilized for agriculture (*e.g.* Sites 20738/A and B, and 20741/D), storage (*e.g.* Site 20739), and temporary habitation (*e.g.* Sites 20711 and 20728).

Lava tubes and blisters are numerous throughout the region and - depending on a wide range of factors such as size, accessibility, and interior environmental conditions - were utilized for various functions. Many blisters and small tubes, inspected during the present survey, showed no evidence of utilization. The range of functions for tubes and blisters within the project area include: possible burial/ temporary habitation (Site 20749), temporary habitation (Sites 20727, 20742 and 20741), storage (Site 20709/D and 20746), and indeterminate (Sites 20696, 20707, and 20748).

Lava tubes and blisters also generally offer a greater degree of midden and artifact preservation compared to surface sites. In the present project area all 13 of the indigenous artifacts were recovered from tubes, with 12 of the 13 from Site 20749/B.

The bases for functional interpretations are presented in the SURVEY RESULTS section of this report. Eight primary function categories were identified within the project area and include: habitation, transportation, human burial (possible only), agriculture, indeterminate, marker, storage and mining (or lithic procurement).

Twenty-three sites within the project area are interpreted as habitation sites, eight of which contain non-habitation component features related to agriculture, possible burial, marker, mining, storage and transportation. The habitation sites have been interpreted as temporary habitations, including one - Site 20709 - that we refer to as recurrent. The temporary habitation designation for the sites within the project area fit the models of type of habitation expected within the Intermediate Zone as well as meeting a set of criteria for interpreting modes of habitation (*i.e.* Cordy et al. 1991:529 and Clark 1986:198).

Transportation refers to the 20 trail segments at 16 sites. As stated previously, this is a common site type within the Kekaha region in general and one of the more prevalent types specific to the Intermediate Zone. Particularly problematic in the project area was following trails on the pahoehoe lava. Trails observed as stepping stone trails or trodden paths on the a'a lava would be lost on the pahoehoe lava. The pahoehoe lava negates the necessity of constructing a substantial trail structure for foot trails. Additionally, grass and *koa haole* growth is thickest on the pahoehoe terrain; this, in combination with the lack of trail structure, makes identifying specific trail alignments on the pahoehoe lava essentially impossible.

We have interpreted nine features at eight sites as possible burials. Six of the nine features are modified tumuli with single features of a mound, terrace and lava tube. The modified tumuli refer to filled crevices either on the top or side of a tumulus. No testing of possible burial features was undertaken during this phase of investigation (see RECOMMENDATIONS section).

Agricultural activity was not intensively pursued within the project area. However, eight sites have been interpreted as having features related to agricultural pursuits. The terrain within the project area severely limits agricultural productivity. Roughly 20% of the project area is a'a lava which is virtually vegetation free. The remainder of the project area is rough pahoehoe with numerous pressure ridges and tumuli. Neither terrain type has any soil development except for small pockets or depressions where vegetation decomposition creates a thin highly organic soil horizon.

The agriculture related sites and features within the project area represent more of an opportunistic approach versus the more expansive/intensive approach practiced at higher, more productive elevations within Kaloko and Kohanaiki *ahupua'a*. Agricultural sites in the project area ranged from minimal constructions, characterized by the removal of stones to clear small depressions in pahoehoe lava (*i.e.* Sites 20734, 20718 and 20740), to larger more defined enclosures (Sites 20700, 20709, 20738, and 20741). Two of these enclosures, at Sites 20700 and 20709, enclose natural depressions or undulations in pahoehoe terrain. The other two, Sites 20738 and 20741, are constructed on pahoehoe lava but abutting edges of a'a flows which form a portion of the enclosures. In all four cases, pahoehoe is the preferred substrate with the choice of location based on maximizing soil and water retention.

Six sites are presently listed as Indeterminate (Sites 20696, 20699, 20707, 20714, 20729 and 20748). The sites lacked construction characteristics and other evidence (*e.g.* midden and artifacts) that would aid confident interpretation of function on a per site basis. The six sites include two modified tumuli, three lava tubes (all of which had bare bedrock floors), and a 3.7 m. long wall segment.

Marker category refers to two *ahu* (or stacked stone structures), one of which (Site 20713) may be on the border of Kaloko and Kohanaiki. The other *ahu* may have functioned as a site-specific marker for Site 20719. However, the construction style of this *ahu* is more oval, or donut shaped, and an alternative interpretation, that the feature represents a small fire place or hearth related to the temporary habitation function of Site 20719, is also suggested.

The storage category includes features at four different sites (Sites/Features 20709/D, 20735/B, 20739/A, and 20746). Storage at Sites 20735 and 20739 refers to constructed small enclosures interpreted to be built as receptacles for water catchment items, presumably gourds. These features are constructed in a'a lava near trails and beyond the opportunistic approach of water catchment, storage of already filled containers or storage of other necessities are plausible uses.

Site 20709 Feature D is a small unmodified lava blister which contained some *kukui* nut remains, and thus has been interpreted as related to storage at this recurrent habitation site which includes a total of four associated features (A-D).

Site 20746 is a low lava tube which had just a crawl space entrance and bare bedrock floor. The only item observed in the accessible chamber was a wooden club which has been identified as a probable early stage *tapa* beater. The club would have had to purposefully been deposited in the tube's chamber, which may have contained more items that have already decomposed, thus storage is the interpreted function.

Site 20703 in the southwest portion of the project area is centered around a prominent tumulus that has been battered or quarried. It appears that the outer crust of the pahoehoe tumulus was the desired lithic resource, as scoria type material. Scoria, as a major lithic resource within the Intermediate Zone of the Kekaha region, has been well documented in the Waikoloa area (*e.g.* Jensen and Donham 1988). Additionally, isolated quarried outcrops or tumuli have also been reported (*e.g.* Hammatt *et al.* 1995). Based on the relatively small area of quarrying and lack of associated abrader basins, like those at Waikoloa, it is felt that the quarrying activities at Site 20703 reflect localized (*ahupua'a*) exploitation of the limited resources for local consumption.

The distribution of sites, like the types and functions, correlate closely with expectations for the Intermediate Zone. Sites are near visible portions of trails or near the presumed courses or corridors of trails. However, direct association between certain sites and trails is somewhat tenuous because the majority of sites are on pahoehoe lava where trail identification is difficult.

As stated above, there is a clear preference of pahoehoe terrain over a'a terrain in terms of site location. Approximately 82% of habitation sites, all eight burial sites, and all agriculture related sites or features are on pahoehoe lava terrain or utilize pahoehoe depressions in a'a lava. This is not to say the a'a is void of sites or features, as trails, habitation, and storage sites are present.

Sites are fairly evenly distributed *makai* to *mauka* within the project area, with habitation and burial site location apparently more dependent on the choice of a natural geological feature for utilization than an elevational range variant specific to the project area. The most commonly utilized geological feature is the pahoehoe tumulus. The advantage for habitation appears to be, in part, the raised or uplifted nature of the tumuli provides for better air circulation and view plane. The advantage for burials is that tumuli have existing cracks and crevices that can relatively easily be filled once the human remains have been deposited.

In conclusion, the site/feature types and functions correlate with the anticipated finds for the region and zone within which the project area lies. Habitation sites have been interpreted as temporary in nature, with no permanent habitation sites present. Burials, trails, and lithic resource procurement are documented site types within the Intermediate Zone of the Kekaha region and are present within the project area. Agricultural sites/features are also present but represent opportunistic productivity versus the type of full scale land modification for intensive productivity at higher elevations (*i.e.* upland zone).

All the recorded sites in the project area are presumed to be prehistoric, which indicates very little historic period activity. Based on historic information, grazing by goats and cattle was the main form of land use during the historic to modern era. *Mauka/makai* transportation through the *mauka* south corner of the project area is suggested by an old wooden gate within a fenceline near the *mauka* boundary. This gate and rough bulldozing in the vicinity may be the remnants of the Kohanaiki Road as it passed into the adjacent Kaloko *ahupua'a*. Presently, the project area is not utilized, though urban encroachment is quite evident with Queen Ka'ahumanu Highway on the western boundary, Hina-Lani Road, and the Kaloko Light Industrial Complex along the southern boundary.

XI. SIGNIFICANCE AND RECOMMENDED TREATMENT

A. Significance Evaluations

A total of 55 sites of varied archaeological significance are present in the project area. Individual site significance and recommended treatment are specified in Table 1. Sites were evaluated for significance according to the broad criteria established for the National and State Registers. The five criteria are:

A Site reflects major trends or events in the history of the state or nation.

B Site is associated with the lives of persons significant in our past.

C Site is an excellent example of a site type.

D Site may be likely to yield information important in prehistory or history.

E Site has cultural significance; probable religious structures (shrines, *heiau*) and/or burials present.

Of the total 55 sites with the project area, 44 sites (80%) are considered solely to yield information important to prehistory and history (Criterion D). A total of eleven sites within the project area meet multiple significance criteria, including the following: nine sites to yield information important to prehistory and history (Criterion D) and in combination with cultural significance, probable religious structures and/or burials present (Criterion E). The final two sites meet the multiple criterion of an excellent example of a site type (Criterion C) and likely to yield information important in prehistory or history (Criterion D).

Significance criterion C - "site is an excellent example of a site type" is assigned to two sites in the project area (Sites 20703 and 20709). These sites represent the best examples of structural and functional archaeological components within the project area (Site 20703, represents an excellent example of a temporary habitation site in combination with mining activities, and Site 20709 represents the best example of a recurrent habitation site). These sites were also the best structural sites (i.e. best condition and architecture) within the project area.

Significance criterion D - "site may be likely to yield information important in prehistory and history" is assigned to 44 sites in the project area. All of these sites provide important information to the settlement patterns and livelihood of the Kaloko and Kohanaiki residents (by the sites plotted location, and structural and functional nature), and some of these sites may provide more detailed archaeological data through future excavations or other additional documentation.

Significance criterion E - "site has cultural significance; probable religious structures...and burials" - is given to nine sites in the project area. These sites include all of the possible burials encountered and one of the trails within the project. Further testing or data recovery may alter the significance assessments of the eight possible burial sites.

B. Recommended Treatment

It is recommended that of the 55 sites in the project area, 40 (72.7%) sites be subjected to a program of data recovery to address scientific and informational concerns and ten (18.2%) sites be preserved. A single site (Site 15324, trail)(1.8%) is recommended for a combination of data recovery and preservation.

The remaining four sites (7.3%) are not recommended to undergo further research, because it has been determined that these sites lack cultural or scientific significance beyond the documentation and plotting of location completed during the inventory survey. These sites are classified under Criterion D significance and are generally characterized sites in poor structural condition or unmodified lava tubes that lack excavation potential. Thus, the sites which are not recommended for future archaeological research are now no longer considered culturally significant.

Data Recovery

Forty (40) sites are slated for data recovery and should be subjected to further documentation and, if feasible, excavation to address scientific and information interests. Data recovery should proceed in accordance with a data recovery plan which is to be submitted to DLNR State Historic Preservation Division and Hawaii County for review and approval. A single site (Site 15324) is recommended for data recovery of portions of the trail while portions are recommended for preservation. This final site is in addition to the forty sites recommended solely for data recovery. Therefore 41 sites in whole or part are recommended for data recovery.

The sites selected for data recovery include a variety of site and function types attributable to traditional Hawaiian use. Functional types include: habitation (temporary), agricultural, trails, and sites deemed indeterminate that have excavation potential.

Data Recovery - Potential Research Topics

(1) *Chronology* of traditional Hawaiian settlement and land use in Kaloko and Kohanaiki *ahupua'a* and expansion into the intermediate zone. External correlations: compare with other Hawaii Islands or Kona-specific "cultural sequence" models (e.g., Schilt 1984; Kirch 1985; and Cordy et al. 1991).

(2) *Function analysis* of site/feature types and relationship of feature components in sites, with a focus on temporary habitation research. External correlation: compare with other temporary habitation models (e.g. Cordy et al. 1991; Mitchell and Kolb 1992; and Hammatt et al. 1995).

(3) *Socio-political rank* of Kaloko and Kohanaiki occupants in the intermediate zone. Hypothesis could be based on size, nature and architecture of the sites, and type of material remains. External correlations: compare with Dr. Ross Cordy's model of social rank determinants in coastal Kaloko and Honokohau I and II *ahupua'a*.

Preserve

The 10 sites in the project area recommended for preservation include the only recurrent habitation site (Site 20709), a temporary habitation site with associated mining (Site 20703), all possible burials (Sites 20702, 20705, 20716, 20717, 20720, 20731, 20743, and 20749), and partial preservation of a traditional trail (Site 15324).

All of the possible burial sites in the project area are presently recommended for preservation. Testing of these sites should be completed, to determine the presence or absence of human burials, prior to finalization of any development plan.

XI. REFERENCES

Apple, Russell
1965 *Trails: From Steppingstones to Kerbstones*, B.P. Bishop Mus. Spec. Publ. 53, Bishop Museum Press, Honolulu.

Barrera, Jr., William M.
1990 *Kaumalumalu and Pahoehoe, North Kona, Hawaii Island: Archaeological Inventory Survey*, Chiniago Inc., Kamuela, Hawaii Draft.

Barrera, William Jr.
1985 *Kaloko and Kohanaiki, North Kona, Hawaii: Archaeological Survey (TMK 7-3-09:19)*, Chiniago Inc., Honolulu HI.

Buck, Peter H.
1964 *Arts and Crafts of Hawaii*, Volume V - Clothing, Bernice P. Bishop Museum Special Publication 45, Bishop Museum Press, Honolulu, HI.

Ching, Francis K. W.
1980 Letter to Mr. Clifford H.F. Lum regarding an archaeological reconnaissance survey at TMK 7-3-09, Kaloko, Hawaii.

Clark, Jeffrey
1986 *Waimea-Kawaihae, A Leeward Hawaii Settlement System*, Ph.D. Dissertation, University of Illinois at Urbana - Champaign.

Cordy, Ross
1981 *A Study of Prehistoric Social Change: The Development of Complex Societies in the Hawaiian Islands*. Academic Press: New York.

Cordy, Ross, Joseph Tainter, Robert Renger, and Robert Hitchcock
1993 "Archaeology Of Kaloko: A Generalized Model of a Hawaiian Community's Social Organization and Adaptions," *Hawaiian Archaeology*, Volume 2:28-49, Journal of the Society for Hawaiian Archaeology, Honolulu, HI.

Cordy, Ross and Joseph Tainter and Robert Renger and Robert Hitchcock
1991 An Ahupua'a *Study: The 1971 Archaeological Work at Kaloko* Ahupua'a *North Kona, Hawai'i: Archaeology at Kaloko-Honokohau National Park*, Western Archaeological and Conservation Center Publications in Anthropology No. 58.

Donham, Theresa K.
1986 *Full Archaeological Reconnaissance Survey, Kohana-Iki Development Project Area, Land of Kohana-Iki, North Kona, Island of Hawaii (TMK:3-7-3-09:3,14)*, PHRI Report 216-040286, Hilo, HI.

Emory, Kenneth P. and Lloyd J. Soehren
1971 *Archaeological and Historical Survey, Honokohau Area, North Kona, Hawaii*, Bishop Museum, Dept. Anthro. Revised Edition, Report 61-1, Honolulu.

Fager, Mikele W. and Donna K. Graves
1993 *Archaeological Inventory Survey, Kaloko Industrial Park Parcel, Land of Kaloko, North Kona District, Island of Hawaii (TMK:7-3-51:Por.1)*. PHRI: Hilo.

Hammatt, Hallett H. and Rodney Chiogioji
1995 *Archaeological Inventory Survey of a 53-Acre Parcel in the Ahupua'a of Manini'ōwali and Awake'e, North Kona District, Island of Hawai'i (TMK 7-2-04:4)*, Cultural Surveys Hawai'i and *Addendum Report to the West Hawaii Archaeological Inventory Survey* by Borthwick and Hammatt.

Honokohau Study Advisory Commission
1974 *The Spirit of Kaloko Honokohau: A Proposal for the Establishment of a Kaloko Honokohau National Cultural Park Island of Hawai'i, State of Hawai'i*, National Park Service, Department of the Interior.

'I'i, John Papa
1959 *Fragments of Hawaiian History*. Honolulu: Bishop Museum Press, Honolulu, HI.

Jensen, Peter M. and Theresa K. Donham
1988 *Archaeological Data Recovery and Intensive Survey, Resort Expansion Area and Selected Undeveloped Resort Parcels, Waikoloa Beach Resort, Lands of Waikoloa and Anaehoomalu, South Kohala, Island of Hawai'i*, PHRI, Hilo, HI.

Kamakau, Samuel Manaiakalani
1961 *Ruling Chiefs of Hawaii*, The Kamehameha Schools Press, Honolulu, HI.

Kelly, Marion
1983 *Nā Māla o Kona: Gardens of Kona*. Department of Anthropology Report Series 83-2, Bishop Museum, Honolulu, HI.

Kelly, Marion
1971 *Kekaha: 'Aina Malo'o, Historical Survey and Background of Kaloko and Kuki'o Ahupua'a, North Kona, Hawaii*, Department of Anthropolgy Report 71-2, Bishop Museum, Honolulu HI.

Kennedy, Joseph
1983 *An Archaeological Walk-Through Reconnaissance at Kaloko Golf Course (TMK 7-3-09:01), Kaloko, North Kona, Hawaii*, Archaeological Consultants of Hawaii, Inc., Honolulu, HI.

Kennedy, Joseph
1984 *An Intensive Archaeological Survey for the Proposed Kaloko Golf Course, Kaloko, North Kona, TMK 7-3-09: por. 17*, Archaeological Consultants of Hawaii, Inc., Honolulu, HI.

1991 *Surface Reconnaissance of the Proposed Industrial Development at Kohanaiki, North Kona, Hawaii, TMK: 7-3-09:15 (Revised 8-12-91.* Archaeological Consultants of Hawaii: Haleiwa.

Macdonald, Gordon, Agatin T. Abbott
1970 *Volcanoes in the Sea*, The Geology of Hawaii, University of Hawaii Press, Honolulu, HI.

National Park Service
1975 *National Park Service and Department of the Interior Draft Environmental Statement* DES 75-12.

Newman, T. Stell
1970 *Hawaiian Fishing and Farming on the Island of Hawaii in A.D. 1778*, Division of State Parks, Department of Land and Natural Resources, State of Hawai'i.

O'Hare, Constance R. and Susan T. Goodfellow
1992 *Kohana-Iki Resort Phased Archaeological Mitigation Program, Phase II - Data Recovery, Land of Kahana-Iki, North Kona District, Island of Hawaii (TKM:3-7-3-09:3)*, PHRI, Hilo, Hawaii.

Pukui, Mary Kawena
1983 *'Ōlelo No'eau, Hawaiian Proverbs and Poetical Sayings*, Collected, Translated and Annotated by Mary Kawena Pukui, Illustrated by Dietrich Varez, Bernice P. Bishop Museum Special Publication No. 71, Bishop Museum Press, Honolulu, HI.

Reinecke, John E.
1930 *Survey of Hawaiian Sites from Kailua, Kona to Kalahuipua'a, Kohala*, Bishop Museum Manuscript, Honolulu.

Rosendahl, Margaret L.K., and Alan E. Haun
1987 *Archaeological Reconnaissance Survey, Kaloko Water Tank Sites, Land of Kaloko, North Kona, Island of Hawaii.* PHRI Report 370-101487. Paul H. Rosendahl, Ph.D., Inc.: Hilo.

Rosendahl, Paul H.
1989 "Addendum Report: Archaeological Inventory Survey, Additional Kaloko Water Tank Site, Land of Kaloko, North Kona District, Island o Hawaii (TMK: 3=7-3-10:Por.17)." Letter Report. PHRI: Hilo.

Schilt, Rose C.
1984 *Subsistence and Conflict in Kona, Hawaii: An Archaeological Study of the Kuakini Highway Realignment Corridor, June 1984*, Departmental Report Series 84-1, Dept of Anthropology, B.P. Bishop Museum for Dept. of Transportation.

Schmitt, Robert C.
1973 *The Missionary Censuses of Hawaii*, Number 20, Pacific Anthropological Records, Department of Anthropology, Bernice P. Bishop Museum, Honolulu, HI.

Soehren, Lloyd J.
1983 Letter to Mr. Kazuo Omiya concerning an archaeological Reconnaissance at Kaloko, Island of Hawaii.

Walsh, Patrick, and Hallett H. Hammatt
1995 *An Archaeological Inventory Survey of the New Queen Kaahumanu Highway Right-Of-Way Between Palani Road and Keahole Airport; Within the* Ahupua'a *of Keahuolu, Kealakehe, Honokohau, Kaloko, Kohanaiki, O'oma 2, Kalaoa-O'oma, and Kalaoa 1-4; Kekaha, North Kona District, Hawai'i Island.* Cultural Surveys Hawaii: Kailua.

Yen, D. E.
1978 *The Amy Greenwell Bequest: 3rd Report*, Ms. 05-9-78, Department of Anthropology, Bishop Museum, Honolulu, HI.

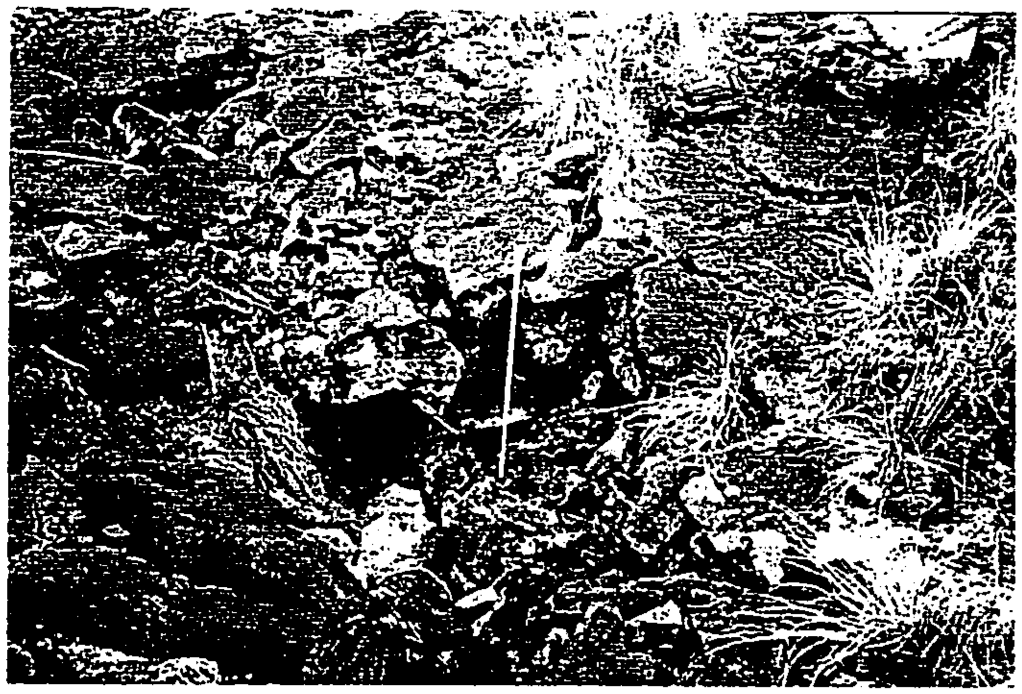


Figure 57 State Site 50-10-27-20696. Lava tube entrance, View to west

Figure 58 State site 50-10-27-20700. Feature A, Modified tumulus, View to south

DOCUMENT CAPTURED AS RECEIVED

Figure 59 State site 50-10-27-20703, Feature A, Terrace, View to south

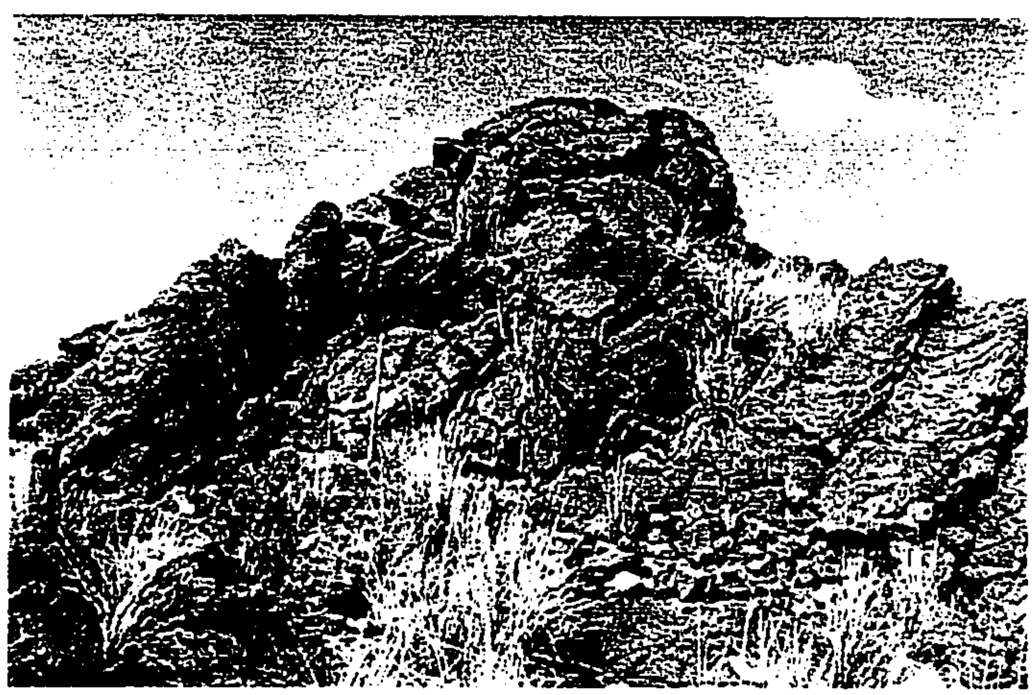


Figure 60 State site 50-10-27-20703, Feature C, Quarry, View to north

Figure 61 State site 50-10-27-20709, Feature A, Hearth

Figure 62 State site 50-10-27-20709, Feature C, Enclosure, View to northwest

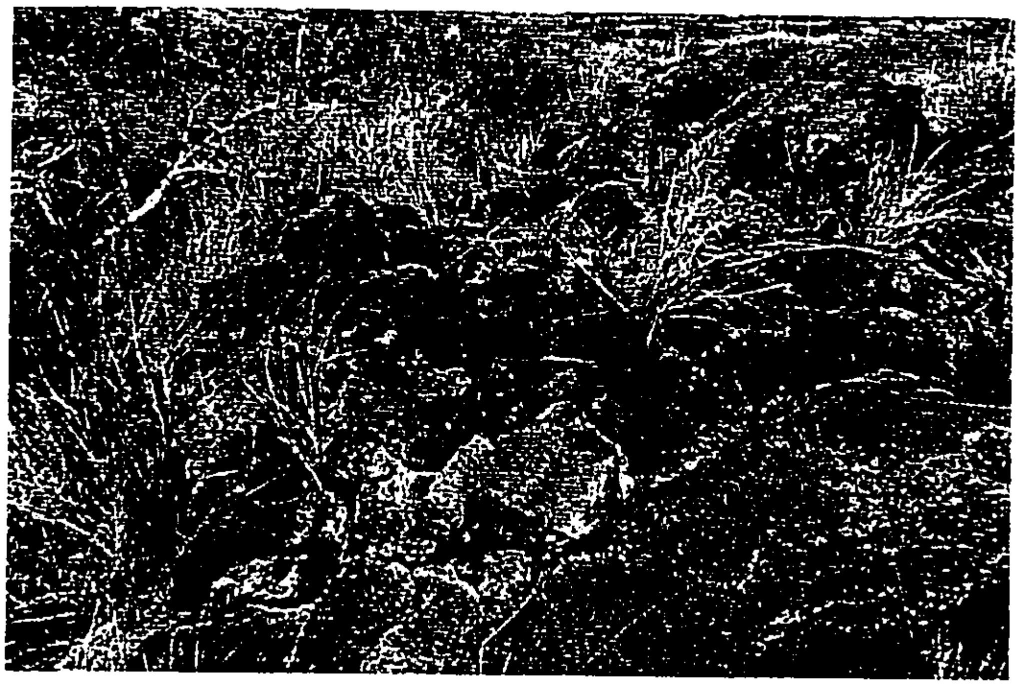


Figure 63 State site 50-10-27-20712, C-shape. View to south

Figure 64 State site 50-10-27-20715, Terrace. View to northeast

Figure 65 State site 50-10-27-20719, Feature A, Rockshelter, View to west

Figure 66 State site 50-10-27-20722, Trail, View to south

Figure 67 State site 50-10-27-20725, Feature A. Terrace, View to southwest

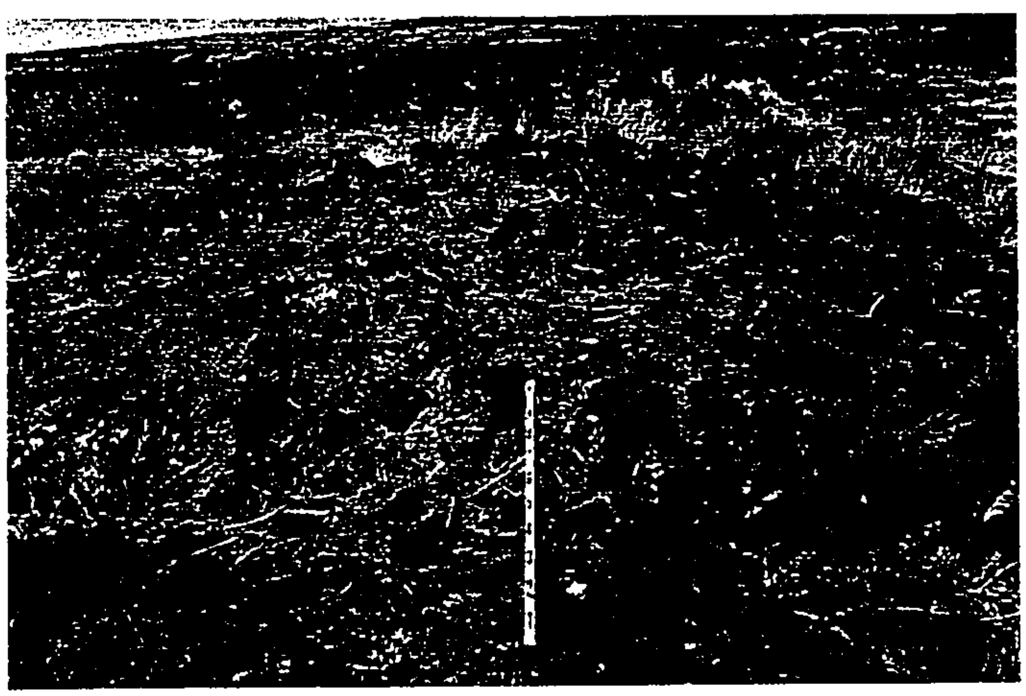


Figure 68 State site 50-10-27-20725, Feature B, Platform, View to northeast

Figure 69 State site 50-10-27-20726, Feature A, Trail, View to south

Figure 70 State site 50-10-27-20727, Lava tube, View to west

Figure 71 State site 50-10-27-20732, Trail, View to northeast

Figure 72 State site 50-10-27-20738, Feature A, Enclosure, View to north

Figure 73 State site 50-10-27-20741, Feature B, Modified tumulus, View to southeast

Figure 74 State site 50-10-27-20745, Trail, View to south

Figure 75 State site 50-10-27-20749, Feature A, Terrace, View to northeast

Record Research of Roadways and Trails at Kohanaiki and Kaloko, North Kona, Island of Hawaii

R.M. Towill Corporation, May 1995

RECORD RESEARCH OF ROADWAYS AND TRAILS
AT KOHANAIKI AND KALOKO, NORTH KONA
ISLAND OF HAWAII, HAWAII

May 1995

Prepared by:
Russell Figueiroa
Licensed Professional Land Surveyor
Certificate Number 4729

R.M. Towill Corporation
420 Waiakamilo Road, Suite 411
Honolulu, Hawaii 96817

Record Research of Roadways and Trails at Kohanaiki and Kaloko, North Kona Island of Hawaii, Hawaii

INTRODUCTION

The R.M. Towill Corporation conducted a research of recorded documents to determine the existence of roadways and trails which may have been utilized to provide access over and across the project which is specifically identified in the site location.

The study did not involve any field reconnaissance, however, it did utilize the archaeological reconnaissance that was conducted by Cultural Surveys Hawaii, dated April 1995.

SITE LOCATION

A record research was conducted of portions of the lands of Kohanaiki and Kaloko, North Kona, Hawaii. The specific location of the subject or study area is delineated in yellow on the attached tax map and is further identified as Lot 7-A-1, being a portions of Grant 2942 to Hulikoa and Royal Patent 8214, Land Commission Award 7715, Apana 11 to Lota Kamehameha.

The project area encompasses 224.43 acres and is bounded on the West by Queen Kaahumanu Highway, on the North by Parcel 3, being a portion of Grant 2942 to Hulikoa, on the East by Lot 7-C-1, being portions of Grant 2942 to Hulikoa and Royal Patent 8214, Land Commission Award 7715, Apana 11 to Lota Kamehameha, and on the South by the Kaloko-Mauka/Makai roadway which is a portion of Royal Patent 8214, Land Commission Award 7715, Apana 11 to Lota Kamehameha.

RESEARCH

A record research for the existence of documents, descriptions, maps and sketches was conducted at the Bureau of Conveyances, Tax Map Branch, State Survey Office, State Land Management, State Archives, State Department of Transportation and the Planning Department, County of Hawaii.

The original survey notes for Grant 2942 could not be located by the State Survey Office and site specific maps were not available for Grant 2942 and Land Commission Award 7715, Apana 11.

FINDINGS

* ITEM 1

Grant 2942 and Land Commission Award 7715, Apana 11, have reservations for the rights of native tenants which provides for access to Kuleanas situated within said lands.

* ITEM 2

In September of 1888, J.S. Emerson, Surveyor, prepared a map titled "Akahipuu Section, North Kona, Hawaii". The plat shows Grant 2942 to Hulikoa in its entirety and also shows a roadway which runs in a Mauka-Makai direction from an approximate elevation of 325 feet to 504 feet. The road depicted on Emerson's plat is shown in purple on the attached exhibit and commences within the Land of Kaloko, more particularly Land Commission Award 7715, Apana 11, and extends into Grant 2942, which is in the Land of Kohanaiki.

* ITEM 3

J.S. Emerson, Surveyor, in January of 1889, prepared a plat titled "Map No. 6, Homestead Lots, Akahipuu Section, North Kona, Hawaii". The plat depicts a road which is named "Kohanaiki Road" which extends from the Government Road at the East boundary of Grant 2030 to Kaiakoili and runs in a Westerly direction into Grant 2942. The general location of the roadway is delineated in orange on the attached Exhibit "A". A portion of the Kohanaiki Road which is presently a public road is shown in orange and outlined in red. The portion of Kohanaiki Road which became a public road is not identified as a government road on the plat prepared by J.S. Emerson.

Records which are kept at the Archives, State of Hawaii, also substantiate the existence of the Kohanaiki Road and is referred to as "old road".

* ITEM 4

A tracing was made in August 1952 of Registered Map 1280 which was prepared and surveyed by J.S. Emerson, Surveyor, in 1888. The plat was titled "Kailua Section, North Kona, Hawaii" and it depicts a roadway which runs along the South side of Grant 2030 and over and across the East boundary of Grant 2942 and into Land Commission Award 7715, Apana 11. The roadway runs from the Kaloko Fish Pond to the Mauka Government Road. The road is not labeled and appears to be in a different location from the roadway shown on Emerson's plats prepared for the Akahipuu, North Kona area. The location of the roadway is shown in green on the attached Exhibit "A".

* ITEM 5

The Department of Transportation, Highways Division, State of Hawaii, conducted a survey for the Queen Kaahumanu Highway in April 1968. The plat shows a portion of Queen Kaahumanu Highway where it crosses the Land of Kaloko and a portion of the Land of Kohanaiki. The plat also shows two (2) trails which crosses the Queen Kaahumanu Highway in a Mauka-Makai direction, being approximately 400± feet South and 850± feet from the boundary of Kaloko and Kohanaiki. The trails are shown in blue on the attached exhibit.

* ITEM 6

In 1971 an archaeological survey was conducted by the National Park Service, U.S. Department of the Interior, titled "An Ahupua'a Study, the 1971 Archaeological Work at Kaloko Ahupua'a, North Kona, Hawaii" in which reference is made to a "1888 Emerson Survey", which list the following "roads" that lead out of the homesteads:

(a) A road leading inland and totally within Kohanaiki, called "Kohanaiki Road" (Emerson 1888c:79/80). A stone wall lined the South side of this road (Emerson 1888c:79/80).

(b) A road leading seaward, "Rd to Nawahiahu" (Emerson 1888c:57), "Road to Sea" (Emerson 1888d:Reg.#1512) This is the road which enters Kaloko in the Middle Zone and extended to Kaloko Fishpond (cf Chap. 7, Part D).

(c) A road leading South and across Kaloko at 1,200-1,300 feet elevation, called "Road to Kailua" (Emerson 1888d:Reg.#1512), "Kohanaiki Homestead Road" on today's TMK book (TMK: 7-3-08).

SUMMARY

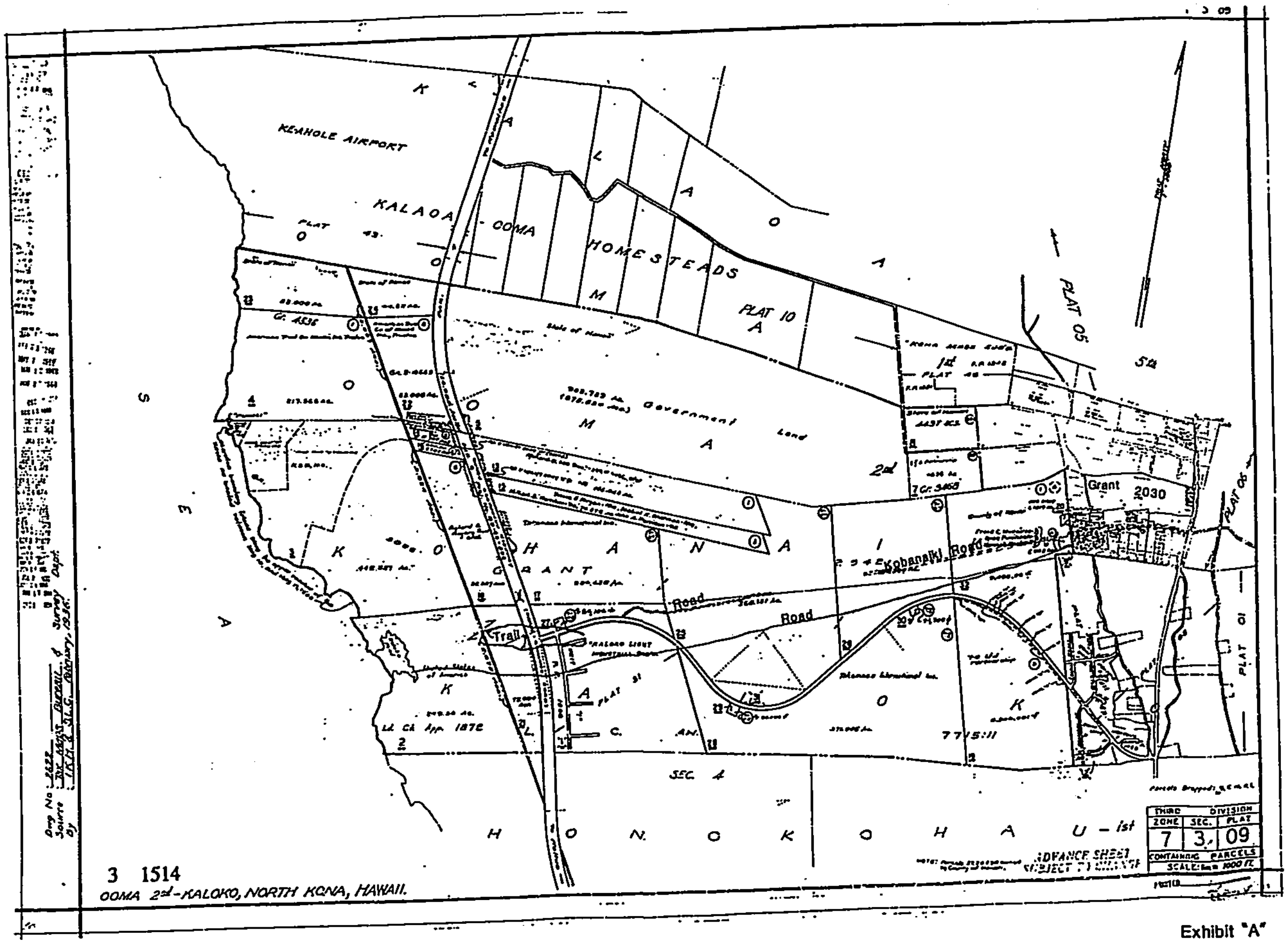
It appears that J.S. Emerson in his survey plats shows two (2) different locations of the Kohanaiki Road, one location which affects the Lands of Kaloko and Kohanaiki, as shown in orange and purple on the Exhibit "A", and the other location which is almost entirely within the Land of Kohanaiki and depicted in green on Exhibit "A".

The Kohanaiki Road which affects both Lands of Kaloko and Kohanaiki, as shown in purple and orange, is probably the more accurate depiction of the location since the location appears to be more detailed, however, an archaeological reconnaissance would be required to accurately locate the "Kohanaiki Road". There is no reservation for the roadway in the original grants and awards, however, it appears that this was a primary route in early times to get from the sea to the Mauka Government road.

R.M. TOWILL CORPORATION

RUSSELL FIGUEIROA
LICENSED PROFESSIONAL LAND SURVEYOR
No. 4729
HAWAII, U.S.A.

Russell Figueiroa
Licensed Professional Land Surveyor
Certificate Number 4729



3 1514

OOMA 2nd-KALOKO, NORTH KONA, HAWAII.

Exhibit "A"

Economic and Fiscal Impact Assessment for the Kaloko Town Center

KPMG Peat Marwick, May 21, 1996

KPMG

The Global Leader

Pacific Land Services, Inc. for
Tokyo Green Hawaii, Inc.

ECONOMIC AND FISCAL IMPACT ASSESSMENT FOR THE KALOKO TOWN CENTER

Final Report
May 21, 1996

KPMG Peat Marwick LLP

P.O. Box 4150
Honolulu, HI 96812-4150

Telephone 808 531 7286
Telex 7238615

Telefax 808 541 9321

May 21, 1996

Tokyo Green Hawaii, Inc.
c/o Mr. Ned Dewey
Pacific Land Services, Inc.
810 Richards Street, Suite 900
Honolulu, Hawaii 96813

Dear Mr. Dewey:

KPMG Peat Marwick LLP is pleased to submit this report which presents an assessment of the economic and fiscal impacts of the Kaloko Town Center to Hawaii County and the State of Hawaii.

BACKGROUND

Tokyo Green Hawaii, Inc. (Tokyo Green) owns approximately 1,100 acres of land located in Kaloko, on the western side of the island of Hawaii. The property is defined as TMK 7-3-9-17 and 25 through 30. It consists of lands mauka of and adjacent to the existing Kaloko Light Industrial Subdivision, along the Queen Kaahumanu Highway. The lands are managed by Pacific Land Services, Inc. (Pacific Land).

Approximately 224 acres of this land are proposed for development as the Kaloko Town Center. The remainder of the site is still undergoing data reconnaissance and planning. Preliminary development plans for the 224-acre property include a school or park site, roads and open space, and the following developments:

Preliminary Land Uses at the Kaloko Town Center

Residential (units)	
Multifamily	480
Single-family	370
Commercial/Retail and Office (acres)	57

Working with your land planner, Kimura International, Inc., Pacific Land has asked KPMG to prepare this economic and fiscal impact assessment of the Kaloko Town Center for inclusion in an Environmental Impact Statement.

In March 1996, KPMG reviewed the market support for the project in a report entitled "Market Assessment for the Kaloko Town Center." The objective of this report is to evaluate the anticipated economic and fiscal impacts to Hawaii County and the State of Hawaii, assuming that the project is developed and received in the marketplace as presented in our March 1996 market assessment. Unless otherwise stated, all dollars herein are stated in 1995 dollars.

DEVELOPMENT ASSUMPTIONS (Exhibit A)

Based upon the projected market support, residential and commercial/retail developments at the Kaloko Town Center are expected to be completed by the year 2020, as presented in Exhibit A and summarized below:

- **Residential developments** at the Kaloko Town Center are projected to occur through the year 2015. Approximately 100 multifamily units are projected to be completed by the year 2000; an additional 500 units (250 multifamily and 250 single-family) by the year 2010; and the final 250 units (130 multifamily and 120 single-family) by the year 2015.

- **Traditional commercial/retail developments** at the Kaloko Town Center are projected to occur through the year 2020. By the year 2000, about 9.0 acres are projected to be developed; an additional 12.7 acres by the year 2010; and another 16.2 acres by the year 2020. Overall, approximately 37.9 acres of traditional commercial/retail development (32.4 acres of retail and 5.5 acres of office), comprising about 380,400 square feet of leasable area (291,900 square feet of retail and 88,500 square feet of office), are projected to be developed through the year 2020.

- **Alternative (non-traditional) commercial/retail developments** are also projected to be developed at the site. Alternative commercial/retail uses at the Kaloko Town Center were not part of Pacific Land's original development plans, but are now being considered as a result of interviews held in conjunction with the social impact assessment conducted by Earthplan.

  While we believe that these other commercial/retail developments would have positive economic and fiscal impacts for the County and State, this study does not quantify the impacts of the approximately 21 acres proposed for these uses. This is because there are relatively fewer comparables for each of these uses in the State, and economic and fiscal information on many of these uses are difficult to estimate. Therefore, the net economic and fiscal benefits stated herein may be a conservative estimate of the total impact of the project.

EMPLOYMENT IMPACTS

The Kaloko Town Center will generate short-term employment during the construction and sales/lease up of the developments, and long-term employment in the sales, operations and support of the projects upon completion. Projected employment is presented in the following sections, classified as being direct, or indirect and induced.

Construction Employment (Exhibit B)

- **Direct construction employment at Kaloko Town Center** includes on-site laborers, operators and craftsmen, as well as professional, managerial, sales, and clerical workers whose usual place of employment may be elsewhere on the island or State. Other types of direct employment include professional consultants such as architects, engineers, and a variety of technical consultants.

  Direct construction employment for the residential and commercial/retail projects have been projected based upon the estimated development costs provided by Pacific Land and the proposed development schedule discussed previously. The projections also consider 1994 average industry wages as reported in the State of Hawaii, Department of Labor and Industrial Relations, "Employment and Payrolls in Hawaii," October 1995. The 1994 wage data has been inflated by 2.2% (estimated CPI increase by Bank of Hawaii) to adjust to estimated 1995 dollars.

  Direct construction employment required for the residential and commercial/retail developments at the Kaloko Town Center is calculated based upon the construction budgets and the percentage of development costs devoted to labor (estimated at 40%). This amount is then divided by the estimated wages and benefits of an average construction worker (estimated at $49,800 for Hawaii County). This results in estimated total employment that is measured in full-time equivalent (FTE) positions.

  Direct construction employment from the development of the Kaloko Town Center is estimated to range from an average of about 60 to 130 FTE positions annually during the respective periods, as shown in Exhibit B. From the commencement of development to the year 2000, an average of about 130 FTE positions are projected annually, dropping to an average of about 60 FTE positions annually during the final 10-year period. Overall, total direct construction employment is projected to amount to about 1,770 FTE employees over the term of the project.

- **Indirect and induced construction employment** within other industries on the island and within the State are expected to be stimulated by the direct employment of construction workers at the Kaloko Town Center. Indirect and induced employment is estimated based upon 1991 ratios provided by the Department of Business, Economic Development and Tourism (DBEDT) Input-Output Model and Hawaii Econometric Model.

Based upon findings of the DBEDT model, an additional 0.79 FTE positions appear to be created statewide for every direct FTE position in the construction industry. Thus, indirect and induced FTE positions are projected to range from an average of 50 to 100 positions annually during the respective periods, as also shown in Exhibit B. During the initial three year period, an average of about 100 FTE positions annually are projected, dropping to about 60 FTE positions annually during the subsequent 10-year period, and declining to about 50 FTE positions annually over the final 10-year period. Overall, indirect and induced construction employment is projected to account for roughly 1,400 FTE positions over the term of the project.

- **Total direct, indirect and induced construction employment** is projected to range from about 110 to 230 FTE positions annually. Overall, total direct, indirect and induced construction employment is projected to account for almost 3,200 FTE positions over the term of the project.

Operational Employment (Exhibit C)

- **Direct operational employment at the Kaloko Town Center** is projected to be created by the sales and maintenance of the residential developments and by the operations of the various commercial/retail facilities at the project.

  Based upon the marketing experience at similar projects, property management and sales are estimated to require an average of 5.0 FTE positions annually throughout the absorption period (projected to be from 1998 - 2015). Once all of the residential units have been sold, these positions would not be required.

  Operational employment at the various commercial/retail facilities has been projected based upon the Urban Land Institute's (ULI) "Development Impact Assessment Handbook," 1994. ULI estimates an average of 2.5 workers per 1,000 square feet of gross leasable area for retail space and 3.0 workers per 1,000 square feet for office space.
  Thus, in the year 2000, about 219 FTE positions are projected, increasing to 559 and 995 FTE positions by the years 2010 and 2020, respectively.

- **Indirect and induced operational employment** within other industries on the island and elsewhere in the State is projected to occur during the sales/lease-up and facility operations at the Kaloko Town Center. Analysis of the total economic impacts of direct, indirect and induced employment multipliers by the DBEDT suggest that for every direct position, an average of 2.16 FTE positions for other services and 0.66 FTE positions for retail services could be generated.

  Thus, indirect and induced operational employment attributable to the sales/lease-up period at the Kaloko Town Center is estimated at 11 FTE positions in the years 2000 and 2010, respectively.

Additionally, indirect and induced employment as a result of the operation of the various commercial/retail facilities is estimated at about 160 FTE positions in the initial period, increasing to about 380 and 660 FTE positions by the years 2010 and 2020, respectively.

- **Total direct, indirect and induced operational employment** is projected at 380 FTE positions in the year 2000; 940 FTE positions by the year 2010; and 1,660 FTE positions by the year 2020.

POPULATION IMPACTS (Exhibits D, E & F)

The development of the Kaloko Town Center is expected to lead to an increase in the households and population in the North Kona area. On-site population is projected based upon the number of homes planned to be developed at the project, and occupancy rates and average household sizes as projected in Exhibit D. All home owners are assumed to be full-time owner-occupants (i.e. no investor owners).

The projected occupancy rates are based upon the estimated demand for residential units in the North Kona area; the projected average household sizes are based upon the estimated 1995 average household size of 2.76 persons, and adjusted to account for differing household sizes for multifamily and single-family units. As shown in Exhibit D, a 90% occupancy rate is projected for the residential units completed at the Kaloko Town Center, with average household sizes for multifamily and single-family units projected at 2.56 and 2.96 persons, respectively.

The projected increase in the number of households and the population is presented in Exhibit E and summarized below:

- **The number of households at the Kaloko Town Center** are projected at about 90 by the year 2000, 540 by the year 2010, and 770 by the year 2020.

- **The population increase directly resulting from the residential units at the Kaloko Town Center** are projected at about 230 by the year 2000, 1,470 by the year 2010, and 2,090 by the year 2020.

Based upon the sales at other comparable projects, the majority of the residents (approximately 75%) at the Kaloko Town Center are projected to be current residents living elsewhere on the island, with the remaining approximately 25% coming from the other islands or out of state. The projected in-migrant residents to the County and State attributable to the Kaloko Town Center are presented in Exhibit F and summarized below:

<u>New Residents to the County of Hawaii</u>

- **On-site community residents** are projected at about 60 by the year 2000, 370 by the year 2010, and 520 by the year 2020. These new County residents living at the Kaloko Town Center include in-migrant residents to the County who are currently living on another island, as well as people from out of state.

Approximately 10% of the on-site residents are projected to be Hawaii residents currently residing on another island and about 15% are projected to be in-migrants from out of state.

- **Off-site residents** are projected at about 130 in the year 2000 and increasing to about 210 and 330 in the years 2010 and 2020, respectively. These new County residents living in the North Kona area include construction and operational employees (and their dependents) attributable to the development and operation of the Kaloko Town Center.

  Based upon discussions with representatives in the construction industry, approximately 35% of the construction workers required for the Kaloko Town Center are projected to come from Oahu, and one out of every three are estimated to have a dependent. Additionally, about 5% of the operational employees are projected to be Hawaii residents moving from another island, while about 15% are projected to come from out of state; one out of every two operational employees is projected to have a dependent.

Overall, the total in-migrant population to Hawaii County (new County residents) is projected at about 180 residents in the year 2000, 570 in the year 2010, and 850 in the year 2020.

<u>New Residents to the State of Hawaii</u>

- **On-site community residents** are projected at about 40 by the year 2000, 220 by the year 2010, and 310 by the year 2020. These new State residents living at the Kaloko Town Center, projected to comprise approximately 15% of the total on-site population, include in-migrant people from other states or countries.

- **Off-site residents** are projected at about 50 in the year 2000, increasing to about 130 and 230 in the years 2010 and 2020, respectively. These new State residents living in the North Kona area include operational employees (and their dependents) for the commercial/retail facilities at the Kaloko Town Center.

  Due to the relative inactivity in the construction industry and the sizable in-state trained labor market, no construction workers from out of state are projected. On the other hand, about 15% of the operational employees at the Kaloko Town Center are projected to come from out of state and one out of every two is projected to have a dependent.

Overall, the total in-migrant population to the State of Hawaii (new State residents) is projected at about 80 residents in the year 2000, 350 in the year 2010, and 540 in the year 2020.

PERSONAL INCOME IMPACTS (Exhibit G)

The Kaloko Town Center would generate additional personal income for residents of Hawaii County and the State of Hawaii. For purposes of this assessment, personal income is defined as the wages and salaries paid to the direct construction and operational employees associated with the Kaloko Town Center. Personal income is projected on the basis of average industry wages and salaries (based upon the Department of Labor and Industrial Relations "1994 Employment and Payrolls in Hawaii," and inflated to 1995 dollars) for the various anticipated categories of employment and on the projected future employment demands of the project as presented in Exhibit G.

- **Personal income paid to Hawaii residents employed in the construction of the Kaloko Town Center** could be expected to average approximately $4.8 million annually in the initial three year period. In the subsequent 10-year periods, the number of construction workers is expected to slightly decline, with personal income projected to average about $3.0 million and $2.2 million annually, respectively. Overall, direct personal income from the construction of the Kaloko Town Center is projected at about $66.1 million (1995 dollars).

- **Personal income paid to Hawaii residents employed in the operation of the Kaloko Town Center** is expected to generate personal income of about $4.4 million in the year 2000, increasing to about $10.9 million and $19.0 million in the years 2010 and 2020, respectively.

- **Kaloko Town Center's impact on total annual personal income for both construction and operational employment** is projected at almost $9.2 million in the year 2000, escalating to about $13.8 million in the year 2010 and $21.2 million in the year 2020.

FISCAL IMPACTS

The Kaloko Town Center is expected to generate significant positive fiscal benefits to Hawaii County, as well as the State of Hawaii. These fiscal impacts have been evaluated by comparing the additional operating tax revenues with the additional operating expenditures that are projected to be incurred by the County and State governments as a result of the project.

County government revenues are projected to be from additional real property taxes generated as a result of the developments, as well as other County revenue sources (from the additional County residents) such as taxes on fuel, utilities, motor vehicle, etc. State revenues would be composed of general excise taxes, additional personal income taxes from the construction and operation of the project, and miscellaneous taxes (from the additional State residents) including general excise, automobile, gas, etc. Projected revenues and expenditures resulting from the development and operation of the Kaloko Town Center are presented in Exhibits H, I, J and K and summarized in the following sections.

Additional County Operating Revenues (Exhibits H and I)

- **Net increase in property tax revenues to the County** attributable to the development of the Kaloko Town Center are projected at about $360,000 in the year 2000, escalating to about $860,000 and $1.2 million in the years 2010 and 2020, respectively.

  Real property taxes in Hawaii County are based upon the tax assessed building and land values. The tax rate on buildings is $8.50 per $1,000 of value. Commercially zoned land is taxed at $10.00 per $1,000 of value; residential zoned land is taxed at $8.50 per $1,000 of value. However, for residential units, owner-occupied units are taxed at a rate of $4.45 per $1,000 of land and building value.

- **The net increase in non-real property revenues to the County** attributable to the development of the Kaloko Town Center is projected at about $30,000 in the year 2000, escalating to about $90,000 and $130,000 in the years 2010 and 2020, respectively.

- **Total increase in revenues to the County** attributable to the development of the Kaloko Town Center are projected at about $390,000 in the year 2000, escalating to about $950,000 and almost $1.4 million in the years 2010 and 2020, respectively.

Additional State Operating Revenues (Exhibits J and K)

- **State tax revenues from direct construction spending** are projected to approach an average of $590,000 annually from 1998 to the year 2000; dropping to an average of $390,000 annually in the subsequent 10-year period; and further declining to an average of $270,000 annually in the final 10-year period. Overall, about $8.4 million in additional general excise taxes are projected as a result of direct construction spending.

  New revenues to the State are projected to be generated by general excise taxes related to construction spending. A 0.5% tax is payable to the State from contractors on all wholesale materials purchased, while an additional 4% general excise tax is also payable on the total development costs.

- **State tax revenues from indirect and induced expenditures** are also projected to be generated as a result of the direct construction expenditures associated with the Kaloko Town Center. Based upon the DBEDT's Input-Output Model and Hawaii Econometric Model, the indirect and induced effect is estimated at $0.77 per direct tax dollar. Accordingly, general excise taxes on indirect and induced spending is projected to average about $210,000 to $450,000 annually during the respective periods. Over the term of the project, the indirect and induced effect is projected to generate about $6.4 million in additional general excise taxes.

- **Total State tax revenues from construction spending, including direct, indirect and induced expenditures** could approach about $14.8 million.

- **State tax revenues from additional personal income taxes from the direct employment associated with the Kaloko Town Center** are projected to generate an average of about $920,000 to $2.1 million annually during the respective periods (based upon an average effective State income tax rate of 10%).

- **State tax revenues from miscellaneous taxes** (based upon The Tax Foundation of Hawaii's "The Tax Burden of The Arnie Aloha Family") are projected at $60,000 in the year 2000, increasing to about $240,000 in the year 2010, and $370,000 in the year 2020.

  Miscellaneous taxes include general excise, automobile, gas and specific taxes from new residents to the State of Hawaii.

- **Total increase in revenues to the State** attributable to the development of the Kaloko Town Center is projected at about $2.0 million in the year 2000, escalating to about $2.3 million and $3.0 million in the years 2010 and 2020, respectively.

Additional Government Operating Expenditures (Exhibits L and M)

As a result of the additional households and residents in the area attributable to the Kaloko Town Center, it is expected that the County and State would incur additional expenditures of public resources. Although the majority of residents at the Kaloko Town Center are expected to already reside elsewhere on the island, a fair number of "new residents" to the County and State are also expected. Specific government expenditures resulting from the additional residents to the County and State as a result of the development of the Kaloko Town Center are discussed below.

County of Hawaii

- **Annual County expenditures are projected to be about $940 per resident (1995 dollars).** The various County government operating expenditures for fiscal year 1994 were analyzed with respect to the relevant population served by each of the government functions. This analysis indicates that the County of Hawaii government expenditures in fiscal year 1994 totaled about $924 per resident, as shown in Exhibit L. A 2.2% increase, equal to the rise in the CPI from 1994-1995 was applied to estimate per capita expenditures in 1995 dollars of about $940.

- **New County expenditures directly attributable to the Kaloko Town Center** are projected at $170,000 in the year 2000, escalating to $540,000 and $800,000 in the years 2010 and 2020, respectively.

State of Hawaii

- **Annual State expenditures are projected to be about $4,790 per resident (1995 dollars).** The various State government operating expenditures for fiscal year 1994 were analyzed with respect to the relevant population served by each of the government functions. This analysis indicates that the State of Hawaii's expenditures in 1994 totaled about $4,700 per resident, as shown in Exhibit M. Adjusting for inflation (2.2% for 1994-1995), per capita expenditures in 1995 dollars is estimated at about $4,790.

- **New State expenditures directly attributable to the Kaloko Town Center** are projected at $380,000 in the year 2000, escalating to $1.7 million and $2.6 million in the years 2010 and 2020, respectively.

Summary of Government Revenues and Expenditures (Exhibits N and O)

The additional fiscal impacts of the Kaloko Town Center to the County and State operating budgets are estimated by comparing the projected operating revenues and expenditures of both the County and State. The net additional revenues to the County and State are presented in Exhibits N and O and summarized below.

- **Net additional revenues to the County** are projected to be about $217,000 in the year 2000, escalating to about $406,000 and $548,000 in the years 2010 and 2020, respectively.

  The analysis also indicates that additional County government revenues generated by the Kaloko Town Center and its facilities could be about 2.3, 1.8, and 1.7 times the additional operating expenses incurred for the years 2000, 2010, 2020, respectively.

- **Net additional revenues to the State** are projected at about $1.6 million in the year 2000, declining to $630,000 and $380,000 in the years 2010 and 2020, respectively. The initially higher revenues are attributable to the income, excise and other state taxes from the high levels of construction activity in the early years.

  Thus, the State government's additional revenues attributable to the Kaloko Town Center are projected at about 5.2 times the estimated additional expenses to be incurred in the year 2000, and 1.2 and 1.0 times expenses in the years 2010 and 2020, respectively.

* * * * * * *

We appreciate the opportunity to be of assistance to Tokyo Green Hawaii, Inc. and Pacific Land Services, Inc.

Very truly yours,

KPMG Peat Marwick LLP

KPMG Peat Marwick LLP

Exhibit A

Kaloko Town Center

KALOKO TOWN CENTER DEVELOPMENT AND OPERATIONAL ASSUMPTIONS

	1998 - 2000	2001 - 2010	2011 - 2020	Total
Incremental development (1)				
Residential developments (units)				
Multifamily	100	250	130	480
Single-family	0	250	120	370
Total residential units	100	500	250	850
Commercial/Retail developments				
Retail				
Land area (acres)	8.4	10.5	13.5	32.4
Gross leasable area (sq. ft.) (2)	75,600	94,900	121,400	291,900
Office				
Land area (acres)	0.6	2.2	2.7	5.5
Gross leasable area (sq. ft.) (3)	10,000	34,250	44,250	88,500
Cumulative development (1)				
Residential developments (units)				
Multifamily	100	350	480	
Single-family	0	250	370	
Total residential units	100	600	850	
Commercial/Retail developments				
Retail				
Land area (acres)	8.4	18.9	32.4	
Gross leasable area (sq. ft.) (2)	75,600	170,500	291,900	
Office				
Land area (acres)	0.6	2.8	5.5	
Gross leasable area (sq. ft.) (3)	10,000	44,250	88,500	

(1) Based upon the development schedule presented in the "Market Assessment for the Kaloko Town Center, April 1996."
(2) Based upon gross leasable area of 9,000 square feet per acre for retail developments.
(3) Based upon gross leasable area of 16,000 square feet per acre for office developments.

Note: This economic/fiscal impact assessment does not include the costs and benefits associated with the proposed alternative commercial/retail uses at the Kaloko Town Center.

Kaloko Town Center

PROJECTED DIRECT, INDIRECT AND INDUCED CONSTRUCTION EMPLOYMENT
(Full-Time Equivalent Positions)

	Construction cost assumptions (rounded)	Average annual FTE positions (1) 1998 - 2000	2001 - 2010	2011 - 2020	Total FTE positions
Direct construction employment					
Off-site construction costs	$12,767,000	34	0	0	103
On-site construction costs					
Multifamily	9,600,000	5	4	2	77
Single-family	12,000,000	0	7	3	96
Commercial	9,475,000	6	3	3	76
Design fees					
Multifamily	1,250,000	1	1	0	16
Single-family	1,200,000	0	1	1	16
Commercial	4,976,000	5	2	3	65
Engineering					
Off-site	1,277,000	6	0	0	17
Multifamily	960,000	1	1	0	13
Single-family	1,200,000	0	1	1	16
Commercial	948,000	1	0	1	12
Soft costs					
Off-site	1,532,000	7	0	0	20
Multifamily	5,184,000	5	4	2	68
Single-family	6,324,000	0	6	3	83
Commercial	7,109,000	7	3	4	93
Residential development (2)					
Multifamily	33,600,000	19	14	7	270
Single-family	40,700,000	0	22	11	327
Commercial/Retail (3)					
Retail space	36,488,000	25	9	12	293
Office space	13,275,000	4	4	5	107
Subtotal, direct construction employment (rounded)		130	80	60	1,770
Indirect and induced construction employment (rounded) (4)	79% of direct employment	100	60	50	1,400
Total, direct, indirect and induced employment		230	140	110	3,170

(1) Based upon the projected residential and commercial developments (as shown in Exhibit A) and estimated construction costs as provided by Pacific Land Services, Inc.: 40% of the total construction costs for off-site, on-site, residential development and commercial/retail costs are assumed to account for wages and benefits, while 65% of the design fees, engineering, and soft costs are allocated to wages and benefits. Average annual wages and benefits are estimated at $49,800 per FTE worker. Development costs allocated by period based upon the respective residential and commercial/retail development schedule.

(2) Construction costs for multifamily and single-family units are projected to average $70,000 and $110,000 per unit, respectively, as provided by Pacific Land Services, Inc.

(3) Construction costs for retail and office space are projected to average $125 and $150 per sq. ft. (including TI's), respectively, as provided by Pacific Land Services, Inc.

(4) Indirect and induced effect estimated at 0.79 full-time equivalent positions per direct position, based upon 1991 ratios from the DBEDT Input-Output Model and Hawaii Econometric Model, as presented in the Department of Business, Economic Development and Tourism, "The Hawaii State Data Book," 1992.

Sources: Pacific Land Services, Inc., Department of Labor and Industrial Relations (DLIR), "1994 Employment and Payrolls in Hawaii," and the DBEDT "The Hawaii State Data Book."

Note: This economic/fiscal impact assessment does not include the costs and benefits associated with the proposed alternative commercial/retail uses at the Kaloko Town Center.

<u>*Exhibit C*</u>

Kaloko Town Center

PROJECTED TOTAL OPERATIONAL EMPLOYMENT IMPACTS
(Full-Time Equivalent Positions)

	FTE assumptions	2000	2010	2020
Direct operational employment				
Property management and sales	Note (1)	5	5	0
Commercial/Retail space	Note (2)	219	559	995
Subtotal direct operational employment (rounded)		220	560	1,000
Indirect and Induced operational employment (3)				
Property management and sales	216% of dir. op. emp.	11	11	0
Commercial/Retail space	66% of dir. op. emp.	145	370	658
Subtotal, indirect and induced operational employment (rounded)		160	380	660
Total		380	940	1,660

(1) Property management and sales operational employment estimated at 5.0 persons annually throughout the projected sales period (1998 - 2015).
(2) Estimated at an average of 2.5 persons per 1,000 square feet of gross leasable area of retail space and 3.0 persons per 1,000 square feet of office space, as presented in the Urban Land Institute's "Development Impact Assessment Handbook," 1994.
(3) Estimate based upon 2.16 FTE indirect and induced positions per direct position for other services and 0.66 per direct position for retail services, based upon 1991 ratios from the DBEDT Input-Output Model and Hawaii Econometric Model, as presented in the Department of Business, Economic Development and Tourism, "The Hawaii State Data Book," 1992.

Note: This economic/fiscal impact assessment does not include the costs and benefits associated with the proposed alternative commercial/retail uses at the Kaloko Town Center.

Kaloko Town Center

UNIT USAGE ASSUMPTIONS FOR ON-SITE POPULATION PROJECTIONS (FOR SOLD UNITS)

	Projected occupancy rate	Persons per unit (1)
Projected ocupancy and persons per unit		
Multifamily units	90%	2.56
Single-family units	90%	2.96

(1) Estimated based upon the projected 1995 average household size (2.78 persons) for the North Kona and South Kohala areas, adjusted for unit type.

Sources: U.S. Bureau of the Census, Summary Tape File 1A; "Census of Population and Housing, Census Tracts, Honolulu, Hawaii, Standard Metropolitan Area," 1990.

Note: This economic/fiscal impact assessment does not include the costs and benefits associated with the proposed alternative commercial/retail uses at the Kaloko Town Center.

Exhibit E

Kaloko Town Center

PROJECTED NUMBER OF ON-SITE HOUSEHOLDS AND POPULATION

	2000	2010	2020
Incremental growth in households and population			
Projected number of households (1)			
Multifamily	90	225	117
Single-family	0	225	108
Total households (rounded)	90	450	230
Projected on-site population (2)			
Multifamily	230	576	300
Single-family	0	666	320
Total residents (rounded)	230	1,240	620
Cumulative growth in households and population			
Projected number of households (1)			
Multifamily	90	315	432
Single-family	0	225	333
Total households (rounded)	90	540	770
Projected on-site population (2)			
Multifamily	230	806	1,106
Single-family	0	666	986
Total residents (rounded)	230	1,470	2,090

(1) Based upon the projected number of housing units developed, as presented in Exhibit A (with sales occurring within the same period) and occupancy rates, as presented in Exhibit D.

(2) Based upon the number of households and average household size, as presented in Exhibit D.

Note: This economic/fiscal impact assessment does not include the costs and benefits associated with the proposed alternative commercial/retail uses at the Kaloko Town Center.

Kaloko Town Center

TOTAL PROJECTED ADDITIONAL IN-MIGRANT RESIDENT POPULATION TO THE COUNTY OF HAWAII AND STATE OF HAWAII

	Assumptions	2000	2010	2020
COUNTY OF HAWAII				
On-site community residents, cumulative (1)	25% of total	58	368	523
Off-site community residents:				
Construction employees (2)	35% of direct	46	28	21
Construction employee' dependents (3)	0% of above	15	9	7
Operational employees (4)	20% of direct	44	112	200
Operational employee' dependents (5)	50% of above	22	56	100
Subtotal		127	205	328
Total in-migrant population to the County (rounded)		180	570	850
STATE OF HAWAII				
On-site community residents, cumulative (1)	15% of total	35	221	314
Off-site community residents:				
Construction employees (2)	0% of direct	0	0	0
Construction employee' dependents (3)	0% of above	0	0	0
Operational employees (4)	15% of direct	33	84	150
Operational employee' dependents (5)	50% of above	17	42	75
Subtotal		50	126	225
Total in-migrant population to the State (rounded)		80	350	540

(1) Based upon the assumption that 10% of the Kaloko Town Center's residents will be from the other islands and 15% will be from out of state.
(2) Based upon the assumption that about 35% of the construction employees would be from Oahu, while none would be from out of state. Population numbers shown are average annuals for the period.
(3) Based upon the assumption that about 1 out of 3 construction employees would also have a dependent. Population numbers shown are average annual for the period.
(4) Based upon the assumption that about 5% of the operational employees would be from the other islands and 15% would be from out of state.
(5) Based upon the assumption that about 1 out of 2 operational employees would also have a dependent.

Sources: Discussions with real estate brokers, representatives in the construction industry and retailers.

Note: This economic/fiscal impact assessment does not include the costs and benefits associated with the proposed alternative commercial/retail uses at the Kaloko Town Center.

Kaloko Town Center

PROJECTED DIRECT PERSONAL INCOME FROM DIRECT EMPLOYMENT ASSOCIATED WITH THE PROJECT
(1995 Dollars)

	Full-time equivalent wages (1)	2000	2010	2020
Direct employment (persons)				
Construction (2)		130	80	60
Operational (3)				
Property management & sales		5	5	0
Commercial/Retail space		219	559	995
Direct personal income ($000's) (4)				
Construction	$36,900	$4,797	$2,952	$2,214
Operational				
Property management & sales	36,400	182	182	0
Commercial/Retail space	19,100	4,183	10,677	19,009
Total personal income (rounded)		$9,160	$13,810	$21,220

(1) Estimated based upon 1994 wages as reported by the Department of Labor and Industrial Relations, "Employment and Payrolls in Hawaii," and inflated to 1995 dollars.
(2) As presented in Exhibit B; average annual FTE positions.
(3) As presented in Exhibit C.
(4) Direct personal income estimated by applying the projected number of employees for the period to the estimated average FTE wages (excludes benefits).

Sources: Department of Labor and Industrial Relations (DLIR), "1994 Employment and Payrolls in Hawaii," and the Bank of Hawaii.

Note: This economic/fiscal impact assessment does not include the costs and benefits associated with the proposed alternative commercial/retail uses at the Kaloko Town Center.

Kaloko Town Center

PROJECTED ADDITIONAL PROPERTY TAX REVENUES TO THE COUNTY GOVERNMENT
(1995 Dollars, $000's)

	Property tax rate per $1,000 value (building / land)	2000	2010	2020
Projected property taxes (1)				
Multifamily (2)	$4.45 / $4.45	$83	$239	$320
Single-family (2)	$4.45 / $4.45	35	234	329
Commercial/Retail	$8.50 / $10.00	258	403	588
Total property tax revenues (rounded)		$380	$880	$1,240
Less: Current property taxes (3)		20	20	20
Net change in County property tax revenues (rounded)		$360	$860	$1,220

(1) Assuming all of the residential units are owner-occupied and a tax rate of $4.45 per $1,000 of assessed value; tax rate for the commercial/retail space is assumed to be $8.50 and $10.00 per $1,000 of assessed value for the building and land, respectively.
(2) Also included is real property taxes on the unimproved portion of the parcels; based upon the current tax rate of $10.00 per $1,000 of assessed value.
(3) Based upon the tax assessed value of $2,019,900 and the current tax rate of $10.00 per $1,000 of assessed value for conservation-zoned land.

Note: This economic/fiscal impact assessment does not include the costs and benefits associated with the proposed alternative commercial/retail uses at the Kaloko Town Center.

Exhibit I

Kaloko Town Center

PROJECTED TOTAL NEW TAX REVENUES TO THE COUNTY GOVERNMENT
(1995 Dollars, $000's)

Hawaii County per capita non-real property tax revenues

Revenue sources	Total revenues FY'94 (000's) (1)	Service population (2)	Annual tax revenues per resident
Liquid fuel	$5,504	147,800	$37
Utility franchise	2,851	147,800	19
Motor vehicle weight	2,312	147,800	16
Other (non-grant) sources	10,546	147,800	71
Total 1994 dollars	$21,213		$144
Total 1995 dollars, rounded (3)			$150

Total County tax revenues associated with the Kaloko Town Center (1995 dollars, $000's)

	2000	2010	2020
Net new property tax revenues (4)	$360	$860	$1,220
New non-real property tax revenues to the County (5)	27	86	128
Total new County tax revenues (rounded)	$390	$950	$1,350

(1) County government operating revenues for fiscal year ended June 30, 1994 as reported by the Tax Foundation of Hawaii.
(2) Estimated de facto population estimates for the County as of January 1, 1994, based upon the estimated de facto population for July 1, 1993 and 1994.
(3) Adjusted to 1995 dollars based upon CPI increases from 1994 to 1995, as reported by the Bank of Hawaii.
(4) As presented in Exhibit H.
(5) Based upon the increase in the County population as shown in Exhibit F, multiplied by the revenues per person.

Note: This economic/fiscal impact assessment does not include the costs and benefits associated with the proposed alternative commercial/retail uses at the Kaloko Town Center.

Exhibit J

Kaloko Town Center

PROJECTED ANNUAL GENERAL EXCISE TAX REVENUES FROM CONSTRUCTION TO THE STATE GOVERNMENT (1995 Dollars, $000's)

General excise tax on direct construction spending (1)	Construction costs (2)	Average annual revenue during the respective period 1998 - 2000	2001 - 2010	2011 - 2020	Total
Off-site construction costs	$12,767	$179	$0	$0	$536
On-site construction costs					
Multifamily	9,600	28	21	11	403
Single-family	12,000	0	34	16	504
Commercial	9,475	32	13	17	392
Design fees					
Multifamily	1,250	3	3	1	50
Single-family	1,200	0	3	2	48
Commercial	4,976	16	7	9	199
Engineering					
Off-site	1,277	17	0	0	51
Multifamily	960	3	2	1	38
Single-family	1,200	0	3	2	48
Commercial	948	3	1	2	38
Soft costs					
Off-site	1,532	21	0	0	64
Multifamily	5,184	15	11	6	218
Single-family	6,324	0	18	9	266
Commercial	7,109	24	10	13	294
Residential development					
Multifamily	33,600	98	74	38	1,411
Single-family	40,700	0	116	55	1,709
Commercial/Retail					
Retail space	36,488	132	50	64	1,532
Office space	13,275	21	22	28	558
Total annual general excise tax on construction spending (rounded)		$590	$390	$270	$8,360
General excise tax on indirect and induced spending (rounded) (3)		450	300	210	6,430
Total general excise tax on construction spending		$1,040	$690	$480	$14,790

(1) Based on a wholesale construction material tax of 0.5% charged to contractors for materials (assumed to be 40% of off-site, on-site, soft, residential development and commercial/retail costs) and a general excise tax of 4% charged to the developer (total costs).

(2) As presented in Exhibit B.

(3) Indirect and induced effect estimated at $0.77 per one dollar of general excise tax on direct construction, based on 1991 ratios from the DBEDT Input-Output Model and Hawaii Econometric Model, as presented in the Department of Business, Economic Development and Tourism, "The Hawaii State Data Book," 1992.

Note: This economic/fiscal impact assessment does not include the costs and benefits associated with the proposed alternative commercial/retail uses at the Kaloko Town Center.

Exhibit K

Kaloko Town Center

PROJECTED TOTAL NEW TAX REVENUES TO THE STATE GOVERNMENT
(1995 Dollars, $000's)

Revenue sources	Basis	2000	2010	2020
Direct personal income from construction (1)		$4,797	$2,952	$2,214
Direct personal income from operations (1)				
Property management & sales		182	182	0
Commercial/Retail space		4,183	10,677	19,009
Total personal income		$9,160	$13,810	$21,220
Total personal income taxes (rounded) (2)	10% of income	$920	$1,380	$2,120
Miscellaneous taxes from in-migrant residents:				
Number of residents (3)				
On-site		35	221	314
Off-site		50	126	225
State tax collections (4)				
On-site residents	$690 per person	$24	$152	$216
Off-site residents	$690 per person	34	87	155
Total miscellaneous taxes (rounded)		$60	$240	$370
General excise taxes from construction (5)		$1,040	$690	$480
Total new State tax revenues		$2,020	$2,310	$2,970

(1) As presented in Exhibit G, average annual during the respective period.
(2) Estimated average effective Hawaii State tax rate.
(3) As presented in Exhibit F.
(4) Includes general excise, automobile, gas and specific taxes, based upon the typical tax burdens for households as shown for "The Tax Burden of The Amie Aloha Family," by the Tax Foundation of Hawaii.
(5) As presented in Exhibit J; average annual for the period.

Note: This economic/fiscal impact assessment does not include the costs and benefits associated with the proposed alternative commercial/retail uses at the Kaloko Town Center.

Exhibit L

Kaloko Town Center

COUNTY OF HAWAII ADDITIONAL GOVERNMENT EXPENDITURES ATTRIBUTABLE TO THE KALOKO TOWN CENTER

Function	Total expenditures FY'94 ($000's) (1)	Service population (2)	Annual expenditure per County resident
General government	$15,888	134,100	$118
Public safety	50,583	147,800	342
Highways	4,766	147,800	32
Health and sanitation	9,781	147,800	66
Public welfare	11,233	134,100	84
Public schools	290	134,100	2
Recreation	9,587	147,800	65
Interest	6,459	147,800	44
Bond redemption	4,923	134,100	37
Retirement and pension	14,024	134,100	105
Mass transit	1,088	147,800	7
Cash capital improvements	3,193	147,800	22
Miscellaneous	11,543	134,100	86
Total 1994 dollars	$143,359		$924
Total 1995 dollars (rounded) (3)			**$940**

	2000	2010	2020
New residents to the County			
On-site (Kaloko Town Center) resident population (4)	58	368	523
Off-site in-migrant population (4)	127	205	328
Total new residents to the County (rounded)	180	570	850
New County expenditures (rounded) ($000's, 1995 dollars)	$170	$540	$800

(1) County government operating expenditures for fiscal year ended June 30, 1994, as reported by the Tax Foundation of Hawaii.
(2) Estimated de facto and resident population estimates for the County as of January 1, 1994, based upon the estimated de facto and resident populations for July 1, 1993 and 1994.
(3) Adjusted to 1995 dollars based upon CPI increases from 1994 to 1995, as reported by the Bank of Hawaii.
(4) As presented in Exhibit F.

Note: This economic/fiscal impact assessment does not include the costs and benefits associated with the proposed alternative commercial/retail uses at the Kaloko Town Center.

Kaloko Town Center

STATE OF HAWAII ADDITIONAL GOVERNMENT EXPENDITURES ATTRIBUTABLE TO THE KALOKO TOWN CENTER

Function	Total expenditures FY'94 ($000's) (1)	Service population (2)	Annual expenditure per State resident
General government	$480,514	1,172,000	$410
Public safety	187,381	1,276,400	147
Highways	125,105	1,276,400	98
Natural resources	42,560	1,276,400	33
Health and sanitation	186,710	1,276,400	146
Hospitals and institutions	331,924	1,172,000	283
Public welfare	831,575	1,172,000	710
Education	1,432,753	1,172,000	1,222
Recreation	37,985	1,276,400	30
Utilities and other enterprises	286,438	1,276,400	224
Debt service	460,258	1,276,400	361
Retirement and pension	275,168	1,172,000	235
Employees' health insurance	622	1,172,000	1
Unemployment compensation	243,985	1,172,000	208
Grants-in-aid to counties	2,375	1,276,400	2
Urban redevelopment and housing	142,609	1,172,000	122
Cash capital improvements	455,369	1,276,400	357
Miscellaneous	112,760	1,172,000	96
Total 1994 dollars	$5,636,091		$4,684
Total 1995 dollars (rounded) (3)			$4,790

	2000	2010	2020
New residents to the State			
On-site (Kaloko Town Center) resident population (4)	35	221	314
Off-site in-migrant population (4)	50	126	225
Total new residents to the State (rounded)	80	350	540
New State expenditures (rounded) ($000's, 1995 dollars)	$380	$1,680	$2,590

(1) State government operating expenditures for fiscal year ended June 30, 1994 as reported by the Tax Foundation of Hawaii.
(2) Estimated de facto and resident population estimates for the State as of January 1, 1994, based upon the estimated de facto and resident populations for July 1, 1993 and 1994.
(3) Adjusted to 1995 dollars based upon CPI increases from 1994 to 1995, as reported by the Bank of Hawaii.
(4) As presented in Exhibit F.

Note: This economic/fiscal impact assessment does not include the costs and benefits associated with the proposed alternative commercial/retail uses at the Kaloko Town Center.

Kaloko Town Center

SUMMARY OF COUNTY GOVERNMENT REVENUES AND EXPENDITURES
(1995 Dollars, $000's)

	2000	2010	2020
New County revenues (1)			
Property taxes	$360	$860	$1,220
Miscellaneous taxes	27	86	128
Total	$387	$946	$1,348
New County expenditures (2)	(170)	(540)	(800)
Net additional revenues	$217	$406	$548
Revenue/expenditure ratio (3)	2.3	1.8	1.7

(1) As presented in Exhibit I.
(2) As presented in Exhibit L.
(3) New revenues divided by new expenditures.

Note: This economic/fiscal impact assessment does not include the costs and benefits associated with the proposed alternative commercial/retail uses at the Kaloko Town Center.

Exhibit O

Kaloko Town Center

SUMMARY OF STATE GOVERNMENT REVENUES AND EXPENDITURES
(1995 Dollars, $000's)

	2000	2010	2020
New State revenues (1)			
Personal income taxes	$920	$1,380	$2,120
Miscellaneous taxes	60	240	370
General excise taxes (2)	1,040	690	480
Total	$2,020	$2,310	$2,970
New State expenditures (3)	(380)	(1,680)	(2,590)
Net additional revenues	$1,640	$630	$380
Revenue/expenditure ratio (4)	5.2	1.2	1.0

(1) As presented in Exhibit K.
(2) Average annual for the period.
(3) As presented in Exhibit M.
(4) New revenues divided by new expenditures.

Note: This economic/fiscal impact assessment does not include the costs and benefits associated with the proposed alternative commercial/retail uses at the Kaloko Town Center.

Market Assessment for the Kaloko Town Center

KPMG Peat Marwick, April 2, 1996

KPMG

The Global Leader

Pacific Land Services, Inc. for
Tokyo Green Hawaii, Inc.

MARKET ASSESSMENT FOR THE KALOKO TOWN CENTER

Final Report
April 2, 1996

KPMG Peat Marwick LLP

P.O. Box 4150
Honolulu, HI 96812-4150

Telephone 808 531 7286
Telex 7238615

Telefax 808 541 9321

April 2, 1996

Tokyo Green Hawaii, Inc.
c/o Mr. Ned Dewey
Pacific Land Services, Inc.
810 Richards Street, Suite 900
Honolulu, Hawaii 96813

Dear Mr. Dewey:

KPMG Peat Marwick LLP is pleased to submit this final report, entitled "Market Assessment for the Kaloko Town Center."

The report is divided into five chapters as follows:

Chapter 1: Background and Executive Summary

Chapter 2: North Kona and South Kohala Economic, Demographic and Visitor Overview

Chapter 3: Residential Market Assessment

Chapter 4: Commercial/Retail Market Assessment

Chapter 5: Office Market Assessment

We appreciate the opportunity to be of assistance to Pacific Land Services, Inc. on this important project.

Very truly yours,

KPMG Peat Marwick LLP

MARKET ASSESSMENT FOR
THE KALOKO TOWN CENTER

CONTENTS

1 - BACKGROUND AND EXECUTIVE SUMMARY

Tokyo Green Hawaii, Inc. proposes to develop a mixed-use project in Kaloko, located on the western side of the island of Hawaii. The project is expected to contain multifamily and single-family housing units, a retail complex, office space, and other uses that could support the quality of life in the region. This chapter describes the background of our study and outlines the approaches used to assess the market demand, as well as the conclusions that were reached.

BACKGROUND

Tokyo Green Hawaii, Inc. owns approximately 1,100 acres of land located in Kaloko, on the western side of the island of Hawaii. The property is defined as TMK 7-3-9-17 and 25 through 30, and consists of lands mauka and adjacent to the existing Kaloko Light Industrial Subdivision, along the Queen Kaahumanu Highway. The lands are managed by Pacific Land Services, Inc. (Pacific Land).

Approximately 224 acres of this land are proposed for development as the Kaloko Town Center. The remainder of the site is still undergoing data reconnaissance and planning.

Preliminary development plans for the 224-acre property include 480 multifamily units, 370 single-family units, up to 57 acres of retail and office use, a school or park site, roads and open space.

Working with your land planner, Kimura International, Inc., Pacific Land has asked KPMG Peat Marwick LLP (KPMG) to prepare this market assessment of the Kaloko Town Center for inclusion in an Environmental Impact Statement.

STUDY OBJECTIVES

The objectives of our assistance were:

- To review the relevant residential, retail and office market conditions in West Hawaii on the island of Hawaii.
- Based on the above, to assess the anticipated market support for the proposed residential, retail and office land uses at the subject property.

RESIDENTIAL MARKET ASSESSMENT

The demand for housing units in North Kona and South Kohala is based upon the projected increase in population and the estimated housing units required to accommodate the population. This analysis is based upon the desirability of the area and the demand for homes, assuming that a sufficient supply of additional housing units are available. The assessment of the North Kona and South Kohala residential markets is summarized as follows:

- **Approximately 16,600 households** could be added to the North Kona and South Kohala area by the year 2020.

- **About 600 housing units are planned to be constructed on other projects in the area by the year 2000**, based upon current development plans. Projected sales prices at these projects range from about $150,000 to $500,000.

- **Approximately 9,000 additional housing units are proposed** (including both rental and for-sale units), but currently have indefinite completion dates or significant hurdles to development.

Therefore, through the year 2020, approximately 17,400 housing units could be required in the North Kona and South Kohala districts. This is based upon the estimated 16,600 potential new households, and including a desired 5% vacancy factor to provide for flexibility in the market.

However, during this same period, only about 9,550 housing units are projected to be constructed at other projects in the area, based upon current entitlements and development plans, resulting in a shortfall of almost 7,900 units by the year 2020.

Thus, based upon the projected demand for additional housing units and the competitive supply, the 480 multifamily and 370 single-family residential units at the Kaloko Town Center could be absorbed at an average rate of 50 units per year (approximately a 17-year absorption period, from 1999 to 2015), accounting for roughly 4% to 10% of the regional market demand in any given period.

RETAIL MARKET ASSESSMENT

Demand for traditional retail space in the North Kona and South Kohala districts is projected based upon expenditures from regional residents and out-of-state visitors to the island. Projected expenditures from residents are based upon typical retail spending patterns of households. Visitor expenditures are based upon the average daily expenditure on retail items surveyed by the Hawaii Visitors Bureau. Projected retail expenditures and the supportable retail space at the Kaloko Town Center are summarized in the following sections.

North Kona and South Kohala Residents

Households in the North Kona and South Kohala area are estimated to spend, on average, about $16,200 annually, or about 38% of the total household income (households earning 100% of the North Kona and South Kohala median income) on retail goods.

The projected retail expenditure capture rate at the Kaloko Town Center has been based upon an assessment of the project in comparison to the existing retail facilities in the North Kona and South Kohala area. Assuming an appropriate tenant mix, retail space at the Kaloko Town Center is projected to capture some 10% to 30% of the various household retail expenditures projected for the North Kona and South Kohala area, resulting in an overall capture rate of about 19%, or $3,000 per household per year (1995 dollars).

Thus, annual resident expenditures captured at the Kaloko Town Center (1995 dollars) is projected at about $8.1 million by the year 2000, increasing to about $49.8 million by the year 2020.

Visitors to North Kona and South Kohala

In addition to the residents of North Kona and South Kohala, visitors to the area also comprise a formidable market for retail development at the site, due to the project's excellent location and other factors. Retail demand from visitors is based upon visitor arrival projections to the County and their historical retail spending patterns. Visitors from the United States spent on average about $83 per day (excluding lodging expenses) on retail items. On the other hand, visitors from Japan spent significantly more on retail items, averaging about $185 per day.

Thus, annual visitor expenditures captured at the Kaloko Town Center (1995 dollars) are projected at about $9.1 million by the year 2000, increasing to about $16.7 million by the year 2020.

Supportable Traditional Retail Space at the Kaloko Town Center

In summary, by the year 2000, traditional retail expenditures by residents and visitors at the Kaloko Town Center (1995 dollars) are projected to reach about $17.2 million, and to increase to over $66.5 million by the year 2020.

Assuming an overall average sales per square foot of $245 (typical of retail centers in the area), and including a 7% vacancy factor, approximately 76,000 square feet are projected to be supportable by the year 2000, increasing to almost 292,000 square feet by the year 2020.

Thus, by the year 2020, about 32.4 acres of retail lands could be expected to be supported at the Kaloko Town Center.

OTHER COMMERCIAL/RETAIL USES AT THE KALOKO TOWN CENTER

Based on interviews with residents of the community conducted by Ms. Berna Cabacugnan of Earthplan, many residents of the nearby communities are concerned about what the Kaloko Town Center can offer to residents of the region. Further, many of those interviewed indicated that there are insufficient activities for children and families in the Kona area.

Based upon these concerns, several less traditional commercial/retail uses were reviewed for possible inclusion at the Kaloko Town Center. These include:

- Miniature golf
- Bowling
- Batting cages
- Drive-In theater
- Go-carts
- Family dining/amusement
- Gas station, car wash and convenience store
- Various visitor attraction and support services

With the site's highly visible and central location, a number of family-oriented activities could be successful. The project and the community could also be complemented by a one-stop gas, car wash and convenience store, with a visitor attraction type of factory tours/retail sales also added to take advantage of the site's proximity to the airport and hence the majority of visitor traffic in West Hawaii. In consideration of such uses, another approximately 21 acres of commercial/retail use could be developed at the Kaloko Town Center.

TOTAL SUPPORTABLE COMMERCIAL/RETAIL LAND AREA AT THE KALOKO TOWN CENTER

In conclusion, based upon the support shown for traditional retail shopping center space, as well as the alternative uses discussed above, a total of about 53.4 acres of commercial/retail land area are projected to be supportable by the year 2020.

OFFICE MARKET ASSESSMENT

The future demand for office space in the North Kona and South Kohala area is projected as a function of the area's population, relative to the historical ratio of office space per resident.

The analysis used to project the amount of supportable office space considers the anticipated increases in North Kona and South Kohala's population, declining ratios of the amount of office space required relative to the number of residents in the area due to changing technology and business practices, and a 7% vacancy rate. This results in supportable office space of about 748,000 square feet by the year 2020 for North Kona and South Kohala as a whole.

Additional supportable office space in North Kona and South Kohala is projected based upon the supportable office space, less existing office space. By the year 2000, about 40,000 square feet of additional office space is projected to be required, increasing to about 354,000 square feet by the year 2020.

Of this regional market demand, the Kaloko Town Center is assumed to be able to capture about 25%, or about 89,000 square feet. This capture rate could be expected to be achieved due to the project's central location within the North Kona and South Kohala region, and its proximity to residential and retail projects in the area.

In summary, up to about 89,000 square feet of office space are projected to be supportable at the Kaloko Town center by 2020. Based upon the assumption that approximately 16,000 square feet of office space can be developed per acre (a ratio of about 37%), it is estimated that by the year 2020, 5.5 acres of office land could be supportable at the Kaloko Town Center.

PROJECTED MARKET SUPPORT FOR THE KALOKO TOWN CENTER

The following table summarizes the projected market support for the proposed developments at the Kaloko Town Center.

Projected Market Support at the Kaloko Town Center Through the Year 2020

Land use	Market support
Residential (units):	
Multifamily	480
Single-family	370
Commercial/Retail (acres)	53.4
Office (acres)	5.5

2 - NORTH KONA AND SOUTH KOHALA ECONOMIC, DEMOGRAPHIC AND VISITOR OVERVIEW

This chapter reviews the recent trends and projected future economic, demographic, and tourism industry that pertain to the North Kona and South Kohala areas, more specifically as they relate to the market demand for the Kaloko Town Center.

NORTH KONA AND SOUTH KOHALA AREA DESCRIPTION

In the County of Hawaii, the West Hawaii area, more specifically, the North Kona and South Kohala districts, have been the primary growth areas in recent history. The area continues its transition from a heavily agriculture-oriented economy, to a more diverse mixture of agriculture and tourism/service-oriented economy. Employment and infrastructure development also continues to be heavily concentrated in this area

Additionally, the area has developed into the visitor destination on the island. In 1994, the Hawaii Visitors Bureau reported that the County of Hawaii had a total of 26 hotels, offering approximately 6,700 visitor rooms. Visitor units in West Hawaii total about 5,700, or roughly 85% of the island's visitor units. Further, Kona's visitor industry is expecting tens of thousands additional eastbound visitors as a result of Japan Airlines and United Airlines plans to begin direct flights from Japan to Kona (currently awaiting government approvals). Additionally, Keahole Airport's main runway was recently extended to allow for direct flights from the mainland and overseas market, and an interim U.S. Customs and Immigration area has been recently completed in anticipation of the first international arrivals to the island.

HAWAII COUNTY AND THE NORTH KONA AND SOUTH KOHALA DISTRICTS POPULATION, HOUSEHOLD SIZE AND NUMBER OF HOUSEHOLDS

The following sections present the historical trends and future projections of population, household size, and number of households in Hawaii County and the North Kona and South Kohala districts.

Population

From 1970 to 1990, Hawaii County's population grew an average of 3.3% annually from about 63,500 to about 120,300. In comparison, during the same period, the North Kona and South Kohala districts grew almost 2.4 times as fast, increasing an average of 7.7% annually, from approximately 7,100 to about 31,400, as shown in Exhibit 2-A. Characteristics of the population growth in the North Kona and South Kohala districts are summarized below:

- **During the 1970's,** North Kona and South Kohala's population increased an average of 9.9% annually, or about 2.6 times the growth of Hawaii County.
- **During the 1980's,** North Kona and South Kohala's population increase continued to outpace Hawaii County, reporting an average annual increase of 5.5%, versus 2.7%, or about 2.0 times the growth of Hawaii County.

The Department of Business, Economic Development and Tourism projects that the population in the County of Hawaii will reach 199,000 by the year 2010; additionally, assuming the population increases at an average annual growth rate similar to that projected from 1995 to 2010, Hawaii County's population is projected to reach 254,500 by the year 2020.

Based upon the historical growth multiple of the North Kona and South Kohala districts in comparison to the island overall, as well as the desirability of the area, North Kona and South Kohala's population is projected to continue to increase at a relatively rapid pace. Through the year 2000, North Kona and South Kohala's population is projected to increase 1.5 times as fast as Hawaii County, reaching about 42,900. From the year 2000 to 2020, this growth multiple is assumed to level off at 1.2 times the growth rate of the County of Hawaii, with the North Kona and South Kohala population projected at about 77,700.

Household Size

From 1970 to 1990, the average household sizes in the County of Hawaii and the North Kona and South Kohala districts have consistently declined. The average household sizes for the County of Hawaii and the North Kona and South Kohala districts up to 1990 are estimated by the U. S. Bureau of the Census. The historical average household sizes are presented in Exhibit 2-B, and are summarized below:

- **Hawaii County's average household size** decreased an average of 1.2% annually from 1970 to 1990, from 3.61 to 2.86.
- **North Kona and South Kohala's average household size** decreased an average of 1.0% annually during the same period, from 3.41 to 2.79.

Average household sizes from 1995 to the year 2020 are projected based on the assumption that the average household size will continue to decrease, but at a much slower pace than historically. For purposes of this study, average household sizes are projected to decrease at one-fourth the rate experienced from 1970 to 1990, or about -0.29% and -0.25%, for Hawaii County (2.82 to 2.62) and the North Kona and South Kohala districts (2.76 to 2.59), respectively.

Number of Households

From 1970 to 1990, the number of households in the North Kona and South Kohala districts grew an average of 8.7% annually, from about 2,100 to nearly 11,000. By the year 2020, based upon the projected average household size and the historical percentage of persons living in households, the number of households in the North Kona and South Kohala districts are projected to reach 29,400, or about 16,600 additional households, as also shown in Exhibit 2-B.

MEDIAN HOUSEHOLD INCOME

Median household income is determined by the U. S. Department of Housing and Urban Development (HUD) based upon results compiled by the U. S. Bureau of the Census. Median household income for Hawaii County and the North Kona and South Kohala districts are presented below:

- **1989 Hawaii County median household income was estimated at $33,200** for a household size of four, as shown in Exhibit 2-C.

- **1989 North Kona and South Kohala districts median household income was estimated to be 10% higher** than Hawaii County overall, or about $36,600.

Using the 1989 median household income as a basis and utilizing adjustment factors, HUD estimates the 1995 median household income for Hawaii County at $38,800 for a household of four. Based upon the North Kona and South Kohala districts historically having a median household income 10% greater than Hawaii County, 1995 North Kona and South Kohala districts median household income is estimated at about $42,800, as also shown in Exhibit 2-C.

Exhibit 2-D presents the distribution of North Kona and South Kohala households by estimated 1995 income; approximately 70% of the households can be categorized as being in either the "affordable" or "gap" income groups, earning up to 140% of the Hawaii County median household income, or up to $54,300.

VISITOR ARRIVALS TO THE STATE OF HAWAII AND THE COUNTY OF HAWAII

This section reviews the historical trends and projected future influences on visitor arrivals to the State of Hawaii. These trends and the anticipated future market conditions are used as a basis to project the number of visitors to the County of Hawaii.

Visitor Arrivals to the State of Hawaii

From 1980 to 1990, visitor arrivals to the State of Hawaii experienced rapid expansion, increasing from 3.9 million visitors to a peak of almost 7 million visitors, or an average increase of about 5.9% annually, as shown in Exhibit 2-E. However, thereafter a number of economic events converged which caused a serious downturn in Hawaii's tourism industry. These events included the Persian Gulf War, collapse of the Japanese investment market, and the economic recessions experienced in the United States and Japan.

Currently, Hawaii's visitor industry appears to be recovering, as visitor arrivals for 1995 increased 3.2% over 1994. Particularly strong increases were reported in visitors from Japan and Korea.

In the future, Hawaii's visitor industry is expected to continue to grow due to a number of significant influences:

- **Economic recovery is occurring in most of the nation** - California, which is Hawaii's dominant westbound market, has begun to gain momentum and is following the rest of the United States in increased economic growth and employment.

- **Completion of the Hawai'i Convention Center** - The Hawai'i Convention Center is projected to be operational by 1998, and is expected to bring up to 600,000 new visitors to the State each year.

- **Opening of the Kansai International Airport** - The opening of Japan's first 24-hour airport in September 1994 has added approximately 28 additional flights a week to Hawaii. Visitor arrivals in 1994 and 1995 have already reflected an increase in travel from Japan by opening new travel markets for Hawaii and by making travel to the islands more convenient.

- **Increased airline service and competition** - Increasing competition among the airlines in the U. S. mainland and Japan markets has resulted in heavy discounting and incentives, allowing more people the opportunity to travel, and with more frequency.

- **Devaluation of the dollar** - Japanese visitors continue to benefit from the strong purchasing power of the Japanese yen. As of February 1996, the yen/dollar exchange rate is about Y105 to the $1 U. S. Compared to 1990 when the yen was Y145 per $1 U. S., the cost of traveling is thus still about 28% less expensive for the Japanese. This makes a stay in Hawaii a greater value and contributes to the increasing length of stay by Japanese visitors.

- **Japanese government travel promotion** - The Japanese government is promoting travel to the United States to help offset the balance of trade payments between Japan and the United States. This effort should continue to have a positive influence on Hawaii's tourism industry.

Visitor arrivals to the State of Hawaii are projected to increase based on the strength of the 1995 figures and the expected influence of the factors listed above. The consensus among industry observers for the next few years is for about 3% to 5% annual increases in visitor arrivals. The respective forecasts are presented below:

- **Hawaii Visitors Bureau** is projecting a growth in visitor arrivals of 2% to 4% for 1996.

- **State Department of Business, Economic Development and Tourism (DBEDT)** *is projecting a growth in visitor arrivals of 5% in 1996.*

- **Bank of Hawaii Economics Division** is projecting a growth in visitor arrivals of 3% to 4% annually through 1997.

- **First Hawaiian Bank Economics Division** is projecting a growth in visitor arrivals of 3% to 5% annually for 1996 and 1997.

Based upon the above market projections and the continued maturation of Hawaii as a visitor destination, visitor arrivals to the State are projected to increase an average of 2.9% annually through the year 2020, as also shown in Exhibit 2-E. Visitor growth rates could be expected to be relatively higher in the early years, reflecting the recovery of the industry and the initial impact of the opening of the Hawai'i Convention Center. However, over the longer term, growth rates could be expected to stabilize at lower levels due to Hawaii's maturity as a visitor destination and large base of visitors.

Westbound visitor arrivals are projected to increase 2.5% annually from 1995 to 2020. This reflects both the size and maturity of the mainland markets. Eastbound visitor arrivals, primarily Japanese visitors, are projected to have a higher growth rate, averaging 3.4% annually. This reflects the potential to capture a greater share of the Japanese market, the development of new Asian markets, the general affluence of the area, and the increasing travel interests outside of the Asia region.

As in any cyclical industry, visitor arrivals could be expected to experience significant annual fluctuations year-to-year. However, the long-term growth potential for Hawaii remains positive given its attractiveness as well as the many attributes discussed previously.

Thus, visitor arrivals to the State of Hawaii are projected to exceed the 1990 peak of almost 7 million visitors by 1997. Further, by the year 2020, total visitor arrivals could be expected to amount to over 13.4 million per year, more than twice the amount of arrivals in 1995.

Visitor Arrivals to the County of Hawaii

Similar to the State, visitor arrivals to the County of Hawaii were also impacted by recent economic events, as visitor arrivals declined from the early 1990s, as shown in Exhibit 2-F.

However, the future for Hawaii County's visitor industry looks encouraging, as the declines in visitor arrivals have slowed in recent years. Further, similar to the State, Hawaii County's visitor industry could anticipate a positive impact from the external influences discussed previously.

Visitor arrivals to Hawaii County were projected based upon the historical ratio of visitors to the island as a percentage of total visitors to the State. In 1985, Hawaii County attracted about 19% of all westbound visitors to the State, and the percentage has been increasing. Currently, Hawaii County attracts about 22% of the total westbound visitors to the State. With respect to eastbound travelers, about 8% of the visitor arrivals to the State have stayed on the island.

Based upon the historical percentage of visitors to the State that have visited Hawaii County since 1989 (18% to 22% for westbound and 7% to 10% for eastbound), Hawaii County is expected to attract 22% to 23% of westbound visitors and 8.5% to 11% of eastbound visitors to the State, as also shown in Exhibit 2-F. Through the year 2020, arrivals are projected to increase an average of 3.2% annually, *from 1.1 million in 1995* to almost 2.4 million, an increase of almost 1.3 million visitors.

Exhibit 2-A

Population growth in North Kona and South Kohala is expected to continue to be relatively rapid

RESIDENT POPULATION TRENDS, MARKET INDICATOR AREAS: 1970 - 2020

				Projected (1)					
	1970	1980	1990	1995	2000	2005	2010	2015	2020
Population:									
North Kona &									
South Kohala	7,142	18,355	31,424	35,900	42,900	49,500	57,900	67,100	77,700
County of Hawaii	63,468	92,053	120,317	137,600	154,900	174,600	199,000	225,000	254,500
State of Hawaii	768,561	964,691	1,108,229	1,194,000	1,255,000	1,333,700	1,417,300	1,500,700	1,589,000
Compound average annual percent growth since prior date:									
North Kona &									
South Kohala	NAV	9.9%	5.5%	2.7%	3.6%	2.9%	3.2%	3.0%	3.0%
County of Hawaii	NAV	3.8%	2.7%	2.7%	2.4%	2.4%	2.7%	2.5%	2.5%
State of Hawaii	NAV	2.3%	1.4%	1.5%	1.0%	1.2%	1.2%	1.1%	1.1%
North Kona & South Kohala as a percentage of:									
County of Hawaii	11%	20%	26%	26%	28%	28%	29%	30%	29%
State of Hawaii	1%	2%	3%	3%	3%	4%	4%	4%	4%

(1) Projected growth rates for the State of Hawaii and the County of Hawaii through the year 2010 are based upon U.S. Census and the State of Hawaii, Department of Business, Economic Development and Tourism, "Population and Economic Projections for the State of Hawaii to 2010 (Series M-K)," November 1988.
Projected average annual growth rates from the year 2010 to 2020 are based upon the average annual growth rate projected from 1995 to the year 2020.
Projected growth rates for North Kona and South Kohala are based upon the historical growth multiple experienced in the area in comparison to the County of Hawaii.
NAV = Not available
Sources: KPMG Peat Marwick LLP; U.S. Bureau of the Census, 1970,1980 and 1990; State of Hawaii, Department of Business Economic Development and Tourism.

Exhibit 2-B

By the year 2020, the number of households in the North Kona and South Kohala districts are expected to increase by almost 130%

RESIDENT HOUSEHOLD TRENDS, MARKET INDICATOR AREAS: 1970 - 2020

				Projected						Percentage change
	1970	1980	1990	1995	2000	2005	2010	2015	2020	1995 - 2020
Resident population (1):										
North Kona & South Kohala	7,142	18,355	31,424	35,900	42,900	49,500	57,900	67,100	77,700	116.4%
County of Hawaii	63,468	92,053	120,317	137,600	154,900	174,600	199,000	225,000	254,500	85.0%
State of Hawaii	768,561	964,691	1,108,229	1,194,000	1,255,000	1,333,700	1,417,300	1,500,700	1,589,000	33.1%
Average persons per household (2):										
North Kona & South Kohala	3.41	2.96	2.79	2.76	2.72	2.69	2.65	2.62	2.59	(6.1%)
County of Hawaii	3.61	3.09	2.86	2.82	2.78	2.74	2.70	2.66	2.62	(7.0%)
State of Hawaii	3.59	3.15	3.01	2.98	2.94	2.91	2.88	2.85	2.82	(5.3%)
Number of households (3):										
North Kona & South Kohala	2,081	6,085	10,993	12,800	15,500	17,800	21,400	25,100	29,400	129.7%
County of Hawaii	17,260	29,237	41,461	47,800	54,600	61,600	72,300	82,900	95,100	99.0%
State of Hawaii	203,088	294,052	356,267	389,000	413,400	439,300	477,200	510,900	546,900	40.6%

(1) As shown in Exhibit 2-A.
(2) The decline in average persons per household from 1995 to the year 2020 is projected based upon the average annual percentage change experienced from 1970 to 1990. The average household size is projected to continue to decrease, though at a slower pace. For purposes of this study, it is assumed to decrease at one-fourth the pace experienced from 1970 to 1990
(3) The projected number of households for the period from 1995 to the year 2020 are based on historical data involving the number of persons living in households as a percentage of the total population. Historically, the South Kohala and North Kona Districts and the County of Hawaii as a whole has had approximately 98% of their total population living in households. The State of Hawaii has historically had 97% of its total population living in households.

Source: U.S. Bureau of the Census and KPMG Peat Marwick LLP.

Exhibit 2-C

Households in the North Kona and South Kohala districts tend to have higher incomes compared to the rest of the County

HOUSEHOLDS BY INCOME IN NORTH KONA AND SOUTH KOHALA, AND COUNTY OF HAWAII: 1995

	North Kona and South Kohala			Hawaii County		
	Number of households	Percent	Cumulative Percent	Number of households	Percent	Cumulative percent
1989 Income groups:						
Less than $15,000	1,727	16%	16%	10,105	24%	24%
$15,000 - $24,999	1,754	16%	32%	7,535	18%	42%
$25,000 - $34,999	1,741	16%	47%	6,650	16%	58%
$35,000 - $49,999	2,355	21%	69%	7,329	18%	76%
$50,000 - $74,999	2,023	18%	87%	6,305	15%	91%
$75,000 - $99,999	644	6%	93%	2,041	5%	96%
$100,000 - $149,999	455	4%	97%	1,044	3%	99%
More than $150,000	302	3%	100%	570	1%	100%
Total, rounded	11,000	100%	100%	41,600	100%	100%

Median household income, rounded:	1989	1995
North Kona and South Kohala (1)	$36,600	$42,800
Hawaii County (2)	$33,200	$38,800

(1) 1989 median household income is based on the weighted average of the North Kona and South Kohala districts of the County of Hawaii, as reported by the U.S. Bureau of Census, 1990. 1995 median household income is based on the percentage change in median household income from 1989 to 1995 for the County of Hawaii.

(2) As reported by the HUD Office of Economic Affairs, Economic and Market Analysis Division, December 5, 1994.

Source: U.S. Bureau of the Census, 1990 and estimates on median family income provided by the Department of Housing and Urban Development.

Exhibit 2-D

70% of the households in the North Kona and South Kohala districts can be categorized as being in either the "affordable" or "gap" income groups

DISTRIBUTION OF NORTH KONA AND SOUTH KOHALA HOUSEHOLDS BY ESTIMATED 1995 INCOME

Percentage of median income	Income range		Estimated number of households, rounded (1)	Percent of total (2)	Cumulative percent of total
Affordable group:					
Below 80%	$31,040	or less	4,900	38%	38%
80%-100%	31,040 -	38,800	1,500	11%	50%
100%-120%	38,800 -	46,560	1,300	10%	60%
Gap group:					
120%-140%	46,560 -	54,320	1,200	10%	70%
Market group:					
140%-160%	54,320 -	62,080	700	5%	75%
160%-180%	62,080 -	69,840	700	5%	81%
180%-200%	69,840 -	77,600	700	5%	86%
Above 200%	77,600	or more	1,800	14%	100%
			12,800		

(1) Based on the projected total number of households in the North Kona and South Kohala districts, as shown in Exhibit 2-B.
(2) Based on the "Fiscal Year 1995 Decile Distribution of Household Incomes," as provided by the Department of Housing and Urban Development.
(3) Totals differ from the prior exhibit due to the actual number of respondents for the "household income" section of the Census.
Source: Department of Housing and Urban Development.

Exhibit 2-E

Visitor arrivals to the State are projected to increase an average of 2.9% annually through the year 2020

HISTORICAL AND PROJECTED OVERNIGHT VISITORS TO THE STATE OF HAWAII: 1980 TO 2020

	Westbound		Eastbound		Total	
	Arrivals	Compound annual percentage change	Arrivals	Compound annual percentage change	Arrivals	Compound annual percentage change
Historical (1):						
1980	3,046,132	--	888,372	--	3,934,504	--
1985	3,708,610	4.0%	1,175,500	5.8%	4,884,110	4.4%
1990	4,719,730	4.9%	2,251,450	13.9%	6,971,180	7.4%
1994	3,997,820	(4.1%)	2,432,480	2.0%	6,430,300	(2.0%)
1995	3,977,820	(0.5%)	2,656,020	9.2%	6,633,840	3.2%
Projected:						
1996	4,037,000	1.5%	2,815,000	6.0%	6,852,000	3.3%
1997	4,118,000	2.0%	2,956,000	5.0%	7,074,000	3.2%
1998	4,242,000	3.0%	3,119,000	5.5%	7,361,000	4.1%
1999	4,361,000	2.8%	3,291,000	5.5%	7,652,000	4.0%
2000	4,470,000	2.5%	3,439,000	4.5%	7,909,000	3.4%
2005	5,057,000	2.5%	4,125,000	3.7%	9,182,000	3.0%
2010	5,722,000	2.5%	4,781,000	3.0%	10,503,000	2.7%
2015	6,474,000	2.5%	5,411,000	2.5%	11,885,000	2.5%
2020	7,325,000	2.5%	6,122,000	2.5%	13,447,000	2.5%
Compound annual percentage change:						
1980 to 1990		4.5%		9.7%		5.9%
1990 to 1995		(3.4%)		3.4%		(1.0%)
1995 to 2020		2.5%		3.4%		2.9%

(1) Hawaii Visitors Bureau.

Exhibit 2-F

Visitor arrivals to the County of Hawaii are projected to increase an average of 3.2% annually through the year 2020

HISTORICAL AND PROJECTED VISITOR ARRIVALS TO THE STATE AND COUNTY OF HAWAII: 1985 to 2020

	Westbound			Eastbound			Total	
	State arrivals (1)	Hawaii arrivals as a percent of State	Hawaii arrivals	State arrivals (1)	Hawaii arrivals as a percent of State	Hawaii arrivals	Hawaii arrivals	Compound annual percentage change
Historical (2):								
1985 (3)	3,708,610	18.8%	697,380	1,175,500	--	N/A	N/A	--
1990	4,719,730	20.8%	982,900	2,251,450	8.3%	187,930	1,170,830	--
1994	3,997,820	21.7%	866,300	2,432,480	8.8%	213,330	1,079,630	(0.7%)
1995	3,977,820	21.6%	860,540	2,656,020	8.1%	215,330	1,075,870	(0.3%)
Projected (4):								
1996	4,037,000	22.0%	888,000	2,815,000	8.5%	239,000	1,127,000	4.8%
1997	4,118,000	22.0%	906,000	2,956,000	8.5%	251,000	1,157,000	2.7%
1998	4,242,000	22.0%	933,000	3,119,000	8.5%	265,000	1,198,000	3.5%
1999	4,361,000	22.5%	981,000	3,291,000	9.0%	296,000	1,277,000	6.6%
2000	4,470,000	22.5%	1,006,000	3,439,000	9.0%	310,000	1,316,000	3.1%
2005	5,057,000	23.0%	1,163,000	4,125,000	10.0%	413,000	1,576,000	4.0%
2010	5,722,000	23.0%	1,316,000	4,781,000	11.0%	526,000	1,842,000	2.6%
2015	6,474,000	23.0%	1,489,000	5,411,000	11.0%	595,000	2,084,000	2.5%
2020	7,325,000	23.0%	1,685,000	6,122,000	11.0%	673,000	2,358,000	2.5%
Compound annual percentage increase:								
1985 to 1990			7.1%			N/A		N/A
1990 to 1995			(2.6%)			2.8%		(1.7%)
1995 to 2020			2.7%			4.7%		3.2%

(1) As shown in Exhibit 2-E.
(2) Hawaii Visitors Bureau.
(3) Information for westbound arrivals only; eastbound arrivals were not reported prior to 1989.
(4) Based on the historical percentage trends of the total State visitor arrivals that visited the County of Hawaii.

3 - RESIDENTIAL MARKET ASSESSMENT

This chapter provides an overview of the North Kona and South Kohala housing market, including resales of multifamily and single-family units, the projected supply of new housing, and affordability by household income. With this overview, the specific market support for multifamily and single-family units at the Kaloko Town Center is presented based upon the overall demand for housing units in the North Kona and South Kohala districts.

RESIDENTIAL PROJECT DESCRIPTION

Preliminary plans for the residential portion of the Kaloko Town Center include approximately 850 housing units, consisting of 370 single-family units and 480 multifamily units. The proposed residential units are expected to be compatible with the existing homes in the area, and will provide home ownership opportunities for a greater number of families. Products offered could include low-rise townhome developments, duplex and zero-lot developments, and single-family homes.

HAWAII COUNTY RESIDENTIAL RESALE TRANSACTIONS

Resales prices in Hawaii County have declined slightly since peaking in 1992-1993. In 1995 (transactions from January to November), multifamily resales were averaging about $189,000, or slightly lower than the peak of $193,000 experienced in 1992, but an improvement over 1994, as shown in Exhibit 3-A. The single-family market also experienced a decline from its peak in 1993, with average prices declining from $218,000 in 1993 to $197,000 in 1995. However, this also was a slight improvement over 1994, as shown in Exhibit 3-B.

North Kona and South Kohala Multifamily and Single-Family Resale Transactions

Characteristics of the housing market in North Kona and South Kohala, excluding sales of oceanfront units, and units in Mauna Lani, Mauna Kea, Waikoloa Beach and Keauhou resorts, but including Waikoloa Village and other residential communities are presented below:

- **Average multifamily resales prices for the North Kona and South Kohala districts** have decreased an average of 7.3% annually from 1990 to 1995, from about $164,000 to $112,000, as also shown in Exhibit 3-A. However, it is important to note that since 1991, the number of multifamily resale transactions for non-oceanfront and non-resort properties have been extremely limited (ranging from 3 to 13 transactions annually), therefore, the figures shown may not be accurately depicting the state of the market.

- **Average single-family resales prices for the North Kona and South Kohala districts** decreased an average of 4.7% annually from 1990 to 1995, from about $296,000 to $233,000, as also shown in Exhibit 3-B.

NORTH KONA AND SOUTH KOHALA HOUSING OVERVIEW

North Kona and South Kohala currently have an estimated 12,800 households, over six times the number housed in the region in 1970, and over twice the amount in 1980. The growth in households in this area is projected to continue at a relatively rapid pace due to the desirability of the area and the continuing concentration of employment and the development of infrastructure in this area.

North Kona and South Kohala Housing Demand

The demand for housing units in North Kona and South Kohala is based upon the projected increase in population and the estimated housing units required to accommodate the population. This analysis is based upon the desirability of the area and the demand for homes, assuming that a sufficient supply of additional housing units are available. As previously presented, about 29,400 households could reside in the North Kona and South Kohala districts by the year 2020, assuming no supply constraints. Based upon this estimate, the demand for housing units in North Kona and South Kohala is presented in Exhibit 3-C and summarized as follows:

- **Approximately 16,600 households** could be added to the North Kona and South Kohala area by the year 2020.
- **Approximately 10,000 of the households** (60%) are projected to earn less than 120% of the Hawaii County median household income and are expected to be in the "affordable" housing market.
- **Approximately 6,600 of the households** (40%) are projected to earn greater than 120% of the Hawaii County median household income and are expected to be able to qualify for "gap" and market-priced housing units.

North Kona and South Kohala Housing Supply

The future housing supply in North Kona and South Kohala is based upon discussions with project representatives and industry professionals. A number of projects are currently being marketed or are in the planning stages. North Kona and South Kohala's projected new housing supply is presented in Exhibit 3-D and summarized below:

- **About 600 housing units are proposed to be constructed on other projects in the area by the year 2000**, based upon current development plans. Projected sales prices range from about $150,000 to $500,000.
- **Approximately 9,000 additional housing units are proposed (including both rental and for-sale units), but currently have indefinite completion dates or significant hurdles to development.** Many of the projects have been placed on hold for differing reasons. The two largest projects are:

  The Kawaihae Master Plan (Department of Hawaiian Home Lands), with 3,100 units proposed, has been placed on hold. The lack of water and depressed economic conditions have been cited as reasons for not proceeding further.

  The Villages of Lai'opua (Housing Finance Development Corporation), planned to include almost 4,100 units, is also on hold. A number of legal and political issues must be resolved before this project can proceed further; the dispute with the Office of Hawaiian Affairs regarding the sale of ceded lands is expected to prevent this project from proceeding in the immediate future.

Although the completion dates and specific range of selling prices are not presently known due to the preliminary nature of many of the planned projects, for purposes of this analysis, it was assumed that the total number of "indefinite" units would be developed relatively evenly through the year 2020.

NORTH KONA AND SOUTH KOHALA HOUSING MARKET ASSESSMENT

The housing market assessment in the North Kona and South Kohala districts is based upon the projected increase in households, in comparison to the projected housing supply.

Through the year 2020, approximately 17,400 housing units could be required in the North Kona and South Kohala districts, as shown in Exhibit 3-E. This is based upon the estimated 16,600 potential new households, and including a desired 5% vacancy factor to provide for flexibility in the market.

During this same period, only about 9,550 housing units are projected to be constructed at other projects in the area, based upon current entitlements.

Thus, comparing the supportable housing units (based upon the market demand) with the current entitled supply in North Kona and South Kohala, without the planned units at the Kaloko Town Center, housing demand is projected to exceed the supply by almost 7,900 units by the year 2020. Thus, the development of the 850 housing units at the Kaloko Town Center could be expected to meet some of this demand.

PROJECTED HOUSING ABSORPTION AT THE KALOKO TOWN CENTER

As shown in Exhibit 3-F, from 1995 to the year 2015, the projected increase in households in the North Kona and South Kohala area could result in demand for over 13,000 additional housing units. The 850 housing units planned at the Kaloko Town Center could be absorbed at an average rate of 50 units per year, accounting for roughly 4% to 10% of the regional market demand in any given period. Assuming that residential units at the Kaloko Town Center could be on the market by about 1999, the absorption period is estimated to be approximately 17 years.

HOME PURCHASE AFFORDABILITY

Households earning from 80% to 160% of the Hawaii County median household income are the primary target market for the residential units planned for the Kaloko Town Center. The home purchasing ability of such households is presented in Exhibit 3-G. The price ranges for home purchases are estimated using the following assumptions for each respective income category:

- **Maximum 33% of gross household income** allocated to housing costs such as for mortgage, property tax and insurance expenses.
- **A typical down-payment** of 5% to 20%.
- **A 30-year mortgage** with interest rates ranging from 8.0% to 10.0%.

Based upon the assumptions stated above, potential North Kona and South Kohala households are estimated to be able to afford multifamily and single-family homes priced from about $124,000 to over $235,000.

TARGET MARKETS FOR RESIDENTIAL UNITS AT THE KALOKO TOWN CENTER

As previously discussed, the residential units planned (480 multifamily and 370 single-family units) at the Kaloko Town Center are projected to target households earning from 80% to 160% of the Hawaii County median household income. Based upon the home purchase affordability assumptions shown above, this section summarizes the projected support by median household income category and product type through the year 2015, and is also presented in Exhibit 3-H.

- **Households earning from 80% to 120% of the Hawaii County median household income** are expected to be in the market for a multifamily unit, based upon the affordability assumptions presented earlier.

  Approximately 50% (192 units) of the planned multifamily units are projected to target households in the 80% to 100% of median income range, with the other 50% (288 units) projected to target the 100% to 120% range.

- **Households earning from 120% to 160% of the Hawaii County median household income** are expected to be in the market for a single-family unit due to the higher home prices that they are able to qualify for.

  About 50% (148 units) of the single-family units planned are projected to target households in the 120% to 140% of median income range, with the other 50% (222 units) targeting the 140% to 160% range.

In summary, the overall market support for the 850 residential units planned for the Kaloko Town Center is expected to come from households earning from 80% to 160% of the Hawaii County median household income, distributed as shown in the table on the following page. However, the distribution presented should be considered as preliminary, as changes may become necessary as dictated by the market.

Buyer group by percent of median household income	Projected market mix
80-100%	28%
100-120%	28%
120-140%	22%
140-160%	22%
Total	100%

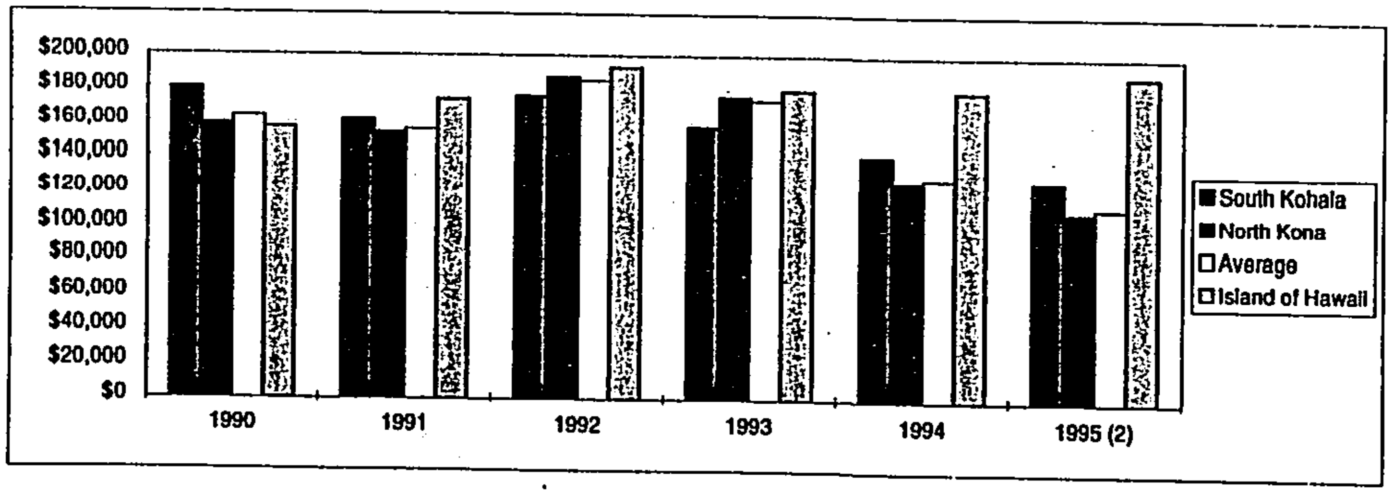
Additionally, as shown in Exhibit 3-H, the residential capture rate at the Kaloko Town Center is projected to range from about 15% to 26% throughout the various household income ranges. Overall, the 850 units planned for the Kaloko Town Center are expected to capture approximately 19% of the projected 4,500 increase in the number of North Kona and South Kohala households.

Exhibit 3-A

Average sales prices for multifamily homes within the North Kona and South Kohala districts have declined in recent years

AVERAGE NON-RESORT AND NON-OCEANFRONT MULTIFAMILY RESIDENTIAL RESALES: 1990 TO 1995 (1)

	1990	1991	1992	1993	1994	1995 (2)	Compound annual percentage change, 1990 to 1995
Multifamily:							
South Kohala	$180,000	$162,000	$176,000	$158,000	$142,000	$127,000	(6.7%)
North Kona	$159,000	$154,000	$187,000	$176,000	$126,000	$110,000	(7.1%)
Average	$164,000	$156,000	$185,000	$174,000	$128,000	$112,000	(7.3%)
Island of Hawaii (3)	$157,000	$174,000	$193,000	$180,000	$180,000	$189,000	3.8%



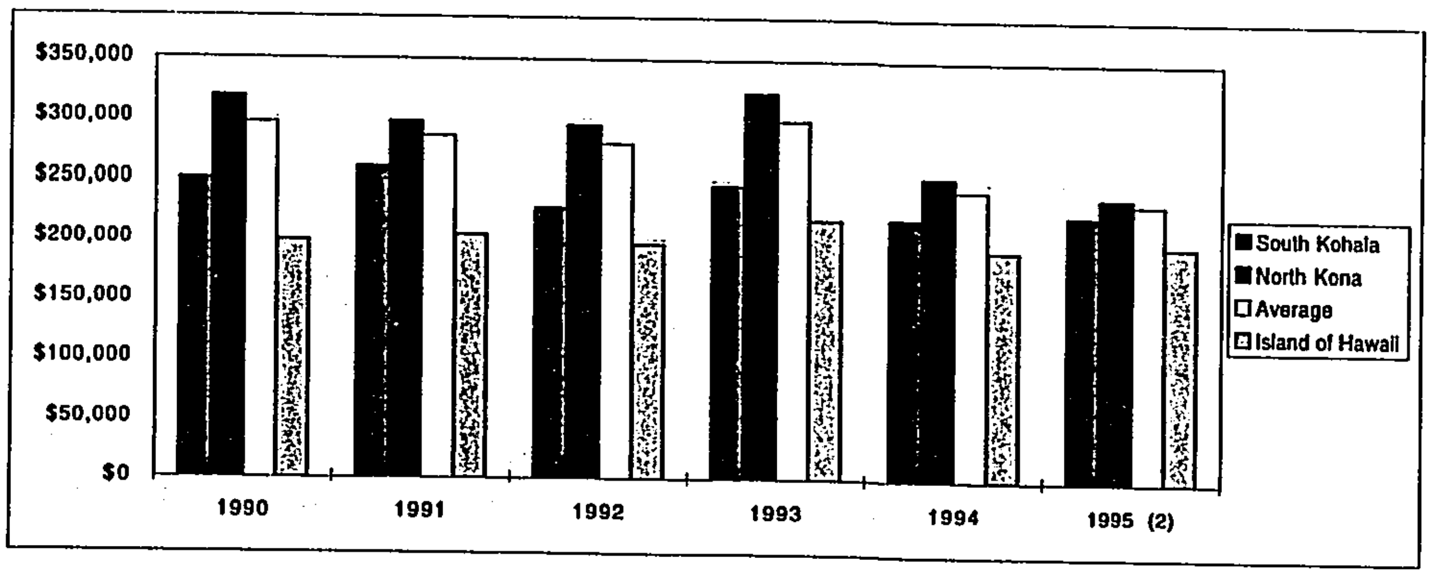
(1) Excludes sales of oceanfront properties and from the resort areas of Mauna Lani, Mauna Kea, Waikoloa Beach and Keauhou, but includes Waikoloa Village and other residential communities.
(2) Data for the South Kohala, North Kona, and district average are based on information from January through mid-November, 1995.
(3) The Prudential Locations, Inc.
Source: MLS Hawaii, Inc. and The Prudential Locations, Inc.

Exhibit 3-B

The single-family home market has shown positive signs, as average prices in selected areas have increased compared to 1994

AVERAGE NON-RESORT AND NON-OCEANFRONT SINGLE-FAMILY RESIDENTIAL RESALES: 1990 TO 1995 (1)

	1990	1991	1992	1993	1994	1995 (2)	Compound annual percentage change, 1990 to 1995
Single-family:							
South Kohala	$250,000	$260,000	$227,000	$246,000	$219,000	$223,000	(2.3%)
North Kona	$319,000	$297,000	$295,000	$323,000	$254,000	$238,000	(5.7%)
Average	$296,000	$286,000	$280,000	$299,000	$243,000	$233,000	(4.7%)
Island of Hawaii (3)	$199,000	$204,000	$196,000	$218,000	$192,000	$197,000	(0.2%)



(1) Excludes sales of oceanfront properties and from the resort areas of Mauna Lani, Mauna Kea, Waikoloa Beach and Keauhou, but includes Waikoloa Village and other residential communities.
(2) Data for the South Kohala, North Kona, and district average are based on information from January through mid-November, 1995.
(3) The Prudential Locations, Inc.
Source: MLS Hawaii, Inc. and The Prudential Locations, Inc.

Exhibit 3-C

Through the year 2020, approximately 16,600 additional households could be demanded in the North Kona and South Kohala districts

	Affordable housing / percent of median income				Gap group	Market priced housing / percent of median income					
	Below 80%	80% to 100%	100% to 120%	Subtotal	120% to 140%	140% to 160%	160% to 180%	180% to 200%	Above 200%	Subtotal	Total
Percent of total households by income category (1)	38%	11%	10%	60%	10%	5%	5%	5%	14%	30%	100%
Number of households by income category, rounded (2):											
1995	4,900	1,500	1,300	7,700	1,200	700	700	700	1,800	3,900	12,800
2000	6,000	1,800	1,600	9,400	1,500	800	800	800	2,200	4,600	15,500
2005	6,800	2,000	1,900	10,700	1,700	1,000	1,000	1,000	2,500	5,500	17,900
2010	8,200	2,400	2,200	12,800	2,000	1,200	1,200	1,200	3,000	6,600	21,400
2015	9,700	2,800	2,600	15,100	2,400	1,400	1,400	1,400	3,500	7,700	25,200
2020	11,300	3,300	3,100	17,700	2,800	1,600	1,600	1,600	4,100	8,900	29,400
Projected incremental increase in households:											
1996 - 2000	1,100	300	300	1,700	300	100	100	100	400	700	2,700
2001 - 2005	800	200	300	1,300	200	200	200	200	300	900	2,400
2005 - 2010	1,400	400	300	2,100	300	200	200	200	500	1,100	3,500
2010 - 2015	1,500	400	400	2,300	400	200	200	200	500	1,100	3,800
2015 - 2020	1,600	500	500	2,600	400	200	200	200	600	1,200	4,200
Total increase in households	6,400	1,800	1,800	10,000	1,600	900	900	900	2,300	5,000	16,600
Percent of total increase in households				60%	10%					30%	100%

(1) As shown in Exhibit 2-D.
(2) Based on the total actual and estimated number of households as shown in Exhibit 2-D. Totals may differ due to rounding.
Source: KPMG Peat Marwick LLP.

Exhibit 3-D

Approximately 9,550 units are expected to be constructed in North Kona and South Kohala, based upon the zoned residential parcels in the area; however, only about 6% are anticipated to be developed in the near future

SIGNIFICANT PLANNED, ZONED RESIDENTIAL HOUSING PROJECTS IN NORTH KONA AND SOUTH KOHALA

	Developer	Number of units/lots (1)	Prices Low	Prices High	Possible development timing 1994(2)	1995(2)	1996	1997	1998	1999	2000	Subtotal	Indefinite
Currently planned:													
Iolani	Maryl Development	87	$395,000	$460,000	11	—	—	—	—		—	11	48
Kealoha	Maryl Development	32	$257,500	$319,000	—	6	24	—	—	—	—	30	0
Kona Vistas	Gamrex	225	$319,000	$500,000	72	35	—	—	—	—	—	107	100
Malulani Gardens (2)	B. Cook	121	$226,000	$286,000	35	—	—	—	—	—	—	35	82
Pualani (3)	Benchmark	384	$149,500	$249,500	—	—	140	100	100	44	—	384	0
Pualani	Benchmark	18	$300,000 +		—	—	—	6	6	3	3	18	0
Subtotal		867			118	41	164	106	106	47	3	585	230
Planned but currently on hold:													
Puuhonua	Haseko	247	Project is on hold		—	—	—	—	—	—	—	0	247
Waikoloa Village	OHCD	600	Project is on hold		—	—	—	—	—	—	—	0	600
University Heights	White Hat	108	Project is on hold		—	—	—	—	—	—	—	0	108
Kawaihae Master Plan	DHHL	3,100	Project is on hold		—	—	—	—	—	—	—	0	3,100
Napuunani	Castle & Cooke	600	Project is on hold		—	—	—	—	—	—	—	0	600
Villages of Lai'opua	HFDC	4,082	Project is on hold		—	—	—	—	—	—	—	0	4,082 (4)
Subtotal		8,737			0	0	0	0	0	0	0	0	8,737
Total		9,604			118	41	164	106	106	47	3	585	8,967
												9,552	

(1) Number of units shown may be greater than the number of units shown in the development schedule, as some units have been completed and have been absorbed by the market.
(2) Totals listed are those available for sale, as of December 1995.
(2) Subdivision is condominiumized to share in ownership of private lanes. CAM expenses are expected to be less than $100 per month.
(3) The development reportedly has reservations for 140 units as of December 1995.
(4) Based upon discussions with industry sources, this Project is not expected to begin until substantive legal issues are cleared up.
Estimated to restart development in the year 2000, with a 20 year build out.
Sources: KPMG Peat Marwick LLP; County of Hawaii, Office of Housing and Community Development; Interviews with developers; Various newspaper articles.

Exhibit 3-E

Through the year 2020, demand for housing units in the North Kona and South Kohala area is expected to exceed the supply by almost 7,900 units

PROJECTED HOUSING SHORTFALL FOR THE NORTH KONA AND SOUTH KOHALA DISTRICTS

	Projected new households (1)	Desired vacancy factor	Total new housing demand	Projected supply of currently entitled units (2)	Estimated unsatisfied demand, (rounded)	Cumulative shortage
2000	2,700	5%	2,835	585	2,250	(2,250)
2005	2,400	5%	2,520	2,241	280	(2,530)
2010	3,500	5%	3,675	2,242	1,430	(3,960)
2015	3,800	5%	3,990	2,242	1,750	(5,710)
2020	4,200	5%	4,410	2,242	2,170	(7,880)
Total	16,600		17,430	9,551	7,880	

(1) Based upon Exhibit 3-C.
(2) Based upon Exhibit 3-D.
Source: KPMG Peat Marwick LLP.

Exhibit 3-F

Sales of residential units at the Kaloko Town Center are projected to account for roughly 4% to 10% of the regional market for new housing units

PROJECTED ABSORPTION OF RESIDENTIAL UNITS AT THE KALOKO TOWN CENTER

Period	Estimated regional demand (1)	Projected absorption at the Kaloko Town Center	Kaloko Town Center as a percent of overall demand
1995 - 2000	2,835	100	4%
2001 - 2005	2,520	250	10%
2006 - 2010	3,675	250	7%
2011 - 2015	3,990	250	6%
Total/average	13,020	850	7%

(1) Demand in North Kona and South Kohala, as shown in Exhibit 3-E.

Exhibit 3-G

Households earning from 80% to 160% of the median household income are able to qualify for homes priced from about $124,000 to over $235,000

HOME PURCHASE AFFORDABILITY INDICATORS FOR NORTH KONA AND SOUTH KOHALA HOUSEHOLDS (1995 DOLLARS)

	Affordable housing group			Gap group (1)	Market housing group			
	Up to 80%	80% to 100%	100% to 120%	120% to 140%	140% to 160%	160% to 180%	180% to 200%	Above 200%
Household income:								
Annual (1)	$31,040	38,800	46,560	54,320	62,080	69,840	77,600	77,600 +
Monthly	2,590	3,230	3,880	4,530	5,170	5,820	6,470	6,470 +
Home purchase assumptions, monthly:								
Maximum monthly payment (2)	850	1,070	1,280	1,490	1,710	1,920	2,140	2,140 +
Less real property tax and insurance (3)	90	110	130	160	180	200	220	220 +
Maximum amount to principal and interest	760	960	1,150	1,330	1,530	1,720	1,920	1,920 +
Maximum mortgage amount (4)	94,100	118,000	141,800	164,400	188,300	212,100	236,000	236,000 +
Down payment amount:								
At 5% of purchase price	NAP	6,200	7,500	8,700	9,900	11,200	12,400	12,400
At 10% of purchase price	NAP	13,100	15,800	18,300	20,900	23,600	26,200	26,200
At 20% of purchase price	NAP	29,500	35,500	41,100	47,000	53,100	59,000	59,000
Home purchase affordability:								
With a 30-year mortgage at 8.0%:								
Maximum price at 5% down	NAP	136,100	163,600	189,700	217,200	244,700	272,200	272,200 +
Maximum price at 10% down	NAP	143,600	172,700	200,200	229,200	258,300	287,300	287,300 +
Maximum price at 20% down	NAP	161,600	194,300	225,200	257,900	290,600	323,200	323,200 +
With a 30-year mortgage at 9.0%:								
Maximum price at 5% down	NAP	124,200	149,300	173,100	198,200	223,300	248,400	248,400 +
Maximum price at 10% down	NAP	131,100	157,600	182,700	209,200	235,700	262,200	262,200 +
Maximum price at 20% down	NAP	147,500	177,300	205,500	235,300	265,200	295,000	295,000 +
With a 30-year mortgage at 10.0%:								
Maximum price at 5% down	NAP	114,000	137,000	158,800	181,900	204,900	227,900	227,900 +
Maximum price at 10% down	NAP	120,300	144,600	167,600	192,000	216,300	240,600	240,600 +
Maximum price at 20% down	NAP	135,300	162,700	188,600	216,000	243,300	270,600	270,600 +

(1) Based on information as shown in Exhibit 2-C.
(2) Based on 33% of monthly income.
(3) Estimated at 10.5% of the maximum monthly payment, rounded.
(4) Based on a 30-year mortgage with a 9.0% interest rate with 33% of gross household income available for payment of mortgage principal, interest, real property taxes and insurance.

NAP = Not applicable.

Exhibit 3-H

Residential units at the Kaloko Town Center are expected to attract households earning between 80% to 160% of the median household income

PROJECTED HOUSING DEMAND BY PRODUCT TYPE AT THE KALOKO TOWN CENTER

	Percent of Hawaii County median household income				
	80% to 100%	100% to 120%	120% to 140%	140% to 160%	Total
Estimated pricing range, rounded (1995 dollars) (1)	$125,000 to 150,000	$150,000 to 175,000	$175,000 to 200,000	$200,000 to 235,000	
Projected incremental increase in households (1996 - 2015) (2)	1,300	1,300	1,200	700	4,500
Projected housing demand (3):					
Multifamily (4)	240	240	0	0	480
Single-family (5)	0	0	185	185	370
Total	240	240	185	185	850
Percent of total	28%	28%	22%	22%	
Percent capture of new households at Kaloko Town Center	18%	18%	15%	26%	19%

(1) Based upon Exhibit 3-G, assuming a 9.0% mortgage interest rate with a down payment of 5% to 20%.
(2) Based upon Exhibit 3-C.
(3) Based upon Exhibit 3-C; demand by household income category is based upon the projected incremental increase in households earning from 80% to 160% of the Hawaii County median household income through the year 2015.
(4) Of all households expected to purchase a unit at the Kaloko Town Center, those earning between 80% to 120% of the median income are expected to purchase a multifamily unit; with households earning 80% to 100% and 100% to 120% each accounting for about 50% of the units, respectively.
(5) Of all households expected to purchase a unit at the Kaloko Town Center, those earning between 120% to 160% of the median income are expected to purchase a single-family unit; with households earning 120% to 140% and 140% to 160% each accounting for about 50% of the units, respectively.

4 - COMMERCIAL/RETAIL MARKET ASSESSMENT

This chapter provides an overview of the key retail market conditions in the North Kona and South Kohala districts of the County of Hawaii, and assesses the amount of supportable commercial/retail space at the Kaloko Town Center.

RETAIL MARKET OVERVIEW

There are 12 shopping centers that contain an estimated 740,000 square feet of gross leasable retail space in the North Kona and South Kohala districts, as shown in Exhibit 4-A. Approximately 150,000 square feet are located in the Kuakini Shopping Center, the area's largest; other centers range from about 21,000 to 88,000 square feet.

Characteristics of the area's major shopping centers are shown in Exhibit 4-B and are summarized as follows:

- **Lease Rates** - Base rents for well-located, in-line space range from about $1.50 to $5.00 per square foot per month, triple net. Percentage rents range from 5% to 9% of gross sales.
- **Occupancy Rates** - Overall, occupancy rates for the various centers appear to be relatively healthy; occupancy rates range from about 83% to 99% at selected centers in the area.
- **Tenant Profile** - The existing tenant mix at shopping centers varies considerably and is dependent on whether the center is targeted more towards the resident market or the visitor market.

Overall, the retail market in the North Kona and South Kohala districts has been heavily impacted by the emergence of national discount and warehouse-type stores on the island. These high-volume retailers have attracted consumer spending and added a new layer of competition to the area's traditional shopping centers. Within the past several years, the Kona coast has become home to:

- **Costco** - In November 1993, the State's largest Costco opened in the Kaloko Industrial Park area of Kona, with approximately 156,000 square feet.
- **KMart** - Located in the Makalapua Center, consisting of approximately 215,000 square feet.
- **Wal Mart** - In August 1995, Wal Mart opened with approximately 132,000 square feet of retail space at the Crossroads Center.
- **Marshalls** - On the same day as the Wal Mart opening, Marshalls opened its first store on the island of Hawaii at the Kona Coast Shopping Center.

The influx of new retailers to the Kona coast of the County of Hawaii is not expected to end with the above mentioned retailers. Tentative plans are for a stand-alone Liberty House to open in the Spring of 1997. This will be the island's second full-service Liberty House. Cross Roads, currently anchored by Wal Mart, is expanding with the addition of a Safeway, Barnes & Noble, and a Chevron service station. The Lanihau Shopping Center is also in the process of developing "Phase II" of their Center with over 100,000 square feet of new retail space.

RETAIL DEMAND ANALYSIS

Demand for retail space in the North Kona and South Kohala districts is projected based upon expenditures from area residents and visitors. Projected expenditures from residents and visitors, and the supportable retail space at the Kaloko Town Center are presented in the following sections.

North Kona and South Kohala Residents

North Kona and South Kohala residents make up the primary market for the retail merchants in the area. Retail demand from residents is based upon demographic and economic projections that have been previously presented in Chapter 2. They are summarized as follows:

- **Population** - North Kona and South Kohala's current population is estimated to be about 35,900. Over the next 25 years, the population is projected to increase an average of 3.3% annually, resulting in about 77,700 residents by the year 2020.
- **Households** - North Kona and South Kohala's average household size is estimated to decrease steadily, from 2.76 persons in 1995, to 2.59 persons by the year 2020. Thus, the number of households in North Kona and South Kohala is projected to reach 29,400 by the year 2020, an increase of 16,600.
- **Household Income** - 1995 median household income for Hawaii County is estimated at approximately $38,800. Of the 16,600 households projected to be added in the North Kona and South Kohala area over the next 25 years, approximately 8,400 households, or about 51% are projected to have incomes greater than the median income for Hawaii County.

In addition, the "Consumer Expenditure Survey," conducted by the United States Department of Commerce (DOC) in 1992 was used to provide a general indication as to the retail spending patterns of households (1992 figures were inflated based upon inflation estimates for 1993 to 1995). Further, the DOC survey was based upon Oahu residents, therefore, adjustments were made accordingly to various line items to account for perceived differences between the markets, as shown in Exhibit 4-C.

Based upon the factors presented above, households in the North Kona and South Kohala area are estimated to spend, on average, about $16,200 annually, or about 38% of the total household income (households earning 100% of the North Kona and South Kohala median income) on retail goods, as also shown in Exhibit 4-C.

Further, the projected retail expenditure capture rate at the Kaloko Town Center has been based upon an assessment of the project in comparison to the existing and planned retail facilities in the North Kona and South Kohala area. As shown in Exhibit 4-D, assuming an appropriate tenant mix, retail space at the Kaloko Town Center is projected to capture some 10% to 30% of the various household retail expenditures projected for the North Kona and South Kohala area, resulting in an overall capture rate of about 19%, or $3,000 per household per year (1995 dollars). These capture rates could be supported by the following:

- **The Kaloko Town Center's central location** within the region, being near the airport and between the resort centers of each district.
- **The Kaloko Town Center's proposed retail development's** excellent visibility along Queen Kaahumanu Highway.
- **Additional expenditures could be captured from residents who live outside of the North Kona and South Kohala districts**; potential expenditures from Hawaii residents who reside outside of the North Kona and South Kohala areas have not been accounted for in the demand model.

Visitors to North Kona and South Kohala

In addition to the residents of North Kona and South Kohala, visitors to the area also comprise a formidable market for retail development at the site. Retail demand from visitors is based upon visitor arrival projections to the island that have been previously presented in Chapter 2, and are summarized as follows:

- **Westbound visitor arrivals are projected to increase an average of 2.7% annually** through the year 2020; visitor arrivals projected to approach 1.7 million.
- **Eastbound visitor arrivals are projected to increase an average of 4.7% annually** through the year 2020; total visitor arrivals projected to approach 700,000.

Overall, visitor arrivals to the County of Hawaii are projected to increase an average of 3.2% annually through the year 2020; total visitor arrivals are projected to exceed 2.3 million.

Exhibit 4-E presents the typical daily expenditures by visitors from the United States, as well as Japan. As shown, visitors from the United States spent on average about $83 per day (excluding lodging expenses) on retail items. On the other hand, visitors from Japan spent significantly more on retail items, averaging about $185 per day.

Retail Demand Projections

The analysis used to project the demand for retail space at the Kaloko Town Center is presented in Exhibit 4-F, and summarized below:

Resident Retail Demand:

- **The number of households in North Kona and South Kohala** is projected to increase by about 16,600 by the year 2020.

- **Of the additional households projected, approximately $3,000 per household** (1995 dollars) per year is expected to be captured at the Kaloko Town Center.

Thus, annual resident expenditures captured at the Kaloko Town Center (1995 dollars) is projected at about $8.1 million by the year 2000, increasing to about $49.8 million by the year 2020.

Visitor Retail Demand:

- **Annual visitor arrivals to the County of Hawaii** are projected to reach about 1.69 million (westbound visitors) and 673,000 (eastbound visitors), respectively, by the year 2020.

  Additionally, it has been assumed that one out of every four visitors to the island (both westbound and eastbound visitors) would visit the Kaloko Town Center. Among the 25% of such visitors, westbound visitors, with an average length of stay of 7.1 days, are projected to visit the project an average of 1.5 times, while eastbound visitors, with an average length of stay of 3.3 days, are projected to visit the project an average of 1.0 times.

- **Annual visitors to the Kaloko Town Center** are projected to exceed 800,000 by the year 2020 (632,000 westbound visits and 168,000 eastbound visits).

  Further, based upon the retail expenditure patterns of visitors from the United States and Japan and the competitive retail market in the area, it is projected that approximately 20% of the average daily expenditure would be spent during their respective visit(s) to the Kaloko Town Center; westbound and eastbound visitors are projected to spend approximately $17 and $37, respectively.

Thus, annual visitor expenditures captured at the Kaloko Town Center (1995 dollars) are projected at about $9.1 million by the year 2000, increasing to about $16.7 million by the year 2020.

Supportable Retail Shopping Center Space at the Kaloko Town Center

In summary, by the year 2000, retail expenditures by residents and visitors at the Kaloko Town Center (1995 dollars) are projected to reach about $17.2 million, with approximately 47% coming from residents and 53% from visitors; retail expenditures are expected to increase to over $66.5 million by the year 2020, with residents and visitors accounting for about 75% and 25%, respectively.

Assuming an overall average sales per square foot of $245 (typical of retail centers in the area), and including a 7% vacancy factor, approximately 76,000 square feet are projected to be supportable by the year 2000, increasing to almost 292,000 square feet by the year 2020.

Further, based upon an approximately 20% coverage ratio, it is estimated that by the year 2020, about 32.4 acres of traditional retail shopping center uses could be supported at the Kaloko Town Center.

OTHER COMMERCIAL/RETAIL USE ANALYSIS

This section analyzes the market support for other commercial/retail uses at the Kaloko Town Center. The concepts presented are based on interviews held in conjunction with the social impact assessment conducted by Earthplan. Some of those interviewed were concerned about what the proposed Kaloko Town Center can offer to residents of the region. Further, some expressed a concern that the area has insufficient recreational and pastime activities for families and children.

Thus, commercial/retail uses that are not part of traditional shopping centers were reviewed for their appropriateness at the Kaloko Town Center. A list of potential uses and indicative land area requirements are presented in Exhibit 4-G, and summarized below:

- **Miniature golf** - Similar to the Jungle River Miniature Golf located in Phase III of the Pearlridge Center. This type of activity caters to children as well as adults and is considered to be family entertainment.

  The land area required to construct a miniature golf operation, including parking, is estimated at 0.5 to 1.0 acre, depending on whether one or two 18-hole courses are constructed.

- **Bowling** - Another type of family entertainment, generally consisting of about 24 lanes, with some arcade games and a refreshment center.

  The land area required to construct a 24- to 28-lane bowling alley and parking is estimated at 1.7 to 2.0 acres.

- **Batting cages** - Similar to the Ohana Batting Cages located in Honolulu; consists of four fast-pitch baseball batting cages with speeds ranging from 40 to 85 miles per hour, and two slow-pitch softball batting cages.

  The land area required to construct a batting cage operation, including parking, is estimated at 0.8 to 1.2 acres, depending upon the number of cages to be constructed.

- **Drive-In theater** - Family entertainment, with movies shown in the evening, and a flea market, craft fair, or produce market type of operation possible during the day. This use could realistically serve two markets, with residents supporting the movie operation, and residents and visitors supporting the daytime uses.

  The land area required is estimated to be about 7.3 to 7.5 acres.

- **Go-carts** - Similar to Hawaii Formula Kart, located in Ewa on the island of Oahu, and many other operations across the United States. These Indy-style go-carts are raced on a scaled-down version of a race track, with the go-carts able to reach speeds of up to 55 miles per hour, or limited to any speed the operator chooses.

  The land area required, including parking, is estimated to be about 2.0 to 2.2 acres.

- **Family dining/amusement** - Similar to Chuck E. Cheese's Pizza, located in the Aina Haina Shopping Center and the Pearl City Shopping Center on the island of Oahu. Extremely popular with families, offering games, food and drinks. Also specializes in hosting supervised parties for children.

  The leasable area for such an operation is estimated to range from about 10,000 to 12,000 square feet, or about 0.6 to 0.7 acres using a floor-to-area ratio of 40%.

- **Gas station, car wash and convenience store** - Similar to various gas station and car wash operations or gas station and convenience store operations. The Kaloko Town Center could be an ideal site for such an operation that will be convenient for residents in the community, as well as for visitors on their way to return cars at the airport.

  The land area required is estimated to be about 1.0 to 1.5 acres.

- **Various visitor attraction and support services** - Could include factory tours and retail sales of products made in Hawaii, including coffee, cookies, candies, apparel, flowers, etc. The Kaloko Town Center site is considered to be ideal for this type of use due to the proximity to the airport.

  The land area required is estimated to range from about 3.0 to 5.0 acres, depending upon the number of businesses in the project.

It appears that many non-shopping center commercial/retail uses at the Kaloko Town Center could be attractive to both residents and visitors. The project and the community could also be complemented by a one-stop gas, car wash and convenience store, with a visitor attraction type of factory tours/retail sales also added to take advantage of the site's proximity to the airport. In consideration of the alternative uses presented above, up to about 16.9 to 21.1 additional acres of commercial/retail use is projected to be supportable at the Kaloko Town Center.

TOTAL SUPPORTABLE COMMERCIAL/RETAIL LAND AREA AT THE KALOKO TOWN CENTER

As presented earlier, residents in the North Kona and South Kohala area as well as visitors to the island are expected to support about 32.4 acres of land for traditional retail space at the Kaloko Town Center. Additionally, another approximately 21 acres could be used for alternative commercial/retail uses that provide residents and visitors with additional family activities in the community. Thus, based upon the support shown for traditional retail space, as well as the alternative uses that could be appropriate for the Kaloko Town Center, a total of about 53.4 acres of commercial/retail land area is projected to be supportable by the year 2020.

There are 12 shopping centers, totaling about 740,000 sq. ft. of GLA, in the North Kona and South Kohala districts

INVENTORY OF SHOPPING CENTERS WITH GROSS LEASEABLE AREAS GREATER THAN 20,000 SQUARE FEET IN THE NORTH KONA AND SOUTH KOHALA DISTRICTS: 1995

Name/address	Opened	Site area (acres)	Gross leaseable area (sq. ft.)	Parking spaces
Keauhou Kona Shopping Village 78-6831 Alii Drive Kailua-Kona	1985	8.26	75,588	393
King Kamehameha's Kona Beach Hotel 75-5660 Palani Road Kailua-Kona	1975	13.00	32,000	458
King's Shops Waikoloa Beach Resort Waikoloa	1992	7.00	50,577	300
Kona Coast Shopping Center 74-5588 Palani Road Kailua-Kona	1975	7.50	85,688	440
Kona Inn Shopping Village 75-5744 Alii Drive Kailua-Kona	1978	6.00	60,000	300
Kona Market Place Alii Drive Kailua-Kona	1974	3.00	50,000	200
Kopiko Plaza 75-5660 Kopiko Street Kailua-Kona	1990	3.00	33,400	169

There are 12 shopping centers, totaling about 740,000 sq. ft. of GLA, in the North Kona and South Kohala districts

INVENTORY OF SHOPPING CENTERS WITH GROSS LEASEABLE AREAS GREATER THAN 20,000 SQUARE FEET IN THE NORTH KONA AND SOUTH KOHALA DISTRICTS: 1995

Name/address	Opened	Site area (acres)	Gross leaseable area (sq. ft.)	Parking spaces
Kuakini Shopping Center Kuakini Highway and Lako St. Kailua-Kona	1993	17.00	150,000	750
Lanihau Center 75-5595 Palani Road Kailua-Kona	1987	9.47	87,820	496
North Kona Shopping Center 75-5629 Kuakini Highway Kailua-Kona	1973	3.67	38,731	80
Old Kailua Town Alii Drive Kailua-Kona	1993	5.16	54,000	307
Waterfront Row 75-5770 Alii Drive Kailua-Kona	NAV	1.46	20,867	102
Total			**738,671**	

Exhibit 4-B

Rents at major shopping centers in the area range from about $1.50 to $5.00, and occupancy levels range from 83% to 99%

DESCRIPTION OF SELECTED NORTH KONA AND SOUTH KOHALA SHOPPING CENTERS

Name/address	Rent range	Occupancy rate	Anchor/major tenants	Comments
Keauhou Kona Shopping Village 78-6831 Alii Drive Kailua-Kona	$1.50 $0.55 CAM 6% - 10%	90%	Longs; Ben Franklin; Ace Hardware; KTA Supermarket; Liberty House Penthouse	The Center is located in the Keauhou Resort, which contains several hotels and planned residential communities.
King's Shops Waikoloa Beach Resort Waikoloa	$2.35 - $2.85 $1.35 CAM 5%	95%	Liberty House Collections; The Ocean Club	The King's Shops is considered to be a specialty shopping center located in the Waikoloa Resort, specializing in resort and visitor specialty shops.
Kona Coast Shopping Center 74-5588 Palani Road Kailua-Kona	Negotiable $0.45 CAM 7% - 10%	96%	KTA Supermarket; Marshalls; Blockbuster Video	The Center is located on Palani Road, a main connector road between the highway and Alii Drive.
Kona Market Place Alii Drive Kailua-Kona	$2.00 - $5.00 $0.90 CAM 10%	83%	Various specialty shops	
Kopiko Plaza 75-5660 Kopiko Street Kailua-Kona	$2.25 $0.25 CAM 7% - 10%	NAV	Music store; Japanese restaurant; Pizza restaurant; Canyon-Rent-To-Own	The Center is located adjacent to the Lanihau Center with access either through the Center or a secondary street off of Palani Road.
Kuakini Shopping Center Kuakini Highway and Lako St. Kailua-Kona	NAV NAV NAV	NAV	Safeway; Ben Franklin	
Lanihau Center 75-5595 Palani Road Kailua-Kona	$3.50 - $3.75 $0.61 CAM 6.5% - 11%	99%	Long's; Sack-N-Save; various specialty shops and restaurants	The Center is located on Palani Road, a main connector road between the highway and Alii Drive.

NAV = Not available.
Source: Monroe and Friedlander and interviews with shopping center representatives.

Households in the North Kona and South Kohala districts are projected to spend approximately $16,200 on retail expenditures in 1995

NORTH KONA AND SOUTH KOHALA DISTRICT RETAIL EXPENDITURES: 1995

	Island of Oahu		Adjustment	North Kona and South Kohala	
	Household retail expenditures (1)	Percent of total	for the subject area	Household retail expenditures	Percent of total
Median household income (2)	$53,600		(20%)	$42,800	
Retail expenditure category:					
Food at home	$4,208	21%	0%	$4,208	26%
Food away from home	3,479	18%	(15%)	2,957	18%
Alcoholic beverages	544	3%	0%	544	3%
Housekeeping supplies	523	3%	(20%)	418	3%
Household furnishings and equipment	1,433	7%	(50%)	716	4%
Apparel and services	2,257	11%	(40%)	1,354	8%
Transportation	3,140	16%	0%	3,140	19%
Entertainment	1,788	9%	(40%)	1,073	7%
Personal care products and services	537	3%	(20%)	429	3%
Reading	220	1%	(20%)	176	1%
Miscellaneous	1,505	8%	(20%)	1,204	7%
Total/average	$19,634	100%	(17%)	$16,221	100%

(1) 1992 figures based on the "Consumer Expenditure Survey," produced by the U.S. Department of Commerce; inflated by Bank of Hawaii inflation estimates of 3.2%, 2.8%, and 2.0% for the years 1993, 1994, and 1995, respectively.
(2) As shown in Exhibit 2-C.
Source: "Consumer Expenditure Survey 1992-1993," U.S. Department of Commerce and Bank of Hawaii.

Approximately $3,000 of retail expenditures per household are projected to be captured at the Kaloko Town Center

ESTIMATED RETAIL EXPENDITURE CAPTURE AT THE KALOKO TOWN CENTER

	North Kona and South Kohala retail expenditure (1)	Percentage of category spent at the Kaloko Town Center	Expenditures at the Kaloko Town Center	Percent of residents' retail expenditure
Food at home	$4,208	20%	$842	5%
Food away from home	2,957	10%	296	2%
Alcoholic beverages	544	20%	109	1%
Housekeeping supplies	418	30%	125	1%
Household furnishings and equipment	716	25%	179	1%
Apparel and services	1,354	15%	203	1%
Transportation	3,140	25%	785	5%
Entertainment	1,073	25%	268	2%
Personal care products and services	429	15%	64	0%
Reading	176	25%	44	0%
Miscellaneous	1,204	10%	120	1%
Total, rounded	$16,200		$3,000	19%

(1) As shown in Exhibit 4-C.

Westbound visitors spend about $83 per day on retail expenditures while eastbound visitors spend about $185 per day

NEIGHBOR ISLAND DAILY VISITOR EXPENDITURES: 1995

	United States visitors		Japanese visitors	
	Daily expenditure (1)	Percent of total	Daily expenditure (1)	Percent of total
Food and beverage	$29.09	22%	$56.16	20%
Entertainment	9.97	7%	19.65	7%
Transportation	19.79	15%	24.83	9%
Fashion	12.10	9%	48.11	17%
Agriculture	1.96	1%	1.44	1%
Communication	0.63	0%	2.40	1%
Personal service	1.14	1%	1.12	0%
Lodging	50.70	38%	90.18	33%
Souvenirs	3.86	3%	19.22	7%
Other	2.36	2%	4.75	2%
Amount that was Duty-Free	0.00	0%	2.25	1%
Adjustment factor	1.94	1%	5.50	2%
Total	$133.53	100%	$275.61	100%
Total daily retail expenditures, excluding lodging	**$82.84**	**62%**	**$185.44**	**67%**

(1) 1993 figures inflated by Bank of Hawaii inflation estimates of 2.8% and 2.0% for 1994 and 1995, respectively.
Source: "Visitor Expenditures 1993," Hawaii Visitors Bureau.

Exhibit 4-F

Through the year 2020, approximately 32.4 acres of retail land is projected to be supportable at the Kaloko Town Center

SUPPORTABLE RETAIL SPACE AT THE KALOKO TOWN CENTER

	2000		2005		2010		2015		2020	
Retail expenditures:										
Resident population:										
Increase in households (1)		2,700		5,000		8,600		12,300		16,600
Estimated annual retail household expenditures at the Kaloko Town Center, 1995 dollars (2)		$3,000		$3,000		$3,000		$3,000		$3,000
Estimated annual resident expenditures at the Kaloko Town Center, 1995 dollars		$8,100,000		$15,000,000		$25,800,000		$36,900,000		$49,800,000
	Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound
Visitor population:										
Annual visitors from out of state (3)	1,006,000	310,000	1,163,000	413,000	1,316,000	526,000	1,489,000	595,000	1,685,000	673,000
Estimated percentage of visitors to the Kaloko Town Center (4)	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Estimated number of visits to the Kaloko Town Center (4)	1.50	1.00	1.50	1.00	1.50	1.00	1.50	1.00	1.50	1.00
Estimated annual visitors to the Kaloko Town Center	377,300	77,500	436,100	103,300	493,500	131,500	558,400	148,800	631,900	168,300
Estimated retail expenditures per visit to the Kaloko Town Center, 1995 dollars (5)	$16.57	$37.09	$16.57	$37.09	$16.57	$37.09	$16.57	$37.09	$16.57	$37.09
Estimated annual retail expenditures at the Kaloko Town Center, 1995 dollars	$6,250,800	$2,874,300	$7,225,000	$3,831,100	$8,175,900	$4,877,000	$9,251,200	$5,518,600	$10,468,800	$6,241,800
Total estimated annual retail expenditures at the Kaloko Town Center, 1995 dollars		$17,225,100		$26,056,100		$38,852,900		$51,669,800		$66,510,600
Estimated sales per square foot		$245		$245		$245		$245		$245
Supportable gross leaseable area, including a 7% vacancy factor (square feet)		75,600		114,400		170,500		226,800		291,900
Supportable retail land area (6)		8.4		12.7		18.9		25.2		32.4

(1) Based on information shown in Exhibit 2-B.
(2) As shown in Exhibit 4-D.
(3) Based on Exhibit 2-F.
(4) The percentage of total visitors and the number of visits to the Kaloko Town Center were projected based upon the assumption that approximately 1 out of every 4 visitors would visit the Project and westbound visitors (ALOS of 7.1 days) would visit the Project an average of 1.5 times while eastbound visitors (ALOS of 3.3 days) would visit the Project an average of 1.0 times.
(5) Based on a projected market share of 20% of total retail expenditures as shown in Exhibit 4-E.
(6) Based upon a floor-to-area ratio of 9,000 square feet of leasable area per acre (a ratio of about 20%).
Source: KPMG Peat Marwick LLP.

Exhibit 4-G

Alternative commercial/retail uses could require up to about 21 acres

APPROXIMATE LAND AREA REQUIRED FOR SELECTED COMMERCIAL/RETAIL USES

Type of use/example	Location	Approximate land area (acres) (1)	Description
Miniature golf:			
Jungle River Miniature Golf	Aiea, Oahu	0.5	18-hole miniature golf course located in Phase III of the Pearlridge Center.
Estimated land area required		***0.5 - 1.0***	
Bowling:			
Lihue Lanes	Lihue, Kauai	1.5 - 2.0	28-lane bowling alley within Rice Shopping Center.
Stadium Bowl-O-Drome	Honolulu, Oahu	1.5	24-lane bowling alley located in Moiliili.
Mak Bowl	Honolulu, Oahu	1.6	24-lane bowling alley located in Kalihi.
Pali Lanes	Kailua, Oahu	1.7	24-lane bowling alley located in Kailua.
Estimated land area required		***1.7 - 2.0***	
Batting cages:			
Ohana Batting Cages	Honolulu, Oahu	1.0	Practice baseball and softball batting cages for children and adults; various pitching speeds.
Estimated land area required		***0.8 - 1.2***	
Drive-in theater:			
Kam Drive-In Theaters	Aiea, Oahu	14.0	Two drive-in theaters located across the street from Phase I of the Pearlridge Center
Estimated land area required		***7.3 - 7.5 (2)***	
Go-carts:			
Hawaii Formula Kart	Ewa, Oahu	1.4	Indy-style go-carts designed for teenagers and adults.
Estimated land area required		***2.0 - 2.2 (3)***	
Family dining/amusement:			
Chuck E. Cheese's Pizza	Honolulu, Oahu Pearl City, Oahu	0.7 (4)	Family amusement/entertainment facility offering games, food, drinks and supervised children's parties.
Estimated land area required		***0.6 - 0.7***	
Gas station, car wash and convenience store:			
Chevron gas station, car wash and convenience store	Various	1.0 - 1.5	Self-service gas station, car wash and a convenience store all at one stop.
Estimated land area required		***1.0 - 1.5***	
Various visitor attraction and support services:			
Factory tours of products made in Hawaii	–	INA	Various factory tours and retail sales of products made in Hawaii, including coffee, candies, apparel, flowers, etc.
Estimated land area required		***3.0 - 5.0***	
Total estimated land area required, rounded		***16.9 - 21.1*** ***acres***	

(1) Approximate land area for the respective uses, including space for parking.
(2) Kam Drive-In consists of two drive-in theaters; slightly more than half the area is assumed to be adequate for one drive-in theater.
(3) Operator's existing location has about 1.4 acres, however, he feels that about 2.0+ acres would be more appropriate for this type of operation.
(4) Based upon leasable area of approximately 10,000 to 12,000 square feet; land area estimated using a 40% floor-to-area ratio, including parking.
INA = Information not available.

Sources: Interviews with management, real estate brokers and Hawaii TMK Service.

5 - OFFICE MARKET ASSESSMENT

This chapter provides an overview of the office markets in the North Kona and South Kohala districts, and projects the amount of office space that could be supportable at the Kaloko Town Center.

OFFICE MARKET OVERVIEW

The North Kona and South Kohala districts have roughly 394,000 square feet of office space, as detailed in Exhibit 5-A. The largest office complex, Waikoloa Highlands Center, contains approximately 74,000 square feet. Other office complexes in the area range from about 9,000 to 50,000 square feet.

Characteristics of the office market in the region are also presented in Exhibit 5-A, and summarized below:

- **Lease rates** - Rates on existing leases range from about $1.00 to $2.75 per square foot per month, triple net.

- **Occupancy rates** - The current occupancy rate for office space is estimated at about 85%. Much of the vacant space is less desirable, such as second-floor shopping center space. With demand primarily from small business owners, the North Kona and South Kohala *office demand is largely tied to economic growth in the area.*

Overall, the office market in the North Kona and South Kohala districts is currently considered to be sluggish, as evidenced by the relatively low occupancy rates and aggressive leasing terms. In general, demand will continue to be largely a function of the overall economy, and can be expected to be related to the area's population growth.

OFFICE DEMAND ANALYSIS

The future demand for office space in the North Kona and South Kohala area is projected as a function of the area's population, relative to the historical ratio of office space per resident.

Office Demand Projections

Projected growth in the resident population was previously presented in Chapter 2. The analysis used to project the amount of supportable office space is presented in Exhibit 5-B, and summarized below:

- **North Kona and South Kohala's population** could increase by about 116% over the next 25 years; from 35,900 in 1995, to 77,700 by the year 2020.

- **An office space support indicator** is used to provide a basis for determining the amount of office space, in square feet, that is required, relative to the number of residents in the area.

In 1995, approximately 9.58 square feet of regional office space were occupied per North Kona and South Kohala resident. This ratio is expected to decrease slightly as changing technology has enhanced the mobile office concept and businesses are becoming more efficient in how they use their space, thereby gradually reducing the amount of office space required.

- **Supportable office space in North Kona and South Kohala** is projected to reach 699,000 square feet by the year 2020. In order to allow for flexibility in the market, a 7% vacancy rate has been assumed, resulting in supportable office space of about 748,000 square feet by the year 2020.

- **Additional supportable office space in North Kona and South Kohala** is projected based upon the supportable office space, less existing office space. By the year 2000, about 40,000 square feet of additional office space is projected to be required, increasing to about 354,000 square feet by the year 2020.

- **Of this regional market demand, the Kaloko Town Center is assumed to be able to capture about 25%**, or about 89,000 square feet by the year 2020.

  This capture rate could supported by the project's central location within the North Kona and South Kohala region, and its proximity to residential and retail projects in the area.

In summary, *up to about 89,000 square feet of office uses are expected to be supportable at the Kaloko Town Center by the year 2020.* Based upon the assumption that approximately 16,000 square feet of office space can be developed per acre (a ratio of about 37%), it is estimated that by the year 2020, 5.5 acres of office land could be supportable at the Kaloko Town Center.

Exhibit 5-A

Rents for office space in the North Kona and South Kohala districts range from $1.00 to $2.75 per square foot; while occupancy rates average about 85%

Building name & address	Year built	Number of floors	Building square footage	Occupancy rate	Range of lease rents
Bank of Hawaii Center 75-5742 Hualalai Rd. (2 buildings)	1969	2 & 3	9,715 gross	100%	$1.10 - $1.50 net
First Federal Savings Business Plaza 75-5737 Kuakini Highway	1980	2	9,000 gross	94%	$1.70 - $2.40 net Op. exp. $0.65
Frame Ten Business Center 75-5586 Ololi Road	1991	2	18,004 rentable	68%	Negotiable Op. exp. $0.49
Frame Ten Center 75-5586 Ololi Road	1991	2	33,110 rentable	93%	Negotiable Op. exp. $0.53
Hanama Place 75-5706 Kuakini Highway	1990	1	13,715 gross	86%	$1.85 net Op. exp. $0.62

Exhibit 5-A, Continued

Rents for office space in the North Kona and South Kohala districts range from $1.00 to $2.75 per square foot; while occupancy rates average about 85%

Building name & address	Year built	Number of floors	Building square footage	Occupancy rate	Range of lease rents
Hualalai Center 75-170 Hualalai Road (4 buildings)	NAV	3	27,200 gross	82%	$1.85 - $1.95 net Op. exp. $0.52
Kailua Trade Center 75-5706 Hanama Place	1980	2	18,027 rentable	84%	$1.55 - $1.75 net Op. exp. $0.71
Kaiwi Square Office Building 74-5565 Luhia Street (3 bldgs: 2 retail, 1 office)	NAV	2	37,590 gross	96%	Negotiable Op. exp. $0.38
Kuakini Towers 75-5722 Kuakini Highway	1978	2	26,137 gross 25,720 rentable	90%	$1.60 net Op. exp. $1.81
Lunapule Professional Plaza 75-127 Lunapule Drive	1991	3	17,076 rentable	77%	$2.00 gross
Palani Court Office Building 74-5620 Palani Road	1991	2	18,745 gross	86%	$1.75 net Op. exp. $0.64

Exhibit 5-A, Continued

Rents for office space in the North Kona and South Kohala districts range from $1.00 to $2.75 per square foot; while occupancy rates average about 85%

Building name & address	Year built	Number of floors	Building square footage	Occupancy rate	Range of lease rents
The Pines Plaza 75-240 Nani Kailua Drive	1991	2	17,180 gross 16,300 rentable	73%	$1.50 - $2.75 net Op. exp. $0.32
The Pottery Terrace 75-5995 Kuakini Highway (10 buildings)	NAV	2	50,000 gross	98%	$1.65 gross
Territorial Center 75-5751 Kuakini Highway	1984	2	16,085 gross	56%	$1.25 - $1.55 net Op. exp. $0.63
Village Professional Plaza Kuakini Highway	1992	2	10,003 gross	90%	$1.45 net Op. exp. $0.52
Waikoloa Highlands Center Waikoloa	1988	2	73,623 gross	89%	$1.75 - $2.00 net Op. exp. $0.45
Approximate Total/average			394,000	85%	

Source: Monroe and Friedlander; KPMG Peat Marwick LLP.

Exhibit 5-B

Through the year 2020, approximately 5.5 acres of office land is projected to be supportable at the Kaloko Town Center

PROJECTED SUPPORTABLE OFFICE SPACE AT THE KALOKO TOWN CENTER

	1995	2000	2005	2010	2015	2020
North Kona and South Kohala population (1)	35,900	42,900	49,500	57,900	67,100	77,700
Office space support indicator (2)	9.58	9.46	9.35	9.23	9.11	9.00
Actual/supportable occupied office space (sq. ft.)	344,000	406,000	463,000	534,000	612,000	699,000
Supportable total office space, including a 7% vacancy factor (sq. ft.)	368,000	434,000	495,000	571,000	655,000	748,000
Less: 1995 existing office space (sq. ft.) (3)	(394,000)	(394,000)	(394,000)	(394,000)	(394,000)	(394,000)
Additional supportable office space (sq. ft.)	(26,000)	40,000	101,000	177,000	261,000	354,000
Projected capture rate at the Kaloko Town Center	25%	25%	25%	25%	25%	25%
Projected supportable office space at the Kaloko Town Center (sq. ft.)	(6,500)	10,000	25,250	44,250	65,250	88,500
Supportable office land area (4)	-	0.6	1.6	2.8	4.1	5.5

(1) As shown in Exhibit 2-A.
(2) Actual occupied square feet of office space per North Kona and South Kohala resident in 1995. Projected to decrease slightly due to changing technology and other factors.
(3) As shown in Exhibit 5-A.
(4) Based upon a floor-to-area ratio of 16,000 square feet of leasable area per acre (a ratio of about 37%).
Source: KPMG Peat Marwick LLP.

Kaloko Town Center
Social Impact Assessment

Earthplan, March 1996

Kaloko Town Center
Social Impact Assessment

Prepared for Kimura International

by Earthplan

March 1996

Contents

Tables and Figures

Tables

Figure

1 Background and Introduction

1.1 Purpose

Tokyo Green Hawaii, Inc., proposes to develop the Kaloko Town Center in North Kona on Hawai'i Island. Implementation of the proposed action requires major land use approvals, including reclassification of the project site to Urban, an amendment to the Hawai'i County General Plan and re-zoning.

An Environmental Impact Statement, hereby referred to as an EIS, is being prepared to provide pertinent information in these processes. This report contains the social impact assessment for the EIS. Included in this assessment is a description of the existing community, an identification of potential social impacts and a discussion of current community issues.

This report was prepared by Earthplan, whose offices are located at 81 South Hotel Street, Suite 211, Honolulu, Hawai'i. Berna Cabacungan, principal of Earthplan, was project manager, and principal researcher, interviewer and writer. Assistance was provided by two independent contractors. Paul Kiikoro compiled census information, analyzed public policies and proposed developments, and conducted interviews with public officials, people involved in social agencies and nearby users. Traver Carroll conducted interviews with the general community and area developers.

1.2 Report Organization

The remaining portion of Section 1 describes the proposed project. Section 2 describes the existing community in terms of population trends, demographics, household and housing characteristics, and labor force.

In Section 3, the baseline information on the existing community is extended with information on relevant policies and plans which guide the future of the Study Area major proposed development projects.

Section 4 presents preliminary community issues, based on field interviews conducted for this study.

Potential social impacts are identified in Section 5. Topics include residential population increase, relationship with public policies and community objectives, change in the character of the area, and social and public services.

1.3 Description of the Proposed Project

The project site is located in North Kona, Hawai'i. Most of the 224.43-acre site is situated in the Kohainiki ahupua'a; a small portion is part of the Kaloko ahupua'a. The site is bounded by the Queen Ka'ahumanu Highway on its makai side, or its west, and vacant land on the mauka side or its east. Hina Lani Drive forms the site's southern boundary, beyond which is the Kaloko Industrial Park. The northern boundary of the site is fronted by vacant land.

Tokyo Green Hawaii proposes to develop this currently-vacant site into the Kaloko Town Center, a primarily residential community with commercial, retail and office areas. Table 1 summarizes the proposed project.

Table 1: Kaloko Town Center Project Components

Project Component	Number of Acres	Number of Units
Single family residential	80	370
Multi-family residential	48	480
School and park	13	not applicable
Office-Commercial-Retail	37	not applicable
Commercial-Retail	20	not applicable
Roadways and open space	26	not applicable
Total	**224 acres**	**850 units**

The single family homes would be located in the mauka, or northeast, portions of the site. Multi-family units are proposed to front Hina Lani Drive and the lower portions of the site. The commercial, retail and office uses would be located along Queen Ka'ahumanu Highway and Hina Lani Drive. A 13-acre site situated in the middle of the community is proposed to be set aside for a school and park.

Access to the site would be via a new roadway on Queen Ka'ahumanu Highway, and another on Hina Lani Drive.

2 Profile of the Existing Community

The Study Area for this project is the North Kona district on the west coast of Hawai'i Island. Illustrated in *Figure A,* the Study Area extends from Pu'u Anahulu Homesteads to Keauhou and Kainaliu. The five census tracts (CT) which make up the populated areas of North Kona [1] are as follows:

1. *CT 215.01* covers the area from Pu'u Anahulu to Kealakehe, and includes the project site. This CT is often referred to as the "project site CT" in this report.
2. *CT 215.02* covers most of North Kona situated mauka of Mamalahoa Highway.
3. *CT 215.97* encompasses Kainaliu.
4. *CT 215.98* is mostly Keauhou.
5. *CT 216* centers around Kailua Town.

Section 2.1 presents population trends over a 20-year period. Age and ethnicity characteristics are discussed in Section 2.2, followed by education and previous residence in Section 2.3. Discussions on household and housing unit characteristics are provided in Sections 2.4 and 2.5, respectively. Labor force characteristics are presented in Section 2.6.

2.1 Population Trends

As illustrated in *Figure B*, Hawai'i County's population grew steadily in the past three decades. The island's population grew from 63,000 in 1970, to 92,000 in 1980, and to 120,000 in 1990. On the average, these population counts represent an annual 3.8 percent increase between 1970 and 1980,

1. *The Study Area for this report includes the populated portions of the five census tracts. The census tracts at the northernmost and southernmost ends of North Kona extend into the neighboring districts and the portions in North Kona are not populated.*

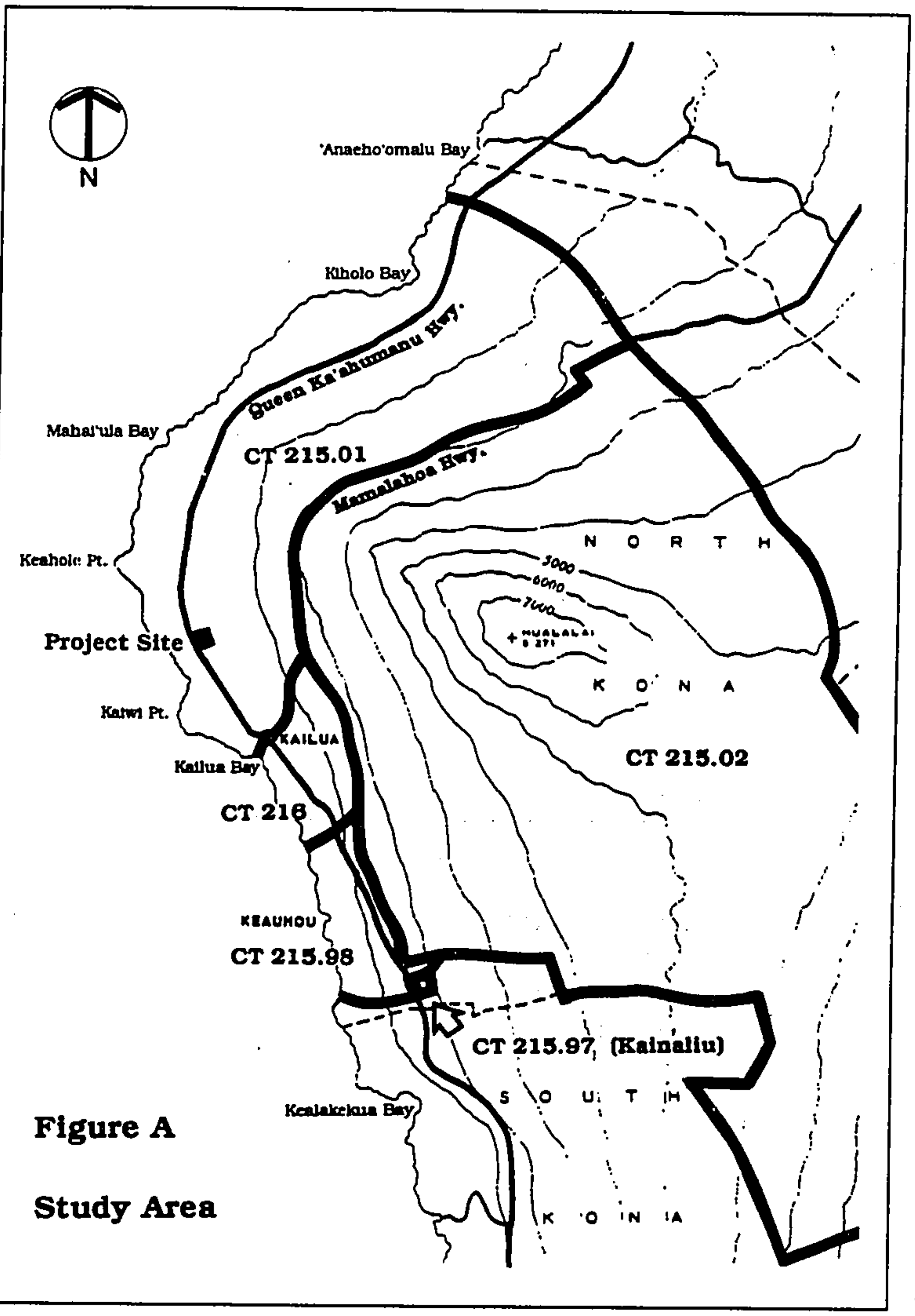
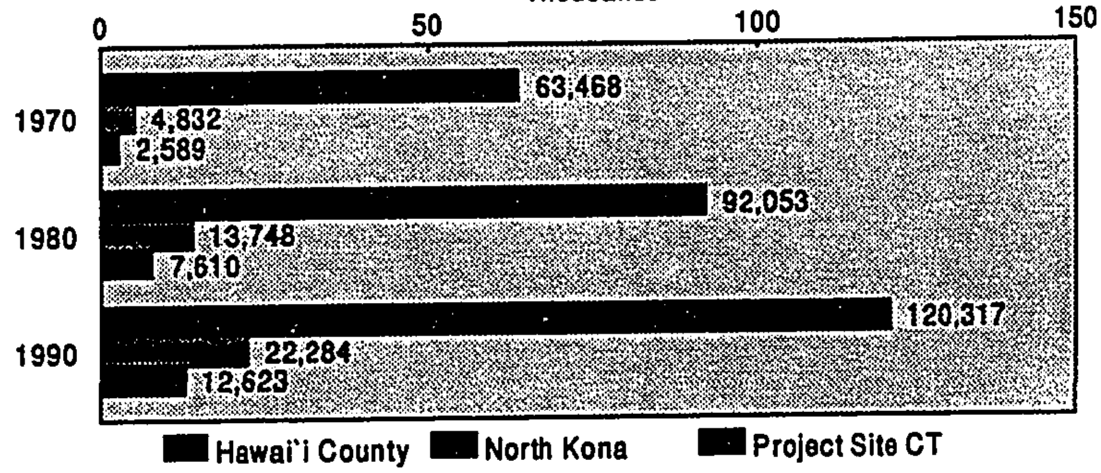


Figure A

Study Area

and a 2.7 increase between 1980 to 1990. *Table 2* summarizes the population trends for the County, North Kona and the census tract in which the project site is located.

Figure B
Population Count, 1970 - 1990
Thousands



Population growth in the Study Area was much more dramatic than that of the overall County. In North Kona, the population almost tripled in the 20-year period. The increase from 4,800 persons in 1970 to 22,000 persons in 1990 implies an average annual growth rate of eleven percent from 1970 to 1980, and five percent from 1980 to 1990.

Census tract designations have been modified between the 1970 and 1990 census taking. In 1970, the project site was in CT 215. This tract has since been subdivided and is coterminous with 1990 Census Tracts 215.01, 215.02, 215.97, and 215.98.

The larger 1970 project site CT experienced even a greater rate of growth than the fast-growing North Kona. The population increased almost six times, from 2,600 to 12,600 from 1970 to 1990. The average annual growth rate was 11.4 percent in the 1970s and 5.2 percent in the 1980s.

Table 2: Population Trend, 1970 - 1980

	Population			Percent Change		Average Annual Growth Rate	
	1970	1980	1990	1970 to 1980	1980 to 1990	1970 to 1980	1980 to 1990
Hawai'i County	63,468	92,053	120,317	45%	31%	3.8%	2.7%
North Kona [a]	4,832	13,748	22,284	184%	62%	11.0%	5.0%
CT 215 (Project Site CT [b])	2,589	7,610	12,623	194%	66%	11.4%	5.2%

a. *North Kona is coterminous with 1990 Census Tracts 215.01, 215.02, 215.97, 215.98 and 216.*

b. *1970 Census Tract 215 includes the project site. In 1990, this tract was split into CT 215.01, 215.02, 215.97 and 215.98.*

Sources: U.S. Bureau of the Census, 1991, 1983; Hawai'i State Department of Planning and Economic Development, 1972.

2.2 Age and Ethnicity

As shown in *Table 3*, over 22,000 persons resided in North Kona, and this comprised one sixth of Hawai'i County's total population. About 43 percent lived in Kailua Town. CT 215.01, which is the 1990 project site CT, and which extends from Pu'u Anahulu to Kealakehe, contained 6,500 residents, which accounted for 29 percent of North Kona's population.

With a median age of 32.1 years, the project site CT had a slightly younger population than Hawai'i County and all other CTs in the North Kona region. The median ages in Hawai'i County and North Kona were 34.3 and 34.7 years, respectively. The highest median age was found in Kainaliu, at 43.5 years.

Table 3: Demographic Characteristics, 1990

	Hawai'i County	Total North Kona	Census Tract [a]				
			215.01 (project site CT)	215.02	215.97	215.98	216
Population	120,317	22,284	6,486	2,944	104	3,089	9,661
Age (in percent)							
Under 5	8	8	10	8	4	6	7
5 to 17	21	19	22	18	13	17	17
18 to 44	40	45	46	46	36	38	46
45 to 64	19	18	15	17	15	21	20
65 and older	13	10	7	10	32	17	10
Median Age	34.3 years	34.7 years	32.1 years	35.1 years	43.5 years	38.6 years	35.0 years
Ethnicity (in percent)							
Caucasian	40	59	56	55	34	61	61
Japanese	21	10	9	15	44	14	8
Hawaiian	19	16	18	19	11	15	15
Filipino	13	8	9	6	7	5	8
Other	7	7	7	5	5	5	8

a. *CT 215.01 covers the area from Pu'u Anahulu to Kealakehe.*
CT 215.02 covers most of North Kona situated mauka of Mamalahoa Highway.
CT 215.97 encompasses Kainaliu.
CT 215.98 is mostly Keauhou.
CT 216 centers around Kailua Town.

Source: U. S. Bureau of the Census, 1992, 1991.

In terms of ethnicity, North Kona differs from the overall Hawai'i County in several respects. There are proportionally more Caucasians in North Kona (59 percent) than in Hawai'i County (40 percent). Subsequently, North Kona has less people of other ethnicities. Notably, there are significantly fewer people of Japanese (ten percent compared to Hawai'i County's 21 percent), and Filipino (eight percent compared to Hawai'i County's 13 percent) ancestry. The ethnic pattern in the project site CT is similar to that of the North Kona district.

2.3 Education and Previous Residence

Overall, North Kona residents attained similar levels of education as Hawai'i County residents. *Table 4* shows that, of residents 25 years and older, 31 percent graduated from high school in both North Kona and Hawai'i County; an additional 30 percent and 28 percent in North Kona and Hawai'i County, respectively, received some form of college degree.

The educational levels within the individual census tracts in North Kona varied. In the project site CT, 33 percent graduated from high school, and another 29 percent completed college. Kainaliu (CT 215.97) residents had lower levels of high school and college graduates, at 22 and 14 percent, respectively. Keauhou, on the other hand, had a high 34 percent of its residents graduating from college.

Table 4: Education and Previous Residence, 1990

	Hawai'i County	Total North Kona	Census Tract [a]				
			215.01 *(project site CT)*	215.02	215.97	215.98	216
Educational Attainment for Persons 25 Years and Older (in percent) [b]							
High school graduate	31	31	33	28	22	26	32
College degree	28	30	29	29	14	34	30

Table 4: Education and Previous Residence, 1990

(Continued)

	Hawai'i County	Total North Kona	Census Tract [a] 215.01 *(project site CT)*	215.02	215.97	215.98	216
Residence in 1985 for Persons 5 Years and Older (in percent)							
Same county, same house	53	39	40	42	24	45	36
Same county, different house	26	27	28	32	49	27	24
Different county	7	7	6	6	27	5	8
Different state	12	24	22	16	0	23	28
Different country	2	3	3	3	0	1	3

a. CT 215.01 covers the area from Pu'u Anahulu to Kealakehe.
CT 215.02 covers most of North Kona situated mauka of Mamalahoa Highway.
CT 215.97 encompasses Kainaliu.
CT 215.98 is mostly Keauhou.
CT 216 centers around Kailua Town.

b. The remaining population over 25 years either did not graduate from high school, or attended some post high school establishment but did not receive a degree.

Consistent with the significantly high population increase discussed earlier, North Kona has a high proportion of people who moved into their house some time in the five years prior to the 1990 census. In Hawai'i County, slightly over half of the residents (53 percent) had lived in same house five years prior to the census. Twenty-six percent lived in another house on Hawai'i County, and another seven percent lived in another county. Twelve percent came from another state.

In North Kona, only 39 percent lived in the same house five years prior to the census. Another 27 percent moved to their present house from another place in Hawai'i County, and seven percent came from another island.

Almost one-fourth of North Kona residents were from another state, and three percent were from a foreign country. The project site CT had similar proportions as the North Kona region.

2.4 Study Area Households

North Kona had almost 7,900 households in 1990, as indicated in *Table 5*. The region's average household size of 2.75 persons was slightly lower than the County-wide average of 2.86 persons. The average household size in the project site's CT was slightly higher than both North Kona and Hawai'i County at 2.99 persons.

The level of crowding in North Kona's households was similar to that of the overall County. In Hawai'i County, twelve percent of the households met the crowded criteria of having more than one person per room. In North Kona, 13 percent of the households were considered crowded; in the project site CT, twelve percent. The highest level of crowding was Kailua Town where 15 percent of its households met the crowded criteria.

At $35,364, the median household income was higher in North Kona than Hawai'i County's median of $29,712. The median household income in the project site CT was even higher at $37,500.

Table 5: Households and Families, 1990

	Hawai'i County	Total North Kona	Census Tract [a]				
			215.01 *(project site CT)*	215.02	215.97	215.98	216
Total Households [b]	41,461	7,898	2,166	1,058	33	1,142	3,499
Persons per household	2.86	2.75	2.99	2.78	2.67	2.63	2.63
Crowded households [c]	12%	13%	12%	10%	6%	10%	15%

Table 5: Households and Families, 1990 *(Continued)*

	Hawai'i County	Total North Kona	Census Tract [a]				
			215.01 *(project site CT)*	215.02	215.97	215.98	216
Median household income	$29,712	$35,364	$37,500	$33,103	$40,469	$36,118	$33,967
Family households	30,235	5,533	1,680	743	24	821	2,265
Percentage of total households	73%	70%	78%	70%	73%	72%	65%
Percentage of married couple families in family households	78%	80%	79%	80%	75%	81%	80%
Median family income	$33,186	$39,329	$37,985	$37,159	$41,250	$40,990	$39,717
Families below poverty level in total households	11%	7%	7%	4%	0%	6%	8%

a. CT 215.01 covers the area from Pu'u Anahulu to Kealakehe.
CT 215.02 covers most of North Kona situated mauka of Mamalahoa Highway.
CT 215.97 encompasses Kainaliu.
CT 215.98 is mostly Keauhou.
CT 216 centers around Kailua Town.
b. Equivalent to the total number of occupied units.
c. Defined as more than ten persons per room.

Source: U. S. Bureau of the Census, 1992, 1991.

North Kona tended to be less family-oriented than Hawai'i County, where 73 percent of its households were family households. In the overall North Kona district, only 70 percent of the total household were family households. The project site CT had the highest proportion of family households with 78 percent.

As with household income, the median family income in North Kona was high at $39,329, when compared to Hawai'i County's median family income of $33,186. The median family income in the project site CT was $37,985.

Poverty levels were lower in North Kona than in Hawai'i County, where eleven percent of family households had incomes below poverty levels. In North Kona, only seven percent of family households were in this category, and the project site CT had a similar proportion.

2.5 Housing Units

Table 6 contains statistics on the Study Area's housing units. North Kona's 9,990 housing units accounted for 21 percent of Hawai'i County's 48,200 housing units. Its vacancy rate of 21 percent was high compared to Hawai'i County's 14 percent due to the presence of seasonal units. Within the individual CTs, the vacancy rate ranged from a low of seven percent in the project site CT to a high of 40 percent in Keauhou, where there is a high proportion of seasonal and vacation units.

Table 6: Housing Units, 1990

	Hawai'i County	Total North Kona	Census Tract [a]				
			215.01 *(project site CT)*	215.02	215.97	215.98	216
Total Housing units	48,253	9,990	2,330	1,231	38	1,912	4,479
Vacant units	14%	21%	7%	14%	13%	40%	22%

Table 6: Housing Units, 1990 *(Continued)*

	Hawai'i County	Total North Kona	Census Tract [a]				
			215.01 *(project site CT)*	215.02	215.97	215.98	216
Type of Unit (in percent)							
Single family b	79	62	81	76	63	49	53
Multi-family c	19	37	18	20	34	50	46
Other d	2	1	1	4	3	1	1
Type of Occupancy (as percent of total occupied units)							
Owner-occupied	61	55	64	48	52	57	50
Renter-occupied	39	45	36	52	48	43	50
Median home value of owner-occupied homes	$113,000	$211,900	$194,500	$264,600	$175,000	$267,000	$209,000
Median monthly rent of renter-occupied units	$428	$644	$660	$654	$425	$674	$628

a. CT 215.01 covers the area from Pu'u Anahulu to Kealakehe.
CT 215.02 covers most of North Kona situated mauka of Mamalahoa Highway.
CT 215.97 encompasses Kainaliu.
CT 215.98 is mostly Keauhou.
CT 216 centers around Kailua Town.
b. Includes both stand-alone (detached) and duplex (attached) homes.
c. Includes townhouses and apartments.
d. A non-conventional dwelling, such as a mobile home or trailer.

Source: U. S. Bureau of the Census, 1991.

Proportionally, there are fewer single family homes in North Kona than in

Hawai'i County. Approximately 62 percent of the total units were single-family homes, compared to 79 percent of the Hawai'i County housing stock. In the individual census tracts, the proportion of single to multi-family units varied greatly. In the project site CT, the housing units were predominantly single-family homes, at 81 percent. In Keauhou, on the other hand, single-family homes made up only 49 percent of the housing supply.

North Kona tended to have proportionally more renters than the overall County. About 45 percent of the North Kona occupied units had renters; in Hawai'i County, only 39 percent of the housing units were renter-occupied. The project site CT differed in this respect, in that its housing units were mostly owner-occupied (64 percent).

The median value of owner-occupied homes was significantly higher in North Kona ($211,900) than in Hawai'i County ($113,000). Within the individual census tracts, median home values ranged from a high of $267,000 in Keauhou to a low of $175,000 in Kainaliu. The project site CT had a median home value of $194,500.

Rent was relatively high in North Kona. North Kona's median rent of $644 was significantly higher than Hawai'i County's median rent of $428. Within the individual census tracts, the median rents ranges from a $674 in Keauhou to a low of $425 in Kainaliu.

2.6 Labor Force Characteristics

Labor force information suggests that North Kona residents, and in particular those in the project site CT, were very active in the labor force, and were able to find jobs. As shown in *Table 7*,North Kona had a high labor force participation rate, when compared to Hawai'i County. In 1990, 71 percent of the residents 16 years and older participated in the civilian labor force, which is higher than the 64 percent participation rate in Hawai'i County.

Non-participation in the labor force is where a person is not part of the labor force due to illness, injury, age, lifestyle choice or other reason. Such a person is not considered unemployed. The non-participation rate in North Kona (29 percent) is much lower than that in Hawai'i County (36 percent).

Further, North Kona's 1990 unemployment rate was low at 2.9 percent, especially when compared to Hawai'i County's rate of 4.6 percent.

The project site CT had a very high civilian labor force participation rate (76 percent), and a very low non-participation rate (24 percent). Only three percent of the participating civilian labor force were unemployed at the time of the 1990 census.

Table 7: Labor Force Characteristics, 1990

	Hawai'i County	Total North Kona	Census Tract [a] 215.01 *(project site CT)*	215.02	215.97	215.98	216
Potential Labor Force [b]	88,999	16,836	4,499	2,327	36	2,342	7,632
Labor Force Participation (in percent)							
Civilian labor force	64	71	76	74	42	58	70
Armed forces	0	0	0	0	0	0	0
Not in labor force	36	29	24	26	58	41	30
Unemployed civilian labor force [c]	4.6	2.9	3.0	1.7	0.0	4.4	2.9
Employed Civilian Labor Force by Occupation (in percent)							
Managerial and professional	24	25	22	27	0	32	25
Technical and sales	15	17	17	14	0	17	19
Service	30	29	33	21	47	26	30

Table 7: Labor Force Characteristics, 1990 *(Continued)*

	Hawai'i County	Total North Kona	Census Tract [a]				
			215.01 *(project site CT)*	215.02	215.97	215.98	216
Farming and fishing	8	6	4	15	0	7	3
Precision and craft	15	15	15	17	53	14	14
Transportation	4	4	6	2	0	3	5
Operators and laborers	5	3	2	5	0	1	4
Mean commute time to work	20.8 minutes	19.0 minutes	24.3 minutes	20.1 minutes	30.3 minutes	15.5 minutes	16.1 minutes

a. CT 215.01 covers the area from Pu'u Anahulu to Kealakehe.
CT 215.02 covers most of North Kona situated mauka of Mamalahoa Highway.
CT 215.97 encompasses Kainaliu.
CT 215.98 is mostly Keauhou.
CT 216 centers around Kailua Town.
b. All persons 16 years and older.
c. Persons 16 years and older who are part of the labor force, but are not in the armed forces.

Source: U.S. Bureau of the Census, 1992.

In a profile of occupations, 30 percent of Hawai'i County's employed civilian labor force held service occupations, and North Kona's proportion in this category was similar at 29 percent. There was slightly more workers in service occupations in the project site CT, at 33 percent.

Islandwide, 24 percent of the workers held managerial and professional jobs, and another 15 percent were in technical and sales. There were slightly higher proportions in North Kona, where 25 percent were in management and professional occupations, and 17 percent were in technical and sales. In the project site CT, 22 percent had management and professional jobs, while 17 percent were in technical and sales.

Study Area residents generally spent less time commuting to work than islandwide residents. In Hawai'i County, the mean commute time to work was 20.8 minutes; in North Kona, 19.0 minutes. Those living in the project site CT had a longer commute time of 24.3 minutes.

3 Policies and Plans Which Guide Change in the Study Area

This section identifies forces for change in the Study Area which are independent of the proposed project. This information extends the baseline information on the existing communities by exploring the type of change directed by public policy. The potential social impacts of the project can then be weighed against this "no-action" scenario. Section 3.1 discusses major County-wide public policies. Section 3.2 presents plans which guide the future of the project site, its environs and the Study Area.

3.1 County-Wide

3.1.1 State Population Projections

The State Department of Business, Economic Development, and Tourism, hereafter referred to as DBEDT, publishes long-range population and economic projections up to the year 2010. The M-K Series is the most recent series which offer County-level future scenarios based on historical and existing trends at the time of release.

While this series is valuable in indicating possible trends, long-term projections and forecasts need to be considered in their proper perspectives. Long-term forecasts are not intended to predict economic measures for a specific time frame, such as the population in a specific year, or to forecast prevalent business cycles. Rather, long term projections are valuable because they help us understand likely overall trends and patterns over a many years.

The most recent complete set of M-K projections for Hawai'i County was released in 1988 and these are presented in *Table 8*.

Table 8: Selected M-K Projections for Hawai'i County: 1990 to 2010 [a]

	Projections			Percent Change	
	1990	2000	2010	1990 to 2000	2000 to 2010
Resident population	124,600	160,400	206,100	29%	28%
Average visitor census	11,400	24,700	39,600	117%	60%
Civilian jobs	50,800	68,200	89,200	34%	32%

a. *The economic recession which occurred subsequent to these projections has slowed development activity and population growth, and DBEDT is currently revising the M-K series. New preliminary projections up to the year 2020 were tentatively made public in December 1995, but these have not been officially adopted. While these new figures do show that the 1988 M-K Series are overstated, the general patterns of Hawai'i County growth over the long haul should still hold true.*

Source: Hawai'i State Department of Business and Economic Development, 1988.

The M-K Series project that Hawai'i County's population could reach 160,400 by the end of the century, based on the normal pre-recession growth cycle. This translates to a net population increase of 29 percent between 1990 and 2000, spurring added demand for housing and services.

Hawai'i County's visitor industry was projected to grow so that the island will account for 16 percent of all statewide visitor units by as early as 2000. Based on this assumption, Hawai'i's average visitor census may reach 24,700 in 2000, which is a 117 percent increase over the 1990 level.

The 34 percent growth in civilian jobs from 50,800 in 1990 to 68,200 in 2000 is more modest than the visitor industry growth, but still reflects a fairly robust near-term economic future.

3.1.2 Hawai'i County General Plan

The backbone of Hawai'i County's planning efforts is its General Plan. First established in 1971, the General Plan provides the legal framework for all subdivision, zoning, and related ordinances on the Big Island, and for the initiation and authorization for all public improvements and projects.

The General Plan was last updated in 1989. The update clarifies island-wide development objectives, standards, and principles in terms of the types of land use most desired by the county. Population growth scenarios for 2005 range from two percent per annum to 4.7 percent per annum -- a range based on alternative economic and employment growth estimates.

For North Kona, the General Plan advocates further development of diversified agriculture and aquaculture, protection of the Kona coffee belt, and the continued support of the University of Hawai'i's Ocean Thermal Energy Conversion project. The county hopes to promote the establishment of a small resident college, as well as expand existing public school facilities. The Plan encourages new industries throughout North Kona, but particularly in the area surrounding the airport. Strip resort development is discouraged along Alii Drive. The Kaloko Town Center project site is designated for Urban Expansion on the Hawai'i County General Plan map for North Kona.

The Plan envisions increased agriculture while limiting urbanization in the distinctly rural South Kona region. Only low-key, centralized industrial development is planned there. Similarly, the General Plan calls for small family-operated resort facilities in South Kona.

3.1.3 State Land Use Boundary Review

In 1992, OSP conducted a statewide policy-oriented examination of land use district classifications. The Five-Year Boundary Review allows the State Land Use Commission to review urbanization proposals in the context of a comprehensive planning horizon, rather than attempting to evaluate the merits of isolated cases.

As part of the review process, OSP comprehensively analyzed urban areas. It gauged the sufficiency of urban-zoned lands and the ability of those lands to deal with expected population and economic growth. *Table 9* presents the Boundary Review's population projections derived from the earlier discussed M-K projections.

Table 9: Five-Year Boundary Review Population Projections [a]

	1990	2000	2010
Hawai'i County	120,300	160,400	206,100
North Kona	22,300	35,700	52,600
South Kona	7,700	9,100	10,700

a. *Figures are rounded to the nearest hundred.*

Source: Office of State Planning, 1992.

North and South Kona's combined population growth is estimated at 49 percent between 1990 and 2000, and 41 percent between 2000 and 2010. These figures tend to be somewhat high due to being based on the optimistic 1988 M-K Series. Nevertheless, it is clear that the state expects strong population pressures on the Kona region over the next two decades.

The Boundary Review's projections, taken with the present supply of urbanized lands and remaining vacant developable lands, suggest that a further 6,478 acres islandwide are required by 2010 to meet demand. Within Kona specifically, the Boundary Review estimates an additional 3,155 acres above the current urban-zoned acreage to meet demand; this is about half of the total county demand.

As part of the Keahole to Kailua Urban area, the Kaloko Town Center project site was recommended for redesignation from Conservation to Urban. [2]

2. *Office of State Planning, 1992.*

3.2 Regional Plans

3.2.1 West Hawai'i Regional Plan

The Office of State Planning, hereafter referred to as OSP, produced the West Hawai'i Regional Plan in 1989. The plan covered the judicial districts of North Kohala, South Kohala, and North Kona, and, to a lesser extent, portions of South Kona and Hamakua. The plan was intended to coordinate state activities in the region, coordinate capital improvements, address state concerns, and provide guidance in state land-use decisions.

The plan identifies critical current and anticipated needs in the region, and examines viable methods of addressing such needs. Specific strategies outlined in the Regional Plan with social implications for Kona include:

1. **Resort Destination Nodes.** Resort additions and expansions are expected to be the main catalyst for change in West Hawai'i due to the region's heavy dependence on the visitor industry. In order to sensibly manage future growth, OSP developed the concept of "Resort Destination Nodes," which are planned clusters of resort and resort-related activities. The Kaloko Town Center project site is located in the substantial Keahole-Keauhou Node. As the principal resort destination node in West Hawai'i, this area is projected to total 5,370 visitor units upon buildout.

2. **Support Communities.** The plan describes a "Support Community" as a large new residential community that will house regional employees, as well offer essential support services. A "Secondary Support Community" is an existing area that is predominantly rural, but can serve as a bedroom community for the region's workforce. The project site is in proximity of Kealakehe, a designated support community.

3. **Subregional Planning Areas.** A "Subregional Planning Area" is an existing urban region that will support resort, residential, industrial, and agricultural development through a variety of land uses. The project site is in the Keahole to Kailua area, which is the subregional planning area slated to absorb the continued growth that centers on

Kailua-Kona town. This area already provides a mix of uses such as housing in Kealakehe and light industry in Kaloko. In-fill of its undeveloped acreage should adequately accommodate regional growth.[3]

3.2.2 Northwest Hawai'i Open Space and Community Development Plan

The County's 1992 Northwest Hawai'i Open Space and Community Development Plan aims to strike a balance between protection of valuable open space and natural resources and well-planned economic growth. The plan concentrates on North and South Kohala, but also discusses the northern portion of North Kona.

Devised in the context of the West Hawai'i Regional Plan, the Northwest Hawai'i Open Space Plan views development in terms of resort nodes and support communities. The North Kona coastline is identified as an area of future resort expansion, and the Plan anticipates the creation of a Kukio/Kaupulehu/Kona Village Resort Node as one of three nodes in Northwest Hawai'i. The plan recommends that the nodes be separated by coastal parklands and open space so as to avoid urban sprawl. Keahole to Kailua is the principal regional support community, and Waikoloa would serve as an important support community for North Kona as well.

3.2.3 Keahole to Kailua Development Plan

Hawai'i County published a 1990 development plan for the urbanized region stretching from Keahole to Kailua-Kona. Often referred to as the "K to K Plan", this study remains the most recent document regarding County policy for the heart of North Kona. Serving as an implementation tool in this region for the County General Plan, the basic goal of the K to K Plan over the next 20 years is "to develop a mixed residential, commercial, resort, industrial and recreational community, with approximately 8,000 or more residential units, in a functional, attractive, and financially viable manner." [4]

3. *Office of State Planning, 1989.*
4. *R.M. Towill Corporation, 1990.*

The Plan organizes projected land use of approximately 13,350 acres into three broad development zones:

1. **The Coastal Zone.** Generally makai of Queen Ka'ahumanu Highway, this is the region's largest zone of development, with 6,225 acres slated for commerce, industry, resort, recreation and open space, waterfront parks, a sewage treatment plant, a civic center, a harbor complex, a national cultural park, ocean research, and airport expansion.

2. **The Lowland Urban Zone.** This zone is generally a half to one mile band mauka of Queen Ka'ahumanu Highway. This is the smallest zone, with only 2,600 acres planned for development. Important components of this zone include a portion of Kealakehe Planned Community, a municipal golf course, recreation and open space, limited industry, and urban expansion. The proposed Kaloko Town Center is designated for urban expansion in this zone.

3. **The Upland Residential Zone.** Encompassing 4,525 acres from about elevation 600 feet to the Mamalahoa Highway, this zone includes the balance of Kealakehe Planned Community, other residential and park areas, schools, a private golf course, a university and university-related housing, and the Lands of Ka'u residential project.

The plan also calls for a new Government and Business Center. Since civic and commercial uses already concentrate in the area mauka of Queen Ka'ahumanu Highway, the plan proposes that a new regional center should be located in Kealakehe. Such a facility would house important civic and business functions with ample room for expansion while allowing relative convenience to nearby urban areas.

Traffic flow is of great concern to Kona residents so the Plan proposes several improvements to upgrade the major thoroughfares. Eventually, five major north-south roads (running parallel to the shoreline) and four major east-west roads (running mauka-makai) will accommodate Kona's traffic needs. The existing Queen Ka'ahumanu Highway will be augmented by an additional lane in both directions, making it a four-lane highway. Another north-south road to bypass Queen Ka'ahumanu Highway will be constructed sometime beyond 2010. In addition, three new north-south collector roads will be built. The three east-west roads will include a new alignment for Palani Highway, and two new roads to traverse the Kealakehe and Kaloko regions. Since the plan's 1990 publication, Hina Lani Drive, one of these traverse roads, has been constructed; it is adjacent to the project site's southern boundary.

The K to K Plan also hopes to help maintain the region's physical beauty by buffering major roadways and urban facilities. Greenbelts of up to 300 feet would buffer either side of Queen Ka'ahumanu Highway and other arterial roads. New residential projects in the uplands will be required to adhere to aesthetic standards that will mitigate any potential negative visual impact. All new housing developments will also be required to provide extensive walking/jogging/bicycling pathways and significant stormwater drainage.

4 Preliminary Community Issues

Community issues are people's reactions to the proposed actions. Issues are opinions and they change over time, as people's priorities and values change. Also, in some cases, the proposed action changes in response to issues raised by the community and public officials.

This section presents preliminary issues related to the Kaloko Town Center as of June 1996. As the project progresses through the land use approval system, some issues may be no longer be considered important, while others may arise.

Section 4.1 provides the background and methodology for the issues analysis. Section 4.2 presents interview findings regarding the existing community, and Section 4.3 discusses reactions to the Kaloko Town Center.

4.1 Background and Methodology

4.1.1 Description of Issues Analysis

Issues analysis is designed to identify and analyze community concerns about a proposed action. To ensure that the project is reviewed in an overall social context in which the project is proposed, feelings and concerns about the existing community need to be considered as well. Also, trends are part of the overall social context. For example, it is helpful to understand if a project is unique in terms of its issues, or if reactions are consistent with previous proposals or other development projects.

Issues analysis differs from statistical surveys, the latter of which are designed to focus on frequency of reactions. Polls are valuable because they tell us about the opinions of the majority or the minority. The survey instrument is typically not conducive to dialogue, however, and the personalized reasons for these opinions are often not evident in the responses. In contrast, the only time we make reference to the quantity of opinion in issues analysis is where there is significant difference of number, such as "almost all respondents" or "only two respondents."

4.1.2 Source of Information

Our primary source of information for this analysis were interviews held with various people in the community. Three interviewers conducted interviews. The discussions were informal, and most were held in person.

Interviewees were informed that their individual conversations are confidential, and that their comments would be collectively analyzed.[5] Those interviewed were asked to share information and opinions as individuals. They were not asked to represent or take positions for their organizations, although their affiliations provide the reader with an indication of the person's interests and perspectives.

To achieve a cross section of interests, four groups were targeted in these interviews. Interviews with each group started with a different focus, followed by project-related questions. The four groups and a description of the interviews are as follows: [6]

- **Mauka residents**

  The Kaloko Town Center project is relatively far from residential neighborhoods. There are no residences makai of the Queen Ka'ahumanu, and the only residential communities are those mauka near the Mamalahoa Highway. Our study interviewed six people from the nearest four communities. Three live in Kona Heavens, which is mauka of the project site, and the others reside in Kona Palisades and Kona Acres mauka of the airport, and on Palani Road mauka of Kailua Town.

  These interviewees were asked to share their ideas about the strengths and problems of their communities, as well as what they expect or want to see in the future. They were then asked to discuss what they believed were possible positive and negative char-

5. *While interviewees' opinions and subjective comments were kept confidential, information which could be substantively used in the impact analysis was attributed to the person.*
6. *Some people belonged to more than one category.*

acteristics of the proposed Kaloko Town Center, and to share recommendations, if any.

- **Nearby Users**

  The different types of users in the vicinity include people involved in the Kaloko Industrial Park, landowners and developers, and people involved with the Kaloko-Honokohau National Historic Park. Nine people were interviewed in this category.

  Interviewees in this group were asked to provide information about their properties, and to share plans for the future. They were then asked if they felt that the Kaloko Town Center will affect their efforts.

- **Community and Cultural Organizations**

  Twenty interviewees were contacted because of their active involvement with regional or islandwide organizations. Such organizations included the Kona Conservation Group, the Kona Hawaiian Civic Club, Greater Kona Community Council, Protect Kohanaiki 'Ohana, the Kona-Kohala Chamber of Commerce, Plan to Protect, and so on.

  These people were asked to discuss the existing community in terms of its strengths and problems, as well as their ideas for the future of their community. They were then asked to share their views and recommendations about the project.

- **Social Service and Public Officials**

  People involved in social service agencies and public service were also interviewed. We contacted 14 individuals working in youth and family organizations, the police and fire departments, in recreation, and in the medical profession.

  These interviewees were asked to provide information about their agency or department, as well as plans for the future. They were then asked to comment on whether the Kaloko Town Center will affect their delivery of service.

We interviewed 45 people, and the list of interviewees is contained in *Table 10.*

Table 10: People Interviewed for This Study[a]

Name	Affiliation
Ron Aronson	Senior Vice President at Clark Realty Corporation
Joseph Augustine	Realtor who works with properties in Kaloko Industrial Park
George Bennett	President of Kona Heavens Community Association *(mauka residential community)*
Douglas Blake	President of the Kona Conservation Group Board member of the Conservation Council for Hawai'i Member of Sierra Club
Ron Borkowski	Recreation Director for the County of Hawai'i Department of Parks and Recreation, West Hawai'i
Leimana Demate	President of Kona Hawaiian Civic Club
Wanda Dettling	Past president of the Greater Kona Community Council Resident of mauka community
Karen Eoff	Director of Protect Kohanaiki 'Ohana Member of Ka Pa'akai O Ka 'Aina (umbrella organization comprising Kona Hawaiian Civic Club, Ka Lahui and Protect Kohanaiki 'Ohana)
Glennon Gingo	Executive Director of the Kona YMCA
James Greenwell	President of Lanihau Partners *(landowner of nearby parcel)*

Table 10: People Interviewed for This Study[a] *(Continued)*

Name	Affiliation
Roger Harris	Director of Planning for the Hualalai Development Company Member of Kona - Kohala Chamber of Commerce Member of Waimea Community Association Member of Hawai'i Leeward Planning Conference
Marni Herkes	President and Executive Director of the Kona - Kohala Chamber of Commerce Member of the Rotary Club of Kona Member of the Kona Outdoor Circle Member of the Kona Historical Society Member of Destination Kona Coast
Mary Beth Hilburn	Vice Principal of Kealakehe Elementary School Member of the Kona Outdoor Circle
Frank Jahrling	Trust officer at First Hawaiian Bank who handles trust account for the Queen Liliuokalani Trust *(landowner of nearby parcel)*
Richard Jones	Administrator of Child and Family Service, West Hawai'i Office
Keith Kato	Project Manager for Nansay, Inc., projects in Kona *(nearby developer)*
Francis Kaulilani	Superintendent of Kaloko-Honokohau National Historical Park
Colleen Lasham	President of Kona Acres Property Owners Association *(mauka residential community)* Former Chair of the Membership Committee of the Kona Outdoor Circle
Jim Lightner	Chair of the Kona Traffic Safety Committee *(advisory group to Hawai'i County Council)* Member of the Kona - Kohala Chamber of Commerce Member of Rotary Club of Kona Resident of Kona Heavens Community Association *(nearby residential community)*

Table 10: People Interviewed for This Study[a] *(Continued)*

Name	Affiliation
Peter L'Orange	President of Hawai'i Leeward Planning Conference Director and Chief Operating Officer of the West Hawai'i Housing Foundation Board member of Kona - Kohala Chamber of Commerce Member of Kona Soil and Water Conservation District
Mike Matsukawa	Trustee of Hawai'i Conference Foundation Director of the Kona Homeless Task Force Former president of the Kona Adult Center
Burke Matsuyama	Owner of Matsuyama Store A principal in Kamaaina 8 (adjacent landowner)
Nancy Matsukawa	Vice Principal of Kealakehe Intermediate School
Mike McElroy	Project Manager at State Housing Finance and Development Corporation for the Villages of La'I'Opua at Kealakehe *(nearby planned development)*
Clarence Mills	Deputy District Superintendent with the State Department of Education Hawai'i District Office West Hawai'i Annex Vice Chair of the State Housing Finance and Development Corporation
Greg Ogin	Chair of the Kona Family YMCA Chair of the Kona Village Task Force Past President of the Rotary Club of Kona Past President of the Children's Advocacy Center
Claude Onizuka	President of Onizuka Memorial Committee President of Kona Junior Golf Association Member of Keopu Citizens Club Member of Boy Scouts Aloha Council
David Patton	Administrator and Chief Executive Officer of the Kona Community Hospital

Table 10: People Interviewed for This Study[a] *(Continued)*

Name	Affiliation
Dawn Perry	Secretary of Kona Heavens Community Association *(mauka residential community)*
Nancy Pisicchio	President of Plan to Protect Member of Kona Farm Bureau Member of Thousand Friends Member of Protect Kohanaiki ʻOhana
Bonnie Rice	President of the Kona Outdoor Circle Board Member of Hawaiʻi United Way Board Member of West Hawaiʻi Fund
Confessor Rivera	Past President of Farmers Lokahi Alliance Former President of Mil-Ka-Ko *(non-profit organization that used federal grants to develop farming and fishing cooperatives in the rural areas of Miloliʻi, Kaʻu, Kona)*
Jesse Rosenbloom	Division Section Administrator for the State Department of Human Services Family and Adult Services, West Hawaiʻi
Jerry Rothstein	Public Access Shoreline Hawaiʻi (PASH) Member of the Sierra Club
Mauna Roy	President of Na Kokua Kaloko-Honokohau, Inc. *(non-profit organization established to support the nearby Kaloko-Honokahau National Historic Park)*
Norman Sakata	President of the Kona Coffee Cultural Festival Former District Governor of the Lions Club Active on Boy Scouts of America Member of the Ellison Onizuka Memorial Committee Member of the Kona Historical Society
Richard Schenkel	General Manager and member of the Architectural Committee for the Kona Palisades Estates Community Association *(mauka residential community)*
Hannah Kihalani Springer	Kamaʻaina Kaʻupulehu Member of Kona Hawaiian Civic Club

Table 10: People Interviewed for This Study[a] (Continued)

Name	Affiliation
Captain Vince Tolentino	Station Commander of the Kailua-Kona Station, Hawai'i Fire Department
Mark Van Pernis	Member of 1990 Re-Districting Advisory Committee Vice Chair of Hawai'i County Democratic Party Board member of the West Hawai'i Red Cross
Captain John Vares III	Field operations for Area II, Kona Patrol, Kona District Hawai'i Police Department
C. J. Villa	Conservation Chair of the West Hawai'i Sierra Club Vice President of Plan to Protect
Royden Yamasato	West Hawai'i Planning Coordinator for the County of Hawai'i Planning Department
Charles Young	Po'o for South Kona, Ka Lahui Hawai'i
Jon Znamierowski	Acting Principal of the Kealakehe Intermediate School

a. *Note that those interviewed were asked to provide their views and opinions about the project as individuals. They were not asked to take a position on the project.*

4.2 Feelings About the Existing Community

Those interviewed were asked to identify strengths and problems in their community.

Almost all of those interviewed felt that the people, or the human element, in their community was a major strength. They described a strong sense of community in two ways. First, it was felt that there is often a cooperative spirit among the different interests in North and South Kona. Interviewees reported that people are willing to participate in good faith efforts, that there is often a "sincerity of spirit." They said that coalitions between different groups are often formed for a common good. Examples include umbrella organizations for Hawaiian organizations, coalitions between environmental and Hawaiian groups, and developer - community cultural efforts.

The second aspect of the sense of community is the willingness to take action. Interviewees felt that Kona residents are willing to take a stand on issues, and to actively work towards a goal. It was also pointed out that Kona residents have a tradition of independence. Because of historic land ownership patterns and economic necessities, long term residents and newcomers share independent roots.

While considered a major strength, the social aspects of the community are also a problem. Social and economic diversity brings strengths because the community has a depth and wealth of knowledge, expertise, skills, ideas and energy. This diversity also is problematic, particularly when the different groups work against each other. At times, the community is characterized by its fractured aspects. Long-time residents feel that newcomers do not appreciate the host culture, that recent residents have a "gangplank" mentality,[7] and that there is a lack of long-term commitment. Newcomers feel that long-time residents do not welcome recent residents, and that they are too quick to accept changes in the name of jobs and economic development.

In spite of changes and newcomers, those interviewed felt that another community strength is the continuing sense of a rural lifestyle. There is still a strong orientation to the ocean and agriculture. The natural physical resources of the ocean, the shore and the land still dominate the sense of place. Further, it was pointed out that there is still a very strong presence of the host kanaka maoli culture in tangible (facilities, sites) and intangible (cultural activities) forms. The regional climate is also a big plus.

In terms of community problems, frequently cited was the extent and effectiveness of comprehensive planning. Interviewees pointed out that public plans promote extensive development and growth, but do not include realistic provisions for providing adequate infrastructure and public services

---

7. Characterized as once a newcomer is settled in the area, he or she then tries to keep other newcomers out.

and facilities. It was pointed out that major decisions are made without an objective cost-benefit analysis so that the public does not really understand the costs of development.

Interviewees, particularly long-time residents, felt that the government funds and priorities are unfairly allocated. They said that Hilo residents traditionally get capital improvements, even though the Kona economy is more productive. They further suspected that this disparity is due to Kona's independence in terms of political parties and affiliations.

Those interviewed also felt that government decision-makers are readily inconsistent with plans once adopted, the results of which are spot or piecemeal zoning and variances. Further, they were concerned that the public input process in land use decisions is ineffective. They said that government officials do not really listen to public input, and that this "arrogance" leads to contested cases and lawsuits. It was noted that cultural impact studies would be able to point out impacts on traditional kanaka maoli *practices and could* have alleviated the need for current land use related lawsuits.

Related to the planning problem is the inadequacy of several components of public services and facilities. Traffic continues to worsen because roadway improvements are too slow in implementation, and utilities are not being provided in a timely manner. Interviewees noted that the level of police staffing has not improved, even though there has been a big increase in residents. They further pointed out that hospital facilities are not keeping pace with growth.

Concerns about school facilities were raised and those interviewed pointed out several problems with the existing facilities. They said that schools were very overcrowded, that there is insufficient space for the needed portable classrooms, that classes were being held in inappropriate places, and that teachers do not have adequate spaces for their non-classroom activities. It was felt that the overcrowding is stressful, and this leads to behavioral problems and crime.

Those involved in providing social services warned that population growth, coupled with funding cuts, will become increasingly inadequate at a time when these services are need the most. It was pointed out that as much as 20 percent of any given population will be dysfunctional, and yet the State has no additional funds for increased services and more staff. Interviewees said that any new project will further stretch too limited resources.

Interviewees were concerned that there are inadequate areas and facilities for recreation both in schools and in the larger community. This leaves young people and families with little to do, and can contribute to youth-related crime and family stress.

Economic problems were cited. Those interviewed felt that there is an oversupply of wholesale and large retail establishments, that the combination of Costo, Wal-Mart and K-Mart is unnecessary in Kona. It was feared that this oversupply puts the existing retailers and small businesses at an unfair disadvantage.

Interviewees also were concerned about the weak economy. They said that family life is increasingly stressed as parents work hard and long to make ends meet. The high cost of housing, the lack of affordable housing, and high cost of land also contributed to the economic situation.

Those interviewed were hopeful that the future will bring a diversified and stronger economic base, more responsible planning, slowed growth and more responsive government.

Interviewees wanted to see an economic base which includes educational facilities, and they mentioned a State college near the airport and a merging of the University of Hawai'i Marine Science Department and the Natural Energy Lab of Hawai'i. They discussed the prospect of health-related facilities, and high technology operations.

There was mixed reaction towards future growth, ranging from wanting to see tourism expanded to capitalize on the international market, to hoping that there is a moratorium on new projects until the already-approved projects are built or "removed from the books." Two people wanted to see the area expand the market for retirees as a way to bring in income without over-stressing public services.

In terms of planning, interviewees hoped that government officials will be more responsive to the communities they serve; this would minimize lawsuits. Further, they wanted to see more emphasis on public facility improvements and infrastructure upgrades, as well as objective cost-benefit analysis in land use decision-making. They also hoped that cultural impact studies would be a standard element in EISs, and some were actively lobbying the State Legislature to pass related legislation.

4.3 Reactions to the Kaloko Town Center

Information on the proposed Kaloko Town Center was provided based on the environmental assessment prepared by Kimura International. Interviewees were then asked what they felt were positive characteristics and potential problems. Their recommendations were also solicited.

In general, the Kaloko Town Center did not elicit comments that were specific to the site nor were the project components considered unique or different. Those interviewed did not have strong feelings about the project itself, but rather reacted to the project as part of regional development and change. The following summarizes reactions to the project:

1. **The location of Kaloko Town Center was considered consistent with expected growth.**

   Interviewees acknowledged that the project site is in an area slated for growth. They mentioned the K to K Plan, and generally expected that growth will occur between Kealakehe and the airport. Those interviewed felt that the project is consistent with public plans.

2. **The project's timing was a key factor in interviewees' opinions.**

   While the interviewees did not have strong feelings about the project, they did express concern about the timing of Kaloko Town Center. They pointed out that there are several land use changes which have already received approval, but have yet to be built. Further, they reiterated that infrastructure is inadequate, and that schools are not being built quickly enough to meet the demand of the growing population. Given these feelings about planning, infrastructure and public facility problems, the Kaloko Town Center was seen as a reasonable, but premature, effort.

Further, those who want to see cultural impact studies in EISs noted that the legislation was still pending at the time of the interviews, and they wanted to the EIS processing to wait until the bill was passed so that the document would need such a study. [8]

3. **The overall Kaloko Town Center was seen as having mixed effects on neighboring users and developments.**

Those interviewed expressed a range of reactions regarding the effect of the proposed project on nearby residents and uses. Nearby landowners and developers felt that the project would have either a positive effect, or no impact at all, on their own development.

Mauka residents expressed concern about the precedence of having multi-family units mauka of Queen Ka'ahumanu, particularly in an area which has mostly single-family units. They felt that this type of housing, as well as increased traffic, may eventually negatively affect property values.

Makai users felt that the installation of a sewer system which would then hook into the municipal system is a positive move. They believed that this would address environmental problems along the shore and in the ocean due to the existing cesspool system. Concern was raised about the compatibility of the project with the long term future of Kaloko-Honokohau National Park and the Kohanaiki shoreline.

8. *In response to the interviewees' comments, the EIS preparer expanded the project archaeologist's scope of work to include a cultural impact study.*

4. **The proposed park and school site elicited conditionally positive comments.**

   Interviewees appreciated the park and school site because they felt that this was a responsible move, particularly in light of existing problems with existing facilities. They did not want to see a repeat of current problems related to untimely implementation and inadequate staffing, and strongly suggested that the developer take the initiative to build the school and maintain the park.

5. **Housing component seen as possible solution and potential drawback.**

   Those interviewed cited examples where houses were purchased by off-island and out-of-district residents, but were out of reach for area residents. They wanted to make sure that the Kaloko Town Center offered homes would be affordable to local residents, and hoped that the small lots and multi-family units would enable affordability.

   On the other hand, they were also concerned that the multi-family units would be inappropriate for this area. They preferred single family houses instead, since that would reduce the density and be consistent with the mauka communities. Interviewees pointed out that realtors are having difficulty in selling existing multi-family units.

   The location of the housing was also seen as a potential problem. Those interviewed cited the warm, dry weather at the project site, and feared that residents would be uncomfortable. They suspected that many would require air conditioning systems which would then increase the demand for electricity, which is already in short supply.

6. **The feasibility of the commercial component is questioned.**

   Those who felt that there is an oversupply of commercial establishments in the area questioned the feasibility of Kaloko Town Center's commercial component. They pointed out that the three major outlets, plus other existing commercial establishments, are more than adequate to meet the retail needs of the population. It was further noted that realtors are have difficulty leasing industrial property near Costco, which is just south of the project site.

Recommendations offered by those interviewed are summarized as follows:

- Be culturally sensitive. Make sure you understand the cultural significance of the site.
- Do a cultural impact study.
- Build truly affordable housing. That would benefit the community.
- Build less units to decrease density.
- Build less or no multi-family units.
- Be environmentally sensitive. Use reflective, non-glare building materials.
- Maintain the park through the homeowners' association. Do not dedicate it to the County.
- Help the larger community by opening up the park. Build a teen center and a community center.
- Do as much as you can to facilitate the operation of the school. Build the school.
- Make sure the community is well-landscaped with native vegetation. The area is dry and the landscaping will need to be constantly maintained.
- Put in bike/walking/skating/running paths.
- Make sure you meet all of your infrastructure and utility needs.
- Connect the project to the municipal sewer system.

- Make sure nearby uses have to connect to the municipal sewer system.
- The additional ingress/egress to Queen Ka'ahumanu Highway is too close to Hina Lani Drive.
- Put in a cloverleaf intersection at Hina Lani and skip the new road.
- Signalize Hina Lani Drive.
- Build the commercial area cautiously. The market is already inundated.
- Make sure the commercial uses have enough parking.
- Put in more light industrial areas.
- Put all utilities underground.
- Wait.
- Don't build until most of the approved projects are completed.

5 Potential Social Impacts

This section presents social impacts which may occur in the Study Area resulting from the Kaloko Town Center. Residential population impacts are identified in Section 5.1. Implications for regional development are discussed in Section 5.2, and this is followed by a discussion of project's effects on neighboring uses in Section 5.3. Section 5.4 presents project impacts on public services.

5.1 Resident Population

The Kaloko Town Center will impact the population of the area by adding 850 residential units to the area, thereby increasing the number of residents. Of the total units, 43 percent are single family units, and 57 percent are multi-family homes.

It is estimated that the proposed project will house between 2,240 and 2,300 residents. The low end of the range is based on a household size of 2.63 persons, the average household size of Census Tract 215.98 which includes mostly Keauhou. This census tract was selected because it has a similar proportion of single to multi-family housing units as the proposed project. The high end is based on the average household size of 2.75 persons in the North Kona district.

The additional population implies about a ten percent increase over the 1990 North Kona population of 22,284, and would account for about six percent of the projected 2000 population in North Kona of 35,700. In the project site CT, Kaloko Town Center would increase the 1990 population of 2,944 by 78 percent.

5.2 Relationship with Regional Development

Public policy call for substantial regional development in the North Kona Study Area. As discussed in Section 3, the Hawai'i County General Plan encourages growth in North Kona, and the State's Five-Year Boundary

Review recommends that over 3,100 in Kona acres be re-designated into Urban lands to accommodate anticipated growth.

In the vicinity of the Kaloko Town Center, the area is planned for substantial resort and residential growth. Strategies for this growth are spelled out in both the West Hawai'i Regional Plan and the K to K Plan.

Carrying out these plans, several projects have been planned for this vicinity as follows:

- **Hualalai**

  Located makai of the Queen Ka'ahumanu Highway and northwest of Kaloko Town Center, the Hualalai project encompasses 625 acres along the coast. The project includes a 243-room Four Seasons Hotel and a private 18-hole golf course. At full build-out, which is expected to take 15 to 20 years, Hualalai will also contain another golf course and a mix of single family lots, townhouses and villas. The hotel is scheduled to open in the fourth quarter of 1996, and the golf course is operational. Zoning is already in place for 1,000 residences, but the actual number depends on market conditions. [9]

- **Kohanaiki**

  Located makai and west of Kaloko Town Center, this project covers 470 acres. Developer Nansay, Inc., proposes to develop an integrated resort, including two resort hotels with approximately 700 rooms, an 18-hole golf course and recreational clubhouse complex, a 150-slip marina, 200 single-family house lots, and 150 multi-family units. The project received its major permits, but has been delayed. The Protect Kohanaiki 'Ohana has legally challenged the Hawai'i County Planning Commission and the developer because of the Commission's denial of their request to intervene. The Third Circuit Court found that the Commission should have allowed the intervention, and in August 1995 the Hawai'i Supreme Court issued a deci-

9. *Personal communication with Roger Harris, Director of Planning with the Hualalai Development Company, January 25, 1996.*

sion that the Commission needs to hold an evidentiary hearing. Nansay is appealing this decision. [10]

- **Keahuolu Lands of Kailua-Kona**

  Southeast of Kaloko Town Center, this project is situated on 762 acres near the intersection of Palani Road and the Queen Ka'ahumanu Highway. Approximately 550 acres are located mauka of the highway, and the other 212 are makai. Phase 1 of the development project includes 314 acres at the corner of Palani Road and Queen Ka'ahumanu Highway; K-Mart is located there. Phase 2 encompasses 340 acres which is located towards the airport mauka of the highway. Phase 3 is the makai property. Currently, less than 50 acres are properly zoned, and the remaining property is in various stages of approval by State and County agencies. [11]

- **The Villages of La'i'opua**

  Located near the Keahuolu project, the Villages of La'i'opua covers 822 acres and is being developed by the State Housing and Finance and Development Corporation. The project's 4,082 units are intended to provide a range of housing opportunities, and is to include 2,560 units for homeownership, and 1,522 rental units. Also included are an elementary school, a regional high school, two commercial areas, parks, churches/day care, a community golf course, and archaeological and botanical preserves. It is scheduled for implementation over a 20-year period. As of December 1995, two phases of infrastructure development were completed and about 225 acres have major roads and utilities. The first increment of housing is scheduled for completion in 1998. [12]

---

10. Based on personal communication with Keith Kato, Project Manager for Nansay, Inc. on January 19, 1996; Helber, Hastert, Van Horn & Kimura, 1986; and a fact sheet produced by Protect Kohanaiki 'Ohana.

11. Personal communication with Frank Jahrling, First Hawaiian Bank Trust Officer for the Queen Liliuokalani Trust on February 12, 1996.

- **Kamaaina 8**

  This narrow strip of 70 acres is located adjacent to the northern boundary of Kaloko Town Center. Plans for the site include a roadway along the site's northern edge, with nine acres near the highway to be used for commercial use. The balance is planned for light industrial uses. The developed land will be sold in fee, and the project is scheduled to commence in two years. [13]

The Kaloko Town Center is consistent with public plans which direct the future of the region and will be compatible with changes already planned for the area. The project site is designated for Urban Expansion on the Hawai'i County General Plan, and is recommended for redesignation from Conservation to Urban in the OSP Five-Year Boundary Review. It is located in the Keahole-Keauhou Resort Destination Node, which is planned for major change and near the Kealakehe support community in the West Hawai'i Regional Plan. Further, in the K to K plan, the Kaloko Town Center project site is recommended for urban expansion in the Lowland Urban Zone.

The project is also likely to complement other projects proposed in this vicinity. It will provide housing for people who will work in these other projects, as well as expand the housing market by adding more multi-family and small single-family units to the regional supply.

5.3 Relationship with Neighboring Uses

5.3.1 Industrial

Located immediately south of the project site, the Kaloko Industrial Park was built around 14 years ago, and originated as 55 one-acre lots sold in fee. Each lot sold for approximately $550,000.

12. Based on personal communication with Mike McElroy, Project Manager with the Housing Finance and Development Corporation (HFDC) on February 1, 1996 and a fact sheet produced by HFDC dated 29 December 1995.

13. Personal communication with Burke Matsuyama, a principal in Kamaaina 8 on February 1, 1996.

Today, many lots have several tenants and it is difficult to estimate the number of businesses located in this park.[14] Recent business activity has been lukewarm and there are now several vacant lots.

The biggest recent addition is Costco, which opened about two years ago, just mauka of the original industrial park. Lots north and east of Costco are on the market, but, as of this writing, no lots have been sold.[15]

The Kaloko Town Center is not expected to affect the industrial users. Further, the on-site residents on Hina Lani Drive should not be affected by the Kaloko Industrial Park. Light industrial uses are regulated to avoid the more noxious and offensive impacts sometimes associated with heavy industrial uses. Any impact from the industrial park can be mitigated by creating a landscape buffer or berm between the residential uses and Hina Lani Drive.

5.3.2 Residential

The Kona Heavens residential subdivision is located mauka of the project site and comprises 118 approximately one-acre lots. The community has a rural atmosphere in that sidewalks and other typical subdivision ingredients are absent. The homes are attractive and well-maintained.

The Kaloko Town Center may affect the mauka residents who have a view of the project site. The project would alter views by transforming a currently undisturbed landscape into an extension of the urban environment already created by the Kaloko Industrial Park. This impact is not unique to the project site since the region between Kealakehe and Keahole is planned for substantial growth. In time, much of this region will attain a more urbanized character.

To mitigate such impacts, the development should be attractively landscaped and well-maintained, and its structures need to be designed to be environmentally sensitive and compatible.

---

14. Attempts to identify an umbrella organization in the industrial park were unsuccessful.
15. Personal with Joseph W. Augustine, Augustine Realty, January 26, 1996.

5.3.3 The Kaloko-Honokohau National Historic Park

This park is located makai of the Queen Ka'ahumanu Highway, slightly southeast of the project site. It was authorized in 1978 by Public Law 95-625 to preserve the natural and cultural resources of the park. Nearly all of the land area in the park has been designated a national historic landmark; two endangered vertebrate species nest within the park.

The park includes lands in the ahupua'a of Kaloko and Honokohau located makai of the Queen Ka'ahumanu Highway, a coastal strip extending to the Wawahiwa'a Point in the ahupua'a of Kohanaiki, and two small parcels located in the ahupua'a of Kealakehe next to the Honokohau small boat harbor. The park also includes the waters of Honokohau Bay. The total park encompasses 1,161 acres. The Federal government owns 616 acres, and the State owns the remaining land. Most of the State land is submerged.

The proposed action in the 1994 general management plan includes a live-in cultural education complex near the Kaloko Fishpond, which is makai of the project site. A visitor orientation center, which includes an amphitheater, administration and a viewing deck, is proposed as a central feature about a mile south of the Hina Lani Drive - Queen Ka'ahumanu Highway intersection. Also included are a replica of a Hawaiian Village, restrooms and on-site maintenance housing.

The park is not yet fully operational. Some resource management has occurred, but there are no on-site facilities for park administration, maintenance, visitor use, sanitation or interpretation. No formal road access to the park off the Queen Ka'ahumanu Highway presently exists. Vehicular access to park lands is either via the entrance road to the harbor or via an unimproved service road to the Kaloko Fishpond.

In spite of the lack of facilities, visitors to the park have been steadily increasing. In 1988, the first year that visitation figures were kept, about 12,500 visits were recorded. In 1989, visitation increased to 17,000. By 1991, visitation reached 46,790. Nearly all of the 1991 increase is attributed to beach users of the Honokohau parcel acquired in late 1990. [16]

At the southern end of the park are several small waterfront dwellings. Until recently, the kanaka maoli residents maintained residency under the provisions of individual, non-transferable, special use permits granted by the National Park Service. The family refused to sign another five-year permit with the Park Service, citing restrictions which prohibit their cultural practices, and the National Park Service initiated eviction proceedings. The State Land Board Chair then initiated negotiations with the Park Service that resulted in a two-week suspension of eviction proceedings, and the parties on working on an agreement to allow the family to remain on the land. [17]

The Kaloko Town Center may have a beneficial impact on the park and its resources due to the installation of a sewer line and hookup to the municipal sewer system. Currently, the nearby industrial park is on cesspool, and this reportedly has potential negative impacts on the makai fishponds and the shoreline environment. The project developers propose to transmit the Kaloko Town Center sewage to the municipal sewer system at Kealakehe. In doing so, a sewer line will be installed along Queen Ka'ahumanu Highway. This line will be sized large enough so that other users along the highway can hook into the sewer system.

5.4 Social and Public Services

5.4.1 Police Protection

The Kona Police Station is located near the project site on Queen Ka'ahumanu Highway. Currently 53 police officers cover both North and South Kona districts. There are three watches in a 24-hour period, and 14 officers are assigned to a watch. Two officers staff a small substation in Captain Cook. Support staff for the Kona Station includes three full-time clerks.

Presently, the level of staffing at the Kona Station presents problems in covering the entire area, and servicing a rapidly growing community. The two Kona Districts encompass thousands of acres, and geographical chal-

16. U. S. Department of the Interior, National Park Service, 1994.
17. Neil, 1996.

lenges include mountainous topography, many dead-end roads and rough terrain. Further, the service population continues to increase, yet there has been no increase in officers since 1990. There has been a 50 percent increase in miscellaneous calls from 1994 to 1995, from 7,086 to 10,633. Serious crime reports is estimated at 27,000 in 1995.[18]

The proposed project will negatively impact the delivery of police services because it will increase the resident population. Further, the increased de facto population in the commercial areas will add to the service requirements related to crime and traffic.

These impacts can be mitigated in several ways. First, the project design elements could include measures to deter property crime, such as well-lit public thoroughfares and paths, high visibility for structural entrances, and secure carports. Second, the roadway and circulation system should be designed to minimize traffic congestion and unsafe driving conditions. Third, the developer could encourage the homeowners' association to initiate a community-based neighborhood watch program whereby residents monitor their community for suspicious activity. Fourth, the commercial areas could be monitored by on-site security who would handle minor offenses.

5.4.2 Fire Protection

The project site is served by the Kailua-Kona Fire Station, which covers a 30-mile radius extending from Kona Village Resort to Keauhou. There are three shifts a day, and each shift is staffed by 13 firefighters. Equipment includes an engine company, a ladder truck, a tanker, a rescue boat and an EMS ambulance.

Other fire stations include the Maunalani Station in South Kohala, which has a pumper, a tanker, an EMS chopper and an EMS ambulance; it is staffed by seven persons per shift. There are other County fire stations at Kainaliu and Waikoloa. Further, there is a volunteer-operated fire station is kept on the Belt Highway. The volunteers are only used as a back-up to

18. Personal communication with Captain John Vares III, Field Operation Area II, Kona Patrol, Hawai'i Police Department, January 26, 1996.

the Kailua-Kona station, and are not used in front-line emergencies. A small temporary station to house the fire truck is being constructed on Hualalai Ranch.

A new fire station is scheduled to be built near Keauhou in 1997. The County also wants to install another fire station between the airport and Kealakehe. Because of current funding shortages, there are insufficient funds for land acquisition, construction and equipment, and the County is seeking assistance in these areas. [19]

The project will increase the residential population and people activity on this site, and therefore increase the need for fire protection services in the area.

5.4.3 Medical Facilities

The project site is within the service area of the Kona Community Hospital located in Kealakekua. The hospital is administered by the State Department of Health and is staffed by 60 doctors and 325 employees. Its 75 beds include 53 for acute care and 22 for long-term care. Most surgery needs are met at the hospital, though some specialized cases are transferred to Honolulu. The Kona Community Hospital handles about 37,000 emergency visits and 650 births per year. Its occupancy rate ranges between 90 to 95 percent.

Planned improvements to the hospital include a new wing and a new administration buildings to be construction in the next two years. No new patient beds are planned.

The other Hawai'i County major hospital is Hilo Hospital. There are also small, primarily long-term care, hospitals in Ka'u, North Kohala and Honoka'a. All are administered by the State. The North Community Hospital in Waimea will be opening shortly, adding 25 beds to the islandwide supply. This private hospital received some State funding.

---

19. Personal communication with Captain Vince Tolentino, Station Commander of the Kailua-Kona Fire Station, January 25, 1996.

The project will impact the hospital system by increasing the population. This additional demand may be tempered and can be met, however, through a combination of more beds and health care management. Hill Haven, a nursing home in the area has 30 long-term care beds and plans to increase its supply by 30 more beds. This increase may allow the Kona Community Hospital to transfer its long-term care beds to acute care. Managed care practices will also reduce hospital occupancy as Hawai'i follows the industry's trend of increasing outpatient services and same-day surgery. [20]

5.4.4 Schools

The project site will be served by the Kealakehe Elementary, Kealakehe Intermediate and Kealakehe High Schools.

Kealakehe Elementary School opened in 1969, and its service area extends from Kona Heights to Holualoa Elementary School. The school's current enrollment is around 900 students. It is presently at full capacity with the use of 13 portable classrooms. The school needs more buildings and playground space. Meals are prepared at the adjacent intermediate school because its kitchen does not meet standards.

The service area of Kealakehe Intermediate School comprises the urban area of North Kona. The school is currently operating over capacity. All available rooms are used for instruction, including the cafeteria, storage rooms, teachers' rooms and the boys' locker room. Also, several non-PE courses are taught outdoor. The intermediate school's playing field is shared with the neighboring elementary school. Five classrooms are currently under construction, but they are not expected to fully accommodate the overcrowding.

---

20. Personal communication with David Patton, Administrator and Chief Executive Officer of the Kona Community Hospital, January 25, 1996.

Yet unbuilt, Kealakehe High School is scheduled for construction in 1997, and will relieve the Konawaena High School, which is currently the only high school in the area. The new school will serve students from Kona to Waikoloa, and Konawaena High will serve the southern part of West Hawai'i.

The project will negatively impact the schools because it will increase the demand for public educational facilities and services. It is estimated that the project will generate 213 students in kindergarten through grade five; 51 students in grades six through eight, and 85 students in grades nine through twelve.

The existing facilities cannot accommodate project students under present conditions. The Kaloko Town Center will help mitigate the situation by setting aside eight acres for a school. Further, the Kealakehe High School will be operational by the time the project is completed.

These measures will only alleviate a portion of the problem, however. State officials interviewed for this report indicate that actual construction of facilities is preferred.[21]

5.4.5 Recreation

The region's only full-service active recreation park is Kona Park, located at the old airport. Kona Park was developed 26 years ago, and its gym was built two years ago. The gym includes a full-sized basketball court, a small office, and a multi-purpose room. Its bleachers have a seating capacity of 1,350 persons. Other park facilities include five baseball fields, two soccer fields, two football fields and four tennis courts.

---

21. *Information compiled from personal communication with Clarence Mills, deputy District Superintendent with the State Department of Education; Mary Beth Hilburn, Vice Principal of Kealakehe Elementary School; Nancy Matsukawa, Vice Principal of Kealakehe Intermediate School; and Jon Znamierowki, Acting Principal of Kealakehe Intermediate School on various dates. Estimates were provided in memorandum dated December 26, 1995 from Gregory Pai, Director of Office of State Planning to Esther Ueda, Executive Officer of the Land Use Commission.*

The recreation staff includes on full-time cluster director and one part-time assistant. They are supported by a custodian and maintenance person.

There are four small parks in the Kona region located in Kona, Kailua, Kainaliu and Captain Cook. [22]

The project will impact existing facilities by increasing the residential population and demand for recreational facilities. This impact will be mitigated, by the on-site four-acre park proposed next to the proposed school site. The impact can be further mitigated by developer-initiated park improvements.

22. Personal communication with Ron Borkowski, Recreation Director with the County of Hawai'i Department of Parks and Recreation, West Hawai'i on January 26, 1996.

K

Native Hawaiian Cultural Impact Assessment on the Development of a 224.43 Acre Parcel within Portions of Kaloko and Kohanaiki Ahupua'a

Hammatt, Hallett H., PhD, David W. Shideler, MA and Cultural Surveys Hawaii, April 1996

Native Hawaiian Cultural Impact Assessment on the Development of a 224.43 Acre Parcel Within Portions of Kaloko and Kohanaiki Ahupua'a (TMK 7-3-09:17 and Portion of 2)

by

Hallett H. Hammatt Ph.D.
David W. Shideler M.A.
and
Cultural Surveys Hawai'i

Prepared for
KIMURA INTERNATIONAL

Cultural Surveys Hawai'i

April 1996

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

I. INTRODUCTION

A. Purpose

The Purpose of this Cultural Impact Statement is to give due consideration to the effects that the proposed development activity may have on the specific rights, culture, and traditions of native Hawaiians and to give due consideration to appropriate measures to ensure the protection thereof. This is meant to be an informational document disclosing the impacts on native Hawaiian culture of proposed development within this specific project area. While not presently required by law, a bill for an act (H.B. No. 3081) is before the state house of representatives which would mandate the analysis of the effects of development activity on the specific rights of native Hawaiians and their culture and traditions. This document is prepared for possible submission to any state agency that might require such a cultural impact statement as a condition for the issuing of a permit or other approval.

B. Legal Background

A brief review of some of the legal documents involved in the issue of native rights is presented below. The following discussion is not intended as, and should not be construed as, legal advice but rather is presented as an introduction to some of the complexities involved in the issues of native rights.

A number of matters of law are relevant to the issue of native rights, including: 1). Hawaii Revised Statutes (HRS) Chapter 7 "Miscellaneous Rights of the People", Section 7-1. "Building Materials,water, etc.; landlords' titles subject to tenant's use." 2). the State Constitution of Hawai'i, Article XII Section 7 "Traditional and Customary Rights", 3). the case of Kalipi v. Hawaiian Trust Company, et. al. (Civil Case No. 2808 in the Second

Circuit Court on Maui) filed on August 29, 1975 [Case Notes offer the following nomenclature: Kalipi v. Hawaiian Trust Co., 66 Haw. 1, 656 P. 2d 745 (1982)], 4). the case of Pele Defense Fund v Paty (1992) (hereafter PDF). and 5). the case of Public Access Shoreline Hawaii (hereafter PASH) v. Hawai'i County Planning Commission and Nansay Hawaii, Inc. [Supreme Court of Hawai'i, Cite as 79 Hawai"i 425 (1995)]

The Hawaii Revised Statutes explain the basis of the laws of our State (HRS Sec. 1-1):

> The common law of England, as ascertained by English and American decisions, is declared to be the common law of the State of Hawaii in all cases except as otherwise expressly fixed by Hawaiian judicial precedent, or established by Hawaiian usage. The present law (HRS 7-1) regarding "the rights of the people" to land access and gathering rights, is an example of law established by Hawaiian usage and reads as follows: "Where the landowners have obtained, or may hereafter obtain allodial titles to their lands, the people on each of their lands shall not be deprived of the right to take firewood, house-timber, *aho* cord, thatch or *ki* leaf, from the land on which they live, for their own private use, but they shall not have a right to take such articles to sell for profit. The people shall also have a right to drinking water, and running water, and the right of way. The springs of water, running water, and roads shall be free to all, on all lands granted in fee simple; provided that this shall not be applicable to wells and water-courses, which individuals have made for their own use."

This law reads today exactly the same as section 1477 of the Civil Code of the Hawaiian Islands of 1859.

The State Constitution, Article XIII Section 7. [Added in the Constitutional Convention of 1978 and the election of November 7, 1978] reads as follows:

> The State reaffirms and shall protect all rights customarily and traditionally exercised for subsistence, cultural, and religious purposes and possessed by *ahupua'a* tenants who are descendants of native Hawaiians who inhabited the Hawaiian islands prior to 1778, subject to the Right of the State to regulate such rights.

A recent case that would seem to have set some precedent in this matter of native gathering rights was filed by the plaintiff Kalipi seeking injunctive and declaratory relief in that the defendants (Hawaiian Trust Co.) had prevented him from "exercising his rights to gather products for his private use from the upper reaches of the *ahupua'a* in violation of HRS Sec. 7-1 and in violation of ancient Hawaiian custom and usage" (quoted in Baxa, 1976:17). The defendants advanced among other defenses, 1). "the claims asserted in the complaint are barred by the statute of limitations", 2). that the "Defendants are not obligated under the provisions of HRS Sec. 7-1, to open their lands to others not owners therein" and 3). that the "Plaintiff and/or his predecessors in title have waived any rights they might have with respect to the defendant's land." (quoted in Baxa, 1976:18). While the details of this case are not readily available, the plaintiff won, as the "Case Notes" for HRS 7-1 relate the following:

> Gathering Rights-Lawful Occupants of an *Ahupua'a* may, for the purpose of practicing native Hawaiian customs and traditions, enter undeveloped lands within the *ahupua'a* to gather those items enumerated in this section" (Citation of Kalipi case).

Whether this applies only to native Hawaiians residing immediately within the *ahupua'a* in question is not clear. This question was a major consideration in the PDF case. In the PDF decision, the scope of Hawaiian rights was expanded to acknowledge that, at least in some cases, Hawaiians living outside an *ahupua'a* may have traditional rights to gather or harvest on the property in question.

The PASH case challenged the Hawaii County Planning Commissions approval of a Special Management Area Use Permit for Nansay Hawai'i Inc. to develop a $350 million 450-acre resort complex at Kohanaiki, Hawai'i Island. The State Supreme Court's 1995 ruling gave PASH the right to a contested state hearing on the basis of the right of certain Hawaiians to continue the cultural subsistence practice of gathering shrimps at certain ponds located on the Nansay property. As a result of this decision landowners may be obliged to allow native Hawaiians to practice their customs and, furthermore, landowners may have to provide access and preserve resources used in Hawaiian religious or cultural activity.

The most recent legal exploration of native Hawaiian rights has been the Kaupulehu Developments hearing. In this hearing, the Kona Hawaiian Civic Club, Ka Lahui Hawai'i and the Protect Kohanaiki 'Ohana have intervened as parties advocating a number of points including:

1. The governmental permitting processes are flawed because they fail to adequately address and protect native Hawaiian cultural resources and legal rights.
2. A petition or EIS is flawed if there is no inventory of cultural resources. Beyond physical resources, intangible resources (stories, teachings,legends, etc.) must be evaluated.
3. A property's cultural resources cannot be understood without understanding those for the *ahupua'a* and surrounding region.
4. Cultural impact statements should be required before a hearing can be held. Current legislation (status unknown) in H. B. 3081 would require this in proceedings by all state agencies and would also amend the EIS law to incorporate such a concept into the content of an EIS.
5. Without the necessary inventory and evaluation of cultural resources, the Land Use Commission cannot issue a valid approval because it can not consider the projects impact to such resources as required in section 205-17, HRS, and section 15-15-77 (b) (3).

II. PROJECT AREA DESCRIPTION

A. Project Area Location and Boundaries

The project area (Lot 7-A-1) lies in North Kona, Hawaii Island, approximately 4 miles north of Kailua-Kona Town. Queen Ka'ahumanu Highway serves as the western (*makai*) boundary of the project area (Figures 1-2). The project area extends 3600 ft. *mauka*, from the intersection of Hina-Lani Road (the southern boundary) and Queen Ka'ahumanu Highway, to the southeastern corner of the project along Hina-Lani Road . The northern boundary of the project (which is not demarcated on the ground) extends 4400 ft. at 91.5° TN from Queen Ka'ahumanu Highway to the northeastern corner of the project. An existing fence line serves as the eastern property boundary. From the northeastern corner of Hina-Lani Road and Queen Ka'ahumanu Highway. the property extends approximately 3500 ft. to the north along Queen Ka'ahumanu Highway.

The project area is bounded on the north by parcel 3, being a portion of Grant 2942 to Hulikoa, on the east by Lot 7-C-1, being portions of Grant 2942 to Hulikoa, and Land Commission Award 7715, *Apana* 11, and Royal Patent 8214 to Lota Kamehameha, and on the south by the Kaloko - *mauka/makai* roadway which is a portion of LCA 7715, *Apana* 11, Royal Patent 8214 to Lota Kamehameha (Figueiroa 1995:1).

B. Description of the Affected Land

The project area comprises approximately 224 acres in the *ahupua'a* of Kaloko and Kohanaiki. The lands are located on the leeward coast of Hawai'i Island within the district of North Kona on the lower west slope of Hualalai Volcano. Elevation within the project area range from 90 ft. a.m.s.l. at Queen Ka'ahumanu Highway to 340 ft. a.m.s.l. along the eastern boundary.

DOCUMENT CAPTURED AS RECEIVED

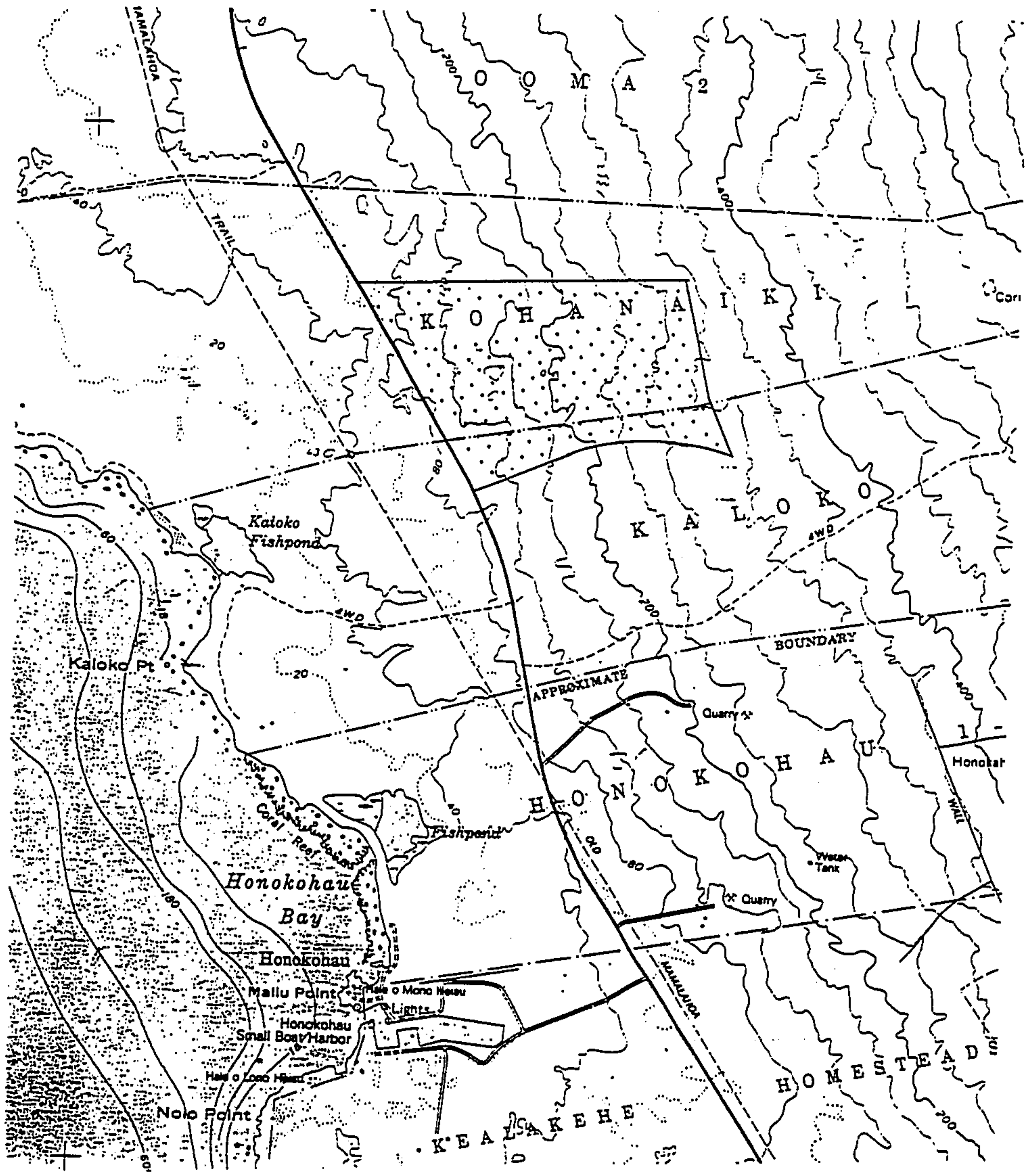


Figure 1 Portion of USGS Keahole Point Quadrangle Map, Showing Project Area

DOCUMENT CAPTURED AS RECEIVED

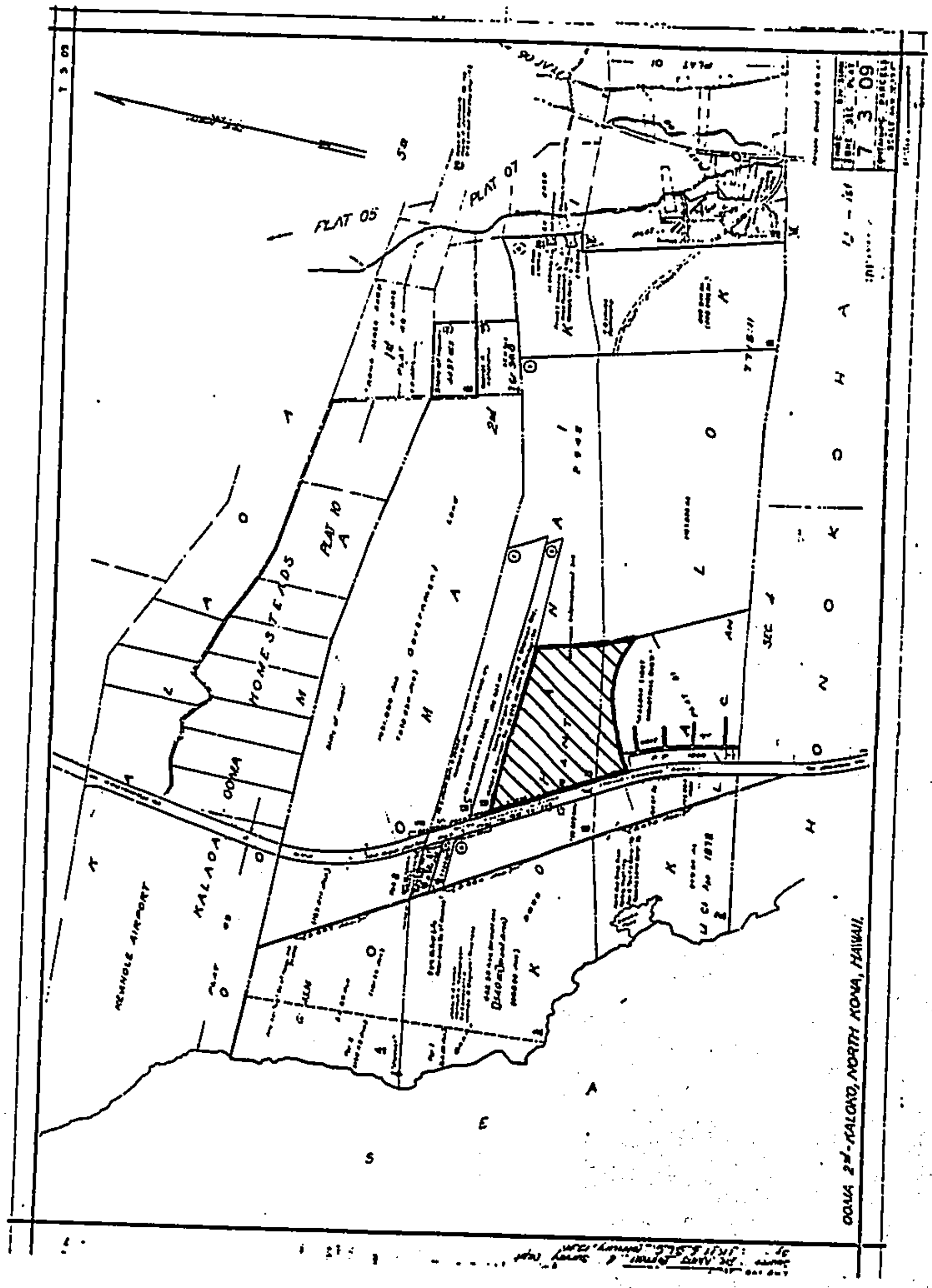


Figure 2 Current Tax Map of the General Area Showing the Affected Lands

Kona weather is typified by afternoon showers brought on by warm air which has been moved inland by light sea breezes. The humid air gradually condenses over higher altitudes throughout the day. At night the land cools resulting in breezes which send warm air back out to sea. Rainfall in the Kaloko project area averages 10 inches per year (Cordy 1991). There are no natural springs or perennial streams within the project area.

The land surface is comprised predominately of exposed a'a and pahoehoe lava. Two a'a lava flows occur along the north side of the project area, extending in a *mauka/makai* direction for the entire length of the project area. The surface of the a'a lava ranges from roughly level expanses to rough fractured ridges.

Pahoehoe lava covers the central and south sections of the project area from *mauka* to *makai*. The surface is generally uneven and is characterized by numerous tumuli and pressure ridges with depressions or undulations in the pahoehoe having thin soil pockets. Collapsed portions of lava tubes also contribute to the uneven surface of the pahoehoe flows.

Grasses dominate the project area vegetation, with predominately non-native fountain grass (*Pennisetum sectacacum)* and the less common native *pili* (*Heteropogon contortus*). Shrubs and trees present include: the native *'ilima* (*Sida fallax*) in scattered numbers, the non-native *klu* (*Acasia fornesiana*), lantana (*Lantana camera*), native *noni* (*Morinda citrifolia*), and a few *kiawe (Prosopis pallida)*, and *'ōhi'a (Metrosideros polymorpha*) trees, along with an abundance of the non-native *koa haole* (*Leucaena glauca*).

Portions of the a'a flow in the *mauka* southeast corner of the project area have been bulldozed. Bulldozer pushpiles and tracks are also visible around the edges of the a'a within this area including an adjacent fence line and cattle gate.

The present project area's location within the interpreted "intermediate zone" (discussed below) places it outside the major areas of pre-contact Hawaiian habitation and activity which would have focused at the coast.

During the decades following western contact, populations of both *ahupua'a* would have declined significantly - reduced by disease and out migration to developing commercial centers. As the western commercial model continued to displace the traditional subsistence economy, localities such as the present project area would have been further marginalized and abandoned. Land Commission Award documents indicate that by the middle of the 19th-century, habitation and activity within Kaloko (and most likely Kohanaiki as well) had shifted far *mauka* to land between the 1200 and 1700 ft. elevation near the Government Road. During the second half of the 19th-century this *mauka* shift is fully established with the formation of the Kohanaiki Homesteads near the Government Road. Throughout the 19th-century, use of the project area would likely have been limited to use of existing *mauka/makai* trails for ocean access by *ahupua'a* residents of the uplands.

Into the 20th-century, major developments within Kohanaiki and Kaloko have occurred outside the project area, which has remained undeveloped. Activities of the Huehue Ranch (established early in the century) - including the erection of walls and fencing - may have impacted the project area. Such activities are evidenced by the wall along the Kaloko-Kohanaiki boundary - site 40 - recorded by Kennedy (1984) in a project area immediately *mauka* of the present project area; as Cordy (1991) notes, documentary evidence - including the absence of the wall in J.S. Emerson's 1888 notes and maps - suggests that the wall was constructed for the ranch in this century.

III. DESCRIPTION OF THE TRADITIONAL CULTURAL PRACTICES REGION

Kaloko and Kohanaiki *ahupua'a* are located within the Kekaha region of North Kona. The Kekaha region, or "Kekaha-Waiole, the desolate land without water" (Kelly 1983:74) refers to the barren lava fields extending north from Kailua-Kona to Anaehoʻomalu (*Ibid.*).

As has been observed in Kaloko, Kohanaiki and other *ahupua'a* in Kekaha, this band of barren lava fields does not encompass entire *ahupua'a* nor does it inhibit land usage from occurring along the coast and inland where rainfall is sufficient for intensive agriculture. Instead, Kekaha refers more accurately to portions or "zones" of the regions where lava flows encompass the lands which - according to elevation - sustain little rainfall. Correspondingly, the lands of Kekaha are suggested, based on ethnographies, ethno-histories and archaeological sources, to contain three general terrestrial zones that directly influenced land usage of prehistoric and historic populations. These three zones may be understood as forming the traditional cultural practices region in which the project area lies. These zones include: (1) Coastal; (2) Intermediate or Transitional and; (3) Upland. Based on the archaeological record of the present study area and previous archaeology in the Kaloko *ahupua'a* (Cordy et al. 1991) a land usage summary of each zone is provided below.

A. Coastal Zone

The Coastal zone begins at sea level and extends to approximately 15 ft. a.m.s.l. The zone contains evidence of prehistoric and historic settlement in both Kaloko and Kohanaiki.

Kaloko contained a permanent settlement concentrated along the coast. The settlement most likely comprised "several local residential groups with constituent households. One household headed each residential group" (Cordy et al. 1991:522). Radiocarbon dating for the coastal region within Kaloko *ahupua'a* has produced dates ranging between A.D. 920 and A.D. 1430 (*Op.cit.*:465). Cordy concludes that one site (D13-3) on the Kaloko coast - with date ranges between A.D. 920-980 and A.D. 1005-1290 is one of the oldest permanent habitation known in leeward Hawaii (ibid.,473).

Although few absolute dates are known for the construction of fishponds, Cordy conjectures that the Kaloko and Honokohau fishponds were constructed by at least the A.D. 1400-1500 period (*Op.cit.*, 576).

B. Intermediate Zone

The Intermediate Zone extends from the *mauka* margin of the coastal zone (15 ft. a.m.s.l.) to approximately 400 ft. a.m.s.l. (the present project area is located within this zone). Similar to other portions of Kekaha, the intermediate zone of Kaloko and Kohanaiki is characterized by low rainfall and uneroded lava terrain.

The Intermediate Zone of Kaloko and Kohanaiki contained a scattered distribution of habitations of different modes (i.e. temporary and recurrent) which were generally located within the vicinity of *mauka/makai* trails or in association with other functional site types like agriculture and lithic resource procurement.

The general lack of consistent rainfall and virtual absence of soil directly limits agricultural use within the Intermediate Zone. Nonetheless, small concentrations of mounds, modified outcrops (enclosing minimal soil areas), enclosures, and some pahoehoe excavations evidence a degree of agricultural productivity. Lava tubes and blisters are abundant in this zone and contain temporary components, and post-habitation burial interments.

The Intermediate Zone is also characterized by an extensive network of *mauka/makai* trails. These trails facilitated inter-*ahupua'a* travel of residents between their coastal habitation and the agricultural fields in the upland zone.

Within the Intermediate Zone permanent habitation may occur directly adjacent to the Coastal Zone and are associated with small scale agricultural activities.

C. Upland Zone

The Upland Zone of Kaloko and Kohanaiki begins at approximately 400 ft. a.m.s.l. and continues *mauka*. The Upland Zone is characterized by an increase in permanent habitation sites, in conjunction with intensive non-irrigated (dryland) agricultural features. Gradually, the ascending natural landscape contains a greater soil base and, due to an increase in elevation, the rainfall is more plentiful and consistent.

Intensive non-irrigated agriculture is characteristic of the Kona slopes where irrigation, because of the lack of perennial waterways, is not possible. The "Kona Field System" - generally defined by a grid-like patterning of stone constructed field boundaries - represents an interrelated network of intensive non-irrigated agriculture covering an estimated area of 139 $km.^2$ (Kirch 1985:225) between Kealakekua Bay and Kailua Bay. Archaeological studies beyond the arbitrary northern boundary of the "Kona Field System", have documented evidence of intensive non-irrigated agriculture in the Kekaha region within the Upland Zone between 400 to 1200 ft. a.m.s.l. (i.e., Cordy 1985; Hammatt et al. 1987; Walker and Rosendahl 1990; Robins et al. 1993).

Intensive non-irrigated agriculture is characterized by concentrated occurrences of similar feature types (i.e. field walls, modified a'a lava, pahoehoe excavations, and mound complexes). Variations in the methods of non-irrigated agriculture occur as a response to topographical and geological variation, and rainfall in the region. Radiocarbon dates taken from upland field shelters within the Kona Field System indicates that intensive agriculture began developing between *ca.* A.D. 1400 - 1600 and intensified with permanent upland settlements between *ca.* A.D. 1600 - 1779 (Schilt 1984).

D. Summary of Hawaiian Land Use

The cultural practices region described above reveals a variety of land uses across all zones - including the Intermediate Zone - during the prehistoric and early historic period. The pattern then dramatically changed during the middle to late historic period (post *mahele, ca.* 1850s).

The original settlement of both Kaloko and Kohanaiki was focused on the coast beginning circa 900 A.D. (Cordy et al. 1991). These earlier settlers were likely drawn to the coast by the presence of potable water found in the brackish ponds, the excellent fishing, and specifically to one of the most protected inlets on the Kona Coast at Kaloko (Ibid.:575).

Radiocarbon dates from the Kekaha region, may indicate that all three zones of the Kaloko and Kohanaiki *ahupua'a* were utilized to some degree as early as A.D. 1280 (Walker and Haun 1988). This period correlates with an apparent population increase and geographical expansion in the Hawaiian islands identified as the "Expansion Period" (Kirch 1985:303) or the middle of the "Pioneer Settlement" (Schilt 1984:276). Permanent settlement continued to be centered on the coast and agriculture developed upland as the endemic forest lands were gradually reduced by slash-and-burn methods.

Development of the intensive upland agricultural system probably occurred between *ca*. A.D. 1400 and 1650 (Schilt 1984:277) and focused on the more prime agricultural lands, at elevations where soil was abundant and rainfall sufficient for productive cultivation. During this period, permanent settlement continued to be centered at the coast but also began to be developed in the upland localities of Kaloko and Kohanaiki, as the distance between the upland farms and original coastal settlement expanded. By the end of this period it is expected that most of the upland permanent habitations were occupied. It is likely that the Kaloko fishponds were constructed during this period.

During early historic times (*ca* A.D. 1800-1840) following western contact, Kaloko and Kohanaiki populations undoubtedly declined rapidly due to disease, and a major shift in the traditional Hawaiian settlement pattern ensued. The residents who survived disease likely shifted their residences to economic centers - such as Kailua Town - or in closer proximity to major roadways and to the localities of churches and schools established by the missionaries.

Following the *Mahele* (*ca* 1850's), Kaloko and Kohanaiki shorelines were virtually abandoned "with the Kohanaiki Homesteads the new upland population focus in the Kaloko area" (*Ibid.*:580). As a result, the vacant lands were subsequently acquired for cattle ranching.

IV. ORIGINAL SOURCE OF TITLE AND HISTORY OF LAND USE:

The ahupua'a of Kohanaiki and Kaloko lie at the southern end of Kekaha, the portion of North Kona extending from Honokōhau to 'Anaeho'omalu. Describing the apportioning of land by the *ali'i* before the ascendancy of Kamehameha, the nineteenth-century Hawaiian historian Samuel M. Kamakau records:

> Waimea was given to the Pa'ao kahuna class in perpetuity and was held by them up to the time of Kamehameha III when titles had to be obtained. But there was one land title held by the kahuna class for many years and that was Puuepa in Kohala. In the same way the land of Kekaha was held by the kahuna class of Ka-uahi and Nahulu. (Kamakau 1961:231)

Kamakau further records that during the 1770s, "Kekaha and the lands of that section" were held by descendants of the Nahulu line, the Ka-me'e-ia-moku and Ka-manawa, the twin half brothers of Ke'e-au-moku, the Hawai'i island chief (*Ibid.*:310).

Into the last decades of the 18th-century, following western contact, Kohanaiki and Kaloko, -as elements of the larger Kekaha area, remained under the control of Ka-me'e-ia-moku, who resided to the north at Ka'upulehu (Kamakau 1961:147).

At the *Mahele* of 1848, Kaloko was claimed by and awarded (LCA 7715 *Apana* 11, Royal Patent 8214) to Lot Kamehameha (Kamehameha V). Kohanaiki was classified as Government Land. Subsequently, eighteen *kuleana* claims were made by commoners claiming to occupy and/or cultivating land parcels in Kaloko *ahupua'a*. Twelve of these claims were awarded. All claims were for *mauka* lands (between 1200 and 1700 ft. elevation) adjacent to or just *makai* of the Government Road. All *kuleana* claims were well outside of the present project area. Only five of the total eighteen claims mention residence on or use of the Kaloko lands dating to the time of Kamehameha I, in the first decades of the nineteenth century; the remaining claims testify to residence/use beginning in the 1830s and 1840s.

Parcels within Kohanaiki, having become Government Land, were subject to sale - designated Grants - by the Hawaiian government. Most of the present project area (lying in Kohanaiki) fell within the 930 acre Grant bought by Hulikoa. The Land Index File at the State Archives includes a report from the surveyor J. Fuller to the Minister of the Interior (John Young II) dated May 28, 1855 asserting the land had been sold to Hulikoa and was "now waiting to be approved." The Grants and Patents Book (1916) however lists the grant as awarded to Hulikoa nine years later in 1864.

Much of the subsequent history of land tenure is unclear. As Cordy notes about Kaloko: "The historical documents suggest that by the 1840s-1850s, the Coastal Zone had been abandoned as a residential area, except probably for a house used by the fishpond's caretaker. This pattern would have been a stunning change from prehistoric and early historic times, when many coastal residences were present" (Cordy 1991:288). This pattern likely also held for Kohanaiki.

Kaloko continued to be held by the *ali'i* throughout the remainder of the 19th century, passing, after the death of Lot Kamehameha, successively to Bernice Pauahi Bishop, Kalākaua and Kapi'olani.

During the 20th century, major developments focused on Kaloko *ahupua'a*. After John Maguire purchased the former chiefly lands of Kaloko in 1906, the uplands of the *ahupua'a* were developed into the Huehue Ranch. The Kaloko fishpond, leased from the ranch, continued as a commercial fishing operation until the 1950s. During the 1970s, the pond was incorporated into the newly-established Kaloko-Honokohau National Historic Park

V. NATIVE HAWAIIAN RIGHTS PERTAINING TO THE PROJECT AREA

A. Rights to Burials

The draft Archaeological Inventory Survey report (Colin *et al.* April 1996:114) identifies eight sites (including a total of nine features) within the project area as possible burial sites (Figure 3). The sites (State Site Numbers 20702, 20705, 20716, 20717, 20720, 20731, 20743, and 20749) include six modified tumuli, one linear mound, one terrace, and one lava tube feature. As shown in figure 4, these eight sites designated as including possible burials are widely scattered and lie in all four quadrants of the project area. While no human remains have been confirmed at these sites, it is probable that many, and perhaps all, of these sites include human burials.

On March 16, 1996, CSH staff interviewed the Reverend Norman Keanaaina, a kama'āina of Kohanaiki since the 1940s (See Appendix: Oral Histories). Reverend Keanaaina stated his belief that there were indeed burials within the project area. He stated that interment within the project area continued into the 1930s or 1940s, when his "grandmother's husband", of the Kapaa family, was buried. Reverend Keanaaina made a site visit with CSH personnel and was taken to three sites (20702, 20717, and 20720) in the south central portion of the project area which had previously been identified by CSH as probable burials. The Reverend agreed that the filled-in cracks at these sites were probable burials. He stated that the common practice was to wrap the body in a mat on a horse blanket, and inter it in a sufficiently large crack which would subsequently be filled with stones.

The draft Inventory Survey Report (Colin et al. April 1996:141) recommends that all eight of the designated possible burial sites within the project area be tested to determine the presence or absence of human burials. These eight possible burial sites are presently recommended for preservation (*Ibid.*) but if they are later found not to include burials, then they would probably not merit preservation status.

If human skeletal interments are identified and are thought to be over fifty years old then they cannot be removed without the permission of the Department of Land and Natural Resources (under section 6E-43a). The law asserts: "The appropriate island burial council shall determine whether preservation in place or relocation is warranted." The wishes of known lineal descendants are to be taken into consideration in this decision. Council determinations may be appealed.

DOCUMENT CAPTURED AS RECEIVED

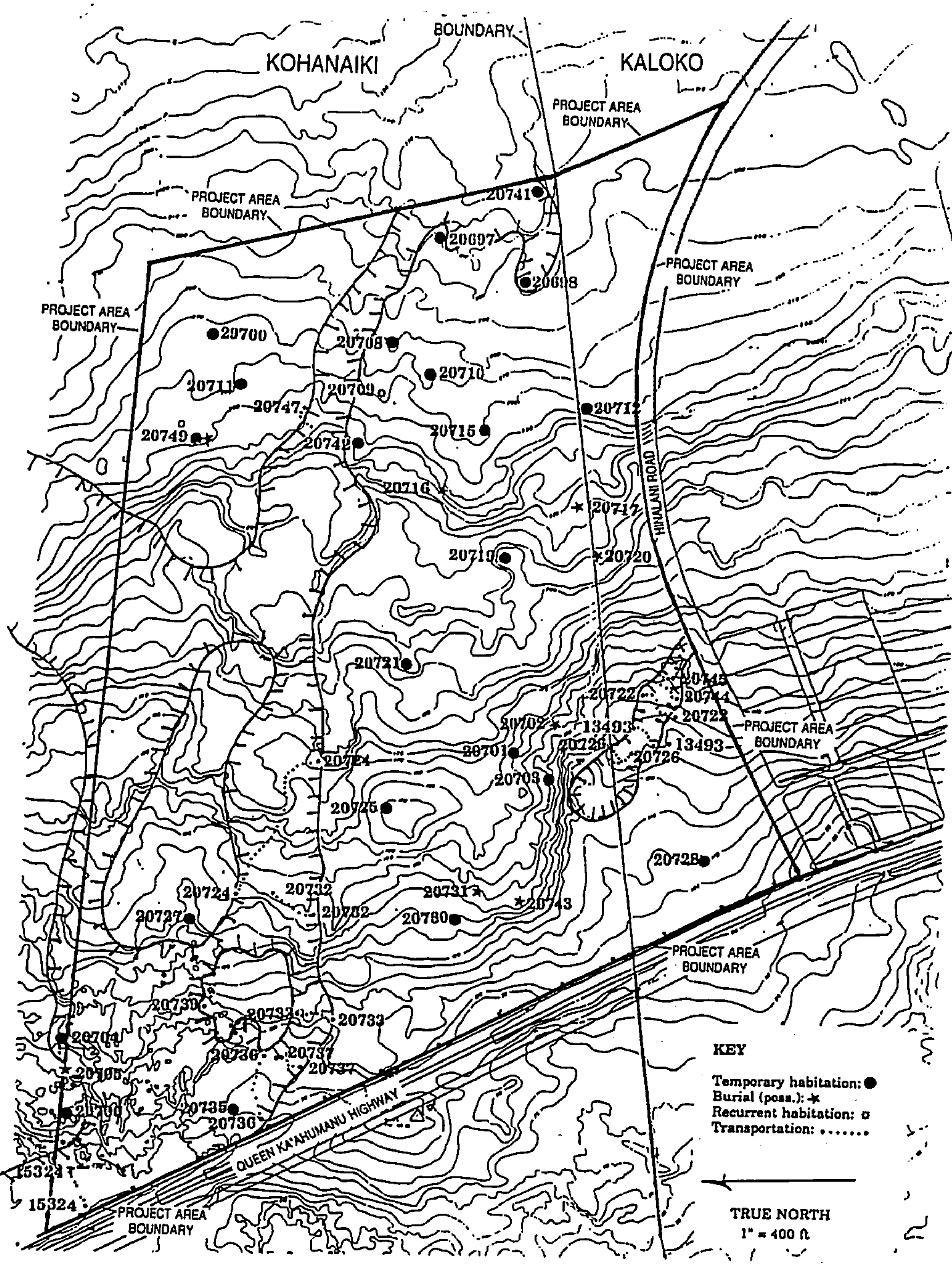


Figure 3 Archaeological Site Map of Project Area Showing Location of Possible Burials

"Within ninety days following the final determination [of the island burial council] a preservation or mitigation plan shall be approved by the department in consultation with any lineal descendants, the representative council, other appropriate Hawaiian organizations, and any affected property owners" (6E-43d). A request for council determination of burial treatment requires the production of "evidence of a good faith search for lineal and cultural descendants ["cultural descendants" typically have some strong history of association with the *ahupua'a* involved] (S 13-300-33,1) This requirement includes the "publication of a notice in a newspaper of general circulation in the county in which the burial site is located [*West Hawai'i Today* in this case] and a newspaper of statewide circulation for a minimum of three days including Sunday and Wednesday" giving the particulars of the burial location and known associations, proposed treatment and a number and address of a contact person. Lineal or cultural descendants are to be verified by the department.

Preservation in place or relocation also requires the production of an acceptable preservation or mitigation plan which must specify provisions for reasonable access and upkeep of burial sites. This typically involves discussion of buffers and landscaping and may even involve issues of viewplanes. If relocation is determined to be the preferred option, it is generally preferred to reinter on the project area or if that is not feasible, at least within the *ahupua'a* in the general vicinity. The production of this plan and subsequent follow-through is typically the responsibility of the landowner or developer. Typically the adoption of such a plan requires at least two appearances before the island burial council.

The Reverend Keanaaina has clearly stated his intention to come forward to make his claim as a lineal descendant of those interred within the project area. We feel that the Reverend has a strong claim. There may be other parties, however, who will respond to efforts of public notification and may also be recognized as descendants.

Another burial issue concerns the remains of Kamehameha the Great which have long been asserted to lie in the lands of Kaloko or the vicinity of Kaloko (Kamakau 1961:215). There is no evidence to suggest that the remains of Kamehameha the Great lie within the present project area. We have reason to believe that they are not within the project area. The disposition of the bones of Hawaiian chiefs, like those of any other ancient Hawaiian, would be up to the island burial council and the SHPD.

B. Rights to Trails

The earliest historic documentation of Hawaiian trails in the vicinity of the project area appears to be Emerson's map of 1888 (Figure 4). This map shows a coastal trail running parallel to and just back from the ocean and two major *mauka/makai* trails - one traversing Kaloko *ahupua'a* and one traversing Honokohau *ahupua'a*. Both of these *mauka/makai* trails meet the coastal trail in the vicinity of a fishpond (Kaloko Pond and Aimakapa'a Pond respectively). Heading *mauka*, these two trails veer north and converge within Kohanaiki *ahupua'a* in the immediate vicinity of the old Kohanaiki Church; the trail continues *mauka* to the government road. These were most likely the major trails in use in the 1880s and all lie well outside of the project area. Clearly however there were many earlier trails which are not depicted on the Emerson map.

Emerson does not depict prehistoric trails which were no longer in use in the 1880s. Most notably, he does not depict the "Old Mamalahoa" trail which is shown on modern USGS maps (See Figure 1). The Old Mamalahoa Trail would have been the major cross-*ahupua'a* trail in the vicinity of the project area in pre-Contact times, but lies well *makai* of the project area. The Emerson map also omits an alignment known as the "Kohanaiki Road" which passed through the southeast corner of the project area (in Kaloko *Ahupua'a*).

The nature of pre-Contact trails within the project area remains unclear but it is clear that there were many of them. The discussion of trails within the archaeological inventory survey is given below verbatim and is subsequently discussed.

Twenty trails (22.2 percent of the total features) were encountered during the inventory survey which were encompassed within sixteen sites (29 percent of the total 55 sites) (State sites 13493, 15324, 20704, 20722, 20724, 20726, 20732, 20733, 20735, 20736, 20737, 20739, 20741, 20744, 20745, 20747). All of the trails within the project area appear to be prehistoric in nature. Russell A. Apple (1965) provides classifications ("Types A through D") of Hawaiian trails based on architectural design, location and orientation. As a result of these classifications, it can be suggested what method of transportation (i.e. foot, horse or wheeled vehicle) was facilitated by the trail and during what time period. "Type A" trails appear to be the only type applicable to the present study area.

Apple defines "Type A" trails as being prehistoric and early historic (prior to abolishment of the *kapu* system) "single-file foot trails" that follow the configuration of the

DOCUMENT CAPTURED AS RECEIVED

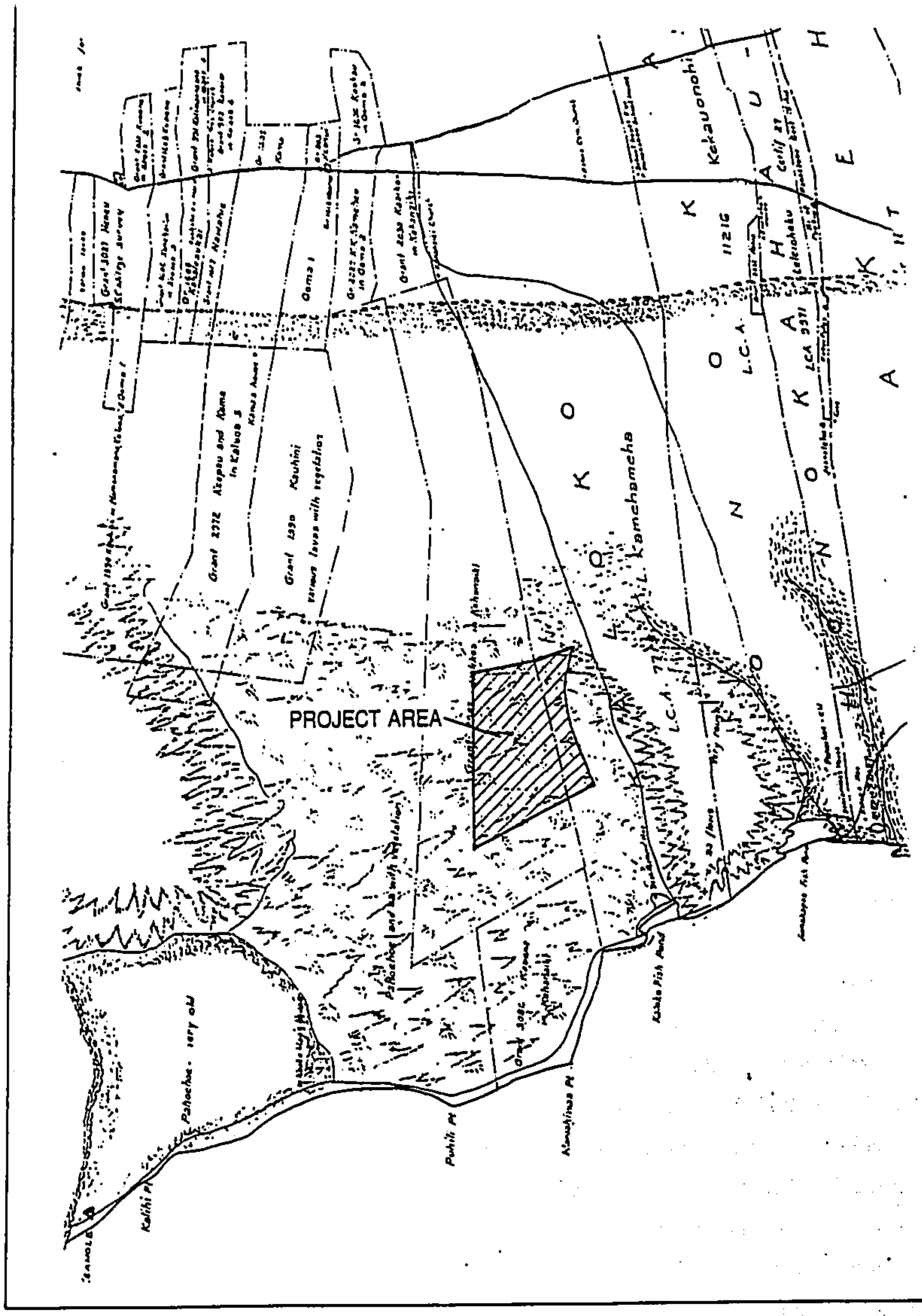


Figure 4 Portion of 1888 J. S. Emerson Map Showing Kaloko and Kohanaiki Ahupua'a (location of project area superimposed; Scale 1" = 4,000')

shoreline and extend between the coast and upland localities (Apple 1965: Appendix 2). "Type A" trails were designed in accordance to the *kapu* system, for example: trails would not cross *ahupua'a* boundaries because the *kapu* system prohibited residents to go beyond their *ahupua'a* boundaries. Apparently only one trail (encircling the perimeter of each island crossed *ahupua'a* boundaries. This trail was used during the *makahiki* festival for tax collection purposes (*op.cit*: 25). All of the stepping-stone trails are considered to be "Type A" trails. The identified sections of the stepping-stone trails in the project area cross over a'a lava terrain and are believed to be associated with localized travel between the coast and uplands, as well as accessing project area-specific sites and/or features (i.e. agriculture, lithic resource and temporary habitations).

The large number of trails within the project area reveal that the residents of both Kaloko and Kohanaiki had a significant network of travel routes that provided access to resources and exchange of resources between the coast and upland regions of the two *ahupua'a*. The fact that all of the trails within the project area are of Apple's "Type A" attests to the fact that while the area within the project was commonly traversed during the prehistoric period it was not as heavily traversed in the historic and modern period. The Kohanaiki road traverses - in a *mauka / makai* direction - through the southeastern portion of the project. The road proved hard to follow with some places being clearly bulldozed (bulldozer scars on the pahoehoe), some sections only evident through apparent stunted vegetation, and there is an old wooden gate in a fenceline which parallels the *mauka* project boundary, believed to have been related to the former road.

> Attempts were made with all trails in the project area to follow them to their full extent and where possible make relevant correlations. It proved impossible to follow trails on the grass-covered pahoehoe adjacent to the a'a lava where the trails were still visible. The uniformity of the terrain (usually consisting of undulating pahoehoe) surrounding the a'a flows negates the necessity of extensive trail construction and leads the authors to believe that while the trails followed a single route over the a'a flows once the trail exited the a'a more than one path may have been traversed by travelers. (Colin et al. April 1996:121-122).

While some of these pre-Contact Hawaiian trail segments were quite minimal in construction, twelve of them include at least a few stepping stones or set slabs and three others involved the clearing of a'a boulders thus indicating the expenditure of considerable effort in their construction. These trails were probably constructed for a variety of purposes including access to temporary habitations or the one designated recurrent habitation (site 20709), access to burial sites, access to the eight sites in which some agriculture was indicated, access to the scoria mining site (20703), access to sites of opportunistic water catchment, access to various local wild plant resources, and access to areas just *mauka* and *makai* of the project area.

While the abundance of trail segments might be perceived as indicative of intensive Hawaiian utilization of the project area, the lack of a clear purpose to these trail segments could be interpreted as an absence of intensive use. For example, in the southwest portion of the project area, five trail segments (13493, 20722, 20726, 20744, and 20745) traverse an a'a exposure. All of these trail segments include at least some stepping stones, but these trail segments appear roughly parallel (in series) and all five lie within a span of 500 feet. This number of trails running so closely together may suggest the absence of a well-defined trail network within the project area and a more random pattern of land use over time.

It is clear from the number of apparently prehistoric trail segments that many Hawaiians traversed the project area in pre-Contact times. These trails were probably used for a variety of purposes but there is no clear explanation for the construction of many of these trails. Curiously none of these trail segments appear to be part of a well-defined *mauka-makai* trail running up the length of Kohanaiki *ahupua'a*. Possibly the a'a in the *makai* portion of Kohanaiki *ahupua'a* encouraged Hawaiian residents of the ahupua'a to use a *mauka-makai* alignment running through the seaward portion of Kaloko *ahupua'a*, cutting north into Kohanaiki above the a'a exposure near the government road. The *mauka-makai* trail system shown in Emerson's 1880s map may well have been the pre-Contact system. The major cross-*ahupua'a* trails lay well *makai* of the project area (the coastal trail and the Old Mamalahoa trail)

Presently, *mauka* access is adequately provided by Hinalani Road on the south edge of the project area. Cross-*ahupua'a* travel in the vicinity of the project area is adequately provided by the Queen Ka'ahumanu Highway which forms the west boundary of the project area.

C. Native Use of Unique Geological or Geographical Resources

The only unique geological or geographical resources in the project area is a pre-Contact scoria quarry (designated site 20703 Feature C). Hawaiians utilized scoria for various abrading tools used in wood working and the fashioning of fishhooks. The archaeological inventory survey (Colin et al. April 1996:121) notes:

> Feature C consists of an area in which it appears that the outer crust of a high pahoehoe tumulus was removed as a layer of low grade scoria. Mining activities do not appear to have been extensive and there is no evidence of further processing of the mined material (i.e. abrader basins or partially worked pieces of scoria). Due to the quality of the scoria and the lack of evidence of extensive mining it is believed by the authors that the activities represent a localized (ahupua'a) exploitation of a resource for local consumption.

This entire site is presently recommended for preservation (Colin et al. April 1996:141).

The traditional Hawaiian use of scoria for tools largely ceased with the widespread availability of iron ca. 1800. Any present day Hawaiian use of scoria at site 20703C would seem to inherently cause impact to the site. Other sources of scoria of as good, or better, quality are thought to exist elsewhere. The evaluation of native Hawaiian rights to a scoria quarry site versus the laws regarding historic preservation would seem to be a matter for consideration by the State Historic Preservation Division (SHPD). Access to scoria is not anticipated to be a native rights issue as scoria is not used today.

D. Other Archaeological Concerns

The entire project area has been subject to an archaeological inventory survey and fifty-five sites, including ninety structural and non-structural (lava tubes blisters and rock shelters) features, have been identified (Colin et al. April 1996:108). The formal feature type and function of these sites are related in the following tables and implications regarding cultural impact are discussed below.

Table 1 - Occurrences of Formal Feature Types (total number of features: 90)

FORMAL FEATURE TYPE	NUMBER	PERCENTAGE
Ahu	2	2.2
Alignment	1	1.1
C-shape	1	1.1
Enclosure	9	10.0
Lava blister	2	2.2
Lava tube	8	8.9
Modified depression	2	2.2
Modified tumulus	22	24.4
Mound	2	2.2
Pavement	7	7.8
Planting area	1	1.1
Platform	4	4.4
Quarry	1	1.1
Rockshelter	1	1.1
Terrace	4	4.4
Trail	20	22.2
Wall	3	3.3

Table 2 - Occurrences of Formal Function Types (Total number of sites in project = 55.)

FUNCTION	No. of Sites
Agriculture	4
Possible burial	7
Recurrent habitation/Agriculture/Storage	1
Temporary habitation/Mining	1
Temporary habitation	15
Temporary habitation/Agriculture	1
Temporary habitation/Agriculture/Transportation	1
Temporary habitation/Storage/Transportation	1
Temporary habitation/Possible burial	1
Temporary habitation/transportation	1
Temporary habitation/Agriculture/Marker	1
Indeterminate	6
Marker	1
Storage	1
Storage/Transportation	1
Transportation	12

No permanent habitations, religious sites (other than the possible burials previously discussed) , or unique sites (other than the quarry) are believed to lie within the project area. It is presently recommended (Colin et al. April 1996:140) that forty sites be subject to a program of data recovery to address scientific and informational concerns, and that ten sites (including the eight possible burials, the only recurrent habitation site, and the quarry site) be preserved. A single trail site is recommended for both data recovery and preservation. Four sites are recommended for no further work because it has been determined that these sites lack cultural or scientific significance beyond the documentation and plotting of location completed during the inventory survey. Determination of the treatment of archaeological sites is up to the SHPD of DLNR. As these archaeological sites would generally be regarded as modest and the archaeological recommendations would generally be regarded as conservative, the SHPD will probably be in accord with the recommended treatment. None of the other Hawaiian archaeological sites appear to involve cultural impact issues.

E. Native Hunting Rights

Native subsistence hunting rights remains something of a gray area but should not prove problematic for the subject property. The Reverend Keanaaina relates hunting for goats and donkeys within the immediate vicinity of the project area. There is no evidence for subsistence hunting for pigs or any other animals (other than donkeys and goats) within the project area. There is no reason to believe that the project area was a particularly good hunting ground for goats and donkeys, but rather that these animals would range widely over hundreds of miles of the Kekaha lands. There is no evidence of recent goat or donkey hunting within the project area nor any evidence that any Hawaiians would want to hunt these species there at the present time.

F. Native Gathering Rights

The Keanaaina family exercised native gathering rights in the collecting of various medicinal plants in the project area and vicinity. Some of the plant species specifically mentioned such as *Koko'olau* (*Bidens* species) and *'Uhaloa* (*Waltheria indica*) are abundant over many square miles of North Kona. Adella Keanaaina Bates made reference to the Hawaiian poppy in a discussion of medicines in the lava fields of the area. This is probably *Pua-kalā* (*Argemone glauca*) which was used medicinally. It is uncertain whether it is found in the project area, but is abundant elsewhere. Mrs. Bates discussed the medicinal use of *'uhi* growing in the vicinity of the project area, but this is thought to be the cultivated yam (*Dioscora alata*). Duane Keanaäina made reference to *'ulei* (*Osteomeles anthyllidifolia*) growing in the vicinity of the project area and having been used for *akule* nets (bent into net hoops) and for musical instruments (dancing sticks). *'Ulei* is believed to be not uncommon in the general vicinity of the project area. Other plants gathered by Hawaiians including *pili* grass, *noni*, and *'ōhia* do indeed exist within the project area and may have been gathered by Hawaiians in former times. There is no reason to believe that the abundance or quality of these resources was or is in any way exceptional. A similar abundance of these resources may be encountered in many square miles of North Kona. The distance of the project area from permanent Hawaiian habitations and major Hawaiian trails would have been a significant deterrent to the utilization of these resources in the project area.

The project area does not appear to contain any unique botanical resources nor is it particularly rich in any botanical resources. There is no reason to believe that the development of the project area will significantly inconvenience any native Hawaiian in the matter of gathering plants.

VI. SUMMARY

This cultural impact statement has attempted to give due consideration to the effects which the proposed development activity may have on the specific rights, culture and traditions of native Hawaiians. Specific areas which have been examined have included the issue of burials within the project area, the issue of access to Hawaiian trails, the issue of unique geographic or geological features (in this case a scoria mine) traditionally used by Hawaiians, Hawaiian hunting rights, and Hawaiian gathering rights. The conclusion of this study is that the impact of the development of this specific parcel *per se* on Hawaiian culture would be minimal.

The lack of impact is a reflection largely of the geographic location of the parcel, set well back from the coast, in an area with very low rainfall, and virtually no unique features (the scoria mine being the only exception). There were no commoner land claims within the project area or anywhere in the immediate vicinity of the project area. While the absence of *kuleana* land claims does not necessarily mean an absence of Hawaiian activity, the patterns of land use in this area are relatively clear, and Hawaiians did not utilize this *kula* land of the intermediate zone nearly as intensively as they utilized the coastal zone and upland zone.

The only significant native rights issue would seem to be the possible burials. Positive identification of human remains within the project area remains to be undertaken. Once, one or more burials are identified as present, the remains will be treated within existing laws and the rules of SHPD in conjunction with the Big Island Burial Council.

VII. REFERENCES

Apple, Russell A.
1965 *Trails: From Steppingstones to Kerbstones*, B.P. Bishop Mus. Spec. Publ, 53, Bishop Museum Press, Honolulu.

Baxa, Artemio C.
1976 "Ancient System of Land Tenure in Hawaii and Land as Patrimony of the People" Ms. University of Hawaii Hamilton Library,

Colin, Brian L. *et al.*
1996 "An Archaeological Inventory Survey and Limited Subsurface Testing of 224.43 Acre Parcel within Portions of Kaloko and Kohanaiki Ahupua'a (TMK 7-3-09:17 and Portion of 2)" (Draft) April 1996.

Cordy, Ross
1985 *Working Paper I: Hawaii Island Archaeology, Ooma & Kalaoa Ahupua'a, Kekaha, North Kona. TMK 7-3.* Historic Sites Section, Division of State Parks, Dept. of Land & Natural Resources, State of Hawaii.

Cordy, Ross, Joseph Tainter, Robert Renger, and Robert Hitchcock
1991 *An Ahupua'a Study: The 1971 Archaeological Work at Kaloko Ahupua'a North Kona, Hawai'i, Archaeology at Kaloko-Honokōhau National Historical Park.* National Park Service, U.S. Dept. of the Interior.

Figueiroa, Russell
1995 "Record Research of Roadways and Trails at Kohanaiki and Kaloko, North Kona, Island of Hawai'i, Hawai'i.

Hammatt, Hallett H., David Shideler and Douglas Borthwick
1987 *Archaeological Survey and Test Excavations of a 15-Acre Parcel, Kealakehe, Kona, Hawaii (TMK 7-4-17:30)*, Prepared for Mauna Lani Resort, Inc., Cultural Surveys Hawaii, Kailua, HI.

Kamakau, Samuel M.
1961 *Ruling Chiefs of Hawaii*, The Kamehameha Schools Press, Honolulu (2 vols.).

Kelly, Marion
1983 *Na Mala o Kona: Gardens of Kona, A History of Land Use in Kona, Hawaii*, Bishop Museum Dept. Report Series 83-2, Honolulu.

Kennedy, Joseph
1984 *An Intensive Archaeological Survey for the Proposed Kaloko Golf Course, Kaloko, North Kona, TMK 7-3-09: por. 17*, Archaeological Consultants of Hawaii, Inc., Honolulu, HI.

Kirch, Patrick V.
1985 *Feathered Gods and Fishhooks*, University of Hawaii Press, Honolulu.

Otaguro, Janice
1996 "Islander of the Year: Mahealani Pai" *Honolulu* January 1996 (pgs. 32-35, 62,69,70)

Robins, Jennifer J., Rodney Chiogioji, Joy Collins, Ingrid Carlson, Ian Masterson and Hallett H. Hammatt
1993 *An Archaeological Inventory Survey of an Approximately 82-Acre Subject Parcel in the Ahupua'a of Honokōhau II, North Kona District, Island of Hawai'i (TMK 7-4-08:por 34)*, 3 vol. Cultural Surveys Hawaii, Kailua, HI.

Schilt, Rose C.
1984 *Subsistence and Conflict in Kona, Hawaii: An Archaeological Study of the Kuakini Highway Realignment Corridor, June 1984*, Departmental Report Series 84-1, Dept of Anthropology, B.P. Bishop Museum for Dept. of Transportation.

Springer, Hannah Kihalani
1996 "LUC Contested Case at Ka'upulehu" *Ka'u Landing*, March 1996, (pgs. 14-16)

State of Hawaii, House of Representatives
1996 "A Bill for an Act (H.B. No. 3081),

Walker, Alan T. and Alan E. Haun
1988 *Limited Archaeological Data Recovery, Kona Palisades Subdivision Parcel, Land of Kalaoa 4th, North Kona District, Island of Hawaii (TMK 3-7-3-05:87), PHRI, Ms Report 452-090888, Kailua-Kona.*

Walker, Alan T. and Paul H. Rosendahl
1990 *Archaeological Inventory Survey, Kona Palisades Development, Land of Kalaoa 4th, North Kona, Island of Hawaii*(TMK 3-7-3-05:86), PHRI Report 806-061190(b), Hilo, HI.

West's Hawai'i Reports vol. 79, "Pub. Access Shoreline v. City. Planning Comn. (pgs. 425-452)

_____ Public Access Shoreline Hawaii v. Hawai'i County Planning Commission (pgs. 246-255)

APPENDIX

APPENDIX: ORAL HISTORIES

Reverend Norman Keanaaina

Reverend Norman Keanaaina was interviewed in Kona, Hawaii by Hallett Hammatt and Douglas Borthwick of Cultural Surveys Hawaii on March 16, 1996. Rev. Keanaaina - son of William Keanaaina Jr. and Emily Kapānui - is a *kama'aina* of Kekaha and Kohanaiki since the 1940s. Also present during the first portion of the interview was Mrs. Adella Bates, Rev. Keanaaina's sister. The second portion of the interview was conducted within the project area in Kohanaiki; Rodney Chiogioji of Cultural Surveys Hawaii was also present during this portion. Rev. Keanaaina was shown a map of the project area and a list of the archaeological sites recorded during the present survey. Notes of the interview were recorded by Hallett Hammatt.

Rev. Keanaaina's family managed the Kaloko Pond on the coast from 1934 to 1940; commercial fishing in the pond continued until the 1950s. The 1946 tidal wave damaged the pond wall but it was rebuilt soon after; the present wall is built inside of the original wall, which can be seen underwater on aerial photographs, making the current pond smaller than its previous configuration.

Rev. Keanaaina explained the proper pronunciation of Kohanaiki *ahupua'a*: it is Ko-ha-naiki, not Ko-ha-na-iki. The *ahupua'a* name refers to *naiki* or "discipline".

Rev. Keanaaina discussed burials within Kohanaiki and the present project area. He mentioned visiting the project area 7 or 8 years ago with the late Joe Kahananui, another *kama'aina* of the area, and viewing two caves and other burial places. He believes that among the last burials in the project area was a member of his family, his grandmother's husband, who died in the 1930s or 40s.

Rev. Keanaaina said they used *mauka-makai* trails in Kalaoa, Kohanaiki and Kaloko. The nearest such trail in the vicinity crossed from Kohanaiki to Kaloko, down to Kaloko Pond. He noted there were families living on the coast until the beginning of World War II when the military evacuated the coastal zone and burned houses located there.

Rev. Keanaaina recalled grazing and herding of goats and cows, and hunting of goats, in the lava fields between the *mauka* government road (where homes were located) and the coast. Donkey hunting also occurred but it was made illegal.

Rev. Keanaaina inspected Sites 20703 (a habitation and mining site), 20702 (possible burial), 20720 (terrace with possible burial), and 20717 (possible burial). Rev. Keanaaina agreed that sites 20702, 20720 and 20717 included possible burials. He also noted that Site 20749 in the northeast portion of the project area seemed familiar to him.

Rev. Keanaaina was re-interviewed in Kona by Rodney Chiogioji of Cultural Surveys Hawaii on April 16, 1996. Emendations by the interviewer are placed in brackets [...].

ON THE KEANAAINA FAMILY IN KOHANAIKI AND THE KEKAHA AREA:

My great grandmother Kalua Kanemano owned a 60-acre grant at Honokohau. It is between the present Honokohau Harbor and Aimakapaa Pond. She married Kamau and his first name was

Puamana. You know Hawaiians switched around their names: so actually my great grandfather's name should have been Puamana but because his first name was Keanaaina, that's where our Keanaaina name carried through because the land that he received was by his first name. So she [great grandmother] granted [sold] this property to the Kekaha Protestant Church. And the Church leased it out to four of the members and somehow the members were employed by Greenwell - Frank Greenwell - and Greenwell somehow acquired the property and sold it to the National Parks.

The Church was moved to Kohanaiki *mauka* and then it was moved to Kalaoa, the present site of Kekaha Mauna Ziona Church. All the churches from Honokohau to Waikoloa were all under the Kekaha Protestant Church.

Actually, the church down in Honokohau village [at the coast] was the second church. The first church was above the present Queen Kaahumanu Highway but that church burnt down so they built a new one *makai*. And my great grandmother Kalua is buried on the church property [below the highway]. If you look down from the highway you're going to see a little gravesite, it's to the south and down to the level area where she's buried.

My family extends from Honokohau to Makalawena down to Kona Village all those areas all the way over to Kapalaua and that's Waikoloa.

But for me, the Keanaainas stayed from Kailua and then up to Makalawena. We didn't go any further than that, only if it was necessary that we would go beyond that.

Four generations [have taken the Keanaaina name]: me, my dad, my grandfather and his father. Now of course it goes beyond me - great grandchildren.

I would say there were forty different families in the area but we were related. So we have no boundaries, actually...because we're all related. That's the reason we could travel all over the place without anyone saying hey you cannot come through here. We knew everybody at the time. This goes way way back when there were only trails, until prior to my mom's death, we had jeep trails and used four-wheel drive.

ON FAMILY ACTIVITIES:

We raised horses and cattle. People say, how do you raise cattle down on this place. Simple. The cattle, the horses they eat the *kiawe* beans and the *ekoa* shots, the leaves. I find it was different in those days. The weather has changed. There were a lot of *ti* leaves even down where they call Pine Trees. *Ti* leaves [were] still growing in the area. There were a lot of *ti* leaves and we'd take down *ti* leaves also and stick them in the ground and they would grow. We would plant it near some brackish water. And we would take some grass, or my uncle used to take some grass, and plant it in the shady areas for the cattle.

But the funniest thing is how people survived in the area. The ocean was plenteous. And of course on the lava fields were a lot of goats. My grandparents used to get all these goats and brought them to Kailua and they would ship it out. And what they'd do to get the goats: they'd raise their own billys and then they'd take the billys down and let the billys go and the billys would gather all the other goats that would follow.

And to me it was something so simple; people would say wow it's hard work but actually it's not. The only thing that was hard was going over all the a'a, the lava field, and spending time in the hot sun. So it took time to bring the cattle and goats to Kailua to ship them out.

As a family we needed to go down to prepare coffee twice a year. So our vacation was more a coffee break and we'd have three months vacation: harvesting of the coffee and all that. We sometimes took a week - it depended what we were doing for that vacation period - to a month go to the beach. The boys would take down two t-shirts, one shorts, one pants for sleeping, that's all. It was very light.

And we would catch fish: we would would filet, salt it, dry it. There were no flies before down at the beach. We just dried the fish on the rocks. We never had problems with mongoose down there. And the fish: today you show yourself and the fish scatter and go away. But before the fish didn't run away. And you had a choice of what you want to catch down there. I used to go and throw net from the horse: before I reached the beach, I would look down and say okay, the fish that I like is over there so I set my net on the horse and just walked down on the sand or at the edge of the pahoehoe, threw the net in the water.

I can recall at age six, Keakealani, a well-known Hawaiian group of people, owed my dad some money and they paid it by giving me a pony and I used to call him Boy. Because I was a boy when they brought it over and my mom said what's the horse for and they said it was for boy. So I called the horse Boy. And ever since that we had horses. My brother had one with a diamond in the front of the head. I could travel when I was six. I could go to the beach. Prior to that I was only permitted to go and cut trails.

My mom did not ride a horse, she rode a donkey. And she loved the beach. Of course she loved to work in the taro patches also. She was always trying to make ends meet so we would have food on the table. She was blinded [in one eye] I guess at the age of fifteen. And she worked real hard. She picked coffee too and she wove a lot of *lauhala*, making mats and coasters and hats. So with her one eye she did a beautiful job. Everyone - like Kimura Store - they'd order the hats and stuff, would were always coming to pick the ones she makes first. One of my sisters grew up following mom's trait. She does beautiful *lauhala* work also.

We learned from the tilling of the ground, to hunting, to carrying up the livestock and fishing and even making...see we have to pick the lauhala, we have to learn to strip it and whatever to roll it around. Strips of lauhala, we just put it aside for mom to weave. Sometimes she said come over here and learn to weave. So I learned a lot, weaving baskets and mats. What they call the wide strips, not the little strips. Before she went to bed she's weaving and when she woke up early she'd have her coffee and she'd be weaving before she got out to the yard or somewhere. When she's meditating or I would say that she'd not doing anything, you know housework, she's weaving, she's always weaving, and always trying to make some money to make ends meet. I remember she gave me a licking once, just once, because we went down to pick *lauhala* and got home with mangoes, not with lauhala. She said you know you spent all day down there, coming home with the mangoes, I didn't want mangoes, we have to make ends meet and we needed more. Well she just gave me a whack with a stick. She didn't beat me up, never did beat us up. And I told her what was more important I wanted to give her something, we didn't have any money, give her the best of the mangoes that we picked. But of course we were playing all day, eating mangoes, doing something else, not even paying attention to what we went there for. I was about fourteen or so.

Our family had a home here in Kohanaiki on the north side of Kaloko Pond. That's where Nansay Corporation wants to claim. And people or families made reservations ahead of time so if we wanted to go down to the beach we needed to go to another area because they already asked permission to be there. Sometimes we would go together but most times if they're going down there for the whole month to gather food we tried not to interfere with them. We'd go into another area.

Huehue Ranch, John MacGuire, his wife is Luka. In our family genealogy it shows Keanaaina as one of the oldest sons and then Luka and then Makahi. And so there's three brothers, three diferent names. So the Luka family were Huehue Ranch so they had a lot of ranching area. And because of being related we would go to other areas where it belonged to the ranch by lease.

We travelled with the families...it was more like the cousins getting together, just going all over the area there. It's beautiful actually. Not only going down to the ocean but going up to the mountain, camping way up in the hills.

[I'm talking] back in the forties, fifties, until today.

I recall there were times where we had to really gather food from the land. Even our planting, because of the drought, no water, sometimes we had to get the National Guard to bring in water from Kamuela or even from Hilo, bring it over to Kona. We used to put buckets in the caves, let the water drip in; we put rice bag cloths over it, let the water drip in it, and then after we'd take it and boil it for drinking. I can remember how you washed clothes one day, all the clothes, and in the same tub of water, regardless, so you start from your whites to your colored clothes. The same water, you wash, you rinse. And when we really didn't have any water we'd go down to Saint Peter's Church, or anywhere they had brackish water. And I forget the name of the bar of brown soap that you used before, that you could use in salt water. And all the kids would be there and taking the pants and the stick and pound it and turn it over. Our moms were scrubbing it. And we sort of grew up learning all these traits. It was beautiful to know. Even to teach our children today. They don't believe it's possible.

So we learned to wash our own clothes, to clean house, fix bed, everything. Everybody had to do their part because mom wasn't going to come and wash our clothes. She tells us you got to do it. I had to wash my own clothes; we knew we had to do it otherwise no one's going to...We want to go somewhere and the clothes are dirty, we just don't have clothes and if we don't have clothes then we can't go. For school, we had one pair of pants to wear for the whole day. After school, you get home you got to take it off and wear your home clothes. And the home clothes we wore was raggedty clothes. And my mom would buy clothes that were bigger than us. We asked her why? She said, when you grow up you're going to fit it. We never did. But she would buy one pants one shirt per year and we had to make sure we keep it. We hardly wore any of the shirts unless for special occasions. But it was more t-shirts or no shirt at all. Shoes were only when we went to high school. It was slippers or if we had shoes, it would be something like we had a pair for life. We cut holes because our toes were sticking too far out, and put car tires and rubber underneath and nail it.

We got our electricity I think in '56 up in Kalaoa. That's when the first television came. But prior to that it was all kerosene lanterns and lamps. And many times because of the shipments we didn't have oil to burn. We would go shopping once every two months. It depends on the government check that comes in. Because my dad when he died we were all minors.

You had to farm in order to have bread for your table. And you need to plant for money. When tourism came about - I would say in the mid-forties - there were tour cars bringing tours around the island. And we would take our vegetables or fruits picked from the wild and bring it in along side the road way and we'd have this little booth we'd be selling guava, mangoes, papayas. And it was so cheap. One mango we'd probably sell it for one cent.

We had school in Kalaoa, Honokohau. And the high school is Konawaena. That's the only high school until today. We'd catch the bus in the morning sometimes at five-thirty and we'd get home about five-thirty, six o'clock. The buses were few and then they had to do many trips and then transfer and we had to wait because the bus broke down or the driver never showed up. I know that by age fourteen, we're in high school, we had to pay ten cents a ride, to pay the bus driver to buy this scrip, tickets. But it went as far as no more money, no more money cannot ride the bus to school, so honestly we stole the tickets from the bus and gave it back to the driver.

We had a grand time and the celebrations that we would go through. [At Christmas] the celebration would go for the whole week, sometimes the whole month. You start from one house and every night you'd be going to another house. The family just goes into the different homes and have a party. And of course our parents used to drink a lot of wine and home-made brews. And played a lot of music and sang alot. And sometimes they would gather all the kids and would listen to stories. Stories of areas like Kaloko. Kaloko Pond - they claim that there is a mermaid that comes to sit on the rock close by the men's house, on the north side of the coconut grove. I still remember, my parents as we went down to spend vacation or week-end, they would do some offering on that rock there. There were bowls carved out of rocks and that was used for placing food for offering.

There was a lot of music in the evenings, especially, after everyone would finish eating, taking a bath, and clean up, and then everybody would come up with a ukulele and guitar. That's how I learned and they would sing songs. We were never tired of the songs that we sang, the old Hawaiian songs. It was always a pleasure. [The songs] come from the family and friends and it's songs that they have sung when there was no written words whatsoever. It was just songs that the old folks would just sing and how they made up their songs I really don't know. But you would find some of the lyrics or some of the words different from different parts of areas of the island. Like my grandmother, she was in her seventies when I knew her, and in the evenings she would sing her same songs over and over again. She's singing a song and letting us know how she felt. But it's the same thing over and over every evening: "The night breeze that is cold" and all of those things that she would sing from what happened during the day.

We tried to beat each other in singing falsetto. I had a brother named Abraham. He had a beautiful falsetto voice. And now his son, he has that voice. I used to sing "Akaka Falls" with the falsetto voice and my family used to be angry with me: you know that song is not supposed to be sung in falsetto tone, and I'm sorry but I'm singing it and it just flows. And that's the only song that none of my family, not even my brother Abraham, are able to sing in the falsetto tone. they were angry with me. But falsetto, in all the families, everyone tries...it's a challenge to sing better than the other ones.

My grandmother was mostly at home and she'd play her *ukulele* and I would watch and play but she would always play in the key of C, the hardest key to sing in. I like the key of F and G.

ON FAMILY TRADITIONS:

We come from a family that is called *mo'o* family which includes the eel. My oldest brother one day caught this *puhi* [eel] and he just beat it up, just pounded away because it was the only hook he had. And afterwards when he got home, according to my sister, his whole hand started to turn into scales. And when my father saw that, my father got the family together and did some kind of blessing to remove those curses that were brought to the family.

And all the artifacts that they call today were all buried down at Kaloko. And there's many at Kaloko and Honokohau that were retrieved by National Parks. And I told the archaeologists what you people know in the areas of study is not actually what the use was. We were told by our parents to have respect, because if you don't understand don't think you have the power to overcome it. So we had that as experience down at Kaloko.

Also we were told there is a lizard. I have not seen the lizard but we were told that parts of the year the water [of Kaloko Pond] would turn red. And it's the lizard having her menstruation that makes the water that way and we were asked not to go into the pond at that time.

I have seen many things that are unexplainable. And most often my mom would say, "Sha...Go 'way." She didn't want to say anything or try to explain to us anything because we'd probably be more inquisitive to do more wrong than good.

I was the last to be home in the family. In my family, when my brothers and sisters were old enough to care for themselves they woould go and stay with uncles and aunties somewhere else. And I would be the only one home. I have always been around the elders and we would talk, And I would sit around to hear. As long as you're quiet, you're not bothering, they would allow you to be around. But once you interfere they would tell you to leave. But I've learned a lot, I've asked a lot of questions, I've been dealing with many *kahunas*.

ON THE KEKAHA POPULATION:

In the Forties, there were about thirty homes from the junction of Honokohau to Huehue Ranch and then there were no more homes in between until Pu'u Wa'awa'a. The families, the majority in the home would be six. So that would be about 180 or so. I would say that by the Sixties it became smaller because everybody moved away. Few families remained but most moved away.

Everybody knew everybody. If you'd come into the area, they knew already that you were a stranger. You could hear vehicles travelling. And you could recognize every vehicle. You knew when your family was coming home because you could hear the car. Better make sure you get everything in order before they reach home. We recognized every vehicle that comes through, of people living within the community. We knew who was coming in, no matter what time of the night because they have to pass the same road in the front of the house. Oftentimes, you could just pitch your tent or your sleeping bag on the roadway. You could sleep and you could hear cars coming and you get off the road. Other than that, you could spend the whole day on the road, no cars. Especially on Sunday, nobody travels. They only go to church and go home. Sundays were a family day that after church all the families got together and went into a park for a picnic.

Our doors had no locks. The door locks were a piece of wood and a nail inside. Close the door and turn it, it keeps the door closed. No padlocks, no nothing. All of the homes were the same. Nobody locked their house.

ON TRAVEL THROUGH THE REGION:

Everything was by trails, or we'd go in a canoe in the ocean and come in. These trails go all the way up *mauka*. There's a lot of paddocks in these areas here [*mauka*]. For instance, if I would catch your cow on my property I would put it in the paddock and let you know it's over there. You have a calf and you need to go down there and brand it. I cannot steal the litter from your cow. There was a lot of honesty and some dishonesty. I could never figure out our neighbor having one cow with three calves.

We needed to cut trails, to open up the trails because we had the horses and donkeys carrying our supplies. We had to clear the lantana from the pathway. If we don't of course the donkey just goes through the lantana and everything just rips off. So it took us about a week to come down. Of course most often we'd be playing instead of cutting trails, then it took us so long to clear the trail from the top of the old Mamalahoa Highway, the old government road, all the way down to the beach area. So we'd use the Kohanaiki Road.

ON BURIALS:

There are a lot of burials in the area [lava fields]. Lot of *ali'i*. Lot of the royal guard - as we would say - for King Kamehameha in the area. When they buried one of the *ali'i* they would sacrifice themselves also. But there was one person that didn't do that. His name was Kapalu and he changed his name to Ha'ao and they couldn't locate him.

ON KEKAHA TRADITIONS:

The land in Kona there's a lot of history on it. There's a lot of *holua*, the tunnels, and this is the *holualoa*, like the name *Holualoa* [*ahupua'a*], there's a lot of caves. I used to ask grand uncles, if they cannot travel, going over the *alanui kahiko* because of the *ali'i* trail, what did they do if they had to get down to the beach. They said they went under ground, because a lot of caves goes right down into the ocean and they would swim and come out. Down at the Pine Trees, Wawahiwaa, they said there is an underwater current, fresh water goes out to the ocean and pours out. And according to National Parks findings, they claim that at one point the *heiau* [there] was on ground level and it sunk down, went underneath because of the lava flow. But Wawahiwaa is an area where because the water current pushes the fresh water out into the ocean, on the top [*mauka*] they would let the logs go and the logs would down and the canoes would come in down here and the logs would be coming up from underneath and rap the canoes. But [I asked] how come, how can you do that? They said no, they have all these sacred areas that they kind of protect. But they go up in the mountains, they cut the logs and get the logs all ready, and just drop it down in these caves and the water brings it all the way down, shooting right up to the canoes.

There's another cave that's close by to Kaloko, or Wawahiwaa, where you wouldn't think there's a cave. But that cave. if you find the entrance to it, there's water underneath, like a river. You jump in and you come out outside the ocean. Those were all stories and the funniest thing, too, I asked him, what happened? He said the warriors, also, they would go down first and as they dropped the log down they would take hold of the log and then they would ride that log out all the way too and come up and as the log would hit the canoe, because it comes out like a bullet, it would hit the canoe and they would take those guys in for prisoners.

Kohanaiki means a place of discipline and then they would discipline the prisoners and the warriors also. So they had a big *heiau* down there. The *heiau* they had down there was more of a ground level, something like two feet high, the rocks, platform. It's not to keep anyone out or in, but it's a place of discipline. They had three pillars standing close to the shore line. The middle one has fallen underneath, forward to the ocean. The one by Puhili, that one fell toward the north. The other pillar, down by Honokohau and Kaloko, that the bulldozer pushed down. The pillars were for watch towers.

[The Kohanaiki area] was more for the protection of Kamehameha, the area down here, to protect the king. The *ali'i* were from Kailua to Keauhou. The most Hawaiian warrior they would be afraid of was Kahekili coming from Maui. The archaeologists, I had to take them down there and tell them you folks were incomplete. [I told them] this is the *heiau* and this is where the *ki'i* stood. And they said there's no such thing down there and I said come go look and then I showed them the markings on the ground. [They said] we never saw that before. [I said] that's because you don't know. You think there wasn't a *heiau* here? But people took the rocks to build their stone houses, beach homes. Others [were destroyed] because of the high [surf], even Iniki, everything scattered all over. But [the archaeologist] doesn't want to change his report. Make him look silly.

There's a lot of history here. There's a place down at Makalawena which is called Waiopio. And the history books state that Kamehameha, the infant, was with his mother: they were trying to get to Maui and evidently the current wasn't in their favor, they ended up in Waipio. Actually, they didn't wind up in Waipio, they ended up in Waiopio at Makalawena. The landlord, the owner of the property there, was Akahi. Akahi was one of King Alapa'i's wives. And when she saw Keoua's wife Puiwa she knew the baby [Kamehameha] was going to be destroyed by her husband Alapa'i. Because of Makalawena being the holy ground, there was no bloodshed. King Alapa'i was not permitted to go on the premises. So they kept him there for about twelve years. They reared him in the areas of spiritual training, physical training. That's where he learned the art of what they call *lua*. So if you look in the history books you will find that every time he landed in different areas of the Hawaiian islands, all of the warriors of that island would be throwing spears to him as his got off the *wa'a* [canoe] at the shoreline and he would dodge all of the spears because of the training he got.

He had his great grandfather's pendant. What I can tell you is this: King Kahekili, he was the king of Maui all the way through O'ahu, and Puiwa were brother and sister. Now, at the marriage of Puiwa and Keoua, it was the king who slept with the sister, Kahekili slept with the sister, not Keoua. And that's when she got her name Puiwa [startled, surprised]: when she woke up that morning she found she wasn't sleeping with her husband, she was sleeping with her brother. And so the child Kamehameha was known as Paia.

Kahekili sent his *kahuna* Laea to Kohala to retrieve this child. And on the way back to Maui, of course, the spirits, the current, brought Laea, Paia, and also Puiwa to Makalawena and there Laea remained twelve years and he reared this child. Paia was not permitted to associate with any other children. But he had a friend. Paia grew up with a friend, they talked story, got together. That's how he got his name Kamehameha, because he was the lonely one, always brought up by himself, never had any friends, supposedly. After that, twelve years, he was directed to meet his grandfather Umi down at Kahalu'u, Kona. And he was given the pendant of his real father, Kahekili, and that pendant was given to Kahekili by his father. So Umi knew the pendant.

When Kamehameha was on his way, coming over the a'a field, the warriors, because he was dressed as a commoner, the warriors found him up the trail and beat him up. As he regained consciousness, he continued his journey down to Kahalu'u. And realizing that he wasn't able to get into the *hale* of Umi, the guardsman there was his good friend's father. So when he saw his friend, he told his friend to get into the house, that his friend was to distract his father. His friend distracted his father. Paia wore the pendant and as the father was distracted Paia ran into the *hale*. With the sound of his running the guardsman heard and turned and went after him. And when he got into the *hale* he threw himself down to Umi, the guardsman grabbed him from behind, grabbed his hair, yanked him up and the pendant came out. And Umi stopped and told: This is the one I was waiting for. So that's how he got his royalty recognized from that point.

Honokohau: you know the lost ship that they claim Kamehameha stole. I think the cannon is down at Honokohau, hidden under all those piles of rocks. It doesn't make sense, to have this in the middle of the [lava] field, these huge [piles of rocks]...it's not a *heiau*. I've gone on it, I tried not the feel the presence, but it's there. And I walked further down toward the ocean, then I saw all these petroglyphs, the markings of the boat, pictures of the cannon. The archaeologist there said oh no it's a boat. I said no it's not, it looks like a cannon. I think it's a cannon underneath that pile of rocks up there. It cannot be the boat. So something is hidden underneath there. If you're born in this area, you'll find... all powerful *mana*. And all the loose rocks are on the center of it, it just fell down. So there must be something hiding in there. It's on the south side of the park. Nobody seems to know what it is...But there's something hidden out there.

I think there's still a problem [people disturbing archaeological sites], a lot of people looking for artifacts, a lot of people looking for fishhooks. They have no respect, they don't understand with us the significance, the sacredness...And all they're doing is taking it, selling it to the museum and making money.

MRS. ADELLA BATES

Mrs. Adella Bates - daughter of William Keanaaina Jr. and Emily Kapānui and sister of Rev. Norman Keanaaina - was interviewed in Kona on April 17, 1996. Mrs. Bates' grandfather, William Keanaaina Sr. - leased Kaloko Pond from 1934 to 1940. Also present and participating in the interview were Mrs. Bates' sons Duane and Darryl, and her niece Cynthia Torres.

Mrs. Bates recollections of Kohanaiki and the Kekaha area of North Kona date back to the 1920s. Emendations by the interviewer appear in brackets [...]. Also in brackets are additional comments by Duane Keanaaina and Cynthia Torres.

ON MRS. BATES AND HER FAMILY:

My grandfather had a meat market in Honokohau [on Mamalahoa Highway]. He also ran his own business. He also had a grocery store. He ran the school. He had a coffee mill, dried his own coffee, and he used to sell it to American Factors down in Kailua.

I was born in Honokohau, right in back of my grandfather's store. I was raised with my grandparents and I attended school in Honokohau on Mamalahoa Highway [the old belt road].

We had another house that was up in Kalaoa, near Matsuyama Store.

Grandfather kept us busy. We were his workingmen. He didn't hire nobody. We worked for him, took care of the coffee, and grind the coffee, and dried the coffee. And he was a man that had seven different businesses. One man. He delivered meat. And he had the school bus. He had the service station. He had the store. We took care of [Kaloko] pond.

ON FAMILY TRADITIONS AND PRACTICES:

My grandfather Jacob [her step-father's father]. He would tell us the story in Hawaiian. He would tell you a story, but he would stop, left you hanging. 'Til today I don't know. He would get to the best part of the story, he would stop.

My grandmother was a weaver, she weaved *lauhala*, she was the one who taught me how to weave *lauhala*. She would tell us stories of her young days. She weaves, she quits, sew. She taught all the Japanese down where we lived [Honokohau] how to weave hats. There was Fujioka, Kurosawa, Fukuzaki, Matsumoto, Takahashi, all those Japanese ladies learned from her, all of them, how to weave.

Lauhala [weaving] I learned from my grandmother: only one hat she taught me, the rest I learned myself. And that was what we used, at that time our living was very hard, so weaving came into... I was taught very early how to prepare *lauhala* and everything, and my grandmother taught me how to weave. I started when I was age seven. And it helps a lot because it helps to support the family. That's how we bought our food, our clothing. All these things. Weaving hats, we wove hats, we sold it.

ON LIFE IN THE KEKAHA REGION:

We had water catchment. At that time, it wasn't as bad as it is now. Those days it rained for months. We'd go to school every morning and get wet by the time we get to school. I don't remember any bad droughts [in the 1920s and 30s]. We always had water, water to wash dishes, or for the plants.

We had donkeys, horse, we had pigs also. We raised pigs.

[We got around] all on foot. Barefoot. [For going over the lava fields] we'd make ti leaf shoes. You know when you're young, nothing matters, you walk all over.

ON WATER CATCHMENT IN KEKAHA:

They put gourds outside...Like Kohala, where it doesn't rain...and they put banana leaves and put it in the gourd, that's where they have their water. When it rains here, the mist or whatever, [the leaf] collects the water in the gourd, sends it right down. That's how they collected drinking water. [DUANE KEANAAINA: You find it in caves too. As you go in you find shelves of caves. These little pebbles would be on top the shelves. And the water would drip. That's where the gourd [would be]; the pebbles would balance the gourd. So every once in a while when you go through a cave system and you look, you see little pebbles just stacked up on top of these shelves. The cave would be wet on the inside wall...the pebbles hold the gourd to collect the water...Some caves you'll always find water dripping; the surface could be bone dry on the outside but inside the system water was always dripping, that's where the gourds were.]

ON FAMILY LIFE AT KALOKO POND:

I loved going [*makai*]. That was school vacation. We lived with my grandparents. Go to school at Honokohau School. Vacation at that time, we had school vacation in August. Go back to school in November. And we'd get all our things together, pack it on the animals, and then go down to Kaloko and stay down there for two months. Francis Foo had the pond and then afterwards my grandfather took over.

We had a house there [at the pond] just about three feet off the ground. There was a net house. But every now and then someone goes to Kailua to get whatever you need. Water we had to pack to Kaloko because there was no fresh water. All of us kids would carry two gallons. We'd cook with brackish water, like rice.

Our living then was simple. You taking down sugar, flour, coffee or like kokoolau tea, it wasn't fancy. We were satisfied. We collected *kiawe* [for firewood]. That's another thing we have to do down there: make sure we have enough wood, so we'd go and collect.

Stayed out months, get *pāpa'a* [sunburnt, tanned], and then we'd go back up.

Funny, in those days we had so much to do, down at Kaloko.

Isolated, no strangers. It was really good, quiet. Once in a while a family would come through, like a Filipino family would come through [from Kailua] and how'd they go back I don't know.

Then we had cousins or uncles, men that came down to help surround the fish. They would come down and help my father gather the nets so they can surround the fish and bring it up on shore. Mullet, *awa*. It was Christmas and New Year's, the only two times we would surround fish in the pond.

They used a canoe inside the pond. [DUANE KEANAAINA: You didn't want to go into the pond itself. There's something inside that bites, stings. The first fish within the net, those fish were given to the people of Kohanaiki. The second netting would be taken to Kailua by mule and then sold in the market where the Hukilau Hotel was.]

We had to work around the pond. The boys would go around and check [the part of the pond] where they had the *ohua*, what they call those little baby fish. They had one of that and then the next one was a little bigger one. They took care that; keep the pond clear. And there was the *makaha* [pond gate]. My brothers would patch it up.

We had horses [at the pond]. There were wild goats.

There was a rock down there, they called that *mo'o wahine*. Once a month, all women...my grandmother told us that. But now they say it was that red worm. But in those days they believed it was time for women. Like they have down at Makalawena; they have a rock like that.

The only kapu is for the wahine: the red *opae* pond, the *opae ula*, women not supposed to go in there. That's the only kapu I know.

You know there is a cemetery right above the house [at Kaloko Pond]. That's where I'd go all the time and I got scolding. I liked to walk on the a'a, I'd go all over, you'd wonder where I'm gone. I would get up there and see all these bones, graves. At that time, like my parents said, [grave robbers would dig for] old Hawaiian things like money...They were looking for Hawaiian money, I think. Hawaiian gold. They never found any. I was nine years old when we were kids down at Kaloko and it was all wide open way before my time period. Digging up all these places...

ON PEOPLE LIVING DOWN ON THE BEACH BEFORE THE WAR:

Those days they had people living [by Pine Trees]. They built stone houses. I don't know whether they lived down there but there were houses down there.

Then when we were there, there were a lot of people living in Honokohau. We were the only ones at Kaloko. At Honokohau, there was one of the Pai's and one other family.

ON FISHING PRACTICES:

Those days my father sent us down the beach, all of us kids. If he only wanted half a bucket of fish, that's all we catch. Half a bucket. Half an hour, or less than that, you get half a bucket. Those days fish was so plentiful. But [my father] didn't want us to waste. Only what you can eat.

[There was] pole fishing and net, throw net. But in the pond it was *'upena ku'u*, surround. But if you know how to go spearing...

[DUANE KEANAAINA: You don't see too much of this anymore but a lot of the old time fishing, the men went down into the water and built *imu* inside the water itself. The *imu* were placed in different locations throughout the coast and they were like houses where the fish would gather. You know if you walk along the fish would spook and then go underneath this *imu* and then the net would be thrown over the *imu* and then taken apart. The fish would spook again and get stuck in the throw net. Depending on which variety of fish you wanted to harvest these would collect different varieties of fish. Certain fish were hard to catch because if you went too close to the shoreline and unless you got lucky enough to catch them, they just took off. So by having these *imu* would stay in that area. The fish would come in, feed, and actually go into the *imu*. And then the nets would be thrown over the *imu*. The *imu* would be taken off. There would be one stone that caps the top of the *imu* that you would lift off and then either you would stick a stick or a coconut leaf inside and everything would come out of the *imu*.

When I fished with my uncle, what he'd do is just go along the coast and all of a sudden he'd stop and just tell you, "Okay, throw the net over there." And you'd go, "What? Why over there?" He'd just say throw the net over there so you'd throw it and then after you'd picked up the net you'd find out why because there's certain fish in that one area. Or he'd give you a face mask and tell you dive over there and go get two lobsters. And sure enough, right underneath the certain stone was where the lobsters would gather.

The fishing down there was harvested by whatever you were *ono* for. So that day if you wanted to eat *moi* you knew exactly where to go for the *moi*. If they wanted *manini* they knew exactly where to go for that. Whatever variety you wanted to eat, you'd just go and get it.]

ON TRAILS:

In 1934 and after that, we went back and forth, up and down, up and down. If we lived in Kalaoa, we would take the Kalaoa trail to go down. In Kohanaiki, the Kohanaiki. If we're down Honokohau, we would take the Honokohau trail to go down. Three ways you can go down...I don't know if the trails are still there...Now the trails they use for cars, roads to go down to the subdivision. Honokohau, I think is still there. They planted coffee both sides.

You see the trail we take from Kohanaiki to go down, there were a lot of people living, they even had a Chinese store [in the area below the old government road at the boundary of O'oma and Kohanaiki *ahupua'a*]. They even had Lau Yee store, Chinese store where he supplies everybody. I remember one time we went down this trail a bull chased me. I was faster than the bull. We had a lot of wild cows.

[There was] no problem [maintaining the trails]. Only the ones up here [*mauka* there was more vegetation] but when you come down [no problem].

[It took] forty-five minutes I guess [to reach Kaloko Pond by trail].

ON ANIMALS AND VEGETATION IN THE KEKAHA REGION:

[There were] cows and goats and donkeys.

Further *mauka* there was lantana then, when you get closer to the beach, *keawe* trees, christmasberry; in front of Kaloko Pond, it was all open, only had coconut trees.

[DUANE KEANAAINA: Medicine was also harvested from that area [the lava fields]. *Ko'oko'olau* tea was harvested all along the flats.]

Kauwila at Kaloko Pond. *'Uhaloa* is all over the lava right now. *Pili* grass. *Noni.*

They had the Hawaiian poppy. I know many, many but I don't know the name. *Mamaki,* that's what we used to make tea: *mamaki* and *ko'oko'olau. Uhi* for appendicitis. It's like a potato...they take it, clean it, grate it and that's what you have to drink.

[DUANE Keanaaina: *'Ulei* is also grown in that area. One to use for netting, for the opelu net. The other was for hula, kalaau, dancing sticks.] Good whipping stick. I never used it, though.

[CYNTHIA TORRES notes a stand of *'ōhi'a* above the present project area long Hinalani Road.]

ON CAVES IN THE LAVA FIELDS:

[In the vicinity of project area] got some beautiful caves inside.

[DUANE KEANAAINA: There are a couple of caves where you can walk right by them and not even know they're there. One of them...there's a staircase...but it's camouflaged. You actually got to get to it and go around it. If you're headed toward the sea, you'll never even see it. You have to backtrack and come around the back of it. There's a staircase that goes down into the cave itself right to the actual floor. There's another one down there but not in the Kohanaiki area. It's more toward O'oma. It's on the O'oma boundary. Within that cave the walls are [filled] with petroglyphs.]

ON WALLED AREAS IN THE LAVA FIELDS:

I think half of those walls you see around, like the square walls you see around, I think it's for planting potatoes...keep the animals out. Because we have a place up there where we lived, we made walls around so the cows won't come in. But they do anyway. And for pigs: like potatoes, they like to eat, they know when it's time to cultivate, they come right in.

Like down in the lava, I think when you see those walls I think it's just a place where they can keep their wild goats...

But those days I don't think it was overgrown like it is today. Because my father's days, he sits on the porch and he can look down with his glasses (what do you call those glasses?) and check on his goats...Those days you just look down, it's so clear. You can see people down, or whatever...

ON NORTH-SOUTH TRAVEL BETWEEN KOHALA AND KAILUA:

What they call the [*mauka*] government road, that's the road I think they would usually take. Down here [*makai* along the coast] was hardly anybody.

It was mostly our family that would go down there [to the pond] even after we did have [the lease] to the pond [after 1940]. We were still going down there and take care, like by what they call Wahi waa, what they call Pine Trees. We'd go down there, we'd camp.

Traffic Analysis Report for the Proposed Kaloko Town Center

The Traffic Management Consultant, May 28, 1996

TRAFFIC ANALYSIS REPORT
FOR THE PROPOSED

KALOKO TOWN CENTER

PREPARED FOR

TOKYO GREEN HAWAII, INC.

May 28, 1996

RANDALL S. OKANEKU
LICENSED PROFESSIONAL ENGINEER
No. 4922-C
HAWAII, U.S.A.

PREPARED BY

TMC

THE TRAFFIC MANAGEMENT CONSULTANT

RANDALL S. OKANEKU, P. E., PRINCIPAL • 1188 BISHOP STREET, SUITE 1907 • HONOLULU, HAWAII 96813

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT'D.)

TABLE OF CONTENTS (CONT'D.)

LIST OF FIGURES

LIST OF TABLES

TRAFFIC IMPACT ANALYSIS REPORT FOR THE PROPOSED

KALOKO TOWN CENTER

I. Introduction

A. Purpose of Study

The purpose of this study is to identify the traffic impacts resulting from the urban reclassification of 224.43 acres, herein referred to as Kaloko Town Center, in North Kona, Hawaii. The petition area is identified as Tax Map Key 7-3-9:17.

B. Scope of Study

The scope of this study includes:

1. Description of the proposed project.
2. Description of the study area and existing land uses.
3. Evaluation of existing roadway and traffic conditions.
4. Description of the project environs, relative to proposed projects and related future and ongoing roadway improvements.
5. Evaluation of future roadway and traffic conditions without the proposed project, and the development of alternative improvements to meet future highway needs.
6. Development of trip generation characteristics of the subject project, using generally accepted techniques developed by the Institute of Transportation Engineers.
7. Estimation of future traffic with the proposed project.
8. The identification and analysis of traffic impacts resulting from the proposed project.
9. Recommendation of improvements that would mitigate the traffic impacts resulting from the development of the proposed project.

C. Project Description

The Kaloko Town Center is located in the northeast quadrant of the intersection of Queen Kaahumanu Highway and Hina Lani Drive, immediately north of the existing Kaloko Light Industrial Subdivision. Figure 1 depicts the vicinity of the proposed project. Access is proposed on Hina Lani Drive via Road B, which is proposed to be located opposite Road F. Direct access on Queen Kaahumanu Highway is also proposed at an at-grade intersection, located approximately 2,000 feet north of Hina Lani Drive. Figure 2 depicts the proposed development plan.

The proposed project consists of mixed uses, including commercial and residential land use activities. A school site is also located within the project. The residential development includes 370 single-family dwelling units (DU) and 480 multi-family dwelling units. The commercial activities include office space and retail uses. A total of 37 acres is analyzed as retail-commercial activities. A 20-acre site is analyzed as mixed commercial, 25% office and 75% retail activities. The assumed density for the office uses is 15,000 square feet (SF) of gross floor area (GFA) per acre and the retail density is assumed to be 11,000 square feet of gross floor area per acre. Table 1 summarizes the proposed development plan.

Table 1. Development Plan

Land Use	Acres	Land Use Intensity
Single-Family Residential	80	370 DU
Multi-Family Residential	48	480 DU
Retail	52	572,000 SF GFA
Office	5	75,000 SF GFA
School	13	200 Students

The project development is expected to commence in the Year 2000 and be completed by the Year 2020. This traffic impact analysis is based upon full build-out and occupancy in the Year 2020.

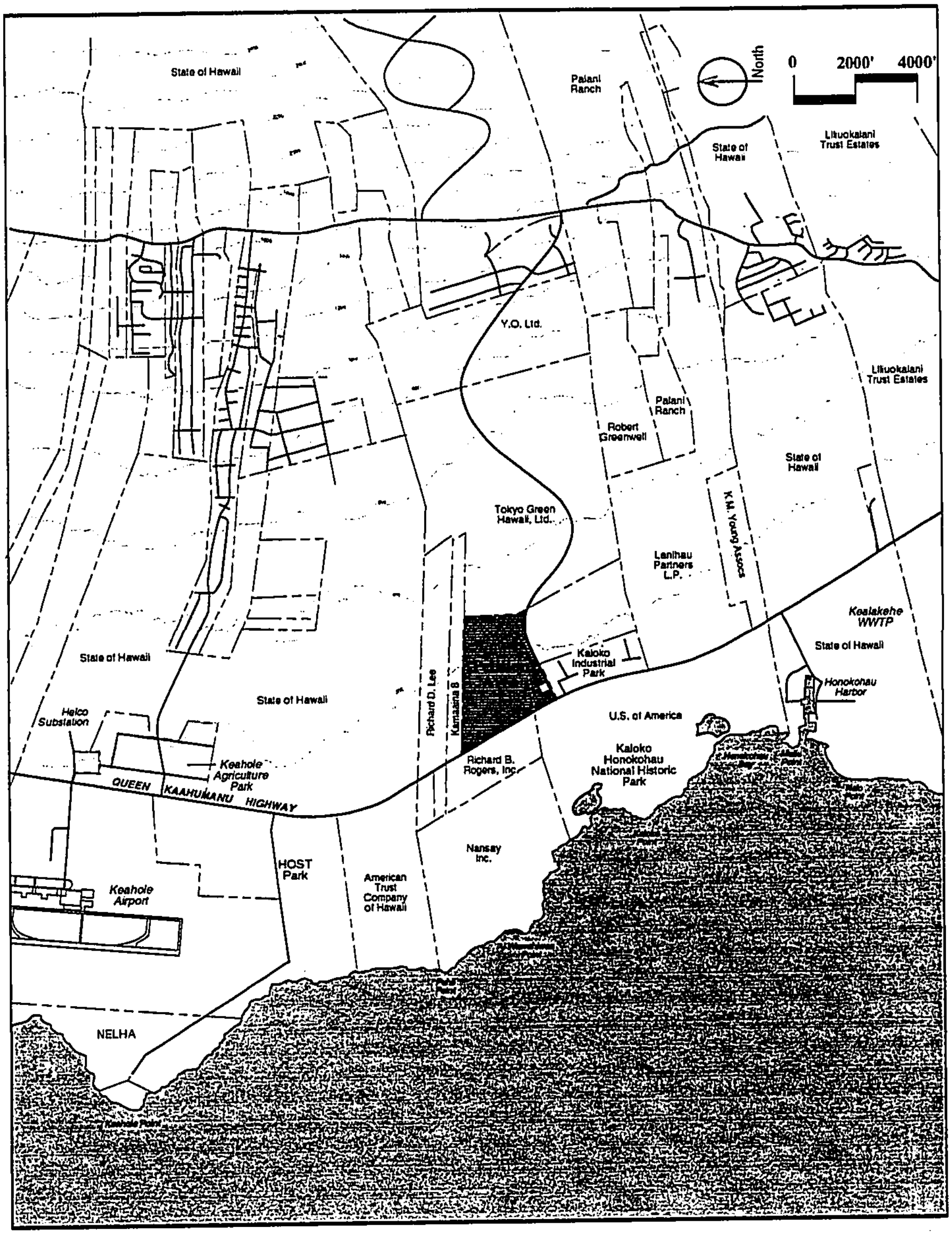


Figure 1. Keahole to Kailua Region

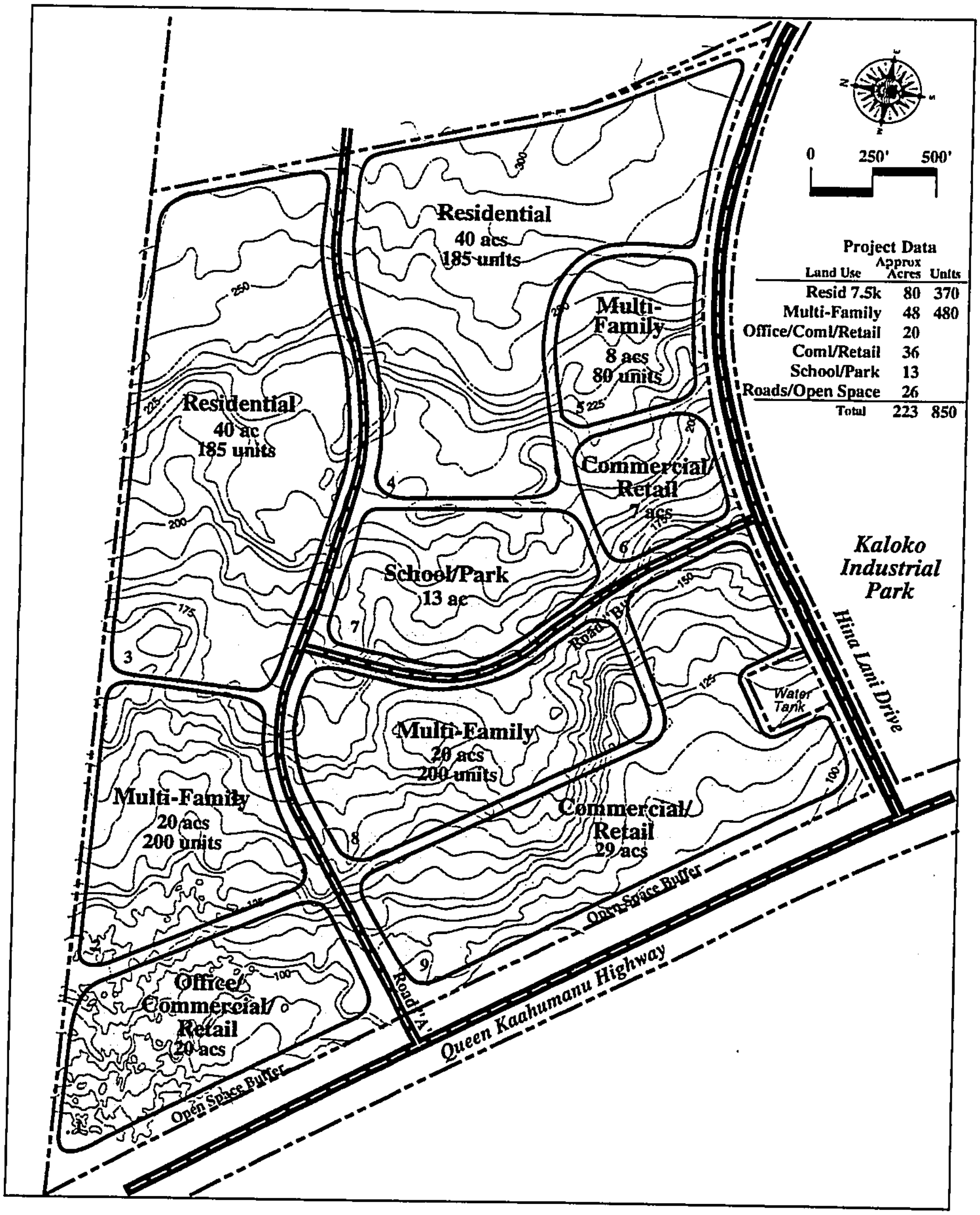


Figure 2. Kaloko Town Center Master Plan

II. Existing Conditions

A. Area Roadway System

Queen Kaahumanu Highway is a two way, two lane, high quality arterial highway between Kailua-Kona and Kawaihae. Queen Kaahumanu Highway is the primary highway along the South Kohala and North Kona coasts. Exclusive left turn and right turn lanes are provided on Queen Kaahumanu Highway at key intersections, such as at Keahole Airport Access Road and at Hina Lani Drive. Left turn median storage lanes and right turn acceleration lanes are also provided at these intersections. These intersections are unsignalized at this writing.

Mamalahoa Highway is a two lane, two way arterial highway that is a continuation of a "belt" road that circles the island of Hawaii. Mamalahoa Highway is located approximately 3.3 miles mauka of Queen Kaahumanu Highway. Mamalahoa Highway provides the primary route between Waimea and Kailua-Kona.

Hina Lani Drive is a two-way, two-lane collector roadway, located about 3.2 miles south of the Keahole Airport Access Road. Hina Lani Drive provides mauka-makai (east-west) access between Queen Kaahumanu Highway and Mamalahoa Highway. Hina Lani Drive intersects Queen Kaahumanu Highway at a stop-controlled, Tee-intersection.

Kanalani Street is a two-lane, two-way local roadway providing access to the Kaloko Light Industrial Subdivision. Kanalani Street intersects Hina Lani Drive at a stop-controlled, Tee-intersection.

Road F is a two-lane, two-way local roadway providing access to the Costco Store. Road F intersects Hina Lani Drive at a stop-controlled, Tee-intersection.

B. Existing Traffic Volumes and Operating Conditions

1. General

The field investigation was conducted on November 20, 1995 between the hours of 6:00 AM and 9:00 AM during the morning peak period of traffic, and between the hours of 2:30 PM and 5:30 PM during the afternoon peak period of traffic.

The following intersections were surveyed:

- Queen Kaahumanu Highway and Hina Lani Drive
- Hina Lani Drive and Kanalani Street
- Hina Lani Drive and Road F
- Mamalahoa Highway and Hina Lani Drive

Additional traffic count data were obtained from the State Department of Transportation (DOT). The existing daily traffic count data were taken from DOT Traffic Count Station No. T-8-M, Queen Kaahumanu Highway, about 1.5 miles north of the project site; and Station No. C-8-D, Queen Kaahumanu Highway at Kealakehe Parkway, which is located about 2 miles south of the project site; and Station No. 9, Mamalahoa Highway at Palani Road and Old Mamalahoa Highway, located about 1,000 feet south of Hina Lani Drive. The traffic data were collected on June 29-30, 1994, July 19-20, 1994, and July 13-14, 1994, respectively. North of the project site, Queen Kaahumanu Highway carries about 13,000 vehicles per day, total for both directions. To the south, Queen Kaahumanu Highway carries about 19,000 vehicles per day, total for both directions. In the vicinity of Hina Lani Drive, Mamalahoa Highway carries about 10,000 vehicles per day, total for both directions.

2. Capacity Analysis Methodology

The highway capacity analysis performed for this study is based upon procedures presented in the "Highway Capacity Manual" (HCM), Special Report 209, Transportation Research Board, and the "Highway Capacity Software", Federal Highways Administration.

Level of Service (LOS) is defined as "a qualitative measure describing operational conditions within a traffic stream". Several factors are included in determining LOS such as: speed, delay, vehicle density, freedom to maneuver, traffic interruptions, driver comfort, and safety. LOS "A", "B", and "C" are considered satisfactory levels of service. LOS "D" is generally considered a "desirable minimum" operating level of service. LOS "E" is an undesirable condition and LOS "F" is an unacceptable condition.

Another level of analysis for signalized intersections, relating traffic volumes to intersection capacity, is presented in the HCM as the "planning analysis" method. The planning method is a broad measure of traffic operations at an intersection, where the details of the traffic signal design and operation, intersection geometrics, and vehicle type distribution of traffic are not available. Three categories are used: "under capacity", "near capacity", and "over capacity". Under capacity conditions indicate that critical traffic volumes would virtually always be below the intersection's capacity. Near capacity conditions require engineering judgment as to whether or not intersection improvements would be required, especially when critical traffic volumes approach over capacity conditions. Over capacity conditions indicate that the intersection capacity will be exceeded in most cases and the intersection would require geometric improvements. The purpose of this analysis is to determine the adequacy of intersection geometrics, i.e., number of through and turning lanes required, under given traffic demands.

3. Existing AM Peak Hour Traffic

The AM peak hour of traffic generally occurs between 7:00 AM and 8:00 AM. The intersections within the study area operate at satisfactory Levels of Service during the existing AM peak hour of traffic. North of Hina Lani Drive, Mamalahoa Highway carries about 900 vehicles per hour (vph), total for both directions, and operates at LOS "E". Queen Kaahumanu Highway, in the vicinity of the project, carries about 1,100 vph and operates at LOS "D" during the existing AM peak hour of traffic. Figure 3 depicts the AM peak hour of traffic and results of the capacity analysis.

4. Existing PM Peak Hour Traffic

The PM peak hour of traffic on Queen Kaahumanu Highway generally occurs between 3:45 PM and 4:45 PM. The left turn movement on mauka bound Hina Lani Drive operates at LOS "D" at Mamalahoa Highway. The remaining intersections within the study area operate at satisfactory Levels of Service during the existing PM peak hour of traffic. North of Hina Lani Drive, Mamalahoa Highway carries 880 vph, total for both directions, and operates at LOS "E", during the existing PM peak hour of traffic. Queen Kaahumanu Highway, in the vicinity of the project, carries about 1,600 vph and operates at LOS "E" during the existing PM peak hour of traffic. Figure 4 depicts the PM peak hour of traffic and results of the capacity analysis.

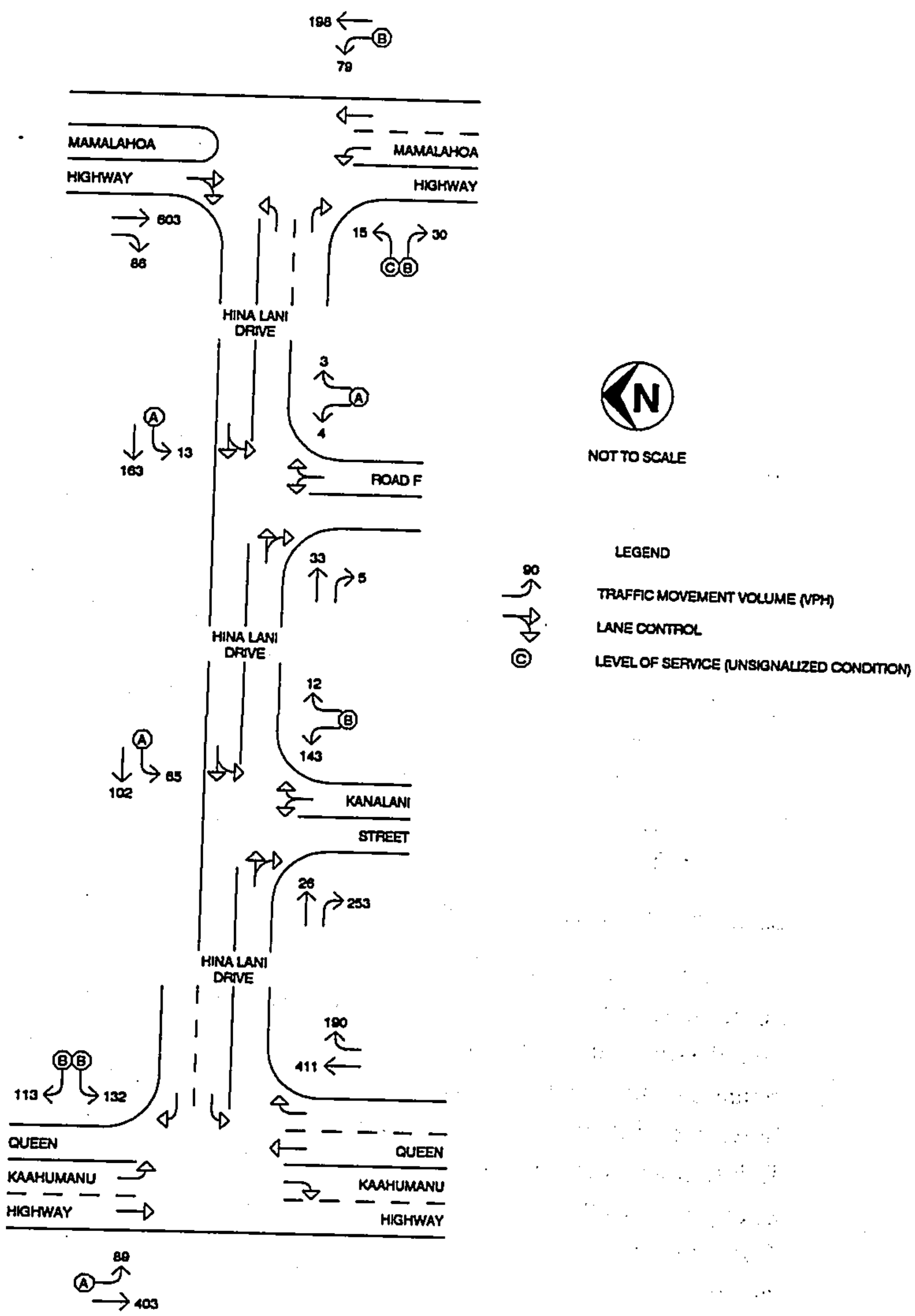


Figure 3. Existing AM Peak Hour Traffic

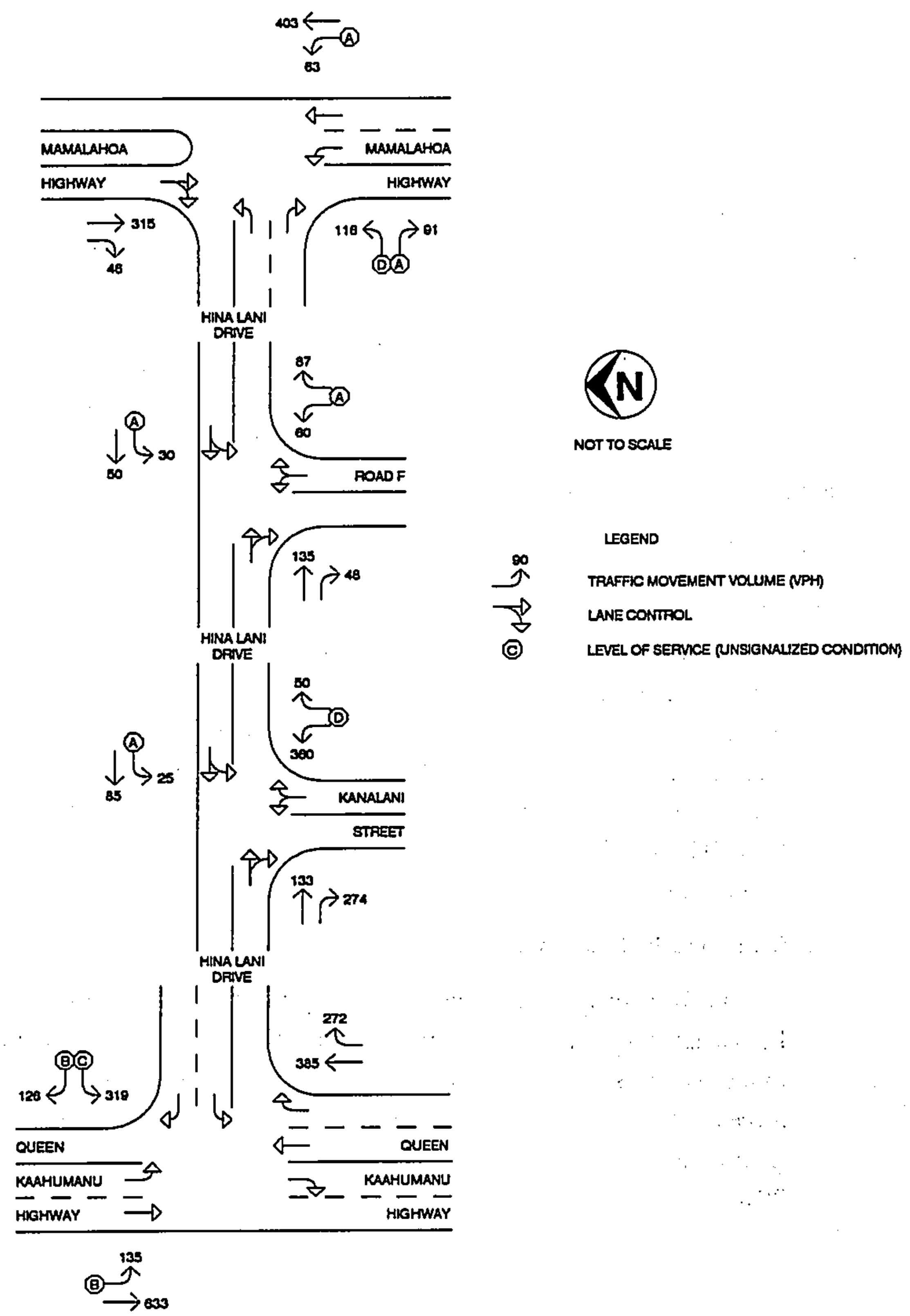


Figure 4. Existing PM Peak Hour Traffic

III. Projected Traffic

A. External Traffic

The Land Transportation Master Plan for Hawaii County (LTMPHC) is being prepared by the State Department of Transportation (DOT) at this writing. The transportation plan would evaluate the regional transportation needs, based upon updated Statewide population and employment forecasts to the Year 2020. The LTMPHC estimates that the Year 2020 average daily traffic on Queen Kaahumanu Highway would increase to 29,300 vehicles per day between Keahole and Kealakehe. The Year 2020 average daily traffic on Mamalahoa Highway is expected to increase to 18,400 vehicles per day. The Year 2020 traffic projections on Queen Kaahumanu Highway and Mamalahoa Highway represents a 3.44% annual increase in regional traffic.

B. Anticipated Future Development

1. General

The trips, generated by the proposed projects along Hina Lani Drive, are added to the background growth in traffic in the region. The development schedule for projects along Hina Lani Drive is based upon the land use forecast developed for the "Draft Keahole to Kailua Development Plan", being prepared by County of Hawaii Planning Department. State DOT's LTMPHC traffic forecast is assumed to include all the future development beyond the immediate vicinity of the proposed Kaloko Town Center.

2. Kaloko Industrial Park

The Kaloko Industrial Park is an expansion of the existing Kaloko Light Industrial Subdivision. Approximately 127 acres are planned for light industrial uses, located mauka of the existing light industrial subdivision. Access would be provided on Hina Lani Drive. For the purpose of this traffic impact analysis, it is assumed that 50 acres will be developed by the Year 2020.

3. **Kaloko Subdivision**

Y.O. Ltd. is planning a residential development along the mauka section of Hina Lani Drive. The 400-acre property would ultimately contain a total of 2,154 single-family and multi-family dwelling units. For the purpose of this traffic impact analysis, it is assumed that 320 single-family dwelling units and 80 multi-family dwelling units will be developed by the Year 2020.

4. **Kama'aina Eight Industrial Subdivision**

The Kama'aina Eight Industrial Subdivision is planned on a 70-acre property located immediately north of the Kaloko Town Center project. Access is planned at an at-grade channelized intersection on Queen Kaahumanu Highway. The mauka boundary of the project site fronts the proposed Mid-Level Arterial.

5. **Honokohau Light Industrial Project**

The Honokahau Light Industrial Project, also known as the McLean-Isemoto project, has received County zoning approvals. The project site is located on the mauka side of Queen Kaahumanu Highway, immediately north of the Villages of La'i'opua. Access is provided on Queen Kaahumanu Highway

6. **Lanihau Partners/Palani Trust**

The Lanihau Partners/Palani Trust property is a 630-acre area, located immediately south of the Kaloko Industrial Subdivision. The master plan contains residential, commercial, and industrial uses. Planning is in the conceptual stages at this writing. All north-south collector roadways in the Keahole to Kailua Development Plan pass through the Lanihau Partners/Palani Trust property.

7. **Kohanaiki Resort**

The "Traffic Impact Analysis Update for the Kohanaiki Resort Development", September 27, 1990, was prepared for Nansay Hawaii, Inc. The proposed Kohanaiki Resort is located on the makai side of Queen Kaahumanu Highway, opposite the Kaloko Town Center. The proposed Kohanaiki Resort consists of 2,200 hotel rooms and resort condominium units, 210 single-family residential dwelling units, commercial village, and an

18-hole golf course. Access to Phase I (900 hotel and resort units) is proposed via an unsignalized at-grade intersection on Queen Kaahumanu Highway, located about 1 mile north of Hina Lani Drive. The Kohanaiki Resort project is expected to generate 1,320 vph during the PM peak hour of traffic. The M&E Report proposes a fully channelized, at-grade intersection at their project access for its Phase I development.

8. Kealakehe Planned Community (Villages of La'i'opua)

The "Traffic Impact Assessment Report for Kealakehe Planned Community", July 1990, was prepared for State of Hawaii Housing Finance & Development Corporation (HFDC). The 960-acre development includes 4,379 residential dwelling units, a golf course, two school sites, civic center, and three commercial areas, totaling 26 acres. The HFDC project is expected to generate a total of 5,021 vph during the AM peak hour and 6,636 vph during the PM peak hour. The HFDC traffic study concludes that by the Year 2010, two-lane Queen Kaahumanu Highway and two-lane Mamalahoa Highway would operate at LOS "F" during the AM and PM peak hours.

9. Keahole Airport Expansion

The "Keahole Airport Traffic Circulation Plan", September 1990, was prepared for the State Department of Transportation as part of the development of the Keahole Airport Master Plan. By the Year 2005, the Keahole Airport is expected to generate 3,300 vehicles per hour (vph) during the airport peak hour of traffic. The airport traffic study recommends that access to Keahole Airport be provided by separate one-way roadways. Access onto Queen Kaahumanu Highway would be provided by grade-separated on and off-ramps providing makai access only at each one-way roadway. The airport access recommendation has since been revised to provide for the expansion to a full service interchange that also would provide access to the mauka area. The Keahole Airport traffic study also recommends that interim access should be provided by signalizing the existing intersection.

10. West Hawaii State Lands

The West Hawaii State Lands consists of approximately 2,640 acres in North Kona, Hawaii. The site is located on the mauka (east) side of Queen Kaahumanu Highway, opposite the Keahole Airport. Its northern most boundaries are located approximately one mile north of the Keahole Airport Access Road. The State Lands extend southward, about two miles south of Keahole Airport Access Road. The frontage of the State Lands on Queen Kaahumanu Highway begins near the Keahole Airport Access Road and extends about one mile to the north. The highway frontage of State Lands on Queen Kaahumanu Highway begins about 1 mile north of Hina Lani Drive and extends another mile and one half to the north. The State Lands extend up to 2.7 miles mauka of Queen Kaahumanu Highway.

The proposed plan for the State Lands has not been developed at this writing. In general, the proposed project would include urban activities including, but not limited to, residential, commercial, industrial, and institutional land uses. A West Hawaii University of Hawaii campus is also proposed within limits of the State Lands.

11. Hawaii Ocean Science & Technology Park and Natural Energy Laboratory of Hawaii (NELH)

The "Traffic Impact Study for a Natural Energy Laboratory of Hawaii Authority Project" (NELHA) in Kailua-Kona Hawaii, June 1992, was prepared for NELHA. The NELHA Study analyzes the traffic impacts resulting from the Hawaii Ocean Science & Technology (HOST) Park and Natural Energy Laboratory of Hawaii. The HOST/NELH project is located immediately south of Keahole Airport, on the makai side of Queen Kaahumanu Highway. The HOST/NELH project is expected to generate an additional 95 vph and 89 vph during the AM and PM peak hours of traffic, respectively. The NELHA study concludes that the projected 1997 peak hour traffic demands on Queen Kaahumanu Highway would exceed the existing two lane capacity. Project access is proposed at a fully channelized, at-grade signalized intersection. The NELHA traffic study indicates that at-grade signalized access would be feasible only if Queen Kaahumanu Highway is widened to four lanes to accommodate future through traffic.

C. Anticipated Future Roadway Improvements

1. General

The Queen Kaahumanu Highway Widening and the Kealakehe Parkway can be considered "committed" projects by the State Department of Transportation. According to State DOT, the Queen Kaahumanu Highway widening, between Kailua-Kona and the Keahole Airport, will be completed by the Year 2000. The Kealakehe Parkway is expected be completed as part of the development of the Villages of La'i'opua. For the purpose of this analysis, only these committed State DOT projects are assumed to be constructed by the Year 2020. The widening of Mamalahoa Highway to a four-lane, undivided highway, between Waimea and Palani Road, is being considered in the ongoing LTMPHC. The other roadways contained in the Keahole to Kailua Development Plan are expected to be constructed as development occurs within the region.

2. Queen Kaahumanu Highway Widening

The "Draft Environmental Assessment for the Queen Kaahumanu Highway Widening" (EA) was completed by State DOT in January 1996. Queen Kaahumanu Highway is proposed to be widened from a two-lane highway to a four-lane, divided highway from Henry Street in Kailua-Kona to the Keahole Airport Access Road. By the Year 2010 the highway corridor, south of Hina Lani Drive, is expected to carry about 47,000 vehicles per day, total for both directions.

The Draft EA also considered the alternative of constructing a four-lane, controlled-access freeway with grade-separated interchanges and a system of frontage roads. The freeway concept was rejected since the traffic projections did not justify the alternative within the time frame of that study.

The intersection of Queen Kaahumanu Highway and Hina Lani Drive is proposed to be signalized. Queen Kaahumanu Highway at Hina Lani Drive would consist of two through lanes in each direction with an exclusive left turn lane in the southbound direction, an exclusive right turn lane in the northbound direction, a bicycle lane in northbound direction, and a bicycle route/paved shoulder in the southbound direction. The existing two-lane highway would become the northbound through lanes of the highway improvements. The median and southbound lanes would be constructed on the makai (west) side of the existing highway. The proposed improvements are expected to be constructed within the existing 300-foot right-of-way.

3. **Kealakehe Parkway**

The first phase of the Kealakehe Parkway has been completed, as part of the development of HFDC's Villages of La'i'opua. The makai portion of Kealakehe Parkway will provide access to the initial phases of the Villages of La'i'opua and the proposed Kealakehe High School. Kealakehe Parkway is ultimately proposed as four-lane arterial roadway through the Kealakehe area between Mamalahoa Highway and Queen Kaahumanu Highway.

4. **Mamalahoa Highway**

The widening of Mamalahoa Highway from a two-lane to a four-lane highway is proposed as an alternative in the preliminary LTMPHC. The final preferred plan and the priority listing of the proposed highway improvements are not available at this writing.

5. **Keahole to Kailua Development Plan**

The "Keahole to Kailua Development Plan" (K-K Plan), April 1991, was prepared for the County of Hawaii Planning Department. The K-K Plan is intended to guide the urbanization of the region between Keahole Airport and Kailua-Kona. The roadway plan, proposed in the K-K Plan, includes four new roadways which may affect the proposed project by providing north-south access, in addition to Queen Kaahumanu Highway and Mamalahoa Highway.

The Mid-Level Arterial would run roughly parallel to Queen Kaahumanu Highway, beginning at Palani Road and extending north of the Keahole to Kailua region. The alignment for the Mid-Level Arterial is located above the east (mauka) boundary of the Kaloko Town Center, about one mile mauka of Queen Kaahumanu Highway. The Mid-Level Arterial is classified as a four-lane minor arterial with a 120-foot right-of-way.

Waena Drive is a four-lane, north-south collector roadway, beginning at Palani Road and extending north of the Keahole to Kailua region. Waena Drive would be located mauka of and parallel to the Mid-Level Arterial. The section of Waena Drive between Palani Road and Kealakehe Parkway is planned as part of the Villages of La'i'opua.

Kealakaa Drive Extension is the third major north-south planned roadway, located the furthest mauka in the Keahole to Kailua region. The existing Kealakaa Drive would be extended to the north of the Keahole to Kailua region, parallel to Waena Drive. Kealakaa Drive Extension is envisioned to be a four-lane undivided roadway.

Main Street is planned as a minor collector roadway between Kealakehe Parkway and Hina Lani Drive. A five lane roadway is envisioned, two through lanes in each direction and a median left turn lane, providing for left turn movements to driveways along Main Street.

D. Year 2020 Peak Hour Traffic Analysis Without the Project

1. General

The purpose of analyzing the future traffic conditions without the proposed project is to establish the base line conditions from which to assess the traffic impacts resulting from the proposed project. The travel forecast is assigned to the planned highway network to develop future traffic conditions without the proposed project.

This traffic analysis is based upon the assumption that the Queen Kaahumanu Highway Widening Project, between Kailua-Kona and the Keahole Airport, would be completed by the Year 2020. This analysis does not take into account the construction of any future north-south roadways, as described in the Keahole to Kailua Development Plan. Access to Hina Lani Drive would continue to be provided by an upgraded Queen Kaahumanu Highway and Mamalahoa Highway.

The following improvements are assumed to be implemented under the State DOT-proposed Queen Kaahumanu Highway Widening Project:

a. Queen Kaahumanu Highway is assumed to be widened from two lanes to four lanes between Kailua and the Keahole Airport.

b. The intersection of Queen Kaahumanu Highway and Hina Lani Drive is expected to be signalized.

c. Queen Kaahumanu Highway at Hina Lani Drive is assumed to be upgraded to provide an exclusive left turn lane in the southbound direction and an exclusive right turn lane in the northbound direction.

2. AM Peak Hour Traffic Analysis Without the Proposed Project

The four-lane Queen Kaahumanu Highway is expected to operate at LOS "A" during the 2020 AM peak hour without the proposed project. The intersection of Queen Kaahumanu Highway and Hina Lani Drive is expected to operate at "under capacity" conditions with traffic signalization.

The two-lane Mamalahoa Highway is expected to operate at LOS "F" during the 2020 AM peak hour without the proposed project. The left turn movement from mauka bound Hina Lani Drive to northbound Mamalahoa Highway is expected to operate at LOS "F" under unsignalized conditions.

The left turn movement from Kanalani Street onto Hina Lani Drive is expected to operate at LOS "D". Figure 5 depicts the Year 2020 AM peak hour traffic without the proposed project and results of the capacity analysis.

3. PM Peak Hour Traffic Analysis Without the Proposed Project

During the Year 2020 PM peak hour of traffic, Queen Kaahumanu Highway is expected to operate at LOS "B". The signalized intersection of Queen Kaahumanu Highway and Hina Lani Drive is expected to continue to operate at "under capacity" conditions.

Mamalahoa Highway is expected to operate at LOS "E" during the 2020 PM peak hour without the proposed project. The left turn movement from mauka bound Hina Lani Drive to northbound Mamalahoa Highway is expected to continue to operate at LOS "F".

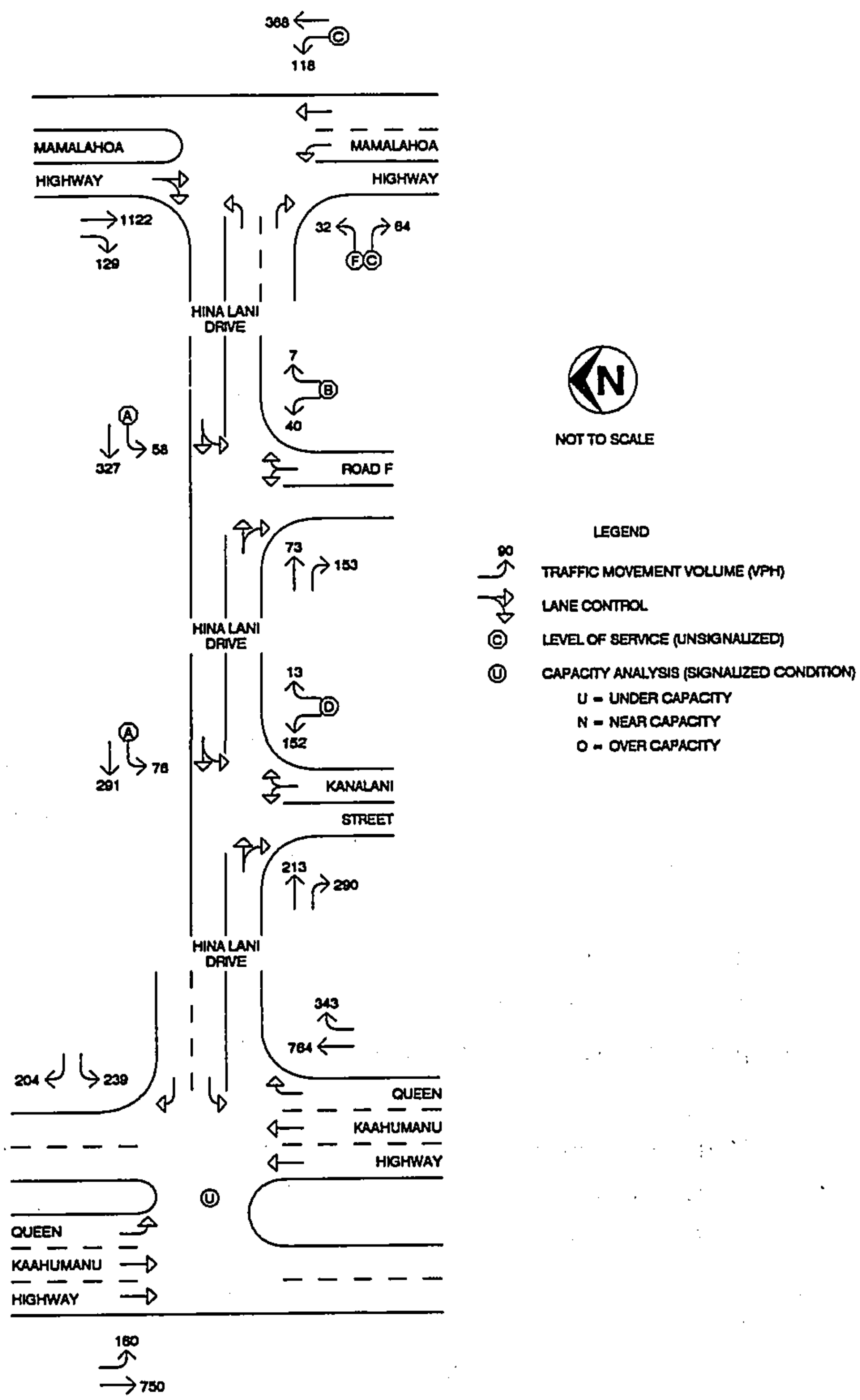


Figure 5. Year 2020 AM Peak Hour Traffic Without Project

The left turn movement from Kanalani Street onto Hina Lani Drive also is expected to operate at LOS "F". Figure 6 depicts the Year 2020 PM peak hour traffic without the proposed project and results of the capacity analysis.

E. Trip Generation

1. Methodology

The trip generation methodology used in this study is based upon generally accepted techniques developed by the Institute of Transportation Engineers (ITE) and published in "Trip Generation", 5th Edition, 1991. The ITE trip rates for commercial and residential activities are developed by correlating the vehicle trip generation data with various land use characteristics, such as vehicle trips per 1,000 square feet of gross leaseable floor area or vehicle trips per dwelling unit.

2. Trip Generation Characteristics

The commercial mix is based upon the preliminary market assessment for the proposed project. Of the total 57 acres of commercial area planned for the site, 52 acres would contain a variety of retail-commercial activities. The remaining 5 acres would be occupied by general office building(s). The assumed density for the office uses is 15,000 square feet of gross floor area per acre and the retail density is assumed to be 11,000 square feet of gross floor area per acre.

The proposed Kaloko Town Center is expected to generate a total of 1,094 vehicles per hour (vph) during the AM peak hour and 2,740 vph during the PM peak hour. Table 2 summarizes the trip generation characteristics for the proposed development of the Kaloko Town Center.

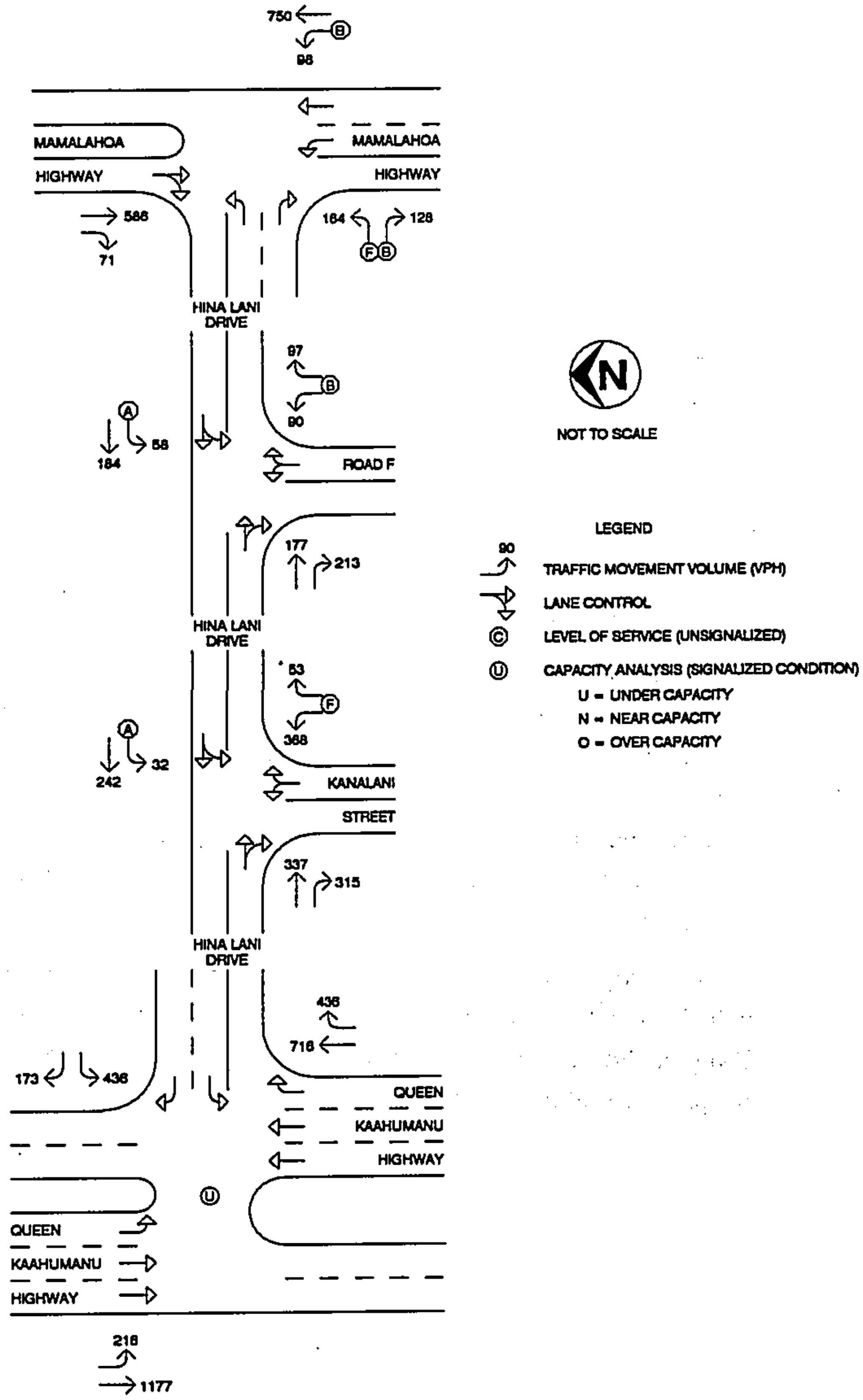


Figure 6. Year 2020 PM Peak Hour Traffic Without Project

Table 2. Trip Generation Summary							
Land Use	Land Use Intensity	AM Peak Hour Traffic (vph)			PM Peak Hour Traffic (vph)		
		Enter	Exit	Total	Enter	Exit	Total
Single - Family Dwellings	370 DU	65	186	251	228	123	351
Multi - Family Dwellings	480 DU	30	146	176	149	77	226
Retail	52 Acres	286	168	454	937	997	1,994
Office	5 Acres	136	17	153	26	125	151
School	13 Acres	36	24	60	8	10	18
	Totals	553	541	1,094	1,408	1,332	2,740

IV. Traffic Impact Analysis

A. Proposed Traffic Improvements

1. General

The roadway improvements, discussed in the following sections, are assumed to be constructed by the Year 2020 and are included in this traffic impact analysis. The traffic improvements "by others" are based upon expected highway deficiencies without the proposed project. They are expected to be constructed by State DOT or in conjunction with other developments planned along Hina Lani Drive. The "project-related" traffic improvements are associated with access improvements required by the proposed project.

2. **Traffic Improvements By Others**

   a. The intersection of Hina Lani Drive and Kanalani Street is expected to be signalized to mitigate LOS "F" conditions expected during the Year 2020 PM peak hour of traffic without the proposed project. Hina Lani Drive is assumed to be widened at Kanalani Street to provide an exclusive right turn lane in the mauka bound direction and an exclusive left turn lane in the makai bound direction. Kanalani Street is expected to be widened at Hina Lani Drive to provide separate left turn and right turn lanes at Hina Lani Drive.

   b. Mamalahoa Highway is assumed to be signalized at its intersection with Hina Lani Drive to mitigate LOS "F" conditions expected during the Year 2020 AM and PM peak hours of traffic without the proposed project. Southbound Mamalahoa Highway is expected to be widened to provide an exclusive right turn lane at Hina Lani Drive.

3. **Project Access Improvements**

   a. The intersection of Queen Kaahumanu Highway and Road A should be signalized, when it becomes warranted.

   b. Queen Kaahumanu Highway should be widened to provide an exclusive left turn lane in the southbound direction and an exclusive right turn lane in the northbound direction at Road A.

   c. Hina Lani Drive should be widened at Road B to provide an exclusive left turn lane in the mauka bound direction and an exclusive right turn lane in the makai bound direction.

   d. The intersection of Hina Lani Drive and Road B should be signalized, when it becomes warranted.

   e. Southbound Hina Lani Drive should be widened to provide dual left turn lanes at Queen Kaahumanu Highway.

B. Year 2020 Peak Hour Traffic Impact Analysis With the Proposed Project

1. AM Peak Hour Traffic Impact Analysis

The Year 2020 AM peak hour traffic volumes with the proposed project and the results of the capacity analysis are depicted on Figure 7. The intersection of Mamalahoa Highway and Hina Lani Drive is expected to operate at "near capacity" under signalized conditions. Mamalahoa Highway is expected to continue to operate at LOS "F". Queen Kaahumanu Highway continues to operate at satisfactory LOS during the Year 2020 AM peak hour of traffic with the proposed project.

2. PM Peak Hour Traffic Impact Analysis

The Year 2020 PM peak hour traffic volumes with the proposed project and results of the capacity analysis are depicted on Figure 8. The intersection of Mamalahoa Highway and Hina Lani Drive is expected to continue to operate at "near capacity" under signalized conditions. Mamalahoa Highway is again expected to operate at LOS "F". Queen Kaahumanu Highway is expected to operate at satisfactory LOS during the Year 2020 PM peak hour of traffic with the proposed project.

V. Recommendations and Conclusions

A. Recommendations

1. Traffic Improvements By State DOT

a. Queen Kaahumanu Highway should be widened from two lanes to four lanes between Kailua and the Keahole Airport.

b. The intersection of Queen Kaahumanu Highway and Hina Lani Drive should be be signalized.

c. Queen Kaahumanu Highway at Hina Lani Drive should be upgraded to provide an exclusive left turn lane in the southbound direction and an exclusive right turn lane in the northbound direction.

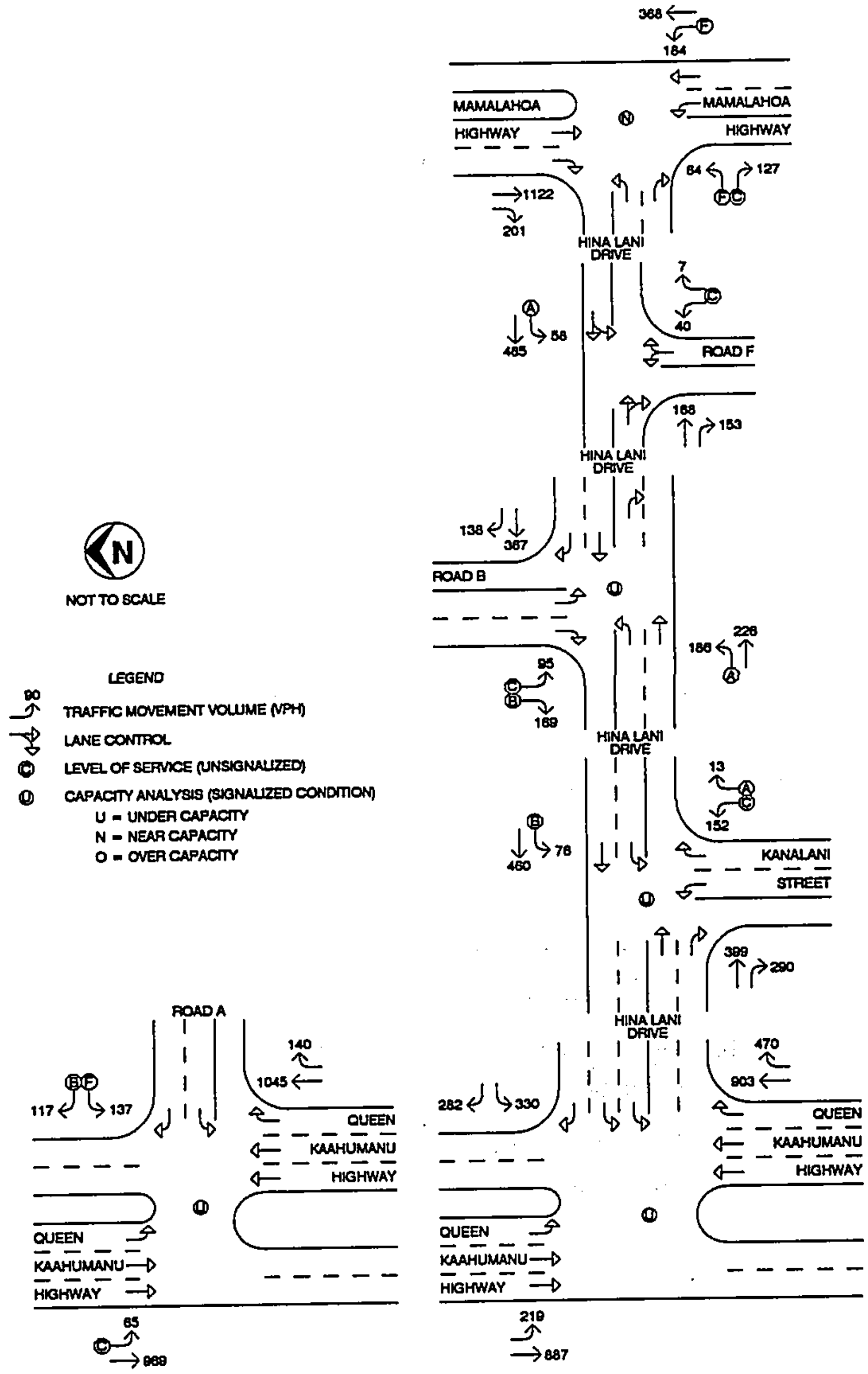


Figure 7. Year 2020 AM Peak Hour Traffic With Project

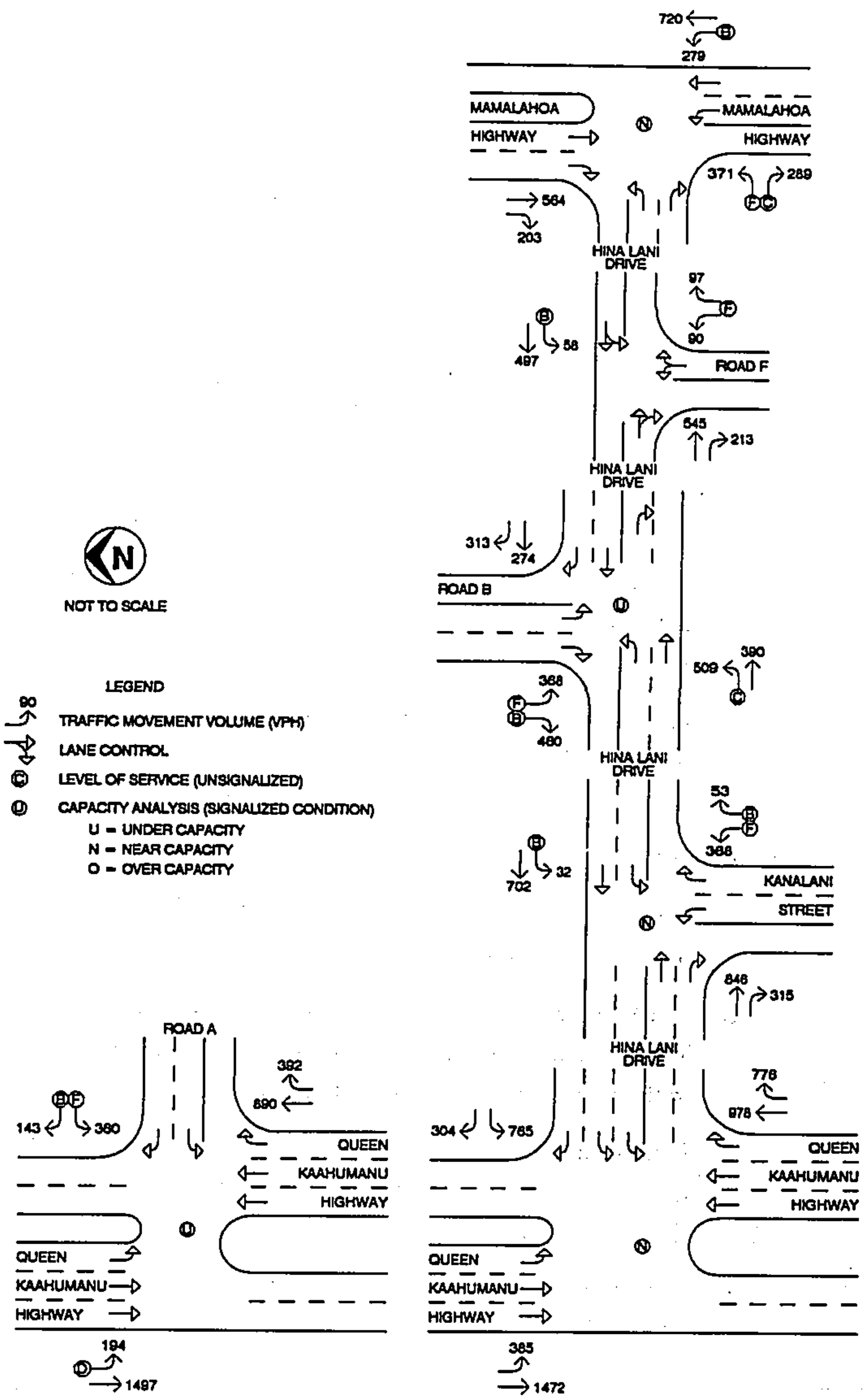


Figure 8. Year 2020 PM Peak Hour Traffic With Project

2. **Traffic Improvements By Others**

   a. The intersection of Hina Lani Drive and Kanalani Street should be signalized to mitigate LOS "F" conditions expected during the PM peak hour of traffic without the proposed project.

   b. Hina Lani Drive should be widened at Kanalani Street to provide an exclusive right turn lane in the mauka bound direction and an exclusive left turn lane in the makai bound direction to minimize queuing from Kanalani Street to Queen Kaahumanu Highway.

   c. Kanalani Street should be widened at Hina Lani Drive to provide separate left turn and right turn lanes at Hina Lani Drive to facilitate the side street movements at the proposed signalized intersection.

   d. Mamalahoa Highway should be signalized at its intersection with Hina Lani Drive to mitigate the LOS "F" conditions during AM and PM peak hours of traffic without the proposed project.

   e. Southbound Mamalahoa Highway should be widened to provide an exclusive right turn lane at Hina Lani Drive, to facilitate the right turn movement at the proposed signalized intersection.

3. **Project Access Improvements**

   a. The intersection of Queen Kaahumanu Highway and Road A should be signalized, when it becomes warranted.

   b. Queen Kaahumanu Highway should be widened to provide an exclusive left turn lane in the southbound direction and an exclusive right turn lane in the northbound direction at Road A.

   c. Hina Lani Drive should be widened at Road B to provide an exclusive left turn lane in the mauka bound direction and an exclusive right turn lane in the makai bound direction.

   d. The intersection of Hina Lani Drive and Road B should be signalized, when it becomes warranted.

4. **Off-Site Improvements**

   a. Southbound Hina Lani Drive should be widened to provide dual left turn lanes at Queen Kaahumanu Highway.

   b. Widen Hina Lani Drive at Road F to provide an exclusive left turn lane in the makai bound direction and an exclusive right turn lane in the mauka bound direction.

5. **Future Traffic Improvements**

   a. Mamalahoa Highway should be widened from two lanes to four lanes, as described in the LTMPHC.

   b. The Mid-Level Arterial should be extended from Kealakehe Parkway to Kaimi Nani Drive, as described in the Keahole to Kailua Development Plan.

   c. Main Street should be extended from Kealakehe Parkway to Hina Lani Drive, as described in the Keahole to Kailua Development Plan.

   d. Kealakaa Drive and Waena Drive should be extended from Kealakehe Parkway to Kaimi Nani Drive, as described in the Keahole to Kailua Development Plan.

B. Conclusions

Table 3 summarizes the Level of Service for the existing two-lane and future four-lane highways analyzed in this study.

Table 3. Summary of Level of Service Analysis				
Highway	**Peak Hour**	**Existing LOS**	**Future LOS W/O Project**	**Future LOS W/Project**
Queen Kaahumanu Highway North of Hina Lani Drive	AM	E	*A*	*B*
	PM	E	*B*	*C*
Mamalahoa Highway North of Hina Lani Drive	AM	D	F	F
	PM	E	E	F
LOS A - Level of Service for Two-Lane Highway *LOS A* - Level of Service for Multi-Lane Highway				

About 1,500 acres of undeveloped land are located along Hina Lani Drive. The development of a total of 350 acres, which includes a portion of the Kaloko Subdivision and the proposed project, is analyzed in this traffic impact analysis. Hina Lani Drive at its intersection with Queen Kaahumanu Highway and its intersection with Mamalahoa Highway is expected to operate at near capacity conditions. The traffic impacts of the future development of the remaining acreage are subject to the development of additional north-south roadways, proposed in the Keahole to Kailua Development Plan. The Kealakaa Drive Extension, Waena Drive, and Main Street are expected to facilitate traffic circulation within the Keahole to Kailua area. The Mid-Level Arterial would increase access between Kailua-Kona and the Keahole to Kailua region.

All the previous studies, reviewed in this report, concur that the traffic demand on Queen Kaahumanu Highway would exceed the existing two-lane capacity before the Year 2000. The widening of Queen Kaahumanu Highway, between Kailua-Kona and Keahole Airport, is planned to be completed by the Year 2000.

The Year 2020 peak hour traffic demands on Mamalahoa Highway are expected to reach the capacity of the existing two-lane highway. The ongoing State DOT Land Transportation Masterplan for Hawaii County proposes to widen Mamalahoa Highway from two lanes to a four-lane, undivided highway from Waimea to Palani Road.

The Draft Environmental Assessment for the Queen Kaahumanu Highway Widening indicates that the proposed Mid-Level Arterial can be expected to carry about 36 percent of the total corridor traffic demand in the Year 2010, thereby relieving Queen Kaahumanu Highway and Mamalahoa Highway of traffic between Kailua-Kona and the Keahole to Kailua region.

The peak hour traffic, generated by the proposed Kaloko Town Center, is expected to impact traffic on the existing roadways in the surrounding area. The traffic improvements, proposed by others and those recommended in this report, are expected to mitigate the traffic impacts resulting from this project.